LIST OF FILES

UNMANNED AIRCRAFT SYSTEMS LEGISLATIVE TASK FORCE, 2013-2016
(SCOMM 181)

MEMBERS:

SENATOR OLSON (CO-CHAIR)
REPRESENTATIVE HUGHES (CO-CHAIR)

10 PUBLIC MEMBERS

Established by LR 17 SLA 2013 (HCR 6), LR 60 SLA 2014 (HCR 15)

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06/27/13	HCR 6: Appointment Letter of Task Force Members
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10/23/13	Task Force Meeting: Public Testimony
10/24/13	Task Force Meeting: Presentations and Public Testimony
11/26/13	Task Force Meeting: Minutes and Background Information
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12/05/14	Task Force Meeting: Presentations
02/11/15	Task Force Meeting: Presentations and Public Testimony
03/27/15	Media Articles: Eagle River Drone Incident
06/19/15	Task Force Meeting
09/03/15	Task Force Meeting

UNMANNED AIRCRAFT SYSTEMS LEGISLATIVE TASK FORCE, 2013-2016 (SCOMM 181)

11/15/15 Task Force Meeting

Drones on the Horizon: SciTech Lawyer (2015)

Economic Impact of a Pan-Pacific Unmanned Aircraft Systems Test Site - McDowell Group (2013)

Excerpts from FAA, GOA, and Other Federal Documents Governing UAS Use

Integration of Drones into Domestic Airspace - Congressional Research Service (2013)

Misc. Meeting Notes - No Date

MOA between USDOT, FAA, UAS Integration Office, US Dept. of Justice

Observations From Above: Unmanned Aircraft Systems and Privacy

Pilotless Drones - Congressional Research Service (2012)

Public Member Applications + Resumes - 2014

Small Unmanned Aircraft System Rulemaking Committee (Federal)

Survey of Other States' Legislation and Programs Governing UAS Use

03/26/13 HCR 6/HJR 12: Public Testimony and Background Documents

<TARGET><BILL>HCR 6</BILL><SUBJECT>03-26-13 HCR 6-HJR 12 Public Testimony and Background Documents</SUBJECT><COMM>JUNM28</COMM></TARGET>

SITE: MATSU	SUBJECT OF MEETING:	TESTIFY KEY:
COMMITTEE: HEDT	BILL# HCR6/HJR12	Y = yes LO = Listen only ? = Available for questions
DATE: 03/26/2013	UPDATE #:list 1	

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TO TESTIFY
Stewart Thompson	Meadow Lakes	SELF District 10	Y/HCR6

March 26, 2013

COMMITTEE:	SUBJECT:
HOUSE ECON. DEV., TRADE & TOURISM **DATE:** March 26, 2013	HCR6-EST. LEG. TASK FORCE ON UNMANNED AIRCRAFT

PLEASE SIGN IN

PLEASE PRINT: NAME & TITLE	ADDRESS (CITY & STATE)	REPRESENTING (No acronyms unless for a state agency, please.)	DO YOU WANT TO TESTIFY?
Luke Hopkins Mayor	Fairbanks North star Boro		✓
Theresa Woldstad	North Pole, Ak	COGS	

SITE:	SUBJECT OF MEETING:	TESTIFY KEY:
COMMITTEE:	BILL# HCR 6	Y = yes LO = Listen only ? = Available for questions
DATE:	UPDATE #:	

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TESTIFY
Lisa Herbert		Fairbanks Chamber of Commerce	yes
Ro Bailey		University of Alaska, Fairbanks	A ?'s
Steven Colligan		Academy of ~~Auto~~ MODEL Aeronautics, Wasilla	yes

Ms. Chairman and Committee members, I am Stuart Thompson of District 10, a private Alaskan citizen and voter. I am here to testify concerning HCR 6 under the dominate authority of Alaska Constitution Article I, Sections 1&2. Start of my prepared 3 Minute testimony.

This resolution needs considerable work before you pass it out. It is typical of district special interest legislation. I've worked seasonally in Fairbanks before to know. The sponsors have not thought it through and it comes off as another parroted propaganda resolution. Please recall the embarrassing example of the one in 2002 that supported President Bush's manufactured justifications to go to war in Iraq.

Now I do whole-heartedly support establishing a task force to recommend state and federal regulation of unmanned aircraft systems. But it is dumb and unethical not to balance all the special interests currently placed on the task force with actual public representation – such as people with constitutionally-driven interests from, for example, the Interior Alaska Conservative Coalition and the ACLU. Get real please. The current task force membership are not competent, by legal definition, to advise on citizen privacy—openly admitted to be an issue.

On that note, I testify that the following section of the resolution is blatantly false:

"WHEREAS unmanned aircraft systems may present a substantial risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific statutory authority to regulate privacy matters relating to unmanned Aircraft systems"

The sponsors overlook that constitutions are supreme statutory authority—clearly demonstrating the legitimacy of Rep. Wes Keller's Constitutional History Curriculum Bill now before the Senate Judiciary. Alaska's Constitution Article I, Section 14 (Searches & Seizures) & 22 (Right of Privacy) already regulate the use of unmanned aircraft in conducting population surveillance – in a word NOT AT ALL WITHOUT A PROPERLY ISSUED WARRANT. The sponsors also appear to ignore the US Constitution's 4th Amendment that covers the same thing.

Next, the US Constitution's Third Amendment, if given the same legal development that the Commerce Clause has enjoyed, would establish that privacy is the protected right—not just mere protection from forced support of military lodging. Americans have been continually forced to support the quartering of soldiers through their taxes—so the issue addressed by the Third Amendment cannot be an economic one. However, unrestricted quartering of soldiers in private homes is the simplest low-tech method of government surveillance of its population possible. This makes unregulated high tech surveillance just as unconstitutional, regardless of occasional benefits obtained.

This resolution as written starts another end run around our constitutions that you swore to uphold and defend. Please direct it back to the sponsors for substantial correction, or address my concerns in a committee work session.

Stuart Thompson
PO Box 870702
Wasilla, AK 99687
1-877-950-7980

FISCAL NOTE

STATE OF ALASKA
2013 LEGISLATIVE SESSION

Bill Version: **HCR6**
Fiscal Note Number:
() Publish Date:

Identifier (file name): HCR6-LEG-SESS-03-25-13
Title: Establishing Legislative Task Force on Unmanned Aircraft.....
Sponsor: Hughes, Kawasaki, Isaacson, Pruitt
Requester: Representative Hughes

Dept. Affected: Alaska Legislature
Appropriation: Legislative Operating Budget
Allocation: Session Expenses
OMB Component Number: 782

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

	FY14 Appropriation Requested	Included in Governor's FY14 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	**FY14**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**	**FY19**
Personal Services							
Travel							
Services							
Commodities							
Capital Outlay							
Grants, Benefits							
Miscellaneous							
TOTAL OPERATING	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

FUND SOURCE		(Thousands of Dollars)						
1002	Federal Receipts							
1003	GF Match							
1004	GF							
1005	GF/Prgm (DGF)							
1037	GF/MH (UGF)							
1178	temp code (UGF)							
TOTAL		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

POSITIONS							
Full-time							
Part-time							
Temporary							

CHANGE IN REVENUES							

Estimated SUPPLEMENTAL (FY13) operating costs _____ *(separate supplemental appropriation required)*
(discuss reasons and fund source(s) in analysis section)

Estimated CAPITAL (FY14) costs _____ *(separate capital appropriation required)*
(discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? _____
If yes, by what date are the regulations to be adopted, amended, or repealed? _____ Discuss details in analysis section.

Why this fiscal note differs from previous version (if initial version, please note as such)

Initial Version

Prepared by: Jessica Geary, Finance Manager — Phone: 465-6626
Division: Legislative Affairs Agency — Date/Time: 3/25/13 11:17am
Approved by: Pamela Varni, Executive Director — Date: 3/25/2013
Legislative Affairs Agency

(Revised 1/15/2013 OMB)

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2013 LEGISLATIVE SESSION

BILL NO. HCR6

Analysis

This Legislation has zero fiscal impact on the Legislative Affairs Agency.

ALASKA STATE LEGISLATURE

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Representative Shelley Hughes
House District 8 - Greater Palmer

House Special Committee Economic Development Trade and Tourism
State Capitol, Room 409
Juneau, AK 99801

HCR6 Unmanned Aircraft Task Force

Sponsor Statement

March 19, 2013

HCR6 recognizes the accomplishments of the University of Alaska Fairbanks, Center for Unmanned Aircraft Systems Integration and the research conducted to advance this technology in a safe manner. The research team at the Center has proven that unmanned aircraft can complete tasks more efficiently than traditional means, provide better information, and reduce life safety risks to animals and humans.

HCR6 also recognizes that with new technology comes the need to revisit certain laws to ensure the safety of our citizens and protect their privacy. This resolution forms a task force made up of legislators, government officials, and industry members. The task force will consider recommendations for privacy, appropriate use, and possible remedies for misuse. A preliminary report to the legislature is due in January 2014 and a final report of recommendations due January 2015.

While national news has sparked debate regarding the privacy concerns and the use of "drones" in U.S. National Airspace, Alaska has responsibly used unmanned aircraft for more than ten years. Some privacy concerns are due to limited understanding of this technology and some concerns are justified. The task force will consider regulation already in place by the Federal Aviation Administration and industry codes of conduct while reviewing Alaska state laws to determine the changes that may be necessary to protect the privacy of all Alaskans.

SPECIAL ORDERS: "**Sounds like the title for a new movie**"

Unmanned Aircraft VS Drones

In recent news, we've been saturated with articles about

- drones causing worldwide destruction and killing people,
- we've listened to hours of testimony, and
- even local news reported just yesterday on this seemingly hot topic.

The other side of the story may not be as newsworthy as death and filibustering but it's very exciting for Alaska.

Did you know that unmanned aircraft have been used in Alaska for some years?

This technology is known for taking care of the jobs that are determined "dull, dirty, and dangerous." Unmanned Aircraft Systems (UA Systems) helped with

- guiding the oil tanker to Nome to restock their tank farm for the winter,
- located a downed airplane near Bethel a few months ago, and
- they've even been used for counting sea lions that kept them from being placed on the endangered species list.

The missions UA Systems have successfully completed have protected pilots that would have been flying in inclement weather and have **conducted research in an economical fashion with reduced risk to human and animal lives**.

In the next couple of weeks, we will hear more from the University of Alaska Fairbanks and the ten years of work they've done with UA Systems and Alaska's opportunity to become selected as one of the nation's six test sites. A recent study indicated that the locations **selected as a NASA test site will bring significant growth in jobs, income, and in technological advancements in which Alaska can lead the nation.**

While "big brother" may be what many of us envision, miniature helicopters will not be recording us while singing in the shower. They may, however, fly over a car crash site to clear a highway in half the time of manual investigative methods.

What is the difference between unmanned aircraft systems and drones?

- UAS are aircraft operated without a pilot in or onboard the aircraft.
- Drones are a 'nickname' used by the military where UAS fly on a mission of military intent in a war zone.

I hope that you learn about unmanned aircraft systems with an open mind and an outlook for opportunity for our state. **I'll stop here before you think I'm "droning on" about this topic.**

AACC

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Alaska Aviation Coordination Council >

About the Council

Purpose:

The Alaska Aviation Coordination Council promotes aviation in Alaska. The Council provides a forum for aviation organizations active in the state to interact with each other and with government organizations. The principle goals of the Council are to:

- Share information among aviation organizations active in Alaska
- Exchange information with government organizations that have responsibilities or impact upon aviation
- Study matters that impact the Alaskan aviation community
- Provide accurate information to government agencies, or other entities, including the general public, concerning the nature and needs of the Alaskan aviation community

Membership:

The Council shall be composed of groups, organizations and individuals representing aviation in Alaska. Each organization represented will have one vote, cast by its official member, who may vote on matters considered by the Council. Additional members may be added upon a majority vote of the Council.

Membership in this council is considered as a public service focusing on contributing to the advancement of aviation. For this reason, each member is expected to recuse him or herself when their personal circumstances are in actual or apparent conflict with the issue at hand.

Officers:

The Council will elect a Chair, Vice-Chair and Secretary from the industry members to serve terms of two-years.
Current officers are:

Chair	Jim Cieplak	Alaskan Aviation Safety Foundation	(907) 360-5544	jcieplak@gci.net
Vice Chair	Dave Palmer	Arctic ATC & Aviation Technologies	(907) 745-5227	arcticatc@mtaonline.net
Secretary	Jane Dale	Alaska Airports Association		jdale@alaska.com

New chairman →

ALASKA STATE LEGISLATURE

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Representative Shelley Hughes
House District 8 - Greater Palmer

SECTION ANALYSIS
LS0639 version N

An Act establishing a crime for certain uses of unmanned aircraft; restricting the use of unmanned aircraft for collection of information or investigation by peace officers; establishing a task force to study and provide recommendations on the use of unmanned aircraft systems; and providing for an effective date.

Section	Language	Effects of Language
Section 1	adds a new section of uncodified law	
	LEGISLATIVE FINDINGS:	
(1)	the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has been designing and making control systems for unmanned aircraft systems since 1998 and is a leading research institution at the forefront of developing unmanned systems as cost-effective and readily available research tools;	(1) the UAF has been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing new uses, demonstrating these uses for various potential users, working with the FAA for safe use as well as developing technology to improve safety since 2001. The University has become known throughout the country for its leadership in advancing the state of the art and the safe use of UAS. Recently the importance of this work to the State of Alaska was recognized by the Board of Regents who established the Alaska Center for Unmanned Aircraft Systems Integration - Research, Development, Test & Evaluation, hereafter known as ACUASI, to provide this work for the benefit of the entire State of Alaska. Rationale: UAF started its work in 2001, but ACUASI was only established in Dec 2012. Also, UAF has worked on much more than control systems.
(2)	as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in	(2) UAF is currently researching other technologies being developed and improved for many users including law enforcement, which could potentially use these technologies for a variety of missions including search and rescue, forensic

	search and rescue operations, aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research on the Arctic, and for other private and public sector activities demonstrated by the use of an unmanned aircraft system by the Alaska Center for Unmanned Aircraft Systems Integration to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome, Alaska in 2012;	recording of scenes, and surveillance missions similarly to how manned aircraft are used today; Rationale: currently the language suggests only that law enforcement could use UAS for surveillance, yet the majority of potential uses for them are both beneficial and completely consistent with how manned aircraft are currently legally and appropriately used
(3)	while government agencies, including law enforcement agencies and universities, may operate unmanned aircraft systems using the Federal Aviation Administration Certificate of Authorization or Waiver process, a civil operator may only operate an unmanned aircraft system under a Federal Aviation Administration Special Airworthiness Certificate for experimental purposes, which does not provide for commercial operations; therefore, no unmanned aircraft systems are being lawfully deployed for commercial purposes;	FAA: UAS Interim Operational Approval Guidance 08-01 section 4.1 Certificate of Waiver or Authorization (COA). COAs are granted for a period of one year or less (for the length of use for a specific project) and each project is evaluated on its individual merits. GAO (Government Accountability Office) 12-889T Unmanned Aircraft Systems states that Using UAS for commercial purposes in not currently allowed in the national airspace.
(4)	the Federal Aviation Administration currently requires the designation of one pilot to be in command of an unmanned aircraft system at all times, and restricts the use by public agencies of unmanned aircraft systems to conduct routine flights over urban or populated areas, operations over heavily trafficked roads or open-air assemblies of people, discharge or drop objects while in flight, and operate without the capability of pilot intervention;	FAA: UAS Interim Operational Approval Guidance 08-01 section 4.1 Certificate of Waiver or Authorization (COA). Requirements and restrictions for use are expressed in section 8.0 Flight Operations.
(5)	the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that the unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; however, since unmanned aircraft systems present a substantial risk to privacy when used by law enforcement for surveillance, and given that currently neither the Federal Aviation Administration nor any other state or federal agency has specific statutory authority to	Since unmanned aircraft systems may present new risks to privacy when used by law enforcement for surveillance, and given that updated rules have not yet been promulgated by the FAA or other federal agencies, the legislature finds that, until appropriate rulemaking is completed with input from user groups affected by unmanned aircraft systems, a moratorium on certain uses by law enforcement is appropriate while encouraging other uses of unmanned aircraft systems to proceed. Rationale: While the public believes that "UAS present a substantial risk to privacy"

	regulate privacy matters relating to unmanned aircraft systems, the legislature finds that, until a comprehensive statutory structure can be put in place to protect privacy, controls must be established to preclude the use of unmanned aircraft systems by law enforcement while allowing certain uses of unmanned aircraft systems to proceed.	and that there is a "current lack of controls in place to protect privacy", the basis for that belief is likely overstated. Current rules for law enforcement regarding admissibility of evidence in court and protection of privacy cover the vast majority of cases likely to arise. What we know is there may be gaps that need to be covered with statute, regulations, or ultimately, court cases, and this bill intends to protect against those gaps until better understanding is achieved.
Section 2	AS 11.61 is amended by adding a new section	AS 11 is Criminal Law
	Sec. 11.61.260. Unlawful use of unmanned aircraft.	Creates a new crime
(a)	A person commits the crime of unlawful use of an unmanned aircraft if the person knowingly operates an unmanned aircraft in or on the premises of another person or entity for the purposes of acquiring information by the use of a sensing device that is capable of acquiring data from its surroundings, including by a camera, microphone, thermal detector, chemical detector, radiation gauge, and wireless receiver.	
(b)	This section does not apply to the use of an unmanned aircraft to conduct a search	All law enforcement activity is unauthorized except for:
(1)	under the express terms of a search warrant issued under AS 12.35;	Court issued search warrant
(2)	in accordance with a judicially recognized exception to the warrant requirement in AS 12.35;	
(3)	to monitor public land or an international border;	Public land and international borders
(4)	to monitor private land with the consent of the land owner; or	Private land with consent of owner
(5)	if an imminent risk of harm to life or property exists.	Imminent risk to life or property
(c)	In this section, "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from inside or on the aircraft.	This definition is provided in Public Law 112-95 Sec 331.
(d)	Property used to aid a violation of (a) of this section may be forfeited to the state upon conviction of the offender.	Forfeiture of the aircraft and associated equipment
(e)	Unlawful use of an unmanned aircraft is a class A misdemeanor.	Sentence and fine up to one year in jail and up to $10,000

Section 3	AS 18.65 is amended by adding a new section	AS 18 is Police Protection
	Article 4A. Unmanned Aircraft	
	Sec. 18.65.380. Use of unmanned aircraft in law enforcement.	
(a)	A peace officer or law enforcement agency may not use unmanned aircraft, participate in an investigation in which unmanned aircraft are being used, use information gathered by unmanned aircraft, or otherwise direct the use of unmanned aircraft.	Law enforcement may not use unmanned aircraft
(b)	This section does not apply to the use of an unmanned aircraft for a purpose permitted under AS 11.61.260(b).	Law enforcement can use unmanned aircraft for the exceptions listed above.
(c)	In this section, "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.	This definition is provided in Public Law 112-95 Sec 331.
Section 4	Adds a new section of uncodified law	
	UNMANNED AIRCRAFT SYSTEMS TASK FORCE	
(a)	The Unmanned Aircraft Systems Task Force is created in the legislative branch for the purpose of making recommendations for a statewide comprehensive plan to regulate that use of unmanned aircraft systems for public and private sector purposes.	
(b)	The task force consists of 10 members who, except for those in (1) and (2) of this subsection, shall be appointed jointly by the president of the senate and the speaker of the house of representatives as follows:	
(1)	One senator selected by the president of the senate, who shall serve as co-chair;	
(2)	One representative selected by the speaker of the house of representatives who shall serve as co-chair;	
(3)	The commissioner of transportation	
(4)	The commissioner of public safety	
(5)	The commissioner of natural resources	
(6)	One member representing municipal law enforcement	
(7)	The attorney general or the attorney general's designee	
(8)	The public defender or the public defender's designee	
(9)	The office of public advocacy	

(10)	One member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks.	
(c)	The task force shall, not later than January 15, 2014, submit an initial report to the legislature, and not later than January 15, 2015, submit a final report to the legislature. The reports must include	
(1)	Policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy when used by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;	
(2)	Recommendations to the legislature and the governor, including draft legislation required to achieve the policy objectives proposed by the task force.	
(d)	The task force shall meet as frequently as necessary to carry out its responsibilities.	
(e)	The task force may request administrative and technical support from the University of Alaska Fairbanks.	
(f)	Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180.	
(g)	The task force terminates on January 15, 2015.	
Section 5	**This act takes effect immediately under AS 01.10.070(c).**	

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Friday, March 08, 2013 10:53 AM
To: LAA Legal
Subject: Doug Gardner FW: FW: drone legislation

Re: weapons use

From: Ro Bailey [mailto:rbailey11@alaska.edu]
Sent: Wednesday, March 06, 2013 3:34 PM
To: Ginger Blaisdell
Cc: Matthew Cooper
Subject: Re: FW: drone legislation

We will have to look at the Hawaii bill. We had seen OR a bit ago.

While I'm not sure why they defined drones that way, we would not argue the point. However, the exact same definition works if you replace the word "drone" with "manned aircraft". The term weapon authorization is separate. Any aircraft, manned or unmanned, carries some sort of payload, ranging from passengers and baggage to sensors of various types, to weapons. Weapons on domestic aircraft that are not military are prohibited by the FAA Regulation Part 91.15, which specifically prohibits dropping objects from aircraft, and part 91.13 which prohibits careless and reckless use. As a matter of practice, even the law enforcement types we have talked with, nationwide, dismiss without consideration any weaponizing of UAS, and that includes the National Institute of Justice as well as the International Association of Chiefs of Police. So, it would be both unnecessary and redundant to forbid weapons on drones (or UAS, again, our preferred term).

In the military, weapons authorization is what must happen before an individual operator, pilot in this case, is permitted to engage an enemy with lethal force, whether it is a rifle, a shoulder-fired missile, or a bomb or missile from an aircraft. So, a fighter pilot would be given authorization both before takeoff and in flight, depending on the circumstances, to employ the weapons his or her aircraft carries. I'm not specifically knowledgeable on this for law enforcement, but I know they have rules of engagement which would also dictate when and how they use their personal weapons. Since weapons on UAS are categorically excluded by law, protocol, and practice, weapons authorization would not even come up.

Does that help?

Ro

On Wed, Mar 6, 2013 at 2:47 PM, Ginger Blaisdell <Ginger.Blaisdell@akleg.gov> wrote:

If you are entering into an application with HI and OR have you seen their recent legislation regarding drones?

Hawaii is SB783

What does it mean in the definitions of "drone" that it can carry a lethal or nonlethal payload? Is this the weapon authorization?

Thanks again,

Ginger

From: Ro Bailey [mailto:rbailey11@alaska.edu]
Sent: Wednesday, March 06, 2013 12:17 PM
To: Ginger Blaisdell

Subject: Re: FW: drone legislation

Great, Ginger, we will call you about 1:15 today.

Ro

On Wed, Mar 6, 2013 at 12:02 PM, Ginger Blaisdell <Ginger.Blaisdell@akleg.gov> wrote:

Yes, thank you!

I'm available any time today.

465-5256

ginger

From: Ro Bailey [mailto:rbailey11@alaska.edu]
Sent: Wednesday, March 06, 2013 12:01 PM
To: Ginger Blaisdell
Cc: esther.tempel@alaska.gov
Subject: Re: FW: drone legislation

Hi, Ginger,

Thank you for contacting me. The University of Alaska, primarily Fairbanks, has been working with Unmanned Aircraft Systems for over 10 years. We are currently in the middle of a major proposal to the FAA,

leading the proposal effort for the state as directed by last year's session funding, to become one of six test sites where the FAA will study the safe and proper tools and procedures for integrating these systems into the national airspace. There is a great deal more to this than your questions draw out. Would you be available for a telephone conversation today? I'd like to explain more of the program and also get a more complete understanding of what you need.

Ro

Ro Bailey

Deputy Director

Alaska Center for Unmanned Aircraft Systems Integration - RDT&E

University of Alaska Fairbanks

w: 907-455-2104

f: 907-455-2120

On Wed, Mar 6, 2013 at 11:07 AM, Ginger Blaisdell <Ginger.Blaisdell@akleg.gov> wrote:

With further reading, UAA and DNR may also be currently using drone technology.

I've included both of you to please respond to the following questions that I've asked of other agencies.

Thank you so much,

Ginger

From: Ginger Blaisdell
Sent: Wednesday, March 06, 2013 10:02 AM
To: McKenzie, Constance M (DOT) (connie.mckenzie@alaska.gov); 'mchugh.pierre@alaska.gov'; terry.vrabec@alaska.gov
Subject: drone legislation

Representative Hughes has requested that I prepare "drone" legislation and I need some basic feedback from your agencies.

What existing statutes authorize your respective agency the ability to use drones? (DOTPF might be FAA regulation)

What purposes do you currently use drones and what purposes would you anticipate the need for drone use?

What restrictions do you currently impose on drone use (size, power/speed, functional capacity such as, cameras, infrared, weapons, microphones/announcements, quieting technology, etc.)

I've read HB159 but it seems to focus more on admissible evidence where Rep Hughes would like to provide specific provisions for use of drones (and possibly include admissible evidence).

I need any feedback you can give by tomorrow as the bill drafters are beginning right away. We are hoping to introduce legislation next week.

Thank you

Ginger

Office of Representative Shelley Hughes

Room 409 State Capitol

Juneau, AK 99811

907-465-5265

Ginger Blaisdell

From: Pierre, McHugh (MVA) <mchugh.pierre@alaska.gov>
Sent: Wednesday, March 06, 2013 2:40 PM
To: Ginger Blaisdell; McKenzie, Constance M (DOT); Vrabec, Terry E (DPS)
Subject: RE: drone legislation

All aircraft are regulated by the FAA. Remotely Piloted Aircraft, RPAs, are specifically identified by the FAA.
There are altitude requirements that must be met. The University of Alaska operates a program dedicated to small RPAs. They fly under 500 feet and must be within sight of the operator, just like a remote controlled air plane operated by a hobbyist. They must also not fly within 3 miles of an active air field.
Any RPAs we operate are on federal military installations used for security of the base. Fort Greely is a good example. It is easier to patrol the fence with an RPA, and allows another way to keep eyes in the field without having the presence of a humvee or a sus-v.
We only have RPAs that are military property and operated under military command and control on a base. We do not have the ability to take that federal property outside the wire to use for State of Alaska needs.
I really think the issue is not flying an RPA, but what type of sensors are being used to gather information and where that information is going. I know there is a large remote control group in the Mat-Su that could be impacted by some legislation, so please consider them before you move forward.
Thanks.

McHugh Pierre
Deputy Commissioner
Department of Military and Veterans Affairs
907-428-6003 Anchorage Office

From: Ginger Blaisdell [mailto:Ginger.Blaisdell@akleg.gov]
Sent: Wednesday, March 06, 2013 10:02 AM
To: McKenzie, Constance M (DOT); Pierre, McHugh (MVA); Vrabec, Terry E (DPS)
Subject: drone legislation

Representative Hughes has requested that I prepare "drone" legislation and I need some basic feedback from your agencies.

What existing statutes authorize your respective agency the ability to use drones? (DOTPF might be FAA regulation)
What purposes do you currently use drones and what purposes would you anticipate the need for drone use?
What restrictions do you currently impose on drone use (size, power/speed, functional capacity such as, cameras, infrared, weapons, microphones/announcements, quieting technology, etc.)

I've read HB159 but it seems to focus more on admissible evidence where Rep Hughes would like to provide specific provisions for use of drones (and possibly include admissible evidence).

I need any feedback you can give by tomorrow as the bill drafters are beginning right away. We are hoping to introduce legislation next week.

Thank you
Ginger

Office of Representative Shelley Hughes
Room 409 State Capitol
Juneau, AK 99811

Ginger Blaisdell

From: Maisch, John C (DNR) <chris.maisch@alaska.gov>
Sent: Thursday, March 07, 2013 8:33 AM
To: Tempel, Esther (DNR); Swenson, Robert F (DNR); Combellick, Rod A (DNR); Goodrum, Brent W (DNR); Parsons, Martin W (DNR); Menefee, Wyn (DNR); Brown, Dean N (DNR)
Cc: Ginger Blaisdell; Kurth, J Thomas (DNR); Henderson, Marsha J (DNR)
Subject: RE: drone legislation

Esther,

Please see Tom's comments below and let us know if you need anything more. As you know, Tom is our Chief of Fire and Aviation at DOF, but the context might be helpful to Ginger.

Chris...this is what I wrote up this morning. It is "off the cuff" as I would talk directly with Poker Flat on this for more detail. However, let's see if this will work.

What *existing statutes authorize your respective agency the ability to use drones? (DOTPF might be FAA regulation)*

The Division of Forestry and the interagency wildland fire community works cooperatively with the University of Alaska at Poker Flats. Poke Flat is the operator of the drone(s) and has the authorization to do so.

What purposes do you currently use drones and what purposes would you anticipate the need for drone use?

The Division of Forestry's WIldland Fire Program has utilized drones on several occasions on an interagency basis on large fires. We also have worked cooperatively with the University of Alaska at Poker Flats to apply and improve drone application in fire management. There most important and only use has been on large fires when smoke or weather conditions have prohibited more conventional aerial support. Often times weather conditions that prohibit conventional flying and fire monitoring may persist for long periods of time. Using Forward Looking Infrared Technology (FLIR), a drone has allowed an incident management team to utilize data to search for fire perimeter growth and improve mapping capabilities.

Aerial reconnaissance for fire behavior, perimeter growth, and mapping are the current applications. In the future, fire detection, communications (repeater), suppression effectiveness (line construction) and weather monitoring are potential applications.

What restrictions do you currently impose on drone use (size, power/speed, functional capacity such as, cameras, infrared, weapons, microphones/announcements, quieting technology, etc.)

Drones provided to the Division of Forestry and the incident management teams have been small and self contained. The unit is launched and captured on incident. It is controlled by a mobile until and flown by computer with an operator on incident. Usage has been limited to remote areas where they have not interfered with regular air traffic.

One limitation we operate under:

When flying drones in support of fire reconnaissance, FAA regulations impose the same restrictions on pilots that are flying in conventional aircraft. A typical large fire has a significant "air show" in the form of helicopters,

air tankers, air attack, etc. We would typically limit any drone operation outside of our operational period of sixteen work hours. FAA regulations allow a pilot to fly eight hours within a fourteen hour availability day. Incorporating a drone operation in fire management within the timeframes most valuable for data collection, before the operational period and after the operational period, a drone operation then needs two operators. Two operators are not always available with the operation we use. This regulation limits our data collection opportunities.

Tom Kurth
(907) 590-3184

From: Tempel, Esther (DNR)
Sent: Wednesday, March 06, 2013 11:15 AM
To: Swenson, Robert F (DNR); Combellick, Rod A (DNR); Goodrum, Brent W (DNR); Parsons, Martin W (DNR); Menefee, Wyn (DNR); Maisch, John C (DNR); Brown, Dean N (DNR)
Subject: FW: drone legislation

I may be way off base but I imagine the only divisions within DNR that might possibly even use drones would be DGGS, DMLW and DOF. If you do, can you answer the questions posed below and if you don't, just let me know ☺

Esther

From: Ginger Blaisdell [mailto:Ginger.Blaisdell@akleg.gov]
Sent: Wednesday, March 06, 2013 11:07 AM
To: rbailey11@alaska.edu; Tempel, Esther (DNR)
Subject: FW: drone legislation

With further reading, UAA and DNR may also be currently using drone technology.
I've included both of you to please respond to the following questions that I've asked of other agencies.

Thank you so much,
Ginger

From: Ginger Blaisdell
Sent: Wednesday, March 06, 2013 10:02 AM
To: McKenzie, Constance M (DOT) (connie.mckenzie@alaska.gov); 'mchugh.pierre@alaska.gov'; terry.vrabec@alaska.gov
Subject: drone legislation

Representative Hughes has requested that I prepare "drone" legislation and I need some basic feedback from your agencies.

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Thank you
Ginger

Office of Representative Shelley Hughes
Room 409 State Capitol
Juneau, AK 99811
907-465-5265

VIRGINIA ACTS OF ASSEMBLY — CHAPTER

An Act to place a moratorium on the use of unmanned aircraft systems.

[S 1331]

Approved

Be it enacted by the General Assembly of Virginia:

1. *§ 1. No state or local agency or organization having jurisdiction over criminal law enforcement or regulatory violations, including but not limited to the Department of State Police, and no department of law enforcement as defined in § 15.2-836 of the Code of Virginia of any county, city, or town shall utilize an unmanned aircraft system before July 1, 2015.*

Notwithstanding the prohibition in this section, an unmanned aircraft system may be deployed before July 1, 2015, when an Amber Alert is activated pursuant to § 52-34.3 of the Code of Virginia, when a Senior Alert is activated pursuant to § 52-34.6 of the Code of Virginia, when a Blue Alert is activated pursuant to § 52-34.9 of the Code of Virginia, or for the purpose of a search and rescue operation. In no case may a weaponized unmanned aircraft system be deployed or its use facilitated by a state or local agency in Virginia.

The prohibitions in this section shall not apply to the Virginia National Guard while utilizing unmanned aircraft systems during training required to maintain readiness for its federal mission, when facilitating training for other United States Department of Defense units, or when such systems are utilized to support the Commonwealth for purposes other than law enforcement, including damage assessment, traffic assessment, flood stages, and wildfire assessment.

Ginger Blaisdell

From: Chuck Burnham
Sent: Wednesday, March 06, 2013 2:36 PM
To: Ginger Blaisdell
Subject: RE: Leg. Research: Drones
Attachments: FAA 91-57.pdf; FAA 4910-13.pdf; FAA Guidance 08-01.pdf

Hi Ginger –The FAA is in the process of developing classifications for drones but have not yet published direction to that end. The agency's current working definitions are below.

The distinguishing characteristics between drones (unmanned aircraft systems to the FAA) and model aircraft is not necessarily the vehicles but rather their intended use, although the FAA Reauthorization of 2012 prohibits the FAA from regulating vehicles flown for hobby or recreational use that are 55 pounds or less (details below). The classes of use are public (law enforcement, etc.), civil/commercial (private businesses), and model/hobby. Each of the three classes has different requirements (see attached FAA clarification document 4910-13), with public and civil/commercial uses strictly regulated and requiring certification by the FAA. By contrast, flight by hobbyists comes with fewer regulations; however, operators are barred from use in certain areas and are not allowed to charge for services.

There is no widely-accepted classification system or series of definitions for drones of which I am aware beyond calling them small, medium, and large. Legislative Legal may be better equipped to recommend definitions for potential legislation. Sorry I can't be more definitive than what the FAA has issued below.

From FAA Interim Operational Approval Guidance 08-01 (http://www.faa.gov/about/initiatives/uas/reg/media/uas_guidance08-01.pdf):

> **Unmanned Aircraft:** A device used or intended to be used for flight in the air that has no onboard pilot. This includes all classes of airplanes, helicopters, airships, and translational lift aircraft that have no onboard pilot. Unmanned aircraft are understood to include only those aircraft controllable in three axes and therefore, exclude traditional balloons.

From FAA website (http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=14153):

> **Model Aircraft**
> Recreational use of airspace by model aircraft is covered by FAA Advisory Circular 91-57, which generally limits operations to below 400 feet above ground level and away from airports and air traffic. In 2007, the FAA clarified that AC 91-57 only applies to modelers, and specifically excludes individuals or companies flying model aircraft for business purposes.

Expanded discussion of model aircraft makes from the FAA's clarification of policy under 14 CFR 91 regarding unmanned aircraft systems:

> In 1981, in recognition of the safety issues raised by the operation of model aircraft, the FAA published Advisory Circular (AC) 91-57, Model Aircraft Operating Standards for the purpose of providing guidance to persons interested in flying model aircraft as a hobby or for recreational use. This guidance encourages good judgment on the part of operators so that persons on the ground or other aircraft in flight will not be endangered. The AC contains among other things, guidance for site selection. Users are advised to avoid noise sensitive areas such as parks, schools, hospitals, and churches. Hobbyists are advised not to fly in the vicinity of spectators until they are confident that the model aircraft has been flight tested and proven airworthy. **Model aircraft should be flown below 400 feet** above the surface to avoid other aircraft in flight. **The FAA expects that hobbyists will**

> **operate these recreational model aircraft within visual line-of-sight.** While the AC 91-57 was developed for model aircraft, some operators have used the AC as the basis for commercial flight operations. [emphasis added]

Importantly, according to a report by the Government Accountability Office, the FAA Reauthorization Act of 2012 prohibits the agency from promulgating regulations where the aircraft in question is:

> (1) flown strictly for hobby or recreational use, (2) operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization, (3) limited to not more than 55 pounds (unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization), (4) operated in a manner that does not interfere with and gives way to any manned aircraft, and (5) when flown within 5 miles of an airport, prior notice of the operation is given to the airport operator and the air traffic control tower. (GAO 12-889, http://homeland.house.gov/sites/homeland.house.gov/files/Testimony-Dillingham.pdf)

To be clear, however, the FAA currently has no codified regulations regarding model aircraft.

Guidance 08-01, Circular 91-57, and clarification document 4910-13 are attached.

Best,

Chuck Burnham, Legislative Analyst
Legislative Research Services
State Capitol
Juneau, Alaska 99801
907.465.6607
907.465.3908 (fax)
chuck.burnham@legis.state.ak.us

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From: Ginger Blaisdell
Sent: Wednesday, March 06, 2013 1:17 PM
To: Chuck Burnham
Subject: RE: Leg. Research: Drones

Thank you – I'm scanning through this document to find more specifically what my original request was; I'm looking for definitions of use of drones. I think definitions are going to be critical at this point.
Can you help me research definitions?
I'm also looking for the difference between recreational RC aircraft and drones.
ginger

From: Chuck Burnham
Sent: Wednesday, March 06, 2013 12:29 PM
To: Ginger Blaisdell
Subject: Leg. Research: Drones

Hi Ginger – My report on drones is attached. The text of bills and resolutions from other states is Attachment B, which begins on page 34 of the file. Let me know if you need clarification or require additional information.

Best,

Chuck Burnham, Legislative Analyst
Legislative Research Services
State Capitol
Juneau, Alaska 99801
907.465.6607
907.465.3908 (fax)
chuck.burnham@legis.state.ak.us

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HOUSE BILL NO. 159

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVES KAWASAKI, Tuck

Introduced: 3/5/13
Referred: State Affairs, Transportation, Judiciary, Finance

A BILL

FOR AN ACT ENTITLED

"An Act relating to the admissibility of evidence acquired through the use of an unmanned aerial vehicle; establishing a crime for certain uses of unmanned aerial vehicles; and restricting the use of unmanned aerial vehicles for collection of information or investigation by peace officers and other government agents."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* **Section 1.** AS 09.25 is amended by adding a new section to read:

Sec. 09.25.052. Inadmissibility of information acquired by unmanned aerial vehicle. (a) In a civil action or proceeding, information obtained from the unlawful operation of an unmanned aerial vehicle is not admissible as evidence and may not be used for any purpose except as provided under AS 11.61.260 and AS 18.65.900.

(b) In this section, "unmanned aerial vehicle" has the meaning given in AS 11.61.260.

* **Sec. 2.** AS 11.61 is amended by adding a new section to read:

Sec. 11.61.260. Unlawful use of unmanned aerial vehicle. (a) A person commits the crime of unlawful use of an unmanned aerial vehicle if the person knowingly operates an unmanned aerial vehicle in or on the premises of another person or entity for the purpose of acquiring information by the use of a sensing device that is capable of acquiring data from its surroundings, including by a camera, microphone, thermal detector, chemical detector, radiation gauge, and wireless receiver.

(b) This section does not apply to the use of an unmanned aerial vehicle to conduct a search

(1) under the express terms of a search warrant issued under AS 12.35;

(2) in accordance with a judicially recognized exception to the warrant requirement in AS 12.35;

(3) to monitor public land or an international border; or

(4) to monitor private land with the consent of the landowner.

(c) In this section, "unmanned aerial vehicle" means an aircraft that is operated without direct human intervention from inside or on the aircraft.

(d) Unlawful use of an unmanned aerial vehicle is a class A misdemeanor.

* **Sec. 3.** AS 12.45 is amended by adding a new section to read:

Sec. 12.45.038. Inadmissibility of information acquired by unmanned aerial vehicle. (a) In a criminal action or proceeding, information obtained from the unlawful operation of an unmanned aerial vehicle is not admissible as evidence and may not be used for any purpose except as provided in AS 11.61.260 and AS 18.65.900.

(b) In this section, "unmanned aerial vehicle" has the meaning given in AS 11.61.260.

* **Sec. 4.** AS 18.65 is amended by adding a new section to read:

Article 13. Use of Unmanned Aerial Vehicles.

Sec. 18.65.900. Use of unmanned aerial vehicles. (a) Except as provided in (b) of this section, a government employee or agent, including a peace officer, may not participate in an investigation in which an unmanned aerial vehicle is being used, or otherwise direct the use of an unmanned aerial vehicle.

(b) This section does not apply to the use of an unmanned aerial vehicle for a purpose permitted under AS 11.61.260(b).

(c) In this section, "unmanned aerial vehicle" has the meaning given in AS 11.61.260.

Legislative Research Request Form

After filling out this form, print and send to ***research@akleg.gov*** or fax to Research at 465.3908.

Legislator Hughes

Requestor Ginger Blaisdell

Staff Contact Ginger Blaisdell

Telephone 465-5265

Report Topic Use of drones by non-military authorities in the USA

If related to a bill, please provide the bill number:
Please provide a date if the report is needed for a hearing or meeting: ASAP for bill drafting

Type Your Question or Questions Below

Please provide as much information as possible; use additional sheets if necessary. (See Tips for Requesting Research).

I would like to know the use of drones by non-military authorities in the USA to use examples or definitions of use in legislation being drafted currently. Expedited research is desirable because Rep Hughes would like the bill drafted and introduced as soon as possible.

Please note that the more we know about the overall purpose behind the request, the better able we are to focus our approach and to judge whether what we're finding is relevant to your needs. We also appreciate your sharing any background information you've already found, such as names and phone numbers of authorities, and citations to, or copies of, pertinent documents.

Additional Information (Overall Objective, Sources contacted, etc.)

(http://www.usnews.com/news/articles/2013/02/05/city-in-virginia-becomes-first-to-pass-anti-drone-legislation-)
http://www.washingtonguardian.com/drones-home
Rutherford Institute: Freedom from drone surveillance

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LEGISLATIVE RESEARCH SERVICES

Alaska State Legislature
Division of Legal and Research Services
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Research Brief

TO: Representative Shelley Hughes
FROM: Chuck Burnham, Legislative Analyst
DATE: March 6, 2013
RE: Drone Aircraft
LRS Report 13.269

You asked about measures to limit the use of unmanned aerial vehicles commonly known as "drones." Specifically, you wanted to know whether federal, state, and local governments have placed restrictions on the use of drones to collect data on citizens and if they have barred that information from being introduced as evidence in court proceedings. You also asked if states have restricted access to airspace for drones.

Briefly, neither Congress nor any state legislature has yet directly restricted the use of drones, although measures to do so are being considered across the country. At present, drone flight is closely regulated by the Federal Aviation Administration (FAA), which holds primacy over the use of the skies over all U.S. territory. In recent legislation Congress required the FAA to streamline the process by which unmanned aircraft are permitted; however, the Administration, like policymakers and other interested parties, is facing difficulty balancing security and privacy concerns with the practical and economic promise of drones.

As you know, unmanned aircraft systems (UAS), or "drones," have no onboard pilot and are operated remotely. Drones range from palm-size devices with a range of only a few dozen yards that must be flown within sight of the operator, to vehicles with wingspans as great as a Boeing 737 that can fly hundreds of miles at great speeds and at altitudes of greater than 60,000 feet using sophisticated satellite navigation systems monitored by operators on the other side of the globe. The possible applications of UAS include military and covert missions, law enforcement, search and rescue, weather and other scientific research, border surveillance, and others. The FAA expects the use of drones, particularly by law enforcement agencies, to expand rapidly in coming years as the devices become more readily available and their costs decrease.[1] The specter of the proliferation of drones for domestic surveillance has raised concern for advocates of privacy and civil liberties.

Federal Actions

Members of Congress have variously taken positions in favor and opposed to the domestic use of drones. Privacy concerns are represented by Senator Rand Paul's "Preserving Freedom from Unwarranted Surveillance Act" (S. 3287, 112th Congress, Second Session, 2012), which sought to prohibit the use of drones to gather evidence or other information unless pursuant to a legal warrant. The Act provides exceptions for drones used to patrol national borders, where "exigent circumstances" exist involving law enforcement possessing reasonable suspicion that swift action is necessary to protect life from imminent danger, and when high risk of a specific terrorist attack is identified by the Department of Homeland Security. Evidence collected in violation of the Act would be inadmissible as evidence in a criminal proceeding, and parties aggrieved by violations of the Act could bring civil action for relief or remedy.[2] The bill was referred to the Committee on the Judiciary but received no hearing. A similar bill was recently introduced in the new Congress (H.R. 637).[3]

Countervailing the privacy concerns of certain members of Congress is the recognition that drones hold great promise in domestic applications where the use of aircraft with onboard pilots is deemed impractical, too dangerous, or cost prohibitive.

---

[1] The FAA maintains a website on its activities regarding UAS at *http://www.faa.gov/about/initiatives/uas/*.

[2] More information on S. 3287 and companion legislation in the House of Representative (H.R. 5925), including full text of the measures, is available at *http://thomas.loc.gov/cgi-bin/thomas*.

[3] At the time of this writing the full text of H.R. 637, introduced Feb. 13, 2013, was not yet available from the Library of Congress. News media reports indicate that the measure is substantially similar to those that were before the 112th Congress (*http://thehill.com/blogs/transportation-report/aviation/283195-lawmakers-file-bill-to-limit-domestic-drone-flights*). The current resolution can be tracked at *http://thomas.loc.gov/cgi-bin/bdquery/D?d113:28:./temp/~bd9J4B::|/home/LegislativeData.php?n=BSS;c=113|*.

In an effort to realize this promise, Congress placed directives within the FAA Modernization and Reform Act of 2012 (P.L. 112-95, 49 USCS § 40101, et seq.) to streamline the process of obtaining permits for the use of UAS.[4]

FAA Authority

The FAA has primary authority over regulation of the National Airspace System (NAS), which includes essentially all of the atmosphere above U.S. territory extending 12 nautical miles offshore. Civilian use of UAS is tightly restricted, requiring the issuance of an experimental certificate from the FAA. Regulations for those certificates currently preclude carrying people or property for compensation, but allow research and development operations. Far more common is the use of drones by public agencies, which are required to obtain a Certificate of Waiver or Authorization (COA) from the Administration. Although COAs are typically more permissive than experimental certificates, strict regulation is maintained with flight restricted to a defined section of airspace and under specific circumstances, such as only during daylight hours and in the sight of the operator. The use of drones in densely populated areas is currently prohibited.[5] The COA process has been deemed by supporters of drone use to be overly restrictive, cumbersome, and time consuming. Congress included provisions to address those criticisms in its 2012 FAA reforms. Table 1 (attached), compiled by the U.S. Government Accountability Office (GAO), summarizes those provisions and the dates by which Congress expects the measures to be in place.[6]

Other Federal Issues: Jurisdiction, Security, and Privacy

The primary function of the FAA is to promote and maintain safety in the nation's skies. The major concerns of critics of drones are security and privacy. Interested observers, including the U.S. Government Accountability Office, believe that Congress' dependence on the FAA to manage these concerns is misplaced, urging that security and privacy are areas more appropriately under the purview of the Departments of Homeland Security and Justice, neither of which have taken significant steps to address the issue.

The legal questions regarding domestic drone use centers on the protections against unreasonable searches and seizures provided in the Fourth Amendment to the U.S. Constitution and related laws.[7] Although the jurisprudence on the general topic of privacy as relates to the Fourth Amendment is voluminous, the U.S. Supreme Court has not yet dealt specifically with the admissibility of information collected by drones into legal proceedings; however, previous decisions on privacy and related matters provide a framework on the topic. These issues are discussed in by the Congressional Research Services in its January 2013 report "Integration of Drones into Domestic Airspace: Selected Legal Issues," a copy of which we include as Attachment A. The FAA's concern over privacy issues has delayed implementation of a number of the Congressional benchmarks described in Table 1.[8]

State Opposition

Legislative measures opposing and/or restricting the use of drones are currently under consideration in at least 22 states. In two of these states—Montana and Virginia—a bill has been approved by one chamber of the legislature and, as is the case in a number of other states, news media suggests it is likely that the measures will ultimately be enacted. The impact of state actions will, however, be limited in scope by the primacy of the FAA in determining what sorts of vehicles are allowed in the National Airspace System and where they may fly. That is, states do not have the authority to simply prohibit drones in their skies. Instead, most of the measures we reviewed are substantively similar to those before Congress in that complete prohibitions are eschewed in favor of restricting who may use the drones and what can be done with the information gathered.

---

[4] Full text of the Act is available at *http://thomas.loc.gov/cgi-bin/query/z?c112:H.R.658:*.

[5] The FAA provides a fact sheet on UAS at *http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=14153#*.

[6] The GAO report on progress toward integrating UAS into the National Airspace System and associated privacy concern is available at *http://www.gao.gov/assets/650/648348.pdf*.

[7] Specifically, the Amendment reads, "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."

[8] For example, the program to establish six test ranges has been delayed (*http://www.businessweek.com/news/2013-02-14/drone-tests-must-adhere-to-privacy-rules-u-dot-s-dot-faa-says*).

The most common provisions in the state measures we reviewed bar state and local law enforcement from operating drones without a warrant or court order, prohibit information collected by UAS from being introduced in legal proceedings, and provide for civil actions brought by the targets of drones used in violation of the law. Exceptions to these restrictions are typically provided where there is reasonable suspicion that a crime is underway or is about to occur, where imminent danger to life exists, or for specific uses such as patrolling national borders. Certain measures, such as those before the legislatures of Hawaii and Maine, explicitly limit the duration of warrants obtained for drone use. Others, like those being considered in Indiana and Montana, provide for criminal penalties and/or fines for civilian use of UAS to monitor another person. A bill recently approved by the Virginia Assembly would place a moratorium until July 1, 2015, on the use of drones by state and local law enforcement agencies except as related to Amber, Senior, or Blue Alerts or rescue operations. Table 2 (following page) summarizes measures opposing or restricting the use of drones in 12 selected states. We include copies of the bills cited in Table 2 as Attachment B.

We hope this is helpful. If you have questions or need additional information, please let us know.

Table 1: Selected Federal Aviation Administration (FAA) Modernization and Reform Act of 2012 Requirements for Drone Regulation	
Approximate Deadline	**Requirement**
5/14/2012	Enter into agreements with appropriate government agencies to simplify the process for issuing Certificates of Authorization (COA) or waivers for public Unmanned Aircraft Systems (UAS).
8/12/2012	Establish a program to integrate UAS into the national airspace system at six test ranges. This program is to terminate 5 years after date of enactment.
8/12/2012	Develop an Arctic UAS operation plan and initiate a process to work with relevant federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes.
8/12/2012	Determine whether certain UAS can fly safely in the national airspace system before the completion of the Act's requirements for a comprehensive plan and rulemaking to safely accelerate the integration of civil UAS into the national airspace system or the Act's requirement for issuance of guidance regarding the operation of public UAS including operating a UAS with a COA or waiver.
11/10/2012	Expedite the issuance of a COA for public safety entities.
11/10/2012	Develop a comprehensive plan to safely accelerate integration of civil UAS into national airspace system.
11/10/2012	Issue guidance regarding operation of civil UAS to expedite COA process; provide collaborative process with public agencies to allow an incremental expansion of access into the national airspace system as technology matures and the necessary safety analysis and data become available and until standards are completed and technology issues are resolved; facilitate capability of public entities to develop and use test ranges; provide guidance on public entities' responsibility for operation.
2/14/2013	Approve and make publically available a five-year road map for the introduction of civil UAS into national airspace system, to be updated annually.
2/14/2013	Submit to Congress a copy of the comprehensive plan.
2/12/2013	Make operational at least one project at a test range.
8/14/2014	Publish in the Federal Register the Final Rule on small UAS.
8/14/2014	Publish in the Federal Register a Notice of Proposed Rulemaking to implement recommendations of the comprehensive plan.
8/14/2014	Publish in the Federal Register an update to the Administration's policy statement on UAS in Docket No. FAA-2006-25714.
9/30/2015	Achieve safe integration of civil UAS into the national airspace system.
12/14/2015	Publish in the Federal Register a Final Rule to implement the recommendations of the comprehensive plan.
12/31/2015	Develop and implement operational and certification requirements for public UAS in national airspace system.
2/14/2017	Report to Congress on the test ranges.

Notes: The FAA has delayed a number of the deadlines in this table due to privacy concerns.
Source: U.S. Government Accountability Office, "Measuring Progress and Addressing Potential Privacy Concerns Would Facilitate Integration into the National Airspace System," GAO 12-981, updated September 18, 2012, *http://www.gao.gov/assets/650/648348.pdf*

Table 2: Measures Impacting the Use of Unmanned Drones Currently Under Consideration in Selected States		
State	**Measure**	**Summary**
Arizona	HB 2574	Prohibits agencies of law enforcement, the state, or political subdivisions from using drones to gather evidence of any sort without a search warrant, and makes such evidence inadmissible in state or local legal proceedings. Bars monitoring persons in their homes, places of worship, or other locations where an expectation of privacy exists. Allows civil actions against law enforcement agencies in order to prevent, restrain, or remedy the unlawful use of drones.
Florida	HB 119	Prohibits law enforcement agencies from using drones to gather evidence; provides for civil actions in order to prevent or remedy violations; and makes such evidence inadmissible in state or local legal proceedings. Provides an exception for drones used to counter a terrorist attack deemed a high risk by the secretary of the U.S. Department of Homeland Security.
Florida	SB 92	Bars law enforcement agencies from using drones to gather evidence; provides for civil actions in order to prevent or remedy violations; and makes such evidence inadmissible in state or local legal proceedings. Provides exceptions for drones used to counter a terrorist attack deemed a high risk by the secretary of the U.S. Department of Homeland Security, and a warrant is obtained or reasonable suspicion is present that swift action is needed to prevent danger to life or property, escape of a suspect, or destruction of evidence.
Hawaii	SB 783	Prohibits state agencies from operating drones unless in certain emergency situations, pursuant to a warrant or court order. Any data collected on any person or area other than those legally targeted must remain confidential and be deleted within 24 hours. Limits the duration of warranted use to 48 hours before an extension must be requested. Requires a report to the legislature of any use of drones by state agencies, and related actions by courts.
Idaho	SB 1051	Prohibits any person, entity, or state agency from using drones to gather evidence or any information without a search warrant. Makes unlawful surveillance with drones of any individual, property, farm, or agricultural industry. Allows civil actions against law enforcement agencies in order to prevent, restrain, or remedy the unlawful use of drones. Provides an exception for use of a drone by law enforcement when "exigent circumstances" exist--that is, when there is reasonable suspicion that swift action is needed to prevent imminent danger to life.

Table 2: Measures Impacting the Use of Unmanned Drones Currently Under Consideration in Selected States (continued)		
State	**Measure**	**Summary**
Illinois	SR 792	Urges the United States Congress to repeal the provisions of the Federal Aviation Administration Modernization and Reform Act that require the FAA to develop a plan to expand the use of unmanned aircraft in the airspace above the continental United States and any other territory or possession of the United States, and thereby repeal the FAA's rules that have begun to implement the mandated plan.
Indiana	SB 20	Provides that a person who knowingly or intentionally uses an unmanned aerial vehicle to monitor a person, property, or thing without the written consent of the subject of the monitoring commits a Class D felony. Provides that images or communications obtained through the use of an unmanned aerial vehicle are not admissible as evidence. Provides that a person who possesses an image or communications obtained through the use of an unmanned aerial vehicle commits a Class A misdemeanor. Prohibits the use of public money to purchase an unmanned aerial vehicle.
Maryland	HB 1233	Prohibits law enforcement agencies from using drones to gather evidence; provides for civil actions in order to prevent or remedy violations; and makes such evidence inadmissible in state or local legal proceedings. Provides an exception for drones used to counter a terrorist attack deemed a high risk by the secretary of the U.S. Department of Homeland Security.
Maine	SB 72	Prohibits law enforcement agencies from using drones to gather evidence except in emergencies, in the face of threats to national security or imminent criminal activity, or in accordance with a warrant or a court order. Such use is restricted to 48 hours unless an extension not to exceed 30 days is granted. Bans the use of facial recognition or biometric technology and weaponry on drones. Any data collected on any person or area other than those legally targeted must remain confidential and be deleted within 24 hours. Authorizes civil action for violations. Requires reports by law enforcement agencies and the Attorney General of drone use.
Missouri	HB 46	Prohibits unwarranted intrusion through the use of unmanned aerial vehicles commonly known as drones; provides that no person, entity, or state agency shall use a drone or other unmanned aircraft to conduct surveillance of any individual, property owned by an individual, farm, or agricultural industry without the consent of that individual, property owner, farm or agricultural industry. Authorizes civil action for violations. Provides an exception for use of a drone by law enforcement when "exigent circumstances" exist--that is, when there is reasonable suspicion that swift action is needed to prevent imminent danger to life.

Table 2: Measures Impacting the Use of Unmanned Drones Currently Under Consideration in Selected States
(continued)

State	Measure	Summary
Montana	SB 150 (passed Senate 2/6/13)	Disallows introduction of information from drones in criminal proceedings. Prohibits any government agency from owning, using, or contracting an aerial vehicle containing an anti-personnel device. Provides for compensatory and punitive damages for a victim of a drone equipped with an anti-personnel device.
Montana	SB 196	Makes an offense for use of a drone for information collection in or upon the residence of another. Bars such information from being used as evidence in any proceeding, and provides a maximum fine of $500 for violation. Prohibits government agencies from operating drones except pursuant to a warrant, court order, to monitor public lands or international borders, or with consent of a private landowner.
North Dakota	HB 1373	Bars law enforcement agencies from using drones to gather evidence except pursuant to a warrant and only for investigation of felonies. Establishes conditions for such warrants. Provides exceptions for patrolling national borders, in exigent circumstances involving threats to life, and environmental catastrophes. Prohibits weaponry on drones, private surveillance uses, and law enforcement surveillance of lawfully assembled persons. Provides for civil actions. Prescribes uses of information from drones as evidence and the handling of that information. Requires documentation of drone use.
Virginia	HB 2012 (passed House 2/6/13)	Places a moratorium until July 1, 2015, on the use of drones by law enforcement agencies except in the case of Amber, Senior, or Blue Alerts or for search and rescue operations. In no circumstance may armed drones be deployed.

Notes: This table is not exhaustive of all measures currently under consideration that impact the use of drone aircraft.
Source: National Conference of State Legislature's Bill Information System (*http://www.ncsl.org/legislative-staff.aspx?tabs=856,34,721*).

Attachment A

U.S. Government Accountability Office, "Measuring Progress and Addressing Potential Privacy Concerns Would Facilitate Integration into the National Airspace System," *GAO 12-981*, updated September 18, 2012, http://www.gao.gov/assets/650/648348.pdf

Integration of Drones into Domestic Airspace: Selected Legal Issues

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Summary

Under the FAA Modernization and Reform Act of 2012, P.L. 112-95, Congress has tasked the Federal Aviation Administration (FAA) with integrating unmanned aircraft systems (UASs), sometimes referred to as unmanned aerial vehicles (UAVs) or drones, into the national airspace system by September 2015. Although the text of this act places safety as a predominant concern, it fails to establish how the FAA should resolve significant, and up to this point, largely unanswered legal questions.

For instance, several legal interests are implicated by drone flight over or near private property. Might such a flight constitute a trespass? A nuisance? If conducted by the government, a constitutional taking? In the past, the Latin maxim *cujus est solum ejus est usque ad coelum* (for whoever owns the soil owns to the heavens) was sufficient to resolve many of these types of questions, but the proliferation of air flight in the 20th century has made this proposition untenable. Instead, modern jurisprudence concerning air travel is significantly more nuanced, and often more confusing. Some courts have relied on the federal definition of "navigable airspace" to determine which flights could constitute a trespass. Others employ a nuisance theory to ask whether an overhead flight causes a substantial impairment of the use and enjoyment of one's property. Additionally, courts have struggled to determine when an overhead flight constitutes a government taking under the Fifth and Fourteenth Amendments.

With the ability to house surveillance sensors such as high-powered cameras and thermal-imaging devices, some argue that drone surveillance poses a significant threat to the privacy of American citizens. Because the Fourth Amendment's prohibition against unreasonable searches and seizures applies only to acts by government officials, surveillance by private actors such as the paparazzi, a commercial enterprise, or one's neighbor is instead regulated, if at all, by state and federal statutes and judicial decisions. Yet, however strong this interest in privacy may be, there are instances where the public's First Amendment rights to *gather* and *receive* news might outweigh an individual's interest in being let alone.

Additionally, there are a host of related legal issues that may arise with this introduction of drones in U.S. skies. These include whether a property owner may protect his property from a trespassing drone; how stalking, harassment, and other criminal laws should be applied to acts committed with the use of drones; and to what extent federal aviation law could preempt future state law.

Because drone use will occur largely in federal airspace, Congress has the authority or can permit various federal agencies to set federal policy on drone use in American skies. This may include the appropriate level of individual privacy protection, the balancing of property interests with the economic needs of private entities, and the appropriate safety standards required.

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Introduction

The integration of drones into U.S. skies is expected by many to yield significant commercial and societal benefits.[1] Drones could be employed to inspect pipelines, survey crops, and monitor weather.[2] One newspaper has already used a drone to survey storm damage,[3] and real estate agents have used them to survey property.[4] In short, the extent of their potential domestic application is bound only by human ingenuity.

In an effort to accelerate this introduction, in the FAA Modernization and Reform Act of 2012, Congress tasked the Federal Aviation Administration (FAA) with safely integrating drones into the national airspace system by September 2015.[5] Likewise, sensing the opportunities that unmanned flight portend, lobbying groups and drone manufacturers have joined the chorus of those seeking a more rapid expansion of drones in the domestic market.[6]

Yet, the full-scale introduction of drones into U.S. skies will inevitably generate a host of legal issues. This report will explore some of those issues. To begin, this report will describe the regulatory framework for permitting the use of unmanned vehicles and the potential rulemaking that will occur over the next few years. Next, it will discuss theories of takings and property torts as they relate to drone flights over or near private property. It will then discuss the privacy interests implicated by drone surveillance conducted by private actors and the potential countervailing First Amendment rights to gather and receive news. Finally, this report will explore possible congressional responses to these privacy concerns and identify additional potential legal issues.

Development of Aviation Law and Regulations

The predominant theory of airspace rights applied before the advent of aviation derived from the Roman Law maxim *cujus est solum ejus est usque ad coelum*, meaning whoever owns the land

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[1] A "drone" is simply an aircraft that can fly without a human operator. They are sometimes referred to as unmanned aerial vehicles (UAV), and the whole system—including the aircraft, the operator on the ground, and the digital network required to fly the aircraft—is referred to as an unmanned aircraft system (UAS). *See generally* CRS Report R42718, *Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System*, by Bart Elias.

[2] *See* GOV'T ACCOUNTABILITY OFFICE, UNMANNED AIRCRAFT SYSTEMS: MEASURING PROGRESS AND ADDRESSING POTENTIAL PRIVACY CONCERNS WOULD FACILITATE INTEGRATION INTO THE NATIONAL AIRSPACE SYSTEM (2012).

[3] It is reported that News Corp. has used a small drone to monitor storm damage in Alabama and flooding in North Dakota. Kashmir Hill, *FAA Looks Into News Corp's Daily Drone, Raising Questions About Who Gets to Fly Drones in the U.S.*, FORBES, (Aug. 2, 2011 3:52 P.M.), http://www.forbes.com/sites/kashmirhill/2011/08/02/faa-looks-into-news-corps-daily-drone-raising-questions-about-who-gets-to-fly-drones-in-the-u-s/.

[4] Nick Wingfield & Somini Sengupta, *Drones Set Sights on U.S. Skies*, N.Y. TIMES (Feb. 17, 2012), *available at* http://www.nytimes.com/2012/02/18/technology/drones-with-an-eye-on-the-public-cleared-to-fly.html?pagewanted=all&_r=0.

[5] FAA Modernization and Reform Act of 2012, P.L. 112-95, 126 Stat. 11.

[6] Groups such as the Association for Unmanned Vehicle Systems International, which boasts 7,200 members, including defense contractors, educational institutions, and government agencies, have been formed to advance the interests of the UAV community. Association for Unmanned Vehicle Systems International, http://www.auvsi.org/Home (last visited Jan. 7, 2012).

possesses all the space above the land extending upwards into the heavens.[7] This maxim was adopted into English common law and eventually made its way into American common law.[8] At the advent of commercial aviation, Congress enacted the Air Commerce Act of 1926[9] and later the 1938 Civil Aeronautics Act.[10] These laws included provisions stating that "to the exclusion of all foreign nations, [the United States has] complete sovereignty of the airspace" over the country.[11] Additionally, Congress declared a "public right of freedom of transit in air commerce through the navigable airspace of the United States."[12] This right to travel in navigable airspace came into conflict with the common law idea that each landowner also owned the airspace above the surface in perpetuity. If the common law idea was followed faithfully, there could be no right to travel in navigable airspace without constantly trespassing in private property owners' airspace. This conflict was directly addressed by the Supreme Court in *United States v. Causby*, discussed extensively below.

With the passage of the Federal Aviation Act in 1958,[13] the administrator of the FAA was given "full responsibility and authority for the advancement and promulgation of civil aeronautics generally.... "[14] This centralization of responsibility and creation of a uniform set of rules recognized that "aviation is unique among transportation industries in its relation to the federal government—it is the only one whose operations are conducted almost wholly within federal jurisdiction.... "[15] The FAA continues to set uniform rules for the operation of aircraft in the national airspace. In the FAA Modernization and Reform Act of 2012, Congress instructed the FAA to "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system."[16] These regulations must provide for this integration "as soon as practicable, but not later than September 30, 2015."[17]

Current FAA Regulations of Navigable Airspace

Fixed-Wing Aircraft

FAA regulations define the minimum safe operating altitudes for different kinds of aircraft. Generally, outside of takeoff and landing fixed-wing aircraft must be operated at an altitude that allows the aircraft to conduct an emergency landing "without undue hazard to persons or property on the surface."[18] In a congested area, the aircraft must operate at least "1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft."[19] The minimum safe

[7] Colin Cahoon, *Low Altitude Airspace: A Property Rights No-Man's Land*, 56 J. AIR L. & COM. 157, 161 (1990).

[8] *Id*; *see also* R. WRIGHT, THE LAW OF AIRSPACE 11-65 (1968).

[9] Air Commerce Act of 1926, P.L. 69-254, 44 Stat. 568, 572.

[10] Civil Aeronautics Act of 1938, P.L. 75-706, 52 Stat. 973.

[11] Codified as amended at 49 U.S.C. § 40103 (2012).

[12] Codified as amended at 49 U.S.C. § 40101 (2012).

[13] P.L. 85-726; 72 Stat. 737 (1958).

[14] H.Rept. 2360, 85th Cong., 2d Sess. (1958).

[15] S. Rept. 1811, 85th Cong., 2d Sess. (1958).

[16] P.L. 112-95, § 332(a)(1).

[17] *Id.* at § 332(a)(3).

[18] 14 C.F.R. § 91.119(a).

[19] *Id.* at § 91.119(b).

operating altitude over non-congested areas is "500 feet above the surface."[20] Over open water or sparsely populated areas, aircraft "may not be operated closer than 500 feet to any person, vessel, vehicle, or structure."[21] Navigable airspace is defined in statute as the airspace above the minimum safe operating altitudes, including airspace needed for safe takeoff and landing.[22]

Helicopters

While fixed-wing aircraft are subject to specific minimum safe operating altitudes based on where it is flying, regulation of helicopter minimum altitudes is less rigid. According to FAA regulations, a helicopter may fly below the minimum safe altitudes prescribed for fixed-wing aircraft if it is operated "without hazard to person or property on the surface."[23] Therefore, arguably a helicopter may be lawfully operated outside the zone defined in statute as navigable airspace.[24]

Current FAA Regulation of Drones

Public and Commercial Operators

Drones operated by federal, state, or local agencies must obtain a certificate of authorization or waiver (COA) from the FAA. After receiving COA applications, the FAA conducts a comprehensive operational and technical review of the drone and can place limits on its operation in order to ensure its safe use in airspace.[25] In response to a directive in the FAA Modernization and Reform Act of 2012, the FAA recently streamlined the process for obtaining COAs, making it easier to apply on their website.[26] It also employs expedited procedures allowing grants for temporary COAs if needed for time-sensitive mission.[27]

Private commercial operators must receive a special airworthiness certificate in the experimental category in order to operate.[28] These certificates have been issued on a limited basis for flight tests, demonstrations, and training. Presently, there is no other method of obtaining FAA approval to fly drones for commercial purposes. It appears these restrictions will be loosened in the coming

[20] *Id.* at § 91.119(c).

[21] *Id.*

[22] 49 U.S.C. § 40102(32).

[23] 14 C.F.R. § 91.119(d).

[24] *See* People v. Sabo, 185 Cal. App. 3d 845, 852 (1986) ("While helicopters may be operated at less than minimum altitudes so long as no hazard results, it does not follow that such operation is conducted within navigable airspace. The plain meaning of the statutes defining navigable airspace as that airspace above specified altitudes compels the conclusion that helicopters operated below the minimum are not in navigable airspace. The helicopter hovering above the surface of the land in such fashion as not to constitute a hazard to persons or property is, however, lawfully operated.").

[25] *See generally* FAA "Unmanned Aircraft Systems," *available at* http://www.faa.gov/about/initiatives/uas/cert/.

[26] *See* P.L. 112-95, § 334(a) (instructing the issuance of "guidance regarding the operation of public unmanned aircraft systems to ... expedite the issuance of a certificate of authorization process ... "); *see also* "Certificates of Authorization or Waiver (COA)," *available at* http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/.

[27] "FAA makes progress with UAS integration," *available at* http://www.faa.gov/news/updates/?newsId=68004.

[28] *See* 14 C.F.R. §§ 21.191, 21.193 (experimental certificates generally); 14 C.F.R. § 91.319 (operating limitations on experimental certificate aircraft).

years, since the FAA has been instructed to issue a rulemaking that will lead to the phased-in integration of civilian unmanned aircraft into national airspace.[29]

Recreational Users

The FAA encourages recreational users of model aircraft, which certain types of drones could fall under, to follow a 1981 advisory circular. Under the circular, users are instructed to fly a sufficient distance from populated areas and away from noise-sensitive areas like parks, schools, hospitals, or churches. Additionally, users should avoid flying in the vicinity of full-scale aircraft and not fly more than 400 feet above the surface. When flying within three miles of an airport, users should notify the air traffic control tower, airport operator, or flight service station. Compliance with these guidelines is voluntary. In the FAA Modernization and Reform Act of 2012, the FAA was prohibited from promulgating rules regarding certain kinds of model aircraft flown for hobby or recreational use. This prohibition applies if the model aircraft is less than 55 pounds, does not interfere with any manned aircraft, and is flown in accordance with a community-based set of safety guidelines. If flown within five miles of an airport, the operator of the model aircraft must notify both the airport operator and air traffic control tower.[30]

Safe Minimum Flying Altitude

The FAA does not currently regulate safe minimum operating altitudes for drones as it does for other kinds of aircraft. This may be one way that the FAA responds to Congress's instruction to write rules allowing for civil operation of small unmanned aircraft systems in the national airspace.[31] One possibility is for the FAA to create different classes of drones based on their size and capabilities. Larger drones that physically resemble fixed-wing aircraft could be subject to similar safe minimum operating altitude requirements whereas smaller drones could be regulated similar to helicopters.

Airspace and Property Rights

Since the popularization of aviation, courts have had to balance the need for unobstructed air travel and commerce with the rights of private property owners. The foundational case in explaining airspace ownership rights is *United States v. Causby*.[32]

United States v. Causby

In *United States v. Causby*, the Supreme Court directly confronted the question of who owns the airspace above private property.[33] The plaintiffs filed suit against the U.S. government arguing a violation of the Fifth Amendment Takings Clause, which states that private property shall not "be taken for public use, without just compensation." Generally, takings suits can only be filed

[29] P.L. 112-95, § 332(2).

[30] P.L. 112-95 § 336.

[31] *See id.* at § 332(b).

[32] United States v. Causby, 328 U.S. 256 (1946).

[33] *Id.*

against the government when a government actor, as opposed to a private part, causes the alleged harm.[34]

Causby owned a chicken farm outside of Greensboro, North Carolina that was located near an airport regularly used by the military. The proximity of the airport and the configuration of the farm's structures led the military planes to pass over the property at 83 feet above the surface, which was only 67 feet above the house, 63 feet above the barn, and 18 feet above the tallest tree.[35] While this take-off and landing pattern was conducted according to the Civil Aeronautics Authority guidelines, the planes caused "startling" noises and bright glare at night.

As the Court explained, "as a result of the noise, respondents had to give up their chicken business. As many as six to ten of their chickens were killed in one day by flying into the walls from fright. The total chickens lost in this manner was about 150.... The result was the destruction of the use of the property as a commercial chicken farm."[36] The Court had to determine whether this loss of property constituted a taking without just compensation.

At the outset, the Court directly rejected the common law conception of airspace ownership: "It is ancient doctrine that at common law ownership of the land extended to the periphery of the universe—*Cujus solum ejus est usque ad coelum.* But that doctrine has no place in the modern world."[37] The Court noted that Congress had previously declared a public right of transit in air commerce in navigable airspace and national sovereignty in the airspace.[38] These statutes could not be reconciled with the common law doctrine without subjecting aircraft operators to countless trespass suits. In the Court's words, "common sense revolts at the idea."[39]

Even though it rejected the idea that the Causbys held complete ownership of the air up to the heavens, the Court still had to determine if they owned any portion of the space in which the planes flew such that a takings could occur. The government argued that flights within navigable airspace that do not physically invade the surface cannot lead to a taking. It also argued that the landowner does not own any airspace adjacent to the surface "which he has not subjected to possession by the erection of structures or other occupancy."[40]

The Court did not adopt this reasoning, finding instead that "the landowner owns at least as much space above the ground as he can occupy or use in connection with the land. The fact that he does not occupy it in a physical sense—by the erection of building and the like—is not material."[41] Therefore, it found that the landowner owns the airspace in the immediate reaches of the surface necessary to use and enjoy the land and invasions of this space "are in the same category as invasions of the surface."[42] Above these immediate reaches, the airspace is part of the public

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[34] Takings claims filed against state government actors would not be filed under the Fifth Amendment. Rather, they would arise as state constitutional claims. For more information on takings, *see* CRS Report RS20741, *The Constitutional Law of Property Rights "Takings": An Introduction*, by Robert Meltz.

[35] *Id.* at 258.

[36] *Id.* at 259.

[37] *Id.* at 260-61.

[38] *Id.* at 260 (citing statutes then codified at 49 U.S.C. §§ 176(a), 403).

[39] *Id.*

[40] *Id.*

[41] *Id.* at 264 (citing Hinman v. Pacific Air Transport, 84 F.2d 755 (1936)).

[42] *Id.* at 265.

domain, but the Court declined to draw a clear line. The Court also noted that the government's argument regarding the impossibility of a taking based on flights in navigable airspace was inapplicable in this case because the flights over Causby's land were not within navigable airspace.[43] At the time, federal law defined navigable airspace as space above the minimum safe flying altitudes for specific areas, but did not include the space needed to take off and land. Even though these flights were not within navigable airspace, the Court seemed to suggest that if they were, the inquiry would not immediately end. Instead, the Court would then have to determine when the regulation itself, defining the navigable airspace, was valid.[44]

Ultimately, in the context of a taking claim, the Court concluded that "flights over private land are not a taking, unless they are so low and so frequent to be a direct and immediate interference with the enjoyment and use of the land."[45] With regard to the Causbys' chicken farm, the Court concluded that the military flights had imposed a servitude upon the land, similar to an easement, based on the interference with the use and enjoyment of their property. Although the land did not lose all its economic value, the lower court's finding clearly established the flights led directly to a diminution in the value of the property, since it could no longer be used for its primary purpose as a chicken farm.

Post-*Causby* Theories of Airspace Ownership

Causby clearly abandoned the ancient idea that private landowners each owned their vertical slice of the airspace above the surface in perpetuity as incompatible with modern life. The case set up three factors to examine in a taking claim that courts still utilize today: (1) whether the planes flew directly over the plaintiff's land; (2) the altitude and frequency of the flights; and (3) whether the flights directly and immediately interfered with the plaintiff's use and enjoyment of the surface land.[46]

However, it left many questions unanswered. Where is the dividing line between the "immediate reaches" of the surface and public domain airspace? Can navigable airspace intersect with the "immediate reaches" belonging to the private property? Can aircraft flying wholly within navigable airspace, as defined by federal law, ever lead to a successful takings claim? How does one assess claims based on lawfully operated aircraft, such as helicopters, flying below navigable airspace?

Subsequent cases have been brought using many different legal claims, including trespass and nuisance, as discussed below, and various ways of describing the resulting injury. Claims could include an "inverse condemnation," another way of describing a taking, or the establishment of an avigation, air, or flying easement. While these legal claims may have different names, it appears that courts use *Causby* as the starting point for analyzing all property-based challenges to

[43] *Id.* at 264.

[44] *Id.* at 263.

[45] *Id.* at 266.

[46] *See e.g.*, Andrews v. United States, 2012 U.S. Claims LEXIS 1644, *10 (explaining that the "The United States Court of Appeals for the Federal Circuit (Federal Circuit) has derived from Causby three factors for consideration 'in determining whether noise and other effects from overflights ... constitute a taking.... '"). *But see* Argent v. United States, 124 F.3d 1277, 1284 (1997) (finding a taking claim may be based on "a peculiarly burdensome pattern of activity, including both intrusive and non-intrusive flights").

intrusions upon airspace. Several different interpretations of *Causby* have emerged in the attempt to articulate an airspace ownership standard, a few of which are described here.

Following *Causby*, several lower courts employed a fixed-height theory and interpreted the decision as creating two distinct categories of airspace. On the one hand, the stratum of airspace that was defined in federal law as "navigable airspace" was always a part of the public domain. Therefore, flights in this navigable airspace could not lead to a successful property-right based action like a takings or trespass claim because the property owner never owned the airspace in the public domain. On the other hand, the airspace below what is defined as navigable airspace could be "owned" by the surface owner and, therefore, intrusions upon it could lead to a successful takings or property tort claim. Since this fixed-height theory of airspace ownership relies heavily on the definition of navigable airspace, the expansion of the federal definition of "navigable airspace" to include the airspace needed to take-off and land[47] greatly impacts what airspace a property owner could claim.

This strict separation between navigable airspace and the airspace a landowner can claim seems to have been disavowed by the Supreme Court. First, in dicta in *Braniff Airways v. Nebraska State Bd. of Equalization & Assessment*,[48] a case primarily dealing with the question of federal preemption of state airline regulations, the Court left open the possibility of a taking based on flights occurring in navigable airspace. It summarized *Causby* as holding "that the owner of land might recover for a taking by national use of navigable air space resulting in destruction in whole or in part of the usefulness of the land property."[49] Next, in *Griggs v. Allegheny County* the Supreme Court found that the low flight of planes over the plaintiff's property, taking off from and landing at a nearby airport's newly constructed runway, constituted a taking that had to be compensated under the Fifth Amendment.[50] The noise and fear of a plane crash caused by the low overhead flights made the property "'undesirable and unbearable'" for residential use, making it impossible for people in the house to converse or sleep.[51] The Court reached this conclusion that a taking occurred based on this injury, despite the fact that the flights were operated properly under federal regulations and never flew outside of navigable airspace.[52] Despite this holding, some lower courts have continued to lend credence to a fixed-height ownership theory as a reasonable interpretation of *Causby*.[53]

Another interpretation of *Causby* essentially creates a presumption of a non-taking when overhead flights occur in navigable airspace. This presumption would recognize the importance of unimpeded travel of air commerce and that Congress placed navigable airspace in the public domain. However, the presumption could be rebutted by evidence that the flights, while in navigable airspace, interfered with the owner's use and enjoyment of the surface enough to justify compensation. As one court reasoned, "as the height of the overflight increases... the Government's interest in maintaining sovereignty becomes weightier while the landowner's

[47] 49 U.S.C. § 40102(32) (2012).

[48] 347 U.S. 590 (1954).

[49] *Id.* at 596.

[50] Griggs v. Allegheny County, 369 U.S. 84, 90 (1962).

[51] *Id.* at 87.

[52] *Id.* at 86-89.

[53] *See, e.g.*, Aaron v. United States, 311 F.2d 798 (Ct. Cl. 1963); Powell v. United States, 1 Cl. Ct. 669 (1983).

interest diminishes, so that the damage showing required increases in a continuum toward showing absolute destruction of all uses of the property."[54]

Finally, some courts have concluded that the altitude of the overhead flight has no determinative impact on whether a taking has occurred. One federal court noted that the government's liability for a taking is not impacted "merely because the flights of Government aircraft are in what Congress has declared to be navigable airspace and subject to its regulation."[55] Under this approach, "although the navigable airspace has been declared to be in the public domain, 'regardless of any congressional limitations, the land owner, as an incident to his ownership, has a claim to the superjacent airspace to the extent that a reasonable use of his land involves such space.'"[56] Under this theory, the court would only need to examine the effect of the overhead flights on the use and enjoyment of the land, and would not need to determine if the flight occurred in navigable airspace.

While the definition of navigable airspace impacts each theory differently, it is clear that under the current interpretation a showing of interference with the use and enjoyment of property is required. Cases have clearly established that overhead flights leading to impairment of the owner's livelihood or cause physical damage qualify as an interference with use and enjoyment of property.[57] Additionally, flights that cause the surface to become impractical for its intended use by the current owner also satisfy the use and enjoyment requirement.[58] For example, in *Griggs*, the noise, vibration, and fear of damage caused by overhead flights made it impossible for the plaintiffs to converse with others or sleep within their house, leading to their retreat from the property, which had become "undesirable and unbearable for their residential use."[59] Some courts have recognized a reduction in the potential resale value of the property as an interference with its use and enjoyment, even if the property continues to be suitable for the purposes for which it is currently used.[60] One court explained: "Enjoyment of property at common law contemplated the entire bundle of rights and privileges that attached to the ownership of land ... Owners of fee simple estates ... clearly enjoy not only the right to put their land to a particular present use, but also to hold the land for investment and appreciation.... "[61] However, other courts have rejected the idea that restrictions on uses by future inhabitants, without showing loss of property value, are relevant to a determination of the owner's own use and enjoyment of the property.[62]

Trespass and Nuisance Claims Against Private Actors

Although *Causby* arose from a Fifth Amendment takings claim, its articulation of airspace ownership standards is also often used in determining state law tort claims such as trespass and nuisance. These state law tort claims could be used to establish liability for overhead flights

[54] Stephens v. United States, 11 Cl. Ct. 352, 362 (1986).

[55] Branning v. United States, 654 F.2d 88, 99 (1981).

[56] *Id.* at 98-99 (citing Palisades Citizens Association, Inc. v. C.A.B, 420 F.2d 188, 192 (D.C. Cir. 1969)).

[57] *See, e.g.*, *Causby*, 328 U.S. 256.

[58] *See, e.g., Griggs*, 369 U.S. 84; Pueblo of Sandia v. Smith, 497 F.2d 1043 (10th Cir. 1974) ("appellant failed to show interference with actual, as distinguished from potential, use of its land.").

[59] *Griggs*, 369 U.S. at 87.

[60] *See, e.g.*, Brown v. United States, 73 F.3d 1100 (1996); *Branning*, 654 F.2d 88.

[61] *Brown*, 73 F.3d 1100.

[62] Stephens v. United States, 11 Cl. Ct. 352 (1986).

operated by private actors, where a lack of government involvement precludes a takings claim. Generally, trespass is any physical intrusion upon property owned by another. However, unlike with surface trespass claims, simply proving that an object or person was physically present in the airspace vertically above the landowner's property is generally not enough to establish a trespass in airspace. Since *Causby* struck down the common law idea of *ad coelum*, landowners generally do not have an absolute possessory right to the airspace above the surface into perpetuity. Instead, airspace trespass claims are often assessed using the same requirements laid out in the *Causby* takings claim. Arguably, these standards are used in property tort claims because there can be no trespass in airspace unless the property owner has some possessory right to the airspace, which was the same question at issue in *Causby*.

To allege an actionable trespass to airspace, the property owner must not only prove that the interference occurred within the immediate reaches of the land, or the airspace that the owner can possess under *Causby*, but also that its presence interferes with the actual use of his land. As one court explained, "a property owner owns only as much air space above his property as he can practicable use. And to constitute an actionable trespass, an intrusion has to be such as to subtract from the owner's use of the property."[63] This standard for airspace trespass was also adopted by the Restatement (Second) of Torts.[64]

Nuisance is a state law tort claim that is not based on possessory rights to property, like trespass, but is rooted in the right to use and enjoy land.[65] Trespass and nuisance claims arising from airspace use are quite similar, since trespass to airspace claims generally require a showing that the object in airspace interfered with use and enjoyment of land. However, unlike trespass, nuisance claims do not require a showing that the interference actually occupied the owner's airspace. Instead, a nuisance claim can succeed even if the interference flew over adjoining lands and never directly over the plaintiff's land, as long as the flight constitutes a substantial and unreasonable interference with the use and enjoyment of the land.

Potential Liability Arising from Civilian Drone Use

The integration of drones into domestic airspace will raise novel questions of how to apply existing airspace ownership law to this new technology. How courts may apply the various interpretations of *Causby*, discussed above, to drones will likely be greatly impacted by the FAA's definition of navigable airspace for drones.

The potential for successful takings, trespass, or nuisance claims from drone use will also be impacted by the physical characteristics of the drone, especially given that current case law heavily emphasizes the impact of the flight on use and enjoyment of the surface property. Several characteristics of drones may make their operation in airspace less likely to lead to liability for drone operators than for aircraft operators. First, the noise attributed to drone use may be significantly less than noise created by helicopters or planes powered by jet engines. Second, drones commonly used for civilian purposes could be much smaller than common aircraft used today. This decreased size is likely to lead to fewer physical impacts upon surface land such as

[63] Geller v. Brownstone Condominium, 82 Ill. App. 3d 334, 336-37 (1980).

[64] RESTATEMENT (SECOND) OF TORTS § 159(2) (1965) (stating that "Flights by aircraft in the airspace above the land of another is a trespass if, but only if, (a) it enters into the immediate reaches of the airspace next to the land, and (b) it interferes substantially with the other's use and enjoyment of the land.").

[65] RESTATEMENT (SECOND) OF TORTS § 821D (1979); 2 DAN B DOBBS, ET AL. THE LAW OF TORTS § 398 (2d ed. 2011).

vibration and dust, which are common complaints arising from overhead aircraft and helicopter flights. Finally, it is unknown at this time how most drones will be deployed into flight. Will drone "airports" be used to launch the aircraft or will they take off and land primarily from individual property? If drone use remains decentralized and is not organized around an "airport," then drones are less likely to repeatedly fly over the same piece of property, creating fewer potential takings, trespass, or nuisance claims. Additionally, the majority of drones are more likely to operate like helicopters, taking off and landing vertically, than like traditional fixed-wing aircraft. This method of takeoff reduces the amount of surface the aircraft would have to fly over before reaching its desired flying altitude, minimizing the potential number of property owners alleging physical invasion of the immediate reaches of their surface property.

Alternatively, the potential ability for drones to fly safely at much lower altitudes than fixed-wing aircraft or helicopters could lead to a larger number of property-based claims. Low-flying drones are more likely to invade the immediate reaches of the surface property, thus satisfying part of the requirement for a takings or trespass claim.

Privacy

Perhaps the most contentious issue concerning the introduction of drones into U.S. airspace is the threat that this technology will be used to spy on American citizens. With the ability to house high-powered cameras, infrared sensors, facial recognition technology, and license plate readers, some argue that drones present a substantial privacy risk.[66] Undoubtedly, the government's use of drones for domestic surveillance operations implicates the Fourth Amendment and other applicable laws.[67] In like manner, privacy advocates have warned that private actors might use drones in a way that could infringe upon fundamental privacy rights.[68] This section will focus on the privacy issues associated with the use of drones by private, non-governmental actors. It will provide a general history of privacy law in the United States and survey the various privacy torts, including intrusion upon seclusion, the privacy tort most applicable to drone surveillance. It will then explore the First Amendment right to gather news. Application of these theories to drone surveillance will be discussed in the section titled "Congressional Response."

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[66] *See* Jennifer Lynch, *Are Drones Watching You?*, ELECTRONIC FRONTIER FOUNDATION (Jan. 10, 2012), https://www.eff.org/deeplinks/2012/01/drones-are-watching-you; M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 STAN. L. REV. ONLINE 29 (Dec. 12, 2011), http://www.stanfordlawreview.org/sites/default/files/online/articles/64-SLRO-29_1.pdf.

[67] For an analysis of the Fourth Amendment implications of government drone surveillance, see CRS Report R42701, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, by Richard M. Thompson II.

[68] *See* Press Release, Rep. Ed Markey, Markey Releases Discussion Draft of Drone Privacy and Transparency Legislation (Aug. 1, 2012), *available at* http://markey.house.gov/press-release/markey-releases-discussion-draft-drone-privacy-and-transparency-legislation.

> Drones are already flying in U.S. airspace – with thousands more to come – but with no privacy protections or transparency measures in place. We are entering a brave new world, and just because a company soon will be able to register a drone license shouldn't mean that company can turn it into a cash register by selling consumer information. Currently, there are no privacy protections or guidelines and no way for the public to know who is flying drones, where, and why. The time to implement privacy protections is now.

Id.

Early Privacy Jurisprudence

Although early Anglo-Saxon law lacked express privacy protections, property law and trespass theories served as proxy for the protection of individual privacy. Lord Coke pronounced in 1605 that "the house of everyone is to him as his castle and fortress, as well for his defence against injury and violence, as for his respose[.]"[69] This proposition that individuals are entitled to privacy while in their homes crossed the Atlantic with the colonists and appeared prominently in early revolutionary thinking.[70] In one early American common law decision, the court noted that "[t]he law is clearly settled, that an officer cannot justify the breaking open an outward door or window, in order to execute process in a civil suit; if he doth, he is a trespasser."[71] In cases lacking physical trespass, prosecutors relied on an eavesdropping theory, which protected the privacy of individuals' conversations while in their home.[72]

These century-old theories of trespass and eavesdropping, however, failed to keep up with a rapidly changing society fueled by advancing technologies. As with today's celebrity-obsessed society, late-19th century society experienced the birth and spread of "yellow journalism," a new media aimed at emphasizing the "curious, dramatic, and unusual, providing readers a 'palliative of sin, sex, and violence.'"[73] Faster presses and instantaneous photography enabled journalists to exploit and spread gossip.[74] Louis D. Brandeis (then a private attorney) and Samuel Warren were bothered with the press's constant intrusions into the private affairs of prominent Bostonians.[75] In 1890, they published a seminal law review article formulating a new legal theory—the right to be let alone.[76] Brandeis and Warren understood that existing tort doctrines such as trespass and libel were insufficient to protect privacy rights, as "only a part of the pain, pleasure, and profit of life lay in physical things."[77] They noted that this new right to privacy derived not from "the principle of private property, but that of an inviolate personality."[78] The authors observed that "instantaneous photographs and newspaper enterprise have invaded the sacred precincts of private and domestic life; and numerous mechanical devices threaten to make good the prediction that 'what is whispered in the closet shall be proclaimed from the house-tops.'"[79] Although this new theory had its detractors,[80] it found its way into the common law of several states.[81]

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[69] Semayne's Case, 5 Co. Rep. 91 (K. B. 1604).

[70] In contesting the use of general warrants by officials of the British Crown, known then as writs of assistance, James Otis argued that "one of the most essential branches of English liberty, is the freedom of one's house. A man's house is his castle; and while he is quiet, he is as well guarded as a prince in his castle." II LEGAL PAPERS OF JOHN ADAMS 142.

[71] *See* State v. Armfield, 9 N.C. 246, 247 (1822).

[72] Note, *The Right to Privacy in Nineteenth Century America*, 94 HARV. L. REV. 1892, 1896 (1981). In an early case from Pennsylvania, in recognizing eavesdropping as an indictable offense, the court noted: "Every man's home is his castle, where no man has a right to intrude for any purpose whatever. No man has a right to pry into your secrecy in your own house." Commonwealth v. Lovett, 4 Pa. L.J. Rpts. (Clark) 226, 226 (Pa. 1831); *see also* State v. Williams, 2 Tenn. 108, 108 (1808) (recognizing eavesdropping as an indictable offense).

[73] Ken Gromley, *One Hundred Years of Privacy*, 1992 WIS. L. REV. 1335, 1351 (1992) (quoting EDWIN EMERY & MICHAEL C. EMERY, THE PRESS AND AMERICA: AN INTERPRETATIVE HISTORY OF THE MASS MEDIA 349-50 (3d ed. 1972).

[74] *Id.* at 1350-51.

[75] William M. Prosser, *Privacy*, 48 Cal. L. Rev. 383, 383 (1960).

[76] Louis D. Brandeis & Samuel D. Warren, *The Right to Privacy*, 4 HARV. L. REV. 193, 205 (1890).

[77] *Id.* at 195.

[78] *Id.* at 205.

[79] *Id.* at 195.

[80] Herbert Spencer Hadley, *Right to Privacy*, 3 N.W. L. REV. 1, 3-4 (1894) ("The writer believes that the right to (continued...)

Privacy Torts

In 1939, the First Restatement of Torts (a set of model rules intended for adoption by the states) created a general tort for invasion of privacy.[82] By 1940, a minority of states had adopted some right of privacy either by statute or judicial decision, and six states had expressly refused to adopt such a right.[83] Twenty years later, Dean William Prosser surveyed the case law surrounding this right and concluded that the right to privacy entailed four distinct (yet, sometimes overlapping) rights: (1) intrusion upon seclusion; (2) public disclosure of private facts; (3) publicity which puts the target in a false light; and (4) appropriation of one's likeness.[84] These four categories were incorporated into the Restatement (Second) of Torts.[85]

Section 652B of the Restatement (Second) of Torts creates a cause of action for intrusion upon seclusion,[86] the privacy tort most likely to apply to drone surveillance.[87] It has been adopted either by common law or statute in an overwhelming majority of the states.[88] Section 652B provides: "One who intentionally intrudes, physically or otherwise, upon the solitude or seclusion of another or his private affairs or concerns, is subject to liability to the other for invasion of his privacy, if the intrusion would be highly offensive to a reasonable person."[89] Courts have developed a set of rules for applying § 652B. First, it requires an objective person standard, testing whether a person of "ordinary sensibilities" would be offended by the alleged invasion.[90] Thus, someone with an idiosyncratic sensitivity—say, an aversion to cameras—could not satisfy this standard by simply having his photograph taken. Likewise, the intrusion must not only be offensive, but "*highly* offensive,"[91] or as one court put it, "outrageously unreasonable conduct."[92] Generally, a single incident will not suffice; instead, the intrusion must be "repeated with such persistence and frequency as to amount to a course of hounding" and "becomes a burden to his existence.... "[93] However, in a few cases a single intrusion was adequate.[94] The invasion of

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privacy does not exist; that the arguments in its favor are based on a mistaken understanding of the authorities cited in its support[.]").

[81] *Compare* Roberson v. Rochester Folding Box Co., 171 N.E. 538, 542 (N.Y. 1902) (declining to adopt right of privacy), *with* Pavesich v. New England Life Ins. Co., 50 S.E. 68 (Ga. 1905) (recognizing a right to privacy).

[82] RESTATEMENT (FIRST) OF TORTS § 867 (1939).

[83] *See* Louis Nizer, *Right of Privacy – A Half Century's Development*, 39 MICH. L. REV. 526, 529-30 (1940).

[84] Prosser, *supra* note 75, at 385.

[85] RESTATEMENT (SECOND) OF TORTS §§ 652B (intrusion upon seclusion), 652C (appropriation of name or likeness), 652D (publicity given to private fact), 652E (publicity placing person in false light).

[86] *Id.* at § 652B.

[87] Because the use of drones for surveillance primarily concerns the collection, and not necessarily the dissemination, of information, this section will focus on the tort of intrusion upon seclusion, which has no publication requirement for recovery. *Id.* cmt. a.

[88] North Dakota and Wyoming are the only states not to adopt the privacy tort of intrusion upon seclusion. *See* Tigran Palyan, *Common Law Privacy in a Not So Common World: Prospects for the Tort of Intrusion Upon Seclusion in Virtual Worlds*, 38 SW. L. REV. 167, 180 n.106 (2008).

[89] *Id.*

[90] Shorter v. Retail Credit Co., 251 F. Supp. 329, 322 (D.S.C. 1966).

[91] RESTATEMENT (SECOND) OF TORTS § 652B (emphasis added).

[92] N.O.C., Inc. v. Schaefer, 484 A.2d 729, 733 (N.J. Super. Ct. Law Div. 1984).

[93] RESTATEMENT (SECOND) OF TORTS § 652B cmt. d.

[94] *See, e.g.*, Miller v. National Broadcasting Co., 187 Cal. App. 3d 1463 (Cal. Ct. App. 1986) (videotaping man in his (continued...)

privacy must been intentional, meaning the defendant must desire that the intrusion would occur, or as with other torts, [95] knew with a substantial certainty that such an invasion would result from his actions.[96] An accidental intrusion is not actionable. Finally, in some states, the intrusion must cause mental suffering, shame, or humiliation to permit recovery.[97]

A review of the case law demonstrates that the location of the target of the surveillance is, in many cases, determinative of whether someone has a viable claim for intrusion upon seclusion. For the most part, conducting surveillance of a person while within the confines of his home will constitute an intrusion upon seclusion.[98] The illustrations to § 652B offer an example of a private detective who photographs an individual while in his home with a telescopic camera as a viable claim.[99] Likewise, as one court observed, "when a picture is taken of a plaintiff while he is in the privacy of his home, ... the taking of the picture may be considered an intrusion into the plaintiff's privacy just as eavesdropping or looking into his upstairs windows with binoculars are considered an invasion of his privacy."[100]

The likelihood of a successful claim is diminished if the surveillance is conducted in a public place. The comments to § 652B explain that there is generally no liability for photographing or observing a person while in public "since he is not then in seclusion, and his appearance is public and open to the public eye."[101] Likewise, Prosser observed:

> On the public street, or in any other public place, the plaintiff has no right to be alone, and it is no invasion of his privacy to do no more than follow him about. Neither is it such an invasion to take a photograph in such a place, since this amounts to nothing more than making a record, not differing essentially from a full written description, of a public sight which anyone present would be free to see.[102]

The case law also supports this proposition. The Alabama Supreme Court dismissed a claim of wrongful intrusion against operators of a race track who photographed the plaintiffs while they were in the "winner's circle" at the track.[103] Similarly, a federal district court dismissed a claim by a husband and wife who had been photographed by Forbes Magazine while waiting in line at the Miami International Airport as it was taken in "a place open to the general public."[104] Likewise, a Vietnam veteran lost a claim for invasion of privacy based on photographs that depicted him and

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home while being resuscitated after having suffered a heart seizure); Nader v. General Motors Corp., 25 N.Y.2d 560, 570 (1970) (surveilling plaintiff in bank in an "overzealous" manner).

[95] RESTATEMENT (SECOND) OF TORTS § 652B.

[96] *See* DOBBS ET AL., *supra* note 65, at § 29.

[97] DeAngelo v. Fortney, 515 A.2d 594, 596 (Pa. Sup. 1986); Burns v. Masterbrand Cabinets, Inc., 369 Ill. App. 3d 1006, 1012 (Ill. App. Ct. 2007).

[98] *See, e.g.,* Wolfson v. Lewis, 924 F. Supp. 1413 (E.D. Penn. 1996).

[99] RESTATEMENT (SECOND) OF TORTS § 652B cmt. b, illus. 2.

[100] Lovgren v. Citizens First Nat. Bank of Princeton, 534 N.E.2d 987 (Ill. 1989); *see also* Souder v. Pendleton Detectives, 88 So.2d 716, 718 (La. Ct. App. 1956) (peeping into plaintiff's widows); Egan v. Schmock, 93 F. Supp. 2d 1090, 1094-95 (N.D. Cal. 2000) (filming plaintiff and family while in their home).

[101] RESTATEMENT (SECOND) OF TORTS § 652B cmt. c.

[102] Prosser, *supra* note 75, at 392.

[103] Schifano v. Green County, 624 So. 2d 178 (Ala. 1993).

[104] Fogel v. Forbes, 500 F. Supp. 1081, 1084, 1087 (E.D. Pa. 1980).

other soldiers during a combat mission in Vietnam—again, a public setting.[105] Other examples include the recording of license plate numbers of cars parked in a public parking lot[106] and photographing a person while walking on a public sidewalk.[107]

Indeed, even plaintiffs who were videotaped or photographed while on their own property have generally been unsuccessful in their privacy claims so long as they could be viewed from a public vantage point. Rejecting one plaintiff's claim for intrusion upon seclusion, the Supreme Court of Oregon held that even though the investigators trespassed on the plaintiff's property to film him, the investigation did not "constitute an unreasonable surveillance 'highly offensive to a reasonable man[,]'"[108] as the plaintiff could have been viewed from the road by his neighbors or passersby.[109] In another case, the wife of a prominent Puerto Rican politician sought damages from a newspaper for invasion of privacy allegedly committed when an agent of the newspaper photographed her house as part of a news story about her husband.[110] The court dismissed her claim as the photographers were not "unreasonably intrusive," and the photographs depicted only the outside of the home and no persons were photographed. [111] Similarly, in one case a couple sued a cell phone company for intrusion upon seclusion when the company's workers looked onto their property each time they serviced a nearby cell tower.[112] The court rejected their claim, holding that '[t]he mere fact that maintenance workers come to an adjoining property as part of their work and look over into the adjoining yard is legally insufficient evidence of highly offensive conduct."[113] There are many other examples.[114]

However, there have been some successful claims for intrusion upon seclusion involving surveillance conducted in public.[115] The comments to § 652B explain: "Even in a public place, however, there may be some matters about the plaintiff, such as his underwear or lack of it, that are not exhibited to the public gaze, and there may still be invasion of privacy when there is intrusion upon these matters."[116] One of the most famous cases concerning this "public gaze" theory involved a suit for invasion of privacy against a newspaper when it published a picture of

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[105] Tellado v. Time-Life, 643 F. Supp. 904, 907 (D.N.J. 1986).

[106] *See* International Union v. Garner, 601 F. Supp. 187, 191-92 (M.D. 1985); Tedeschi v. Reardon v. 5 F. Supp. 2d 40, 46 (D. Mass. 1998).

[107] Jackson v. Playboy Enterprises, Inc., 574 F. Supp. 10, 13 (S.D. Ohio 1983).

[108] McClain v. Boise Cascade Corp., 271 OR 549, 556 (1975). It should be noted that the court also relied on previous case law which held that one who seeks damages for alleged injuries "waives his right to privacy to the extent of a reasonable investigation." *Id.* at 554-555.

[109] *Id.* at 556.

[110] Mojica Escobar v. Roca, 926 F. Supp. 30, 32-33 (D.P.R. 1996).

[111] *Id.* at 35 (citing Dopp v. Fairfax Consultants, Ltd., 771 F. Supp. 494, 497 (D.P.R. 1990)).

[112] GTE Mobilnet of South Texas, LTD. Partnership v. Pascouet, 61 S.W. 3d 599, 605 (Tex. App. 2001).

[113] *Id.* at 618.

[114] *See, e.g.*, Aisenson v. American Broadcasting Co, 220 Cal. App. 3d 146, 162-63 (1990) (holding that broadcast of plaintiff while in his driveway and car was not an intrusion upon seclusion); Wehling v. Columbia Broadcasting System, 721 F.2d 506, 509 (5th Cir. 1983) (holding that broadcast of the outside of plaintiff's home taken from public street was not an invasion of privacy); Munson v. Milwaukee Bd. of School Directors, 969 F.2d 266, 271 (7th Cir. 1992) (same).

[115] *See* Kramer v. Downey, 684 S.W. 2d 524, 525 (Tex. Ct. App. 1984) ("[W]e now hold that the right to privacy is broad enough to include the right to be free of those willful intrusions into one's personal life at home and at work which occurred in this case.").

[116] RESTATEMENT (SECOND) OF TORTS § 652B cmt. c.

the plaintiff with her dress blown up as she was leaving a fun house at a county fair.[117] In upholding the plaintiff's claim, the court observed: "To hold that one who is involuntarily and instantaneously enmeshed in an embarrassing pose forfeits her right of privacy merely because she happened at the moment to be part of a public scene would be illogical, wrong, and unjust."[118] In *Huskey v. National Broadcasting Co. Inc.*, a prisoner sued NBC, a television broadcasting company, alleging that by filming him without consent while he was working out in the exercise yard at the prison, NBC invaded his privacy.[119] NBC countered that depictions of persons in a "publicly visible area" could not support the claim for invasion of seclusion.[120] Ultimately, the court permitted the prisoner's claim to go forward, observing that "[o]f course [the prisoner] could be seen by guards, prison personnel and inmates, and obviously he was in fact seen by NBC's camera operator. But the mere fact a person can be seen by others does not mean that person cannot legally be 'secluded.'"[121] Although relief is available for certain cases of public surveillance, recovery seems to be the exception rather than the norm.[122]

First Amendment and Newsgathering Activities

Based on the foregoing discussion, safeguarding privacy from intrusive drone surveillance is clearly an important societal interest. However, this interest must be weighed against the public's countervailing concern in securing the free flow of information that inevitably feeds the "free trade of ideas."[123] Unmanned aircraft can improve the press and the public's ability to gather news: they can operate in dangerous areas without putting a human operator at risk of danger; can carry sophisticated surveillance technology; can fly in areas not currently accessible by traditional aircraft; and can stay in flight for long durations. However, challenges arise in attempting to find an appropriate balance between this interest in newsgathering and the competing privacy interests at stake.

The First Amendment to the United States Constitution provides that "Congress shall make no law ... abridging the freedom of speech, or of the press.... "[124] The Court has construed this phrase to cover not only traditional forms of speech, such as political speeches or polemical articles, but also conduct that is "necessary for, or integrally tied to, acts of expression,"[125] such as distribution of political literature[126] or door-to-door solicitation.[127] Additionally, the Court has pulled within

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[117] Daily Times Democrat v. Graham, 276 Ala. 380, 381 (1964).

[118] *Id.* at 383.

[119] Huskey v. National Broadcasting Co., Inc., 632 F. Supp. 1282, 1285 (1986).

[120] *Id.* at 1286.

[121] *Id.* at 1287-88 (emphasis in original).

[122] Jennifer R. Scharf, *Shooting for the Stars: A Call for Federal Legislation to Protect Celebrities' Privacy Rights*, 3 BUFF. INTELL. PROP. L.J. 164, 183 (2006) ("Modifying intrusion to apply in public places would be necessary in order to provide any relief.").

[123] Abrams v. United States, 250 U.S. 616, 630 (1919) (Holmes, J., dissenting). Justice Stevens described this as a "conflict between interests of the highest order—on the one hand, the interest in the full and free dissemination of information concerning public issues, and, on the other hand, the interest in individual privacy and, more specifically, in fostering private speech." Bartnicki v. Vopper, 532 U.S. 514, 518 (2001).

[124] U.S. CONST. amend. I.

[125] Barry P. McDonald, *The First Amendment and the Free Flow of Information: Towards a Realistic Right to Gather Information in the Information Age*, 65 OHIO ST. L. J. 249, 260 (2004).

[126] Lovell v. City of Griffin, 3030 U.S. 444, 452 (1938).

[127] Watchtower Bible and Tract Soc'y of New York , Inc. v. Vill. of Stratton 536 U.S. 150, 168-69 (2002).

the First Amendment's protection other conduct that is not expressive in itself, but is "necessary to accord full meaning and substance to those guarantees."[128] For example, the Court has said that the public is entitled to a "right to receive news" as a correlative of the right to free expression.[129]

Like this right to receive news, the Court has intimated in a series of cases beginning in the 1960s that the public and the press may be entitled to *a right to gather news* under the First Amendment. Initially, in *Zemel v. Rusk*, the Court observed that the right "to speak and publish does not carry with it the unrestrained right to gather information."[130] The Court's reluctance to extend this right may have signaled its concern that an unconditional newsgathering right could subsume almost any government regulation that places a slight restriction on the ability to gather news.[131] However, several years later the Court indicated in *Branzburg v. Hayes* that although laws of general applicability apply equally to the press as to the general public, that "[n]ews gathering is not without its First Amendment protections,"[132] and that "without some protection for seeking out the news, freedom of the press could be eviscerated."[133] The Court, however, failed to clearly delineate the parameters of such a protection. In the Court's most recent case, *Cohen v. Cowles Media Co.*, the Court adhered to the "well-established line of decisions holding that generally applicable laws do not offend the First Amendment simply because their enforcement against the press has incidental effects on its ability to gather and report the news."[134] The Court noted that it is "beyond dispute 'that the publisher of a newspaper has no special immunity from the application of general laws. He has no special privilege to invade the rights of others.'"[135]

The lower federal courts have explored this right to gather news in the context of photographing or video recording. In *Dietemann v. Time, Inc.* the Ninth Circuit Court of Appeals explored the extent to which reporters could use surreptitious means to carry out their newsgathering.[136] There, defendants Time Life sent undercover reporters to a man's house where he claimed to use minerals and other materials to heal the sick. The reporters used a hidden camera to take pictures of the man, and a hidden microphone to transmit the conversation to other operatives. The defendants claimed that the First Amendment's right to freedom of the press shielded its newsgathering activities. In rejecting this claim, the court observed that although an individual accepts the risk when inviting a person into his home that the visitor may repeat the conversation to a third party, "he does not and should not be required to take the risk that what is heard and seen will be transmitted by photograph or recording, or in our modern world, in full living color and hi-fi to the public at large or to any segment of it that the visitor may select."[137] The court held that "hidden mechanical contrivances" are not indispensable tools of investigative reporting, and that the "First Amendment has never been construed to accord newsman immunity from torts

[128] McDonald, *supra* note 68, at 260.

[129] Kleindienst v. Mandel, 408 U.S. 753, 762–63 (1972).

[130] Zemel v. Rusk, 381 U.S. 1, 17 (1965).

[131] *Id.* at 16-17 ("There are few restrictions on action which could not be clothed by ingenious argument in the garb of decreased data flow. For example, the prohibition of unauthorized entry into the White House diminishes the citizen's opportunities to gather information he might find relevant to his opinion of the way the country is being run, but that does not make entry into the White House a First Amendment right.").

[132] Branzburg v. Hayes, 408 U.S. 665, 707 (1972).

[133] *Id.* at 681.

[134] *Id.* at 669.

[135] Cohen v. Cowles Media Co., 501 U.S. 663, 666 (1991).

[136] Dietemann v. Time, Inc., 449 F.2d 245 (9th Cir. 1971).

[137] *Id.* at 249.

or crimes committed during the course of newsgathering."[138] In *Galella v. Onassis*, Galella, a self-proclaimed "paparazzo," constantly followed around, harassed, and photographed Jacqueline Kennedy Onassis and her children.[139] As part of an ongoing lawsuit, Onassis sued Galella for, *inter alia*, invasion of her and her family's privacy. Galella argued that he was entitled to the absolute "wall of immunity" that protects newsmen under the First Amendment. The Second Circuit Court of Appeals quickly rejected this absolutist position: "There is no such scope to the First Amendment right. Crimes and torts committed in news gathering are not protected. There is no threat to a free press in requiring its agents to act within the law."[140] By contrast, the Seventh Circuit in *Desnick v. American Broadcast Companies, Inc.* held that surreptitious recording was not a privacy invasion because the target of the surveillance was a party to the conversation, thereby vitiating any claim to privacy in those conversations.[141]

Congressional Response

If Congress chooses to act, it could create privacy protections to protect individuals from intrusive drone surveillance conducted by private actors. Such proposals would be considered in the context of the First Amendment rights to gather and receive news. Several bills were introduced in the 112th Congress that would regulate the private use of drones. Additionally, there are other measures Congress could adopt.

In the 112th Congress, Representative Ed Markey introduced the Drone Aircraft Privacy and Transparency Act of 2012 (H.R. 6676).[142] This bill would amend the FAA Modernization and Reform Act of 2012 to create a comprehensive scheme to regulate the private use of drones, including data collection requirements and enforcement mechanisms. First, this bill would require the Secretary of Transportation, with input from the Secretary of Commerce, the Chairman of the Federal Trade Commission, and the Chief Privacy Officer of the Department of Homeland Security, to study any potential threats to privacy protections posed by the introduction of drones in the national airspace. Next, the bill would prohibit the FAA from issuing a license to operate a drone unless the application for such use included a "data collection statement." This statement would require the following items: a list of individuals who would have the authority to operate the drone; the location in which the drone will be used; the maximum period it will be used; and whether the drone would be collecting information about individuals. If the drone will be used to collect personal information, the statement must include the circumstances in which such information will be used; the kinds of information collected and the conclusions drawn from it; the type of data minimization procedures to be employed; whether the information will be sold, and if so, under what circumstances; how long the information would be stored; and procedures for destroying irrelevant data. The statement must also include information about the possible impact on privacy protections posed by the operation under that license and steps to be taken to mitigate this impact. Additionally, the statement must include the contact information of the drone operator; a process for determining what information has been collected about an individual; and a process for challenging the accuracy of such data. Finally, the FAA would be required to post the data collection statement on the Internet.

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[138] *Id.*

[139] Galella v. Onassis, 487 F.2d 986, 991-92 (2d Cir. 1973).

[140] *Id.* at 996-97 (internal citations omitted).

[141] Desnick v. American Broadcast Corporation, 44 F.3d 1345, 1353 (7th Cir. 1995).

[142] H.R. 6676, 112th Cong. 2d Sess. (2012).

H.R. 6676 includes several enforcement mechanisms. First, the FAA may revoke any license of a user that does not comply with these requirements. The Federal Trade Commission would have the primary authority to enforce the data collection requirements just stated. Additionally, the Attorney General of each state, or an official or agency of a state, is empowered to file a civil suit if there is reason to believe that the privacy interests of residents of that state have been threatened or adversely affected. H.R. 6676 would also create a private right of action for a person injured by a violation of this legislation.

Representative Ted Poe introduced the Preserving American Privacy Act of 2012 (H.R. 6199).[143] This bill would prevent any private actor from using a drone to conduct surveillance on any other private person without the consent of that other person. This ban on the private use of drones to record other private persons could present First Amendment concerns. First, a reviewing court would, in all likelihood, test whether this ban constituted a rule of general applicability under the *Cohen* and *Branzburg* line of cases.[144] In *Bartnicki v. Vopper*, the Supreme Court held that the wiretapping laws in question were of general applicability.[145] The Court observed that the statutes were designed to protect privacy and did not distinguish based on the content of the intercepted conversation. Instead, the communications were "singled out by virtue of the fact that they were illegally intercepted—by virtue of the source, rather than the subject matter."[146] This same argument could shield H.R. 6199 from a First Amendment challenge. Its purpose is to protect privacy,[147] and it does not distinguish between the subject matter of the drone surveillance, but instead bans any instance of private surveillance when the target has not consented to such monitoring. Additionally, this bill does not curtail the freedom to *publish* information,[148] but instead restricts the methods of collection. The public or media would have other avenues for obtaining the information sought. On the other hand, this measure could hinder the free flow of information, including coverage of newsworthy events, in contradiction to public's right to receive news and the Supreme Court's dicta in *Branzburg* that "[n]ews gathering is not without its First Amendment protections,"[149] and that "without some protection for seeking out the news, freedom of the press could be eviscerated."[150]

Additionally, Congress could create a cause of action for surveillance conducted by drones similar to the intrusion upon seclusion tort provided under Restatement § 652B.[151] How would a

[143] H.R. 6199, 112th Cong. 2d Sess. (2012).

[144] *See* "First Amendment and Newsgathering Activities," *supra*.

[145] Bartnicki v. Hopper, 532 U.S. 514, 526 (2001).

[146] *Id.*

[147] *See* Poe: Congress must Preserve American Privacy, http://poe.house.gov/index.php?option=com_content&view=article&id=8758:poe-congress-must-preserve-american-privacy-&catid=104:press-releases ("The bill seeks to ensure the privacy of American citizens by establishing specific guidelines about when and for what purposes law enforcement agencies and private individuals can use drones.")

[148] *See* Associated Press v. National Labor Relations Board, 301 U.S. 103, 133 (1937) (applying the National Labor Relations Act to the Associated press, the Court noted that the regulation in no way "circumscribes the full freedom and liberty of the [A.P.] to publish the news as it desires it published").

[149] Branzburg v. Hayes, 408 U.S. 665, 707 (1972).

[150] *See id.* at 707.

[151] As with the enactment of any federal statute, Congress must act within one of its constitutionally delegated powers when creating a federal privacy tort or a crime based on intrusion of privacy. It would appear that Congress could regulate this area under its Commerce Clause power, U.S. Const. art. I, § 8, cl. 3, which it acts under when regulating similar federal airspace issues. *See* Braniff Airways v. Nebraska Bd. of Equalization and Assessment, 347 U.S. 590 (1954); United States v. Helsley, 615 F.2d 784 (9th Cir. 1979).

court assess whether drone surveillance violated this type of tort? First, generally speaking, the location of the search would be determinative of whether a person is entitled to an expectation of privacy. Although courts have posited that the common law, like the Fourth Amendment, is intended to "protect people, not places[,]"[152] the *location* of an alleged intrusion factors heavily in a privacy analysis. The greatest chance for liability occurs when a person photographs or videotapes another while in the seclusion of his home. While technology has increasingly shrunk other spheres of privacy in the digital age, the home is still accorded significant legal protection. Using a drone to peer inside the home of another—whether looking through a window or utilizing extra-sensory technology such as thermal imaging—would likely constitute an intrusion upon seclusion. Moving from the home to a public space, or even a space on private property where one can be seen from a public vantage point, significantly reduces the chance of tort liability. However, certain instances of highly offensive surveillance in public may be actionable.

This leads to the second factor that will inform a reviewing court's analysis: the degree of offensiveness of the surveillance. The Ninth Circuit Court of Appeals, applying California law, observed that, in determining offensiveness, "common law courts consider, among other things: 'the degree of intrusion, the context, conduct and circumstances surrounding the intrusion as well as the intruder's motives and objectives, the setting into which he intrudes, and the expectations of those whose privacy is invaded.'" Several of these factors—especially, the context of the intrusion and the motive of the intruder—are fact intensive and require application in a particular case to fully understand. However, some generalizations can be made. The cases discussed above that did find an intrusion upon seclusion in a public place required highly offensive activity, such as closely following another person for an extended period or photographing another in a highly embarrassing shot. Likewise, a court might recognize liability if one were to use a drone to follow another for an extended period of time, particularly at a close distance. It is not clear, however, whether knowledge of being surveilled makes the monitoring more or less offensive. For example, one court seemed to rely on the fact that the defendant was unaware that her house was being photographed to hold that she did not have a viable privacy claim.[153] A drone flying at several thousand feet may not significantly disturb the target of the surveillance and could fall within this rationale. Nevertheless, filming someone in a compromising or embarrassing situation without his knowledge can be equally offensive. Here, the facts of the particular case would determine liability.

Congress could also create a privacy statute tailored to drone use similar to the anti-voyeurism statutes, or "Peeping Tom" laws, enacted in many states.[154] These laws prohibit persons from surreptitiously filming others in various circumstances and places.[155] Some states prohibit surreptitious surveillance of a person while on private property, usually a private residence.[156]

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[152] Pearson v. Dodd, 410 F.2d 701, 704 (D.C. Cir. 1969) (quoting Katz v. United States, 389 U.S. 347, 351 (1967)).

[153] Mojica Escobar v. Roca, 926 F. Supp. 30, 35 (D.P.R. 1996).

[154] Federal law does prohibit certain acts of voyeurism on federal property. Section 1801, Title 18 provides: "Whoever, in the special maritime and territorial jurisdiction of the United States, has the intent to capture an image of a private area of an individual without their consent, and knowingly does so under circumstances in which the individual has a reasonable expectation of privacy, shall be fined under this title or imprisoned not more than one year, or both." 18 U.S.C. § 1801(a). As discussed in note 151, *supra*, it appears Congress would have the authority to extend this section to voyeurism committed not only on federal property but that committed from federal airspace.

[155] Timothy J. Hortstmann, *Protecting Traditional Privacy Rights in Brave New Digital World: The Threat Posed by Cellular Phone-Cameras and What States Should Do to Stop It*, 111 PENN. ST. L. REV. 739, 742 (2007).

[156] *See, e.g*, GA. CODE ANN. § 16-11-61; MONT. CODE ANN. § 45-5-223.

Nevada employs this model, prohibiting a person from entering the property of another with the intent to peep through a window of the building.[157] Likewise, New Jersey prohibits a person from peering into the window of the dwelling of another "under circumstances in which a reasonable person in the dwelling would not expect to be observed."[158] Other states require a prurient intent when conducting the surveillance. Under Washington State's statute, a person commits the crime of voyeurism if, for the purpose of arousing or gratifying his sexual desire, he films or photographs (1) a person in a place where he or she would expect privacy; or (2) the intimate areas of another person, whether he or she is in a public or private place.[159]

Similarly, Congress could adopt an "anti-paparazzi" statute, like that enacted in California, to prevent intrusive drone surveillance.[160] In fact, Congress considered a similar measure in the 105th Congress. The Privacy Protection Act of 1998 and the Personal Intrusion Act of 1998 would have made it unlawful to persistently follow or chase another person for the purpose of obtaining a visual image of that person if the plaintiff met the following elements: (1) the image was transferred in interstate commerce or the person taking the photograph traveled in interstate commerce; (2) the person had a reasonable expectation of privacy from such intrusion; (3) the person feared death or bodily injury from being chased; and (4) the taking of the image was for commercial purposes.[161] Also, these bills would have created a civil remedy for an individual whose privacy was intruded upon. Congress could use this model to make it unlawful to persistently monitor another person using drone surveillance.

Related Legal Issues

In addition to the legal issues described above, there are a host of other issues that may arise when introducing drones into United States national airspace system.

Right to Protect Property from Trespassing Drones. There may be instances where a landowner is entitled to protect his property from intrusion by a drone. Under Restatement (Second) of Torts § 260, "one is privileged to commit an act which would otherwise be a trespass to a chattel or a conversion if the act is, or is reasonably believed to be, necessary to protect the actor's land or chattels or his possession of them, and the harm inflicted is not unreasonable as compared with the harm threatened."[162] What this means is, in certain instances, a landowner would not be liable to the owner of a drone for damage necessarily or accidentally resulting from removing it from his property. However, there appear to be no cases where a landowner was

[157] NEV. REV. STAT. § 200.603.

[158] N.J. STAT. ANN. § 2C:18-3c.

[159] WASH. REV. CODE § 9A.44.115; *see also* CAL. PENAL CODE § 647; R.I. GEN. LAWS § 11-64-2.

[160] California Civil Code § 1708.8 provides:

> A person is liable for constructive invasion of privacy when the defendant attempts to capture, in a manner that is offensive to a reasonable person, any type of visual image, sound recording, or other physical impression of the plaintiff engaging in a personal or familial activity under circumstances in which the plaintiff had a reasonable expectation of privacy, through the use of a visual or auditory enhancing device, regardless of whether there is a physical trespass, if this image, sound recording, or other physical impression could not have been achieved without a trespass unless the visual or auditory enhancing device was used.

[161] H.R. 3224, H.R. 2448, 105th Cong., 2d sess. (1998).

[162] RESTATEMENT (SECOND) OF TORTS § 260.

permitted to use force to prevent or remove an aircraft from his property. Additionally, as discussed above, determining whether a drone in flight is trespassing upon one's property may be unusually challenging.

Stalking, Harassment, and Other Crimes. Traditional crimes such as stalking, harassment, voyeurism, and wiretapping may all be committed through the operation of a drone. As drones are further introduced into the national airspace, courts will have to work this new form of technology into their jurisprudence, and legislatures might amend these various statutes to expressly include crimes committed with a drone.

Wiretap Laws. Under the federal wiretap statute, it is unlawful to intentionally intercept an "oral communication"[163] by a person "exhibiting an expectation that such communication is not subject to interception under circumstances justifying such expectation.... "[164] Currently, commercial microphones can record sounds upwards of 300 feet.[165] Use of such a microphone on a drone to record private conversations could implicate the federal wiretap statute.

Preemption of State Aviation Regulations. The increased presence of drones in domestic airspace raises the question of which aspects of drone use states may be able to individually regulate. The Supreme Court has stated that federal preemption of state laws and regulations occurs where "the pervasiveness of the federal regulation precludes supplementation by the States, where the federal interest in the field is sufficiently dominant, or where the object sought to be obtained by the federal law and the character of obligations imposed by it reveal the same purpose."[166] Congress vested sole responsibility for the aviation industry and domestic airspace with the federal government in the Federal Aviation Act of 1958.[167] According to the legislative history, the FAA was to have "full responsibility and authority for the advancement and promulgation of civil aeronautics generally, including promulgation and enforcement of safety regulations."[168]

Generally, state regulations of aviation safety, airspace management, and aviation noise are preempted by federal laws and regulations.[169] In *City of Burbank v. Lockheed Air Terminal, Inc.*, the Supreme Court struck down a local city ordinance that prohibited planes from taking off during certain hours of the day as preempted by the federal regulatory scheme.[170] Expressing its fear regarding local control of airspace, the Court stated, "If we were to uphold the Burbank ordinance and a significant number of municipalities followed suit, it is obvious that fractionalized control of the timing of takeoffs and landings would severely limit the flexibility of

[163] 18 U.S.C. § 2511(1)(a).

[164] 18 U.S.C. § 2510(2).

[165] *See, e.g.*, Electromax International, Inc., http://www.electromax.com/penmics.html (last visited Jan. 22, 2013).

[166] Schneidewind v. ANR Pipeline Co., 485 U.S. 293, 300 (1988).

[167] P.L. 85-726; 72 Stat. 737 (1958).

[168] H.R. Rept. No. 2360, 85th Cong. (1958).

[169] *See, e.g.*, City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973); Abdullah v. American Airlines, Inc., 181 F.3d 363 (3d Cir. 1999); San Diego Unified Port Dist. v. Gianturco, 651 F.2d 1306, 1316 (9th Cir. 1981); Price v. Charter Township, 909 F. Supp. 498 (E.D. Mich. 1995).

[170] *City of Burbank*, 411 U.S. at 639.

the FAA in controlling air traffic flow."[171] The Supreme Court has, however, upheld state regulations imposing taxes on aircraft equipment located within the state.[172]

Conclusion

The legal issues discussed in this report will likely remain unresolved until the civilian use of drones becomes more widespread. To that end, the FAA has been tasked with developing "a comprehensive plan to safely accelerate the integration" of drones into the national airspace, which focuses on the safety of the drone technology and operator certification. While the deadline for development of the plan has already elapsed, the FAA has until the end of FY2015 to implement such a plan.[173] Additionally, the FAA must identify six test ranges where it will integrate drones into the national airspace. This deadline, 180 days after enactment of the act, has also elapsed without FAA compliance. Once these regulations are tested and promulgated, the unique legal challenges that could arise based on the operational differences between drones and already ubiquitous fixed-wing aircraft and helicopters may come into sharper focus.

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[171] *Id.*

[172] Braniff Airways v. Nebraska Board, 347 U.S. 590 (1954). Additionally, several courts have determined that state law tort claims based on injuries caused by aircraft are not federally preempted. *See, e.g.*, Bieneman v. City of Chicago, 864 F.2d 463 (7th Cir. 1988) (overturning Luedtke v. County of Milwaukee, 521 F.2d 387 (7th Cir. 1975), which ruled that *City of Burbank* preempted application of state tort laws, such as negligence and nuisance, to flights that complied with federal laws and regulations); Greater Westchester Homeowners Association v. City of Los Angeles, 603 P.2d 1329 (Sup. Ct. Cali. 1979).

[173] *See* P.L. 112-95, § 332(a) (requiring development of a plan within 270 days of enactment of the act, falling in November 2012).

Attachment B

Arizona	HB 2574
Florida	HB 119
Florida	SB 92
Hawaii	SB 783
Idaho	SB 1051
Illinois	SR 792
Indiana	SB 20
Maryland	HB 1233
Maine	SB 72
Missouri	HB 46
Montana	SB 150
Montana	SB 196
North Dakota	HB 1373
Virginia	HB 2012

REFERENCE TITLE: drone surveillance; prohibition; exceptions

State of Arizona
House of Representatives
Fifty-first Legislature
First Regular Session
2013

HB 2574

Introduced by
Representatives Dial, Seel, Stevens, Senator Burges: Representatives Barton, Borrelli, Lovas, Petersen, Thorpe

AN ACT

AMENDING TITLE 13, CHAPTER 30, ARIZONA REVISED STATUTES, BY ADDING SECTION 13-3007; RELATING TO DRONE SURVEILLANCE.

(TEXT OF BILL BEGINS ON NEXT PAGE)

Be it enacted by the Legislature of the State of Arizona:

Section 1. Title 13, chapter 30, Arizona Revised Statutes, is amended by adding section 13-3007, to read:

13-3007. Unlawful use of drones: admissibility of evidence; civil action: classification: definitions

A. IT IS UNLAWFUL FOR A LAW ENFORCEMENT AGENCY OR A STATE, COUNTY OR MUNICIPAL AGENCY TO USE A DRONE TO GATHER, STORE OR COLLECT EVIDENCE OF ANY TYPE, INCLUDING AUDIO OR VIDEO RECORDINGS, OR BOTH, OR OTHER INFORMATION THAT IS NOT SPECIFICALLY OUTLINED IN A SEARCH WARRANT. A LAW ENFORCEMENT AGENCY MAY NOT USE DRONES FOR SURVEILLANCE OF CITIZENS UNLESS THE CITIZEN IS SPECIFICALLY NAMED ON A VALID SEARCH WARRANT.

B. IT IS UNLAWFUL FOR A PERSON TO USE DRONES TO MONITOR OTHER PERSONS INSIDE THEIR HOMES OR PLACES OF WORSHIP OR WITHIN THE CLOSED CONFINES OF THEIR PROPERTY OR OTHER LOCATIONS WHERE A PERSON WOULD HAVE AN EXPECTATION OF PRIVACY.

C. EVIDENCE THAT IS OBTAINED OR COLLECTED IN VIOLATION OF THIS SECTION IS NOT ADMISSIBLE IN ANY CIVIL OR CRIMINAL PROCEEDING AND MAY NOT BE USED AGAINST A CITIZEN, CORPORATION OR ORGANIZATION IN ANY FORMAL PROCEEDING WITHIN THIS STATE FOR THE PURPOSE OF ENFORCING STATE OR LOCAL LAW.

D. THIS SECTION DOES NOT PROHIBIT EITHER:

1. THE USE OF A DRONE BY A LAW ENFORCEMENT AGENCY IF THE LAW ENFORCEMENT AGENCY FIRST OBTAINS A SEARCH WARRANT THAT AUTHORIZES THE USE OF A DRONE AND THE USE OF THE DRONE IS USED ONLY TO OBTAIN EVIDENCE ON THE PERSON NAMED IN THE WARRANT.

2. THE USE OF A DRONE BY A LAW ENFORCEMENT AGENCY THAT IS ACTIVELY ENGAGED IN THE ENFORCEMENT OF CHAPTER 34 OF THIS TITLE OR SECTION 13-2319 ON PUBLIC LANDS AS DEFINED IN SECTION 37-901 OR ON PRIVATE LAND WITH THE WRITTEN PERMISSION FROM THE LANDOWNER.

3. A CITIZEN FROM OWNING OR OPERATING A DRONE FOR LAWFUL PURPOSES.

E. AN AGGRIEVED PARTY MAY INITIATE A CIVIL ACTION AGAINST A LAW ENFORCEMENT AGENCY TO OBTAIN ALL APPROPRIATE RELIEF IN ORDER TO PREVENT, RESTRAIN OR REMEDY A VIOLATION OF THIS SECTION.

F. A PERSON WHO VIOLATES THIS SECTION IS GUILTY OF A CLASS 6 FELONY.

G. FOR THE PURPOSES OF THIS SECTION:

1. "DRONE" MEANS A POWERED OR AN UNPOWERED AERIAL VEHICLE OR A BALLOON FLOAT OR OTHER DEVICE THAT:

(a) DOES NOT CARRY A HUMAN OPERATOR.

(b) USES AERODYNAMIC FORCES OR GASES TO PROVIDE LIFT.

(c) CAN FLY AUTONOMOUSLY OR BE PILOTED REMOTELY.

(d) CAN BE EXPENDABLE OR RECOVERABLE.

(e) CAN CARRY A LETHAL OR NONLETHAL PAYLOAD.

2. "LAW ENFORCEMENT AGENCY" MEANS A LAWFULLY ESTABLISHED STATE OR LOCAL PUBLIC AGENCY THAT IS RESPONSIBLE FOR THE PREVENTION AND DETECTION OF CRIME, THE ENFORCEMENT OF LOCAL GOVERNMENT CODES AND THE ENFORCEMENT OF

PENAL, TRAFFIC, REGULATORY, GAME OR CONTROLLED SUBSTANCE LAWS AND INCLUDES AN AGENT OF THE LAW ENFORCEMENT AGENCY.

Sec. 2. Severability

If a provision of this act or its application to any person or circumstance is held invalid, the invalidity does not affect other provisions or applications of the act that can be given effect without the invalid provision or application, and to this end the provisions of this act are severable.

Sec. 3. Short title

Section 13-3007, Arizona Revised Statutes, as added by this act, may be cited as the "Citizens Protection From Unwarranted Surveillance Act".

A bill to be entitled

An act relating to searches and seizures; creating the "Freedom from Unwarranted Surveillance Act"; defining the terms "drone" and "law enforcement agency"; prohibiting a law enforcement agency from using a drone to gather evidence or other information; providing an exception; authorizing an aggrieved party to initiate a civil action in order to prevent or remedy a violation of the act; prohibiting use of evidence obtained or collected in violation of the act in any criminal prosecution in any court of law in this state; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Searches and seizure using a drone.—

(1) SHORT TITLE.—This act may be cited as the "Freedom from Unwarranted Surveillance Act."

(2) DEFINITIONS.—As used in this act, the term:

(a) "Drone" means a powered, aerial vehicle that:

1. Does not carry a human operator;

2. Uses aerodynamic forces to provide vehicle lift;

3. Can fly autonomously or be piloted remotely;

4. Can be expendable or recoverable; and

5. Can carry a lethal or nonlethal payload.

(b) "Law enforcement agency" means a lawfully established state or local public agency that is responsible for the prevention and detection of crime and the enforcement of penal,

CODING: Words stricken are deletions; words underlined are additions.

traffic, regulatory, game, or controlled substance laws.

(3) PROHIBITED USE OF DRONES.—A law enforcement agency may not use a drone to gather evidence or other information.

(4) EXCEPTIONS.—This act does not prohibit the use of a drone to counter a high risk of a terrorist attack by a specific individual or organization if the United States Secretary of Homeland Security determines that credible intelligence indicates that there is such a risk.

(5) REMEDIES FOR VIOLATION.—An aggrieved party may initiate a civil action against a law enforcement agency to obtain all appropriate relief in order to prevent or remedy a violation of this act.

(6) PROHIBITION ON USE OF EVIDENCE.—Evidence obtained or collected in violation of this act is not admissible as evidence in a criminal prosecution in any court of law in this state.

Section 2. This act shall take effect July 1, 2013.

CODING: Words stricken are deletions; words underlined are additions.

By the Committee on Criminal Justice; and Senators Negron, Brandes, and Evers

591-00646-13 201392c1

A bill to be entitled

An act relating to searches and seizures; creating the "Freedom from Unwarranted Surveillance Act"; defining the terms "drone" and "law enforcement agency"; prohibiting a law enforcement agency from using a drone to gather evidence or other information; providing exceptions; authorizing an aggrieved party to initiate a civil action in order to prevent or remedy a violation of the act; prohibiting a law enforcement agency from using in any court of law in this state evidence obtained or collected in violation of the act; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Searches and seizure using a drone.—

(1) SHORT TITLE.—This act may be cited as the "Freedom from Unwarranted Surveillance Act."

(2) DEFINITIONS.—As used in this act, the term:

(a) "Drone" means a powered, aerial vehicle that:

1. Does not carry a human operator;

2. Uses aerodynamic forces to provide vehicle lift;

3. Can fly autonomously or be piloted remotely;

4. Can be expendable or recoverable; and

5. Can carry a lethal or nonlethal payload.

(b) "Law enforcement agency" means a lawfully established state or local public agency that is responsible for the prevention and detection of crime, local government code enforcement, and the enforcement of penal, traffic, regulatory,

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game, or controlled substance laws.

(3) PROHIBITED USE OF DRONES.—A law enforcement agency may not use a drone to gather evidence or other information.

(4) EXCEPTIONS.—This act does not prohibit the use of a drone:

(a) To counter a high risk of a terrorist attack by a specific individual or organization if the United States Secretary of Homeland Security determines that credible intelligence indicates that there is such a risk.

(b) If the law enforcement agency first obtains a search warrant signed by a judge authorizing the use of a drone.

(c) If the law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action is needed to prevent imminent danger to life or serious damage to property, or to forestall the imminent escape of a suspect or the destruction of evidence.

(5) REMEDIES FOR VIOLATION.—An aggrieved party may initiate a civil action against a law enforcement agency to obtain all appropriate relief in order to prevent or remedy a violation of this act.

(6) PROHIBITION ON USE OF EVIDENCE.—Evidence obtained or collected in violation of this act is not admissible as evidence in a criminal prosecution in any court of law in this state.

Section 2. This act shall take effect July 1, 2013.

CODING: Words ~~stricken~~ are deletions; words underlined are additions.

THE SENATE
TWENTY-SEVENTH LEGISLATURE, 2013
STATE OF HAWAII

S.B. NO. 783

JAN 18 2013

A BILL FOR AN ACT

RELATING TO UNMANNED AERIAL VEHICLES.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. The Hawaii Revised Statutes is amended by adding a new chapter to be appropriately designated and to read as follows:

"**CHAPTER 263B**

263B-1 Definition. The term 'unmanned aerial vehicle' means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

263B-2 Use of Unmanned Aerial Vehicles. (a) Any use of unmanned aerial vehicles must fully comply with all Federal Aviation Administration requirements and guidelines, and chapters 261, 262, 263, and 263A. Acquisition of unmanned aerial vehicles must be approved by the department of transportation.

(b) Except as provided in subsection (c), it is unlawful for an agent of the state or any political subdivision thereof, or an individual, association, organization, or corporation, to operate an unmanned aerial vehicle or to disclose or receive

information acquired through the operation of an unmanned aerial vehicle.

(c) Exceptions.

(1) Consent. It shall not be unlawful under this chapter to disclose or receive information about any person acquired through the operation of an unmanned aerial vehicle if such person has given written consent to such disclosure.

(2) Emergency Situations. It shall not be unlawful under this chapter for an agent of the state or any political subdivision thereof to operate an unmanned aerial vehicle, and for information from such operation to be disclosed or received if the unmanned aerial vehicle is used in circumstances in which it is reasonable to believe that there is an imminent threat to the life or safety of a person, to assist the person, provided that within 48 hours of the commencement of such operation, a supervisory official of the agent of the state or any political subdivision thereof, shall file a sworn statement with the circuit court of that

jurisdiction setting forth the grounds for the emergency access.

(3) Warrant or Order.

(A) Warrant. An unmanned aerial vehicle may be operated and information from such operation disclosed in order to collect information from a non-public area only pursuant to a warrant issued under chapter 803.

(B) Order. An unmanned aerial vehicle may be operated and information from such operation disclosed in order to collect information from a public area pursuant to a warrant authorized under subsection (3)(A) or pursuant to an order issued by any court that is a court of competent jurisdiction if the agent of the state or any political subdivision thereof offers specific facts demonstrating reasonable suspicion of criminal activity, that the operation of the public unmanned aircraft system is expected to uncover such activity, and that alternative methods of data collection are either cost-prohibitive or present a significant risk to any

person's bodily safety. Such an order shall not be issued for a period greater than 48 hours. Extensions of an order may be granted but shall be no longer than the authorizing judge deems necessary to achieve the purposes for which it was granted and in no event for longer than thirty days.

(d) When unmanned aerial vehicles are used pursuant to subsection (c), they shall be operated in a manner to collect data only on the target and to avoid data collection on individuals, homes, or areas other than the target. Neither facial recognition nor other biometric matching technology may be used on non-target data collected by an unmanned aerial vehicle.

(e) Unmanned aerial vehicles may not be equipped with weapons.

263B-3 Data retention and use. (a) No data collected on an individual, home, or area other than the target that justified deployment may be used, copied, or disclosed for any purpose. Such data must be deleted within twenty-four hours after collection.

(b) Whenever an agent of the state or any political subdivision thereof uses an unmanned aerial vehicle, no part of information acquired and no evidence derived therefrom may be received in evidence in any trial, hearing, or other proceeding in or before any court, grand jury, department, officer, agency, regulatory body, legislative committee, or other authority of the state or a political subdivision thereof if the disclosure of that information would be in violation of this chapter.

(c) Any willful disclosure or use by an agent of the state or any political subdivision thereof of information beyond the extent permitted by this chapter is a violation of this chapter, and is subject to administrative discipline as described in subsection 263B-6 below.

263B-4 Emergency situations exception. (a)Notwithstanding any other provision of this chapter, an agent of the state or any political subdivision thereof may operate an unmanned aerial vehicle and disclose information from such operation if

(1) Such agent of the state or any political subdivision thereof reasonably determines that an emergency situation exists that involves:

(A) Immediate danger of death or serious physical injury to any person;

(B) Conspiratorial activities threatening the national security interest; or

(C) Conspiratorial activities characteristic of organized crime;

(2) The operation of an unmanned aerial vehicle is required before a warrant or order authorizing such interception can, with due diligence, be obtained;

(3) There are grounds upon which such a warrant or order could be entered to authorize such operation; and

(4) An application for a warrant or order approving such operation is made within 48 hours after the operation has occurred or begins to occur.

(b) An operation of an unmanned aerial vehicle carried out under subsection (a) shall immediately terminate when the information sought is obtained or when the application for the warrant or order is denied, whichever is earlier.

(c) In the event an application for a warrant or order is denied, the information obtained from the operation of an unmanned aerial vehicle shall be treated as having been obtained in violation of this chapter and the evidence shall not be used.

263B-5 Delayed Notice. (a) An agent of the state or any political subdivision thereof, in seeking a court order or warrant, may request a delay on the notification required under section 803 for a period not to exceed ninety days, if there is reason to believe that notification of the existence of the court order may have an adverse result. For the purposes of this subsection, an "adverse result" is one that poses a risk of:

(1) Endangering the life or physical safety of an individual;

(2) Flight from prosecution;

(3) Destruction of or tampering with evidence;

(4) Intimidation of potential witnesses; or

(5) Otherwise seriously jeopardizing an investigation or unduly delaying a trial.

Extensions of the delay of notification of up to ninety days each may be granted by the court upon application, or by

certification by the agent of the state or any political subdivision thereof.

(b) Upon expiration of the period of delay of notification, the agent of the state or any political subdivision thereof shall serve upon or deliver by registered or first-class mail to, a copy of the warrant or order upon the person or persons upon whom information was collected together with a notice that

(1) States with reasonable specificity the nature of the law enforcement inquiry; and

(2) Informs the person or persons upon whom information was collected that notification of such customer or subscriber was delayed and which provision of this chapter allowed such delay; and

(3) The governmental entity or court which made the certification or determination of delay.

263B-6 Administrative discipline. If a court or appropriate department or agency determines that an agent of the state or any political subdivision thereof has violated any provision of this chapter, and that the circumstances surrounding the violation raise serious questions about whether or not the agent of the state or any political subdivision

thereof acted willfully or intentionally with respect to the violation, the department or agency shall, upon receipt of a true and correct copy of the decision and findings of the court or appropriate department or agency, promptly initiate a proceeding to determine whether disciplinary action against the agent of the state or any political subdivision thereof is warranted. If the head of the department or agency involved determines that disciplinary action is not warranted, such head shall notify the Attorney General with jurisdiction over the department or agency concerned and shall provide the Attorney General with the reasons for such determination.

263B-7 Reporting. (a) In January of each year, any agent of the state or political subdivision thereof that uses unmanned aerial vehicles shall report to the legislature on activity during the prior year, and shall provide a copy of the report to the office of the administrative director of the courts, information to include:

(1) The number of times an unmanned aerial vehicle was used, organized by the types of incidents and the types of justification for deployment;

(2) The number of crime investigations aided by the use of unmanned aerial vehicles, along with a

description of how the unmanned aerial vehicle was helpful to each investigation;

(3) The number of uses of unmanned aerial vehicles for reasons other than criminal investigations, along with a description of how the unmanned aerial vehicle was helpful in each instance;

(4) The frequency and type of data collected on individuals or areas other than targets; and

(5) The total cost of their unmanned aerial vehicle program.

(b) In January of each year, any judge who has in the prior year issued a warrant or order or an extension thereof, or denied approval of an application for a warrant or order, under this section, shall report to the office of the administrative director of the courts:

(1) The number and kind of orders or extensions applied for, granted, modified, or denied;

(2) The period of unmanned aerial vehicle use authorized by the orders, and the number and duration of any extensions of the orders;

(3) The offense specified in the order or application, or extension of an order; and

(4) The identity of the applying agent of the state or political subdivision thereof making the application and the person authorizing the application.

(c) In April of each year the office of the administrative director of the courts shall report to the legislature information for the prior year, including:

(1) A general description of the information gathered in orders or extensions under this section;

(2) The nature and frequency of incriminating conduct gathered;

(3) The number of persons upon whom information was gathered, and

(4) The nature, amount, and cost of the manpower and other resources used in the collection;

(5) The number of arrests resulting from information gathered and the offenses for which arrests were made;

(6) The number of trials resulting from such information;

(7) The number of motions to suppress made with respect to such information, and the number granted or denied; and

(8) The number of convictions resulting from such information and the offenses for which the convictions were obtained and a general assessment of the importance of the information.

SECTION 2. This Act shall take effect upon its approval.

INTRODUCED BY: _____

S.B. NO. 783

Report Title:
Unmanned Aerial Vehicles; Ban on Surveillance by Drones

Description:
Creates new section relating to unmanned aerial vehicles.

The summary description of legislation appearing on this page is for informational purposes only and is not legislation or evidence of legislative intent.

LEGISLATURE OF THE STATE OF IDAHO

Sixty-second Legislature First Regular Session - 2013

IN THE SENATE

SENATE BILL NO. 1051

BY TRANSPORTATION COMMITTEE

AN ACT

RELATING TO AERONAUTICS; TO PROVIDE A SHORT TITLE; AMENDING CHAPTER 2, TITLE 21, IDAHO CODE, BY THE ADDITION OF A NEW SECTION 21-213, IDAHO CODE, TO PROVIDE DEFINITIONS; AMENDING CHAPTER 2, TITLE 21, IDAHO CODE, BY THE ADDITION OF A NEW SECTION 21-214, IDAHO CODE, TO ESTABLISH PROVISIONS RELATING TO RESTRICTIONS ON GATHERING EVIDENCE OR OTHER INFORMATION THROUGH THE USE OF A DRONE OR OTHER UNMANNED AIRCRAFT AND TO PROVIDE FOR CONSENT; AMENDING CHAPTER 2, TITLE 21, IDAHO CODE, BY THE ADDITION OF A NEW SECTION 21-215, IDAHO CODE, TO ESTABLISH PROVISIONS RELATING TO THE USE OF A DRONE BY A LAW ENFORCEMENT AGENCY WHEN EXIGENT CIRCUMSTANCES EXIST; AND AMENDING CHAPTER 2, TITLE 21, IDAHO CODE, BY THE ADDITION OF A NEW SECTION 21-216, IDAHO CODE, TO ESTABLISH PROVISIONS RELATING TO A CIVIL ACTION AND TO PROVIDE THAT NO INFORMATION OBTAINED IN VIOLATION OF THE PROVISIONS OF THIS ACT MAY BE ADMISSIBLE AS EVIDENCE IN CERTAIN PROCEEDINGS.

Be It Enacted by the Legislature of the State of Idaho:

SECTION 1. SHORT TITLE. This act may be cited as the "Preserving Freedom from Unwarranted Surveillance Act."

SECTION 2. That Chapter 2, Title 21, Idaho Code, be, and the same is hereby amended by the addition thereto of a NEW SECTION, to be known and designated as Section 21-213, Idaho Code, and to read as follows:

21-213. FREEDOM FROM UNWARRANTED SURVEILLANCE -- DEFINITIONS. For the purposes of sections 21-214, 21-215 and 21-216, Idaho Code, the following terms have the following meanings:

(1) "Drone" means any powered aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable and can carry a lethal or nonlethal payload.

(2) "Law enforcement agency" shall have the same meaning as provided for in section 18-4508, Idaho Code.

(3) "Unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

SECTION 3. That Chapter 2, Title 21, Idaho Code, be, and the same is hereby amended by the addition thereto of a NEW SECTION, to be known and designated as Section 21-214, Idaho Code, and to read as follows:

21-214. RESTRICTIONS ON GATHERING OF EVIDENCE. (1) No person, entity or state agency shall use a drone or other unmanned aircraft to gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute, ordinance, regulation or rule, except to the extent authorized in a warrant.

(2) No person, entity or state agency shall use a drone or other unmanned aircraft to conduct surveillance of any individual, property owned by an individual, farm or agricultural industry without the consent of that individual, property owner, farm or agricultural industry.

SECTION 4. That Chapter 2, Title 21, Idaho Code, be, and the same is hereby amended by the addition thereto of a NEW SECTION, to be known and designated as Section 21-215, Idaho Code, and to read as follows:

21-215. USE OF UNMANNED AIRCRAFT -- EXIGENT CIRCUMSTANCES. The provisions of this act do not prohibit the use of a drone by a law enforcement agency when exigent circumstances exist. For the purposes of this section, exigent circumstances exist if a law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action to prevent imminent danger to life is necessary.

SECTION 5. That Chapter 2, Title 21, Idaho Code, be, and the same is hereby amended by the addition thereto of a NEW SECTION, to be known and designated as Section 21-216, Idaho Code, and to read as follows:

21-216. REMEDIES FOR VIOLATION OF THE PROVISIONS OF THIS ACT -- USE OF INFORMATION OBTAINED. (1) In a civil action any aggrieved party may obtain all appropriate relief to prevent or remedy a violation of the provisions of this act.

(2) No information obtained or collected in violation of the provisions of this act may be admissible as evidence in a criminal proceeding in any court of law in the state or in an administrative hearing.

SENATE RESOLUTION

WHEREAS, Unmanned aircraft are aircraft that are operated without the possibility of direct human intervention or control from within or on the aircraft; and

WHEREAS, These unmanned aircraft are most commonly referred to as drones; and

WHEREAS, New developments in technology allow the creation of increasingly smaller unmanned aircraft that are undetectable by the naked eye; and

WHEREAS, The United States Congress enacted the Federal Aviation Administration Modernization and Reform Act ("the Act") which requires the Federal Aviation Administration to develop a plan to accelerate the integration of civil unmanned aircraft into the national airspace system by 2015; and

WHEREAS, Following the passage of the Act, the Federal Aviation Administration (FAA) began to issue rules to implement the Act's mandated plan, including rules that allow law enforcement agencies to operate small unmanned aerial vehicles; and

WHEREAS, Allowing an increased amount of small unmanned

aircraft to fly in the national airspace expands the government's aerial surveillance capability and threatens the protected privacy rights of Illinois citizens; therefore, be it

RESOLVED, BY THE SENATE OF THE NINETY-SEVENTH GENERAL ASSEMBLY OF THE STATE OF ILLINOIS, that we strongly urge the United States Congress to repeal the provisions of the Act that require the FAA to develop a plan to expand the use of unmanned aircraft in the airspace above the continental United States and any other territory or possession of the United States, and thereby repeal the FAA's rules that have begun to implement the mandated plan; and be it further

RESOLVED, That suitable copies of this resolution be delivered to the Speaker and Minority Leader of the United States House of Representatives, the Majority and Minority Leaders of the United States Senate, and the members of the Illinois congressional delegation.

SENATE BILL No. 20

DIGEST OF INTRODUCED BILL

Citations Affected: IC 35-46-10.

Synopsis: Use of unmanned aerial vehicles. Provides that a person who knowingly or intentionally uses an unmanned aerial vehicle to monitor a person, property, or thing without the written consent of the subject of the monitoring commits a Class D felony. Provides that images or communications obtained through the use of an unmanned aerial vehicle are not admissible as evidence. Provides that a person who possesses an image or communications obtained through the use of an unmanned aerial vehicle commits a Class A misdemeanor. Prohibits the use of public money to purchase an unmanned aerial vehicle.

Effective: July 1, 2013.

Tomes

January 7, 2013, read first time and referred to Committee on Rules and Legislative Procedure.

Copy

Introduced

First Regular Session 118th General Assembly (2013)

PRINTING CODE. Amendments: Whenever an existing statute (or a section of the Indiana Constitution) is being amended, the text of the existing provision will appear in this style type, additions will appear in **this style type**, and deletions will appear in ~~this style type~~.

Additions: Whenever a new statutory provision is being enacted (or a new constitutional provision adopted), the text of the new provision will appear in **this style type**. Also, the word **NEW** will appear in that style type in the introductory clause of each SECTION that adds a new provision to the Indiana Code or the Indiana Constitution.

Conflict reconciliation: Text in a statute in *this style type* or ~~*this style type*~~ reconciles conflicts between statutes enacted by the 2012 Regular Session of the General Assembly.

COPY

SENATE BILL No. 20

A BILL FOR AN ACT to amend the Indiana Code concerning criminal law and procedure.

Be it enacted by the General Assembly of the State of Indiana:

SECTION 1. IC 35-46-10 IS ADDED TO THE INDIANA CODE AS A **NEW** CHAPTER TO READ AS FOLLOWS [EFFECTIVE JULY 1, 2013]:

Chapter 10. Use of Unmanned Aerial Vehicles

Sec. 1. As used in this chapter, "person" includes a law enforcement officer.

Sec. 2. As used in this chapter, "unmanned aerial vehicle" means an aircraft that:

(1) does not carry a human operator; and

(2) is capable of flight under remote control or autonomous programming.

Sec. 3. As used in this chapter, "use of an unmanned aerial vehicle" means the use of an unmanned aerial vehicle to monitor or otherwise observe a person, property, or thing. The term includes:

(1) the interception of wire, electronic, or oral communications; or

(2) the capture, collection, monitoring, or viewing of images.

The term does not include the use of an unmanned aerial vehicle solely for recreational or hobby purposes.

Sec. 4. (a) A person may not make use of an unmanned aerial vehicle without the written consent of:

(1) the person; or

(2) the owner of the property or thing;

that is the subject of the use.

(b) A person who knowingly or intentionally makes use of an unmanned aerial vehicle in violation of subsection (a) commits a Class D felony.

Sec. 5. (a) The following are not admissible as evidence in an administrative or judicial proceeding:

(1) A communication or an image that is obtained through the use of an unmanned aerial vehicle in violation of section 4 of this chapter.

(2) Evidence derived from a communication or an image described in subdivision (1).

(b) A person who possesses a communication or an image described in subsection (a) commits a Class A misdemeanor.

Sec. 6. After June 30, 2013, a person may not use public money from any source to purchase or otherwise acquire an unmanned aerial vehicle.

Copy

126th MAINE LEGISLATURE

FIRST REGULAR SESSION-2013

Legislative Document **No. 236**

S.P. 72 In Senate, February 5, 2013

An Act To Protect the Privacy of Citizens from Domestic Unmanned Aerial Vehicle Use

Reference to the Committee on Judiciary suggested and ordered printed.

DAREK M. GRANT
Secretary of the Senate

Presented by Senator PATRICK of Oxford.
Cosponsored by Representative PETERSON of Rumford and
Senators: DUTREMBLE of York, LACHOWICZ of Kennebec, VALENTINO of York,
Representatives: BRIGGS of Mexico, CHIPMAN of Portland, DION of Portland, GILBERT of Jay, MASTRACCIO of Sanford.

Printed on recycled paper

Be it enacted by the People of the State of Maine as follows:

Sec. 1. 25 MRSA Pt. 12 is enacted to read:

PART 12

UNMANNED AERIAL VEHICLES

CHAPTER 551

REGULATION OF UNMANNED AERIAL VEHICLES

§4501. Definitions

As used in this chapter, unless the context otherwise indicates, the following terms have the following meanings.

1. Law enforcement agency. "Law enforcement agency" has the same meaning as in section 3701, subsection 1.

2. Unmanned aerial vehicle. "Unmanned aerial vehicle" means an aircraft that is operated without a physical human presence within or on the aircraft and guided by remote control.

§4502. Operation of unmanned aerial vehicles

1. Acquisition of unmanned aerial vehicles. The acquisition of an unmanned aerial vehicle must be approved by the governing body of the governmental unit overseeing the law enforcement agency seeking to make such an acquisition.

2. Operation of unmanned aerial vehicles. Operation of an unmanned aerial vehicle must fully comply with all Federal Aviation Administration requirements and guidelines. A law enforcement agency may not operate an unmanned aerial vehicle or collect, disclose or receive information acquired through the operation of an unmanned aerial vehicle except:

A. Pursuant to an emergency enforcement exception under section 4504;

B. To collect, disclose or receive information about a person or the person's residence, property or area if that person has given written consent;

C. To assist a person in an emergency circumstance in which it is reasonable to believe that there is an imminent threat to the life or safety of the person, subject to the following limitations:

(1) The law enforcement agency documents the factual basis for the emergency; and

(2) Not later than 48 hours after the emergency operation begins, a supervisory official for the law enforcement agency files a sworn statement setting forth the grounds for the emergency operation;

D. Pursuant to a warrant issued under Title 15, section 55; or

E. Pursuant to an order issued by a court of competent jurisdiction if a law enforcement agency offers specific and articulable facts demonstrating that there is a reasonable suspicion of criminal activity, that the operation of the unmanned aerial vehicle will uncover such activity and that alternative methods of collecting information either are cost-prohibitive or present a significant risk to a person's bodily safety. An order issued under this paragraph may not allow operation for a period greater than 48 hours. An extension of an order issued under this paragraph may be granted for a period no longer than the court determines necessary to achieve the purposes for which it was granted but not to exceed 30 days.

3. Restrictions on operation. The operation of an unmanned aerial vehicle may not:

A. Be conducted for a purpose other than a specific purpose allowed under subsection 2 or section 4504;

B. Be conducted by a person other than a law enforcement agency pursuant to this chapter or a person otherwise authorized by law;

C. Employ the use of facial recognition technology or other biometric technology; or

D. Collect information on a person, residence, property or area not related to a permitted purpose of operation under subsection 2.

An unmanned aerial vehicle may not be equipped with a weapon.

§4503. Retention of information

Information collected by an unmanned aerial vehicle may not be used, copied or disclosed for any purpose other than for a lawful purpose under section 4502, subsection 2. Information collected by an unmanned aerial vehicle for any purpose other than for a lawful purpose under section 4502, subsection 2 must be deleted as soon as possible and no later than 24 hours after collection. Information collected by an unmanned aerial vehicle under section 4502, subsection 2 may be received in evidence in a trial, hearing or other proceeding in or before a court, grand jury, department, officer, agency, regulatory body, legislative committee or other authority of the State or a municipality only if the use of that information as evidence was part of the lawful purpose allowing the unmanned aerial vehicle operation under section 4502, subsection 2.

§4504. Emergency enforcement exception

1. Emergency enforcement exception. A law enforcement agency may operate an unmanned aerial vehicle and collect, disclose or receive information from the operation if the law enforcement agency reasonably determines that an emergency enforcement exception is required because a situation exists:

A. That involves a conspiratorial activity that threatens the national security interest or that is characteristic of organized crime;

B. That requires the operation of an unmanned aerial vehicle before a warrant under section 4502, subsection 2, paragraph D or court order under section 4502, subsection 2, paragraph E with due diligence can be obtained;

C. In which there are grounds upon which a warrant under section 4502, subsection 2, paragraph D or court order under section 4502, subsection 2, paragraph E could be entered to authorize the operation of an unmanned aerial vehicle; and

D. For which an application for a warrant under section 4502, subsection 2, paragraph D or court order under section 4502, subsection 2, paragraph E approving the operation is made within 48 hours after the operation of an unmanned aerial vehicle has occurred.

2. Absence of a warrant or court order. If the information sought by the operation of an unmanned aerial vehicle is obtained prior to the issuance of a warrant or court order under subsection 1, the law enforcement agency shall immediately terminate the operation of the unmanned aerial vehicle.

3. Denial of warrant or court order. If the application for a warrant or court order under subsection 1 is denied, the operation of the unmanned aerial vehicle underlying the application must be immediately terminated and any information obtained from the operation of the unmanned aerial vehicle must be treated as having been obtained in violation of this chapter.

§4505. Delayed notice

1. Delayed notice. When a warrant or court order is sought under section 4502, subsection 2, paragraph D or E or section 4504, a law enforcement agency may request an order delaying the notice required under the Maine Rules of Criminal Procedure, Rule 41B(b)(4) for a period not to exceed 10 days. The court may grant the request if the court determines that the notification of the warrant or court order may have an adverse result under subsection 2.

2. Adverse result. An adverse result for the purposes of a delayed notice under subsection 1 includes the subject of the warrant or court order or other person of interest:

A. Endangering the life or physical safety of a person;

B. Fleeing from prosecution;

C. Destroying or tampering with evidence;

D. Intimidating potential witnesses; and

E. Otherwise seriously jeopardizing an investigation or unduly delaying a trial.

3. Extension. The court may grant an extension of the delayed notice under subsection 1 for up to 10 days for each extension upon application by the law enforcement agency.

4. Expiration of delayed notice. Upon expiration of the period of delayed notice under subsection 1, the law enforcement agency shall serve upon, or deliver by registered or first-class mail to, the person about whom information was collected a copy of the warrant or court order together with notice that:

A. States with reasonable specificity the nature of the law enforcement inquiry; and

B. Informs the person about whom information was collected:

(1) That notification of the warrant or court order was delayed;

(2) What law enforcement agency made the request for delayed notice;

(3) What court made the determination to delay notice; and

(4) Which provision of subsection 2 supported the court's determination.

§4506. Violations

1. Private right of action. If a law enforcement agency violates any provision of this chapter, the person about whom information was collected personally or as owner of a residence, property or area in violation of this chapter may institute and prosecute in that person's own name and on that person's behalf a civil action for legal or equitable relief. In addition to compensatory damages, a person whose rights have been violated by a violation of this chapter may recover no more than $5,000 plus reasonable attorney's fees and court costs.

2. Attorney General. The Attorney General may bring a civil action to enforce the provisions of this chapter.

3. Motion to suppress. A court may not allow to be received into evidence any information collected, disclosed or received in violation of this chapter and shall grant a motion to suppress as evidence any information collected, disclosed or received in violation of this chapter.

§4507. Reporting

1. Reporting by law enforcement agency. In June of each year, a law enforcement agency that uses an unmanned aerial vehicle shall report to the Legislature, retain for public viewing and post on its publicly accessible website, if one exists:

A. The number of times an unmanned aerial vehicle was operated, organized by the types of incidents and the types of justification for operation;

B. The number of criminal investigations aided by the operation of an unmanned aerial vehicle and a description of how the unmanned aerial vehicle aided each investigation;

C. The number of times an unmanned aerial vehicle was operated for reasons other than a criminal investigation and a description of how the unmanned aerial vehicle aided each operation;

D. The frequency and type of information collected on an individual, residence, property or area that was not the subject of an operation; and

E. The total cost of operating the unmanned aerial vehicle for the preceding 12 months.

2. Reporting by Attorney General to the court. In March of each year the Attorney General or the Attorney General's designee shall report to the Administrative Office of the Courts the number of applications for a warrant under section 4502,

subsection 2, paragraph D; court order under section 4502, subsection 2, paragraph E; order for delayed notice under section 4505, subsection 1; and extension of delayed notice under section 4505, subsection 3 made during the preceding calendar year. For each warrant, court order, order for delayed notice and extension of delayed notice reported pursuant to this subsection, the report must include:

A. A general description of the information collected under the warrant, court order, order for delayed notice or extension of delayed notice, including:

(1) The approximate nature and frequency of incriminating conduct;

(2) The approximate number of persons about whom information was collected; and

(3) The approximate nature, amount and cost of the personnel and other resources used in the collection;

B. The number of arrests resulting from the information collected and the offenses for which arrests were made;

C. The number of trials resulting from the information collected;

D. The number of motions to suppress made with respect to the information collected and the number of those motions granted or denied; and

E. The number of convictions resulting from the information collected and the offenses for which the convictions were obtained and a general assessment of the importance of the information.

3. Reporting by Attorney General to the Legislature and public. The Attorney General shall post in June of each year on the Attorney General's publicly accessible website and transmit to the Legislature a full and complete report listing the number of applications for warrants and court orders authorizing and approving operation of unmanned aerial vehicles and disclosure of information collected from the operation of unmanned aerial vehicles pursuant to this chapter and the number of warrants, court orders, orders for delayed notice and extensions of delayed notice granted and denied pursuant to this chapter during the preceding calendar year.

4. Record keeping. A law enforcement agency shall keep a detailed record about each operation of an unmanned aerial vehicle including all information required to be reported in this section and make this record available to the Attorney General.

SUMMARY

This bill regulates unmanned aerial vehicles, including their acquisition and lawful operation by law enforcement agencies in collecting, disclosing and receiving information and the retention of information collected. For the permitted operation of an unmanned aerial vehicle, the bill requires the consent of the subject person, a warrant or court order, an emergency situation that threatens life or serious bodily injury or an emergency enforcement situation that threatens national security or evinces conspiratorial criminal conduct requiring immediate operation of the vehicle before a warrant can be obtained. The bill also allows delayed service of a warrant or court order informing the

subject person until after the warrant's or order's issuance if necessary for avoiding certain adverse results. The bill provides for a private right of action or enforcement by the Attorney General for a violation and disallows the use of any information collected in violation as evidence in a hearing or court of law. The bill requires the Attorney General to report certain information concerning the use of unmanned aerial vehicles to the Legislature and the Administrative Office of the Courts and for law enforcement agencies and the Attorney General to post certain information on their publicly accessible websites.

HOUSE BILL 1233

E2, E4 3lr2070

By: **Delegates George, Dwyer, and W. Miller**
Introduced and read first time: February 8, 2013
Assigned to: Judiciary

A BILL ENTITLED

AN ACT concerning

Criminal Procedure – Law Enforcement Agencies – Use of Drones

FOR the purpose of prohibiting a law enforcement agency from using a drone to gather evidence or other information without a warrant, except under certain circumstances; authorizing an aggrieved party to initiate a certain civil action against a law enforcement agency; establishing that evidence obtained or collected in violation of this Act is not admissible as evidence in a criminal prosecution in a court of law in this State; defining certain terms; and generally relating to the use of drones by law enforcement.

BY adding to
Article – Criminal Procedure
Section 1–203.1
Annotated Code of Maryland
(2008 Replacement Volume and 2012 Supplement)

SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND, That the Laws of Maryland read as follows:

Article – Criminal Procedure

1–203.1.

(A) (1) IN THIS SECTION THE FOLLOWING WORDS HAVE THE MEANINGS INDICATED.

(2) "DRONE" MEANS A POWERED AERIAL VEHICLE THAT:

(I) DOES NOT CARRY A HUMAN OPERATOR;

EXPLANATION: **CAPITALS INDICATE MATTER ADDED TO EXISTING LAW.**
[Brackets] indicate matter deleted from existing law.

(II) USES AERODYNAMIC FORCES TO PROVIDE VEHICLE LIFT;

(III) CAN FLY AUTONOMOUSLY OR BE PILOTED REMOTELY; AND

(IV) IS EXPENDABLE OR RECOVERABLE.

(3) "EMERGENCY" HAS THE MEANING STATED IN § 2–412 OF THE PUBLIC SAFETY ARTICLE.

(4) "LAW ENFORCEMENT AGENCY" HAS THE MEANING STATED IN § 3–201 OF THE PUBLIC SAFETY ARTICLE.

(B) (1) EXCEPT AS PROVIDED IN PARAGRAPH (2) OF THIS SUBSECTION, A LAW ENFORCEMENT AGENCY MAY NOT USE A DRONE TO GATHER EVIDENCE OR OTHER INFORMATION WITHOUT A WARRANT ISSUED IN ACCORDANCE WITH § 1–203 OF THIS SUBTITLE.

(2) THE WARRANT REQUIREMENT CONTAINED IN PARAGRAPH (1) OF THIS SUBSECTION DOES NOT APPLY TO THE USE OF A DRONE TO:

(I) COUNTER A HIGH RISK OF A TERRORIST ATTACK BY A SPECIFIC INDIVIDUAL OR ORGANIZATION, IF THE UNITED STATES SECRETARY OF HOMELAND SECURITY DETERMINES THAT CREDIBLE INTELLIGENCE INDICATES THERE IS THAT RISK; OR

(II) RESPOND TO AN EMERGENCY.

(C) AN AGGRIEVED PARTY MAY INITIATE A CIVIL ACTION AGAINST A LAW ENFORCEMENT AGENCY TO OBTAIN ALL APPROPRIATE RELIEF TO PREVENT OR REMEDY A VIOLATION OF THIS SECTION.

(D) EVIDENCE OBTAINED OR COLLECTED IN VIOLATION OF THIS SECTION IS NOT ADMISSIBLE AS EVIDENCE IN A CRIMINAL PROSECUTION IN A COURT OF LAW IN THIS STATE.

SECTION 2. AND BE IT FURTHER ENACTED, That this Act shall take effect October 1, 2013.

FIRST REGULAR SESSION

HOUSE BILL NO. 46

97TH GENERAL ASSEMBLY

INTRODUCED BY REPRESENTATIVE GUERNSEY.

0371H.01I D. ADAM CRUMBLISS, Chief Clerk

AN ACT

To amend chapter 305, RSMo, by adding thereto four new sections relating to unmanned aerial surveillance.

Be it enacted by the General Assembly of the state of Missouri, as follows:

Section A. Chapter 305, RSMo, is amended by adding thereto four new sections, to be known as sections 305.635, 305.637, 305.639, and 305.641, to read as follows:

305.635. 1. Sections 305.635 to 305.641 shall be known and may be cited as the "Preserving Freedom from Unwarranted Surveillance Act".

2. As used in sections 305.635 to 305.641, the following terms shall mean:

(1) "Drone", any powered, aerial vehicle that:

(a) Does not carry a human operator;

(b) Uses aerodynamic forces to provide vehicle lift;

(c) Can fly autonomously or be piloted remotely;

(d) Can be expendable or recoverable; and

(e) Can carry a lethal or non-lethal payload.

(2) "Unmanned aircraft", an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

(3) "Law enforcement agency", any state, county, or municipal law enforcement agency in the state. The term law enforcement agency shall not include the Missouri department of corrections, or any state, county, or municipal fire department.

305.637. 1. No person, entity, or state agency shall use a drone or other unmanned aircraft to gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation except to the extent authorized in a warrant.

EXPLANATION — Matter enclosed in bold-faced brackets [thus] in the above bill is not enacted and is intended to be omitted from the law. Matter in **bold-face** type in the above bill is proposed language.

2. No person, entity, or state agency shall use a drone or other unmanned aircraft to conduct surveillance of any individual, property owned by an individual, farm, or agricultural industry without the consent of that individual, property owner, farm or agricultural industry.

305.639. This act does not prohibit the use of a drone by a law enforcement agency when exigent circumstances exist. For the purposes of this section, exigent circumstances exist if a law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action to prevent imminent danger to life is necessary.

305.641. 1. Any aggrieved party may in a civil action obtain all appropriate relief to prevent or remedy a violation of this act.

2. No information obtained or collected in violation of this act may be admissible as evidence in a criminal proceeding in any court of law in the state or in an administrative hearing.

✓

SENATE BILL NO. 196

INTRODUCED BY ROSENDALE, AUGARE, DICK BARRETT, BLEWETT, BOULANGER, BRENDEN, D. BROWN, FACEY, L. JONES, F. MOORE, OSMUNDSON, REICHNER, SALES, TAYLOR, THOMAS, VAN DYK, WALKER, WANZENRIED, WARBURTON, WINDY BOY, WITTICH

A BILL FOR AN ACT ENTITLED: "AN ACT LIMITING THE USE OF UNMANNED AERIAL VEHICLES BY LAW ENFORCEMENT AND PRIVATE USERS; PROHIBITING THE USE OF UNLAWFULLY OBTAINED INFORMATION AS EVIDENCE IN COURT; AND AMENDING SECTION 46-1-202, MCA."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MONTANA:

NEW SECTION. **Section 1. Prohibition on use of unmanned aerial vehicles -- penalty.** (1) (a) A person commits the offense of unmanned aerial vehicle data collection if a person purposely or knowingly operates an unmanned aerial vehicle in or upon the premises of another for the purpose of acquiring information through the use of a sensing device that is capable of acquiring data from its surroundings, including but not limited to a camera, microphone, thermal detector, chemical detector, radiation gauge, and wireless receiver.

(b) Information obtained from the unlawful operation of an unmanned aerial vehicle is not admissible as evidence in any proceeding and may not be used for any purpose.

(c) A person convicted of the offense of unmanned aerial vehicle data collection shall be fined an amount not to exceed $500 or be incarcerated in the county jail for a term not to exceed 6 months, or both.

(2) For the purposes of this section, "unmanned aerial vehicle" means an aircraft that is operated without direct human intervention from on or within the aircraft.

NEW SECTION. **Section 2. Prohibition on use of unmanned aerial vehicles and use of evidence acquired -- exceptions.** (1) Except as provided in ~~subsections~~ SUBSECTION (2) ~~and (4)~~, it is unlawful for a ~~peace officer or law enforcement~~ GOVERNMENT agency to operate an unmanned aerial vehicle for the purpose of data collection.

(2) An unmanned aerial vehicle may be used: ~~only~~

(A) to conduct a search that is made:

~~(a)~~(I) pursuant to the authority of a search warrant; or

~~(b)~~(II) in accordance with judicially recognized exceptions to the warrant requirement;

(B) TO MONITOR PUBLIC LANDS OR INTERNATIONAL BORDERS; OR

(C) TO MONITOR PRIVATE LANDS WITH THE CONSENT OF THE LANDOWNER.

(3) Information obtained from the ~~unlawful~~ operation of an unmanned aerial vehicle is not admissible as evidence in any prosecution or proceeding and may not be used in an affidavit of probable cause in an effort to obtain a search warrant UNLESS THE INFORMATION WAS OBTAINED UNDER THE CIRCUMSTANCES DESCRIBED IN SUBSECTION (2)(A) OR (2)(C).

~~(4) It is lawful under this section for a state or federal agency to operate an unmanned aerial vehicle for the sole purpose of monitoring public lands and international borders, provided that no part of any personal information and no evidence derived from the operation may be received in evidence in any prosecution or proceeding unless the state or federal agency complies with the provisions of subsection (2).~~

Section 3. Section 46-1-202, MCA, is amended to read:

"46-1-202. Definitions. As used in this title, unless the context requires otherwise, the following definitions apply:

(1) "Advanced practice registered nurse" means an individual certified as an advanced practice registered nurse provided for in 37-8-202, with a clinical specialty in psychiatric mental health nursing.

(2) "Arraignment" means the formal act of calling the defendant into open court to enter a plea answering a charge.

(3) "Arrest" means taking a person into custody in the manner authorized by law.

(4) "Arrest warrant" means a written order from a court directed to a peace officer or to some other person specifically named commanding that officer or person to arrest another. The term includes the original warrant of arrest and a copy certified by the issuing court.

(5) "Bail" means the security given for the primary purpose of ensuring the presence of the defendant in a pending criminal proceeding.

(6) "Charge" means a written statement that accuses a person of the commission of an offense, that is presented to a court, and that is contained in a complaint, information, or indictment.

(7) "Conviction" means a judgment or sentence entered upon a guilty or nolo contendere plea or upon a verdict or finding of guilty rendered by a legally constituted jury or by a court of competent jurisdiction authorized to try the case without a jury.

(8) "Court" means a place where justice is judicially administered and includes the judge of the court.

(9) "Data collection" means acquiring information through the use of a sensing device that is capable of acquiring data from its surroundings, including but not limited to a camera, microphone, thermal detector, chemical detector, radiation gauge, and wireless receiver.

~~(9)~~(10) "Included offense" means an offense that:

(a) is established by proof of the same or less than all the facts required to establish the commission of the offense charged;

(b) consists of an attempt to commit the offense charged or to commit an offense otherwise included in the offense charged; or

(c) differs from the offense charged only in the respect that a less serious injury or risk to the same person, property, or public interest or a lesser kind of culpability suffices to establish its commission.

~~(10)~~(11) "Judge" means a person who is vested by law with the power to perform judicial functions.

~~(11)~~(12) "Judgment" means an adjudication by a court that the defendant is guilty or not guilty, and if the adjudication is that the defendant is guilty, it includes the sentence pronounced by the court.

~~(12)~~(13) "Make available for examination and reproduction" means to make material and information that is subject to disclosure available upon request at a designated place during specified reasonable times and to provide suitable facilities or arrangements for reproducing it. The term does not mean that the disclosing party is required to make copies at its expense, to deliver the materials or information to the other party, or to supply the facilities or materials required to carry out tests on disclosed items. The parties may by mutual consent make other or additional arrangements.

~~(13)~~(14) "New trial" means a reexamination of the issue in the same court before another jury after a verdict or finding has been rendered.

~~(14)~~(15) "Notice to appear" means a written direction that is issued by a peace officer and that requests a person to appear before a court at a stated time and place to answer a charge for the alleged commission of an offense.

~~(15)~~(16) "Offense" means a violation of any penal statute of this state or any ordinance of its political subdivisions.

~~(16)~~(17) "Parole" means the release to the community of a prisoner by a decision of the board of pardons and parole prior to the expiration of the prisoner's term subject to conditions imposed by the board of pardons and parole and the supervision of the department of corrections.

~~(17)~~(18) "Peace officer" means any person who by virtue of the person's office or public employment is vested by law with a duty to maintain public order and make arrests for offenses while acting within the scope of the person's authority.

~~(18)~~(19) "Persistent felony offender" means an offender who has previously been convicted of a felony and who is presently being sentenced for a second felony committed on a different occasion than the first. An offender is considered to have been previously convicted of a felony if:

(a) the previous felony conviction was for an offense committed in this state or any other jurisdiction for which a sentence of imprisonment in excess of 1 year could have been imposed;

(b) less than 5 years have elapsed between the commission of the present offense and either:

(i) the previous felony conviction; or

(ii) the offender's release on parole or otherwise from prison or other commitment imposed as a result of a previous felony conviction; and

(c) the offender has not been pardoned on the ground of innocence and the conviction has not been set aside at the postconviction hearing.

~~(19)~~(20) "Place of trial" means the geographical location and political subdivision in which the court that will hear the cause is situated.

~~(20)~~(21) "Preliminary examination" means a hearing before a judge for the purpose of determining if there is probable cause to believe a felony has been committed by the defendant.

~~(21)~~(22) "Probation" means release by the court without imprisonment of a defendant found guilty of a crime. The release is subject to the supervision of the department of corrections upon direction of the court.

~~(22)~~(23) "Prosecutor" means an elected or appointed attorney who is vested by law with the power to initiate and carry out criminal proceedings on behalf of the state or a political subdivision.

~~(23)~~(24) "Same transaction" means conduct consisting of a series of acts or omissions that are motivated by:

(a) a purpose to accomplish a criminal objective and that are necessary or incidental to the accomplishment of that objective; or

(b) a common purpose or plan that results in the repeated commission of the same offense or effect upon the same person or the property of the same person.

~~(24)~~(25) "Search warrant" means an order that is:

(a) in writing;

(b) in the name of the state;

(c) signed by a judge;

(d) a particular description of the place, object, or person to be searched and the evidence, contraband, or person to be seized; and

(e) directed to a peace officer and commands the peace officer to search for evidence, contraband, or persons.

~~(25)~~(26) "Sentence" means the judicial disposition of a criminal proceeding upon a plea of guilty or nolo contendere or upon a verdict or finding of guilty.

~~(26)~~(27) "Statement" means:

(a) a writing signed or otherwise adopted or approved by a person;

(b) a video or audio recording of a person's communications or a transcript of the communications; and

(c) a writing containing a summary of a person's oral communications or admissions.

~~(27)~~(28) "Summons" means a written order issued by the court that commands a person to appear before a court at a stated time and place to answer a charge for the offense set forth in the order.

~~(28)~~(29) "Superseded notes" means handwritten notes, including field notes, that have been substantially incorporated into a statement. The notes may not be considered a statement and are not subject to disclosure except as provided in 46-15-324.

~~(29)~~(30) "Temporary road block" means any structure, device, or means used by a peace officer for the purpose of controlling all traffic through a point on the highway where all vehicles may be slowed or stopped.

(31) "Unmanned aerial vehicle" means an aircraft that is operated without direct human intervention from on or within the aircraft.

~~(30)~~(32) "Witness" means a person whose testimony is desired in a proceeding or investigation by a grand jury or in a criminal action, prosecution, or proceeding.

~~(31)~~(33) "Work product" means legal research, records, correspondence, reports, and memoranda, both written and oral, to the extent that they contain the opinions, theories, and conclusions of the prosecutor, defense counsel, or their staff or investigators."

NEW SECTION. **Section 4. Codification instruction.** (1) [Section 1] is intended to be codified as an integral part of Title 45, chapter 5, part 2, and the provisions of Title 45, chapter 5, part 2, apply to [section 1].

(2) [Section 2] is intended to be codified as an integral part of Title 46, chapter 5, and the provisions of

Title 46, chapter 5, apply to [section 2].

- END -

Sixty-third
Legislative Assembly
of North Dakota

HOUSE BILL NO. 1373

Introduced by

Representatives Becker, Anderson, Beadle, Heilman, Hofstad, Monson, Rohr, Toman, Hanson

Senator Sitte

A BILL for an Act to provide for limitations on the use of unmanned aircraft for surveillance.

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF NORTH DAKOTA:

SECTION 1.

Definitions.

As used in this Act:

1. "Law enforcement agency" means a person authorized by law, or funded by the state, to investigate or prosecute offenses against the state.
2. "Unmanned aircraft" means any aircraft that is operated without the possibility of direct human intervention within or on the aircraft.
3. "Unmanned aircraft system" means an unmanned aircraft and associated elements, including communication links and the components that control the unmanned aircraft, which are required for the pilot in command to operate safely and efficiently in state airspace.

SECTION 2.

Prohibited use of unmanned aircraft system.

1. Except as provided in section 4 of this Act, a law enforcement agency may not use an unmanned aircraft for surveillance of a person within the state or for the surveillance of personal or business property located within the borders of the state to gather evidence or other information pertaining to criminal conduct, or conduct in violation of a statute or regulation except to the extent authorized in a warrant that satisfies the requirements of the Constitution of North Dakota.

2. Warrants to conduct surveillance with an unmanned aircraft may only be issued in the investigation of a felony. Unmanned aircraft may not be used to conduct investigations of misdemeanors, traffic infractions, or other violations of law.

SECTION 3.

Warrant requirement.

A warrant for the use of unmanned aircraft must satisfy the requirements of the Constitution of North Dakota. In addition, the warrant must contain a data collection statement that includes:

1. The persons that will have the power to authorize the use of the unmanned aircraft;
2. The locations in which the unmanned aircraft system will operate;
3. The maximum period for which the unmanned aircraft system will operate in each flight; and
4. Whether the unmanned aircraft system will collect information or data about individuals or groups of individuals, and if so:
   a. The circumstances under which the unmanned aircraft system will be used; and
   b. The specific kinds of information or data the unmanned aircraft system will collect about individuals and how that information or data, as well as conclusions drawn from that information or data, will be used, disclosed, and otherwise handled, including:
      (1) The period for which the information or data will be retained; and
      (2) Whether the information or data will be destroyed, and if so, when and how the information or data will be destroyed.

SECTION 4.

Exceptions.

This Act does not prohibit any use of an unmanned aircraft for surveillance during the course of:

1. Patrol of national borders. The use of an unmanned aircraft to patrol within twenty-five miles [40.23 kilometers] of a national border, for purposes of policing that border to prevent or deter the illegal entry of any person, illegal substance, or contraband.
2. Exigent circumstances. The use of an unmanned aircraft by a law enforcement agency is permitted when exigent circumstances exist. For the purposes of this subsection, exigent circumstances exist when a law enforcement agency possesses reasonable

suspicion that absent swift preventative action, there is an imminent danger to life or bodily harm.

3. An environmental or weather-related catastrophe. The use of an unmanned aircraft by state authorities to preserve public safety, protect property, or conduct surveillance for the assessment and evaluation of environmental or weather-related damage, erosion, flood, or contamination during a lawfully declared state of emergency.

SECTION 5.

Prohibited surveillance.

This Act prohibits any use of an unmanned aircraft for:

1. Use of force. A state agency may not authorize the use, including grant a permit to use, of an unmanned aircraft while armed with any lethal or nonlethal weapons, including firearms, pepper spray, bean bag guns, mace, and sound-based weapons.
2. Domestic use in private surveillance. A state agency may not authorize the use, including granting a permit to use, of an unmanned aircraft to permit any private person to conduct surveillance on any other private person without the express, informed consent of that other person or the owner of any real property on which that other private person is present.
3. Surveillance of the exercise of constitutional rights. A state agency may not authorize the use, including granting a permit to use, of an unmanned aircraft for the purpose of the surveillance of persons engaged in the lawful exercise of the constitutional right of freedom of speech and freedom of assembly.

SECTION 6.

Remedies for violation.

Any aggrieved party may obtain in a civil action all appropriate relief to prevent or remedy a violation of this Act.

SECTION 7.

Prohibitions on the conduct of unmanned aircraft surveillance and the use of acquired surveillance as evidence.

1. Evidence obtained or collected in violation of this Act is not admissible as evidence in a criminal prosecution, including use during trial, at sentencing, before a grand jury, as rebuttal evidence, or during administrative hearings in any court of law in the state.

2. Any imaging or other forms of observational data gathered by unmanned aircraft surveillance from or concerning the parties or places subjected to surveillance in violation of this Act may not be preserved by law enforcement or government agencies for any purpose unless required by a court of law.

3. Any imaging or any other forms of data lawfully obtained under this Act for which there is not a reasonable and articulable suspicion that those images or data contain evidence of a crime, or are relevant to an ongoing investigation or trial, may not be retained for more than ninety days, unless the retention is attendant to general agency guidelines regarding the retention of evidence in criminal cases. In those cases, the imaging or other data may not be distributed to agencies, entities, or individuals if the distribution is not necessary to meet general agency guidelines regarding the retention of evidence in criminal cases.

4. An unmanned aircraft may not conduct any type of surveillance that would violate state laws regarding the interception of aural communications, electronic messaging, personal location data, or acquire video or still images of a person within a home or place without first obtaining all required warrants in compliance with state statutes relevant to the interception of such voice communications, digital communications, physical surveillance data, or to capture the still or video images of a person or interior or a place for which a search warrant is prerequisite to its lawful search.

SECTION 8.

Documentation of unmanned aircraft surveillance.

1. The person authorized to conduct the surveillance under this Act shall document all use of unmanned aircraft for surveillance. The person shall document all surveillance flights as to duration, flight path, and mission objectives, including the names of place or persons authorized to be subject to surveillance.

2. The flight information must be certified as accurate and complete by the supervising person authorized by a court to conduct the surveillance.

3. The flight information required under this section must be retained for five years.

4. Except for the operational capabilities of the unmanned aircraft system and other operational information strictly related to the technical conduct and physical security of the surveillance operation, a person before a court of law who has been a target of

unmanned aircraft surveillance must be permitted to obtain by proper motion to the court all information relating to the person acquired in the course of the surveillance.

5. Other persons who have an interest in obtaining the documentation required by this section may obtain that documentation pursuant to chapter 44-04.

13104704D

HOUSE BILL NO. 2012

AMENDMENT IN THE NATURE OF A SUBSTITUTE

(Proposed by the House Committee for Courts of Justice)

(Patron Prior to Substitute—Delegate Cline [HB 1616])

House Amendments in [ ] — February 4, 2013

A BILL to place a moratorium on the use of unmanned aircraft systems.

Be it enacted by the General Assembly of Virginia:

1. *§ 1. No state or local agency or organization having jurisdiction over criminal law enforcement or regulatory violations, including but not limited to the Department of State Police, and no department of law enforcement as defined in § 15.2-836 of any county, city, or town shall utilize an unmanned aircraft system before July 1, 2015.*

[2. Notwithstanding the prohibition in paragraph A of this section, an unmanned aircraft system may be deployed before July 1, 2015 when an Amber Alert is activated pursuant to § 52-34.3, when a Senior Alert is activated pursuant to § 52-34.6, when a Blue Alert is activated pursuant to § 52-34.9, or for the purpose of a search and rescue operation. In no case may a weaponized unmanned aircraft system be deployed or its use facilitated by a state or local agency in Virginia.]

ENGROSSED

04/14/13 HCR 6: Committee Documents

<TARGET><BILL>HCR 6</BILL><SUBJECT>04-14-13   HCR 6 Committee Documents</SUBJECT><COMM>JUNM28</COMM></TARGET>

STATE OF ALASKA
THE LEGISLATURE

2013

Source
SCS CSHCR 6(FIN)

Legislative Resolve No.
17

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS the Unmanned Aircraft Systems Program at the University of Alaska Fairbanks has, since 2001, been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, and developing technology to improve safety and is known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

WHEREAS the importance of the program's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the

state; and

WHEREAS the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

WHEREAS the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to further the center's research initiatives, and to increase its capabilities for use as a possible Federal Aviation Administration test site; and

WHEREAS the State of Alaska, the University of Alaska, the Alaska Aerospace Corporation, the Alaska Aviation Safety Project, and other public and private institutions have developed cooperation with the National Aeronautics and Space Administration, the Federal Aviation Administration, the United States Department of the Interior, the United States Department of Defense, and others to further advance the research, development, and use of technology to benefit and support Alaskans and Americans with the safe use of unmanned aircraft systems; and

WHEREAS Alaska state government and the state's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe unmanned aircraft system ranges onshore and offshore Alaska, which will help establish procedures for the safe operation of unmanned aircraft systems in the National Airspace System; and

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration, by virtue of being located in Alaska, has access to an area of geographic and climatic diversity where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

WHEREAS the state has the highest per capita use of general aviation activity in the nation, and Alaska aviation organizations have helped the Federal Aviation Administration develop the next generation of air traffic control for the nation and the world, while making major gains for the state's aviation safety in the process; and

WHEREAS unmanned aircraft systems may present a risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific

statutory authority to regulate privacy matters relating to unmanned aircraft systems;

BE IT RESOLVED that the Alaska State Legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a leader in aviation pioneering and further recognizes the significant benefit to the state and nation the center provides in research and development of unmanned aircraft systems; and be it

FURTHER RESOLVED that the Alaska State Legislature fully supports the efforts of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

FURTHER RESOLVED by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of seven members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of public safety or the commissioner's designee;

(4) the adjutant general of the Department of Military and Veterans' Affairs or the adjutant general's designee;

(5) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks;

(6) a member of the Academy of Model Aeronautics;

(7) a member from the state Aviation Advisory Board; and be it

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation,

for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on July 1, 2014.

AUTHENTICATION

The following officers of the Legislature certify that the attached enrolled resolution, SCS CSHCR 6(FIN), consisting of 4 pages, was passed in conformity with the requirements of the constitution and laws of the State of Alaska and the Uniform Rules of the Legislature.

Passed by the House April 14, 2013

Mike Chenault, Speaker of the House

ATTEST:

Suzi Lowell, Chief Clerk of the House

Passed by the Senate April 14, 2013

Charlie Huggins, President of the Senate

ATTEST:

Liz Clark, Secretary of the Senate

28-LS0655\O
Gardner
4/12/13

SENATE CS FOR CS FOR HOUSE CONCURRENT RESOLUTION NO. 6( )

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY

Offered:
Referred:

Sponsor(s): REPRESENTATIVES HUGHES, Kawasaki, Isaacson, Pruitt, Johnson, Thompson, Drummond, Saddler

A RESOLUTION

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS the Unmanned Aircraft Systems Program at the University of Alaska Fairbanks has, since 2001, been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, and developing technology to improve safety and is known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

WHEREAS the importance of the program's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the

state; and

WHEREAS the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

WHEREAS the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks to further the center's research initiatives, and to increase its capabilities for use as a possible Federal Aviation Administration test site; and

WHEREAS the State of Alaska, the University of Alaska, the Alaska Aerospace Corporation, the Alaska Aviation Safety Project, and other public and private institutions have developed cooperation with the National Aeronautics and Space Administration, the Federal Aviation Administration, the United States Department of the Interior, the United States Department of Defense, and others to further advance the research, development, and use of technology to benefit and support Alaskans and Americans with the safe use of unmanned aircraft systems; and

WHEREAS Alaska state government and the state's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe unmanned aircraft system ranges onshore and offshore Alaska, which will help establish procedures for the safe operation of unmanned aircraft systems in the National Airspace System; and

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration, by virtue of being located in Alaska, has access to an area of geographic and climatic diversity where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

WHEREAS the state has the highest per capita use of general aviation activity in the nation, and Alaska aviation organizations have helped the Federal Aviation Administration develop the next generation of air traffic control for the nation and the world, while making major gains for the state's aviation safety in the process; and

WHEREAS unmanned aircraft systems may present a risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific

statutory authority to regulate privacy matters relating to unmanned aircraft systems;

BE IT RESOLVED that the Alaska State Legislature recognizes the Alaska Center for Unmanned Aircraft at the University of Alaska Fairbanks as a leader in aviation pioneering and further recognizes the significant benefit to the state and nation the center provides in research and development of unmanned aircraft systems; and be it

FURTHER RESOLVED that the Alaska State Legislature fully supports the efforts of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

FURTHER RESOLVED by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of 7 members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of public safety or the commissioner's designee;

(4) the adjutant general of the Department of Military and Veterans' Affairs or the adjutant general's designee;

(5) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks;

(6) a member of the Academy of Model Aeronautics;

(7) a member from the state Aviation Advisory Board;

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation,

for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on July 1, 2014.

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Friday, April 12, 2013 8:30 AM
To: Sheila Peterson
Subject: FW: HCR6

If the Task Force is removed, we will work on intent language in the Governor's office.
Ginger

From: Ginger Blaisdell
Sent: Thursday, April 11, 2013 9:37 PM
To: Christine Marasigan
Subject: HCR6

The reason for the task force:
There are some user groups interested in unmanned aircraft that are not familiar with the FAA rules and guidelines for use. If these groups remain uninformed, they may break the law unknowingly and could be considered a privacy risk. Breaching privacy could interfere with the good uses of unmanned aircraft and the advancement of the technology. Including private aircraft operators and remote control operators on the task force is for education, safety and security considerations.

The task force is made up of a broad group of users who may be able to brainstorm uses in order for Alaska to implement well-thought-out law rather than adopting the possible model legislation that would have a generic national perspective. Alaskans are concerned for their privacy and the potential for violation of that privacy, particularly if used by law enforcement or "peeping toms."

Fear of military use is national and our citizens are becoming more concerned.

- The task force will help educate those interested in or already using unmanned aircraft
- Education will alleviate uninformed individuals from breaking the laws established for use of unmanned aircraft
- The task force will refine use in Alaska's airspace as well as fit in with the FAA guidelines – inappropriate use could result in aircraft crashes and loss of life.
- The task force will likely meet only once in person but may continue its work via electronic means. It is anticipated that most of the task force will reside in Anchorage. If the in-person meeting is held in Anchorage, travel costs will be negligible. All state agencies stated the costs could be absorbed within exiting budgets, Legislature would absorb within existing budget, and private attendees would receive travel and per diem from the legislative affairs agency.

Hope this summary helps
ginger

Office of Representative Shelley Hughes
Room 409 State Capitol
Juneau, AK 99811
907-465-5265

If you would like to receive Rep. Hughes' electronic newsletter, please click here.

Follow Rep. Hughes on Facebook

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Friday, April 12, 2013 8:27 AM
To: Sheila Peterson
Subject: FW: trying

From: Christine Marasigan
Sent: Thursday, April 11, 2013 8:39 PM
To: Ginger Blaisdell
Subject: RE: trying

If I can make any headway I'll let you know but no guarantees—they've been hearing some pretty heavy stuff.

From: Ginger Blaisdell
Sent: Thursday, April 11, 2013 8:38 PM
To: Christine Marasigan
Subject: RE: trying

9 is good and include a sunset of the task force of June 30, 2014

Can I suggest a couple changes to the membership? See red comments from me embedded...

From: Christine Marasigan
Sent: Thursday, April 11, 2013 8:27 PM
To: Ginger Blaisdell
Subject: trying

Hi,
Am still trying for you. My boss and a few other members do not want to hear HCR 6, however, in the off chance that they do, what do you think:

1 Yes **(1) one senator** selected by the president of the senate, who shall serve as co-

2 Yes **(2) one representative** selected by the speaker of the house of representatives,

who shall serve as co-chair;

delete **(3)** ~~**LT Gov Mead Treadwell or Gov Appointee(Treadwell already part of Aerospace States)**~~

~~(3) the commissioner of transportation and public facilities or the~~

~~commissioner's designee;~~

3 yes **(4) the commissioner of public safety or the commissioner's designee**; law enforcement

~~delete (5) the commissioner of natural resources or the commissioner's designee;~~

4 keep ~~(6) one member representing municipal law enforcement~~; law enforcement – could eliminate this one but APD is already considering using unmanned aircraft

delete ~~(7) the attorney general or the attorney general's designee~~;

~~delete (8) the commissioner of fish and game or the commissioner's designee;~~

5 yes **(9) the adjutant general of the Department of Military and Veterans' Affairs** or the adjutant general's designee; military

6 yes **(10) a member representing the Alaska Center for Unmanned Aircraft Systems Integration** at University of Alaska Fairbanks;

7 yes (11) a member of the Academy of Model Aeronautics; Steve Colligan remote control pilots are looking to use aircraft commercially against FAA rules now

8 yes (12) a member from the State Aviation Advisory Board this is a DOT/PF board of airports

9 yes ~~(13) a member from the Medallion Foundation;~~ private aircraft pilots

10 yes ~~(14) one member of the Aerospace States Association;~~ Lt Governor is Designee Member as well

11 yes ~~(15) one member of the Alaska UAS Interest Group; and be it~~ Already part of University Efforts one Univ person is on this board but includes the Dept of Interior and FAA and other federal members would suggest Harry Keiling

Christine R. Marasigan
Staff to Senator Kevin Meyer
Alaska State Capitol
Juneau, AK 99801
Phone: (907) 465-4945
Fax: (907) 465-3476

Fiscal Note

State of Alaska
2013 Legislative Session

Bill Version: HCR 6
Fiscal Note Number:
() Publish Date:

Identifier: HCR6-LEG-COU-04-05-13
Title: EST. LEG. TASK FORCE ON UNMANNED AIRCRAFT
Sponsor: HUGHES
Requester: State Affairs

Department: Alaska Legislature
Appropriation: Legislative Council
Allocation: Council and Subcommittees
OMB Component Number: 783

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

	FY2014 Appropriation Requested	Included in Governor's FY2014 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	**FY 2014**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**
Personal Services	***	***	***	***	***	***	***
Travel							
Services							
Commodities							
Capital Outlay							
Grants & Benefits							
Miscellaneous							
Total Operating	***	***	***	***	***	***	***
Fund Source (Operating Only)							
None							
Total	***	***	***	***	***	***	***
Positions							
Full-time							
Part-time							
Temporary							
Change in Revenues							

Estimated SUPPLEMENTAL (FY2013) cost: 0.0

Estimated CAPITAL (FY2014) cost: 0.0

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency?
If yes, by what date are the regulations to be adopted, amended or repealed?

Why this fiscal note differs from previous version:

Updated to relect potential fiscal impact

Prepared By:	Jessica Geary, Finance Manager	Phone:	(907)465-6626
Division	Legislative Affairs Agency	Date:	04/05/2013 02:18 PM
Approved By:	Pamela Varni, Executive Director	Date:	04/05/13
	Legislative Affairs Agency		

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2013 LEGISLATIVE SESSION

BILL NO. HCR 6

Analysis

HCR6 creates a task force on unmanned aircraft systems within the legislative branch. The task force will have 15 members which will be comprised of one senator, appointed by the president of the senate and one representative, appointed by the speaker of the house and 7 public members and 6 executive branch members, appointed jointly by the presiding officers. The task force intends to meet as needed during and between sessions and will submit an initial report to the legislature not later than January 15, 2014 and a final report to the legislature not later than January 15, 2015. If meetings take place in between sessions, the task force anticipates being able to meet in Anchorage. With the majority of potential task force members residing in Anchorage, a meeting held there would be at a very minimal cost. It is anticipated that one in-person meeting per year would occur with information shared electronically within the task force membership as needed.

Because the task force intends to utilize existing resources, but the legislation could allow for an unknown cost, the fiscal impact on the legislature is indeterminate.

28-LS0655\N
Gardner
3/23/13

CS FOR HOUSE CONCURRENT RESOLUTION NO. 6(EDT)

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY THE HOUSE SPECIAL COMMITTEE ON ECONOMIC DEVELOPMENT, TRADE, AND TOURISM

Offered:
Referred:

Sponsor(s): REPRESENTATIVES HUGHES, Kawasaki, Isaacson, Pruitt

A RESOLUTION

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS the Unmanned Aircraft Systems Program at the University of Alaska Fairbanks has, since 2001, been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, and developing technology to improve safety and is known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

WHEREAS the importance of the program's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the

state; and

WHEREAS the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

WHEREAS the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks to further the center's research initiatives, and to increase its capabilities for use as a possible Federal Aviation Administration test site; and

WHEREAS the State of Alaska, the University of Alaska, the Alaska Aerospace Corporation, the Alaska Aviation Safety Project, and other public and private institutions have developed cooperation with the National Aeronautics and Space Administration, the Federal Aviation Administration, the United States Department of Interior, the United States Department of Defense, and others to further advance the research, development, and use of technology to benefit and support Alaskans and Americans with the safe use of unmanned aircraft systems; and

WHEREAS Alaska state government and the state's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe unmanned aircraft system ranges onshore and offshore Alaska, which will help establish procedures for the safe operation of unmanned aircraft systems in the National Airspace System; and

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration, by virtue of being located in Alaska, has access to an area of geographic and climatic diversity where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

WHEREAS the state has the highest per capita use of general aviation activity in the nation, and Alaska aviation organizations have helped the Federal Aviation Administration develop the next generation of air traffic control for the nation and the world, while making major gains for the state's aviation safety in the process; and

WHEREAS unmanned aircraft systems may present a risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific

statutory authority to regulate privacy matters relating to unmanned aircraft systems;

BE IT RESOLVED that the Alaska State Legislature recognizes the Alaska Center for Unmanned Aircraft at the University of Alaska Fairbanks as a leader in aviation pioneering and further recognizes the significant benefit to the state and nation the center provides in research and development of unmanned aircraft systems; and be it

FURTHER RESOLVED that the Alaska State Legislature fully supports the efforts of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

FURTHER RESOLVED by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of 15 members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation and public facilities or the commissioner's designee;

(4) the commissioner of public safety or the commissioner's designee;

(5) the commissioner of natural resources or the commissioner's designee;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the commissioner of fish and game or the commissioner's designee;

(9) the adjutant general of the Department of Military and Veterans' Affairs or the adjunct general's designee;

(10) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks;

(11) a member of the Academy of Model Aeronautics;

(12) a member from the Aviation Advisory Board;

(13) a member from the Medallion Foundation;

(14) one member of the Aerospace States Association;

(15) one member of the Alaska UAS Interest Group; and be it

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than January 15, 2015, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on January 15, 2015.

HOUSE CONCURRENT RESOLUTION NO. 6

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVES HUGHES, Kawasaki, Isaacson, Pruitt

Introduced: 3/15/13
Referred: House Special Committee on Economic Development, Trade, and Tourism

A RESOLUTION

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

1A →
1B →
(2) **WHEREAS** the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

(3) **WHEREAS** the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks to further the Center's research initiatives; and to increase capabilities as a possible FAA test site; and

(4) **WHEREAS** the State of Alaska, the University of Alaska, the Alaska Aerospace Corporation, the Alaska Aviation Safety Project, and other public and private institutions have developed cooperation with the National Aeronautics and Space Administration, the Federal Aviation Administration, the United States Department of Interior, the United States

Department of Defense, and others to further advance the research, development and use of technology to benefit and support Alaskans and Americans with the safe use of unmanned aircraft systems; and

(1A) **WHEREAS**, since 2001, the ~~Alaska Center for~~ Unmanned Aircraft Systems ~~Integration~~ Program at the University of Alaska Fairbanks has been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, ~~and~~ developing technology to improve safety; and is

~~**WHEREAS** the University of Alaska Fairbanks has become~~ known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

(1B) **WHEREAS** the importance of the ~~Center's~~ Program's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the state; and

WHEREAS, as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations, aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research in the Arctic, and for other private and public sector activities, as was demonstrated when the Center used an unmanned aircraft system to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome in 2012; and

(11) **WHEREAS** unmanned aircraft systems may present a ~~substantial~~ risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems; and

(1C) **WHEREAS** the Alaska Center for Unmanned Aircraft Systems Integration, ~~at the University of Alaska Fairbanks is located in~~ by virtue of being located in Alaska has access to an area of geographic and climatic diversity

where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

(10) **WHEREAS** the Federal Aviation Administration currently requires the designation of one pilot to be in command of an unmanned aircraft system at all times, restricts use of unmanned aircraft systems by public agencies to conduct routine flights over urban or populated areas and over heavily trafficked roads or open-air assemblies of people, the discharge or dropping of objects while in flight, and the operation of unmanned aircraft systems without the capability of pilot intervention;

rewritten on back page

(5) **WHEREAS** Alaska state government and the state's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe unmanned aircraft system ranges onshore and offshore Alaska, which will help establish procedures for the safe operation of unmanned aircraft systems in the National Airspace System; and

(7) **WHEREAS** the state has the highest per capita use of general aviation activity in the nation, and Alaska aviation organizations have helped the Federal Aviation Administration develop the next generation of air traffic control for the nation and the world, while making major gains for the state's aviation safety in the process; and

(8) **BE IT RESOLVED** that the Alaska State Legislature recognizes the Alaska Center for Unmanned Aircraft at the University of Alaska Fairbanks as a leader in aviation pioneering and further recognizes the significant benefit to the state and nation the Center provides in research and development of unmanned aircraft systems; and be it

(9) **FURTHER RESOLVED** that the Alaska State Legislature fully supports the efforts of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

(12) **FURTHER RESOLVED** by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of 15 members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-

chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation and public facilities or the commissioner's designee;

(4) the commissioner of public safety or the commissioner's designee;

(5) the commissioner of natural resources or the commissioner's designee;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the commissioner of fish and game or the commissioner's designee;

(9) the adjutant general of the Department of Military and Veterans' Affairs or the adjunct general's designee;

(10) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks;

(11) a member of the Academy of Model Aeronautics;

(12) a member from the Aviation Advisory Board;

(13) a member from the Medallion Foundation; ~~and be it~~

(14) one member of the Aerospace States Association;

(15) one member of the Alaska UAS Interest Group, ~~United States Department of the Interior~~; and be it

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than January 15, 2015, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on January 15, 2015.

(10)

WHEREAS the United States Constitution protects the rights of citizens under the 4th Amendment, the Department of Homeland Security and the National Institute for Justice are protecting safety and privacy of all citizens, and the Federal Aviation Administration has established guidelines and grants authorization for appropriate use of unmanned aircraft; and

HOUSE CONCURRENT RESOLUTION NO. 12

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A RESOLUTION

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

WHEREAS the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks to further the Center's research initiatives; and

WHEREAS the State of Alaska, the University of Alaska, the Alaska Aerospace Corporation, the Alaska Aviation Safety Project, and other public and private institutions have developed cooperation with the National Aeronautics and Space Administration, the Federal Aviation Administration, the United States Department of Interior, the United States

Department of Defense, and others to further advance the research, development and use of technology to benefit and support Alaskans and Americans with the safe use of unmanned aircraft systems; and

WHEREAS, since 2001, the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, and developing technology to improve safety; and

WHEREAS the University of Alaska Fairbanks has become known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

WHEREAS the importance of the Center's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the state; and

WHEREAS, as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations, aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research in the Arctic, and for other private and public sector activities, as was demonstrated when the Center used an unmanned aircraft system to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome in 2012; and

WHEREAS unmanned aircraft systems may present a substantial risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems; and

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks is located in an area of geographic and climatic diversity

where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

WHEREAS the Federal Aviation Administration currently requires the designation of one pilot to be in command of an unmanned aircraft system at all times, restricts use of unmanned aircraft systems by public agencies to conduct routine flights over urban or populated areas and over heavily trafficked roads or open-air assemblies of people, the discharge or dropping of objects while in flight, and the operation of unmanned aircraft systems without the capability of pilot intervention;

WHEREAS Alaska state government and the state's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe unmanned aircraft system ranges onshore and offshore Alaska, which will help establish procedures for the safe operation of unmanned aircraft systems in the National Airspace System; and

WHEREAS the state has the highest per capita use of general aviation activity in the nation, and Alaska aviation organizations have helped the Federal Aviation Administration develop the next generation of air traffic control for the nation and the world, while making major gains for the state's aviation safety in the process;

BE IT RESOLVED that the Alaska State Legislature recognizes the Alaska Center for Unmanned Aircraft at the University of Alaska Fairbanks as a leader in aviation pioneering and further recognizes the significant benefit to the state and nation the Center provides in research and development of unmanned aircraft systems; and be it

FURTHER RESOLVED that the Alaska State Legislature fully supports the efforts of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

FURTHER RESOLVED by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of 15 members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-

chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation and public facilities or the commissioner's designee;

(4) the commissioner of public safety or the commissioner's designee;

(5) the commissioner of natural resources or the commissioner's designee;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the commissioner of fish and game or the commissioner's designee;

(9) the adjutant general of the Department of Military and Veterans' Affairs or the adjunct general's designee;

(10) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks;

(11) a member of the Academy of Model Aeronautics;

(12) a member from the Aviation Advisory Board;

(13) a member from the Medallion Foundation; and be it

(14) one member of the Aerospace States Association;

(15) one member of the Alaska UAS Interest Group, United States Department of the Interior; and be it

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than January 15, 2015, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on January 15, 2015.

28-LS0655\A
Gardner
3/14/13

HOUSE CONCURRENT RESOLUTION NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A RESOLUTION

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

(1) **WHEREAS** the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

WHEREAS the legislature ~~recognizes~~ delete the Center for its benefit to the state through its historic role in aviation pioneering; and

(2) **WHEREAS** the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks to further the Center's research initiatives; and

(4) **WHEREAS**, since 2001, the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has been designing payloads and upgrades

(3) WHEREAS, the State of Alaska, the University of Alaska, Alaska Aerospace Development Corporation, the Alaska Aviation Safety Project and other public and private institutions have developed cooperation with NASA, the FAA, the Department of Interior, the Department of Defense and others to further advance the research, development and use of technology to benefit and support Alaskans and Americans with the safe use of Unmanned Aircraft Systems; and

for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, and developing technology to improve safety; and

(5) **WHEREAS** the University of Alaska Fairbanks has become known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

(6) **WHEREAS** the importance of the Center's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the state; and

delete

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks is currently researching other technologies that are being developed and improved for many users, including law enforcement, that could potentially use these technologies for a variety of missions, from search and rescue to forensic recording of scenes and surveillance, in a manner similar to how manned aircraft are used today; and

(7) **WHEREAS**, as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations, aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research in the Arctic, and for other private and public sector activities, as was demonstrated when the Center used an unmanned aircraft system to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome in 2012; and

delete

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; and

delete

WHEREAS, while government agencies, including law enforcement agencies and universities, may operate unmanned aircraft systems using the Federal Aviation

Administration Certificate of Authorization or Waiver process, a civil operator may only operate an unmanned aircraft system under a Federal Aviation Administration Special Airworthiness Certificate for experimental purposes, which does not provide for commercial operations; therefore, no unmanned aircraft systems are being lawfully deployed for commercial purposes; and

(8) **WHEREAS** unmanned aircraft systems May present a substantial risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems; and

(9) **WHEREAS** the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks is located in an area of geographic and climatic diversity where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

(10) **WHEREAS** the Federal Aviation Administration currently requires the designation of one pilot to be in command of an unmanned aircraft system at all times, restricts use of unmanned aircraft systems by public agencies to conduct routine flights over urban or populated areas and over heavily trafficked roads or open-air assemblies of people, the discharge or dropping of objects while in flight, and the operation of unmanned aircraft systems without the capability of pilot intervention;

(11) WHEREAS, Alaska's state government and Alaska's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe UAS ranges onshore on offshore Alaska, which will help set procedures for the safe UAS use in the National Airspace System.

(12) WHEREAS, Alaska has the highest per capita use of general aviation activity in our nation, and Alaskan aviation organizations have helped the FAA develop the next generation of air traffic control for the nation and the world, while making major gains for Alaska's aviation safety in the process; and

[illegible] for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

(15) **FURTHER RESOLVED** by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of 13 members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the

house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair; one ~~representative~~ member selected by the Governor as a representative of the administration

~~(3)~~ the commissioner of transportation and public facilities or the commissioner's designee; one member of the Aerospace States Association

~~(4)~~ the commissioner of public safety or the commissioner's designee;

~~(5)~~ the commissioner of natural resources or the commissioner's designee; one member of the Alaska UAS Interest Group, Dept. of the Interior

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the commissioner of fish and game or the commissioner's designee;

(9) the adjutant general of the Department of Military and Veterans' Affairs or the adjunct general's designee;

(10) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks;

(11) a member of the Academy of Model Aeronautics;

(12) a member from the Aviation Advisory Board;

(13) a member from the Medallion Foundation; and be it

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than January 15, 2015, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to

carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on January 15, 2015.

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Wednesday, March 13, 2013 12:07 PM
To: LAA Legal
Subject: Doug Gardner - unmanned aircraft

So the Speaker does not want a "toothy" bill introduced and wants us to introduce a resolution with the 'findings' and establishing a task force.
LS0639 –
Sec 1 is the "whereas" section:

(1) **Replace with Ro Bailey's email** "the Alaska Center for Unmanned Aircraft Systems Integration at UAF has been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing new uses, demonstrating these uses for various potential users, working with the FAA for safe use as well as developing technology to improve safety since 2001. The University has become known throughout the country for its leadership in advancing the state of the art and the safe use of UAS. Recently the importance of this work to the State of Alaska was recognized by the Board of Regents who established the Alaska Center for Unmanned Aircraft Systems Integration - Research, Development, Test & Evaluation, hereafter known as ACUASI, to provide this work for the benefit of the entire State of Alaska.

(2) **Incorporate the following**: UAF is currently researching other technologies being developed and improved for many users including law enforcement, which could potentially use these technologies for a variety of missions including search and rescue, forensic recording of scenes, and surveillance missions similarly to how manned aircraft are used today;

(3) **Can you reference FAA Rulings in the whereas?** FAA: UAS Interim Operational Approval Guidance 08-01 section 4.1 Certificate of Waiver or Authorization (COA). COAs are granted for a period of one year or less (for the length of use for a specific project) and each project is evaluated on its individual merits. GAO (Government Accountability Office) 12-889T Unmanned Aircraft Systems states that Using UAS for commercial purposes in not currently allowed in the national airspace.

(4) **Can you reference FAA Rulings in the whereas?** FAA: UAS Interim Operational Approval Guidance 08-01 section 4.1 Certificate of Waiver or Authorization (COA). Requirements and restrictions for use are expressed in section 8.0 Flight Operations.

(5) **Line 28 following place to protect privacy**, ... delete all/replace: one directive of the task force is to recommend statute, regulation or other policy directives to protect against the gaps currently in FAA rulings regarding privacy protection and law enforcement uses of UAS.

(6) **New finding insert after (1):**

Identify UAF as the lead in research meeting the goals of industry, FAA and the state. Recognize the benefit for State and historic role by Alaska in aviation pioneering.

(7) **New finding insert at the end:** UAF receives full support of the legislature in its efforts of application and consideration to be one of the nation's six test sites due to geographic and climactic diversity and the desirable air and surface population density for UAS testing and research.

Remove Sec 2

Task Force membership:
Remove public defender
Remove office of public advocacy
Remove transportation
Remove natural resources
Add one member for one of the departments including DOT, DNR, or DFG
Add Dept of Military and Veterans' Affairs
Add Aviation Advisory Board
Add Medallion Foundation

Add local active member of the Academy of Model Aeronautics

Thank you for all of your work on this
Ginger

Office of Representative Shelley Hughes
Room 409 State Capitol
Juneau, AK 99811
907-465-5265

SSH

28-LS0639\U
Gardner/Strasbaugh
3/11/13

HOUSE BILL NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

SOFT

A BILL

FOR AN ACT ENTITLED

"An Act restricting the use of unmanned aircraft; establishing a task force to study and provide recommendations on the use of unmanned aircraft systems; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* **Section 1.** The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has been designing and making control systems for unmanned aircraft systems since 1998 and is a leading research institution at the forefront of developing unmanned aircraft systems as cost-effective and readily available research tools;

(2) as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations,

aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research on the Arctic, and for other private and public sector activities demonstrated by the use of an unmanned aircraft system by the Alaska Center for Unmanned Aircraft Systems Integration to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome, Alaska, in 2012;

(3) while government agencies, including law enforcement agencies and universities, may operate unmanned aircraft systems using the FAA Certificate of Authorization or Waiver process, a civil operator may only operate an unmanned aircraft system under an FAA Special Airworthiness Certificate for experimental purposes, which does not provide for commercial operations; therefore, no unmanned aircraft systems are being lawfully deployed for commercial purposes;

#(4) from Version N to be added

(4) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; however, since unmanned aircraft systems present a substantial risk to privacy when used by law enforcement for surveillance, and given that currently neither the FAA nor any other state or federal agency has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems, the legislature finds that, until a comprehensive statutory structure can be put in place to protect privacy, controls must be established to preclude the use of unmanned aircraft systems by law enforcement while allowing certain uses of unmanned aircraft systems to proceed.

*** Sec. 2.** AS 18.65 is amended by adding a new section to read:

Article 4A. Use of Unmanned Aircraft.

Sec. 18.65.380. Unmanned aircraft. (a) A peace officer or law enforcement agency may not use unmanned aircraft, participate in an investigation in which unmanned aircraft are being used, use information gathered by unmanned aircraft, or otherwise direct the use of unmanned aircraft, unless an imminent risk of harm to life or property exists or the use of the unmanned aircraft is specifically authorized in a search warrant under AS 12.35.

(b) In this section, "unmanned aircraft" means an aircraft that is operated

without the possibility of direct human intervention from within or on the aircraft.

*** Sec. 3.** The uncodified law of the State of Alaska is amended by adding a new section to read:

UNMANNED AIRCRAFT SYSTEMS TASK FORCE. (a) The Unmanned Aircraft Systems Task Force is created in the legislative branch for the purpose of making recommendations for a statewide comprehensive plan to regulate the use of unmanned aircraft systems for public and private sector purposes.

(b) The task force consists of 10 members who, except for those in (1) and (2) of this subsection, shall be appointed jointly by the president of the senate and the speaker of the house of representatives as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation;

(4) the commissioner of public safety;

(5) the commissioner of natural resources;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the public defender or the public defender's designee;

(9) the office of public advocacy;

(10) one member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks.

(c) The task force shall, not later than January 15, 2014, submit an initial report to the legislature, and not later than January 15, 2015, submit a final report to the legislature. The reports must include

(1) policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy when used by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;

(2) recommendations to the legislature and the governor, including draft legislation required to achieve the policy objectives proposed by the task force.

(d) The task force shall meet as frequently as necessary to carry out its responsibilities.

(e) The task force may request administrative and technical support from the University of Alaska Fairbanks.

(f) Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180.

(g) The task force terminates on January 15, 2015.

*** Sec. 4.** This Act takes effect immediately under AS 01.10.070(c).

28-LS0639\N
Gardner/Strasbaugh
3/12/13

HOUSE BILL NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A BILL

FOR AN ACT ENTITLED

"An Act establishing a crime for certain uses of unmanned aircraft; restricting the use of unmanned aircraft for collection of information or investigation by peace officers; establishing a task force to study and provide recommendations on the use of unmanned aircraft systems; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* **Section 1.** The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has been designing and making control systems for unmanned aircraft systems since 1998 and is a leading research institution at the forefront of developing unmanned aircraft systems as cost-effective and readily available research tools;

(2) as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed

for gathering information necessary to protect human life in search and rescue operations, aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research on the Arctic, and for other private and public sector activities demonstrated by the use of an unmanned aircraft system by the Alaska Center for Unmanned Aircraft Systems Integration to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome, Alaska, in 2012;

(3) while government agencies, including law enforcement agencies and universities, may operate unmanned aircraft systems using the Federal Aviation Administration Certificate of Authorization or Waiver process, a civil operator may only operate an unmanned aircraft system under a Federal Aviation Administration Special Airworthiness Certificate for experimental purposes, which does not provide for commercial operations; therefore, no unmanned aircraft systems are being lawfully deployed for commercial purposes;

(4) the Federal Aviation Administration currently requires the designation of one pilot to be in command of an unmanned aircraft system at all times, and restricts the use by public agencies of unmanned aircraft systems to conduct routine flights over urban or populated areas, operations over heavily trafficked roads or open-air assemblies of people, discharge or drop objects while in flight, and operate without the capability of pilot intervention;

(5) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; however, since unmanned aircraft systems present a substantial risk to privacy when used by law enforcement for surveillance, and given that currently neither the Federal Aviation Administration nor any other state or federal agency has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems, the legislature finds that, until a comprehensive statutory structure can be put in place to protect privacy, controls must be established to preclude the use of unmanned aircraft systems by law enforcement while allowing certain uses of unmanned aircraft systems to proceed.

* **Sec. 2.** AS 11.61 is amended by adding a new section to read:

Sec. 11.61.260. Unlawful use of unmanned aircraft. (a) A person commits the crime of unlawful use of an unmanned aircraft if the person knowingly operates an unmanned aircraft in or on the premises of another person or entity for the purpose of acquiring information by the use of a sensing device that is capable of acquiring data from its surroundings, including by a camera, microphone, thermal detector, chemical detector, radiation gauge, and wireless receiver.

(b) This section does not apply to the use of an unmanned aircraft to conduct a search

(1) under the express terms of a search warrant issued under AS 12.35;

(2) in accordance with a judicially recognized exception to the warrant requirement in AS 12.35;

(3) to monitor public land or an international border;

(4) to monitor private land with the consent of the land owner; or

(5) if an imminent risk of harm to life or property exists.

(c) In this section, "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from inside or on the aircraft.

(d) Property used to aid a violation of (a) of this section may be forfeited to the state upon conviction of the offender.

(e) Unlawful use of an unmanned aircraft is a class A misdemeanor.

* **Sec. 3.** AS 18.65 is amended by adding a new section to read:

Article 4A. Unmanned Aircraft.

Sec. 18.65.380. Use of unmanned aircraft in law enforcement. (a) A peace officer or law enforcement agency may not use unmanned aircraft, participate in an investigation in which unmanned aircraft are being used, use information gathered by unmanned aircraft, or otherwise direct the use of unmanned aircraft.

(b) This section does not apply to the use of an unmanned aircraft for a purpose permitted under AS 11.61.260(b).

(c) In this section, "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

* **Sec. 4.** The uncodified law of the State of Alaska is amended by adding a new section to

read:

UNMANNED AIRCRAFT SYSTEMS TASK FORCE. (a) The Unmanned Aircraft Systems Task Force is created in the legislative branch for the purpose of making recommendations for a statewide comprehensive plan to regulate the use of unmanned aircraft systems for public and private sector purposes.

(b) The task force consists of 10 members who, except for those in (1) and (2) of this subsection, shall be appointed jointly by the president of the senate and the speaker of the house of representatives as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation;

(4) the commissioner of public safety;

(5) the commissioner of natural resources;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the public defender or the public defender's designee;

(9) the office of public advocacy;

(10) one member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks.

(c) The task force shall, not later than January 15, 2014, submit an initial report to the legislature, and not later than January 15, 2015, submit a final report to the legislature. The reports must include

(1) policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy when used by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;

(2) recommendations to the legislature and the governor, including draft legislation required to achieve the policy objectives proposed by the task force.

(d) The task force shall meet as frequently as necessary to carry out its responsibilities.

(e) The task force may request administrative and technical support from the University of Alaska Fairbanks.

(f) Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180.

(g) The task force terminates on January 15, 2015.

* **Sec. 5.** This Act takes effect immediately under AS 01.10.070(c).

DOT funding might be available for task force??

Joint Project
- SDMI Statewide Digital Mapping Initiative
- Safety ... ? (project)

FAA = no allowance for Model Aircraft to use UA as a "tool." business

28-LS0639\C
Gardner/Strasbaugh
3/12/13

HOUSE BILL NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A BILL

FOR AN ACT ENTITLED

"An Act restricting the use of unmanned aircraft; establishing a task force to study and provide recommendations on the use of unmanned aircraft systems; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

*** Section 1.** The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has been designing and making control systems for unmanned aircraft systems since 1998 and is a leading research institution at the forefront of developing unmanned aircraft systems as cost-effective and readily available research tools;

(2) as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations,

aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research on the Arctic, and for other private and public sector activities demonstrated by the use of an unmanned aircraft system by the Alaska Center for Unmanned Aircraft Systems Integration to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome, Alaska, in 2012;

(3) while government agencies, including law enforcement agencies and universities, may operate unmanned aircraft systems using the Federal Aviation Administration Certificate of Authorization or Waiver process, a civil operator may only operate an unmanned aircraft system under a Federal Aviation Administration Special Airworthiness Certificate for experimental purposes, which does not provide for commercial operations; therefore, no unmanned aircraft systems are being lawfully deployed for commercial purposes;

(4) the Federal Aviation Administration currently requires the designation of one pilot to be in command of an unmanned aircraft system at all times, restricts the use by public agencies of unmanned aircraft systems to conduct routine flights over urban or populated areas, operations over heavily trafficked roads or open-air assemblies of people, discharge or drop objects while in flight, and restricts operation of unmanned aircraft systems without the capability of pilot intervention;

(5) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; however, since unmanned aircraft systems present a substantial risk to privacy when used by law enforcement for surveillance, and given that currently neither the Federal Aviation Administration nor any other state or federal agency has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems, the legislature finds that, until a comprehensive statutory structure can be put in place to protect privacy, controls must be established to preclude the use of unmanned aircraft systems by law enforcement while allowing certain uses of unmanned aircraft systems to proceed.

*** Sec. 2.** AS 18.65 is amended by adding a new section to read:

Article 4A. Use of Unmanned Aircraft.

Sec. 18.65.380. Unmanned aircraft. (a) A peace officer or law enforcement agency may not use unmanned aircraft, participate in an investigation in which unmanned aircraft are being used, use information gathered by unmanned aircraft, or otherwise direct the use of unmanned aircraft, unless an imminent risk of harm to life or property exists or the use of the unmanned aircraft is specifically authorized in a search warrant under AS 12.35.

(b) In this section, "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

*** Sec. 3.** The uncodified law of the State of Alaska is amended by adding a new section to read:

UNMANNED AIRCRAFT SYSTEMS TASK FORCE. (a) The Unmanned Aircraft Systems Task Force is created in the legislative branch for the purpose of making recommendations for a statewide comprehensive plan to regulate the use of unmanned aircraft systems for public and private sector purposes.

(b) The task force consists of 10 members who, except for those in (1) and (2) of this subsection, shall be appointed jointly by the president of the senate and the speaker of the house of representatives as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation and public facilities;

(4) the commissioner of public safety;

(5) the commissioner of natural resources;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the public defender or the public defender's designee;

(9) the office of public advocacy;

(10) one member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks.

(c) The task force shall, not later than January 15, 2014, submit an initial report to the legislature, and not later than January 15, 2015, submit a final report to the legislature. The reports must include

(1) policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy when used by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;

(2) recommendations to the legislature and the governor, including draft legislation required to achieve the policy objectives proposed by the task force.

(d) The task force shall meet as frequently as necessary to carry out its responsibilities.

(e) The task force may request administrative and technical support from the University of Alaska Fairbanks.

(f) Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180.

(g) The task force terminates on January 15, 2015.

*** Sec. 4.** This Act takes effect immediately under AS 01.10.070(c).

28-LS0639\U
Gardner/Strasbaugh
3/11/13

HOUSE BILL NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A BILL

FOR AN ACT ENTITLED

"An Act restricting the use of unmanned aircraft; establishing a task force to study and provide recommendations on the use of unmanned aircraft systems; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

*** Section 1.** The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has been designing and making control systems for unmanned aircraft systems since 1998 and is a leading research institution at the forefront of developing unmanned aircraft systems as cost-effective and readily available research tools;

(2) as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations,

aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research on the Arctic, and for other private and public sector activities demonstrated by the use of an unmanned aircraft system by the Alaska Center for Unmanned Aircraft Systems Integration to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome, Alaska, in 2012;

(3) while government agencies, including law enforcement agencies and universities, may operate unmanned aircraft systems using the FAA Certificate of Authorization or Waiver process, a civil operator may only operate an unmanned aircraft system under an FAA Special Airworthiness Certificate for experimental purposes, which does not provide for commercial operations; therefore, no unmanned aircraft systems are being lawfully deployed for commercial purposes;

(4) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; however, since unmanned aircraft systems present a substantial risk to privacy when used by law enforcement for surveillance, and given that currently neither the FAA nor any other state or federal agency has specific statutory authority to regulate privacy matters relating to unmanned aircraft systems, the legislature finds that, until a comprehensive statutory structure can be put in place to protect privacy, controls must be established to preclude the use of unmanned aircraft systems by law enforcement while allowing certain uses of unmanned aircraft systems to proceed.

*** Sec. 2.** AS 18.65 is amended by adding a new section to read:

Article 4A. Use of Unmanned Aircraft.

Sec. 18.65.380. Unmanned aircraft. (a) A peace officer or law enforcement agency may not use unmanned aircraft, participate in an investigation in which unmanned aircraft are being used, use information gathered by unmanned aircraft, or otherwise direct the use of unmanned aircraft, unless an imminent risk of harm to life or property exists or the use of the unmanned aircraft is specifically authorized in a search warrant under AS 12.35.

(b) In this section, "unmanned aircraft" means an aircraft that is operated

without the possibility of direct human intervention from within or on the aircraft.

*** Sec. 3.** The uncodified law of the State of Alaska is amended by adding a new section to read:

UNMANNED AIRCRAFT SYSTEMS TASK FORCE. (a) The Unmanned Aircraft Systems Task Force is created in the legislative branch for the purpose of making recommendations for a statewide comprehensive plan to regulate the use of unmanned aircraft systems for public and private sector purposes.

(b) The task force consists of 10 members who, except for those in (1) and (2) of this subsection, shall be appointed jointly by the president of the senate and the speaker of the house of representatives as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation;

(4) the commissioner of public safety;

(5) the commissioner of natural resources;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the public defender or the public defender's designee;

(9) the office of public advocacy;

(10) one member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks.

(c) The task force shall, not later than January 15, 2014, submit an initial report to the legislature, and not later than January 15, 2015, submit a final report to the legislature. The reports must include

(1) policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy when used by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;

(2) recommendations to the legislature and the governor, including draft legislation required to achieve the policy objectives proposed by the task force.

(d) The task force shall meet as frequently as necessary to carry out its responsibilities.

(e) The task force may request administrative and technical support from the University of Alaska Fairbanks.

(f) Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180.

(g) The task force terminates on January 15, 2015.

*** Sec. 4.** This Act takes effect immediately under AS 01.10.070(c).

28-LS0639\A
Gardner/Strasbaugh
3/11/13

HOUSE BILL NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - FIRST SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A BILL

FOR AN ACT ENTITLED

"An Act restricting the use of unmanned aircraft; establishing a task force to study and provide recommendations on the use of unmanned aircraft systems; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

*** Section 1.** The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has been designing and making control systems for unmanned aircraft systems since 1998 and is a leading research institution at the forefront of developing unmanned aircraft systems as cost-effective and readily available research tools;

(2) as the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks has demonstrated, unmanned aircraft systems can be designed for gathering information necessary to protect human life in search and rescue operations,

aiding in the management of resources, including marine mammal and fisheries research, providing humanitarian assistance, providing a platform for scientific research on the Arctic, and for other private and public sector activities demonstrated by the use of an unmanned aircraft system by the Alaska Center for Unmanned Aircraft Systems Integration to assist the United States Coast Guard Cutter Healy and the Russian tanker Renda in delivering fuel to Nome, Alaska, in 2012;

(3) in addition to research applications, unmanned aircraft systems, commonly referred to as "drones," which vary in size from four inches to a full-sized aircraft, have the capability to use global positioning, forward-looking infrared technology, and high resolution cameras, all of which are being developed and improved for use by law enforcement agencies to perform surveillance as technology rapidly advances;

(4) the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks has demonstrated that unmanned aircraft systems can be designed and operated for scientific research, saving human lives, and for use as cost-effective tools for both the public and private sector; however, since unmanned aircraft systems present a substantial risk to privacy when used by law enforcement for surveillance, and given the current lack of controls in place to protect privacy, the legislature finds that, until a comprehensive statutory structure can be put in place with input from all user groups affected by unmanned aircraft systems, to protect privacy, controls must be established to preclude the use of unmanned aircraft systems by law enforcement while allowing certain uses of unmanned aircraft systems to proceed.

*** Sec. 2.** AS 18.65 is amended by adding a new section to read:

Article 4A. Use of Unmanned Aircraft.

Sec. 18.65.380. Unmanned aircraft. (a) A peace officer or law enforcement agency may not use unmanned aircraft, participate in an investigation in which unmanned aircraft are being used, use information gathered by unmanned aircraft, or otherwise direct the use of unmanned aircraft, unless an imminent risk of harm to life or property exists or the use of the unmanned aircraft is specifically authorized in a search warrant under AS 12.35.

(b) In this section, "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

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(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of transportation;

(4) the commissioner of public safety;

(5) the commissioner of natural resources;

(6) one member representing municipal law enforcement;

(7) the attorney general or the attorney general's designee;

(8) the public defender or the public defender's designee;

(9) the office of public advocacy;

(10) one member representing the Alaska Center for Unmanned Aircraft Systems Integration at University of Alaska Fairbanks.

(c) The task force shall, not later than January 15, 2014, submit an initial report to the legislature and the governor, and not later than January 15, 2015, submit a final report to the governor. The reports must include

(1) policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy when used by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;

(2) recommendations to the legislature and the governor, including draft legislation required to achieve the policy objectives proposed by the task force.

(d) The task force shall meet as frequently as necessary to carry out its

responsibilities.

(e) The task force may request administrative and technical support from the University of Alaska Fairbanks.

(f) Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180.

(g) The task force terminates on January 15, 2015.

*** Sec. 4.** This Act takes effect immediately under AS 01.10.070(c).

Be it enacted by the General Assembly of Virginia:

1. *No state or local agency or organization having jurisdiction over criminal law enforcement or regulatory violations, including but not limited to the Department of State Police, and no department of law enforcement as defined in § 15.2-836 of the Code of Virginia of any county, city, or town shall utilize an unmanned aircraft system before July 1, 2015.*

2. *Notwithstanding the prohibition in this section, an unmanned aircraft system may be deployed before July 1, 2015, when an Amber Alert is activated pursuant to § 52-34.3 of the Code of Virginia, when a Senior Alert is activated pursuant to § 52-34.6 of the Code of Virginia, when a Blue Alert is activated pursuant to § 52-34.9 of the Code of Virginia, or for the purpose of a search and rescue operation. In no case may a weaponized unmanned aircraft system be deployed or its use facilitated by a state or local agency in Virginia.*

3. *The prohibitions in this section shall not apply to the Virginia National Guard while utilizing unmanned aircraft systems during training required to maintain readiness for its federal mission, when facilitating training for other United States Department of Defense units, or when such systems are utilized to support the Commonwealth for purposes other than law enforcement, including damage assessment, traffic assessment, flood stages, and wildfire assessment.*

I would like the bill to:

- identify UAF as the lead agency in the research, operation and management of drone (UAS) technology for the State of Alaska (and the USA)
- place a moratorium on law enforcement to utilize UAS technology for discovering but would authorize use in the event of life and safety as part of the investigation of an event that has already occurred and must only be used in conjunction with a warrant
- any information gathered by a drone that is not specifically related to the project contract or warrant may not be used for law enforcement purposes
- prohibition for using any type of weapon using UAS technology for the duration of this moratorium excluding controlled testing as managed by UAF or the US Military in pre-established sites
- The UAS operation has to comply with FAA regulation
- Requires UAF approval/oversight for UAS purchase/use by any governmental agency
- Require a report to the legislature on July 1 and first day of legislative session. One legislator from each body assigned by Speaker and President will receive informal updates of UAS use.

Findings:
Drones can be as small as 4 inches in size (infrared technology seeing through walls) and as large as a full-sized aircraft; they are both gas and electric powered with newer technologies begin developed.
UAS must follow the requirement for marine mammal harassment agreement for aircraft to limit noise
UAF has been using UAS for more than ten years for humanitarian purposes
Economic development – the work by UAF seeks to bring a new industry to Alaska an benefitting existing industry such as fishing, safety, government data collection efforts, NOAA,
Laws of privacy already presumed for UAS use
Manned aircraft by law enforcement has been clearly defined and tried in court
The value of unmanned aircraft for dirty, dull or dangerous jobs saves lives while providing invaluable services to Alaska's citizens.

Non-government commercial use is banned by FAA regulations
Laws and regulations already exist regarding the collection of biometric data whether by human or technology (sight doctrine and warrants)
FAA has published RC guidelines that differentiates recreational use from UAS or manned aircraft.

- **Do not** include physical operation of UAS such as "no-fly" area or altitudes... this is taken care of by FAA and could change through research conducted by UAF
- **Do not** include private use of RC users because it is already governed by personal privacy laws
- Indiscriminant killing VS discriminant killing statement made in WA state went viral
-

Ginger Blaisdell

From: Rep. Shelley Hughes
Sent: Friday, February 15, 2013 12:24 PM
To: Ginger Blaisdell
Subject: FW: Alaska drones

What do you think? May be too "out there" - but then again, setting parameters pro-actively can sometimes be a good idea. My one hesitation is that the technology could possibly be developed for good purposes. Aerial infrared photos that we saw in Energy Comm showing heat loss from building come to mind.

Shelley Hughes
Representative
Alaska State Legislature
House District 8 - Greater Palmer
State Capitol Room 409
Juneau, Alaska 99801
(907) 465-3743
1-800-565-3743

-----Original Message-----
From: George Sahlstrom [mailto:gsahlstrom@me.com]
Sent: Friday, February 15, 2013 6:57 AM
To: Rep. Shelley Hughes
Subject: Alaska drones

Dear Rep. Hughes,

There is an area of privacy that I am concerned about, especially the recent trend to use unmanned drone aircraft for domestic surveillance (see: http://www.washingtonguardian.com/drones-home). I really don't want this country to become a police-state, and feel like we need to take heed lest our freedoms slowly slip away. I see in the news (http://www.usnews.com/news/articles/2013/02/05/city-in-virginia-becomes-first-to-pass-anti-drone-legislation-) where a local jurisdiction has made an effort to ban the use of drones, or at least evidence obtained by them from court. This is probably really off the wall, but could it be time for us as a state to ban their use by local law enforcement?

George Sahlstrom
Palmer, AK
907-982-8480

I like Virginia's language that it is for 2 years but drones can be used for life health & safety.

CITY OF CHARLOTTESVILLE,
VIRGINIA CITY COUNCIL AGENDA

Agenda Date:	February 4, 20122
Action Required:	Vote on Resolution
Presenter:	Maurice Jones
Staff Contacts:	Maurice Jones
Title:	**Anti-Drone Legislation**

Background:

Council requested that this be added to an agenda after a group of citizens spoke in support of passing an anti-drone resolution at the Council meeting on January 22, 2013.

A resolution was also submitted to Council by the Rutherford Institute on January 21, 2013.

Discussion:

Council received an email from David Swanson, as well as a proposed resolution

Attachments:

Email from David Swanson
Proposed Anti-Drone Resolution from David Swanson
Proposed Resolution from Rutherford Institute

ATTACHMENT

A New Model Drone Resolution
By David Swanson
http://warisacrime.org/content/new-model-drone-resolution

In the absence of state or federal laws, localities around the United States are proceeding to put unmanned aerial vehicles in our skies as they see fit. The federal government has authorized the flight of 30,000 drones, and the use of drones up to 400 feet by police departments, at least 300 of which already have surveillance drones in operation.

Concerns include the following: drones can crash into airplanes, buildings, and each other; drones can fall out of the sky; drones can produce noise pollution; drones can produce visual pollution if put to the same use that everything from brick walls to urinals has been put to, viz. advertising; drones can be used to spy on us whether by private or public entities; police surveillance with drones will violate our Fourth Amendment rights as all existing technologies are currently used to do; police forces that view the public as their enemy will deploy drones armed with rubber bullets, tear gas, or other weapons; and ultimately a program run by the U.S. military and the CIA that has targeted and murdered three U.S. citizens that we know of, along with thousands of other men, women, and children, may eventually find it acceptable to include U.S. soil in its otherwise unlimited field of operations.

Contrary concerns over banning or restricting drones include these: drones could conceivably be put to positive or non-offensive use by departments fighting forest fires, first responders in rural areas, farmers, artistic photographers, real estate agents, tourism offices, and hobbyists; states and localities are limited in their control of air space by federal law.

Few if any localities have thus far made their desires known or created ordinances to regulate the use of drones, but state legislatures, including the General Assembly here in Virginia, are taking up bills. With the City of Charlottesville, where I live, planning to address the issue on February 19th, I've taken a look at (and plagiarized liberally from) numerous draft resolutions, including those from several cities that are now considering taking action: Berkeley, Buffalo, Madison, Ft. Wayne, et alia, as well as a draft resolution from anti-drone activist Nick Mottern, and one from the Rutherford Institute. The result is the following draft resolution that I offer for consideration, comment, and modification:

DRAFT ANTI-DRONE RESOLUTION
(submitted by David Swanson)

WHEREAS, United States airspace is the busiest in the world, with up to 87,000 flights per day;
WHEREAS, unmanned aircraft (drones) have an accident rate seven times higher than general aviation and 353 times higher than commercial aviation;

WHEREAS, the Federal Aviation Administration Modernization and Reform Act of 2012 directs the FAA to create regulations that will enable drones to fly throughout U.S. airspace by September, 2015;

WHEREAS, small drones, 25 pounds or under, are now permitted to fly in general airspace below 400 feet for the use of police and first responders, with FAA permission;

WHEREAS, drones do not have the same capability to avoid other aircraft as aircraft piloted by humans;

WHEREAS, drones have at times gotten out of human control, in at least one instance having to be shot down, and drones are susceptible to electronic interference and having control seized electronically by unauthorized operators;

WHEREAS, drones can be used to film individuals or groups around the clock, in public spaces and through the windows of private homes, and to continuously monitor cell-phone and text messaging;

WHEREAS, drones are being developed that will use computerized facial images to target individuals and, once launched, to operate, autonomously, without further human involvement, to locate and kill those individuals;

WHEREAS, Vanguard Defense Industries has confirmed that its Shadowhawk drone, which is already being sold to law enforcement agencies throughout the country, will be outfitted with weapons, including a grenade launcher or a shotgun, tear gas, and rubber buckshot, and such aerial police weapons send a clear and chilling message to those attempting to exercise their First Amendment rights by taking to the streets and protesting government policies --the message: stay home;

WHEREAS, the rapid implementation of drone technology throughout the United States poses a serious threat to the privacy and constitutional rights of the American people, including the residents of Charlottesville;

WHEREAS, the federal government and the Commonwealth of Virginia have thus far failed to provide reasonable legal restrictions on the use of drones within the United States;

WHEREAS, police departments throughout the country have begun implementing drone technology absent any guidance or guidelines from law makers;

WHEREAS, the federal use of drones provides a poor precedent for their domestic use, drone wars having turned public opinion in Yemen and Pakistan dramatically against the U.S. government, drone strikes having killed far more non-targeted people than those targeted, targeted victims having included men, women, and children known by name and unknown, no targeted individual having been charged with any crime, no legislative or judicial or public oversight having been permitted, "double-tap" strikes having been used to target rescuers of

victims of previous strikes, children and adults having been traumatized by the presence of drones, over a million people having fled their homes in heavily droned areas, drones having killed Americans in accidental "friendly fire," drone operators having been targeted and killed on a base in Afghanistan, drone pilots having suffered post-traumatic stress disorder at a higher rate than other pilots as a result of watching families for long periods of time before killing them, and drones having proved a tremendously costly expense for taxpayers;

NOW, THEREFORE, BE IT RESOLVED, that the City Council of Charlottesville, Virginia, calls on the United States Congress and the General Assembly of the Commonwealth of Virginia, to adopt legislation prohibiting the use of drones for surveillance, and prohibiting information obtained from the domestic use of drones from being introduced into a Federal or State court, and precluding the domestic use of drones equipped with anti-personnel devices, meaning any projectile, chemical, electrical, directed-energy (visible or invisible), or other device designed to harm, incapacitate, or otherwise negatively impact a human being.

BE IT FURTHER RESOLVED, that the City Council of Charlottesville, Virginia, calls on the U.S. government to immediately end its practice of extrajudicial killing, whether by drone or any other means.

BE IT FURTHER RESOLVED, that the City Council of Charlottesville, Virginia, declares Charlottesville a No Drone Zone, and instructs the City Attorney to perform the necessary legal tasks to transform this declaration into an Ordinance wherein drones are hereby banned from airspace over the City of Charlottesville, including drones in transit, to the extent compatible with federal law.

BE IT FURTHER RESOLVED, that violation of the ordinance shall be considered a misdemeanor carrying a maximum penalty of up to one year in jail and a fine not to exceed $10,000, and each offense that is more than one offense of flying a drone within said airspace will be considered to be an additional misdemeanor, with jail time and fines based on the number of violations.

BE IT FURTHER RESOLVED, that exemptions will be made for hobbyists to fly remote controlled model aircraft and other unmanned aerial vehicles in specified areas, away from dwellings and the urban cityscape of people and buildings as long as those devices are not equipped to monitor any person or private residence or equipped with any weapon.

BE IT FURTHER RESOLVED, that drones will not be purchased, leased, borrowed, tested, contracted or otherwise used by any agency of the City of Charlottesville.

A RESOLUTION
(submitted by Rutherford Institute)

To encourage the General Assembly of Virginia to provide for limitations on the use of evidence obtained from the domestic use of drones and to preclude the domestic use of drones equipped with anti-personnel devices.

WHEREAS, the rapid implementation of drone technology throughout the United States poses a serious threat to the privacy and constitutional rights of the American people, including the residents of Charlottesville; and

WHEREAS, the federal government and the Commonwealth of Virginia have thus far failed to provide reasonable legal restrictions on the use of drones within the United States; and

WHEREAS, police departments throughout the country have begun implementing drone technology absent any guidance or guidelines from law makers;

NOW, THEREFORE, LET IT BE RESOLVED, that the City Council of Charlottesville, Virginia, calls on the United States Congress and the General Assembly of the Commonwealth of Virginia, to adopt legislation prohibiting information obtained from the domestic use of drones from being introduced into a Federal or State court, and precluding the domestic use of drones equipped with anti-personnel devices, meaning any projectile, chemical, electrical, directed-energy (visible or invisible), or other device designed to harm, incapacitate, or otherwise negatively impact a human being.

Freedom from Drone Surveillance Resolution

January 2013

While there are at least 63 active drone sites around the U.S.,[1] the Obama administration is calling for drone technology to be integrated into the national air space by 2015.[2] By 2020, just seven short years from now, it is estimated that at least 30,000 of these drones will be crisscrossing the nation's skies, serving a wide range of functions, both public and private, governmental and corporate. We will find ourselves operating under a new paradigm marked by round-the-clock surveillance and with little hope of real privacy.[3]

The Problem of Increasing Drone Surveillance

The legislative vehicle for this rapid transition into a surveillance state came in the guise of the Federal Aviation Administration (FAA) reauthorization bill signed into law by President Obama in February 2012.[4] It was enacted after intense corporate lobbying by drone makers and potential customers hoping to capitalize on the $12 - 30 billion per year industry. [5]

Drones will undoubtedly be put to a host of legitimate uses, such as helping to spot wildfires, monitoring illegal border crossings, and carrying out search-and-rescue missions; however, in the name of alleged efficiency and cost-effectiveness, law enforcement agencies will find a whole host of clever and innovative ways to use drones to invade our daily lives, not the least of which will be traffic enforcement and crowd control.

While the threat these drones pose to privacy is unprecedented, they are being unleashed on the American populace before any real protocols to protect our privacy rights have been put in place and in such a way as to completely alter the landscape of our lives and our freedoms. We are truly entering a new era. Drones are equipped with thermal imaging devices to see through walls[6] and outfitted with infrared cameras and radar[7] which allow the police to keep track of anyone walking around, regardless of the nature of their business.

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[1] Julian Gavaghan, "Is there a drone in your neighbourhood? Rise of spy planes exposed after FAA is forced to reveal 63 launch sites across U.S.," *Daily Mail* (April 24, 2012), http://www.dailymail.co.uk/news/article-2134376/Is-drone-neighbourhood-Rise-killer-spy-planes-exposed-FAA-forced-reveal-63-launch-sites-U-S.html#ixzz1tNpEUKcu.

[2] *See* http://www.huffingtonpost.com/2012/02/15/obama-signs-bill-moderniz_0_n_1278594.html.

[3] *See generally*, https://www.rutherford.org/publications_resources/john_whiteheads_commentary/the_empire_strikes_back_attack_of_the_drones; https://www.rutherford.org/publications_resources/john_whiteheads_commentary/the_drone-ification_of_america.

[4] *See* http://www.huffingtonpost.com/2012/02/15/obama-signs-bill-moderniz_0_n_1278594.html.

[5] Market Research, "Robotics: Technologies and Global Markets." Last modified July 1, 2011. Accessed April 26, 2012. http://www.marketresearch.com/BCC-Research-v374/Robotics-Technologies-Global-6481848/.

[6] *See* http://www.theblaze.com/stories/want-to-see-the-aerial-drone-police-could-soon-deploy-in-your-town/.

[7] *See* http://articles.nydailynews.com/2009-10-23/news/17936654_1_international-maritime-bureau-somali-coast-drones.

This Resolution Will Encourage State and Federal Lawmakers To:

- **Protect Privacy Rights**
  - With the help of nanotechnology, scientists have been able to create ever-smaller drones that mimic the behavior of birds and insects and are almost undetectable.[8] Despite their diminutive size, these drones are capable of capturing and relaying vast amounts of data and high-definition video footage. It is inevitable that as more local police agencies acquire these spy flies, their surveillance efforts will expand to include not only those suspected of criminal activity but anyone within range of the cameras. In such a surveillance state, we shall all be treated as suspects.
  - An agency with the Department of Defense is working on turning insects into living unmanned aerial vehicles (UAVs or "cybugs"). By expanding upon the insects' natural abilities (e.g., bees' olfactory abilities being utilized for bomb detection, etc.), government agents hope to use these spy bugs to surreptitiously gather vast quantities of information. Researchers eventually hope to outfit June beetles with tiny backpacks complete with various detection devices, microphones, and cameras. These devices could be powered by the very energy produced by the bugs beating their wings, or the heat they give off while in flight.[9] There have already been reported sightings of dragonfly-like robotic drones monitoring protesters aerially in Washington, DC, as early as 2007.
- **Protect People's First Amendment Rights**
  - Drones will be outfitted with crowd control weapons. Vanguard Defense Industries has confirmed that its Shadowhawk drone, which is already being sold to law enforcement agencies throughout the country, will be outfitted with lethal weapons, including a grenade launcher or a shotgun, and weapons of compliance, such as tear gas[10] and rubber buckshot.[11] Such aerial police weapons send a clear and chilling message to those attempting to exercise their First Amendment rights by taking to the streets and protesting government policies—the message: stay home.
- **Protect against Fourth Amendment Violations**
  - There are many constitutional concerns presented by drones recording Americans' daily activities, with the most obvious being what it means for the Fourth Amendment protection against unreasonable searches and seizures by government agents. While it will certainly give rise to a whole new dialogue about where to draw the line when it comes to the government's ability to monitor one's public versus private life, the courts

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[8] Elisabeth Bumiller and Thom Shanker, "War Evolves With Drones, Some Tiny as Bugs," *NY Times* (June 19, 2011), http://www.nytimes.com/2011/06/20/world/20drones.html?_r=1.
[9] Allison Barrie, "June Beetles Conscripted Into Cyborg Army," *FOX News*, (January 5, 2012), http://www.foxnews.com/tech/2012/01/05/june-beetles-conscripted-into-cyborg-army/.
[10] Morley, Jefferson. "Drones for "urban warfare"." *Salon*, April 24, 2012. http://www.salon.com/2012/04/24/drones_for_urban_warfare/singleton/ (accessed April 26, 2012).
[11] Morley, Jefferson. "The drones are coming — to America." *Salon*, April 10, 2012. http://www.salon.com/2012/04/10/the_drones_are_coming_to_america/singleton/ (accessed April 26, 2012).

have been notorious for their inability to keep pace with rapid advances in technology and its impact on our freedoms.

- With 56 government agencies now authorized to use drones, including 22 law enforcement agencies and 24 universities, the drones are not going away.[12] Included among the institutions authorized to fly drones are police departments in Arkansas, Utah and Florida[13] as well as Virginia Tech and the University of North Dakota. The University of North Dakota even has a degree program in unmanned vehicle flight with 78 majors.[14]

[12] Morley, Jefferson. "Drones for "urban warfare"." *Salon*, April 24, 2012. http://www.salon.com/2012/04/24/drones_for_urban_warfare/singleton/ (accessed April 26, 2012).
[13] Singer, P.W. "We, Robot." *Slate*, May 19, 2010. http://www.slate.com/articles/news_and_politics/war_stories/2010/05/we_robot.single.html (accessed April 26, 2012).
[14] Pasztor, Andy. "Drone Use Takes Off on the Home Front." *Wall Street Journal*, April 21, 2012. http://online.wsj.com/article_email/SB10001424052702304331204577354331959335276-lMyQjAxMTAyMDEwOTExNDkyWj.html?mod=wsj_share_email_bot (accessed April 26, 2012).

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JOHN W. WHITEHEAD
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January 21, 2013

Mayor Satyendra Singh Huja
Charlottesville City Council
Box 911, City Hall
Charlottesville, VA 22902

Re: Model Resolution to Protect Privacy in the Age of Drone Technology

Dear Mayor Huja:

The FAA Reauthorization Act, signed into law by President Obama in February 2012, has opened the door for unmanned aerial vehicles—commonly known as drones—to take to the skies over America. Once confined to the battlefields over Iraq and Afghanistan, these drones are now set to patrol the skies over our homeland. The Obama administration is calling for drone technology to be integrated into the national air space by 2015.[1] By 2020, just seven short years from now, it is estimated that at least 30,000 drones will be airbound, serving a wide range of functions, both public and private, governmental and corporate.

The Rutherford Institute[2] has been particularly vocal in warning against the unprecedented privacy and civil liberties threats posed by allowing drones to take to the skies domestically,[3] particularly when it comes to drones recording Americans' daily activities. Unfortunately, these drones—aerial, robotic threats to privacy and security—are being unleashed on the American populace before any real protocols to protect our privacy rights have been put in place and in such a way as to completely alter the landscape of our lives and our freedoms.

A recent editorial in *The Daily Progress* highlighted the pressing privacy concerns posed by drones, citing legislation put forth by Virginia State Senator Frank Ruff, which is intended to protect citizens engaged in hunting on their private property

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[1] http://www.huffingtonpost.com/2012/02/15/obama-signs-bill-moderniz_0_n_1278594.html.
[2] The Rutherford Institute is a non-profit civil liberties organization that provides free legal representation to individuals whose civil rights are threatened or infringed.
[3] HB 1160, http://lis.virginia.gov/cgi-bin/legp604.exe?121+ful+HB1160ER+pdf.

from drone surveillance by other private citizens.[4] This legislation is far too narrow in scope to have any serious impact on the widespread threat to privacy and civil liberties posed by drone technology, but it also proves that now is the time to start debating the matter and working to safeguard citizens from the prying eyes of this futuristic surveillance technology. I would also caution against providing law enforcement officials with greater leeway to use drones conditioned only on their first acquiring a court-issued warrant.

In the past, Charlottesville City Council has taken the lead in condemning various government policies which threaten the livelihood of all Americans, including the residents of Charlottesville. For example, in July 2003 the Council passed a resolution expressing opposition to the USA PATRIOT Act, the federal law which formed the basis for the rapid erosion of our civil liberties in the post-9/11 era.[5] Just a year ago, in January 2012, the Council passed a resolution expressing opposition to a potential war against Iran in addition to calling for the cessation of ongoing military conflicts abroad which redirect precious tax dollars away from our floundering economy.[6] Most recently, in May 2012, City Council recognized the injustice and inefficiencies of our nation's current drug policy, and so passed a resolution[7] encouraging the Commonwealth of Virginia to consider regulating marijuana in the same manner as alcohol.

Now City Council has another chance to take the lead in expressing its concern about the rapid implementation of drone technology across the United States. It is our hope that you not only give serious consideration to the dangers posed to our freedoms by these aerial devices but ensure that the people of Charlottesville are protected against any resulting incursions on their rights as protected under the U.S. Constitution. To that end, I am submitting to you a model resolution to encourage the Commonwealth of Virginia to take rapid action in regulating this technology and to prevent law enforcement agencies from employing drones equipped with anti-personnel devices and from using evidence gathered via drone surveillance technology in court. These two prohibitions will surely be a strong first step in securing our constitutional rights against potential violations by government agents utilizing this new technology. Also included is a concise factsheet explaining the gravity of the situation and why this model resolution is the best approach.

As Congressmen Edward Markey (D – MA) and Joe Barton (R – TX) pointed out in a letter to the Federal Aviation Administration (FAA) concerning the widespread implementation of drone technology in America:

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[4] "Drones: We need broad protections," *The Daily Progress*, (January 15, 2013), http://www.dailyprogress.com/opinion/editorials/article_2592fab0-5e8c-11e2-9bd3-001a4bcf6878.html.
[5] Christine Wallace, "City Council rebukes Patriot Act in resolution," *Cavalier Daily*, (July 24, 2003), http://www.cavalierdaily.com/article/2003/07/city-council-rebukes-patriot-act-in-resolution/.
[6] David Swanson, "Charlottesville, Va., City Council Passes Resolution Opposing War on Iran," *War is a Crime*, (January 17, 2012), http://warisacrime.org/content/charlottesville-va-city-council-passes-resolution-opposing-war-iran.
[7] Graham Moomaw, "Charlottesville council OKs marijuana resolution," *The Daily Progress*, (May 7, 2012), http://www.dailyprogress.com/news/article_b9f9a423-f85a-5279-ba50-ab906c3015ac.html.

> Many drones are designed to carry surveillance equipment, including video cameras, infrared thermal imagers, radar, and wireless network "sniffers." The surveillance power of drones is amplified when the information from onboard sensors is used in conjunction with facial recognition, behavior analysis, license plate recognition, or any other system that can identify and track individuals as they go about their daily lives.[8]

While drones will undoubtedly be put to some legitimate uses, such as helping to spot wildfires and carrying out search-and-rescue missions, their "beneficence" is a double-edged sword. Indeed, without proper safeguards, rules, and regulations, law enforcement agencies will find a whole host of clever and innovative ways to use drones to invade our daily lives and wreak havoc on our freedoms.

Undoubtedly, these devices, which are capable of videotaping the facial expressions of people on the ground from hundreds of feet in the air, will usher in a new age of surveillance in our society. No person, whether he is at a political rally, exiting a house of worship, or simply walking around downtown, will be safe from the prying eyes of these devices, some of which are deceptively small and agile as a bee.[9] Moreover, not even those indoors, in the privacy of their homes, will be safe from these aerial spies, which can be equipped with technology capable of peering through walls.[10]

Equally troubling, these devices, which are used for bombing campaigns abroad, will also be equipped with anti-personnel weapons for use domestically. Drone manufacturers have confirmed that they can be equipped with automatic weapons, grenade launchers, rubber buckshot,[11] tear gas[12] and tasers. These devices will place a whole new spin on the aggressive police activities witnessed across the nation during the Occupy Wall Street protests in late 2011.[13]

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[8] Congressmen Edward Markey and Joe Barton, Letter to FAA Administrator Michael P. Huerta (April 19, 2012), http://markey.house.gov/sites/markey.house.gov/files/documents/4-19-12.Letter%20FAA%20Drones%20.pdf.

[9] Video: "Pop-up Fabrication of the Harvard Monolithic Bee (Mobee)," *NY Daily News*, (November 17, 2011), http://youtu.be/VxSs1kGZQqc?hd=1&t=3m50s.

[10] Malou Innocent and Medea Benjamin, "Look up in the sky and see a drone," (June 17, 2012), http://articles.nydailynews.com/2012-06-17/news/32285738_1_drones-unmanned-aerial-vehicles-faa.

[11] Morley, Jefferson. "The drones are coming — to America." *Salon*, April 10, 2012. http://www.salon.com/2012/04/10/the_drones_are_coming_to_america/singleton/ (accessed April 26, 2012).

[12] Morley, Jefferson. "Drones for "urban warfare"." *Salon*, April 24, 2012. http://www.salon.com/2012/04/24/drones_for_urban_warfare/singleton/ (accessed April 26, 2012).

[13] Conor Friedersdorf, "14 Specific Allegations of NYPD Brutality During Occupy Wall Street," *The Atlantic*, (July 25, 2012), http://www.theatlantic.com/politics/archive/2012/07/14-specific-allegations-of-nypd-brutality-during-occupy-wall-street/260295/.

Aside from the very serious and grave implications for privacy and civil liberties, there are also a number of safety issues involved with drone technology, with the paramount concern being that drones have a history of malfunctioning mid-air. As David Zucchino reported in the *Los Angeles Times*, "The U.S. military often portrays its drone aircraft as high-tech marvels that can be operated seamlessly from thousands of miles away. But Pentagon accident reports reveal that the pilotless aircraft suffer from frequent system failures, computer glitches and human error."[14]

There's also the problem of drones being hacked into and potentially hijacked. In 2009, it was discovered that Shiite insurgents had hacked into Predator drones with a software program that cost only $26 and gained access to video footage shot by American spy planes.[15] One can only imagine what a technically proficient hacker in America might be able to do with the wealth of information he could potentially access from these drones, not to mention what a terrorist could do with a fully armed remote-controlled guided missile, which is what drones really happen to be.

Clearly, the present rapid adoption of drone technology before properly vetting the safety, privacy, and civil liberties issues involved can only be a disaster for the American people. Moreover, the potential for abuse by government agents of drone technology is high. At the very least, if the use of these machines by local police agencies is not regulated immediately, the First and Fourth Amendment rights of Charlottesville residents *will* suffer.[16]

Many local police departments throughout the country, including in Florida,[17] California, and Washington,[18] have already begun implementing drone technology, often without regulation or oversight. In response, ten state legislatures are in the process of considering legal limitations on the use of drone technology within their borders.[19] By preemptively resolving to prevent local police agencies from spying on or harassing the residents of Charlottesville with drone technology, Charlottesville City Council will

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[14] Zucchino, David. "War zone drone crashes add up." *Los Angeles Times,* July 6, 2010. http://articles.latimes.com/print/2010/jul/06/world/la-fg-drone-crashes-20100706.

[15] Gorman, Dreazan, and Cole, Siobhan, Yochi, and August. "Insurgents Hack U.S. Drones." *The Wall Street Journal*, December 17, 2009 http://online.wsj.com/article/SB126102247889095011.html (accessed April 20, 2011).

[16] *See generally*, https://www.rutherford.org/publications_resources/john_whiteheads_commentary/the_empire_strikes_back_attack_of_the_drones; https://www.rutherford.org/publications_resources/john_whiteheads_commentary/the_drone-ification_of_america.

[17] Dan Tracy, "Sheriff's Office wants to fly drones over Orange County skies," *Orlando Sentinel*, (January 12, 2013), http://www.orlandosentinel.com/news/local/breakingnews/os-drones-sheriff-orange-20130112,0,4271383.story.

[18] Ali Winston, "Drone Surveillance May Be Unconstitutional," *East Bay Express*, (January 2, 2013), http://www.eastbayexpress.com/ebx/drone-surveillance-may-be-unconstitutional/Content?oid=3426632.

[19] Dan Tracy, "Sheriff's Office wants to fly drones over Orange County skies," *Orlando Sentinel*, (January 12, 2013), http://www.orlandosentinel.com/news/local/breakingnews/os-drones-sheriff-orange-20130112,0,4271383.story.

demonstrate that it is ahead of the curve in protecting the basic rights of the citizens it has been elected to serve.

Without a doubt, drone technology poses serious risks to Americans. It is our hope that you will send a strong message that the people of Charlottesville will not stand idly by as their basic civil liberties are threatened by an ever growing surveillance state. It is imperative that you and the members of the Charlottesville City Council adopt this resolution, assuring the citizens of Charlottesville that you intend to secure their privacy, safety, and civil liberties against those who would jeopardize them for the sake of expedience, economy and security.

Sincerely yours,

John W. Whitehead
President

Enclosures: Model "Freedom from Drone Surveillance Resolution"
"Freedom from Drone Surveillance Resolution" Fact Sheet

Cc: Timothy Longo, Charlottesville Chief of Police

06/27/13 HCR 6: Appointment Letter of Task Force Members

<TARGET><BILL>HCR 6</BILL><SUBJECT>06-27-13 HCR 6 Appointment Letter of Task Force Members</SUBJECT><COMM>JUNM28</COMM></TARGET>

SENATOR
CHARLIE HUGGINS
Senate President

(907) 465-3878
Fax (907) 465-3265

State Capitol, Room 111
Juneau, Alaska 99801-1182

Alaska State Legislature

REPRESENTATIVE
MIKE CHENAULT
Speaker of the House

(907) 465-3779
Fax (907) 465-2833

State Capitol, Room 208
Juneau, Alaska 99801-1182

June 27, 2013

Suzi Lowell
Chief Clerk

Liz Clark
Senate Secretary

The following individuals are appointed to the Unmanned Aircraft Systems Legislative Task Force as identified in Legislative Resolve No. 17 (SCS CSHCR6(FIN)) on April 14, 2013.

1. Senator Donny Olson is appointed as "one senator selected by the president of the senate, who shall serve as co-chair;"
2. Representative Shelley Hughes is appointed as "one representative selected by the speaker of the house of representatives who shall serve as co-chair;" and

The following members are appointed jointly by the President of the Senate and the Speaker of the House of Representatives:

3. Joseph Masters, or the commissioner's designee, is appointed as "the commissioner of public safety;"
4. General Thomas Katkus, or the adjutant general's designee, is appointed as "the adjutant general of the Department of Military and Veterans' Affairs;"
5. Douglas Walker, or a designated member of the University of Alaska Fairbanks Center for Unmanned Aircraft Systems Integration;
6. Steve Colligan, a member of the Academy of Model Aeronautics; and
7. Patrick Kemp, Commissioner of the Department of Transportation and Public Facilities, or another member of the state Aviation Advisory Board.

Each member of the task force was selected by the legislature for their use of unmanned aircraft systems in Alaska airspace.

The duties of the task force include:

1. Reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. Providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

3. Submitting not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature.

The Legislative Task Force on Unmanned Aircraft Systems terminates on July 14, 2014.

Sincerely,

Senator Charlie Huggins
Senate President

Representative Mike Chenault
Speaker of the House

CC: Governor Sean Parnell
Heather Brakes, Legislative Director
Jason Hooley, Director Boards and Commissions
Patrick Kemp, Commissioner Department of Transportation and Public Facilities
Joseph Masters, Commissioner Department of Public Safety
Thomas Katkus, Adjutant General Department of Military and Veterans' Affairs
Douglas Walker, Director of Center for Unmanned Aircraft Systems and Integration, UAF
Steve Colligan, Representative member of the Academy of Model Aeronautics

STATE OF ALASKA
THE LEGISLATURE

2013

Source
SCS CSHCR 6(FIN)

Legislative Resolve No.
17

Recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS the Unmanned Aircraft Systems Program at the University of Alaska Fairbanks has, since 2001, been designing payloads and upgrades for unmanned aircraft systems, testing and evaluating their safety and effectiveness, developing and demonstrating new uses for various potential users, working with the Federal Aviation Administration to make the use of unmanned aircraft systems safe, and developing technology to improve safety and is known across the nation for its leadership in advancing the state of the art and the safe use of unmanned aircraft systems; and

WHEREAS the importance of the program's work to the state was recently recognized by the Board of Regents of the University of Alaska when the regents established the Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to continue research and development of unmanned aircraft systems for the benefit of the

state; and

WHEREAS the legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as the state's leader in unmanned aircraft systems research, meeting the goals of industry, the Federal Aviation Administration, and government operations; and

WHEREAS the legislature has provided significant financial support to the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to further the center's research initiatives, and to increase its capabilities for use as a possible Federal Aviation Administration test site; and

WHEREAS the State of Alaska, the University of Alaska, the Alaska Aerospace Corporation, the Alaska Aviation Safety Project, and other public and private institutions have developed cooperation with the National Aeronautics and Space Administration, the Federal Aviation Administration, the United States Department of the Interior, the United States Department of Defense, and others to further advance the research, development, and use of technology to benefit and support Alaskans and Americans with the safe use of unmanned aircraft systems; and

WHEREAS Alaska state government and the state's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe unmanned aircraft system ranges onshore and offshore Alaska, which will help establish procedures for the safe operation of unmanned aircraft systems in the National Airspace System; and

WHEREAS the Alaska Center for Unmanned Aircraft Systems Integration, by virtue of being located in Alaska, has access to an area of geographic and climatic diversity where the air and surface population density is desirable for conducting research and development of unmanned aircraft systems; and

WHEREAS the state has the highest per capita use of general aviation activity in the nation, and Alaska aviation organizations have helped the Federal Aviation Administration develop the next generation of air traffic control for the nation and the world, while making major gains for the state's aviation safety in the process; and

WHEREAS unmanned aircraft systems may present a risk to privacy, but neither the Federal Aviation Administration nor any other state or federal agency currently has specific

statutory authority to regulate privacy matters relating to unmanned aircraft systems;

BE IT RESOLVED that the Alaska State Legislature recognizes the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a leader in aviation pioneering and further recognizes the significant benefit to the state and nation the center provides in research and development of unmanned aircraft systems; and be it

FURTHER RESOLVED that the Alaska State Legislature fully supports the efforts of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks to become one of the nation's six test sites for unmanned aircraft systems testing and research; and be it

FURTHER RESOLVED by the Alaska State Legislature that the Task Force on Unmanned Aircraft Systems is created in the legislative branch and shall consist of seven members, who, except for the member from the senate and the member from the house of representatives, shall be appointed jointly by the president of the senate and the speaker of the house of representatives, as follows:

(1) one senator selected by the president of the senate, who shall serve as co-chair;

(2) one representative selected by the speaker of the house of representatives, who shall serve as co-chair;

(3) the commissioner of public safety or the commissioner's designee;

(4) the adjutant general of the Department of Military and Veterans' Affairs or the adjutant general's designee;

(5) a member representing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks;

(6) a member of the Academy of Model Aeronautics;

(7) a member from the state Aviation Advisory Board; and be it

FURTHER RESOLVED that a vacancy on the task force shall be filled in the manner of the original appointment; and be it

FURTHER RESOLVED that the duties of the task force shall include

(1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;

(2) providing written recommendations, together with suggested legislation,

for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

(3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature; and be it

FURTHER RESOLVED that the task force may meet as frequently as necessary to carry out its responsibilities; and be it

FURTHER RESOLVED that the task force may meet during and between legislative sessions and may request administrative and technical support from the University of Alaska Fairbanks; and be it

FURTHER RESOLVED that the public members of the task force serve without compensation but are entitled to per diem and travel expenses authorized for boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that the task force terminates on July 1, 2014.

07/24/13 Task Force Meeting: Minutes and Background Information

<TARGET><BILL></BILL><SUBJECT>07-24-13 Task Force Meeting Minutes and Background Information</SUBJECT><COMM>JUNM28</COMM></TARGET>

Unmanned Aircraft Systems Legislative Task Force

July 24, 2013

10:00am – 11:00am

Teleconference Call-In Number 855-463-5009

A G E N D A

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair
- Greg Walker, Director for the Center for Unmanned Aircraft Systems Integration UAF
    - Ro Bailey, Assistant Director (alternate for Greg Walker)
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- McHugh Pierre, Deputy Commissioner, Department of Military and Veterans' Affairs
- Alaska Aviation Safety Board, Department of Transportation and Public Facilities
- Steve Colligan, Representative Member for the Academy of Model Aeronautics

Meeting Agenda:

I. Welcome and Introductions — Representative Shelley Hughes
   a. Task Force responsibilities per HCR6
   b. Aerospace States Association, August 14, Washington DC
   c. National Conference of State Legislatures, August 15, Atlanta GA

II. Brief Overview of UAS Work and Use in Alaska — Greg Walker

III. Brief Overview of FAA UAS Work and Timeline — Michaela Goertzen, on behalf of Lt. Governor Treadwell

IV. Task Force Member Input and Expectations (5minutes each):
   a. How is your organization using UAS now and how would you like to use UAS in the future to further your mission?
   b. What policy guidelines or recommendations are currently in place that impact your business practice and the general public?
   c. What policy should the State of Alaska consider in legislation regarding the use of UAS in Alaska, including related to commercial use of UAS and to privacy concerns?

V. Task Force Timeline and Next Meeting Date/Time

VI. Adjournment

Unmanned Aircraft Systems Legislative Task Force

Summarized Minutes of the July 24, 2013 Teleconference

Task Force Members in Attendance:

- Representative Shelley Hughes, Co-Chair
- Ginger Blaisdell, Staff to Rep. Hughes
- David Scott, Staff to Senator Donny Olson, Co-Chair
- Greg Walker, Director for the Center for Unmanned Aircraft Systems Integration UAF
- Ro Bailey, Assistant Director (alternate for Greg Walker)
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- McHugh Pierre, Deputy Commissioner, Department of Military and Veterans' Affairs
- Mark Greby, Alaska Aerospace Corporation, Senior VP and Chief Operating Officer
- Wyatt Rehder, Alaska Aerospace Corporation, Aerospace Engineer
- Steve Colligan, Representative Member for the Academy of Model Aeronautics

Guest Attendee:

- Michaela Goertzen, Staff to Lt. Governor Mead Treadwell

- Not in attendance: Alaska Aviation Safety Board, DOT/PF

Meeting Summary:

I. Welcome and Introductions — Representative Shelley Hughes

Task Force responsibilities per HCR6

The duties of the task force shall include (1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems; (2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and (3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature.

Upcoming national meetings

- **Aerospace States Association, August 14, Washington DC**

The ASA meeting was originally scheduled to be a round table discussion on the draft model legislation that will be made available to all states. At their last meeting, it was determined that the draft was nearly complete and ASA membership did not feel the need for an additional round table discussion on the topic. ASA is still discussing the possibility of a meeting for those who intended to attend the August 14 meeting. The meeting will be held in conjunction with the AUVSI Symposium, attached link:

Association for Unmanned Vehicle Systems International
http://www.auvsishow.org/auvsi13/public/enter.aspx

- **National Conference of State Legislatures, August 15, Atlanta GA**

Representative Hughes was invited to be part of a panel to discuss and answer questions from any of the fifty United States, about unmanned aircraft systems policy for states. She will be part of a panel of university professors, aerospace specialists, and other legislators who have been successful in passing bills in their respective states.

II. Brief Overview of UAS Work and Use in Alaska — Greg Walker

The AUVSI Symposium will have dedicated sessions regarding privacy considerations. Ro (Bailey) and Greg will be at the Symposium and will report back on what they learn.

UAS integration in Alaska began in the late 1990's when University of Colorado and Georgia Tech completed research missions. The Coast Guard used UAS for marine awareness. In 2001 University of Alaska Fairbanks (UAF) contracted to fly UAS for specific missions and research and in 2007 began to acquire its own equipment.

UAF uses unmanned aircraft for military, law enforcement, science and industry missions. The missions have ranged from wildfire monitoring, oil spill monitoring, NASA sea ice research, wildlife mapping, fisheries, measuring methane from decaying permafrost, geothermal activities, and many more.

The number one private industry use is by oil companies monitoring for oil leaks, infrastructure mapping and monitoring. The second prominent industry use is the growth of new companies developing new technology for UAS integration that can be used in Alaska as well as other states and worldwide. The leading technology development is working on sense and avoid and monitoring other aircraft in flight.

Alaska is a prime candidate to be selected as one of the FAA test sites because the application requires opening the Arctic Ocean for UAS missions. UAF has completed more bona fide missions than probably all of the other states combined.

III. Brief Overview of FAA UAS Work and Timeline — Michaela Goertzen, on behalf of Lt. Governor Treadwell

The Modernization and Reform Act of 2012 is a federal mandate that requires the FAA to establish six test sites by December 30, 2013, and incorporate UAS into American airspace with privacy concerns addressed nationwide by September 30, 2015.

In an April meeting, stakeholders did not think privacy policy should fall on the FAA but in a justice agency. House Appropriations Committee asked the FAA to collaborate with other federal agencies to sort out the privacy issue(s).

IV. Task Force Member Input and Expectations (5 minutes each):
   a. How is your organization using UAS now and how would you like to use UAS in the future to further your mission?
   b. What policy guidelines or recommendations are currently in place that impact your business practice and the general public?
   c. What policy should the State of Alaska consider in legislation regarding the use of UAS in Alaska, including related to commercial use of UAS and to privacy concerns?

Representative Hughes

- Some of the highlights noted in other states' bills and other publications include:
  - Definition of unmanned aircraft
  - Parameters for law enforcement use
  - Moratoriums for certain applications.

Steve Colligan, Representing Academy of Model Aeronautics

- Steve plans on using model aviation to enhance his business in mapping and satellite image capturing.
- Concerns with commercial UAS application and model aviation use
- Key role with University and developing industry
- How to use UAS responsibly in airspace

McHugh Pierre, DMVA, Mark Greby and Wyatt Rehder, AK Aerospace Corporation (AAC)

- DMVA and AAC are service providers primarily using high altitude long endurance aircraft such as global hawks and predators. They lease some aircraft from the Airforce and are looking to purchase their own and lease out for missions.
- To have UAF licenced (certified) as a test range would be good
- AAC sees themselves as a responder to flight needs. NASA/military has plans to bring large aircraft to Alaska but not for private or research use yet.
- When asked about the use of the large aircraft, Mark responded that the BLM used the global hawk for wildfire management.

Representative Shelley Hughes

- This issue was brought to her attention to address privacy concerns.
- She is generally interested in UAS but does not have the technical background in the technology.
- Most of her awareness comes through the news.

- She is interested in industry potential.

Lieutenant Steve Adams, Department of Public Safety (DPS)

Steve oversees Search and Rescue, Amber Alert/Silver Alert, and Emergency Management for the DPS.

DPS is creating a small UAS program; keeping equipment in line-of-sight, land-based search and rescue, Amber and Silver Alert searches, mapping road accidents, mapping outdoor crime scenes, use in hostage situations to move personnel safely, natural disasters, and in incidences involving hazardous materials.

DPS has a partnership with UAF for using UAS. They operate with a strict operations procedures manual, and the IACP and ACLU policy manuals. There are fewer than ten law enforcement agencies in the states using UAS for law enforcement.

Alaska is unique and the use of UAS is significantly beneficial to life safety.

DPS is identifying a training program for a certification with FAA (COA – certificate of authorization – is about a year away)

Policy concerns include:

- Operators flying without COA
- FAA is only regulatory, not an enforcement agency
- Some enforcement is necessary
- How to manage inadvertent images/data

Mark Greby, Alaska Aerospace Corporation

Their work would be primarily for the scientific or commercial market.

- With regard to the question of "What to do with the data that is collected as "inadvertent information" – some inadvertent data will be collected as part of their work.
- Policy needs to be crafted to address different kinds of missions

Greg Walker and Ro Bailey, UAF Center for Unmanned Aircraft Systems Integration

UAF's experience with FAA policy so far is that it implements a significant barrier for use.
Policy should reflect:

- Necessary restrictions and no more
- Need to keep industry attracted to Alaska for business
- Alaska's operating policy needs to be simple and clear for all potential users
- Existing privacy laws are on the books
- Policy for this technology might exploit gaps in existing laws (peeping tom laws...)
- Don't create a barrier for industry.

David Scott, Staff to Senator Donny Olson

Senator Olson's concerns include safety and privacy

- How will UAS be integrated into airspace safely, given how much aircraft there is in Alaska
- Privacy – UAS vs. Manned Aircraft – what is existing policy for manned aircraft

V. Task Force Timeline and Next Meeting Date/Time

Ginger will send out current documents regarding laws passed by other states, ASA model legislation and other information on unmanned aircraft system integration.

Ginger will ask Lt. Governor's office for an invitation to members of this task force to attend the AUVSI Symposium and possible ASA meeting in August.

Ginger will gather existing privacy laws for distribution to the task force.

All task force members with information to be distributed to the group can send the documents to Ginger and she will distribute to the group.

A second teleconference meeting of the task force will be during the 1st or 2nd week of September.

October 24th will be the next meeting of the task force. It will occur immediately following the Alaska UAS Interest Group Conference on October 22 and 23 in Anchorage. The afternoon of October 24th, the task force will take public comment.

Adjournment

Pending State-Level UAS Legislation

State	Bill	Sponsor	Status	Last Action	Introduced	Purpose
Alabama	SB 317	Sens. Sanford and Beason	Introduced	3/12/2013	3/12/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
Alaska	HB 159	Rep. Kawasaki	Referred to House Committee on State Affairs	3/5/2013	2/5/2013	Warrant Required; Exceptions: Emergency Situations
Alaska	HCR 6	Reps. Hughes, Kawasaki, Isaacson, & Pruitt	Referred to Committee on Economic Development, Trade & Tourism	3/15/2013	3/15/2013	Recognizes Alaska Center for Unmanned Aerial Systems Integration and Expresses Support for FAA Test Site
~~Arizona~~	~~HB 2574~~	~~Rep. Seel, et al.~~	~~Held in Public Saftey, Military and Regulatory Affairs Committee Hearing~~	~~2/20/2013~~	~~2/11/2013~~	~~Warrant Required; Exceptions: Emergency Situations~~
Arizona	HB 2269	Rep. Forese	Passed by House; Referred to Senate Committee on Rules	3/12/2013	2/19/2013	Creates Interim Study Committee on Public Saftey Uses of UAS through 12/31/2013
Arizona	HCR 2009	Reps. Forese, Dial, Pierce & Thorpe	Voted Do-Pass by the Senate Commerce, Energy & Military Committee	3/13/2013	1/29/2013	Expresses Support for UAS FAA Testing Site
Arizona	HCR 2024	Rep. Forese	Adopted by Senate and House	3/26/2012	1/17/2012	Directs Leadership to Compete for UAS FAA Test Site
Arkansas	SB 1109	Sen. Rapert	Referred to Senate Committee on Judiciary	3/11/2013	3/11/2013	Prohibits Civilian Use of UAS Equipped with Video Recording Devices for the Purpose of Recording Another Person or Person's Property
Arkansas	HB 1904	Rep. Steel	Referred to House Committee on Public Transportation	3/11/2013	3/8/2013	Warrant Required; Exceptions: Emergency Situations, Conspiratorial Activities (Organized Crime, National Security), Consent
California	SB 15	Sen. Padilla	Referred to Committee on Rules	1/10/2013	12/3/2012	Demonstrates Intent to Legislate UAS Regulations
California	AB 737	As. Fox	Re-Referred to Committee on Jobs, Economic Development, and the Economy; Scheduled for Second Read with Amendments	3/4/2013	2/25/2013	Calls for the Drafting of a Proposal for One of the Six FAA UAS Test Site Designations
California	AB 1326	As. Gorrel & Bradford	Referred to Committee on Revenue and Taxation; Hearing Scheduled for 4/22	3/15/2013	2/22/2013	Creates Sales and Use Tax Exemptions for UAS Purchase and Manufacturing; Creates a 10-Year Income Tax Credit for People Involved in UAS Manufacturing
California	AB 1327	As. Gorrel & Bradford	Referred to Committees on Public Saftey and Local Government	3/14/2013	2/22/2013	Warrant Required; Exceptions: Emergency Situations, Imminent Threat, Geological Inspections; Requires Public Agency to Publically Disclose Intent to Start Using UAS Tech (once)
Florida	HB 119	Rep. Workman	Voted Favorably by House Judiciary Committee; Added to Second Reading Calendar	3/19/2013	1/9/2013	Prohibits Law Enforcement Use; Exceptions; Counter Terrorism
Florida	SB 92	Sen. Negron	Unanimous Favorable Vote by Senate Appropriations Committee	3/28/2013	12/5/2012	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
Georgia	SB 200	Sen. McKoon	Referred to Judiciary Non-Civil Committee	2/22/2013	2/21/2013	Warrant Required; Exceptions: Emergency Situations; Prohibits Arming UAV

Pending State-Level UAS Legislation

Hawaii	SB 783	Sen. Ruderman	Referred to Committees on Transportation and IR/ Public Saftey & Judiciary	1/22/2013	1/18/2013	Warrant Required; Execptions: Emergency Situations, Express Consent, Conspiratorial Activites (Re: National Security or Organized Crime)
Hawaii	SCR 137	Sen. Espero	Adopted	6/22/2012	3/14/2012	Calls for the Drafting of a Proposal for One of the Six FAA UAS Test Site Designations
Hawaii	HCR 140	Rep. McKelvey, et al.	Adopted	4/27/2012	3/12/2012	Calls for the Drafting of a Proposal for One of the Six FAA UAS Test Site Designations
Idaho	S 1051 / S 1067	Sen. Chuck Winder	Approved by Senate Transportation Committee	2/7/2013	2/1/2013	Warrant Required; Exceptions: Exigent Circumstances
Idaho	S 1134	Sen. Chuck Winder	Passed by Both Legislative Bodies; Transmitted to Governor	4/4/2013	3/4/2013	Warrant Required; Exceptions: Model Planes, Commercial Photography, Surveying Agriculture when Law Enforcement is Searching for Marijuana, Public Gatherings
Idaho	SCR 103	Transportation Committee	Passed by Senate; Scheduled for 3rd Reading in the House	3/22/2013	2/1/2013	Calls for the Drafting of a Proposal for One of the Six FAA UAS Test Site Designations
~~Illinois~~	~~SR 0792~~	~~Sen. Haine~~	~~Session Sine Die~~	~~1/8/2013~~	~~5/23/2012~~	~~Urges US Congress to Repeal Provisions of FAA Modernization and Reform Act that Call for UAS Integration~~
Illinois	SB 1587	Sen. Biss	Voted Favorably by Committee on Criminal Law; Second House Reading Scheduled for 3/12	3/7/2013	2/13/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
~~Indiana~~	~~SB 20~~	~~Sen. Tomes & Waterman~~	~~Dead in Committee on Rules and Legislative Procedure~~	~~2/25/2013~~	~~1/7/2013~~	~~Prohibits: Law Enforcement Use, Purchase of UAS with Public Money, Info Gathered Not Permissible in Court; Allows Recreational Use~~
Indiana	SR 27	Sen. Tomes & Waltz	Adopted	2/25/2013	2/7/2013	Calls for the Creation of a Committee to Study the Use of UAS
Iowa	SF 276	Sen. Sorenson	Referred to Senate Judiciary Committee	2/27/2013	2/27/2013	2-Year Moratorium; Exceptions: Amber Alert, Disaster, Search and Rescue
Iowa	HF 410	Rep. Schultz	Referred to House Committee on Public Safety	3/5/2013	3/4/2013	2-Year Moratorium; Exceptions: Amber Alert, Disaster, Search and Rescue
Iowa	HF 427	Rep. Schultz	Referred to House Committee on Public Safety	3/6/2013	3/5/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
Kansas	HB 2394	Committee On Federal and State Affairs	Referred to Committee on Corrections and Juvenile Justice	3/8/2013	3/7/2013	Prohibits Law Enforcement Use; Exceptions: Homeland Security / Counterterrorism
Kentucky	HB 454	Sen. Overly	Referred to House Committee On Judiciary	2/20/2013	2/19/2013	Warrant Required; Exceptions: Probably Cause, Counterterrorism
Maine	SP 72 / LD 236	Sen. Patrick	TABLED by Committee on Judiciary	3/7/2013	2/5/2013	Warrant Required; Prohibit Facial Recognition/Biometric Tech; Exceptions: Emergency, Consent, Probable Cause
Maryland	HB 1233	Dels. George, Dwyer and Miller	House Judiciary Hearing Scheduled For 3/19	2/13/2013	2/8/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
Massachusetts	S 1664	Sen. Hedlund	Referred to the Senate Committee On Transportation	1/22/2013	1/22/2013	Warrant Required; Acquisition by Law Enforcement Requires Government Approval; Exeptions: Exigent Circumstances

Pending State-Level UAS Legislation

Massachusetts	H 1357	Rep. Garry	Referred to the Committee on Judiciary	1/22/2013	1/22/2013	Warrant Required; Acquisition by Law Enforcement Requires Government Approval; Exeptions: Exigent Circumstances
Michigan	SR 169	10+	Adopted	8/15/2012	8/15/2012	Expresses Support for UAS FAA Testing Site
Michigan	HB 4455	Rep. McMillin	Referred to Committee on Criminal Justice	3/14/2013	3/14/2013	Warrant Required; Exceptions: Imminent Danger
Minnesota	SF 485 / HF 612	Sen. Nienow	Referred to Senate Judiciary Committee; Author Added Limmer	2/25/2013	2/14/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
Minnesota	HF 1620 / SF 1506	Rep. Wills, et al.	Referred to House Committee on Public Safety and Policy	3/18/2013	3/18/2013	Warrant Required; Exceptions: Counter Terrorism, Probable Cause, Emergency Situations
Missouri	HB 46	Rep. Guernsey	Passed by House and Transmitted to Senate	4/4/2013	12/5/2012	Warrant Required; Exceptions: Exigent Circumstances, Consent of Landowner
Montana	SB 150	Rep. Driscoll	Passed by Senate After 3rd Reading and Transmitted to House; House Judiciary Hearing Scheduled for 3/22	3/12/2013	1/16/2013	Prohibits UAS Equipped with Antipersonnel Device; Evidence Gathered Not Permissible in Courts
Montana	SB 196	Sen. Rosendale	Passed by Senate After 3rd Reading and Transmitted to House; House Judiciary Hearing Scheduled for 3/22	3/12/2013	1/24/2013	Requires Warrant; Exceptions: Border Patrol, Public Lands, Consent
Nebraska	LB 412	Sen. Schumacher	Judiciary Committee Hearing Scheduled for 2/14	2/4/2013	1/22/2013	Prohibits Law Enforcement Use; Exceptions; Counter Terrorism
~~New Hampshire~~	~~HB 619~~	~~Rep. Kurk~~	~~House Voted to Table~~	~~3/27/2013~~	~~1/3/2013~~	~~Warrant Requried; Prohibits: Use by Public Agencies and Private Citizens, Tracking Game, Projectile Weapons~~
New Jersey	A 3157	As. Schroeder & O'Scanlon	Referred to Assembly Homeland Security and State Preparedness Committee	6/25/2012	6/25/2012	Warrant Required; Acquisition by Law Enforcement Requires Public Disclosure
New Jersey	A 3929	As. Quijano & Handlin	Referred to Assembly Homeland Security and State Preparedness Committee	3/14/2013	3/14/2013	Prohibits Law Enforcement Use; Exceptions; Counter Terrorism, State of Emergency
New Mexico	SB 556	Sen. Ortiz y Pino	Voted Do-Pass by Senate Public Affairs Committee, Referred to Senate Judiciary Committee	3/7/2013	2/15/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
New Mexico	HJM 6	Rep. Gonzales	Adopted	2/16/2012	1/18/2012	Requests FAA to Designate NM as "UAS Friendly State" and Select NMSU UAS Flight Test Center as one of the FAA UAS Test Sites
New York	A 6244	As. Sepulveda	Referred to Codes	3/25/2013	3/25/2013	(Applies to Evidence Gathering Only): Warrant Required; Exceptions: "Lawful Exceptions to Warrant Requirement"
New York	A 6370	As. Perry	Referred to Committee on Governmental Operations	3/26/2013	3/26/2013	Warrant Required; Exceptions: Exigent Circumstances, Border Patrol, Counterterrorism, Enforcing Article 220 of Penal Law, Civillian Uses: Recreation, Hobby
North Carolina	HB 312	Reps. Setzer, Moffit, Hall & Harrison	Referred to Committee on Rules, Calendar, and Operations of the House	3/18/2013	3/13/2013	Warrant Required; Exceptions: Emergency Situations

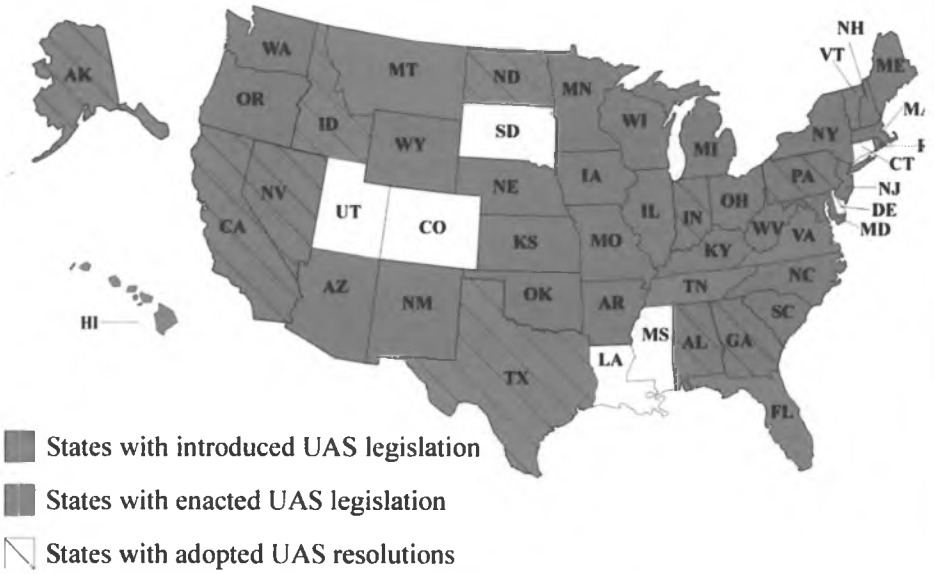
Pending State-Level UAS Legislation

~~North Dakota~~	~~HB 1373~~	~~Reps. Becker, Anderson, Beadle, Heilman, Hofstad, Monson, Rohr, Toman, Hanson~~	~~Senate Judiciary Committee Voted 6-1 Do Not Pass Recommendation~~	~~3/15/2013~~	~~1/21/2013~~	~~Warrant Required; Exceptions: Exigent Circumstances, Border Patrol, Natural Disasters~~
North Dakota	SB 2018	Appropriations Committee	Awaiting Hearing in Appropriations Committee	3/25/2013	1/8/2013	***Section 32*** appropriates $1,000,000 from the general fund for costs related to pursing a FAA UAS Test Site Designation
Ohio	SCR 19	Sen. Oelslager	Adopted	4/23/2012	Unknown	Expresses Support for UAS FAA Testing Site
Oklahoma	HB 1556	Rep. Wesselhoft	Passed by House Energy & Aerospace Committee	2/28/2013	2/4/2013	Warrant Required; Exceptions: Imminent Threat, Natural Disasters, Public Land
Oregon	HB 2710	Rep. Huffman	Heard by House Judiciary Committee	4/3/2013	2/5/2013	Warrant Required; Exceptions: Emergency Situations
Oregon	SB 71	Sen. Prozanski	Public Hearing Scheduled in Senate Judiciary Committee for 3/20; Public Hearing Scheduled for 3/20	2/28/2013	1/14/2013	Warrant Required; Ownership Requires License; Penalties; 'Aispace of Oregon' outside FAA jurisdiction
Pennsylvania	HB 961	Rep. Cruz	Referred to the House Judiciary Committee	3/12/2013	3/12/2013	Warrant Required; Does Not Include Provisions Regulating Civilian or Commercial Use
~~Rhode Island~~	~~SB 411~~	~~Sens. Kettle & Hodgson~~	~~Joint Committee Recommended Measure Be Held for Futher Study~~	~~3/14/2013~~	~~2/26/2013~~	~~Warrant Required; No Exceptions~~
Rhode Island	HB 5780	As. Tanzi, Cimini, Ajello, Valencia & Blazejewski	Hearing Scheduled in House Judiciary Committee for 3/27	2/28/2013	2/28/2013	Warrant Required (from Judge OR Attorney General); Exceptions: Imminent Threat
South Carolina	H 3514	Rep. Hamilton	Referred to House Committee On Judiciary	2/7/2013	2/7/2013	Warrant Required; Prohibits Mass Surveillance
Tennessee	SB 0796 / HB 0591	Sen. Beavers & Rep. Van Huss	Hearing Scheduled in the Civil Justice Committee for 3/27	3/20/2013	1/31/2013	Warrant Required; Exceptions: Counter Terrorism, Exingent Circumstances
Texas	HB 912	Rep. Gooden	Referred to Criminal Jurisprudence Committee	2/25/2013	2/1/2013	Authorization Required for Image Capture; Exceptions: Probable Cause, Imminent Threat, Real Estate
Texas	HR 866	Rep. Hunter	Filed	3/12/2013	3/12/2013	Expresses Support for UAS FAA Testing Site
~~Virginia~~	~~HB 1616~~	~~Del. Gilberts~~	~~Incorporated into HB 2012~~	~~2/1/2013~~	~~1/6/2013~~	~~Warrant Required~~
~~Virginia~~	~~SB 954~~	~~Sen. Ruff~~	~~Passed by indefinitely by Senate Committee for Courts of Justice~~	~~2/1/2013~~	~~1/7/2013~~	~~Impeding Hunting; Drones; Penalty~~
Virginia	HB 2012	Del. Cline	Adopted by House	2/22/2013	1/9/2013	2-Year Moratorium
Virginia	SB 1331	Sen. McEachin	Adopted by Senate	2/23/2013	1/18/2013	2-Year Moratorium
Washington	HB 1771	Rep. Taylor	Returned to Rules Committee for Second Reading	3/13/2013	2/8/2013	Warrant Required; Exceptions: Emergency Situations
Washington	SB 5782	Sen. Chase, et al.	Public Hearing in Senate Committee on Law & Justice	2/20/2013	2/14/2013	Warrant Required; Exceptions: Emergency Situations
West Virginia	HB 2732	Del. Nelson, et al.	Referred to Committee on the Judiciary	2/26/2013	2/26/2013	Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances
~~Wyoming~~	~~HB 0242~~	~~Reps. Loucks, Hunt, Jaggi, Koreker, Krone, Lubnau, Miller & Reeder~~	~~No report prior to CoW Cutoff; Postponed Indefinitely~~	~~2/4/2013~~	~~1/28/2013~~	~~Warrant Required; Exceptions: Counter Terrorism, Exigent Circumstances~~

National Conference of State Legislatures
The Forum for America's Ideas

2013 ENACTMENTS FOR UNMANNED AIRCRAFT SYSTEM, UNMANNED AERIAL VEHICLE AND DRONE LEGISLATION

Unmanned aircraft systems (UAS), also commonly called unmanned aerial vehicles (UAV) or drones, have many applications for law enforcement, land surveillance, wildlife tracking, search and rescue operations, disaster response, border patrol and photography. In 2013, 43 states considered 115 bills and resolutions that address this emerging technology, considering privacy issues, the benefits of their use and their economic impact. As of July 17th, ten bills have been enacted in eight states, and thirteen resolutions have been adopted in ten states.



Defining UAS, UAV and Drones State enactments addressing this new technology identify them as either Unmanned Aircraft Systems, Unmanned Aerial Vehicles or Drones: 13 measures identify them as UAS, 5 as UAV and 3 as drones. Four of the enactments provide a detailed definition - Idaho SB 1134 (UAS), Montana SB 196 (UAV), Florida SB 92 (Drone) and Tennessee SB 796 (Drone). Common elements in the definitions include that it; is a powered aerial vehicle, does not carry a human operator, can fly autonomously or be piloted remotely and can be expendable or recoverable. Idaho's law specifically excludes model airplanes and rockets from their UAS definition, while Montana's UAV and Tennessee's drone definitions exclude satellites. Idaho also excludes UAS used in mapping and resource management from their definition.

Federal Aviation Administration The Federal Aviation Administration's (FAA) primary mission is to ensure the safety and efficiency of the nation's entire airspace. The FAA's current and future rules regarding UAS apply to all public and private entities that fly them in American airspace. When the FAA Modernization and Reform Act of 2012 became law, it charged the FAA with developing a plan for the safe integration of UAS into American airspace by 2015. As part of this process, the FAA will establish 6 UAS test ranges to study and provide answers for UAS related safety questions. Twenty four states have submitted applications to be one of the 6 test sites and 9 states have introduced measures that address the UAS integration process. A North Dakota law (SB 2018) grants $1,000,000 from the state general fund to pursue designation as a FAA unmanned aircraft systems test site. If selected, the law would grant an additional $4,000,000 to operate the test site. Four other states Alaska (HCR 6), Alabama (HR 381), Idaho (SCR 103) and Nevada (SCR 7) adopted measures that encourage partnerships between the FAA and their state for UAS testing.

UAS/Drone use by Law Enforcement This year 41 states considered how UAS/drone technology can be used by law enforcement within the parameters of the 4th Amendment. Tennessee's new law (SB 796) states that the use of a UAS/drone by law enforcement to gather information must comply with the Constitutions of the United States and Tennessee. The law also qualifies drone use as a search under the 4th Amendment.

In addition, warrants are now required for UAS/drone use by law enforcement in 5 states Florida (SB 92), Idaho (SB 1134), Montana (SB 196), Tennessee and Texas (HB 912). These new laws also include exceptions to the warrant requirement. For example, Montana allows law enforcement to use drones pursuant to any judicially recognized exception to the warrant requirement. Laws in Florida and Tennessee allow for UAS/drones to be used to counter a high risk terrorist attack or if swift action is needed to prevent imminent danger or loss of life. Texas's law provides a number of exceptions for their UAS warrant requirement, including use for investigating the scene of a human fatality, searching for a missing person and for conducting a high-risk tactical operation that poses a threat to human life.

Virginia law (HB 2012 and SB 1331) bans the use of UAS by state agencies with jurisdiction over criminal law enforcement or regulatory violations until July 1, 2015, but allows their use for certain situations including Amber Alerts, Blue Alerts, National Guard operations, higher education research and search and rescue operations.

Texas and Virginia laws also require agencies in their state to develop protocols for their use by law enforcement. In Texas it is the Department of Public Safety and in Virginia it is the Department of Criminal Justice Services in coordination with the Office of the Attorney General.

Data Collection and Retention States are considering and implementing reporting requirements for how UAS/drones are used by government agencies and for what information they can collect and retain. Texas's law (HB 912, HCR 217) now requires law enforcement agencies in communities with a population greater than 150,000, to report on their use of UAS every two years. The report must be issued to the governor, the lieutenant governor, each member of the legislature, be retained for public viewing and be made available on the law enforcement agency's website if they have one. Among other requirements, the report must include; the number of times an unmanned aircraft was used, the types of incidents it was used for, the justification for its use, the number of criminal investigations aided by its use, the dates and locations of its operation and the total cost of acquiring, maintaining, repairing, and operating or otherwise using each unmanned aircraft.

The legislatures in Illinois and Oregon have passed bills with reporting requirements; they are currently with their respective Governors.

Prohibition of Evidence Laws in Florida (SB 92) and Tennessee (SB 796) would prevent evidence from being entered in a criminal case if the information was collected by a UAS/drone outside of the scope of its statutorily or court granted authority. Similarly, Montana's law (SB 196) prevents information obtained from the operation of a UAV from being used in an affidavit of probable cause to obtain a search warrant. Sixty-six measures introduced by states this year considered evidence restrictions.

UAS/Drone use by the General Public So far in 2013, two states, Idaho (SB 1134) and Texas (HB 912) have enacted laws that address UAS/drone use by private entities. Idaho's law now states that no person, entity or state agency shall use a UAS to photograph or otherwise record an individual without their written consent for the purpose of publishing or disseminating a photograph or recording. Similarly, Texas created two new offenses, the illegal use of unmanned aircraft to capture an image and the possession, disclosure, display, distribution or use of such an image.

Economic Impact The Association for Unmanned Aircraft Systems International (AUVSI) released a report stating that through 2025, the UAS industry will create over 100,000 jobs and have an economic impact of $82 billion. Six states adopted resolutions – Alaska (HCR 6), California (SCR 16), Georgia, Idaho (SCR 103), North Dakota (HCR 3012) and Nevada (SCR 7) – noting the potential benefits for a thriving UAS industry on their economy. Georgia, for example, adopted three resolutions (HR 80, HR 81, SR 172) recognizing the aerospace industry in their state and applauding the collaborative efforts of the aerospace industry, academia, and state and local government to make Georgia a leader in the rapidly expanding unmanned aerial vehicles market.

Study Committees Adopted resolutions in Alaska (HCR 6) and Indiana (SR 27) create study committees or task forces to evaluate UAS/drone issues in their state. The Alaska resolution creates a legislative task force charged with reviewing FAA regulations and creating written recommendations and legislation that protects privacy while allowing UAS use for public and private applications. Indiana's adopted senate resolution urges their legislative council to establish an interim committee to study the use of UAV's with similar parameters as provided in Alaska.

MEMORANDUM

State of Alaska
Department of Law

TO: Mead Treadwell
Lieutenant Governor
State of Alaska

FROM: Libby Bakalar
Assistant Attorney General
Transportation Section

CC: Jim Cantor
Deputy Attorney General
Department of Law

Margie Vandor
Chief Assistant Attorney General
Department of Law

Michaela Goertzen
Speechwriter
Office of the Lieutenant Governor

DATE: May 20, 2013

FILE NO.: JU2011200514

TEL. NO.: 907.465.3600 main
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SUBJECT: Legal issues related to unmanned aircraft systems

I. Introduction and background.

In your capacity as chair of the Aerospace States Association, you asked me to provide you with a brief description and analysis of the core legal issues related to the civilian use of Unmanned Aircraft Systems (UAS), also known as "drones." The context for your inquiry is the University of Alaska's pending application with the Federal Aviation Administration (FAA) to become one of a limited number of testing sites in the nation for UAS. Please note that this document is not legal opinion of the Office of the Attorney General, but rather simply a compendium of my research and a preliminary analysis.

UAS are unmanned aircraft designed to do tasks that are too difficult, dull, dangerous, or expensive for manned aviation, and are designed to carry a "system payload" such as a camera or sensor.[1] Traditionally, UAS have been used for military

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[1] Association for Unmanned Vehicle Systems International ("AUVSI"), UAS Privacy Issues Document.

purposes, but they are being increasingly deployed in domestic civilian contexts such as law enforcement, disaster relief, fire-fighting, agriculture, energy, industry, wildlife tracking, and others.[2] Commercial use of UAS is currently prohibited, but that is expected to change by 2014.[3] UAS can range in size from smaller than a cell phone to larger than a commercial jetliner.[4] Research sponsored by the Association for Unmanned Vehicle Systems International (AUVSI), a non-profit trade association that supports the civilian use of UAS, concluded that the integration of UAS into the national airspace has the potential to create more than 100,000 new jobs and $82 billion of economic impact by 2025.[5]

The legal issues surrounding the civilian use of UAS relate mainly to privacy and property interests, and are relatively untested in the courts because of the novelty of the technology involved and the regulatory vacuum in which that technology operates. Fortunately, there has been significant legal scholarship as well as congressional reporting[6] in in this area, all of which I rely upon heavily in this memorandum. I have also reviewed all the materials Charles Huettner emailed me after our April 5th teleconference. Some limited case law also exists on the privacy concerns raised by aerial surveillance and similar technologies. These cases telegraph how the Supreme Court might view the privacy implications of UAS. Following is the requested description, summary, and analysis of the issues that have arisen and been analyzed by legal scholars to date. I also discuss the Alaska-specific implications of these issues, which are not discussed in any of the law reviews, journals, or reports.

II. Core legal issues raised by the use of UAS/drones.

The FAA oversees all aircraft operations in the United States and makes and

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2 *See* Villasenor, John, *Observations from Above: Unmanned Aircraft Systems and Privacy*, 36 Harv. J.L. & Pub. Pol'y 458, 459 (2013).

3 *Id.* at 471.

4 *Id.* at 465.

5 "The Economic Impact of Unmanned Aircraft Systems Integration in the United States," AUVSI, March, 2013.

6 *See* Integration of Drones into Domestic Airspace: Selected Legal Issues, Congressional Research Service, CRS Report for Congress (April 4, 2013).

enforces rules to implement and interpret laws passed by Congress governing aviation.[7] Federal law enacted in February 2012 (The Federal Aviation Administration Modernization and Reform Act of 2012) requires the FAA to devise a comprehensive plan to integrate all civilian UAS into the national airspace system by September 30, 2015, appropriates billions of dollars in funding, and creates the six UAS test sites for which many states, including Alaska, are vying.[8]

The federal government is still struggling with the regulation of UAS, specifically, how to define these vehicles, how to clarify which—if any—existing regulations apply to them, how to craft future regulations to encompass vehicles not governed by existing regulations, and how to ensure that future regulations do not inadvertently regulate other industries such as model or hobby aircraft.[9] The FAA will need to identify technology (*e.g.* cameras and radar) that will obviate the need for regulations requiring pilots to "see and avoid" other aircraft, address appropriate training for UAS operators, devise proper procedures for when a UAS loses contact with an operator or is hacked, coordinate with other countries and agencies in adopting regulations, and ensure that there is sufficient wireless spectrum to accommodate the communication needs of these vehicles.[10] Presently, UAS operators engaged in both public aircraft operations and private operations are required to have special certifications from the FAA.[11]

There is no legislation yet governing UAS in Alaska, although there is model legislation that AUVSI is compiling, and according to news reports, at least one other state—Florida—has begun to legislate UAS. Two bills were introduced in Alaska last session that touch upon UAS: HB 159, "An Act relating to the admissibility of evidence acquired through the use of an unmanned aerial vehicle; establishing a crime for certain uses of unmanned aerial vehicles; and restricting the use of unmanned aerial vehicles for collection of information or investigation by peace officers and other government agents;" and HCR 6, "Recognizing the Alaska Center for Unmanned Aircraft Systems

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7 Villasenor, *supra* note 2, at 469.

8 P.L. No. 112-095 (Feb. 14, 2012).

9 *See* Kapnik, Benjamin, *Unmanned but Accelerating: Navigating the Regulatory and Privacy Challenges of Introducing Unmanned Aircraft into the National Airspace System*, 77 J. Air L. & Com. 439, 443 (2012).

10 *Id.* at 448-49.

11 Villasenor, *supra* note 2, at 471.

Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems." Presumably, these bills could be revisited next session.

Any discussion of UAS legislation must also consider federal pre-emption and the interplay between state and federal law. Although aircraft safety, trade, and noise regulation is the established provenance of the federal government, states may still pass laws governing how aircraft are flown.[12] Both Alaska and federal law prohibit the reckless operation of aircraft, but Alaska could not enact privacy laws that would decrease or implicate in any way the safety of flight operations, such as laws governing aircraft speed or altitude.[13] From a pre-emption standpoint, the safest area for state legislation is in the realm of privacy laws aimed at non-government actors that address trespass, invasion of privacy, stalking, and harassment, because state power to legislate in this area is well-established.[14]

In short, there is both a mandate and pressing need to legislate and regulate UAS at both the state and federal level. However, the precise parameters and scope of that legislation and regulation remain nebulous at best.

III. Constitutional rights.

A. The Fourth Amendment.

Probably the biggest legal issue surrounding UAS is the implications of these devices for individual privacy rights. The Fourth Amendment to the United States Constitution guarantees to the people the right to be free from unreasonable search and seizure by the government.[15] The Alaska Constitution contains an analogous search and seizure provision, as well as an explicit clause guaranteeing to its citizens the right to privacy.[16] Because the FAA is primarily a regulating agency whose mandate is to ensure

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12 Villasenor, *supra* note 2, at 513.

13 *Id.*

14 *Id.*

15 *See* U.S. Const. amdt. IV.

16 Alaska Const. art. I, §§ 14 and 22. Note that these provisions bind only government actors—not private citizens.

the efficient and safe operation of U.S. airspace, questions have arisen whether this agency is really the appropriate entity to ensure that government actors using UAS are not violating these basic constitutional principles or whether constitutional privacy compliance should be spearheaded at the state or federal level by some other agency. It is clear, however, that no government actor may commit such violations.

The crucial inquiry for Fourth Amendment and state constitutional privacy purposes is whether a person has a reasonable expectation of privacy that society is prepared to recognize. One scholar notes that "[w]here a [UAS] captures images that could have been obtained from civilian aircraft traveling in a legally authorized manner, privacy claims are limited. Consumers lack a reasonable expectation of privacy with respect to areas already exposed to civilian over-flights."[17] However, novel imaging technologies such as thermal and infrared imaging could raise concerns. Indeed, as noted by another scholar who has examined the issue, "[t]he privacy issues raised by the potential ubiquity of [UAS] go beyond the current Fourth Amendment jurisprudence."[18] Indeed, "[t]here is no precedent that squarely addresses privacy implications of governmental use of a technology that allows essentially permanent, multi-dimensional, multi-sensory surveillance of citizens twenty-four hours a day."[19]

However, there has been some judicial guidance. *Katz v. U.S.*[20] was a landmark Fourth Amendment case in which the Supreme Court held for the first time that a Fourth Amendment violation could occur absent a physical intrusion—specifically, through a listening device the police had affixed to the outside of a public phone booth. This was the first "remote sensing" case, soon to be followed by a trilogy of key "aerial surveillance cases."

The "remote sensing" cases fall into two categories: "open fields" and "curtilage." Remote sensing in "open fields" does not implicate the Fourth Amendment because open

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17 Geoffrey Christopher Rapp, *Unmanned Aerial Exposure: Civil Liability Concerns Arising from Domestic Law Enforcement Employment of Unmanned Aerial Systems*, 85 N.D.L. Rev. 623, 641 (2009).

18 Joseph J. Vacek, *Big Brother Will Soon Be Watching—Or Will He?*, 85 N.D. L. Rev. 673, 674 (2009).

19 *Id.* at 675.

20 389 U.S. 347 (1967).

fields are areas of public and private property that "do not provide the setting for those intimate activities that the [Fourth] Amendment is intended to shelter from government surveillance or interference."[21] However, "curtilage" is a legal "penumbra" surrounding a home where the Fourth Amendment may be implicated.[22] Whether a given area constitutes "curtilage" depends on the proximity of the area to the home, whether the area is enclosed, the nature of the use to which the area is put, and the steps taken by the resident to protect the area from observation.[23] Although a person may have reasonable expectations of privacy in curtilage, remote sensing of curtilage "does not require law enforcement officers to shield their eyes when passing by a home on public thoroughfares."[24] The bottom line is that remote sensing will not implicate the Fourth Amendment "if it is done from a public vantage point where law enforcement officers can make open observations."[25]

The Supreme Court's "aerial surveillance" trilogy consists of *California v. Ciraolo*,[26] *Florida v. Riley*,[27] and *Dow Chemical Company v. U.S.*[28] All three cases were decided in the 1980s. Together, they stand for the proposition that aerial surveillance of any kind over private or commercial property from aircraft that are lawfully in navigable airspace is not a Fourth Amendment search, because there is no reasonable expectation of privacy in an area that is openly visible from above, regardless whether the area is curtilage or an open field.[29]

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21 *Oliver v. U.S.*, 466 U.S. 170, 179 (1984).

22 *U.S. v. Dunn*, 480 U.S. 294, 300 (1987).

23 *Id.* at 301.

24 *California v. Ciraolo*, 476 U.S. 207, 213 (1986).

25 Vacek, *supra* note 18, at 680.

26 476 U.S. 207 (1986).

27 488 U.S. 445 (1989).

28 476 U.S. 227 (1986).

29 Vacek, *supra* note 18, at 682.

In *Ciraolo*, police flew a fixed-wing aircraft 1,000 feet over a defendant's backyard, the minimum safe altitude required by FAA regulations, and observed marijuana plants with the naked eye. The backyard was not visible due to an extensive fencing system, so the aerial search provided the basis for a search warrant and marijuana plants were found after a physical search. The Court held that a ground fence does not create an expectation of privacy to be free from aerial searches because routine flights exposed the backyard to public view.[30]

Riley reached the same holding when officers flew a helicopter 400 feet overhead to peer through openings in a greenhouse and determined marijuana was growing inside the defendant's fenced-in home. Again, the Court found that there was no reasonable expectation of privacy because helicopter flight in navigable airspace was a routine, expected occurrence.[31]

And in *Dow Chemical*, the Environmental Protection Agency, acting without a warrant, hired a private commercial pilot to fly over Dow's property to take aerial photos of suspected regulatory violations. The Court upheld this conduct because "such an industrial complex is more comparable to an open field and as such it is open to the view and observation of persons in aircraft lawfully in the public airspace."[32]

However, decades later in 2001, in *Kyllo v. United States*,[33] the Supreme Court reminded us that the Fourth Amendment protects people—not just places—from unreasonable searches and seizures. *Kyllo* involved law enforcement's warrantless use of thermal imaging to detect unusual amounts of heat radiating from the defendant's home, indicating the presence of marijuana. *Kyllo* held that this surveillance violated the Fourth Amendment because the technology was not in widespread use. Currently, *Kyllo* limits the ability of law enforcement to rely on infrared/thermal imaging technology, but because the Court's decision was directly linked to the prevalence of the technology, it's an open question whether the Court's limitation would persist if these technologies went into more "widespread use." As one scholar put it, "the test seems to turn on whether

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30 476 U.S. at 215.

31 488 U.S. at 450-51.

32 476 U.S. at 239.

33 553 U.S. 27 (2001).

Wal-Mart sells it or not."[34] Such a question would most likely be tested in a criminal context, where the prosecution seeks to admit evidence obtained through the use of these technologies.

Finally, just last year, in *United States v. Jones*,[35] the Supreme Court held that the installation of a GPS tracking device on a suspect's car for eight days constituted a search under the Fourth Amendment. Although *Jones* did not deal with aerial surveillance, the Court held that the placement of the device was a physical intrusion onto private property for the purposes of obtaining information, as well as the extended monitoring of a person in a public space, both of which constituted a Fourth Amendment "search." Some scholars have predicted that one potential result of *Jones* is that extended UAS surveillance could constitute a search within the meaning of the Fourth Amendment.[36]

It is clear from a review of the scholarship and the limited case law that the rate of advancement of these technologies often outpaces the ability of courts to rule upon the validity of their use under the Fourth Amendment. The overall conclusion so far is that aerial surveillance by any method, at a legal altitude, is constitutional if the technology is in general public use and does not trespass upon private property for extended periods of time. Still, the legal landscape has been characterized as "an aeronautical Wild West," and the current regulatory scheme as "inadequate to deal with the novel issues raised" by the use of UAS, particularly by law enforcement.[37]

In Alaska, we must consider an additional important factor: Article I, section 22 of the Alaska Constitution guarantees an explicit individual right to privacy. There is no state case law interpreting this clause (or any part of the state constitution) in the context of UAS. However, it is highly possible that the Alaska Supreme Court would interpret the right in favor of the individual asserting it as opposed to deferring to the government. For example, our Supreme Court has interpreted the privacy clause to create a constitutional right to privacy in garbage placed for collection, which contrasts with both state and

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34 Vacek, *supra* note 18, at 683.

35 132 S. Ct. 945 (2012).

36 Kapnik, *supra* note 9, at 495.

37 Vacek, *supra* note 18, at 675-77.

federal case law on the Fourth Amendment.[38] The take-away point here is that government conduct that complies with the Fourth Amendment under either the state or federal constitution could *nonetheless* violate the state constitutional right to privacy. And in 2002, at least one member of the Alaska Court of Appeals, albeit in a concurring and unreported opinion, expressed constitutional skepticism at law enforcement's surreptitious use of infrared helicopter technology of the type prohibited under *Kyllo* the year before.[39]

B. The First Amendment & individual privacy.

In addition to the Fourth Amendment implications of government-operated UAS, these vehicles may also implicate the First Amendment rights of private citizens to collect and gather information. One scholar has recently addressed this issue, noting that for private entities and persons not bound by the Fourth Amendment, the key constitutional question is the extent of these persons' First Amendment right to access information.[40] The Supreme Court long ago held that the First Amendment protects the act of seeking out news, otherwise "freedom of the press could be eviscerated."[41] And at least one circuit court of appeals has recently held that the First Amendment permits a private citizen to record the actions of people in a public space.[42] Congress could potentially enact laws to protect individuals from intrusive UAS surveillance by private actors, which would be considered in a First Amendment context of the right to gather and receive information.[43] Such bills have been introduced, but none have yet been enacted.[44] Because the civilian use of UAS is nascent, and there is no controlling Supreme Court

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38 *Cf. Beltz v. State*, 221 P.3d 328 (Alaska 2009) and *California v. Greenwood*, 486 U.S. 35 (1988).

39 *See Johnston v. State*, 2002 WL 563609 (April 17, 2002) (Mannheimer, J., concurring) (unpublished opinion).

40 Villasenor, *supra* note 2, at 498.

41 *Branzburg v. Hayes*, 408 U.S. 665, 681 (1972).

42 *Glik v. Cunniffe*, 655 F.3d 78, 82 (1st Cir. 2011).

43 *See* Integration of Drones into Domestic Airspace: Selected Legal Issues, Congressional Research Service, CRS Report for Congress (April 4, 2013).

44 *Id.*

case law, it remains to be seen how far First Amendment protections will extend in this area.

The privacy rights of individuals and businesses exist in perpetual tension with the First Amendment rights of non-government actors to gather information, and that tension could give rise to actionable claims for privacy violations. Common law invasions of privacy could occur if UAS use "intrudes upon seclusion" in the home or results in the "publication of private facts," which are the two main categories of invasion of privacy claims. Intrusion upon seclusion occurs where the intrusion was intentional and would be highly offensive to a reasonable person.[45] A publication of private facts claim could arise where a UAS takes images of private individuals involuntarily caught up in newsworthy events, and those images conveyed facts not previously known to the public.[46] Similarly, the use of UAS could potentially give rise to criminal liability under both federal and state anti-stalking and harassment laws.[47] Finally, UAS could be used by private citizens to investigate or monitor potential health and safety violations by businesses, or engage in corporate espionage. Such conduct raises complex and unanswered questions about a private citizen's right to do under the First Amendment what the government could not do under the Fourth.

In short, the above concepts are nothing new to the First Amendment and privacy arena, but they must and will be revisited in light of UAS enhanced imaging capabilities, ease of use, and ever-increasing availability. As discussed in detail above, the strong privacy protections of the Alaska Constitution make it highly likely that individual privacy rights implicated by UAS will be more zealously legislated and enforced in Alaska than in other jurisdictions.

C. Property rights, & tort liability; nuisance, trespass, & ground damage.

Property owners could potentially file tort claims for nuisance and/or trespass against operators of UAS. According to a preeminent torts treatise, a trespass claim against an aircraft operator is viable only when the aircraft "enters into the immediate reaches of the air space next to the land" and "interferes substantially with . . . the use and

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45 Restatement (Second) of Torts § 625B (1977).

46 Villasenor, *supra* note 2, at 503.

47 *Id.* at 505.

enjoyment" of the property by the landowner."[48] The navigable airspace regulated by the FAA is considered a public highway, but it appears that anywhere between 50 to 150 feet above the property owner could be considered impermissible interference with private property.[49] Accordingly, UAS that operate within this window of airspace could potentially raise trespass claims, and UAS that generate noise, light, pollution, or vibration could lead to viable nuisance claims by homeowners.[50] Additional tort claims could arise if a UAS caused ground damage to personal or real property.

Title 2 of the Alaska Statutes is devoted entirely to the regulation and operation of aircraft ("Aeronautics"). Alaska Statute 02.30.030 provides that "A person may not operate an aircraft in the air or on the ground or water in a careless or reckless manner so as to endanger the property of another." This statute directs the court, when evaluating such claims, to consider "the standards for safe operation of aircraft prescribed by federal statutes or regulations governing aeronautics." The phrase "operate aircraft" is defined in AS 02.30.050 as "to use, navigate, pilot, or taxi an aircraft in the airspace over this state, or upon the land or water inside the state." This chapter does not contain a definition of "aircraft." However, "aircraft" is defined in the general provisions of Title 2 (Alaska Aeronautics Act of 1949) as "a contrivance used or designed for navigation of flight in the air,"[51] which could be read to include UAS, although this definition was enacted prior to the burgeoning use of civilian UAS. Accordingly, I am uncertain whether UAS would fit into the current statutory definition of "aircraft," and therefore I think it's an open question whether a court would find that the foregoing provisions regarding liability for aircraft operation would automatically apply to operation of UAS or whether additional statutory language would be necessary to expand that definition. My instinct is that UAS should be specifically legislated in this manner.

If Alaska chooses to enter this arena by passing laws or regulations, it is advisable for the legislature to also enact a statutory immunity provision. That way, the state may

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48 American Law Institute, Restatement (Second) of Torts § 159 (2009) cmt. i.

49 Rapp, *supra* note 17, at 645 (citing *id.*). See also *United States v. Causby*, 328 U.S. 256 (1946) (rejecting the common law concept that a homeowner owns all the airspace above his property up to the heavens, but rather owns "at least that much space above the ground as he can occupy or use in connection with the land.").

50 *Id.*

51 AS 02.15.260(2).

avoid liability for damages in tort when two private UAS collide and fragments cause damage to people or property. Such immunity clauses are common and can deflect an argument that the state is liable simply because it has chosen to legislate in a particular topic area.[52]

D. Environmental concerns.

Scholars have observed the potential of UAS to generate environmental concerns, which could be starker in Alaska than elsewhere. Alaska is already a hotbed of environmental litigation. Many UAS contain batteries, circuitry, and chemicals that could leach into the ground, and the flight of UAS and the noise they cause could disrupt birds and other wildlife habitats.[53] Environmental groups and private citizens could potentially raise federal claims regarding the operation of UAS under the National Environmental Policy Act, the Endangered Species Act, or the Noise Control Act.[54]

In Alaska, to the extent UAS and the execution of implementing statutes interfere with state fish, wildlife, and waters, the government could be found in violation of the "common use" and "sustained yield" provisions of the Alaska Constitution, which provide, respectively, that the state, fish, wildlife and waters of the state are reserved to the people for their common use and that replenishable resources belonging to the state must be utilized, developed, and maintained according to the sustained yield principle.[55]

E. Communications interference.

UAS also have the potential to interfere with existing civilian communications systems used to operate cell phones, satellite TV signals, and other wireless and telecommunications technology.[56] Further, signal loss between UAS and its ground

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52 *See, e.g.*, AS 09.65.215 (Immunity of peace officer for use of body wire eavesdropping device); AS 09.65.235 (Immunity for negotiated regulation making committee and its members); AS 09.65.250 (Immunity for certain actions related to child support); AS 09.65.330 (Immunity: Use of defensive force).

53 Rapp, *supra* note 17, at 632.

54 *Id.*

55 Alaska Const. art. VIII, §§3, 4.

56 Rapp, *supra* note 17, at 640-41.

control operations could result in a mid-air collision or ground damage.[57] This problem could be somewhat mitigated by the assignation of UAS to specific frequencies once UAS are fully integrated into the national airspace, but the potential for interference still remains.[58]

Under state law, the Department of Transportation and Public Facilities is responsible for supervising, developing, and promoting "aeronautics and communications inside the state . . ."[59] The Department could be held responsible for ensuring, through properly adopted regulations and in conjunction with the federal government, that UAS do not unduly interfere with existing civilian communications systems in the state.

F. Mid-air collisions.

Finally, mid-air collisions of UAS with other aircraft and with each other are always a possibility. Most UAS lack the sophisticated collision avoidance systems required of many manned aircraft, and the absence of an on-board pilot who can physically observe other aircraft exacerbates the risk of a mid-air collision.[60] Furthermore, the "small size and radar profile of [UAS] create significant risk that such craft would damage civilian aircraft, causing both property loss and human casualties."[61]

As described above, individual citizens could file tort claims under state law for damages against operators of UAS or the government associated with such accidents. Collisions and near-collisions have already resulted from the use of UAS at the military level, and the scholarship predicts that "[i]t is hard to imagine widespread integration of [UAS] into populated airspace without some level of air-to-air accidents rising."[62]

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57 *Id.*

58 *Id.*

59 AS 02.10.010(a)-(b).

60 Rapp, *supra* note 17, at 629; 640-41.

61 *Id.*

62 *Id.*

IV. Conclusion.

There are many more questions than answers surrounding the increased civilian use and operation of UAS, because there is no case law that definitively resolves any of the issues discussed above, and there is a regulatory vacuum. Indeed, "[t]he only certain aspect of the debate about unmanned aircraft and privacy is that it will be contentious."[63] However, identifying and analyzing these issues at the executive level is the first step to crafting legislation that attempts to address them. Only when those laws are tested in the courts will we fully come to understand the interplay between the technological advantages offered by UAS, the reach of constitutional protections, and the scope of actionable legal claims.

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63 Villasenor, *supra* note 2, at 516.

Federal Legislation in 2013 http://thomas.loc.gov

1. H.R.972 : Preserving Freedom from Unwarranted Surveillance Act of 2013
Sponsor: Rep Scott, Austin [GA-8] (introduced 3/5/2013) **Cosponsors** (None)
Committees: House Judiciary
Latest Major Action: 3/5/2013 Referred to House committee. Status: Referred to the House Committee on the Judiciary.

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2. H.R.637 : Preserving American Privacy Act of 2013
Sponsor: Rep Poe, Ted [TX-2] (introduced 2/13/2013) Cosponsors (11)
Committees: House Judiciary
Latest Major Action: 2/13/2013 Referred to House committee. Status: Referred to the House Committee on the Judiciary.

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3. H.R.1083 : NADA Act of 2013
Sponsor: Rep Burgess, Michael C. [TX-26] (introduced 3/12/2013) Cosponsors (1)
Committees: House Transportation and Infrastructure
Latest Major Action: 3/12/2013 Referred to House committee. Status: Referred to the House Committee on Transportation and Infrastructure.

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4. H.R.1242 : To prohibit the use of drones to kill citizens of the United States within the United States.
Sponsor: Rep Ribble, Reid J. [WI-8] (introduced 3/18/2013) Cosponsors (2)
Committees: House Intelligence (Permanent Select); House Judiciary; House Armed Services
Latest Major Action: 3/18/2013 Referred to House committee. Status: Referred to the Committee on Intelligence (Permanent Select), and in addition to the Committees on the Judiciary, and Armed Services, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned.

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5. S.505 : A bill to prohibit the use of drones to kill citizens of the United States within the United States.
Sponsor: Sen Cruz, Ted [TX] (introduced 3/7/2013) Cosponsors (3)
Latest Major Action: 3/11/2013 Read the second time. Placed on Senate Legislative Calendar under General Orders. Calendar No. 22.

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6. H.R.1262 : To amend the FAA Modernization and Reform Act of 2012 to provide guidance and limitations regarding the integration of unmanned aircraft systems into United States airspace, and for other purposes.
Sponsor: Rep Markey, Edward J. [MA-5] (introduced 3/19/2013) **Cosponsors** (None)
Committees: House Transportation and Infrastructure; House Energy and Commerce
Latest Major Action: 3/19/2013 Referred to House committee. Status: Referred to the Committee on Transportation and Infrastructure, and in addition to the Committee on Energy and Commerce, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned.

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7. H.R.2183 : To direct the Director of the CIA to cease lethal drone operations, and for other purposes.
Sponsor: Rep Lee, Barbara [CA-13] (introduced 5/23/2013) **Cosponsors** (None)
Committees: House Armed Services; House Intelligence (Permanent Select); House Judiciary
Latest Major Action: 5/23/2013 Referred to House committee. Status: Referred to the Committee on Armed Services, and in addition to the Committees on Intelligence (Permanent Select), and the Judiciary, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned.

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8. S.1016 : A bill to protect individual privacy against unwarranted governmental intrusion through the use of the unmanned aerial vehicles commonly called drones, and for other purposes.
Sponsor: Sen Paul, Rand [KY] (introduced 5/22/2013) Cosponsors (1)
Committees: Senate Judiciary
Latest Major Action: 5/22/2013 Referred to Senate committee. Status: Read twice and referred to the Committee on the Judiciary.

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9. S.1057 : A bill to prohibit the use of unmanned aircraft systems by private persons to conduct surveillance of other private persons, and for other purposes.
Sponsor: Sen Udall, Mark [CO] (introduced 5/23/2013) **Cosponsors** (None)
Committees: Senate Judiciary
Latest Major Action: 5/23/2013 Referred to Senate committee. Status: Read twice and referred to the Committee on the Judiciary.

Integration of Drones into Domestic Airspace: Selected Legal Issues

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CRS Report for Congress
Prepared for Members and Committees of Congress

Summary

Under the FAA Modernization and Reform Act of 2012, P.L. 112-95, Congress has tasked the Federal Aviation Administration (FAA) with integrating unmanned aircraft systems (UASs), sometimes referred to as unmanned aerial vehicles (UAVs) or drones, into the national airspace system by September 2015. Although the text of this act places safety as a predominant concern, it fails to address significant, and up to this point, largely unanswered legal questions.

For instance, several legal interests are implicated by drone flight over or near private property. Might such a flight constitute a trespass? A nuisance? If conducted by the government, a constitutional taking? In the past, the Latin maxim *cujus est solum ejus est usque ad coelum* (for whoever owns the soil owns to the heavens) was sufficient to resolve many of these types of questions, but the proliferation of air flight in the 20th century has made this proposition untenable. Instead, modern jurisprudence concerning air travel is significantly more nuanced, and often more confusing. Some courts have relied on the federal definition of "navigable airspace" to determine which flights could constitute a trespass. Others employ a nuisance theory to ask whether an overhead flight causes a substantial impairment of the use and enjoyment of one's property. Additionally, courts have struggled to determine when a government-operated overhead flight constitutes a taking under the Fifth and Fourteenth Amendments.

With the ability to house surveillance sensors such as high-powered cameras and thermal-imaging devices, some argue that drone surveillance poses a significant threat to the privacy of American citizens. Because the Fourth Amendment's prohibition against unreasonable searches and seizures applies only to acts by government officials, surveillance by private actors such as the paparazzi, a commercial enterprise, or one's neighbor is instead regulated, if at all, by state and federal statutes and judicial decisions. Yet, however strong this interest in privacy may be, there are instances where the public's First Amendment rights to *gather* and *receive* news might outweigh an individual's interest in being let alone.

Additionally, there are a host of related legal issues that may arise with this introduction of drones in U.S. skies. These include whether a property owner may protect his property from a trespassing drone; how stalking, harassment, and other criminal laws should be applied to acts committed with the use of drones; and to what extent federal aviation law could preempt future state law.

Because drone use will occur largely in federal airspace, Congress has the authority or can permit various federal agencies to set federal policy on drone use in American skies. This may include the appropriate level of individual privacy protection, the balancing of property interests with the economic needs of private entities, and the appropriate safety standards required.

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Introduction

The integration of drones into U.S. skies is expected by many to yield significant commercial and societal benefits.[1] Drones could be employed to inspect pipelines, survey crops, and monitor the weather.[2] One newspaper has already used a drone to survey storm damage,[3] and real estate agents have used them to survey property.[4] In short, the extent of their potential domestic application is bound only by human ingenuity.

In an effort to accelerate this introduction, in the FAA Modernization and Reform Act of 2012, Congress tasked the Federal Aviation Administration (FAA) with safely integrating drones into the national airspace system by September 2015.[5] Likewise, sensing the opportunities that unmanned flight portend, lobbying groups and drone manufacturers have joined the chorus of those seeking a more rapid expansion of drones in the domestic market.[6]

Yet, the full-scale introduction of drones into U.S. skies will inevitably generate a host of legal issues. This report will explore some of those issues. To begin, this report will describe the regulatory framework for permitting the use of unmanned vehicles and the potential rulemaking that will occur over the next few years. Next, it will discuss theories of takings and property torts as they relate to drone flights over or near private property. It will then discuss the privacy interests implicated by drone surveillance conducted by private actors and the potential countervailing First Amendment rights to gather and receive news. Finally, this report will explore possible congressional responses to these privacy concerns, discuss how the FAA has approached these concerns, and identify additional potential legal issues.

Development of Aviation Law and Regulations

The predominant theory of airspace rights applied before the advent of aviation derived from the Roman Law maxim *cujus est solum ejus est usque ad coelum*, meaning whoever owns the land

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[1] A "drone" is simply an aircraft that can fly without a human operator. They are sometimes referred to as unmanned aerial vehicles (UAV), and the whole system—including the aircraft, the operator on the ground, and the digital network required to fly the aircraft—is referred to as an unmanned aircraft system (UAS). *See generally* CRS Report R42718, *Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System*, by Bart Elias.

[2] *See* GOV'T ACCOUNTABILITY OFFICE, UNMANNED AIRCRAFT SYSTEMS: MEASURING PROGRESS AND ADDRESSING POTENTIAL PRIVACY CONCERNS WOULD FACILITATE INTEGRATION INTO THE NATIONAL AIRSPACE SYSTEM (2012).

[3] It is reported that News Corp. has used a small drone to monitor storm damage in Alabama and flooding in North Dakota. Kashmir Hill, *FAA Looks Into News Corp's Daily Drone, Raising Questions About Who Gets to Fly Drones in the U.S.*, FORBES, (August 2, 2011 3:52 P.M.), http://www.forbes.com/sites/kashmirhill/2011/08/02/faa-looks-into-news-corps-daily-drone-raising-questions-about-who-gets-to-fly-drones-in-the-u-s/.

[4] Nick Wingfield & Somini Sengupta, *Drones Set Sights on U.S. Skies*, N.Y. TIMES (February 17, 2012), *available at* http://www.nytimes.com/2012/02/18/technology/drones-with-an-eye-on-the-public-cleared-to-fly.html?pagewanted=all&_r=0.

[5] FAA Modernization and Reform Act of 2012, P.L. 112-95, 126 Stat. 11.

[6] Groups such as the Association for Unmanned Vehicle Systems International, which boasts 7,200 members, including defense contractors, educational institutions, and government agencies, have been formed to advance the interests of the UAV community. Association for Unmanned Vehicle Systems International; http://www.auvsi.org/Home.

possesses all the space above the land extending upwards into the heavens.[7] This maxim was adopted into English common law and eventually made its way into American common law.[8] At the advent of commercial aviation, Congress enacted the Air Commerce Act of 1926[9] and later the 1938 Civil Aeronautics Act.[10] These laws included provisions stating that "to the exclusion of all foreign nations, [the United States has] complete sovereignty of the airspace" over the country.[11] Additionally, Congress declared a "public right of freedom of transit in air commerce through the navigable airspace of the United States."[12] This right to travel in navigable airspace came into conflict with the common law idea that each landowner owned the airspace above the surface in perpetuity. If the common law idea was to be followed faithfully, there could be no right to travel in navigable airspace without constantly trespassing in private property owners' airspace. This conflict was directly addressed by the Supreme Court in *United States v. Causby*, discussed extensively below.

With the passage of the Federal Aviation Act in 1958,[13] the administrator of the FAA was given "full responsibility and authority for the advancement and promulgation of civil aeronautics generally.... "[14] This centralization of responsibility and creation of a uniform set of rules recognized that "aviation is unique among transportation industries in its relation to the federal government—it is the only one whose operations are conducted almost wholly within federal jurisdiction.... "[15] The FAA continues to set uniform rules for the operation of aircraft in the national airspace. In the FAA Modernization and Reform Act of 2012 (FMRA), Congress instructed the FAA to "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system."[16] These regulations must provide for this integration "as soon as practicable, but not later than September 30, 2015."[17]

Current FAA Regulations of Navigable Airspace

Fixed-Wing Aircraft

FAA regulations define the minimum safe operating altitudes for different kinds of aircraft. Generally, outside of takeoff and landing, fixed-wing aircraft must be operated at an altitude that allows the aircraft to conduct an emergency landing "without undue hazard to persons or property on the surface."[18] In a congested area, the aircraft must operate at least "1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft."[19] The minimum safe

[7] Colin Cahoon, *Low Altitude Airspace: A Property Rights No-Man's Land*, 56 J. AIR L. & COM. 157, 161 (1990).

[8] *Id*; *see also* R. WRIGHT, THE LAW OF AIRSPACE 11-65 (1968).

[9] Air Commerce Act of 1926, P.L. 69-254, 44 Stat. 568.

[10] Civil Aeronautics Act of 1938, P.L. 75-706, 52 Stat. 973.

[11] Codified as amended at 49 U.S.C. § 40103 (2012).

[12] Codified as amended at 49 U.S.C. § 40101 (2012).

[13] P.L. 85-726; 72 Stat. 737 (1958).

[14] H. Rept. 2360, 85th Cong., 2d Sess. (1958).

[15] S. Rept. 1811, 85th Cong., 2d Sess. (1958).

[16] P.L. 112-95, §332(a)(1).

[17] *Id.* at §332(a)(3).

[18] 14 C.F.R. §91.119(a).

[19] *Id.* at §91.119(b).

operating altitude over non-congested areas is "500 feet above the surface."[20] Over open water or sparsely populated areas, aircraft "may not be operated closer than 500 feet to any person, vessel, vehicle, or structure."[21] Navigable airspace is defined in statute as the airspace above the minimum safe operating altitudes, including airspace needed for safe takeoff and landing.[22]

Helicopters

While a fixed-wing aircraft is subject to specific minimum safe operating altitudes based on where it is flying, regulation of helicopter minimum altitudes is less rigid. According to FAA regulations, a helicopter may fly below the minimum safe altitudes prescribed for fixed-wing aircraft if it is operated "without hazard to person or property on the surface."[23] Therefore, arguably a helicopter may be lawfully operated outside the zone defined in statute as navigable airspace.[24]

Drones

The FAA does not currently regulate safe minimum operating altitudes for drones as it does for other kinds of aircraft. Defining navigable airspace for drone operation may be one way that the FAA responds to Congress's instruction, in FMRA, to write rules integrating civil drones into the national airspace, which is discussed in more detail below.[25] One possibility is for the FAA to create different classes of drones based on their size and capabilities. Larger drones that physically resemble fixed-wing aircraft could be subject to similar safe minimum operating altitude requirements whereas smaller drones could be regulated similar to helicopters.

Current FAA Regulation of Drones

In 2007, the FAA issued a policy notice stating that "no person may operate a UAS in the National Airspace without specific authority."[26] Therefore, currently all drone operators who do not fall within the recreational use exemption discussed below must apply directly to the FAA for permission to fly.[27]

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[20] *Id.* at § 91.119(c).

[21] *Id.*

[22] 49 U.S.C. § 40102(32).

[23] 14 C.F.R. § 91.119(d).

[24] *See* People v. Sabo, 185 Cal. App. 3d 845, 852 (1986) ("While helicopters may be operated at less than minimum altitudes so long as no hazard results, it does not follow that such operation is conducted within navigable airspace. The plain meaning of the statutes defining navigable airspace as that airspace above specified altitudes compels the conclusion that helicopters operated below the minimum are not in navigable airspace. The helicopter hovering above the surface of the land in such fashion as not to constitute a hazard to persons or property is, however, lawfully operated.").

[25] *See id.* at § 332(b).

[26] FAA, "Unmanned Aircraft Operations in the National Airspace System," 72 Fed. Reg. 6689 (Feb. 13, 2007).

[27] *See id.*

Public and Civil Operators

Drones operated by federal, state, or local agencies must obtain a certificate of authorization or waiver (COA) from the FAA.[28] After receiving COA applications, the FAA conducts a comprehensive operational and technical review of the drone and can place limits on its operation in order to ensure its safe use in airspace.[29] In response to a directive in FMRA, the FAA recently streamlined the process for obtaining COAs, making it easier to apply on their website.[30] It also employs expedited procedures allowing grants for temporary COAs if needed for time-sensitive missions.[31]

Civil operators, or private commercial operators, must receive a special airworthiness certificate in the experimental category in order to operate.[32] These certificates have been issued on a limited basis for flight tests, demonstrations, and training. Presently, there is no other method of obtaining FAA approval to fly drones for commercial purposes. It appears these restrictions will be loosened in the coming years, since the FAA has been instructed to issue a rulemaking that will lead to the phased-in integration of civilian unmanned aircraft into national airspace.[33]

Recreational Users

The FAA encourages recreational users of model aircraft, which certain types of drones could fall under, to follow a 1981 advisory circular.[34] Under the circular, users are instructed to fly a sufficient distance from populated areas and away from noise-sensitive areas like parks, schools, hospitals, or churches. Additionally, users should not fly in the vicinity of full-scale aircraft or more than 400 feet above the surface. When flying within three miles of an airport, users should notify the air traffic control tower, airport operator, or flight service station. Compliance with these guidelines is voluntary.

Future FAA Regulation of Drones

FMRA instructs the FAA to integrate civil unmanned aircraft systems into the national airspace by the end of FY2015 and implement new standards for public drone operators. This law included provisions describing the comprehensive plan and rulemaking the agency must create to address different aspects of integrating civil drones, restricting the FAA's ability to regulate "model aircraft," and requiring the creation of drone test sites.

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[28] *Id.*

[29] *See generally* FAA "Unmanned Aircraft Systems," *available at* http://www.faa.gov/about/initiatives/uas/cert/.

[30] *See* P.L. 112-95, § 334(a) (instructing the issuance of "guidance regarding the operation of public unmanned aircraft systems to ... expedite the issuance of a certificate of authorization process ... "); *see also* "Certificates of Authorization or Waiver (COA)," *available at* http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/.

[31] "FAA makes progress with UAS integration," *available at* http://www.faa.gov/news/updates/?newsId=68004.

[32] 72 Fed. Reg. 6689; *see* 14 C.F.R. §§ 21.191, 21.193 (experimental certificates generally); 14 C.F.R. § 91.319 (operating limitations on experimental certificate aircraft).

[33] P.L. 112-95, § 332(2).

[34] *See* 72 Fed. Reg. 6689; Advisory Circular 91-57, "Model Aircraft Operating Standards" (June 1981), *available at* http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf.

Civil Operators

The statute instructs the FAA to create a "comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace"[35] and submit the plan to Congress within one year of enactment.[36] The statute contains a non-exhaustive list of elements that the plan must address, including predictions on how future rulemaking will address the certification process for drones; drone sense and avoid capabilities; and establishing operator or pilot standards, including a licensing and registration system.[37] The plan must also include a timeline for a phased-in approach to integration and ways to ensure the safe operation of civil drones with publicly operated drones in the airspace.[38] The FAA has not yet submitted this comprehensive plan to Congress.

FMRA also directs the FAA to promulgate a series of rules, including rules governing the civil operation of small drones in the national airspace and rules implementing the comprehensive plan described above.[39] Additionally, the FAA must update its 2007 policy statement that established the current scheme of drone authorizations.[40]

Public Operators

As noted above, the FAA has already implemented a streamlined process for public operators to obtain COAs.[41] In addition to this streamlining, FMRA instructs the FAA to "develop and implement operations and certification requirements for the operation of public unmanned aircraft systems in the national airspace."[42] Similar to the provisions governing civil users, these standards must be in place by the end of 2015.

Recreational Users

In FMRA, the FAA was prohibited from promulgating rules regarding certain kinds of model aircraft flown for hobby or recreational use.[43] This prohibition applies if the model aircraft is less than 55 pounds, does not interfere with any manned aircraft, and is flown in accordance with a community-based set of safety guidelines.[44] Additionally, the aircraft must be flown within the line of sight of the operator and be used solely for hobby or recreational purposes.[45] If flown within five miles of an airport, the operator of the model aircraft must notify both the airport operator and air traffic control tower.[46] While the FAA is prohibited from writing rules or

[35] P.L. 112-95, § 332(a)(1).

[36] *Id.* at § 332(a)(4).

[37] *Id.* at § 332(a)(2).

[38] *Id.*

[39] *Id.* at § 332(b).

[40] *Id.* at § 332(b)(3).

[41] P.L. 112-95, § 334(a), (c).

[42] *Id.* at § 334(b).

[43] *Id.* at § 336.

[44] *Id.* at § 336(a).

[45] *Id.* at § 336(c).

[46] *Id. at* § 336(a)(5).

regulations governing these aircraft, it is not prohibited from pursuing enforcement actions "against persons operating model aircraft who endanger the safety of the national airspace system."[47]

Test Ranges

As part of its efforts to integrate drones into the national airspace, FMRA also directed the FAA to establish six test ranges that will serve as integration pilot projects.[48] As part of the test range program, the FAA must designate airspace for the operation of both manned and unmanned flights, develop certification and air traffic standards for drones at the test ranges, and coordinate with both NASA and the Department of Defense during development. The test ranges should address both civil and public drone operations.[49]

In February 2013, the FAA published a notice in the Federal Register announcing the process for selection of the sites.[50] In its words, "The overall purpose of this test site program is to develop a body of data and operational experiences to inform integration and the safe operation of these aircraft in the National Airspace System."[51] As directed in the statute, factors for site selection include geographic and climactic diversity and a consideration of the location of the ground infrastructure needed to support the sites.[52] Additionally, in the notice the FAA announced privacy requirements that will be applicable to operations at test sites. These provisions are discussed in more detail below.[53]

The FAA received 50 applications spread across 37 states and is in the process of making its test range site selections.[54]

Airspace and Property Rights

Since the popularization of aviation, courts have had to balance the need for unobstructed air travel and commerce with the rights of private property owners. The foundational case in explaining airspace ownership rights is *United States v. Causby*.[55]

United States v. Causby

In *United States v. Causby*, the Supreme Court directly confronted the question of who owns the airspace above private property.[56] The plaintiffs filed suit against the U.S. government arguing

[47] *Id.* at § 336(b).

[48] *Id.* at § 332(c).

[49] *Id.* at § 332(c)(2).

[50] Unmanned Aircraft System Test Site Program, 78 Fed. Reg. 12259 (Feb. 22, 2013).

[51] *Id.*

[52] *Id.*; *see* P.L. 112-95, § 332(c)(3).

[53] *See infra* "FAA Regulation of Privacy".

[54] FAA, "UAS Test Site Map," *available at* http://www.faa.gov/about/initiatives/uas/media/UAS_testsite_map.pdf.

[55] United States v. Causby, 328 U.S. 256 (1946).

[56] *Id.*

that flights of military planes over their property constituted a violation of the Fifth Amendment Takings Clause, which states that private property shall not "be taken for public use, without just compensation." Generally, takings suits can only be filed against the government when a government actor, as opposed to a private party, causes the alleged harm.[57]

Causby owned a chicken farm outside of Greensboro, North Carolina, that was located near an airport regularly used by the military. The proximity of the airport and the configuration of the farm's structures led the military planes to pass over the property at 83 feet above the surface, which was only 67 feet above the house, 63 feet above the barn, and 18 feet above the tallest tree.[58] While this take-off and landing pattern was conducted according to the Civil Aeronautics Authority guidelines, the planes caused "startling" noises and bright glare at night.

As the Court explained, "as a result of the noise, respondents had to give up their chicken business. As many as six to ten of their chickens were killed in one day by flying into the walls from fright. The total chickens lost in this manner was about 150.... The result was the destruction of the use of the property as a commercial chicken farm."[59] The Court had to determine whether this loss of property constituted a taking without just compensation.

At the outset, the Court directly rejected the common law conception of airspace ownership: "It is ancient doctrine that at common law ownership of the land extended to the periphery of the universe—*Cujus solum ejus est usque ad coelum.* But that doctrine has no place in the modern world."[60] The Court noted that Congress had previously declared a public right of transit in air commerce in navigable airspace and national sovereignty in the airspace.[61] These statutes could not be reconciled with the common law doctrine without subjecting aircraft operators to countless trespass suits. In the Court's words, "common sense revolts at the idea."[62]

Even though it rejected the idea that the Causbys held complete ownership of the air up to the heavens, the Court still had to determine if they owned any portion of the space in which the planes flew such that a takings could occur. The government argued that flights within navigable airspace that do not physically invade the surface cannot lead to a taking. It also argued that the landowner does not own any airspace adjacent to the surface "which he has not subjected to possession by the erection of structures or other occupancy."[63]

The Court did not adopt this reasoning, finding instead that "the landowner owns at least as much space above the ground as he can occupy or use in connection with the land. The fact that he does not occupy it in a physical sense—by the erection of building and the like—is not material."[64] Therefore, it found that the landowner owns the airspace in the immediate reaches of the surface necessary to use and enjoy the land and invasions of this space "are in the same category as

[57] Takings claims filed against state government actors would not be filed under the Fifth Amendment. Rather, they would arise as state constitutional claims. For more information on takings, *see* CRS Report RS20741, *The Constitutional Law of Property Rights "Takings": An Introduction*, by Robert Meltz.

[58] *Causby*, 328 U.S. at 258.

[59] *Id.* at 259.

[60] *Id.* at 260-61.

[61] *Id.* at 260 (citing statutes then codified at 49 U.S.C. §§ 176(a), 403).

[62] *Id.*

[63] *Id.*

[64] *Id.* at 264 (citing Hinman v. Pacific Air Transport, 84 F.2d 755 (9th Cir. 1936)).

invasions of the surface."[65] Above these immediate reaches, the airspace is part of the public domain, but the Court declined to draw a clear line. The Court also noted that the government's argument regarding the impossibility of a taking based on flights in navigable airspace was inapplicable in this case because the flights over Causby's land were not within navigable airspace.[66] At the time, federal law defined navigable airspace as the space above the minimum safe flying altitudes for specific areas, but did not include the space needed to take off and land. Even though these flights were not within navigable airspace, the Court seemed to suggest that if they were, the inquiry would not immediately end. Instead, the Court would then have to determine if the regulation itself, defining the navigable airspace, was valid.[67]

Ultimately, in the context of a taking claim, the Court concluded that "flights over private land are not a taking, unless they are so low and so frequent to be a direct and immediate interference with the enjoyment and use of the land."[68] With regard to the Causbys' chicken farm, the Court concluded that the military flights had imposed a servitude upon the land, similar to an easement, based on the interference with the use and enjoyment of their property. Although the land did not lose all its economic value, the lower court's findings clearly established the flights led directly to a diminution in the value of the property, since it could no longer be used for its primary purpose as a chicken farm.

Post-*Causby* Theories of Airspace Ownership

Causby clearly abandoned the ancient idea that private landowners each owned their vertical slice of the airspace above the surface in perpetuity as incompatible with modern life. The case set up three factors to examine in a takings claim that courts still utilize today: (1) whether the planes flew directly over the plaintiff's land; (2) the altitude and frequency of the flights; and (3) whether the flights directly and immediately interfered with the plaintiff's use and enjoyment of the surface land.[69]

However, it left many questions unanswered. Where is the dividing line between the "immediate reaches" of the surface and public domain airspace? Can navigable airspace intersect with the "immediate reaches" belonging to the private property? Can aircraft flying wholly within navigable airspace, as defined by federal law, ever lead to a successful takings claim? How does one assess claims based on lawfully operated aircraft, such as helicopters, flying below navigable airspace?

Subsequent cases have been brought using many different legal claims, including trespass and nuisance, as discussed below, and various ways of describing the resulting injury. Claims could include an "inverse condemnation," another way of describing a taking, or the establishment of an avigation, air, or flying easement. While these legal claims may have different names, it appears

[65] *Id.* at 265.

[66] *Id.* at 264.

[67] *Id.* at 263.

[68] *Id.* at 266.

[69] *See e.g.*, Andrews v. United States, 2012 U.S. Claims LEXIS 1644, *10 (explaining that the "The United States Court of Appeals for the Federal Circuit (Federal Circuit) has derived from Causby three factors for consideration 'in determining whether noise and other effects from overflights ... constitute a taking.... '"). *But see* Argent v. United States, 124 F.3d 1277, 1284 (Fed. Cir. 1997) (finding a taking claim may be based on "a peculiarly burdensome pattern of activity, including both intrusive and non-intrusive flights").

that courts use *Causby* as the starting point for analyzing all property-based challenges to intrusions upon airspace. Several different interpretations of *Causby* have emerged in the attempt to articulate an airspace ownership standard, a few of which are described here.

Following *Causby*, several lower courts employed a fixed-height theory and interpreted the decision as creating two distinct categories of airspace. On the one hand, the stratum of airspace that was defined in federal law as "navigable airspace" was always a part of the public domain. Therefore, flights in this navigable airspace could not lead to a successful property-right based action like a takings or trespass claim because the property owner never owned the airspace in the public domain. On the other hand, the airspace below what is defined as navigable airspace could be "owned" by the surface owner and, therefore, intrusions upon it could lead to a successful takings or property tort claim. Since this fixed-height theory of airspace ownership relies heavily on the definition of navigable airspace, the expansion of the federal definition of "navigable airspace" to include the airspace needed to take-off and land[70] greatly impacts what airspace a property owner could claim.

This strict separation between navigable airspace and the airspace a landowner can claim seems to have been disavowed by the Supreme Court. First, in dicta in *Braniff Airways v. Nebraska State Board of Equalization & Assessment*,[71] a case primarily dealing with the question of federal preemption of state airline regulations, the Court left open the possibility of a taking based on flights occurring in navigable airspace. It summarized *Causby* as holding "that the owner of land might recover for a taking by national use of navigable air space resulting in destruction in whole or in part of the usefulness of the land property."[72] Next, in *Griggs v. Allegheny County* the Supreme Court found that the low flight of planes over the plaintiff's property, taking off from and landing at a nearby airport's newly constructed runway, constituted a taking that had to be compensated under the Fifth Amendment.[73] The noise and fear of a plane crash caused by the low overhead flights made the property "'undesirable and unbearable'" for residential use, making it impossible for people in the house to converse or sleep.[74] The Court reached this conclusion that a taking occurred based on this injury, despite the fact that the flights were operated properly under federal regulations and never flew outside of navigable airspace.[75] Despite this holding, some lower courts have continued to lend credence to a fixed-height ownership theory as a reasonable interpretation of *Causby*.[76]

Another interpretation of *Causby* essentially creates a presumption of a non-taking when overhead flights occur in navigable airspace. This presumption would recognize the importance of unimpeded travel of air commerce and that Congress placed navigable airspace in the public domain. However, the presumption could be rebutted by evidence that the flights, while in navigable airspace, interfered with the owner's use and enjoyment of the surface enough to justify compensation. As one court reasoned, "as the height of the overflight increases... the Government's interest in maintaining sovereignty becomes weightier while the landowner's

[70] 49 U.S.C. §40102(32) (2012).

[71] 347 U.S. 590 (1954).

[72] *Id.* at 596.

[73] Griggs v. Allegheny County, 369 U.S. 84, 90 (1962).

[74] *Id.* at 87.

[75] *Id.* at 86-89.

[76] *See, e.g.*, Aaron v. United States, 311 F.2d 798 (Ct. Cl. 1963); Powell v. United States, 1 Cl. Ct. 669 (1983).

interest diminishes, so that the damage showing required increases in a continuum toward showing absolute destruction of all uses of the property."[77]

Finally, some courts have concluded that the altitude of the overhead flight has no determinative impact on whether a taking has occurred. One federal court noted that the government's liability for a taking is not impacted "merely because the flights of Government aircraft are in what Congress has declared to be navigable airspace and subject to its regulation."[78] Under this approach, "although the navigable airspace has been declared to be in the public domain, 'regardless of any congressional limitations, the land owner, as an incident to his ownership, has a claim to the superjacent airspace to the extent that a reasonable use of his land involves such space.'"[79] Under this theory, the court would only need to examine the effect of the overhead flights on the use and enjoyment of the land, and would not need to determine if the flight occurred in navigable airspace.

While the definition of navigable airspace impacts each theory differently, it is clear that under each interpretation a showing of interference with the use and enjoyment of property is required. Cases have clearly established that overhead flights leading to impairment of the owner's livelihood or that cause physical damage qualify as an interference with use and enjoyment of property.[80] Additionally, flights that cause the surface to become impractical for its intended use by the current owner also satisfy the use and enjoyment requirement.[81] For example, in *Griggs*, the noise, vibration, and fear of damage caused by overhead flights made it impossible for the plaintiffs to converse with others or sleep within their house, leading to their retreat from the property, which had become "undesirable and unbearable for their residential use."[82] Some courts have recognized a reduction in the potential resale value of the property as an interference with its use and enjoyment, even if the property continues to be suitable for the purposes for which it is currently used.[83] One court explained: "Enjoyment of property at common law contemplated the entire bundle of rights and privileges that attached to the ownership of land.... Owners of fee simple estates ... clearly enjoy not only the right to put their land to a particular present use, but also to hold the land for investment and appreciation.... "[84] However, other courts have rejected the idea that restrictions on uses by future inhabitants, without showing loss of property value, are relevant to a determination of the owner's own use and enjoyment of the property.[85]

Trespass and Nuisance Claims Against Private Actors

Although *Causby* arose from a Fifth Amendment takings claim, its articulation of airspace ownership standards is also often used in determining state law tort claims such as trespass and nuisance. These state law tort claims could be used to establish liability for overhead flights

[77] Stephens v. United States, 11 Cl. Ct. 352, 362 (1986).

[78] Branning v. United States, 654 F.2d 88, 99 (1981).

[79] *Id.* at 98-99 (citing Palisades Citizens Association, Inc. v. C.A.B, 420 F.2d 188, 192 (D.C. Cir. 1969)).

[80] *See, e.g.*, *Causby*, 328 U.S. 256.

[81] *See, e.g., Griggs*, 369 U.S. 84; Pueblo of Sandia v. Smith, 497 F.2d 1043 (10th Cir. 1974) ("appellant failed to show interference with actual, as distinguished from potential, use of its land.").

[82] *Griggs*, 369 U.S. at 87.

[83] *See, e.g.*, Brown v. United States, 73 F.3d 1100 (1996); *Branning*, 654 F.2d 88.

[84] *Brown*, 73 F.3d 1100.

[85] Stephens v. United States, 11 Cl. Ct. 352 (1986).

operated by private actors, where a lack of government involvement precludes a takings claim. Generally, the tort of trespass is any physical intrusion upon property owned by another. However, unlike with surface trespass claims, simply proving that an object or person was physically present in the airspace vertically above the landowner's property is generally not enough to establish a trespass in airspace. Since *Causby* struck down the common law idea of *ad coelum*, landowners generally do not have an absolute possessory right to the airspace above the surface into perpetuity. Instead, airspace trespass claims are often assessed using the same requirements laid out in the *Causby* takings claim. Arguably, these standards are used in property tort claims because there can be no trespass in airspace unless the property owner has some possessory right to the airspace, which was the same question at issue in *Causby*.

To allege an actionable trespass to airspace, the property owner must not only prove that the interference occurred within the immediate reaches of the land, or the airspace that the owner can possess under *Causby*, but also that its presence interferes with the actual use of his land. As one court explained, "a property owner owns only as much air space above his property as he can practicable use. And to constitute an actionable trespass, an intrusion has to be such as to subtract from the owner's use of the property."[86] This standard for airspace trespass was also adopted by the Restatement (Second) of Torts.[87]

Nuisance is a state law tort claim that is not based on possessory rights to property, like trespass, but is rooted in the right to use and enjoy land.[88] Trespass and nuisance claims arising from airspace use are quite similar, since trespass to airspace claims generally require a showing that the object in airspace interfered with use and enjoyment of land. However, unlike trespass, nuisance claims do not require a showing that the interference actually occupied the owner's airspace. Instead, a nuisance claim can succeed even if the interference flew over adjoining lands and never directly over the plaintiff's land, as long as the flight constitutes a substantial and unreasonable interference with the use and enjoyment of the land.

Potential Liability Arising from Civilian Drone Use

The integration of drones into domestic airspace will raise novel questions of how to apply existing airspace ownership law to this new technology. How courts may apply the various interpretations of *Causby*, discussed above, to drones will likely be greatly impacted by the FAA's definition of navigable airspace for drones.

The potential for successful takings, trespass, or nuisance claims from drone use will also be impacted by the physical characteristics of the drone, especially given that current case law heavily emphasizes the impact of the flight on use and enjoyment of the surface property. Several characteristics of drones may make their operation in airspace less likely to lead to liability for drone operators than for aircraft operators. First, the noise attributed to drone use may be significantly less than noise created by helicopters or planes powered by jet engines. Second, drones commonly used for civilian purposes could be much smaller than common aircraft used today. This decreased size is likely to lead to fewer physical impacts upon surface land such as

[86] Geller v. Brownstone Condominium, 82 Ill. App. 3d 334, 336-37 (1980).

[87] RESTATEMENT (SECOND) OF TORTS §159(2) (1965) (stating that "Flights by aircraft in the airspace above the land of another is a trespass if, but only if, (a) it enters into the immediate reaches of the airspace next to the land, and (b) it interferes substantially with the other's use and enjoyment of the land.").

[88] RESTATEMENT (SECOND) OF TORTS §821D (1979); 2 DAN B DOBBS ET AL., THE LAW OF TORTS §398 (2d ed. 2011).

vibration and dust, which are common complaints arising from overhead aircraft and helicopter flights. Finally, it is unknown at this time how most drones will be deployed into flight. Will drone "airports" be used to launch the aircraft or will they take off and land primarily from individual property? If drone use remains decentralized and is not organized around an "airport," then drones are less likely to fly repeatedly over the same piece of property, creating fewer potential takings, trespass, or nuisance claims. Additionally, the majority of drones are more likely to operate like helicopters, taking off and landing vertically, than like traditional fixed-wing aircraft. This method of takeoff reduces the amount of surface the aircraft would have to fly over before reaching its desired flying altitude, minimizing the potential number of property owners alleging physical invasion of the immediate reaches of their surface property.

Alternatively, the potential ability for drones to fly safely at much lower altitudes than fixed-wing aircraft or helicopters could lead to a larger number of property-based claims. Low-flying drones are more likely to invade the immediate reaches of the surface property, thus satisfying part of the requirement for a takings or trespass claim.

Privacy

Perhaps the most contentious issue concerning the introduction of drones into U.S. airspace is the threat that this technology will be used to spy on American citizens. With the ability to house high-powered cameras, infrared sensors, facial recognition technology, and license plate readers, some argue that drones present a substantial privacy risk.[89] Undoubtedly, the government's use of drones for domestic surveillance operations implicates the Fourth Amendment and other applicable laws.[90] In like manner, privacy advocates have warned that private actors might use drones in a way that could infringe upon fundamental privacy rights.[91] This section will focus on the privacy issues associated with the use of drones by private, non-governmental actors. It will provide a general history of privacy law in the United States and survey the various privacy torts, including intrusion upon seclusion, the privacy tort most applicable to drone surveillance. It will then explore the First Amendment right to gather news. Application of these theories to drone surveillance will be discussed in the section titled "Congressional Response."

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[89] *See* Jennifer Lynch, *Are Drones Watching You?*, ELECTRONIC FRONTIER FOUNDATION (January 10, 2012), https://www.eff.org/deeplinks/2012/01/drones-are-watching-you; M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 STAN. L. REV. ONLINE 29 (December 12, 2011), http://www.stanfordlawreview.org/sites/default/files/online/articles/64-SLRO-29_1.pdf.

[90] For an analysis of the Fourth Amendment implications of government drone surveillance, see CRS Report R42701, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, by Richard M. Thompson II.

[91] *See* Press Release, Rep. Ed Markey, Markey Releases Discussion Draft of Drone Privacy and Transparency Legislation (August 1, 2012), *available at* http://markey.house.gov/press-release/markey-releases-discussion-draft-drone-privacy-and-transparency-legislation.

> Drones are already flying in U.S. airspace – with thousands more to come – but with no privacy protections or transparency measures in place. We are entering a brave new world, and just because a company soon will be able to register a drone license shouldn't mean that company can turn it into a cash register by selling consumer information. Currently, there are no privacy protections or guidelines and no way for the public to know who is flying drones, where, and why. The time to implement privacy protections is now.

Id.

Early Privacy Jurisprudence

Although early Anglo-Saxon law lacked express privacy protections, property law and trespass theories served as proxy for the protection of individual privacy. Lord Coke pronounced in 1605 that "the house of everyone is to him as his castle and fortress, as well for his defence against injury and violence, as for his respose[.]"[92] This proposition that individuals are entitled to privacy while in their homes crossed the Atlantic with the colonists and appeared prominently in early revolutionary thinking.[93] In one early American common law decision, the court noted that "[t]he law is clearly settled, that an officer cannot justify the breaking open an outward door or window, in order to execute process in a civil suit; if he doth, he is a trespasser."[94] In cases lacking physical trespass, prosecutors relied on an eavesdropping theory, which protected the privacy of individuals' conversations while in their home.[95]

These century-old theories of trespass and eavesdropping, however, failed to keep up with a rapidly changing society fueled by advancing technologies. As with today's celebrity-obsessed society, late-19th century society experienced the birth and spread of "yellow journalism," a new media aimed at emphasizing the "curious, dramatic, and unusual, providing readers a 'palliative of sin, sex, and violence.'"[96] Faster presses and instantaneous photography enabled journalists to exploit and spread gossip.[97] Louis D. Brandeis (then a private attorney) and Samuel Warren were bothered with the press's constant intrusions into the private affairs of prominent Bostonians.[98] In 1890, they published a seminal law review article formulating a new legal theory—the right to be let alone.[99] Brandeis and Warren understood that existing tort doctrines such as trespass and libel were insufficient to protect privacy rights, as "only a part of the pain, pleasure, and profit of life lay in physical things."[100] They noted that this new right to privacy derived not from "the principle of private property, but that of an inviolate personality."[101] The authors observed that "instantaneous photographs and newspaper enterprise have invaded the sacred precincts of private and domestic life; and numerous mechanical devices threaten to make good the prediction that 'what is whispered in the closet shall be proclaimed from the house-tops.'"[102] Although this new theory had its detractors,[103] it found its way into the common law of several states.[104]

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[92] Semayne's Case, 5 Co. Rep. 91 (K. B. 1604).

[93] In contesting the use of general warrants by officials of the British Crown, known then as writs of assistance, James Otis argued that "one of the most essential branches of English liberty, is the freedom of one's house. A man's house is his castle; and while he is quiet, he is as well guarded as a prince in his castle." II LEGAL PAPERS OF JOHN ADAMS 142.

[94] *See* State v. Armfield, 9 N.C. 246, 247 (1822).

[95] Note, *The Right to Privacy in Nineteenth Century America*, 94 HARV. L. REV. 1892, 1896 (1981). In an early case from Pennsylvania, in recognizing eavesdropping as an indictable offense, the court noted: "Every man's home is his castle, where no man has a right to intrude for any purpose whatever. No man has a right to pry into your secrecy in your own house." Commonwealth v. Lovett, 4 Pa. L.J. Rpts. (Clark) 226, 226 (Pa. 1831); *see also* State v. Williams, 2 Tenn. 108, 108 (1808) (recognizing eavesdropping as an indictable offense).

[96] Ken Gromley, *One Hundred Years of Privacy*, 1992 WIS. L. REV. 1335, 1351 (1992) (quoting EDWIN EMERY & MICHAEL C. EMERY, THE PRESS AND AMERICA: AN INTERPRETATIVE HISTORY OF THE MASS MEDIA 349-50 (3d ed. 1972).

[97] *Id.* at 1350-51.

[98] William M. Prosser, *Privacy*, 48 Cal. L. Rev. 383, 383 (1960).

[99] Louis D. Brandeis & Samuel D. Warren, *The Right to Privacy*, 4 HARV. L. REV. 193, 205 (1890).

[100] *Id.* at 195.

[101] *Id.* at 205.

[102] *Id.* at 195.

[103] Herbert Spencer Hadley, *Right to Privacy*, 3 N.W. L. REV. 1, 3-4 (1894) ("The writer believes that the right to (continued...)

Privacy Torts

In 1939, the First Restatement of Torts (a set of model rules intended for adoption by the states) created a general tort for invasion of privacy.[105] By 1940, a minority of states had adopted some right of privacy either by statute or judicial decision, and six states had expressly refused to adopt such a right.[106] Twenty years later, Dean William Prosser surveyed the case law surrounding this right and concluded that the right to privacy entailed four distinct (yet, sometimes overlapping) rights: (1) intrusion upon seclusion; (2) public disclosure of private facts; (3) publicity which puts the target in a false light; and (4) appropriation of one's likeness.[107] These four categories were incorporated into the Restatement (Second) of Torts.[108]

Section 652B of the Restatement (Second) of Torts creates a cause of action for intrusion upon seclusion,[109] the privacy tort most likely to apply to drone surveillance.[110] It has been adopted either by common law or statute in an overwhelming majority of the states.[111] Section 652B provides: "One who intentionally intrudes, physically or otherwise, upon the solitude or seclusion of another or his private affairs or concerns, is subject to liability to the other for invasion of his privacy, if the intrusion would be highly offensive to a reasonable person."[112] Courts have developed a set of rules for applying Section 652B. First, it requires an objective person standard, testing whether a person of "ordinary sensibilities" would be offended by the alleged invasion.[113] Thus, someone with an idiosyncratic sensitivity—say, an aversion to cameras—could not satisfy this standard by simply having his photograph taken. Likewise, the intrusion must not only be offensive, but "*highly* offensive,"[114] or as one court put it, "outrageously unreasonable conduct."[115] Generally, a single incident will not suffice; instead, the intrusion must be "repeated with such persistence and frequency as to amount to a course of hounding" and "becomes a burden to his existence.... "[116] However, in a few cases a single intrusion was adequate.[117] The

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privacy does not exist; that the arguments in its favor are based on a mistaken understanding of the authorities cited in its support[.]").

[104] *Compare* Roberson v. Rochester Folding Box Co., 171 N.E. 538, 542 (N.Y. 1902) (declining to adopt right of privacy), *with* Pavesich v. New England Life Ins. Co., 50 S.E. 68 (Ga. 1905) (recognizing a right to privacy).

[105] RESTATEMENT (FIRST) OF TORTS §867 (1939).

[106] *See* Louis Nizer, *Right of Privacy – A Half Century's Development*, 39 MICH. L. REV. 526, 529-30 (1940).

[107] Prosser, *supra* note 98, at 385.

[108] RESTATEMENT (SECOND) OF TORTS §§652B (intrusion upon seclusion), 652C (appropriation of name or likeness), 652D (publicity given to private fact), 652E (publicity placing person in false light).

[109] *Id.* at §652B.

[110] Because the use of drones for surveillance primarily concerns the collection, and not necessarily the dissemination, of information, this section will focus on the tort of intrusion upon seclusion, which has no publication requirement for recovery. *Id.* cmt. a.

[111] North Dakota and Wyoming are the only states not to adopt the privacy tort of intrusion upon seclusion. *See* Tigran Palyan, *Common Law Privacy in a Not So Common World: Prospects for the Tort of Intrusion Upon Seclusion in Virtual Worlds*, 38 SW. L. REV. 167, 180 n.106 (2008).

[112] *Id.*

[113] Shorter v. Retail Credit Co., 251 F. Supp. 329, 322 (D.S.C. 1966).

[114] RESTATEMENT (SECOND) OF TORTS §652B (emphasis added).

[115] N.O.C., Inc. v. Schaefer, 484 A.2d 729, 733 (N.J. Super. Ct. Law Div. 1984).

[116] RESTATEMENT (SECOND) OF TORTS §652B cmt. d.

[117] *See, e.g.*, Miller v. National Broadcasting Co., 187 Cal. App. 3d 1463 (Cal. Ct. App. 1986) (videotaping man in his (continued...)

invasion of privacy must been intentional, meaning the defendant must desire that the intrusion would occur, or as with other torts,[118] knew with a substantial certainty that such an invasion would result from his actions.[119] An accidental intrusion is not actionable. Finally, in some states, the intrusion must cause mental suffering, shame, or humiliation to permit recovery.[120]

A review of the case law demonstrates that the location of the target of the surveillance is, in many cases, determinative of whether someone has a viable claim for intrusion upon seclusion. For the most part, conducting surveillance of a person while within the confines of his home will constitute an intrusion upon seclusion.[121] The illustrations to Section 652B offer an example of a private detective who photographs an individual while in his home with a telescopic camera as a viable claim.[122] Likewise, as one court observed, "when a picture is taken of a plaintiff while he is in the privacy of his home, ... the taking of the picture may be considered an intrusion into the plaintiff's privacy just as eavesdropping or looking into his upstairs windows with binoculars are considered an invasion of his privacy."[123]

The likelihood of a successful claim is diminished if the surveillance is conducted in a public place. The comments to Section 652B explain that there is generally no liability for photographing or observing a person while in public "since he is not then in seclusion, and his appearance is public and open to the public eye."[124] Likewise, Prosser observed:

> On the public street, or in any other public place, the plaintiff has no right to be alone, and it is no invasion of his privacy to do no more than follow him about. Neither is it such an invasion to take a photograph in such a place, since this amounts to nothing more than making a record, not differing essentially from a full written description, of a public sight which anyone present would be free to see.[125]

The case law also supports this proposition. The Alabama Supreme Court dismissed a claim of wrongful intrusion against operators of a race track who photographed the plaintiffs while they were in the "winner's circle" at the track.[126] Similarly, a federal district court dismissed a claim by a husband and wife who had been photographed by Forbes Magazine while waiting in line at the Miami International Airport as it was taken in "a place open to the general public."[127] Likewise, a Vietnam veteran lost a claim for invasion of privacy based on photographs that depicted him and

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home while being resuscitated after having suffered a heart seizure); Nader v. General Motors Corp., 25 N.Y.2d 560, 570 (1970) (surveilling plaintiff in bank in an "overzealous" manner).

[118] RESTATEMENT (SECOND) OF TORTS §652B.

[119] *See* DOBBS ET AL., *supra* note 88, at §29.

[120] DeAngelo v. Fortney, 515 A.2d 594, 596 (Pa. Sup. 1986); Burns v. Masterbrand Cabinets, Inc., 369 Ill. App. 3d 1006, 1012 (Ill. App. Ct. 2007).

[121] *See, e.g.*, Wolfson v. Lewis, 924 F. Supp. 1413 (E.D. Penn. 1996).

[122] RESTATEMENT (SECOND) OF TORTS §652B cmt. b, illus. 2.

[123] Lovgren v. Citizens First Nat. Bank of Princeton, 534 N.E.2d 987 (Ill. 1989); *see also* Souder v. Pendleton Detectives, 88 So.2d 716, 718 (La. Ct. App. 1956) (peeping into plaintiff's windows); Egan v. Schmock, 93 F. Supp. 2d 1090, 1094-95 (N.D. Cal. 2000) (filming plaintiff and family while in their home).

[124] RESTATEMENT (SECOND) OF TORTS §652B cmt. c.

[125] Prosser, *supra* note 98, at 392.

[126] Schifano v. Green County, 624 So. 2d 178 (Ala. 1993).

[127] Fogel v. Forbes, 500 F. Supp. 1081, 1084, 1087 (E.D. Pa. 1980).

other soldiers during a combat mission in Vietnam—again, a public setting.[128] Other examples include the recording of license plate numbers of cars parked in a public parking lot[129] and photographing a person while walking on a public sidewalk.[130]

Indeed, even plaintiffs who were videotaped or photographed while on their own property have generally been unsuccessful in their privacy claims so long as they could be viewed from a public vantage point. Rejecting one plaintiff's claim for intrusion upon seclusion, the Supreme Court of Oregon held that even though the investigators trespassed on the plaintiff's property to film him, the investigation did not "constitute an unreasonable surveillance 'highly offensive to a reasonable man[,]'"[131] as the plaintiff could have been viewed from the road by his neighbors or passersby.[132] In another case, the wife of a prominent Puerto Rican politician sought damages from a newspaper for invasion of privacy allegedly committed when an agent of the newspaper photographed her house as part of a news story about her husband.[133] The court dismissed her claim as the photographers were not "unreasonably intrusive," and the photographs depicted only the outside of the home and no persons were photographed.[134] Similarly, in one case a couple sued a cell phone company for intrusion upon seclusion when the company's workers looked onto their property each time they serviced a nearby cell tower.[135] The court rejected their claim, holding that "[t]he mere fact that maintenance workers come to an adjoining property as part of their work and look over into the adjoining yard is legally insufficient evidence of highly offensive conduct."[136] There are many other examples.[137]

However, there have been some successful claims for intrusion upon seclusion involving surveillance conducted in public.[138] The comments to Section 652B explain: "Even in a public place, however, there may be some matters about the plaintiff, such as his underwear or lack of it, that are not exhibited to the public gaze, and there may still be invasion of privacy when there is intrusion upon these matters."[139] One of the most famous cases concerning this "public gaze" theory involved a suit for invasion of privacy against a newspaper when it published a picture of

[128] Tellado v. Time-Life, 643 F. Supp. 904, 907 (D.N.J. 1986).

[129] *See* International Union v. Garner, 601 F. Supp. 187, 191-92 (M.D. 1985); Tedeschi v. Reardon v. 5 F. Supp. 2d 40, 46 (D. Mass. 1998).

[130] Jackson v. Playboy Enterprises, Inc., 574 F. Supp. 10, 13 (S.D. Ohio 1983).

[131] McClain v. Boise Cascade Corp., 271 OR 549, 556 (1975). It should be noted that the court also relied on previous case law which held that one who seeks damages for alleged injuries "waives his right to privacy to the extent of a reasonable investigation." *Id.* at 554-555.

[132] *Id.* at 556.

[133] Mojica Escobar v. Roca, 926 F. Supp. 30, 32-33 (D.P.R. 1996).

[134] *Id.* at 35 (citing Dopp v. Fairfax Consultants, Ltd., 771 F. Supp. 494, 497 (D.P.R. 1990)).

[135] GTE Mobilnet of South Texas, LTD. Partnership v. Pascouet, 61 S.W. 3d 599, 605 (Tex. App. 2001).

[136] *Id.* at 618.

[137] *See, e.g.*, Aisenson v. American Broadcasting Co, 220 Cal. App. 3d 146, 162-63 (1990) (holding that broadcast of plaintiff while in his driveway and car was not an intrusion upon seclusion); Wehling v. Columbia Broadcasting System, 721 F.2d 506, 509 (5th Cir. 1983) (holding that broadcast of the outside of plaintiff's home taken from public street was not an invasion of privacy); Munson v. Milwaukee Bd. of School Directors, 969 F.2d 266, 271 (7th Cir. 1992) (same).

[138] *See* Kramer v. Downey, 684 S.W. 2d 524, 525 (Tex. Ct. App. 1984) ("[W]e now hold that the right to privacy is broad enough to include the right to be free of those willful intrusions into one's personal life at home and at work which occurred in this case.").

[139] RESTATEMENT (SECOND) OF TORTS §652B cmt. c.

the plaintiff with her dress blown up as she was leaving a fun house at a county fair.[140] In upholding the plaintiff's claim, the court observed: "To hold that one who is involuntarily and instantaneously enmeshed in an embarrassing pose forfeits her right of privacy merely because she happened at the moment to be part of a public scene would be illogical, wrong, and unjust."[141] In *Huskey v. National Broadcasting Co. Inc.*, a prisoner sued NBC, a television broadcasting company, alleging that by filming him without consent while he was working out in the exercise yard at the prison, NBC invaded his privacy.[142] NBC countered that depictions of persons in a "publicly visible area" could not support the claim for invasion of seclusion.[143] Ultimately, the court permitted the prisoner's claim to go forward, observing that "[o]f course [the prisoner] could be seen by guards, prison personnel and inmates, and obviously he was in fact seen by NBC's camera operator. But the mere fact a person can be seen by others does not mean that person cannot legally be 'secluded.'"[144] Although relief is available for certain cases of public surveillance, recovery seems to be the exception rather than the norm.[145]

First Amendment and Newsgathering Activities

Based on the foregoing discussion, safeguarding privacy from intrusive drone surveillance is clearly an important societal interest. However, this interest must be weighed against the public's countervailing concern in securing the free flow of information that inevitably feeds the "free trade of ideas."[146] Unmanned aircraft can improve the press and the public's ability to gather news: they can operate in dangerous areas without putting a human operator at risk of danger; can carry sophisticated surveillance technology; can fly in areas not currently accessible by traditional aircraft; and can stay in flight for long durations. However, challenges arise in attempting to find an appropriate balance between this interest in newsgathering and the competing privacy interests at stake.

The First Amendment to the United States Constitution provides that "Congress shall make no law ... abridging the freedom of speech, or of the press.... "[147] The Court has construed this phrase to cover not only traditional forms of speech, such as political speeches or polemical articles, but also conduct that is "necessary for, or integrally tied to, acts of expression,"[148] such as distribution of political literature[149] or door-to-door solicitation.[150] Additionally, the Court has pulled within

[140] Daily Times Democrat v. Graham, 276 Ala. 380, 381 (1964).

[141] *Id.* at 383.

[142] Huskey v. National Broadcasting Co., Inc., 632 F. Supp. 1282, 1285 (1986).

[143] *Id.* at 1286.

[144] *Id.* at 1287-88 (emphasis in original).

[145] Jennifer R. Scharf, *Shooting for the Stars: A Call for Federal Legislation to Protect Celebrities' Privacy Rights*, 3 BUFF. INTELL. PROP. L.J. 164, 183 (2006) ("Modifying intrusion to apply in public places would be necessary in order to provide any relief.").

[146] Abrams v. United States, 250 U.S. 616, 630 (1919) (Holmes, J., dissenting). Justice Stevens described this as a "conflict between interests of the highest order—on the one hand, the interest in the full and free dissemination of information concerning public issues, and, on the other hand, the interest in individual privacy and, more specifically, in fostering private speech." Bartnicki v. Vopper, 532 U.S. 514, 518 (2001).

[147] U.S. CONST. amend. I.

[148] Barry P. McDonald, *The First Amendment and the Free Flow of Information: Towards a Realistic Right to Gather Information in the Information Age*, 65 OHIO ST. L. J. 249, 260 (2004).

[149] Lovell v. City of Griffin, 3030 U.S. 444, 452 (1938).

[150] Watchtower Bible and Tract Soc'y of New York , Inc. v. Vill. of Stratton 536 U.S. 150, 168-69 (2002).

the First Amendment's protection other conduct that is not expressive in itself, but is "necessary to accord full meaning and substance to those guarantees."[151] For example, the Court has said that the public is entitled to a "right to receive news" as a correlative of the right to free expression.[152]

Like this right to receive news, the Court has intimated in a series of cases beginning in the 1960s that the public and the press may be entitled to *a right to gather news* under the First Amendment. Initially, in *Zemel v. Rusk*, the Court observed that the right "to speak and publish does not carry with it the unrestrained right to gather information."[153] The Court's reluctance to extend this right may have signaled its concern that an unconditional newsgathering right could subsume almost any government regulation that places a slight restriction on the ability to gather news.[154] However, several years later the Court indicated in *Branzburg v. Hayes* that although laws of general applicability apply equally to the press as to the general public, that "[n]ews gathering is not without its First Amendment protections,"[155] and that "without some protection for seeking out the news, freedom of the press could be eviscerated."[156] The Court, however, failed to clearly delineate the parameters of such a protection. In the Court's most recent case, *Cohen v. Cowles Media Co.*, the Court adhered to the "well-established line of decisions holding that generally applicable laws do not offend the First Amendment simply because their enforcement against the press has incidental effects on its ability to gather and report the news."[157] The Court noted that it is "beyond dispute 'that the publisher of a newspaper has no special immunity from the application of general laws. He has no special privilege to invade the rights of others.'"[158]

The lower federal courts have explored this right to gather news in the context of photographing or video recording. In *Dietemann v. Time, Inc.* the Ninth Circuit Court of Appeals explored the extent to which reporters could use surreptitious means to carry out their newsgathering.[159] There, defendants Time Life sent undercover reporters to a man's house where he claimed to use minerals and other materials to heal the sick. The reporters used a hidden camera to take pictures of the man, and a hidden microphone to transmit the conversation to other operatives. The defendants claimed that the First Amendment's right to freedom of the press shielded its newsgathering activities. In rejecting this claim, the court observed that although an individual accepts the risk when inviting a person into his home that the visitor may repeat the conversation to a third party, "he does not and should not be required to take the risk that what is heard and seen will be transmitted by photograph or recording, or in our modern world, in full living color and hi-fi to the public at large or to any segment of it that the visitor may select."[160] The court held that "hidden mechanical contrivances" are not indispensable tools of investigative reporting, and that the "First Amendment has never been construed to accord newsman immunity from torts

[151] McDonald, *supra* note 148, at 260.

[152] Kleindienst v. Mandel, 408 U.S. 753, 762–63 (1972).

[153] Zemel v. Rusk, 381 U.S. 1, 17 (1965).

[154] *Id.* at 16-17 ("There are few restrictions on action which could not be clothed by ingenious argument in the garb of decreased data flow. For example, the prohibition of unauthorized entry into the White House diminishes the citizen's opportunities to gather information he might find relevant to his opinion of the way the country is being run, but that does not make entry into the White House a First Amendment right.").

[155] Branzburg v. Hayes, 408 U.S. 665, 707 (1972).

[156] *Id.* at 681.

[157] *Id.* at 669.

[158] Cohen v. Cowles Media Co., 501 U.S. 663, 666 (1991).

[159] Dietemann v. Time, Inc., 449 F.2d 245 (9th Cir. 1971).

[160] *Id.* at 249.

or crimes committed during the course of newsgathering."[161] In *Galella v. Onassis*, Galella, a self-proclaimed "paparazzo," constantly followed around, harassed, and photographed Jacqueline Kennedy Onassis and her children.[162] As part of an ongoing lawsuit, Onassis sued Galella for, *inter alia*, invasion of her and her family's privacy. Galella argued that he was entitled to the absolute "wall of immunity" that protects newsmen under the First Amendment. The Second Circuit Court of Appeals quickly rejected this absolutist position: "There is no such scope to the First Amendment right. Crimes and torts committed in news gathering are not protected. There is no threat to a free press in requiring its agents to act within the law."[163] By contrast, the Seventh Circuit in *Desnick v. American Broadcast Companies, Inc.* held that surreptitious recording was not a privacy invasion because the target of the surveillance was a party to the conversation, thereby vitiating any claim to privacy in those conversations.[164]

Congressional Response

If Congress chooses to act, it could create privacy protections to protect individuals from intrusive drone surveillance conducted by private actors.[165] Such proposals would be considered in the context of the First Amendment rights to gather and receive news. Several bills have been introduced in the 113th Congress that would regulate the private use of drones. Additionally, there are other measures Congress could adopt.

Drone Aircraft Privacy and Transparency Act of 2013 (H.R. 1262)

In the 113th Congress, Representative Ed Markey introduced the Drone Aircraft Privacy and Transparency Act of 2013 (H.R. 1262).[166] This bill would amend FMRA to create a comprehensive scheme to regulate the private use of drones, including data collection requirements and enforcement mechanisms. First, this bill would require the Secretary of Transportation, with input from the Secretary of Commerce, the Chairman of the Federal Trade Commission, and the Chief Privacy Officer of the Department of Homeland Security, to study any potential threats to privacy protections posed by the introduction of drones in the national airspace. Next, the bill would prohibit the FAA from issuing a license to operate a drone unless the application for such use included a "data collection statement." This statement would require the following items: a list of individuals who would have the authority to operate the drone; the location in which the drone will be used; the maximum period it will be used; and whether the drone would be collecting information about individuals. If the drone will be used to collect personal information, the statement must include the circumstances in which such information will be used; the kinds of information collected and the conclusions drawn from it; the type of data minimization procedures to be employed; whether the information will be sold, and if so, under what circumstances; how long the information would be stored; and procedures for destroying irrelevant data. The statement must also include information about the possible impact on privacy protections posed by the operation under that license and steps to be taken to mitigate

[161] *Id.*

[162] Galella v. Onassis, 487 F.2d 986, 991-92 (2d Cir. 1973).

[163] *Id.* at 996-97 (internal citations omitted).

[164] Desnick v. American Broadcast Corporation, 44 F.3d 1345, 1353 (7th Cir. 1995).

[165] For legislation that would regulate public actors, see Thompson, *supra* note 90.

[166] H.R. 1262, 113th Cong. 1st Sess. (1st Sess. 2013).

this impact. Additionally, the statement must include the contact information of the drone operator; a process for determining what information has been collected about an individual; and a process for challenging the accuracy of such data. Finally, the FAA would be required to post the data collection statement on the Internet.

H.R. 1262 includes several enforcement mechanisms. First, the FAA may revoke any license of a user that does not comply with these requirements. The Federal Trade Commission would have the primary authority to enforce the data collection requirements just stated. Additionally, the Attorney General of each state, or an official or agency of a state, is empowered to file a civil suit if there is reason to believe that the privacy interests of residents of that state have been threatened or adversely affected. H.R. 1262 would also create a private right of action for a person injured by a violation of this legislation.

Preserving American Privacy Act of 2013 (H.R. 637)

Representative Poe introduced the Preserving American Act of 2013 (H.R. 637) which would prohibit the use of drones to capture images in a manner highly offensive to a reasonable person where the person is engaging in a personal or familial activity under circumstances in which the individual has a reasonable expectation of privacy, regardless of whether there is a physical trespass.[167]

Other Proposals

Additionally, Congress could create a cause of action for surveillance conducted by drones similar to the intrusion upon seclusion tort provided under Restatement Section 652B.[168] How would a court assess whether drone surveillance violated this type of tort? First, generally speaking, the location of the search would be determinative of whether a person is entitled to an expectation of privacy. Although courts have posited that the common law, like the Fourth Amendment, is intended to "protect people, not places[,]"[169] the *location* of an alleged intrusion factors heavily in a privacy analysis. The greatest chance for liability occurs when a person photographs or videotapes another while in the seclusion of his home. While technology has increasingly shrunk other spheres of privacy in the digital age, the home is still accorded significant legal protection. Using a drone to peer inside the home of another—whether looking through a window or utilizing extra-sensory technology such as thermal imaging—would likely constitute an intrusion upon seclusion. Moving from the home to a public space, or even a space on private property where one can be seen from a public vantage point, significantly reduces the chance of tort liability. However, certain instances of highly offensive surveillance in public may be actionable.

This leads to the second factor that will inform a reviewing court's analysis: the degree of offensiveness of the surveillance. The Ninth Circuit Court of Appeals, applying California law,

[167] H.R. 637, 113th Cong (1st Sess. 2013).

[168] As with the enactment of any federal statute, Congress must act within one of its constitutionally delegated powers when creating a federal privacy tort or a crime based on intrusion of privacy. It would appear that Congress could regulate this area under its Commerce Clause power, U.S. Const. art. I, §8, cl. 3, which it acts under when regulating similar federal airspace issues. *See* Braniff Airways v. Nebraska Bd. of Equalization and Assessment, 347 U.S. 590 (1954); United States v. Helsley, 615 F.2d 784 (9th Cir. 1979).

[169] Pearson v. Dodd, 410 F.2d 701, 704 (D.C. Cir. 1969) (quoting Katz v. United States, 389 U.S. 347, 351 (1967)).

observed that, in determining offensiveness, "common law courts consider, among other things: 'the degree of intrusion, the context, conduct and circumstances surrounding the intrusion as well as the intruder's motives and objectives, the setting into which he intrudes, and the expectations of those whose privacy is invaded.'" Several of these factors—especially, the context of the intrusion and the motive of the intruder—are fact intensive and require application in a particular case to fully understand. However, some generalizations can be made. The cases discussed above that did find an intrusion upon seclusion in a public place required highly offensive activity, such as closely following another person for an extended period or photographing another in a highly embarrassing shot. Likewise, a court might recognize liability if one were to use a drone to follow another for an extended period of time, particularly at a close distance. It is not clear, however, whether knowledge of being surveilled makes the monitoring more or less offensive. For example, one court seemed to rely on the fact that the defendant was unaware that her house was being photographed to hold that she did not have a viable privacy claim.[170] A drone flying at several thousand feet may not significantly disturb the target of the surveillance and could fall within this rationale. Nevertheless, filming someone in a compromising or embarrassing situation without his knowledge can be equally offensive. Here, the facts of the particular case would determine liability.

Congress could also create a privacy statute tailored to drone use similar to the anti-voyeurism statutes, or "Peeping Tom" laws, enacted in many states.[171] These laws prohibit persons from surreptitiously filming others in various circumstances and places.[172] Some states prohibit surreptitious surveillance of a person while on private property, usually a private residence.[173] Nevada employs this model, prohibiting a person from entering the property of another with the intent to peep through a window of the building.[174] Likewise, New Jersey prohibits a person from peering into the window of the dwelling of another "under circumstances in which a reasonable person in the dwelling would not expect to be observed."[175] Other states require a prurient intent when conducting the surveillance. Under Washington State's statute, a person commits the crime of voyeurism if, for the purpose of arousing or gratifying his sexual desire, he films or photographs (1) a person in a place where he or she would expect privacy; or (2) the intimate areas of another person, whether he or she is in a public or private place.[176]

Similarly, Congress could adopt an "anti-paparazzi" statute, like that enacted in California, to prevent intrusive drone surveillance.[177] In fact, Congress considered a similar measure in the 105th

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[170] Mojica Escobar v. Roca, 926 F. Supp. 30, 35 (D.P.R. 1996).

[171] Federal law does prohibit certain acts of voyeurism on federal property. Section 1801, Title 18 provides: "Whoever, in the special maritime and territorial jurisdiction of the United States, has the intent to capture an image of a private area of an individual without their consent, and knowingly does so under circumstances in which the individual has a reasonable expectation of privacy, shall be fined under this title or imprisoned not more than one year, or both." 18 U.S.C. §1801(a). As discussed in note 168, *supra*, it appears Congress would have the authority to extend this section to voyeurism committed not only on federal property but that committed from federal airspace.

[172] Timothy J. Hortstmann, *Protecting Traditional Privacy Rights in Brave New Digital World: The Threat Posed by Cellular Phone-Cameras and What States Should Do to Stop It*, 111 PENN. ST. L. REV. 739, 742 (2007).

[173] *See, e.g*, GA. CODE ANN. §16-11-61; MONT. CODE ANN. §45-5-223.

[174] NEV. REV. STAT. §200.603.

[175] N.J. STAT. ANN. §2C:18-3c.

[176] WASH. REV. CODE §9A.44.115; *see also* CAL. PENAL CODE §647; R.I. GEN. LAWS §11-64-2.

[177] California Civil Code §1708.8 provides:

> A person is liable for constructive invasion of privacy when the defendant attempts to capture, in a manner that is offensive to a reasonable person, any type of visual image, sound recording, or other

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Congress. The Privacy Protection Act of 1998 and the Personal Intrusion Act of 1998 would have made it unlawful to persistently follow or chase another person for the purpose of obtaining a visual image of that person if the plaintiff met the following elements: (1) the image was transferred in interstate commerce or the person taking the photograph traveled in interstate commerce; (2) the person had a reasonable expectation of privacy from such intrusion; (3) the person feared death or bodily injury from being chased; and (4) the taking of the image was for commercial purposes.[178] Also, these bills would have created a civil remedy for an individual whose privacy was intruded upon. Congress could use this model to make it unlawful to persistently monitor another person using drone surveillance.

FAA Regulation of Privacy

Some observers have questioned whether the FAA has the legal authority to create privacy protections as it begins to integrate drones in the national airspace.[179] This section will explore the FAA's legal authority to establish privacy protections when it engages in rulemaking and establishes the six drone test ranges as required under FMRA.

It is well settled that agencies do not wield inherent powers, and that any authority they do have must be delegated by Congress.[180] Thus, when engaging in rulemaking or any other administrative action, the agency must be able to identify a specific statutory source of authority. In *Chevron v. Natural Resources Defense Council*, the Supreme Court established a two-part test (now known as the *Chevron* two step) that assesses whether a federal agency should be accorded deference in interpreting and implementing its authorizing statute or a statute it administers.[181] First, this test asks "whether Congress has directly spoken to the precise question at issue."[182] If so, the analysis ends there and the court and the agency "must give effect to the unambiguously expressed intent of Congress."[183] If, however, "the statute is silent or ambiguous" the court must

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> physical impression of the plaintiff engaging in a personal or familial activity under circumstances in which the plaintiff had a reasonable expectation of privacy, through the use of a visual or auditory enhancing device, regardless of whether there is a physical trespass, if this image, sound recording, or other physical impression could not have been achieved without a trespass unless the visual or auditory enhancing device was used.

[178] H.R. 3224, H.R. 2448, 105th Cong., 2d sess. (1998).

[179] *See, e.g.*, Press Release, Association for Unmanned Vehicle Systems International, AUVSI to FAA: Focus on your Mission, Proceed with UAS Integration (Nov. 28, 2012) ("As an industry, we support a continued, civil dialogue on privacy, but any such conversations should take place concurrent with the integration. The selection process for the six test sites are a separate issue and should be treated as such. Meanwhile, the FAA should adhere to its mission and do what it does best – focus on the safety of the U.S. airspace – while other, more appropriate institutions consider privacy issues."), *available at* http://www.auvsi.org/AUVSINews/AssociationNews.

[180] *See* Louisiana Pub. Serv. Comm'n v. FCC, 476 U.S. 355, 374 (1986).

[181] Chevron v. Natural Resources Defense Council, 467 U.S. 837 (1984). It should be noted that there is a disagreement among the circuit courts as to whether *Chevron* deference should be accorded to an agency's interpretation of its own jurisdictional statute. *Compare* Hydro Res., Inc. v. EPA, 608 F.3d 1131, 1445-46 (10th Cir. 2010) (en banc) (applying *Chevron* deference) *with* N. Ill. Steel Supply Co. v. Sec'y of Labor, 294 F.3d 844, 846-47 (7th Cir. 2002) (applying de novo standard). The Supreme Court has granted a petition for writ of certiorari in *City of Arlington v. FCC*, 133 S. Ct. 524 (2012) and may potentially resolve this circuit split. *See* CRS Report WSLG373, *Can an Agency Determine the Scope of its Jurisdiction? Supreme Court Hears Argument Regarding Chevron Deference*, by Daniel T. Shedd.

[182] *Chevron*, 467 U.S. at 842.

[183] *Id.* at 843.

then determine if the agency's interpretation is a "permissible construction of the statute."[184] This type of *Chevron* analysis may be applied by a reviewing court if the FAA promulgated rules governing privacy, as part of the FMRA directed rulemaking and those rules were challenged.

Rulemaking Required by FMRA

FMRA directs the FAA to engage in two sets of rulemaking. The first rulemaking requires that by August 14, 2014, the FAA issue a final rule on integrating "small unmanned aircraft systems" into the national airspace system.[185] The second rulemaking requires the FAA to develop a "comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system[;]"[186] provide notice on proposed rulemaking to implement this comprehensive plan not later than August 14, 2014; and publish a final rule by December 14, 2015.[187]

As to the small drone rulemaking, FMRA provides little guidance on what factors should inform the agency's rulemaking. The act merely requires that the FAA issue a final rule "on small unmanned aircraft systems that will allow for civil operation of such systems in the national airspace system.... "[188] Applying the first step of *Chevron*, it is clear that Congress did not address the precise issue at question—that is, Congress did not expressly provide FAA authority to regulate privacy. Accordingly, a reviewing court would then have to assess under step two whether addressing privacy as part of rulemaking would be a reasonable interpretation of FMRA. There are plausible arguments on both sides of this question.

The Court asserted in *Chevron* that "the power of an administrative agency to administer a congressionally created ... program necessarily requires the formulation of policy and the making of rules to fill any gap left, implicitly or explicitly, by Congress."[189] Given that privacy has been a paramount concern of both the public and various Members of Congress, it would seem odd if Congress delegated the FAA rulemaking authority to integrate drones into the national airspace, but withheld the authority to regulate one of the most prominent and controversial issues surrounding this integration. Rather, one could argue that Congress would have inferred that the FAA would fill in these gaps with reasonable regulations, including those regulating privacy and data collection issues. Conversely, those who contend that the FAA has neither the legal authority nor the expertise to regulate privacy issues concerning drone use may point to the FAA's organic statute. This law provides the FAA authority to ensure the safety and efficiency of air travel,[190]

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[184] *Id.*

[185] § 332 (b)(1).

[186] § 332(a)(1).

[187] § 332(b)(2).

[188] § 332(b)(1).

[189] *Chevron*, 467 U.S. at 843 (quoting Morton v. Ruiz, 415 U.S. 199, 231 (1974)).

[190] The policy section to FAA's authorizing statue provides that when implementing agency regulations, the FAA shall consider, among other things, the following:

> (1) assigning, maintaining, and enhancing safety and security as the highest priorities in air commerce.
>
> (2) regulating air commerce in a way that best promotes safety and fulfills national defense requirements.
>
> (3) encouraging and developing civil aeronautics, including new aviation technology.
>
> (4) controlling the use of the navigable airspace and regulating civil and military operations in that

(continued...)

but appears to contain no *express* authority to regulate privacy. They may further argue that the FAA has not historically regulated privacy as it pertains to persons or things on the ground in relation to traditional air flight, and currently does not have the technical expertise to undertake such regulations. These arguments could support the theory that Congress intentionally omitted privacy regulation from the FAA's purview when conducting this required rulemaking.

Next, as to the comprehensive plan rulemaking, Congress has provided some guidance as to the factors the FAA should take into consideration, but none of the factors discuss privacy concerns.[191] Thus, like the rulemaking for small drones, under the *Chevron* first step, Congress has not spoken directly to the issue in question. Moving to the second step, would it be reasonable for the FAA to include privacy regulations in its rulemaking implementing this comprehensive plan? First, the use of the term "at a minimum" as a preface to the list of factors to be considered in this comprehensive plan and rulemaking make it illustrative, not exhaustive. This phrasing

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> airspace in the interest of the safety and efficiency of both of those operations.
>
> (5) consolidating research and development for air navigation facilities and the installation and operation of those facilities.
>
> (6) developing and operating a common system of air traffic control and navigation for military and civil aircraft.
>
> (7) providing assistance to law enforcement agencies in the enforcement of laws related to regulation of controlled substances, to the extent consistent with aviation safety.

49 U.S.C. § 40101(d).

[191] The "comprehensive plan" must contain, "at a minimum," recommendations on:

> (A) the rulemaking to be conducted under subsection (b), with specific recommendations on how the rulemaking will—
>
> (i) define the acceptable standards for operation and certification of civil unmanned aircraft systems;
>
> (ii) ensure that any civil unmanned aircraft system includes a sense and avoid capability; and
>
> (iii) establish standards and requirements for the operator and pilot of a civil unmanned aircraft system, including standards and requirements for registration
>
> and licensing;
>
> (B) the best methods to enhance the technologies and subsystems necessary to achieve the safe and routine operation of civil unmanned aircraft systems in the national
>
> airspace system;
>
> (C) a phased-in approach to the integration of civil unmanned aircraft systems into the national airspace system;
>
> (D) a timeline for the phased-in approach described under subparagraph (C);
>
> (E) creation of a safe
>
> (F) airspace designation for cooperative manned and unmanned flight operations in the national airspace
>
> system;
>
> (G) establishment of a process to develop certification,
>
> flight standards, and air traffic requirements for civil unmanned aircraft systems at test ranges where such systems are subject to testing;
>
> (H) the best methods to ensure the safe operation of civil unmanned aircraft systems and public unmanned aircraft systems simultaneously in the national airspace system; and
>
> (I) incorporation of the plan into the annual NextGen Implementation Plan document (or any successor document) of the Federal Aviation Administration.

§ 332(a).

arguably suggests that Congress understood that the FAA might address other factors, perhaps including privacy, beyond those enumerated in section 332. Second, section 332 provides that the FAA must "define the acceptable standards for operation and certification of civil unmanned aircraft systems."[192] Viewing this language in light of *Chevron* deference, a court could find that regulating requirements that protect privacy fall within the "acceptable standards for operation" of drones in the national airspace.

In sum, it appears that the open-ended nature of Congress's instructions to the FAA, coupled with the prominence of privacy concerns, would likely persuade a court that the FAA's potential regulation of privacy as part of formal rulemaking is a reasonable interpretation of FMRA that should be accorded deference under a *Chevron* analysis.

Test Ranges and Privacy

In addition to the rulemaking described above, section 332(c) of FMRA requires the FAA Administrator to "establish a program to integrate unmanned aircraft systems into the national airspace system at 6 test ranges."[193] On February 22, 2013, the FAA issued a request for comment on the privacy rules that will apply to test range operators.[194] In its request for comment, the FAA proposed several requirements that might apply to the operation of these test ranges.[195] Once the

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[192] § 332(a)(2).

[193] P.L. 112-95, § 332(c)(1), 126 Stat. 11, 74.

[194] Unmanned Aircraft System Test Site Program, 78 Fed. Reg. 12259 (Feb. 22, 2013).

[195] The FAA has proposed that the OTA include the following privacy requirements:

> (1) The Site Operator must ensure that there are privacy policies governing all activities conducted under the OTA, including the operation and relevant activities of the UASs authorized by the Site Operator. Such privacy policies must be available publically, and the Site Operator must have a mechanism to receive and consider comments on its privacy policies. In addition, these policies should be informed by Fair Information Practice Principles. The privacy policies should be updated as necessary to remain operationally current and effective. The Site Operator must ensure the requirements of this paragraph are applied to all operations conducted under the OTA.
>
> (2) The Site Operator and its team members are required to operate in accordance with Federal, state, and other laws regarding the protection of an individual's right to privacy. Should criminal or civil charges be filed by the U.S. Department of Justice or a state's law enforcement authority over a potential violation of such laws, the FAA may take appropriate action, including suspending or modifying the relevant operational authority (e.g., Certificate of Operation, or OTA), until the proceedings are completed. If the proceedings demonstrate the operation was in violation of the law, the FAA may terminate the relevant operational authority.
>
> (3) If over the lifetime of this Agreement, any legislation or regulation, which may have an impact on UAS or to the privacy interests of entities affected by any operation of any UAS operating at the Test Site, is enacted or otherwise effectuated, such legislation or regulation will be applicable to the OTA and the FAA may update or amend the OTA to reflect these changes.
>
> (4) Transmission of data from the Site Operator to the FAA or its designee must only include those data listed in Appendix B to the OTA.

78 Fed. Reg. 12260. Appendix B to the OTA is available at https://faaco.faa.gov/index.cfm/attachment/download/29581.

The FAA notes that these rules are not permanent but are intended to:

> help inform the dialogue among policymakers, privacy advocates, and the industry regarding broader questions concerning the use of UAS technologies. The privacy requirements proposed here are not intended to pre-determine the long-term policy and regulatory framework under which commercial UASs would operate. Rather, they aim to assure maximum transparency of privacy policies associated with UAS test site operations in order to engage stakeholders in discussion

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FAA selects the site operators, each must enter into an Other Transaction Agreement (OTA) with the FAA—a legally binding agreement setting out the terms and conditions under which the site will be operated. This request for comment is intended to provide the public the ability to comment on "potential privacy considerations, associated reporting requirements, and how the FAA can help ensure privacy considerations are addressed through mechanisms put in place as a result of the OTA."[196]

This FAA announcement raises another legal question: does the FAA have the authority to regulate privacy via OTA agreements entered into with the test range operators? As a threshold issue, it is not clear what level of deference a court would apply to this administrative action. In certain instances, agency actions that do not amount to formal rulemaking have not been accorded *Chevron* deference. In *Christensen v. Harris County*, the Supreme Court held that a Department of Labor opinion letter interpreting the Family Medical Leave Act was not entitled to deference under *Chevron*.[197] The Court observed that "[i]nterpretations such as those in opinion letters—like interpretations contained in policy statements, agency manuals, and enforcement guidelines, all of which lack the force of law—do not warrant *Chevron*-style deference."[198] Instead, interpretations contained in administrative pronouncements such as opinion letters are entitled to some deference under the rule pronounced in *Skidmore v. Swift & Co.*,[199] "but only to the extent that those interpretations have the 'power to persuade.'"[200] In *United States v. Mead*, the Court again ruled that *Skidmore*, not *Chevron*, deference applied to a United States Custom Service opinion letter setting tariff levels on certain imports.[201]

A reviewing court could apply the *Christensen-Mead* line of cases to hold that the lower level deference accorded under *Skidmore* should apply to the FAA's use of the OTAs in establishing the test ranges. As in those cases, the OTAs would not have the force of law and would not be the product of formal agency adjudication or rulemaking. These factors weigh against applying *Chevron*'s deferential approach.

However, *Mead* suggested that *Chevron* deference may be due when the agency conducts notice and comment procedures as part of its interpretive process, which were not utilized in either

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> about which privacy issues are raised by UAS operations and how law, public policy, and the industry practices should respond to those issues in the long run.

78 Fed. Reg. 12260.

[196] 78 Fed. Reg. 12260.

[197] Christensen v. Harris County, 529 U.S. 576, 587 (2000).

[198] *Id.*

[199] Skidmore v. Swift & Co., 323 U.S. 134 (1944). In *Skidmore*, the Court was required to determine what level of deference should be accorded the Department of Labor in its issuance of bulletins interpreting a wage provision in the Fair Labor Standard Act. *Id.* at 138. The Court ruled:

> We consider that the rulings, interpretations and opinions of the Administrator under this Act, while not controlling upon the courts by reason of their authority, do constitute a body of experience and informed judgment to which courts and litigants may properly resort for guidance. The weight of such a judgment in a particular case will depend upon the thoroughness evident in its consideration, the validity of its reasoning, its consistency with earlier and later pronouncements, and all those factors which give it power to persuade, if lacking power to control.

Id. at 140.

[200] *Christensen*, 529 U.S. at 588 (citing *Skidmore*, 323 U.S. at 140).

[201] United States v. Mead, 533 U.S. 218 (2001).

Christensen or *Mead*.[202] Here, the FAA has issued a notice for comment on the proposed privacy regulations that will be included in the OTAs. This fact might persuade a court into applying the more deferential *Chevron* test.

Under either level of scrutiny, it is not at all clear whether the FAA would have the authority to regulate privacy as part of the OTAs. Congress did not speak to this issue in FMRA.[203] Thus, a reviewing court would have to determine if the agency's regulation of privacy is either a reasonable interpretation of the statute under *Chevron* or has the "power to persuade" under *Skidmore*. Some of the same factors that arguably support the inclusion of privacy in the formal rulemaking could apply equally to the test ranges. The idea that Congress left it to the FAA to fill in the gaps in establishing the test ranges, and that privacy is one of the primary concerns surrounding the integration of drones into U.S. airspace, could be offered as an argument to uphold the FAA's regulation of privacy. On the other side of the ledger, the act's enumerated list of factors to be addressed at these test ranges is primarily focused on safety issues and does not expressly permit the FAA to regulate privacy. One could argue that this formulation evinces Congress's intent for the FAA to focus on safety, the FAA's stock and trade, rather than privacy, an area in which the FAA appears to have little experience.

Related Legal Issues

In addition to the legal issues described above, there are a host of other issues that may arise when introducing drones into the U.S. national airspace system.

Preemption of State and Local Regulations. The increased presence of drones in domestic airspace raises the question of potential federal preemption of state or local efforts to regulate different aspects of drone use. The doctrine of preemption derives from the Supremacy Clause of the Constitution, which states that federal law, treaties, and the Constitution are the "supreme

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[202] *Mead*, 533 U.S. at 230 ("The overwhelming number of our cases applying Chevron deference have reviewed the fruits of notice-and-comment rulemaking or formal adjudication."); *Christensen*, 529 U.S. at 587 ("Here, however, we confront an interpretation contained in an opinion letter, not one arrived at after, for example, a formal adjudication or notice-and-comment rulemaking.") *See also Mead*, 533 U.S. at 231 ("The authorization for classification rulings, and Custom's practice in making them, present a case far removed ... from notice-and-comment process.... ").

[203] The FAA Reform Act provides that in setting up the test sites, the Administrator shall:

> (A) safely designate airspace for integrated manned and unmanned flight operations in the national airspace system;
>
> (B) develop certification standards and air traffic requirements for unmanned flight operations at test ranges;
>
> (C) coordinate with and leverage the resources of the National Aeronautics and Space Administration and the Department of Defense;
>
> (D) address both civil and public unmanned aircraft systems;
>
> (E) ensure that the program is coordinated with the Next Generation Air Transportation System; and
>
> (F) provide verification of the safety of unmanned aircraft systems and related navigation procedures before integration into the national airspace system.[203]The second is FAA's mandate to come up with a comprehensive plan to integrate drones in the national airspace and subsequent rule-making based on this plan.

§ 332(c)(1).

Law of the Land."[204] A federal law may preempt state or local action in one of three ways: if the statute expressly states its intent to preempt state or local action (express preemption); if a court concludes that Congress intended to occupy the regulatory field, implicitly preventing state or local action in that area (field preemption); or if the state or local action directly conflicts with or frustrates the purpose of the federal provisions (conflict preemption).[205]

With regard to traditional aviation laws, generally, state regulations of aviation safety, airspace management, and aviation noise are preempted by federal laws and regulations.[206] Congress vested sole responsibility for the aviation industry and domestic airspace with the federal government in the Federal Aviation Act of 1958.[207] According to the legislative history, the FAA was to have "full responsibility and authority for the advancement and promulgation of civil aeronautics generally, including promulgation and enforcement of safety regulations."[208] In *City of Burbank v. Lockheed Air Terminal, Inc.*, the Supreme Court struck down a local city ordinance that prohibited planes from taking off during certain hours of the day as preempted by the federal regulatory scheme.[209] Expressing its fear regarding local control of airspace, the Court stated, "If we were to uphold the Burbank ordinance and a significant number of municipalities followed suit, it is obvious that fractionalized control of the timing of takeoffs and landings would severely limit the flexibility of the FAA in controlling air traffic flow."[210] The Supreme Court has, however, upheld state regulations imposing taxes on aircraft equipment located within the state.[211]

State proposals seeking to regulate the use of drones are currently pending in many state legislatures throughout the country.[212] The Virginia General Assembly has passed a two-year moratorium on the use of drones by state and local law enforcement.[213] The bill prohibits the use of drones by agencies with jurisdiction over criminal law enforcement or regulatory violations, but includes exceptions for emergency situations. Following passage of the bill, the Governor neither signed nor vetoed the bill, but rather sent it back to the General Assembly with amendments, where it now awaits further action. Several other states have introduced bills similarly targeting the use of drones for surveillance.[214] Other states, like Texas, have introduced

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[204] U.S. CONST. art. VI, cl 2.

[205] *See, e.g.*, Crosby v. Nat'l Foreign Trade Council, 530 U.S. 363, 373 (2000); English v. Gen. Elec. Co., 496 U.S. 72, 78-79 (1990); Schneidewind v. ANR Pipeline Co., 485 U.S. 293, 300 (1988).

[206] *See, e.g.*, City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973); Abdullah v. American Airlines, Inc., 181 F.3d 363 (3d Cir. 1999); San Diego Unified Port Dist. v. Gianturco, 651 F.2d 1306, 1316 (9th Cir. 1981); Price v. Charter Township, 909 F. Supp. 498 (E.D. Mich. 1995).

[207] P.L. 85-726; 72 Stat. 737 (1958).

[208] H.R. Rept. No. 2360, 85th Cong. (1958).

[209] *City of Burbank*, 411 U.S. at 639.

[210] *Id.*

[211] Braniff Airways v. Nebraska Board, 347 U.S. 590 (1954). Additionally, several courts have determined that state law tort claims based on injuries caused by aircraft are not federally preempted. *See, e.g.*, Bieneman v. City of Chicago, 864 F.2d 463 (7th Cir. 1988) (overturning Luedtke v. County of Milwaukee, 521 F.2d 387 (7th Cir. 1975), which ruled that *City of Burbank* preempted application of state tort laws, such as negligence and nuisance, to flights that complied with federal laws and regulations); Greater Westchester Homeowners Association v. City of Los Angeles, 603 P.2d 1329 (Sup. Ct. Cali. 1979).

[212] *See* CRS Report WSLG447, *Congress and the States Grapple with Drones in U.S. Skies*, by Alissa M. Dolan.

[213] "An Act to place a moratorium on the use of unmanned aircraft systems," HB2012, Virginia General Assembly, *available at* http://lis.virginia.gov/cgi-bin/legp604.exe?131+ful+HB2012ER+pdf.

[214] *See, e.g.*, S. 395, South Carolina General Assembly, 120th Session; S. 524, 77th Oregon Legislative Assembly, 2013 Regular Session; SB 92, Florida Legislature, 2013 Regular Session.

bills attempting to address privacy concerns related to widespread drone use. The Texas proposal would create a new state misdemeanor when a person uses a drone to capture an image without the consent of the landowner who owns the property captured in the image.[215]

If these proposals were implemented, questions about federal preemption may be raised. It appears that field preemption or conflict preemption would be the most likely grounds for finding preemption of such state regulations based on current federal law, if at all, since FMRA does not contain an express preemption clause. The extent to which the state can regulate drone use without being preempted by federal law may depend on the scope of the forthcoming federal regulations, the nature of the state regulations, and a reviewing court's analysis of whether Congress intended to "occupy the field" of regulation on that issue. The Court has determined that field preemption can be inferred when "the pervasiveness of the federal regulation precludes supplementation by the States, where the federal interest in the field is sufficiently dominant, or where the object sought to be obtained by the federal law and the character of obligations imposed by it reveal the same purpose."[216]

Right to Protect Property from Trespassing Drones. There may be instances where a landowner is entitled to protect his property from intrusion by a drone. Under Restatement (Second) of Torts Section 260, "one is privileged to commit an act which would otherwise be a trespass to a chattel or a conversion if the act is, or is reasonably believed to be, necessary to protect the actor's land or chattels or his possession of them, and the harm inflicted is not unreasonable as compared with the harm threatened."[217] What this means is, in certain instances, a landowner would not be liable to the owner of a drone for damage necessarily or accidentally resulting from removing it from his property. However, there appear to be no cases where a landowner was permitted to use force to prevent or remove an aircraft from his property. Additionally, as discussed above, determining whether a drone in flight is trespassing upon one's property may be unusually challenging.

Stalking, Harassment, and Other Crimes. Traditional crimes such as stalking, harassment, voyeurism, and wiretapping may all be committed through the operation of a drone. As drones are further introduced into the national airspace, courts will have to work this new form of technology into their jurisprudence, and legislatures might amend these various statutes to expressly include crimes committed with a drone.

Wiretap Laws. Under the federal wiretap statute, it is unlawful to intentionally intercept an "oral communication"[218] by a person "exhibiting an expectation that such communication is not subject to interception under circumstances justifying such expectation.... "[219] Currently, commercial microphones can record sounds upwards of 300 feet.[220] Use of such a microphone on a drone to record private conversations could implicate the federal wiretap statute.

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[215] H.B. 912, Texas Legislature, 83rd Session, *available at* http://www.capitol.state.tx.us/BillLookup/History.aspx?LegSess=83R&Bill=HB912.

[216] *Schneidewind*, 485 U.S. at 300.

[217] RESTATEMENT (SECOND) OF TORTS §260.

[218] 18 U.S.C. §2511(1)(a).

[219] 18 U.S.C. §2510(2).

[220] *See, e.g.*, Electromax International, Inc., http://www.electromax.com/penmics.html.

Conclusion

The legal issues discussed in this report will likely remain unresolved until the civilian use of drones becomes more widespread. To that end, the FAA has been tasked with developing "a comprehensive plan to safely accelerate the integration" of drones into the national airspace, which focuses on the safety of the drone technology and operator certification. While the deadline for development of the plan has already elapsed, the FAA has until the end of FY2015 to implement such a plan.[221] Additionally, the FAA must identify six test ranges where it will integrate drones into the national airspace. This deadline, 180 days after enactment of the act, has also elapsed without FAA compliance. Once these regulations are tested and promulgated, the unique legal challenges that could arise based on the operational differences between drones and already ubiquitous fixed-wing aircraft and helicopters may come into sharper focus.

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[221] *See* P.L. 112-95, §332(a) (requiring development of a plan within 270 days of enactment of the act, falling in November 2012).

Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses

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Summary

The prospect of drone use inside the United States raises far-reaching issues concerning the extent of government surveillance authority, the value of privacy in the digital age, and the role of Congress in reconciling these issues.

Drones, or unmanned aerial vehicles (UAVs), are aircraft that can fly without an onboard human operator. An unmanned aircraft system (UAS) is the entire system, including the aircraft, digital network, and personnel on the ground. Drones can fly either by remote control or on a predetermined flight path; can be as small as an insect and as large as a traditional jet; can be produced more cheaply than traditional aircraft; and can keep operators out of harm's way. These unmanned aircraft are most commonly known for their operations overseas in tracking down and killing suspected members of Al Qaeda and related organizations. In addition to these missions abroad, drones are being considered for use in domestic surveillance operations to protect the homeland, assist in crime fighting, disaster relief, immigration control, and environmental monitoring.

Although relatively few drones are currently flown over U.S. soil, the Federal Aviation Administration (FAA) predicts that 30,000 drones will fill the nation's skies in less than 20 years. Congress has played a large role in this expansion. In February 2012, Congress enacted the FAA Modernization and Reform Act (P.L. 112-95), which calls for the FAA to accelerate the integration of unmanned aircraft into the national airspace system by 2015. However, some Members of Congress and the public fear there are insufficient safeguards in place to ensure that drones are not used to spy on American citizens and unduly infringe upon their fundamental privacy. These observers caution that the FAA is primarily charged with ensuring air traffic safety, and is not adequately prepared to handle the issues of privacy and civil liberties raised by drone use.

This report assesses the use of drones under the Fourth Amendment right to be free from unreasonable searches and seizures. The touchstone of the Fourth Amendment is reasonableness. A reviewing court's determination of the reasonableness of a drone search would likely be informed by location of the search, the sophistication of the technology used, and society's conception of privacy in an age of rapid technological advancement. While individuals can expect substantial protections against warrantless government intrusions into their homes, the Fourth Amendment offers less robust restrictions upon government surveillance occurring in public places including areas immediately outside the home, such as in driveways or backyards. Concomitantly, as technology advances, the contours of what is reasonable under the Fourth Amendment may adjust as people's expectations of privacy evolve.

In the 113th Congress, several measures have been introduced that would restrict the use of drones at home. Several of the bills would require law enforcement to obtain a warrant before using drones for domestic surveillance, subject to several exceptions. Others would establish a regime under which the drone user must file a data collection statement stating when, where, how the drone will be used and how the user will minimize the collection of information protected by the legislation.

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Introduction

The prospect of drone use in domestic surveillance operations has engendered considerable debate among Americans of various political ideologies.[1] Opponents of drone surveillance have complained that the use of unmanned aircraft on American soil infringes upon fundamental privacy interests and the ability to freely associate with others.[2] Some are specifically concerned about the possibility of turning military technology inward to surveil American citizens.[3] Proponents have responded by emphasizing their potential benefits, which may include protecting public safety, patrolling our nation's borders, and investigating and enforcing environmental and criminal law violations.[4]

The tension between security and privacy interests is not new, but has been heightened by the explosion of surveillance technology in recent decades.

The tension between security and privacy interests is not new, but has been heightened by the explosion of surveillance technology in recent decades. Police officers who were once relegated to naked eye observations may soon have, or in some cases already possess, the capability to see through walls or track an individual's movements from the sky.[5] One might question, then: What is the proper balance between the necessity of the government to keep people safe and the privacy needs of individuals? As some polls suggest, while the public supports drone usage in certain circumstances, they are less enthusiastic about using them as part of routine law enforcement activity.[6]

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[1] The term "domestic drone surveillance" as used in this report is designed to cover a wide range of government uses including, but not limited to, investigating and deterring criminal or regulatory violations; conducting health and safety inspections; performing search and rescue missions; patrolling the national borders; and conducting environmental investigations.

[2] Letter from Representatives Edward J. Markey and Joe Barton, Co-Chairmen of the Congressional Bi-Partisan Privacy Caucus, to Michael P. Huerta, Acting Administrator of the Federal Aviation Administration (April 19, 2012) ("[I]n addition to benefits, there is also the potential for drone technology to enable invasive and pervasive surveillance without adequate privacy protections."), *available at* http://markey.house.gov/sites/markey.house.gov/files/documents/4-19-12.Letter%20FAA%20Drones%20.pdf; AMERICAN CIVIL LIBERTIES UNION, PROTECTING PRIVACY FROM AERIAL SURVEILLANCE: RECOMMENDATIONS FOR GOVERNMENT USE OF DRONE AIRCRAFT 1 (2011), *available at* https://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf.

[3] Mark Brunswick, *Spies in the sky signal new age of surveillance*, STARTRIBUNE (July 22, 2012, 6:26 a.m.), *available at* http://www.startribune.com/local/163304886.html?refer=y.

[4] Some state and local officials have expressed interest in employment of drones for public safety and law enforcement purposes. *See, e.g.*, Brianne Carter, *Gov. Bob McDonnell supports drones policing Virginia*, ABC NEWS (May 30, 2012), *available at* http://www.wjla.com/articles/2012/05/gov-bob-mcdonnell-supports-drones-policing-virginia-76464.html; *Unmanned Aircraft Systems Within the Homeland: Security Game Changer? Hearing Before the Subcomm. on Oversight, Investigations, and Management of the H. Comm. on Homeland Sec.*, 112th Cong. 3 (2012) (statement of William R. McDaniel, Chief Deputy, Montgomery County Sheriff's Office, Conroe, TX) ("UAV systems for public safety agencies are extremely viable, effective, and economical means to enhance the public safety response to critical incidents.").

[5] The Supreme Court remarked in *Kyllo v. United States*, 533 U.S. 27, 37 (2001):

> The ability to 'see' through walls and other opaque barriers is a clear, and scientifically feasible, goal of law enforcement research and development. The National Law Enforcement and Corrections Technology Center, a program within the United States Department of Justice, features on its Internet Website projects that include a 'Radar-Based Through-the-Wall Surveillance System,' 'Handheld Ultrasound Through the Wall Surveillance,' and a 'Radar Flashlight' that 'will enable law officers to detect individuals through interior building walls.'

[6] *U.S. Supports Some Domestic Drone Use, But Public Registers Concern About Own Privacy* 1, Monmouth University Polling Institute (June 12, 2012), *available at* http://www.monmouth.edu.

The Fourth Amendment to the United States Constitution safeguards Americans' privacy and prevents excessive government intrusion by prohibiting "unreasonable searches and seizures."[7] Courts have long grappled with how to apply the text of this 18th century provision to 20th century technologies. Although the Supreme Court has the final say in the interpretation of the Fourth Amendment and other constitutional safeguards,[8] Congress and, in many cases, the President are free to institute more stringent restrictions upon government surveillance operations.[9]

This report first explores the potential uses of drones in the domestic sphere by federal, state, and local governments. It then surveys current Fourth Amendment jurisprudence, including cases surrounding privacy in the home, privacy in public spaces, location tracking, manned aerial surveillance, and those involving the national border. Next, it considers how existing jurisprudence may inform current and proposed drone uses. It then describes the various legislative measures introduced in the 113th Congress to address the legal and policy issues surrounding drones. Finally, it briefly identifies several alternative approaches that may constrain the potential scope of drone surveillance.

Background, Uses, and Drone Technology

Drones, also known as unmanned aerial vehicles (UAVs), are aircraft that do not carry a human operator and are capable of flight under remote control or autonomous programming.[10] An unmanned aircraft system (UAS) is the entire system, including the aircraft, digital network, and personnel on the ground.[11] Drones can range from the size of an insect—sometimes called nano drones or micro UAVs—to the size of a traditional jet.[12]

Drones are perhaps most commonly recognized from their missions abroad, including to target and kill suspected members of Al Qaeda and related groups, but they might be used for a variety of other purposes, including for both commercial and law enforcement activities within the United States. In fact, the FAA predicted that 30,000 unmanned aircraft could be flying in U.S. skies in less than 20 years.[13] One reason for this expansion has been a push by Congress for a

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[7] U.S. CONST. amend IV.

[8] Cooper v. Aaron, 358 U.S. 1, 18 (1958) ("[Marbury v. Madison] declared the basic principle that the federal judiciary is supreme in the exposition of the law of the Constitution, and that principle has ever since been respected by this Court and the Country as a permanent and indispensable feature of our constitutional system.").

[9] In reaction to the Supreme Court's ruling in *United States v. Miller*, 425 U.S. 435 (1976), that the privacy of an individual's bank records were generally not protected by the Fourth Amendment, Congress enacted the Right to Financial Privacy Act, P.L. 95-630, 92 Stat. 3697 (codified at 12 U.S.C. §3401-3422), creating a statutory protection for such records.

[10] DEP'T OF DEFENSE, DICTIONARY OF MILITARY AND ASSOCIATED TERMS 331 (2012). Unless expressly mentioned, the terms "unmanned aerial vehicle," "UAV," "unmanned aircraft system," "UAS," and "drone" are used interchangeably in this report.

[11] *Id.*

[12] See CRS Report R42136, *U.S. Unmanned Aerial Systems*, by Jeremiah Gertler, for a description of the various types of drones currently operated in the United States.

[13] FEDERAL AVIATION ADMINISTRATION, FAA AEROSPACE FORECAST: FISCAL YEARS 2010-2030, at 48 (2010), *available at* http://www.faa.gov/data_research/aviation/aerospace_forecasts/2010-2030/media/2010%20Forecast%20Doc.pdf. The FAA has noted that "Federal agencies are planning to increase their use of UAS's. State and local governments envision using UAS's to aid in law enforcement and firefighting. Potential commercial uses are also possible, for example, in real estate photography or pipeline inspection. UAS's could perform some manned aircraft missions with less noise and fewer emissions." *Id.*

faster integration of UAVs into U.S. airspace.[14] Most recently, as part of the FAA Modernization and Reform Act of 2012, Congress mandated that the Federal Aviation Administration (FAA) "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system."[15] This plan shall provide for integration of UAVs by September 2015.

Drones have been employed domestically by federal, state, and local governments in a range of circumstances. The Department of Homeland Security (DHS) uses them to police the nation's borders to deter unlawful border crossings by unauthorized aliens, criminals, and terrorists, and to detect and interdict the smuggling of weapons, drugs, and other contraband into the country.[16] Within DHS, Customs and Border Protection's (CBP's) Office of Air and Marine (OAM) has flown missions to support federal and state agencies such as the Federal Bureau of Investigation (FBI), the Department of Defense (DOD), Immigration and Customs Enforcement (ICE), the U.S. Secret Service, and the Texas Rangers.[17] According to a recent disclosure by the FAA, several local police departments, state and private colleges, and small cities and towns have also received FAA Certificates of Authorization (COAs) to fly unmanned aircraft domestically.[18] Recently, a police force in North Dakota conducted the nation's first drone-assisted arrest.[19] DHS, in conjunction with local law enforcement agencies, has been testing drone capabilities in a host of other situations including detecting radiation, monitoring a hostage situation, tracking a gun tossed by a fleeing suspect, firefighting, and finding missing persons.[20]

Currently, drones can be outfitted with high-powered cameras,[21] thermal imaging devices,[22] license plate readers,[23] and laser radar (LADAR).[24] In the near future, law enforcement

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[14] *See, e.g.*, Intelligence Reform and Terrorism Prevention Act of 2004, P.L. 108-458, §5102, 118 Stat. 3638, 3732 (requesting that DHS test the feasibility of using unmanned aircraft to patrol the northern border of the United States).

[15] FAA Modernization and Reform Act of 2012, P.L. 112-95, §332, 126 Stat. 11, 73.

[16] *See* CRS Report RS21698, *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance*, by Chad C. Haddal and Jeremiah Gertler.

[17] The OAM mission is to "protect the American people and the Nation's critical infrastructure through the coordinated use of integrated air and marine forces." DEP'T OF HOMELAND SECURITY, OFFICE OF INSPECTOR GENERAL, CBP'S USE OF UNMANNED AIRCRAFT SYSTEMS IN THE NATION'S BORDER SECURITY 2 (2012). These forces are used to "detect, interdict, and prevent acts of terrorism and the unlawful movement of people, illegal drugs, and other contraband toward or across U.S. borders." *Id.*

[18] There are over 300 total, including those issued to the following entities: City of Herrington, KS; Cornell University; Department of Energy Idaho National Laboratory; Eastern Gateway College Community College—Steubenville, OH; Miami-Dade Police Department; Mississippi Department of Marine Resources; North Little Rock Police Department, AR; Ogden Police Department, UT; Ohio University; Seattle Police Department; Texas A&M—Texas Engineering Experiment Station; Texas Department of Public Safety; Texas State University; University of Connecticut; University of Florida; U.S. Department of Agriculture Agricultural Research Service; Utah State University; Virginia Tech. *See* Unmanned Aircraft Systems, Federal Aviation Administration, http://www.faa.gov/about/initiatives/uas/.

[19] *New age of surveillance*, *supra* note 3.

[20] Brian Bennett, *Drones Tested as Tools for Police and Firefighters*, LOS ANGELES TIMES (August 5, 2012 5:00 A.M.), http://www.latimes.com/news/nationworld/nation/la-na-drones-testing-20120805,0,6483617.story.

[21] The U.S. Army recently acquired a 1.8 gigapixel camera for use on its drones. This camera offers 900 times the pixels of a 2 megapixel camera found in some cell phones. It can track objects on the ground 65 miles away from an altitude of 20,000 feet. *US Army unveils 1.8 gigapixel camera helicopter drone*, BBC NEWS (December 29, 2011 6:11 p.m.), http://www.bbc.com/news/technology-16358851.

[22] Infrared cameras, also known as thermal imaging, can see objects through walls based on the relative levels of heat produced by the objects. *See* Draganflyer X6, Thermal Infrared Camera, http://www.draganfly.com/uav-helicopter/draganflyer-x6/features/flir-camera.php.

[23] This sensor can recognize and permit drones to track vehicles based on license plate numbers. Customs and Border (continued...)

organizations might seek to outfit drones with facial recognition or soft biometric recognition, which can recognize and track individuals based on attributes such as height, age, gender, and skin color.[25] As explained below, the relative sophistication of drones contrasted with traditional surveillance technology may influence a court's decision whether domestic drone use is lawful under the Fourth Amendment.

Fourth Amendment "Search" Jurisprudence

The Fourth Amendment's story is one of continuity and change. Core values such as privacy and protection from excessive and arbitrary government intrusion are always within its sweep. A continuing question, though, is how the demands of its protection apply to an ever-changing society in which new and pervasive forms of technology are increasingly common. Although there are numerous rules and exceptions throughout the Supreme Court's Fourth Amendment jurisprudence, this section will explore those most pertinent to domestic drone use.

In short, the Fourth Amendment regulates when, where, and how the government may conduct searches and seizures. The Amendment provides, in relevant part: "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated[.]"[26] The Fourth Amendment does not apply to all government acts, but only to those that constitute a search. So when does government monitoring constitute a Fourth Amendment "search" for which a warrant is generally required? Initially, courts' assessment focused on the specific area being investigated. Consider the 1928 case *Olmstead v. United States*.[27] There, the Supreme Court held that police wiretaps of the defendant's home telephone did not constitute a Fourth Amendment search because the police did not trespass onto Olmstead's property to intercept his conversation.[28] The Court's thinking at the time was that if the person's home, tangible property, or papers were not physically invaded, then no search in the constitutional sense occurred. Almost 40 years later, the Court shifted focus from property to privacy interests.[29] In *Katz v. United States*, decided in 1967, the Court held that an FBI agent's use of a bug to listen to the private conversations of Mr. Katz while in a telephone booth violated his Fourth Amendment rights.[30] Although he was in a public telephone booth and there was no physical invasion, the Court noted that what a person "seeks to preserve private, even in an area accessible to the public, may be constitutionally protected."[31] One of the modern Fourth

(...continued)

Protection Today, Unmanned Aerial Vehicles Support Border Security (July 2004), http://www.cbp.gov/xp/CustomsToday/2004/Aug/other/aerial_vehicles.xml.

[24] This sensor produces three-dimensional images, and has the capability to see through trees and foliage. U.S. ARMY, UAS CENTER FOR EXCELLENCE, "EYES OF THE ARMY" US ARMY ROADMAP FOR UNMANNED AIRCRAFT SYSTEMS 2010-2035, at 83 (2010).

[25] *See* Clay Dillow, *Army Developing Drones that Can Recognize Your Face from a Distance*, POPSCI (September 28, 2011), 5:01 p.m.), *available at* http://www.popsci.com/technology/article/2011-09/army-wants-drones-can-recognize-your-face-and-read-your-mind.

[26] U.S. CONST. amend IV.

[27] Olmstead v. United States, 277 U.S. 438, 466 (1928).

[28] *Id.*

[29] Katz v. United States, 389 U.S. 347, 351 (1967).

[30] *Id.* at 359.

[31] *Id.* at 351.

Amendment tests relied upon by courts in assessing whether government monitoring constitutes a "search" derives from Justice Harlan's concurrence in *Katz*. It considers whether the person has a subjective expectation of privacy in the area to be searched and whether society is prepared to deem that expectation reasonable.[32]

Although the Court said in *Katz* that the Fourth Amendment "protects people not places,"[33] Justice Harlan noted that determining what "protection it affords people ... requires reference to a '*place*.'"[34] And as Justice Scalia observed when writing for a majority of the Court in *United States v. Jones*, a Fourth Amendment search occurs, "at a minimum," where "the Government obtains information by physically intruding on a constitutionally protected area."[35] The majority in *Jones* indicated that the reasonable expectation of privacy test was never intended to replace the property-based approach used in earlier cases, but merely augment it.[36] So where do individuals enjoy the most Fourth Amendment protection? The least? Why does the location dictate the level of protection? And how does technology affect society's expectation of privacy?

When analyzing domestic drone use under the Fourth Amendment, a reviewing court may be informed by cases surrounding privacy in the home, privacy in public spaces, location tracking, manned aerial surveillance, those involving the national border, and warrantless searches under the special needs doctrine.

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[32] *Id.* at 361 (Harlan, J., concurring).

[33] *Id.* at 351.

[34] *Id.* at 361 (Harlan, J., concurring); *see also* Oliver v. United States, 466 U.S. 170 (1984).

> We have frequently acknowledged that privacy interests are not coterminous with property rights. E. g., United States v. Salvucci, 448 U.S. 83, 91 (1980). However, because "property rights reflect society's explicit recognition of a person's authority to act as he wishes in certain areas, [they] should be considered in determining whether an individual's expectations of privacy are reasonable." Rakas v. Illinois, 439 U.S. 128, 153 (1978) (Powell, J., concurring). Indeed, the Court has suggested that, insofar as "[one] of the main rights attaching to property is the right to exclude others, ... one who owns or lawfully possesses or controls property will in all likelihood have a legitimate expectation of privacy by virtue of this right to exclude." *Id.*, at 144, n. 12.

Oliver, 466 U.S. at 189-90.

[35] United States v. Jones, 132 S. Ct. 945, 950 n.3 (2012).

[36] *Id.*

Privacy in the Home

The home has always held a central place in American life, and remains the area accorded the greatest Fourth Amendment protection.[37] The Fourth Amendment protects this zone of privacy by ensuring that "the right of the people to be secure in their ... houses ... against unreasonable search and seizure, shall not be violated[.]"[38] In most instances, the Supreme Court has rigorously adhered to this safeguard.[39] For instance, although police officers may make a warrantless arrest of an individual for a felony offense committed in public,[40] they may not step inside his home without a warrant, barring any recognized exception.[41]

> "The right of the people to be secure in their ... houses ... against unreasonable search and seizure, shall not be violated[.]" U.S. CONST. amend IV.

In addition to a physical entry and search of the home, police are likewise prohibited from using certain technology to pierce this zone of privacy. In *Kyllo v. United States*, government agents used a thermal-imaging device to determine heat patterns inside the home of Danny Kyllo.[42] The Court began with the presumption that a warrantless search of a home is unreasonable.[43] Ultimately, the Court protected this "realm of guaranteed privacy" by holding that obtaining information about the inside of a home that could not otherwise be obtained except by entering the home, through the use of technology not in "general public use," is a "search" covered by the Fourth Amendment.[44]

The home, however, does not provide an absolute shield against government surveillance. As Justice Harlan emphasized in *Katz*, "[A] man's home is, for most purposes, a place where he expects privacy, but objects, activities, or statements that he exposes to the plain view of outsiders are not 'protected' because no intention to keep them to himself has been exhibited." Indeed, in certain instances, police may use their natural senses to conduct warrantless searches of the inside of a home.[45] To fall under this exception—known as the "plain view" doctrine—the police must be in a lawful vantage point when they conduct the surveillance, and the incriminating nature of the evidence must be readily apparent.[46]

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[37] DANIEL SOLOVE, UNDERSTANDING PRIVACY 59 (2008).

[38] U.S. CONST. amend IV.

[39] Silverman v. United States, 365 U.S. 505, 512 (1961) ("At the very core stands the right of a man to retreat into his own home and be free from unreasonable government intrusion.").

[40] United States v. Watson, 423 U.S. 411 (1976).

[41] Payton v. New York, 445 U.S. 573, 603 (1980). This protection not only covers traditional houses, but apartments, Clinton v. Virginia, 377 U.S 158 (1963), and motel rooms, Stoner v. California, 376 U.S. 483 (1964).

[42] Kyllo v. United States, 533 U.S. 27, 29-30 (2001).

[43] *Id.* at 31.

[44] *Id.* at 34.

[45] In one case, police observation of marijuana plants through a crack in the house's siding did not constitute an unlawful search. *United States v. Hammett*, 236 F.3d 1054, 1061 (9th Cir. 2001). In another, the court held that the police officer's observation of contraband through the front dining room window was not unlawful. *United States v. Taylor*, 90 F.3d 903, 909 (4th Cir. 1996).

[46] Coolidge v. New Hampshire, 403 U.S. 443, 466 (1971).

Curtilage and Open Fields

Once an individual moves from the confines of the home, he is entitled to different Fourth Amendment considerations. Depending on a host of varying factors, areas outside of the home may be considered "curtilage" or "open fields."[47] The curtilage is the area immediately surrounding the home—an area the Court has granted similar protections as the inside of the home.[48] To determine if an area is curtilage, a court will look at how close the area is to the home; whether the area is within a fence surrounding the home; how the area is used; and whether the area is protected from observation by passersby.[49] Although an area may be deemed curtilage—as with the home—it is not veiled with unconditional constitutional protection. As the Court noted in one aerial surveillance case:

> The Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares. Nor does the mere fact that an individual has taken measures to restrict some views of his activities preclude an officer's observations from a public vantage point where he has a right to be and which renders the activities clearly visible.[50]

On the other hand, the area outside the curtilage is sometimes considered "open fields," which "do not provide the setting for those intimate activities that the Amendment is intended to shelter from governmental interference or surveillance,"[51] and thus are not given similar Fourth Amendment protections. Differentiating between the two is no easy task. In one case, for example, the Ninth Circuit Court of Appeals determined that the defendant's driveway was not curtilage as he had taken no affirmative steps to block it from observation by passers-by.[52] Furthermore, in the fly-over cases discussed *infra*, the Supreme Court has permitted similar searches in both open fields and the curtilage, to some extent eliminating any constitutional difference between the two.

Manned Aerial Surveillance

In a series of cases that provide the closest analogy to UAVs, the Supreme Court addressed the use of *manned* aircraft to conduct domestic surveillance over residential and industrial areas. In each, the Court held that the fly-over at issue was not a search prohibited by the Fourth Amendment, as the areas surveilled were open to public view.

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[47] United States v. Hester, 365 U.S 57 (1924) (distinguishing between the doctrines of curtilage and open fields).

[48] The Court has defined curtilage as "the area to which extends the intimate activity associated with the 'sanctity of a man's home and the privacies of life.'" Oliver v. United States, 466 U.S. 170, 180 (1984) (quoting Boyd v. United States, 116 U.S. 616, 630 (1886)).

[49] United States v. Dunn, 480 U.S. 294, 301 (1987).

[50] California v. Ciraolo, 476 U.S. 207, 213 (1986).

[51] Dow Chemical Co. v. United States, 476 U.S. 227, 234-35 (1986) (quoting *Oliver*, 466 U.S. at 179).

[52] Maisano v. Welcher, 940 F.2d 499 (9th Cir. 1991).

In *California v. Ciraolo*, police received a tip that an individual was growing marijuana in his backyard next to his suburban home.[54] Because two fences blocked their view of the yard, officers flew a fixed-wing aircraft at an altitude of 1,000 feet over the property to conduct a visual inspection. From this vantage point, the officers readily identified with the naked eye marijuana plants growing in the defendant's yard. The Court held that the defendant's expectation of privacy in the area immediately surrounding his home was not reasonable, since "what a person knowingly exposes to the public ... is not a subject of Fourth Amendment protection."[55] "Any member of the public flying in this airspace who glanced down could have seen everything these officers observed," the Court remarked.[56] Much weight was placed on the fact that the plane was at all times in navigable airspace as defined by federal statute.[57]

> "What a person knowingly exposes to the public ... is not a subject of Fourth Amendment protection."[53]

Similarly, in *Florida v. Riley*, local police received a tip that an individual was growing marijuana in a greenhouse located 10 to 20 feet away from his mobile home.[58] The officers could not see the contents of the greenhouse from the ground, so they flew a helicopter over the defendant's backyard at an altitude of 400 feet. While overhead, an officer saw marijuana plants through a crack in the greenhouse roof. Because the helicopter, like the plane in *Ciraolo*, was in navigable airspace—where any member of the public could have flown—the Court did not consider this a search for which a warrant was required.[59]

In the final case of the series, *Dow Chemical v. United States*, the Court was asked whether a theory of "industrial curtilage" would prevent a government agency from conducting aerial surveillance over a 2,000-acre commercial plant.[60] There, after Dow Chemical Co. refused access to the Environmental Protection Agency (EPA), the EPA hired a commercial aerial photographer to take photos of the facility using a precision aerial mapping camera. Having ruled out the argument that the areas surrounding an industrial complex are entitled to the same protection as similar areas surrounding a home, the Court concluded that photographing the plant from navigable airspace was not a search.[61]

Government Tracking

Like the aerial surveillance cases, individuals have reduced—and in some contexts no—Fourth Amendment protection from government tracking of their travel in public places. This has permitted the government to conduct warrantless tracking of a vehicle's movements while traveling on public streets. However, once people enter a private residence, the tracking must

[53] *Ciraolo*, 476 U.S. at 213.

[54] *Id.* at 207.

[55] *Id.* at 213.

[56] *Id.* at 213-214. It should be noted that although the police did take photographs with a 35-millimeter camera, the warrant relied on naked-eye observations and not the photographs. Thus, the holding was based on the naked-eye observations, unaided by the camera.

[57] *Id.* at 213 (citing 49 U.S.C. §1304).

[58] Florida v. Riley, 488 U.S. 445, 448 (1989).

[59] *Id.*

[60] *Dow Chemical Co.*, 476 U.S. 227.

[61] *Id.* at 239

cease. Also, using technology to perform pervasive tracking might not meet Fourth Amendment muster.

Consider, for example, these two government tracking cases, *United States v. Knotts* and *United States v. Karo*.[62] In both cases, the government hid a location monitoring device in an item that was then given to the suspects. In *Knotts*, the police tracked the suspect's movements solely while traveling on public roadways.[63] The Court held that people have no reasonable expectation of privacy in their movements on public streets. As such, no Fourth Amendment search occurred, thus no warrant was required. By contrast, in *Karo*, the police tracked a beeper device on public streets *and* while the beeper was in a private residence—a "location not open to visual surveillance."[64] "Indiscriminate monitoring of property that has been withdrawn from public view," the Court declared, "would present far too serious a threat to privacy interests in the home to escape entirely some sort of Fourth Amendment oversight."[65] The Court held the search unlawful.

Although surveillance in public is generally not considered a search, pervasive tracking may cross the line. Take, for instance, the Supreme Court's recent decision in the GPS tracking case *United States v. Jones*.[66] In that case, the Court held that the attachment and monthlong tracking of a GPS device on an individual's vehicle constituted a trespass, and hence a Fourth Amendment search.[67] The Court grounded its decision in the property-based approach to assessing what constitutes a "search" under the Fourth Amendment, which had been more prevalent in the late 19th and early 20th century cases involving relatively unsophisticated technology.

The Court's focus on whether the attachment of a tracking device constitutes a trespass triggering Fourth Amendment protections is not necessarily applicable to drone surveillance. However, in two separate concurring opinions that together made up five members of the Court, an alternative framework was proposed that may have more far-reaching implications for the domestic use of UAVs.

Justice Alito, concurring in the Court's judgment, and joined by Justices Ginsburg, Breyer, and Kagan, would have held that "the use of longer term GPS monitoring in investigations of most offenses impinges on expectations of privacy. For such offenses, society's expectation has been that law enforcement agents and others would not—and indeed, in the main, simply could not—secretly monitor and catalogue every single movement of an individual's car for a very long period." Justice Sotomayor, joining the controlling opinion in *Jones*, but also concurring separately, noted that although following people for a short period of time conveys little information about them, tracking an

> Tracking an individual for an extended period "reflects a wealth of detail about her familial, political, professional, religious, and sexual associations."[68]

[62] United States v. Knotts, 460 U.S. 276 (1983); United States v. Karo, 468 U.S. 705 (1984).

[63] *Knotts*, 460 U.S. at 279. The Court reiterated that its analysis was based on the fact that the beeper was tracked within the vicinity of a home, not actually in the home. *Id*

[64] *Karo*, 468 U.S. at 714.

[65] *Id.* at 715.

[66] United States v. Jones, 132 S. Ct. 945 (2012).

[67] *Id.* at 949. *See generally* CRS Report R42511, *United States v. Jones: GPS Monitoring, Property, and Privacy*, by Richard M. Thompson II.

[68] *Jones*, 132 S. Ct. at 955 (Sotomayor, J., concurring).

individual for an extended period "reflects a wealth of detail about her familial, political, professional, religious, and sexual associations."[69] Thus, the length of time an individual is kept under surveillance and the breadth of data collected through such surveillance may inform a reviewing court whether a particular surveillance practice constitutes a Fourth Amendment search.[70]

Border Searches

Even more so than surveillance of public places generally, law enforcement agencies are granted significant deference to conduct surveillance at or near American borders. The federal government has a significant interest in protecting American borders from crossings by persons attempting to enter unlawfully, drug trafficking, and, perhaps most importantly, the transit of weapons and persons seeking to do harm to American people and infrastructure.

Congress has granted federal law enforcement agencies significant search powers at the border. Section 287 of the Immigration and Nationality Act (INA), codified at 8 U.S.C. Section 1357, authorizes immigration officers to conduct warrantless searches of any vessel within a reasonable distance from the United States border and any vehicle within 25 miles from a border for the "purpose of patrolling the border to prevent the illegal entry of aliens into the United States."[71] Similarly, 19 U.S.C. Section 482 authorizes customs officers to search vehicles and persons on which or whom they have reasonable cause to believe are carrying goods unlawfully into the United States.[72]

The Supreme Court has likewise acknowledged this federal interest in the borders, observing that "[t]he Government's interest in preventing the entry of unwanted persons and effects is at its zenith at the international border."[73] Again, the touchstone in every Fourth Amendment case is whether the search is *reasonable*.[74] The Court observed in *United States v. Montoya De Hernandez* that "the Fourth Amendment balance of reasonableness is qualitatively different at the international border."[75] "Routine searches," the Court continued, "are not subject to any requirement of reasonable suspicion, probable cause, or warrant."[76] "Routine" searches have included pat downs for weapons or contraband,[77] the use of drug sniffing dogs,[78] and the

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[69] *Id.*

[70] Although the two concurring opinions in *Jones* arguably do not constitute binding precedent, lower courts have combined them as a possible alternative holding. *See* United States v. Hanna, No. 11-20678-CR, 2012 WL 279435, at *3 (S.D. Fla. Jan. 3, 2012) (analyzing the issue of Fourth Amendment standing to contest GPS surveillance under both the trespass theory and *Katz*'s privacy test); State v. Zahn, No. 25584, 2012 WL 862707 (S.D. Mar. 14, 2012) (holding that both the trespass approach and the mosaic theory can apply to GPS tracking); *but see* United States v. Bradshaw, No. 1:11-CR-257, 2012 WL 774964 (N.D. Ohio Mar. 8, 2012) (noting that the *Jones* majority did not adopt the mosaic theory).

[71] 8 U.S.C. 1357.

[72] 19 U.S.C. §482. In the 112th Congress, the House of Representatives introduced H.R. 1505, which would enlarge CBP's authority to secure U.S. borders on federal land. H.R. 1505; *see also* John S. Adams, *Border bill would expand Homeland Security powers*, USA TODAY (September 26, 2011).

[73] United States v. Flores-Montano, 541 U.S. 149, 152 (2004).

[74] Cady v. Dombrowski, 413 U.S. 433, 439 (1973).

[75] United States v. Montoya De Hernandez, 473 U.S. 531, 538 (1985).

[76] *Id.*

[77] United States v. Beras, 183 F.3d 22, 24 (1st Cir. 1999) (ruling that pat down of defendant's legs was routine search).

[78] United States v. Kelly, 302 F.3d 291, 294-95 (5th Cir. 2002).

inspection of luggage.[79] By contrast, "non-routine" searches are those that go beyond a limited intrusion, and require the government official to have (at a minimum) "reasonable suspicion" of wrongdoing.[80] Prolonged detentions,[81] strip searches,[82] and body cavity searches[83] have all been considered non-routine searches.

Unlike searches directly at the border, the Court has shown more reticence in granting law enforcement unfettered discretion to conduct searches near, but not directly at, the border. In *Almeida-Sanchez v. United States*, the defendant's vehicle was stopped and searched by U.S. Border Patrol agents 25 miles north of the U.S.-Mexico border.[84] The agents had neither a warrant nor probable cause, nor even reasonable suspicion, to conduct the search. The government argued that the search was permissible under Section 287 of the Immigration and Nationality Act. A federal statute, the Court noted, cannot trump the Constitution. The Court refused to permit this suspicionless search, as it was conducted neither at the border nor at its "functional equivalent."[85]

Warrants, Suspicionless Searches, and Special Needs

The baseline rule in Fourth Amendment cases is that police must obtain a warrant to search an individual or their property in all but a few limited instances.[86] This rule ensures that an independent judicial officer, rather than a police officer in the field, is determining whether there is probable cause to conduct a search or seizure.[87] Over time, however, the Court has loosened this warrant requirement in instances where a strict showing of individualized suspicion of probable cause would hinder the government from addressing health and safety concerns.[88] In two lines of overlapping cases—administrative searches and "special needs" cases—the Court has balanced the individual's privacy interest against the government's interest to determine if a

[79] United States v. Okafor, 285 F.3d 842 (9th Cir. 2002).

[80] *Montoya De Hernandez*, 473 U.S. at 541.

[81] *Id.*

[82] United States v. Asbury, 586 F.2d 973, 975 (1978).

[83] United States v. Ogberaha, 771 F.2d 655, 657 (2d Cir. 1985).

[84] Almeida-Sanchez v. United States, 413 U.S. 266, 267-68 (1973).

[85] *Id.* at 272-73 ("For example, searches at an established station near the border, at a point marking the confluence of two or more roads that extend from the border, might be functional equivalents from border searches. For another example, a search of the passengers and cargo of an airplane arriving at a St. Louis airport after a nonstop flight from Mexico would clearly be the functional equivalent of a border search."). Like *Almeida-Sanchez*, Border Patrol agents in *United States v. Brignoni-Ponce* stopped an individual's vehicle as part of a roving patrol solely because the occupants appeared to be of Mexican descent, with no proof of illegal activity. *United States v. Brignoni-Ponce*, 422 U.S. 873, 874-75 (1975). Again, the Court struck down this practice of suspicionless stops, remarking that "[i]n the context of border area stops, the reasonableness requirement of the Fourth Amendment demands something more than the broad and unlimited discretion sought by the Government. Roads near the border carry not only aliens seeking to enter the country illegally, but a large volume of legitimate traffic as well." *Id.* at 882.

[86] Mincey v. Arizona, 437 U.S. 385, 390 (1978) (citation omitted).

[87] Johnson v. Untied States, 333 U.S. 10, 14 (1948) ("The right of officers to thrust themselves into a home is also a grave concern, not only to the individual but to a society which chooses to dwell in reasonable security and freedom from surveillance. When the right of privacy must reasonably yield to the right of search is, as a rule, to be decided by a judicial officer, not by a policeman or government enforcement agent."). Probable cause is found when, looking at the "totality-of-the-circumstances" there "is a fair probability that contraband or evidence of a crime will be found in a particular place." Illinois v. Gates, 462 U.S. 213, 238 (1983).

[88] Eve Brensike Primus, *Disentangling Administrative Searches*, 111 COLUM. L. REV. 254, 256 (2011).

warrant or any individualized suspicion is required.[89] These two theories permit law enforcement to conduct dragnet searches in certain instances.

Suspicionless general searches are ones "in which the government searches or seizes every person, place, or thing in a specific location or involved in a specific activity based only on a showing of a generalized government interest."[90] Suspicionless searches have been conducted at the national border,[91] private businesses,[92] and police roadblocks.[93] In the roadblock cases, the Court has balanced the government's interest against the individual's privacy interest to determine whether police may stop and question drivers without a warrant or any suspicion of criminal wrongdoing. In *Michigan Dep't of State Police v. Sitz*, the Court upheld the suspicionless stopping and examination of drivers for intoxication at sobriety checkpoints.[94] The Court reasoned that the high incidence of drunk driving balanced against the minimal intrusion on drivers permitted suspicionless checkpoints. In *City of Indianapolis v. Edmund*, however, law enforcement was not permitted to set up a drug interdiction checkpoint.[95] The Court held that searches such as this violated the Fourth Amendment when their "primary purpose" is "to uncover evidence of ordinary criminal wrongdoing."[96] Justice O'Connor observed that if this type of roadblock were allowed "the Fourth Amendment would do little to prevent such intrusions from becoming a routine part of American life."[97]

Application of Fourth Amendment to Drone Surveillance

As evidenced by the foregoing, the constitutionality of domestic drone surveillance may depend upon the context in which such surveillance takes place. Whether a targeted individual is at home, in his backyard, in the public square, or near a national border will play a large role in determining whether he is entitled to privacy. Equally important is the sophistication of the technology used by law enforcement and the duration of the surveillance. Both of these factors will likely inform a reviewing court's reasoning as to whether the government's surveillance constitutes an unreasonable search in violation of the Fourth Amendment.

[89] Nat'l Treasury Employees Union v. Von Raab, 489 U.S. 656, 665-66 (1989).

[90] Primus, *supra* note 88, at 263.

[91] United States v. Martinez-Fuerte, 428 U.S. 543, 566 (1976).

[92] United States v. Biswell, 406 U.S 311, 317 (inspection of gun dealer's storeroom) ("We have little difficulty in concluding that where, as here, regulatory inspections further urgent federal interest, and the possibilities of abuse and the threat to privacy are not of impressive dimensions, the inspection may proceed without a warrant where specifically authorized by statute.").

[93] Mich. Dep't of State Police v. Sitz, 496 U.S. 444, 455 (1990).

[94] *Id.* at 455.

[95] City of Indianapolis v. Edmund, 531 U.S. 32 (2000).

[96] *Id.* at 42.

[97] *Id.*

Location of Search

Based on existing case law, it is reasonable to assume that surveillance of an individual while in his home—an area accorded the greatest Fourth Amendment protection—using technology not in general public use would be an unlawful search absent a search warrant. The Supreme Court in *Kyllo* was particularly concerned about law enforcement's use of powerful equipment to peer inside an individual's home. Currently, UAVs carry high-megapixel cameras and thermal imaging, and will soon have the capacity to see through walls and ceilings.[98] These technologies are not generally available to the public, and under current jurisprudence, their use by law enforcement would probably constitute a search covered by the Fourth Amendment. However, the use of low-powered cameras or other unsophisticated technology to view people and objects in plain view while in their home might not trigger Fourth Amendment protections. The rationale for this notion is that officers are not required to avert their eyes when they see illegal activity in plain view, especially when the subject of the search has taken no affirmative efforts to hide their activity from public view.

Moving beyond the home, it is unclear whether circumstances exist in which the area immediately surrounding the home—for instance, a backyard, a swimming pool, a deck, or a porch—would receive similar protections as the interior of the home if surveilled by drones or other aerial vehicles.[99] Although the Supreme Court has recited on many occasions that a person located in a home's curtilage is accorded similar privacy protections as when inside the home, the aerial surveillance cases arguably constitute an exception to this general principle. In the two aerial cases, *Riley* and *Ciraolo*, the area surveilled was within close proximity of the home, yet the police surveillance at altitudes of 400 and 1,000 feet were not considered a search.

Based on the aerial surveillance cases, it may be reasonable to presume a warrant would *not* be required (nor, perhaps, any suspicion, for that matter) to conduct drone surveillance of most public places for a relatively short period of time. The Supreme Court remarked in *Ciraolo* that the "Fourth Amendment simply does not require the police traveling in the public airways at [1,000 feet] to obtain a warrant to observe what is visible to the naked eye."[100] However, the rarity of drone flights may distinguish their use from surveillance by the piloted aircraft used in the three aerial cases decided by the Court. All three of these cases were premised on the fact that each aircraft was flying in navigable airspace, and that these flights were not "sufficiently rare" to provide a reasonable expectation of privacy in the area to be searched. To this point, Justice White remarked in *Riley* that "there is nothing in the record or before us to suggest that helicopters flying at 400 feet are sufficiently rare in this country to lend substance to respondent's claim that he reasonably anticipated that his greenhouse would not be subject to observation from that altitude."[101] Presently, use of UAVs in U.S. airspace is considerably less common. The FAA has issued only approximately 300 licenses for drone use in U.S. airspace.[102] The general public

[98] EYES OF THE ARMY, *supra* note 24.

[99] *See generally,* Paul McBride, *Beyond Orwell: The Application of Unmanned Aircraft Systems in Domestic Surveillance Operations*, 74 J. Air. L. & Com. 627, 655-56 ("This implies that although the curtilage does not benefit from the absolute protection afforded to the interior of the home, there is a close relationship between the two, and that technology directed at the home and its curtilage will be subjected to a more skeptical analysis than would be applied in a case involving open fields or industrial areas.").

[100] California v. Ciraolo, 476 U.S. 207, 215 (1986).

[101] Florida v. Riley, 488 U.S. 445, 451-52 (1989).

[102] Federal Aviation Administration, *supra* note 18.

would likely find it exceedingly unusual for a drone to fly over their homes taking surveillance photographs. This rarity might factor into a reviewing court's determination of whether individuals have a legitimate expectation of privacy from various forms of drone surveillance while in a public place.[103]

The federal government's authority to use unmanned aircraft is undoubtedly at its maximum near U.S. borders. One of the federal government's only affirmative duties is to protect citizens from external harm.[104] This includes securing the borders. The Court has hesitated from interfering with the performance of this duty, and it would in all likelihood demonstrate the same deference when it comes to the use of UAVs. Moreover, the Supreme Court's rulings in border cases have all involved active searches—either a physical search of a vehicle or stopping and questioning a vehicle's passenger. Surveillance by UAVs, on the other hand, may be considered more passive and therefore may be even less likely to run afoul of Fourth Amendment requirements. Drone surveillance does not require any physical manipulation of a person or his things. UAVs also do not require the seizure of a person for any period of time (though drone surveillance may lead to law enforcement physically apprehending a person who is seen engaging in suspected illegal activity). However, the Court has shown some reticence about giving law enforcement carte blanche search power at the border. Roving vehicle patrols and indiscriminate searches in *Almeida-Sanchez v. United States* and *United States v. Brignoni-Ponce* were deemed unconstitutional.[105] It is unclear whether this reticence would extend to drone surveillance along the border if it were to become significantly widespread.

Technology Used

Like location, the technology used by UAVs may be a decisive factor considered by courts in determining whether individuals have a legitimate expectation of privacy in the object or area of the challenged drone search. Technological developments make it increasingly easy to share and acquire personal information about others, oftentimes without their direct knowledge or consent. As surveillance technology advances and becomes ever-present in Americans' lives, people's conception of privacy may tend to oscillate. Justice Scalia, writing for the majority in *Kyllo v. United States*, remarked on this trend:

> It would be foolish to contend that the degree of privacy secured to citizens by the Fourth Amendment has been entirely unaffected by the advance of technology. For example, ... the technology enabling human flight has exposed to public view (and hence, we have said, to official observation) uncovered portions of the house and its curtilage that once were private. The question we confront today is what limits there are upon this power of technology to shrink the realm of guaranteed privacy.[106]

Justice Alito, joined by three other Justices in his *United States v. Jones* concurrence, likewise observed:

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[103] *Ciraolo*, 476 U.S. at 212. However, in determining society's privacy expectations, a reviewing court might also take into consideration the proliferation of aerial mapping such as Google Maps and Google Earth conducted by private actors. *See generally* Google Maps, Street View, http://www.google.com/streetview.

[104] U.S. CONST. art. IV, §4 ("The United States shall guarantee to every State in this Union a Republican Form of Government, and shall protect each of them against Invasion[.]").

[105] Almeida-Sanchez v. United States, 413 U.S. 266 (1973); United States v. Brignoni-Ponce, 422 U.S. 873 (1975).

[106] Kyllo v. United States, 533 U.S. 27, 33-34 (2001).

> The *Katz* test rests on the assumption that this hypothetical reasonable person has a well-developed and stable set of privacy expectations. But technology can change those expectations. Dramatic technological change may lead to periods in which popular expectations are in flux and may ultimately produce significant changes in popular attitudes. New technology may provide increased convenience or security at the expense of privacy, and many people may find the tradeoff worthwhile. And even if the public does not welcome the diminution of privacy that new technology entails, they may eventually reconcile themselves to this development as inevitable.[107]

The crucial question, then, is whether drones have the potential to be significantly more invasive than traditional surveillance technologies such as manned aircraft or low-powered cameras—technologies that have been upheld in previous cases. In this vein, some have asked whether using sophisticated digital platforms on a drone is any different from attaching the same instrument to a lamppost or traditional aircraft.[108] Take, for example, the tracking of license plates. Currently, many states and municipalities employ automatic license plate readers (ALPRs), which are usually mounted on police vehicles or stationary objects along the streets, to take a snapshot of a license plate as a car drives by, and store this information in a large database for possible later use by law enforcement.[109] It is alleged that these devices can be used to track a person's movements when police aggregate the data from a multitude of ALPR stations.[110] A majority of the reviewing federal circuit courts have held that a person has no reasonable expectation of privacy in his license plate number.[111]

However, it appears that no federal court has addressed the constitutionality of the use of ALPRs (whether attached to a drone, manned vehicle, or a stationary device), as opposed to plate numbers collected by a human observer. Nonetheless, the question remains whether attaching an ALPR—or any similar sophisticated technology—to a drone would alter the constitutionality of its use by law enforcement. Some say yes, arguing that the sophistication of drone technology in and of itself "present[s] a unique threat to privacy."[112] Drones are smaller, can fly longer, and can be built more cheaply than traditional aircraft. For instance, defense firm Lockheed Martin's Stalker—a small, electrically powered drone—can be recharged from the ground using a laser.[113] It now has a flight time of more than 48 hours. As this technology advances, it is reported that

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[107] United States v. Jones, 132 S. Ct. 945, 962 (2012) (Alito, J., concurring).

[108] Stanford Law Review Symposium, *Drones—Privacy Paradox: Privacy and its Conflicting Values* (February 2, 2012), http://cyberlaw.stanford.edu/multimedia/drones-privacy-paradox-privacy-and-its-conflicting-values-video.

[109] *ACLU Seeks Details on Automatic License Plate Readers in Massive Nationwide Request,* AMERICAN CIVIL LIBERTIES UNION (July 31, 2012), http://www.aclu.org/technology-and-liberty/aclu-seeks-details-automatic-license-plate-readers-massive-nationwide-reque-4.

[110] *Id.*

[111] *See, e.g.*, Olabisiomotosho v. City of Houston, 185 F.3d 521, 529 (5th Cir. 1999) ("A motorist has no privacy interest in her license plate number. Like the area outside the cartilage [sic] of a dwelling, a car's license plate number is constantly open to the plain view of passersby.") (internal citation and quotation marks omitted); United States v. Ellison, 462 F.3d 557, 562 (6th Cir. 2006) ("No argument can be made that a motorist seeks to keep the information on his license plate private. The very purpose of a license plate number, like that of a Vehicle Identification Number, is to provide identifying information to law enforcement officials and others."); United States v. Castaneda, 494 F.3d 1146, 1151 (9th Cir. 2007); United States v. Walraven, 892 F.2d 972, 974 (10th 1989).

[112] *Using Unmanned Aircraft Systems Within the Homeland: Security Game Changer? Hearing Before the Subcomm. on Oversight, Investigations, and Management of the H. Comm. on Homeland Sec.*, 112th Cong. 3 (2012) (statement of Amie Stepanovich, Counsel, Electronic Privacy Information Center).

[113] Mark Brown, *Lockheed uses ground-based laser to recharge drone mid-flight*, WIRED (July 12, 2012), *available at* http://www.wired.co.uk/news/archive/2012-07/12/lockheed-lasers.

some drones could theoretically "stay in the air forever."[114] Unlike a stationary license plate tracker or video camera, drones can lock on a target's every move for days, and possibly weeks and months. This ability to closely monitor an individual's movements with pinpoint accuracy may raise more significant constitutional concerns than some other types of surveillance technology.

Furthermore, the technology and sophistication of drones may mark a considerable departure from the traditional technologies used in the three manned aerial surveillance cases decided by the Supreme Court. First, all three holdings in *Ciraolo*, *Riley*, and *Dow Chemical* were premised on naked-eye searches. Chief Justice Burger remarked in *Dow Chemical*: "It may well be, as the government concedes, that surveillance of private property using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant."[115] As noted above, the sophistication of surveillance technology available to drones, such as facial recognition or laser radar which can "see" through walls, may lead some to question the relevance of prior Fourth Amendment jurisprudence concerning more rudimentary forms of surveillance technology.

The sophistication of drones also has the ability to break down any practical privacy safeguard. In the pre-computer age, the greatest privacy protections were neither constitutional nor statutory, but practical. Putting officers everywhere in the community cost too much for local police departments. This acted as a natural barrier to excessive police presence. Drones are not hindered by similar limitations. This is similar to the expansion of GPS technology observed by the five concurring Justices in *United States v. Jones*. There, Justice Sotomayor, writing for herself, noted that because GPS technology was cheaper and performed in a surreptitious manner, it "evades the ordinary checks that constrain abusive law enforcement practices: limited police resources and community hostility."[116] Justice Alito sounded a similar note in *Jones*: "Traditional surveillance for any extended period of time was difficult and costly and therefore rarely undertaken. [GPS devices] make long-term monitoring relatively easy and cheap."[117] Instead of putting more officers in the field, a police force could put drones in the sky for potentially less expense. Already, drones with video capabilities can be purchased from private vendors for a few hundred dollars.[118] This access to inexpensive technology may significantly reduce budgetary concerns that once checked the government from widespread surveillance.

This access to inexpensive technology may significantly reduce budgetary concerns that once checked the government from widespread surveillance.

The duration and pervasiveness of drone surveillance—two factors closely associated with the technology employed by law enforcement—may also influence a court's Fourth Amendment analysis. Consider the Fifth Circuit Court of Appeals' ruling in *United States v. Cuevas-Sanchez*.[119] In that case, federal law enforcement agents suspected the defendant was using his home as a drop house for drug traffickers. After obtaining a court order, the agents installed a

[114] *Id.* Lockheed has reportedly been working on extending flight times from days to months. *Id.*

[115] *Dow Chemical*, 476 U.S. at 238.

[116] United States v. Jones, 132 S. Ct. 945, 956 (Sotomayor, J., concurring) (internal quotation marks omitted).

[117] *Id.*

[118] *See, e.g.*, Apple Store, Parrot AR.Drone 2.0, http://store.apple.com/us/product/H8859ZM/A/parrot-ar-drone-2-0. This aircraft, is remote-controlled by an iPhone or iPad, and has a high-definition camera that can take both pictures and videos. *Id.*

[119] United States v. Cuevas-Sanchez, 821 F.2d 248 (5th Cir. 1987).

video camera on a utility pole overlooking the defendant's 10-foot high fence surrounding his back yard. The officers observed the removal of drugs from the gas tanks of several cars parked in the defendant's yard. Based on these observations, the defendant was arrested whereupon the police seized a large amount of marijuana. At trial, the defendant moved to suppress the evidence on the basis that the warrant was defective. However, the court first addressed whether the video surveillance was a search under the Fourth Amendment. In determining that the video surveillance was a search, the panel noted that this "was not a one-time overhead flight or a glance over the fence by a passer-by.... It does not follow that *Ciraolo* authorizes any type of surveillance whatever just because one type of minimally-intrusive aerial observation is possible."[120] Drones have the capability to stay in the air for long periods of time and can hover in one location. Similar to the mounted camera in *Cuevas-Sanchez*, this permits law enforcement to employ drones in prolonged surveillance operations. This capability may sway a court's determination of whether certain types of warrantless drone surveillance are compatible with the Fourth Amendment.

Warrant Requirement and Suspicionless Drone Searches

Applying the Fourth Amendment to drones requires application of the threshold question: was there a search? Again, this will depend on all the factors discussed above—the area of the search, the technology used, and whether society would respect the target's expectation of privacy in the place searched. If a reviewing court concludes that the drone surveillance was not a search, neither a warrant nor any degree of individualized suspicion would be required. If, however, the court concluded there was a search, then a court would ask whether a warrant is required, if one of the exceptions apply, and what level of suspicion, if any, is necessary to uphold the search.

Unless a meaningful distinction can be made between drone surveillance and more traditional forms of government tracking, existing jurisprudence suggests that a reviewing court would likely uphold drone surveillance conducted with no individualized suspicion when conducted for purposes other than strict law enforcement. The Supreme Court has hesitated from interfering in what they see as the executive's function in protecting the health and safety of the American population. As Chief Justice Rehnquist noted in the *Sitz*, the Court does not want

> to transfer from politically accountable officials to the courts the decision as to which among reasonable alternative law enforcement techniques should be employed to deal with serious public danger.... [F]or purposes of Fourth Amendment analysis, the choice among such reasonable alternatives remains with the governmental officials who have a unique understanding of, and a responsibility for, limited public resources, including a finite number of police officers.[121]

The Court may defer to law enforcement officials in the drone context also. There are countless instances where the government may seek to utilize drones for health and safety purposes that go beyond mere law enforcement. These may include firefighting, search and rescue missions, traffic safety enforcement, or environmental protection. If, on other hand, surveillance is conducted primarily to enforce the law, a warrant may be required, unless one of the exceptions to the warrant requirement applies.

[120] *Id.* at 251.

[121] Mich. Dep't of State Police v. Sitz, 496 U.S. 444, 453-54 (1990).

Legislative Proposals in the 113th Congress to Constrain Domestic Use of Drones

Although the Supreme Court is the final arbiter of the Constitution, Congress and the President can provide for greater regulation of drones than the Fourth Amendment requires. Congress has taken such steps over the years to address government surveillance of communications in transit (commonly known as wiretapping),[122] communications in storage such as e-mails,[123] bank records,[124] and health records,[125] among a host of other private information. Several measures have been introduced in the 113th Congress that would restrict the domestic use of drones, and establish arguably greater constraints on their usage than the Fourth Amendment requires. Several bills were prompted by a general concern for potential privacy intrusions by federal and state law enforcement and executive agencies.[126]

Preserving Freedom from Unwarranted Surveillance Act of 2013 (H.R. 972)

In the 113th Congress, Representative Austin Scott has introduced the Preserving Freedom from Unwarranted Surveillance Act of 2013 (H.R. 972).[127] This bill would require any entity acting under the authority of the federal government to obtain a warrant based upon probable cause before conducting drone surveillance to investigate violations of criminal law or regulations. There are, however, several exceptions to this warrant requirement: (1) to prevent or deter illegal entry of any persons or illegal substances into the United States; (2) when a law enforcement officer possesses reasonable suspicion that under particular circumstances "swift action to prevent imminent danger to life or serious damage to property, or to forestall the imminent escape of a suspect, or destruction of evidence" is necessary; or (3) when the Secretary of Homeland Security determines credible intelligence indicates a high risk of a terrorist attack by a specific individual or organization. H.R. 972 would create a right to sue for any violation of its prohibitions.

Preserving American Privacy Act of 2013 (H.R. 637)

Representative Ted Poe introduced the Preserving American Privacy Act of 2013 (H.R. 637), which would restrict the domestic use of drones.[128] To begin, the bill regulates surveillance of "covered information," which means "information that is reasonably likely to enable

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[122] Omnibus Crime Control and Safe Streets Act of 1968, P.L. 90-351, 87 Stat. 197, 211 (codified at 18 U.S.C. §2510-2522).

[123] Electronic Communications Privacy Act of 1986, P.L. 99-508, 100 Stat. 1848 (codified at 18 U.S.C. §2701-2712).

[124] Right to Financial Privacy Act, P.L. 95-630, 92 Stat. 3697 (codified at 12 U.S.C. §3401-3422).

[125] Health Insurance Portability and Accountability Act of 1996, P.L. 104-191, 110 Stat. 1936.

[126] Several bills introduced in the 113th Congress aim to restrict the government's use of drones to lethally target U.S. citizens on U.S. soil. See, e.g., No Armed Drones Act of 2013, H.R. 1083, 113th Cong (1st Sess. 2013); S. 505, 113th Cong. (1st Sess. 2013). These bills, however, are beyond the scope of this report.

[127] H.R. 972, 113th Cong. (1st Sess. 2013). Senator Rand Paul filed similar legislation in the 112th Congress, but has not re-introduced it in the 113th Congress. *See* S. 3287, 112th Cong. (2d Sess. 2012). Unlike H.R. 972, S. 3287 included an express exclusionary rule for evidence obtained in violation of the act.

[128] H.R. 637, 113th Cong. (1st Sess. 2013).

identification of an individual" or "information about an individual's property that is not in plain view." H.R. 637 would create a general prohibition on the use of drones to collect covered information or disclose covered information so collected. It does, however, provide the following exceptions:

- *Warrant*. Law enforcement obtains a court-issued warrant and serves a copy of the warrant on the target of the search within 10 days of the surveillance. However, notice need not be provided if it would jeopardize an ongoing criminal or national security investigation.
- *General Order*. Law enforcement obtains a court-issued order based upon "specific and articulable facts showing a reasonable suspicion of criminal activity and a reasonable probability" that the operation "will provide evidence of such criminal activity." The order may authorize surveillance in a stipulated public area for no more than 48 hours which may be renewed for a total of 30 days. Notice of the operation must be provided to the target no later than 10 days after the operation. Alternatively, notice may be provided not less than 48 hours before the operation in a major publication, on a government website, or with signs posted in the area of the operation.
- *Border searches*. Operation is within 25 miles of national border.
- *Consent*. The targeted individual has provided prior written consent.
- *Emergencies*. Emergency situation involves danger of death or serious physical injury, conspiratorial activities threatening the national security interest, or conspiratorial activities characteristic of organized crime, where a warrant cannot be obtained with due diligence. Law enforcement must then obtain a warrant within 48 hours of such operation.

Any evidence obtained in violation of this act is not admissible in any trial or adjudicative proceeding. Additionally, H.R. 637 requires any governmental entity applying for a certificate or license to operate a UAS to also file a data collection statement with the Attorney General. The statement must include the following:

- Purpose for which the UAS will be used
- Whether the UAS is capable of collecting covered information
- The length of time the information will be retained
- A point of contact for citizen feedback
- The particular unit of governmental entity responsible for safe and appropriate operation of the UAS
- The rank and title of the individual who may authorize the operation of the UAS
- The applicable data minimization policies barring the collection of covered information unrelated to the investigation of crime and requiring the destruction of covered information that is no longer relevant to the investigation of a crime
- Applicable audit and oversight procedures.

Under H.R. 637, the Attorney General may request that the Secretary of Transportation revoke the license or certificate of any entity that fails to file a data collection statement. Further, H.R. 637

contains a provision permitting administrative discipline against an officer who intentionally violates a provision of this act.

Drone Aircraft Privacy and Transparency Act of 2013 (H.R. 1262)

Representative Ed Markey introduced the Drone Aircraft Privacy and Transparency Act of 2013 (H.R. 1262).[129] This bill would amend the FAA Modernization and Reform Act of 2012 to create a comprehensive scheme to regulate government actors' use of drones, including data collection requirements and enforcement mechanisms.

First, this bill would require the Secretary of Transportation, with input from the Secretary of Commerce, the Chairman of the Federal Trade Commission, and the Chief Privacy Officer of the Department of Homeland Security, to study any potential threats to privacy protections posed by the introduction of drones in the national airspace. Next, the bill would prohibit the FAA from issuing a license to operate a drone unless the application for such use included a "data collection statement." This statement would require the following items:

- A list of individuals who would have the authority to operate the drone
- The location in which the drone will be used
- The maximum period it will be used
- Whether the drone would be collecting information about individuals

If the drone will be used to collect personal information, the statement must include the following:

- The circumstances in which such information will be used
- The kinds of information collected and the conclusions drawn from it
- The type of data minimization procedures to be employed
- Whether the information will be sold, and if so, under what circumstances
- How long the information would be stored
- Procedures for destroying irrelevant data.

The statement must also include information about the possible impact on privacy protections posed by the operation under that license and steps to be taken to mitigate this impact. Additionally, the statement must include the contact information of the drone operator; a process for determining what information has been collected about an individual; and a process for challenging the accuracy of such data. Finally, the FAA would be required to post the data collection statement on the Internet.

In addition to the data collection statement, any law enforcement agency which operates a drone must file with the FAA a "data minimization statement." This statement must include policies adopted by the agency that

[129] H.R. 1262, 113th Cong. (2d Sess. 2013).

- minimize the collection of information and data unrelated to the investigation of a crime under a warrant,
- require the destruction of data that is no longer relevant to the investigation of a crime,
- establish procedures for the method of such destruction, and
- establish oversight and audit procedures to ensure the agency operates a UAS in accordance with the data collection statement filed with the FAA.

H.R. 1262 includes several enforcement mechanisms. First, the FAA may revoke a license of a user that does not comply with these requirements. The Federal Trade Commission would have the primary authority to enforce the data collection requirements just stated. Additionally, the Attorney General of each state, or an official or agency of a state, is empowered to file a civil suit if there is reason to believe that the privacy interests of residents of that state have been threatened or adversely affected. H.R. 1262 would also create a private right of action for a person injured by a violation of this legislation.

Conclusion

The introduction of drones into American airspace raises many legal and policy questions. For instance, how far can the government go in its attempts to maintain security and ensure that laws are enforced? What level of privacy should Americans expect in an age where technology facilitating the acquisition of personal information expands at a phenomenal pace? Currently, there is a vast body of Fourth Amendment law that governs the circumstances in which law enforcement must obtain a warrant before conducting surveillance. However, the sheer sophistication of drone technology and the sensors they can carry may remove drones from this traditional Fourth Amendment framework. Beyond the courts and the Constitution, what role should Congress and the President play in regulating the introduction of drones inside the United States? As the integration of drones for domestic surveillance operations quickly accelerates, these questions and others will be posed to the American people and their political leaders.

Author Contact Information

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UAS State Privacy Considerations

Unmanned Aircraft Systems (UAS) are emerging technologies that have the potential to transform America providing wide ranging economic, environmental, and safety benefits. A recent study[i] conservatively estimates that 103,776 high paying jobs could be created and state tax revenue could exceed $482 million by 2025. Every year the integration of UAS into the aviation system[ii] is delayed, America will lose more than $10 billion in potential economic impact. Yet, over 40 states have drafted or passed UAS privacy regulations that would prohibit the use of UAS.

UAS applications include: firefighting, chemical and HAZMAT detection, crop dusting, agricultural development, monitoring of pollution, pipelines, wildlife, traffic, and floods, search and rescue, aerial news coverage, delivering medical supplies to remote areas, aerial photography, filmmaking, communications, broadcasting, arctic and volcanic research, forensic photography, damage assessment, cargo transportation, port, border, and event security, real-estate photography, etc. In addition to these direct benefits, UAS implementation will spawn many new industries and provide an incredible array of manufacturing, operation, and other high paying job opportunities.

Along with these benefits come concerns about individual privacy. There is an existing body of federal, state and local law relating to privacy. The question is whether existing law is adequate, absent extensive judicial review, to alleviate the concerns of state legislators and citizens regarding privacy rights in light of this new technology. Because this technology can use a variety of sensors and some can potentially loiter for long periods of time without detection, there is a fear that government can use these systems to monitor individuals in a way that was not imagined in Supreme Court 4th Amendment rulings based on the presumption of privacy[iii]. Because state law interacts with Federal 4th Amendment rulings, it is appropriate for states to enact legislation addressing this issue. The challenge is to provide privacy protection without impeding the use of UAS in order to achieve UAS' many benefits.

Because of the complexity of this issue and the importance of privacy to citizens in every state, representatives of the Aerospace States Association (ASA)[iv], the Council of State Governments (CSG)[v], and the National Conference of State Legislatures (NCSL)[vi] have joined together to create considerations for states to evaluate in developing UAS legislation. As part of our impartial deliberative process, UAS privacy stakeholder associations including the ACLU, EPIC, and IACPvii, along with AUVSI – the industry trade associationviii -- and academicsix responded to our request to submit their suggestions for state privacy legislation to an independent law firm, Cadwalader, Wickersham & Taft LLPx.[xi] Their submissions can be seen at www.Aerostates.org/privacy. After deliberation, ASA, ASG, and NCSL provide the following considerations:

1. Warrants: A warrant should be required for government surveillance of an individual or their property where the individual is specifically targeted for surveillance in advance without their permission. All other observation activities should not require a warrant, to the extent allowed under Supreme Court rulings.[xii] Additionally, if there is not a specific person identified for surveillance in advance it is generally not possible to obtain a warrant. Requiring one would eliminate UAS benefits.

2. Information collected for commercial use should not be used for law enforcement purposes, without a warrant.
3. Commercial UAS and model aircraft flights should not track specific individuals without their consent.
4. No weapons should be permitted to be carried by any UAS.
5. Any images recorded during a civil or commercial UAS flight must be time- and date-stamped and show relevant GPS designations. If retained, these records must be corroborated with flight records for the UAS, show the purpose of the information collection, and be available for public viewing on request.
6. States should endorse The International Association of Chiefs of Police (IACP) "Recommended Guidelines for the use of Unmanned Aircraft"[xiii]. These guidelines define UAS and provide guidance for community engagement, system requirements, operational procedures, and image retention for UAS operations by law enforcement organizations.
7. Commercial UAS must be operated according to FAA safety and air traffic regulations[xiv] and in a manner not to present a nuisance to people or property.

End Notes

[i] Economic Impact of Unmanned Aircraft Systems in the United States, March 2013, http://qzprod.files.wordpress.com/2013/03/econ_report_full2.pdf.

[ii] The Federal Aviation Administration regulates all civil airspace, vehicles, and operators within the U.S. for safety and efficient airspace use through federal preemption. UAS safety regulations are being developed by the FAA. Until such regulations are in place, civil UAS operations must be specifically approved by the FAA. Government operations must comply with civil air traffic control directives. A lack of FAA permissive regulation and state prohibitions of UAS use delay integration of UAS into the aviation system and adversely affect America's global competitiveness in the development of this industry.

iii The crucial inquiry for Fourth Amendment protection is whether a person has a reasonable expectation of privacy that society is prepared to recognize. Courts have found that individuals may have a Fourth Amendment right against the unreasonable search and seizure of the area surrounding a house, referred to as the "curtilage." The Supreme Court has found that aerial surveillance over private property does not violate the Fourth Amendment if conducted by an aircraft in legally navigable airspace. However, this holding might not apply to UAVs and their unique capabilities, and arguably remains an open question.

[iv] ASA is a bipartisan organization that represents the grass roots of American aerospace. It is a 501(c)(3) scientific and educational organization of lieutenant governors, governor-appointed delegates, and associate members from industry and academia. ASA was formed to promote a state-based perspective in federal aerospace policy development and to support education outreach and economic development opportunities.

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[v] Founded in 1933, The Council of State Governments is our nation's only organization serving all three branches of state government. CSG is a region-based forum that fosters the exchange of insights and ideas to help state officials shape public policy. This offers unparalleled regional, national and international opportunities to network, develop leaders, collaborate and create problem-solving partnerships.

[vi] The National Conference of State Legislatures is a bipartisan organization that serves the legislators and staffs of the nation's 50 states, its commonwealths and territories. NCSL provides research, technical assistance and opportunities for policymakers to exchange ideas on the most pressing state issues. NCSL is an effective and respected advocate for the interests of state governments before Congress and federal agencies.

[vii] In response to our request for information, papers were received from the Airborne Law Enforcement Association (including and referencing the guidelines from the International Association of Chiefs of Police Aviation Committee), the American Civil Liberties Union, the American Legislative Exchange Council, the Electronic Frontier Foundation, the Electronic Privacy Information Center and the National Association of Criminal Defense Lawyers. In addition, the State of Alaska Department of Law provided legal analysis.

[viii] The Association for Unmanned Vehicle Systems International is the world's largest non-profit organization devoted exclusively to advancing the unmanned systems and robotics community. Serving more than 7,500 members from government organizations, industry and academia, AUVSI is committed to fostering, developing, and promoting unmanned systems and robotic technologies. AUVSI members support defense, civil and commercial sectors.

[ix] Douglas Marshall, New Mexico State University, and Paul Voss, Smith College responded to our requests.

[x] Cadwalader, Wickersham & Taft LLP (www.cadwalader.com), established in 1792, is one of the world's leading international law firms, with offices in New York, Washington, D.C., Charlotte, Houston, London, Hong Kong, Beijing and Brussels. Cadwalader has provided pro bono legal services to ASA for over 20 years.

[xi] Our review also included the Congressional Research Service's report "Integration of Drones into Domestic Airspace: Selected Legal Issues, April 4, 2013 and Office of Civil Rights and Civil Liberties, U.S. Department of Homeland Security September 14, 2012 Memorandum for the Secretary.

[xii] Under current law any aircraft can photograph anything outside a home or building. While the surveillance capabilities of UAS are not significantly different

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from other surveillance means, we believe that it is prudent to require a warrant for surveillance of a person specifically targeted because of the unique characteristics of UAS.

[xiii] http://www.theiacp.org/portals/0/pdfs/IACP_UAGuidelines.pdf

[xiv] Code of Federal RegulationsTitle14, as amended.

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Proposal for American Legislative Exchange Council (ALEC)
Unmanned Aerial Vehicle Proposal

Program Objective

The objective of ALEC's Unmanned Aerial Vehicle (UAV) program is to educate our policy makers about the issues surrounding the use of UAVs for domestic purposes. We will inform our state legislator members about considered uses for UAVs in law enforcement, border control, firefighting, search and rescue operations and myriad other uses. We will explore the privacy issues involved and would like to present our members a balanced overview of the topic that addresses some of the misconceptions about UAV capabilities and the benefits of UAV use in the domestic sphere.

Situational Overview

State legislatures are rapidly enacting legislation on domestic UAV use without a complete understanding of the issues involved. As of this writing, 35 states had considered or were considering legislation, including Virginia which passed legislation restricting the use of UAVs, including a two-year moratorium on using UAVs except in university research and search and rescue missions.

State legislators are concerned that UAV surveillance could threaten the civil liberties, especially the privacy of their constituents, so the trend in the legislatures is to err on the side of highly restrictive regulations. Unfortunately, these restrictions might ultimately prevent civilian institutions from taking advantage of UAVs as a cost-effective tool to perform their duties more efficiently during a time of shrinking state budgets. In many cases, ALEC legislators are spearheading these restrictive policies, often due to an incomplete understanding of the issues involved and UAV capabilities.

If misconceptions are not corrected in the immediate future, misguided policy will continue to proliferate throughout state legislatures, and this policy is likely to inform future *national* policy on the domestic use of UAVs. As appropriate UAV implementation could help states meet their public safety objectives in a fiscally responsible way, we would like to see the issues surrounding their use explored in a complete and objective manner.

Program Description

A two-pronged approach would be the most effective way to deal with the issue.

ALEC International Relations Task Force (IRTF) Membership

Model policy on the domestic use of UAVs falls under the jurisdiction of ALEC's International Relations Task Force/National Security Subcommittee, and we anticipate that the task force will consider such policy in the very near future. Issues that capture our members' attention the way this one has are generally brought to ALEC. ALEC task force membership would afford the member

the opportunity to participate in the discussions on the model policy and to inform and enrich the debate. The IRTF is relatively small (well over 100 legislators and 6 private sector members) and has the flexibility to consider and vote on model policy for domestic UAV use rapidly. If this policy is passed within the task force and approved by ALEC's Legislative Board of Directors, it becomes official ALEC model policy and can be accessed by all of our state legislators. Other issues that the task force has explored and continues to discuss include Sequestration, Civilian/Commercial Applications for NASA Research, Sustainable Energy Best Practices in the Military and Overseas, H1B visa expansion, Earth Observation, Expanding the Commercial Marketplace for Space Launches, etc.

The issue of our bimonthly magazine *Inside ALEC* that will be distributed at our Annual Meeting in August 2013 in Chicago will focus on International and Energy issues. An article on domestic uses for UAVs would be a welcome addition to the magazine and would automatically be distributed to those in attendance at the meeting – roughly 1,000 state legislators as well as 1,000 policy and business leaders from across the country. Such distribution would give the issue a deserved spotlight. An article in ALEC's blog, *The American Legislator*, could appear before the Annual Meeting.

UAV Educational Sponsorship Opportunity at ALEC Spring Task Force Summit
ALEC's Communications and Technology Task Force will host a panel discussion/lunch to explore the domestic uses of UAVs at ALEC's Spring Task Force Summit on May 3 in Oklahoma City, OK. We expect 30-40 state legislators to attend. Two speakers who favor more restrictions on the use of UAVs have already been confirmed – Jim Harper a noted privacy expert from the Cato Institute and Ryan Kiesel a noted privacy advocate from the American Civil Liberties Union (ACLU). Both will thoroughly cover the privacy challenges UAV technology poses. This will be our members' first exposure to this issue at an ALEC event, and ALEC wants to ensure that we approach the issue in a balanced fashion. We will have presenters who will emphasize some of the benefits of the domestic uses of UAVs, and the sponsor would be able to select two presenters that would offer this point of view. We would also ask the additional panelists to address the general aviation challenges facing domestic UAVs. We would provide travel expenses for four additional ALEC public sector members from the International Relations Task Force to attend and/or moderate the panel from select states currently considering UAV policy.

Annual Meeting Workshop Sponsorship
This year's Annual Meeting will take place in Chicago, IL August 7-10, 2013 where we expect roughly 2,000 state legislators, policy experts and business leaders to be in attendance. Workshops are panel discussions open to all attendees at our Annual Meeting, and we are confident that a panel discussion on the domestic uses of UAVs would be exceedingly popular. We also have workshop sponsorships at our States and Nation Policy Summit in early December 2013 which generally has attendance of 700-800 state legislators, policy experts and business leaders.

Additional Thoughts
This is a timely issue where our members need a better understanding to make informed decisions. However, this topic is also an excellent opportunity to introduce the concept of civilian applications for products that were originally intended for military and/or space applications and to highlight the critical role that public private partnerships in research play in innovation and economic growth.

May 30, 2013

Bob Davis
Cadwalader
700 6th Street, NW, Suite 300
Washington, DC 20001

Dear Mr. Davis:

On behalf of the American Civil Liberties Union (ACLU), a non-partisan organization with more than a half million members, countless additional activists and supporters, and fifty-three affiliates nationwide, we appreciate the opportunity to comment on the privacy and civil liberties implications of domestic use of unmanned aircraft systems (UAS), also known as drones, and to recommend new protections for use of the technology.

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Like any powerful surveillance tool, UAS have the potential to be used for good or ill. With implementation of good privacy ground rules, we can enjoy the benefits of this technology without bringing our country closer to a "surveillance society" in which every move is monitored, tracked, recorded, and scrutinized by the authorities.

UAS share some characteristics with manned aerial surveillance, such as planes and helicopters, but their threat to privacy is substantially greater in both scope and volume. Manned aircraft are expensive to purchase, operate, and maintain. They require trained pilots and ground crews and must land in order for pilots to rest. The expense both in dollars and in staffing has always imposed a natural limit on the government's aerial surveillance capacity. UAS's low cost and flexibility erode that natural limit. As technology improves, small, hovering devices will be able to explore hidden spaces, peer in windows, or even, potentially, enter homes, and large static blimps will enable continuous, long-term monitoring – all for much less than the cost of a helicopter or plane.

In our society, it is a core principle that the government does not collect information about individuals' innocent activities just in case they do something wrong. But UAS threaten to turn that principle on its head. What would be the effect on our society if everyone felt the keen eye of the government at all times? Psychologists have repeatedly found that people who are being observed tend to behave differently than when they are not being watched. This effect is so great that a recent study found that "merely hanging up posters of staring human eyes is enough to significantly change people's behavior."[1] There is a real danger that, if faced with the prospect of unregulated UAS, people will change how they behave in public – whether at a political rally or in their own backyards.

[1] Sander van der Linden, "How the Illusion of Being Observed Can Make You a Better Person," Scientific American, May 3, 2011, online at http://www.scientificamerican.com/article.cfm?id=how-the-illusion-of-being-observed-can-make-you-better-person; M. Ryan Calo, "People Can Be So Fake: A New Dimension to Privacy and Technology Scholarship," 114 Penn St. L. Rev. 809, online at http://www.pennstatelawreview.org/articles/114/114%20Penn%20St.%20L.%20Rev.%20809.pdf.

UAS may also suffer from the problems we've seen with video surveillance – voyeurism,[2] racial profiling by operators,[3] and automated law enforcement.[4]

The Supreme Court has not yet had occasion to consider whether the Fourth Amendment places limits on government use of UAS. However, it has allowed some warrantless aerial surveillance from *manned* aircraft. Most notably, in the 1986 decision *California v. Ciraolo*, the Court ruled that there was no intrusion into Ciraolo's privacy when police borrowed an airplane, flew it over his backyard and spotted marijuana plants growing there, because "[a]ny member of the public flying in this airspace who glanced down could have seen everything that these officers observed."[5]

Nonetheless, because of their potential for pervasive use and their capacity for revealing far more than the naked eye, there are good reasons to believe that UAS may implicate Fourth Amendment rights in ways that manned flights do not. In both *Dow Chemical Co. v. United States*[6] and *Kyllo v. United States*,[7] the Supreme Court suggested that using sophisticated technology not generally available to the public may be considered a search under the Fourth Amendment.

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Further, the Supreme Court has suggested that the continuous use of a surveillance technology may heighten Fourth Amendment concerns. In *United States v. Knotts*, although the Court concluded that the use of the beeper in that case did not violate the Fourth Amendment, it held that if "such dragnet type law enforcement practices" as "twenty-four hour surveillance of any citizen of this country" ever arose, it would determine if different constitutional principles would be applicable.[8] Similarly, in *United States v. Jones*, five justices agreed (in two concurrences) that when the government engages in prolonged location tracking, it conducts a search under the Fourth Amendment.[9] While this decision may eventually play a role in regulating drone usage, the technology is moving far more rapidly than our jurisprudence, and it is critical that state legislatures act to protect their constituents' privacy.

State legislation should reflect the following key principles:

First, no one should be spied upon unless the government believes that person has committed a crime. Drone use over private property should occur only with a search warrant based on probable cause – the same standard used to search someone's house or business. It might be permissible to monitor individuals in public at a lower standard – perhaps reasonable suspicion – but the key is to prevent mass, suspicionless searches of

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[2] "Did NYPD Cameras Invade A Couple's Privacy?" WCBS-TV report, Feb. 24, 2005, video no longer available online; Jim Dwyer, "Police Video Caught a Couple's Intimate Moment on a Manhattan Rooftop," *New York Times*, Dec. 22, 2005, online at http://www.nytimes.com/2005/12/22/nyregion/22rooftop.html.
[3] Clive Norris and Gary Armstrong, "The Unforgiving Eye: CCTV Surveillance in Public Spaces," Centre for Criminology and Criminal Justice at Hull University, 1997.
[4] Danielle Keats Citron, "Technological Due Process," 85 Washington University Law Review 1249 (2008), online at http://lawreview.wustl.edu/inprint/85/6/Citron.pdf.
[5] 476 U.S. 207 (1986).
[6] 476 U.S. 227 (1986).
[7] 533 U.S. 27 (2001).
[8] 460 U.S. 276, 283-84 (1983).
[9] 132 S. Ct. at 964 (Alito, J., concurring in judgment), 955 (Sotomayor, J., concurring).

the general population, including for intelligence gathering. Exceptions to this rule should be limited to emergencies connected to life and safety or narrowly drawn administrative exceptions in order to prevent pretextual use of drones.

Additionally, while the Constitution may permit UAS surveillance of public spaces on less than a probable cause standard, the vast majority of the 96 different drone bills being considered in 43 states this legislative session[10] require law enforcement to get a probable cause warrant before using a drone in an investigation, whether that investigation occurs in private or public space, a good indicator that a warrant requirement for drone use is both workable and palatable. Already, warrant requirements have been enacted in Florida,[11] Idaho,[12] Montana,[13] and Tennessee.[14]

Second, images of identifiable individuals captured by law enforcement UAS should not be retained or shared unless they are of the target of the investigation that justified drone deployment, and there is reasonable suspicion that the images contain evidence of criminal activity or are relevant to an ongoing investigation or pending criminal trial.

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Third, while drone use should be permitted for reasonable non-law enforcement purposes where privacy will not be substantially affected, such as geological inspections or environmental surveys, information collected by drones for one purpose should not be used for another purpose such as general law enforcement or enforcing administrative laws.

Fourth, drones should not carry weapons.

Finally, oversight is crucial. Communities must play a central role in deciding whether to purchase drones, and the policies and procedures for the use of UAS should be explicit and written, and should be subject to public review and comment. Similarly, like any new technology, drone use must be monitored to make sure it's a wise investment that works.

Placing reasonable limitations on law enforcement is by no means a new idea – for example, authorities may take a thermal image of someone's home only when they get a warrant – and it is imperative that we implement a system of rules to ensure that we can take advantage of UAS technology without sacrificing our privacy. If you have any questions, would like to discuss the issue further, or would like to see ACLU's model state legislation, please don't hesitate to reach out to me at abohm@aclu.org or (212) 284-7335.

Sincerely,

Allison S. Bohm, Advocacy & Policy Strategist

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[10] "States with UAS Legislation" National Conference of State Legislatures. May 29, 2013. http://www.ncsl.org/issues-research/justice/unmanned-aerial-vehicles.aspx.
[11] S.B. 92 (Fla. 2013)
[12] S.B. 1134, 62nd Legislature (Idaho 2013)
[13] S.B. 196, 63rd Legislature (Mont. 2013)
[14] S.B. 796 (Tenn. 2013)

10/23/13 Task Force Meeting: Public Testimony

<TARGET><BILL></BILL><SUBJECT>10-23-13 Task Force Meeting Public Testimony</SUBJECT><COMM>JUNM28</COMM></TARGET>

Alaska State Legislature

Representative Shelley Hughes, Co-Chair

Interim Address:
600 E Railroad Ave
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Phone: (907) 376-3725

Senator Donny Olson, Co-Chair

Interim Address:
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Legislative Task Force on Unmanned Aircraft Systems

To: Members of the Legislative Task Force on Unmanned Aircraft Systems

From: Representative Shelley Hughes, Co-Chair
Senator Donny Olson, Co-Chair

Date: October 16, 2013

Re: Meeting Announcement for October 24, 2013 - UPDATE

The Legislative Task Force on Unmanned Aircraft Systems is soliciting public testimony from businesses interested in the UAS industry in Alaska on Wednesday, October 23, 2013 at the Anchorage Legislative Information Office, 716 W 4th, Suite 220, Anchorage or by calling 855-463-5009. Testifiers must be scheduled in order to provide comments. Testifiers must schedule with Ginger Blaisdell by calling 907-465-5265 or emailing ginger.blaisdell@akleg.gov.

The Legislative Task Force on Unmanned Aircraft Systems will meet on Thursday, October 24, 2013 at the Anchorage Legislative Information Office, 716 W 4th, Suite 220, Anchorage.

The Task Force will meet from 8:30am – 11:30am, followed by public testimony beginning at 1:30pm and ending at 4:30pm.

Public testimony may be received telephonically by calling 855-463-5009.

Task force documents will be posted on BASIS.

Please feel free to contact the Task Force aide, Ginger Blaisdell at 465-5265 with questions.

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Wednesday, October 16, 2013 10:24 AM
To: Com Kemp; Com Masters; Connie McKenzie; David Scott; General Katkus; Ginger Blaisdell; Greg Walker; Howell, Kelly A (DPS) (kelly.howell@alaska.gov); Lt. Steve Adams; McHugh Pierre; Pat Purcell; Rep. Shelley Hughes; Ro Bailey; Sen. Donny Olson; Steve Colligan - Model Aeronautics; Steve Strait (steve@straitmedia.us)
Subject: October 23 and 24 meeting update and schedule
Attachments: October 23 public testimony UAS.docx; Task Force public meeting October 24 UPDATE.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Rep Hughes will host a day of invited testimony from those interested in UAS business in Alaska – task force members are invited to attend or call in to listen to testimony during the day. Please feel free to distribute this flyer to anyone you think may be interested in testifying on Wednesday and invite individuals to also call in on Thursday afternoon for open public testimony.

Wednesday, Oct 23
8:00am – 5:00pm
Anchorage LIO room 220
Or call 855-463-5009
This will be scheduled testimony only (see attached announcement – this announcement will be emailed tonight to more than 500 who have expressed interest in UAS in Alaska)

Thursday, Oct 24
8:30am – 5:00pm
Anchorage LIO room 220
Teleconference lines will be open all day 855-463-5099
Task Force Meeting schedule:

8:30-10:00am Greg Walker, Ro Bailey (possible Harry Keiling DOI and Jay Skaggs FAA)
"Overview of FAA Guidelines"
10:00-10:30am Privacy concerns presentation and discussion
10:30-11:30am discussion of points to consider from Oct 2 meeting minutes
Discussion may cause us to continue into the lunch hour
Lunch 11:30a-1:30p
1:30pm-4:30pm public testimony
4:30 – 5:00pm closing remarks and next steps

Ginger

Office of Representative Shelley Hughes
Capital Building Room 409
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

Legislative Task Force on Unmanned Aircraft Systems
Public meeting October 23 and 24, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Due to the cancellation of the Unmanned Aircraft Interest Group Annual Meeting, Representative Hughes is soliciting conversations from businesses interested in unmanned aircraft systems (UAS) and related industries.

Representative Hughes will schedule testimony for individuals originally planning on attending the UAS Interest Group Annual Meeting and others interested in conducting UAS related business in Alaska. The testimony will be taken on Wednesday, October 23 beginning at 8:00am and ending by 5:00pm. Depending on response from this announcement, each testifier will be given 10-15 minutes. Scheduled testimony time slots will be assigned by first-come, first-serve.

Additionally, the Legislative Task force on Unmanned Aircraft Systems is holding a meeting from 8:30am – 11:30am Thursday, October 24, and is requesting open public testimony from 1:30pm – 4:30pm that same day.

You can attend in person or call on the toll free number 855-463-5009. This information will be consolidated and provided to the entire Legislative Task Force on Unmanned Aircraft Systems for their consideration when drafting legislation. Please call 907-376-3725 to schedule a time to testify on Wednesday. You may call the toll free number to listen at any time during the day. When testifying, you will be asked to provide the following:

Your name
Business name
Contact information
Business category: technology, manufacturing, flight operations, other
Business client: private business, government sub-contractor

As a suggestion for organized testimony and because time may be short for each business, you may be asked the following as it pertains to your business use:

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

The Legislative Task Force on Unmanned Aircraft Systems is holding a meeting from 8:30am – 11:30am Thursday, October 24 and is requesting public testimony from 1:30pm – 4:30pm that same day.

Anyone not able to participate in any public comment period listed above is invited to send their remarks in writing to Representative Hughes, 600 E Railroad Ave, Wasilla, AK 99654 or email representative.shelley.hughes@akleg.gov.

Any questions regarding this announcement, please contact ginger.blaisdell@akleg.gov or call 907-376-3725.

Ginger Blaisdell

From: Apache <apache@wwwjnu02.legis.state.ak.us>
Sent: Wednesday, October 16, 2013 10:00 AM
To: LIO Juneau; Ginger Blaisdell
Subject: Teleconference Order Form

Meeting: existing

Sponsor and/or Committee Name: Task Force on Unmanned Aircraft Systems

Date of Teleconference: October 23

Start Time: 8:00am

End Time: 5:00pm

Chairing Site: Anchorage LIO

Juneau Room:

Bill Information:

Streamed to akl.tv: no

Executive Session: no

Contact Person: Ginger Blaisdell

Telephone Number: 465-5265

Email Address: ginger.blaisdell@akleg.gov

LIO Sites:

May other LIO's add: yes

Offnet Name(s):

October 23 is an additional day of public testimony regarding unmanned aircraft systems. this day will be testimony only - some people may attend in person, many will call in to listen or testify

Other Information:

The teleconference needs for Oct 24 remain the same as scheduled. the meeting is now 2 days when in Anchorage: Ginger can be contacted at 321-4197

Unmanned Aircraft Systems Legislative Task Force

Summarized Minutes of the October 23 and 24, 2013 meeting

Task Force Members in Attendance:

- Representative Shelley Hughes, Co-Chair
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- Greg Walker, Director of UAF ACUASI
- Ro Bailey, Deputy Director of UAF ACUASI
- Mike O'Hare, Director of Homeland Security, DMVA

Committee Staff

- Ginger Blaisdell, Staff to Rep. Hughes

Guest Attendees

- Howard Martin, FAA
- Kathleen Strasbaugh, Legislative Legal Services

Meeting Summary:

I. Welcome and Introductions — Representative Shelley Hughes

Task Force responsibilities per HCR6

The duties of the task force shall include (1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems; (2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and (3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature.

Wednesday, October 23, 2013

Public Testimony Summary of Comments and Recommendations to Task Force

Ben Geilow AUVSI

- Safety and privacy are important so that people trust this market.

    - Code of conduct
    - Endorsed IACP – approved by the ACLU
- 4th Amendment already provides protection of citizens
- Transparency and accountability by UAS users

Brian Whiteside Cascade Chapter AUVSI (Oregon)

- Integrate technology in an exciting and responsible way
- Considerations for data retention
- "gold rush" in Alaska because lower 48 is approaching UAS in a restrictive way

Mark Stigar, MPI Alaska, Wasilla

- How to control the information?

Tyler Hawker/Chris Barton,

- These technologies are in their infancy – prepare for change
- Develop safe operating procedures:
    - Aircraft certification and qualification (not overreaching and cost prohibitive)
    - Pilot certification and qualification (how to be safe without over doing)
    - Environmental and population considerations (integration into population)
    - Test site range cooperation between states – fear of fragmentation of range operations and unify safety protocols
    - Weather considerations – follow the same criteria as manned aircraft, visual flight rules
- How to transition from hobby to commercial use - training and education
- Pilot certification and training to include ground school at a minimum plus software training, safety documentation and pilot log records
- Definitions:
    - Range
    - UAV
    - Flyable condition
    - Data retention schedule
    - Range operations and coordination – who do I report to? Who notifies FAA?
    - Payload requirements

John Parker

- Need balance between: Public's right to know and Public's right to privacy

Ben Miller, Mesa County Sherriff's office

- What we are / are not going to do
- What is legal jurisdiction – search and seizure laws
- Talk to public constantly about UAS activities

Al Palmer, UND

- North Dakota Governor created the Airspace Integration Team made up of stakeholders in UAS operations that was tasked to educate citizens across NorthDakota
- Research Compliance Committee:
    - 19 members that determined what tasks would be acceptable uses for UAS (crime scene, search and rescue, search for major crime suspects...)
    - Committee determined how long to keep data
- Post signs when using UAS and reverse 911

Steve Wackowski

- Definitions:
    - Autonomous
    - Command control
    - What if you lose a link

Adam White, AK Airmen's Assoc

- Doesn't want the FAA shutting down airports for UAS operations

Thursday, October 24, 2013

Call to Order and Welcome from Co-Chair Hughes

N-8900 Overview of FAA Unmanned Aircraft Systems Operational Approval

Greg Walker and Ro Bailey: Overview of the FAA operations guidelines for use of UAS Operations

Law Enforcement Review

Lt. Steve Adams, Alaska State Troopers: Law Enforcement Use and How to Enforce UAS Operations; Overview of IACP Guidelines

Discussion regarding items to be considered for Committee action

The Task Force would like a draft bill at the next meeting and will consider supporting documents and a Task Force Executive Summary as the required report to the legislature January 15, 2014.

1. **Public Privacy: Legal Services Memo regarding Alaska Laws Protecting Privacy**
    a. It was determined by the task force that the State of Alaska has sufficient privacy protection in the constitution and statute. Every scenario that was considered in detail by the task force was determined to fall under one or more of Alaska's existing privacy laws.

b. Inadvertent capture of evidence of illegal activity was discussed at length and determined that sufficient statute, operational protocol, and court findings provide direction to law enforcement on how to appropriately use (or not use) inadvertently captured data.

2. **Observations from Above: Harvard recommendations for consideration into law**
    a. How to draft language that does not affect the rapid changes in technology – the task force believes that most technology changes can be managed under existing laws
    b. Should flight hours be a consideration for use? Task force recommendation was that placing a limitation on flight hours would not be in our best interest.
    c. Should the task force recommend adoption voluntary approaches of self-managed rules of UAS? The task force would like to adopt the International Association of Chiefs of Police aviation committee recommended guidelines for UAS. The task force is continuing to review the AUVSI and Academy of Model Aeronautics guidelines.
3. **Suggestions for legislation:**
    a. Is the approach from the committee to restrict all use and provide for exemptions in statute (like Texas) or to allow all use and restrict where it is deemed necessary? Task force recommendation is to allow all use and restrict only when necessary.
    b. Task force discussed that no areas of federal preemption would be crossed with regard to flights in FAA national airspace and safety guidelines. No specific recommendation for training requirements of UAS pilots was decided on.
4. **Aerospace State Association:**
    a. The task force considered audits of UAS operators and missions and has not recommendations for management of UAS operations at this time.
    b. No blanket prohibitions for use by law enforcement were recommended.
    c. High visibility marking of UAS for law enforcement was considered to be a good idea.
    d. UAS privacy considerations were discussed by the task force including
        i. warrants (no change recommended)
        ii. data concerns (data retention is managed in Article IV statutes – no change recommended)
        iii. individual consent (no change recommended)
        iv. weapons (no change recommended, FAA already prohibits weaponized UAS)
        v. endorsing professional guidelines (IACP)
        vi. emphasize FAA regulations
5. **Recommendations to consider in draft legislation**
    a. Encourage education provisions to train UAS pilots by the University of Alaska
    b. Specialized (high visibility) marking of UAS or lights so that other aircraft can see them
    c. Economic development – marketing this industry for Alaska

d. Barriers for business – insurance for private operators
e. Who is responsible for educating the public about UAS? (each agency that is using UAS will provide education to public regarding their missions)
f. Audits of UAS mission types for public use; state internal review process; sunset?
g. Include a statutory position to manage the test range(s) and UAS paperwork
h. Consideration of incentive grants to businesses looking to establish themselves in Alaska
i. Research appropriation to UAF ACUASI since original funding may be running out and Federal funding is not included in test site selection
j. Definitions – yes: definitions to be determined – please provide words to Ginger

Opened teleconference for public testimony

Closing remarks

- Ginger will summarize the meeting discussion and request draft legislation for consideration at the task force next meeting.
- Task force will meet on Tuesday, November 26 at the Wasilla LIO from 1:00PM – 4:00PM to consider the draft legislation and receive additional public testimony.

Meeting adjourned

After the meeting adjourned the following questions were received for consideration at the next meeting.

- Should the task force consider language for the use of UAS for hunting/fishing purposes? Are UAS treated the same as manned aircraft in existing laws and regulations?

- Should the task force consider language restricting UAS flights near correctional institutions?

- Should the committee adopt some of the FAA guidelines that we want to insure are adopted in Alaska in the event FAA removes those requirements: e.g.; currently FAA does not allow anything to be dropped from a UAS (maybe we can adopt that but include "without explicit exemption for a specific mission approved by test site administrator")

- Will anything be needed to bridge the gap between hobby and commercial/government UAS pilot training qualifications?

- Call Act "Innovation and Industry Act" rather than "Privacy Act"

Good morning all,

For those of you who are wondering why you are receiving an email from Representative Hughes; we were allowed to use a compiled list of individuals interested in UAS goings on in Alaska. I plan to use this distribution list to keep everyone updated periodically on the status of the Task Force meetings and legislation as it works its way through the legislative process.

Last Legislative session, the Legislative Task Force on Unmanned Aircraft Systems was established under HCR6. The Task Force has participated in two teleconference meetings this summer/fall and will convene in person on October 24, 2013 at the Anchorage Legislative Office Bldg for an all-day meeting and collection of public comment. You are invited to call in to listen to any part of the meeting or to provide public testimony on Thursday.

With the onset of the Federal government furlough, the UAS Interest Group Annual Meeting was cancelled for October 22-23, however, the Task Force would appreciate hearing from those involved in the business of UAS to better understand the industry as we begin to draft legislation to be introduced this January. It is important that we understand what obstacles you may have conducting business in Alaska, any privacy concerns, restrictions for use of UAS, or broadening of authority to operate UAS in Alaska. We appreciate your remarks to make the best policy for Alaska and the industry.

The attached flyer provides all the details to be scheduled to provide testimony on Oct 23 and 24. Please contact Ginger Blaisdell at 907-376-3725 to schedule a 10-15 minute time slot on Wednesday, October 23 to share your remarks with the Task Force. I understand there is little time to prepare and your testimony does not have to be formal. If you prefer to send your comments, suggestions, or concerns in writing, please send them to ginger.blaisdell@akleg.gov.

Documents provided to the Task Force can be found by clicking on the "folder icon" at the right side of the meeting announcement in the legislative information system. Please click on this link to view the documents and minutes from the latest Task Force meeting.

http://www.legis.state.ak.us/basis/get_hearing.asp?session=28&Chamb=B&Date1=10%2F23%2F2013&Date2=10%2F24%2F2013&Comty=&Root=&Sel=1&Button=Display

If you no longer want to receive emails from my office, please reply "REMOVE FROM LIST". Your name will NOT be removed from any other UAS related list.

I look forward to hearing from you,

Shelley Hughes

Representative
Alaska State Legislature

House District 8 Greater Palmer

600 East Railroad Avenue

Wasilla, Alaska 99654

(907) 376-3725

1-800-565-3743

DRAFT Alaska UAS Workshop Agenda for 2013

DAY One:

0900 - 0915

A. Welcoming remarks
B. Harry opens meeting with welcome and administrative remarks
    a. Welcome keynote speaker

0915 - 0945

C. Opening remarks by Senator Begich or Senator Murkowski

0945 - 1030

D. ACUASI (Greg and Marty) Would like Bob McCoy to introduce
    a. Charter
    b. Vision
    c. Structure
    d. State benefit
        i. State governments
        ii. Commercial users
        iii. Civil users
    e. National Benefit

1030 – 1100
MORNING BREAK

1100 – 1230

E. FAA Test Site (Ro, Tim and Leonard)
    a. Basics of Proposal Requirements
    b. Overview of the Test Site structure and its operating principals
    c. Overview of Airspace
    d. Overview of Partners
        i. How Partners contributed to Proposal Requirements
    e. State Contributions (unique distinctions that each state brings)
        i. Unique Alaska Distinctions
        ii. Unique Oregon Distinctions
        iii. Unique Hawaii Distinctions
        iv. Combined Distinctions that set the PPUTRC apart
    f. Other Test Site Contenders

1230 -1330
LUNCH

1330 – 1500

F. New FAA guidance (FAA UAS Program Office)
    a. Update from FAA UAS Program Office
        i. Update on Public Law 112-95, Section 332D

ii. Other updates
b. 8900.277 (FAA)
i. COA Requirements
ii. SMS (Appendix D)
iii. The process by which State agencies and commercial/civil entities might be allowed to get a COA thru UAF
iv. Users perspective of 8900.277

1500 – 1530
AFTERNOON BREAK

1530 - 1630
G. Restricted Category Discussion (FAA)
H. Civil versus Public authorization process, and operations (FAA Alaska)

1630 – 1700
Day One Wrap-up (Harry and Greg)

1830 till 2200
POTLUCK at Jay Skaggs house

DAY Two: (All operations and Activities (planned) in Alaska and Arctic)

0830 - 0845
A. Welcoming remarks: Jay welcomes and opens day two with further administrative remarks

0845 – 0945 (This should be all the other Universities plus UAF presenting)
B. Arctic focused UAS Work Conducted by Educational Institutions
a. Science Work
i. List Universities
1. UND
2. NMSU
3. UAA program
4. Kansas State
5. Others??
b. Certification of Aircraft, Ancillary Equipment and/or Personnel
i. List Universities
1. UND
2. NMSU
3. UAF Community College (need to verify)
4. UAA program
5. Others??
c. UAA Aviation School contribution

d. UAF Engineering School contribution
e. Training of Personnel
    i. List Universities
        1. UND
        2. Others??
f. SMS
    i. List Universities
        1. UND
        2. NMSU
        3. UAA program
        4. Kansas State
        5. Others??

0945 - 1030

g. Operational Work
    i. List Universities
        1. UAF
        2. University of Colorado
        3. Kansas State

1030 – 1100
MORNING BREAK

1100 – 1230 (This may be too much for 1.5 hours)

C. Recent Activities with UAS in Alaska
    a. MIZOPEX with NASA, University of Colorado, UAF (NASA and NASA)
    b. Oil Industry—Why UAS in the Arctic is Important
        i. Conoco Phillips
        ii. ENI
        iii. BP
        iv. Alaska Clean Seas
    c. USCG
        i. Healy operations
        ii. Kodiak operations
    d. NOAA
    e. Other Companies
        i. AeroVironment
        ii. Insitiu
    f. Law Enforcement
    g. Search and Rescue
    h. Alaska State Emergency Management Center (Fusion Center) (SSgt Campbell)
    i. Military update
        i. Army
        ii. USAF

1230 – 1330

LUNCH

1330 - 1415

D. Other UAS Users

- **a. Resolution**
- **b. Alaska UVS**
- **c. Alaska Photos**
- **d. Alaska Aerospace**
- **e. Aerovironment**

1415 - 1445

E. Privacy discussion

1445 – 1515
AFTERNOON BREAK

1515 - 1600

F. Aviation Insurance and Liability Requirements

- a. USAIG UNITED STATES AIRCRAFT INSURANCE GROUP—UAS Insurance
- b. Crowell Group—Aviation Law with respect to Insurance and Liablity

~~F.~~

1600 - 1700

G. Meeting Review & Closing Remarks (Harry Kieling & Greg Walker)

- **a. What Have We Found Out During the Workshop?**
- **b. What Have We Learned?**
- **c. What are the Holes for Expanding UAS use in Alaska?**
- **d. How will the work being done by the FAA (PL 112-95) be used to proliferate UAS use in Alaska and what does industry need to bring to bear to help in this endeavor?**
- **e. What Topics Deserve Further Discussion?**
- **f. How Should We Proceed with These Issues?**
- **g. When Should We Meet Again?**

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Legislative Task Force on Unmanned Aircraft Systems
Industry Tetimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK
toll free bridge: 855-463-5009

Time	Testifier's Name	Business Name
8:00		
8:15		
8:30	Ben Gielow	AUVSI - Wash DC
8:45	Ben Gielow	
9:00	Brian Whiteside	Vdocs LLC Oregon, Fairweather AK, Cascade Chapter VP AUVSI
9:15	Erik Johnson	AK Air National Guard
9:30	Mark Stigar	Mpi Alaska, Wasilla
9:45		
10:00	Tyler Hawker	UMS3 - Denver/Colorado Springs
10:15	Tyler Hawker	
10:30		
10:45	John Parker	Integrated Robotics Imaging Systems, Kenai
11:00	~~Jason Mansour~~	~~NOAA Fisheries, Florida~~ Ben Miller
11:15	Al Palmer/Mike Corcoran	UND 701-777-5061
11:30		
11:45	lunch break	
12:00	lunch break	
12:15	lunch break	
12:30	lunch break	
12:45		
1:00	Steve Wackowski	Fairweather Science
1:15		
1:30	Barbara Johnson	Fairbanks N Star Borough Econ Dev
1:45	Greg Walker/Ro Bailey	University of Alaska Fairbanks
2:00		
2:15		
2:30	~~open testimony~~ ADAM WHITE - AK AIRMEN ASSOC.	907-322-1098
2:45		
3:00		
3:15		
3:30		
3:45		
4:00		
4:15		

Airspace Integration Team
UND
educate the
- public
- univ.
- business
- military

970-420-6812

Mesa County Sherrif
4th Amd
search & seizure
disruptions.

adam.white@alaskaairmen.org

Legislative Task Force on Unmanned Aircraft Systems
Industry Tetimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK
855-463-5009

Time	Testifier's Name	Business Name	Contact Info
8:00			
8:15			
8:30	Ben Gielow	AUVSI WashDC	703-845-9671
8:45 ↓			
9:00	Brian Whiteside	Vdocs LLC Oregon, Fairweather AK, Cascade Chapter VP AUVSI	971-237-9698
9:15	Erik Johnson	AK Air Nat'l Guard	907.242.4489
9:30	Mark Stigar	Mpi Alaska, Wasilla	907-373-8444
9:45			
10:00	Tyler Hawker	UMS 3 Denver, Colorado Springs	970-420-6812
10:15		reconned in Colo. legislature	
10:30			
10:45	John Parker	Integrated Robotics Imaging Systems, Kenai	907-283-4223
	Ben Miller	Mesa County Colorado	970-244-1899
11:00	~~Jason Mansour~~	~~NOAA Fisheries, Florida~~	~~813-828-3310 xt3121~~
11:15	~~Jen Haney~~	~~Peak 3 Inc~~	~~907-903-7334~~
11:30	Al Palmer / Mike Corcoran	UND	
11:45			
12:00			
12:15			
12:30			
12:45			
1:00	Steve Wackowski	Fairweather Science	907-306-8007
1:15			
1:30	Barbara Johnson	Palmer	
1:45	UAF	RO & Aviation	
2:00 ↓			
2:15			
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3:45			
4:00			
4:15			

Michael Hurley Conoco Phillips 265-6313

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 8:15am

Testifier's name

Business name Shelley's Welcome

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

- Do you have any specific recommendations that need to be included in state law to help your business?

- Are there any groups or business types that should NOT be authorized to conduct business using UAS?

- Do you have any specific recommendations that may be needed to address public privacy?

- We are open to any other comments you want to share with the Task Force.

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 8:30am

Testifier's name Ben Greilow

Business name AUVSI

Contact information

Business category: technology, manufacturing, flight operations, other Non-profit

Business client: private business, government sub-contractor 7500 members 60 countries

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

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- Do you have any specific recommendations that may be needed to address public privacy?

- We are open to any other comments you want to share with the Task Force.

Save time, money, & lives

Only those testing or public entities have been allowed by FAA to fly UAVs.

In AK, 100 new jobs $20 M
3 yrs.
10 years = $100 M & many more jobs

Safety and privacy are important so that people trust this market

- code of conduct
- endorsed IACP = approved by ACLU

4th Ammendment already provides protection us constitution
applies to all new technologies and tools for 220 yrs.

transparency and accountability

let FAA allow test site to move forward before we establish new privacy laws.

Hughes any gaps in aerial surveillance laws now?

- legislative oversight and judiciary review retain control of electronic imaging.
- we are already protected for privacy

RO - making laws before / anticipating laws rather than making laws after an offense occurs?

- could stifle new uses of technology

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 8:45am

Testifier's name Ben Grillow

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

Greg" what kinds of jobs created?

- manufacturing plus secondary and tertiary jobs
- will send info in writing

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 9:00am

Testifier's name Brian Whiteside

Business name Vdocs LLC / Fairweather AK. & cascade chapter AUVSI

Contact information 971-237-9698 Oregon

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

AUVSI Chapter meeting = 178 attendees membership is growing

- Do you have any specific recommendations that need to be included in state law to help your business?

- Are there any groups or business types that should NOT be authorized to conduct business using UAS?

- Do you have any specific recommendations that may be needed to address public privacy?

- We are open to any other comments you want to share with the Task Force.

Alaska. positive outlook is ahead of the curve
job market in Oregon = already created 120 new jobs
$120 million = 280M economic impact
in the past 7 years

Alaska has more opportunities for UAS than all USA combined

"dull-dirty-dangerous"

— the rest of the world is catching up and surpassing the USA

Commends Alaska in our efforts

- How will govt. collect and store data?
  data retention.

= integrate technology in an exciting and responsible way

= farming is huge industry potential

mapping =

"gold rush" in Alaska because lower 48 is approaching UAS in a restrictive way

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 9:15am

Testifier's name Erik Johnson

Business name

Contact information not available

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

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Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 9:30am

Testifier's name Mark Stigar

Business name Mpi alaska . wasilla

Contact information 373-8444

Aviation safety consulting business

Business category: technology, manufacturing, flight operations, other

military and helicopters.

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

- appreciates proactive approach of committee
- safety perspective:
  reduce risk of pilot jobs/accidents.
- embrace this technology

Greg" we should look at this as "what can existing aircraft do" if they were converted UAS.
= cost barriers?

— what look at industry has come down in cost? camera and video? small drone heli to do house patrol (vivint) today. almost everything in video'd.

How to control the information?

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 10:00am

Testifier's name Tyler Hawkan and Chris Barton

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

- refrain or move cautiously with legislation
  don't risk business or repeat existing laws
  == define definitions for UAS.
- privacy - plenty of laws on the books that cover UAS
- In Alaska - great potential for law enforcement, search & rescue, fires, volcanoes, climate.

Chris

- looking at UAS systems w/ weeping wings and de-icing capabilities.

- Colorado - no new laws re: UAV
  open to UAS business - working on policy / procedures

- Challenge for AK - volume of general aviation traffic

Tyler

- Some technologies are in their infancy
- develop safe operations and procedures
  1. aircraft certification & qualification = not overreaching and cost prohibitive
  2. pilot certification & qualification = how complex to be safe without overdoing
  3. environmental & population considerations.
     integration into population
  4. test site range cooperation between states
     fear of fragmentation of range operations.
     unified safety protocols.
  5. Weather considerations - follow same criteria as manned aircraft
     visual flight rules

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 10:15am

Testifier's name Chris | Tyler

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

transition from hobby to commercial use?
training and education
move from hobby to certification
↑ fee for service

Education: educate the public
benefits of UAVs

- Educating the public

- Tyler =
  pilot certification and training requirements.
  = FAA ground school (general aviation + communication with ground towers. etc. airspace
  = how to train software based systems.
  may not transfer from one platform to another

  FAA will likely put requirements on us.

- Chris =
  definitions:
  range
  UAV
  flyable condition
  data retention schedule
  range operations and coordination
  who do I report to
  who notifies FAA

  Payload requirements (how much weight can it carry)

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 10:30am

Testifier's name Tyler / Chris

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
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- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

development of sense and avoid technology?

Tyler it is developing and is getting physically smaller & more affordable

FAA will probably require it?

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 10:45am

Testifier's name John Parker

Business name Integrated Robotics Imaging Systems, Kenai

Contact information 283-4223 iris@uav-alaska.com

Business category: ~~technology~~, manufacturing, ~~flight operations, other~~ marketing, sales/service, R&D related to UAS integration into NAS

Business client: private business, government sub-contractor law enforcement, academia

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

- Do you have any specific recommendations that need to be included in state law to help your business?

- Are there any groups or business types that should NOT be authorized to conduct business using UAS?

- Do you have any specific recommendations that may be needed to address public privacy?

- We are open to any other comments you want to share with the Task Force.

gather arial data
begin operations spring 2014
patented radar for UAS
arctic batteries for UAS
"fuel cells"

- focus on ability of operator not the capability of the equipment

= Student competitions in UAS
design, operation, integration of a system

"public's right to know" vs "public's right to privacy"

Jen Haney
Peak 3

FAA is doing lots of certification guidance
8900.227
pilot type certificate requirements

Pilot certification with regard to use of operation

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 11:00am

Testifier's name Jason Mansour

Business name NOAA Fisheries, Florida

Contact information 813-828-3310 xt 3121

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

Robin Angleson
NOAA Seattle
206-526-4032

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

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- We are open to any other comments you want to share with the Task Force.

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 11:15am

Testifier's name ~~Jen Haney~~ Ben Miller Mesa County Sherrif office

Business name ~~Peak 3 Inc.~~ Colorado

Contact information ~~903-7334~~

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

- Do you have any specific recommendations that need to be included in state law to help your business?

- Are there any groups or business types that should NOT be authorized to conduct business using UAS?

- Do you have any specific recommendations that may be needed to address public privacy?

- We are open to any other comments you want to share with the Task Force.

started UAS 2008

Search and rescue using infra red technology

not interested in UAS as new capability but cost and life safety

Δ $1200/hr manned

UAS = $25/hr

fuel cost 1¢/hr

www.sheriff.mesacounty.us/UAS

"Military UAS stir the emotions"

Community reception of UAS:

community interest but not outcry of concern -
did a lot of public education
(educated first, then operations)
"Houston operated without telling them
it blew up in the media."

- What we are/are not going to do
- what is legal jurisdiction - search and seizure
- talk to public continually
"public perception"

Colorado has no specific laws re: UAS.

3D reconstruction of crime scenes
data collect = 30 minutes 1-2 cm accuracy

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 11:30am

Testifier's name Al Palmer / Mike Corcoran

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

UND/UAS 2005

mitigated privacy concerns

Gov created 2011 - airspace integration team - stakeholders in UAS operations

task to educate citizens across ND

goal to have one vision "one voice"
from all stakeholders

Law Enforcement 1st responder COA
1/4 NE North Dakota.

research compliance committee / strict federal guidelines.
template of human and wildlife research
19 members talked about UAS uses.

- Crime scene
- Search & Rescue
- search major crime suspects
-
-

through UNV.
has authority to
say yes/no on
certain missions

11:30AM
recording =

committee determined:
how long to keep data - who gets to see it

Post signs when using UAS.
reverse 911

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 1:00pm

Testifier's name Steve Wackowski

Business name Fair weather science

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)

- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)

- Do you have any specific recommendations that need to be included in state law to help your business?

- Are there any groups or business types that should NOT be authorized to conduct business using UAS?

- Do you have any specific recommendations that may be needed to address public privacy?

- We are open to any other comments you want to share with the Task Force.

definitions "~~aut~~ autonamous"

command control
what if you lose a link

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 1:15pm

Testifier's name Barbara Johnson

Business name FNSB

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

HB

AIDEA can finance any project that supports the military

tech park (military, private, univ, administration) →
"plug and play"

Public education — wanting to help facilitate

administrative support for "Plug & play"

Paperwork for flight approval

Support / project manager

Safety and/or risk acceptable

eliminate the administrative barrier

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 1:45pm

Testifier's name Univ. of Ak Fairbanks

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

Oregon is largest manufacturer

Hawaii high range flight corridor and differing weather heat & humidity

Legislative Task Force on Unmanned Aircraft Systems
Industry Testimony, October 23, 2013
Legislative Information Office Room 220
716 W 4th Ave, Anchorage, AK

Time: 2:00pm

Testifier's name Adam White AK Airmens Assoc.

Business name

Contact information

Business category: technology, manufacturing, flight operations, other

Business client: private business, government sub-contractor

- Have you received assistance or encouragement in establishing your business in Alaska? (Economic development organizations, DCCED, UAF, FAA, DOD, DOI, other?)
- Are there any business-related obstacles for conducting your line of business in Alaska? (business license, insurance, state infrastructure, trained workforce, taxes, etc.)
- Do you have any specific recommendations that need to be included in state law to help your business?
- Are there any groups or business types that should NOT be authorized to conduct business using UAS?
- Do you have any specific recommendations that may be needed to address public privacy?
- We are open to any other comments you want to share with the Task Force.

Working with military primarily

- Would like states help with COA's
  doesn't impact ~~other~~ general aviation use business in the state
- doesn't want FAA shutting down an airport for a UAS

incorporate UAS into Alaska airspace

How to best get the word out that we want to fly UAS?

- "Modem" system doesn't work.
- associations can send notices to members
- media
- issues with being in radio range for some pilots.

United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

OCT 2 3 2013

The Honorable Shelley Hughes
Representative
Alaska State Legislature
House District 8 Greater Palmer
600 East Railroad Avenue
Wasilla, Alaska 99654

Dear Representative Hughes:

The Bureau of Ocean Energy Management (BOEM) is responsible for managing exploration and development of mineral and energy resources in the Outer Continental Shelf, seaward of State boundaries. BOEM's Environmental Studies Program (ESP) supports research to collect information needed for assessment and management of potential impacts from oil and gas development and to enable BOEM to develop mitigation protocols to protect the Arctic environment and the Alaska Native subsistence way of life. The ESP has supported aerial surveys generally flying at altitudes between 1000-2000 feet to monitor distribution and movement of multiple species of marine mammals. Manned aircraft flights can be dangerous and expensive because of long transit times, hazardous weather conditions, fuel-capacity limitations and operation costs. The ESP remains interested in working with our partners to evaluate the use of UAS to help fill information gaps often unattainable from manned aircraft in remote, hazardous or sensitive areas where use of conventional aircraft may present logistical difficulties.

Since 1974, the ESP has supported large scale aerial surveys during the summer and fall to document distribution, relative abundance, and migration of marine mammals in the Beaufort Sea. This decades-long coverage provides one of the longest monitoring efforts of biological phenomenon, which is increasingly valuable during this time of changing Arctic environmental conditions. The geographic area of these aerial surveys was extended to also cover the Chukchi Sea in 2008. **As the use of Unmanned Aircraft Systems increases, it is important to ensure that protocols are developed to avoid conflicts between aerial and UAS surveys which may be proposed for the same geographic area during the same time period. We encourage this Legislative Task Force on Unmanned Aircraft Systems to address coordination with ongoing efforts as legislation is developed.**

When we submit our statement, as per the flyer for this, we have been asked to include the following, with proposed answers given in **bold**:

Your name – **Dee Williams, PhD**
Business name – **BOEM Environmental Studies Program**
Contact information – **907-334-5283; dee.williams@boem.gov**
Business category: **Government**
Business client: **Public**

Sincerely,

Sharon E. Warren
Acting Regional Director

Written Testimony

Of

Stephen J. Ingley
Executive Director
Airborne Law Enforcement Association

Before the
Legislative Task Force on Unmanned Aircraft Systems Public Meeting
State of Alaska

Good morning Representative Hughes and members of the Legislative Task Force on Unmanned Aircraft Systems. My name is Stephen Ingley and I am the executive director of the Airborne Law Enforcement Association (ALEA). ALEA is a 501(c)(3) non-profit educational membership organization, founded in 1968 to support, promote and advance the safe and effective utilization of aircraft by governmental agencies in support of public safety missions through training, networking, advocacy and educational programs. Our vision is the safe and successful completion of each airborne public safety operation. And our values are Safety, Education & Training, Networking, Public Service, Professionalism, and Ethics and Integrity. Our members operate traditional aircraft (airplanes and helicopters), alternative aircraft (light sport aircraft, gyro-copters and powered parachutes) and unmanned aircraft systems (UAS).

UAS technology has been successfully fielded by the US military in combating terrorism. As the war has drawn down, UAS manufacturers have developed more devices that are small, portable and reliable. More importantly, the manufacturers started to develop devices that were relatively inexpensive, making it conceivable that those agencies that could not afford traditional aviation assets, could afford small UAS (sUAS) technology.

Realizing the potential of this technology, in 2005, the ALEA became active in researching the feasibility of incorporating sUAS into the "toolbox" of public safety agencies. This included participating in the Federal Aviation Administration's (FAA) Proposed Rulemaking Committee for UAS, participating in the Department of Justice's, National Institute of Justice research projects for UAS, conducting UAS training for ALEA members, and working with various organizations and federal and state legislatures on UAS issues. In addition to this, the ALEA has taken the lead in public safety aviation by embracing this new technology, as we see the capabilities of UAS in enhancing the safety of our citizens and public safety employees.

It is a very common occurrence to see military operated UAS on national and local news programs. These devices are large, armed with weapons and operated in theater. Many times, articles have been written regarding the use of UAS technology by American public safety agencies, along with a photos of military grade Predators and Global Hawks. The depiction of military UAS devices within an article concerning public safety's use only heightens the fear of the public and fosters distrust. More importantly, it paints a picture that your local police or sheriff's department is going to operate Predator type UAS devices, capable of long-term, sustainable surveillance and rocket-launched weapons. This stylized hype couldn't be further from the truth.

While the military has been successful in its use of UAS technology to combat terrorism, American public safety is in its infancy in using these devices to combat crime, save lives and enhance the efficiency of agencies. Today, there are four local agencies that have FAA approval to operate UAS devices in their respective

jurisdictions. They are the Grand Forks County (North Dakota) Sheriff's Office, Mesa County (Colorado) Sheriff's Office, Arlington (Texas) Police Department and the Miami-Dade Police Department. Mesa County was the first agency to initiate utilizing UAS technology within their day-to-day operations. Being a very rural county in Colorado, this was a relatively easy process for them, as they had little impact on the national airspace and interfering with the safe operation of other aircraft. Although rural, Mesa County has pioneered the use of these devices for all agencies. What Mesa County has discovered is that these devices are not just a law enforcement tool, but also a tool for public safety generally, as well as government operations. For example, the Mesa County UAS program routinely assists its various fire agencies in responding to building fires. Their UAS devices are launched to provide fire incident commanders timely information regarding the fire that they are combating. In addition, the devices are routinely used for Search and Rescue (SAR) missions. sUAS are able to clear large areas of land (wooded and cleared) much faster than utilizing ground personnel. This permits the Mesa County rescuers to manage a SAR operation much more efficiently and enhances the chance of finding any victims much sooner by deploying search personnel smarter. Mesa County also utilized its sUAS to survey its county owned landfill for an annual land use survey. In the past, the county hired a company to conduct this survey using traditional aircraft and it cost taxpayers thousands of dollars. By using the county owned sUAS, the work was conducted for only hundreds of dollars, saving the county precious funds to allocate elsewhere.

In the province of Saskatchewan, the Royal Canadian Mounted Police, utilizing a sUAS, was recently credited with the first public safety SAR mission that directly resulted in saving someone's life.

I would like to highlight an event that occurred in Baltimore County (Maryland) recently. On May 28, 2013, a large container vehicle and a CSX freight train collided at a vehicle crossing. This incident occurred in an area that is near the city of Baltimore and in an area of mixed commercial and residential use. In addition, the incident occurred less than one half mile from Interstate 95, a major north and south thoroughfare. The incident included the explosion of a railroad car carrying hazardous materials and serious damage to commercial, government and personal property miles away. Immediately after the incident occurred, the Baltimore County Police Department launched one of their turbine engine helicopters to provide command and control support for the Baltimore County Fire Department incident commander (clearly not a law enforcement mission). The aircraft provided an "eye-in-the-sky" for the incident commander and continuously downlinked the images to the incident command post, Emergency Operations Center and within the county's intranet for police and fire commanders. Although the county used its traditional aviation resources to complete this mission, the mission could have been conducted by a sUAS at a fraction of the cost. The turbine engine aircraft costs approximately $400.00 per hour to operate, and they were on-scene for several hours with multiple aircraft. A sUAS would have only cost the agency approximately $25.00 per

hour to operate and would have provided the same aerial images to the fire and police commanders.

Of course, Mesa County and the other agencies use their sUAS for law enforcement missions as well. These missions include, but are not limited to:

- Traffic crash scene photography
- Crime scene photography (with and without the need for a search warrant)
- Command and control of major incidents
- Tactical Operations (Barricaded subjects, armed subjects, school incidents)

As much as the ALEA embraces the inclusion of new technology into the airborne public safety industry, we also embrace the rights of our citizens. The ALEA supports the professional operation of aircraft in public safety missions and expects its members to do so within the framework of the laws of this country. In fact, we routinely say that we are a "Profession within a Profession." We are both professional public safety officers and professional aviators. As such, we work tirelessly to educate our members on search and seizure laws pertaining to privacy and the use of aircraft, UAS included.

To reiterate our opening remarks submitted to the Privacy Project 2013, we "support and promote the IACP Aviation Committee's Recommended Guidelines for the use of Unmanned Aircraft and the Association for Unmanned Vehicle Systems International's (AUVSI) Unmanned Aircraft System Operations Industry 'Code of Conduct.' We do not concur with privacy advocates who claim that public safety agencies' utilization of unmanned aerial systems (UAS) poses a greater threat to 'privacy rights' than manned aviation. Similarly, we do not concur that said uses pose a greater threat to privacy 'rights' than other technologies currently utilized by public safety agencies, both in manned aircraft and on the ground. Furthermore, we do not accept that any legislation is necessary as there are long-standing court rulings upholding our Fourth Amendment protections; but we are particularly opposed to legislation that focus their attention on one technology based on fears of what could occur tomorrow, however unlikely. Aside from recent laws enacted that place outright bans on UAS use, such as that in Charlottesville, VA, many current 'anti-drone' bills appear to be more of an attempt to increase protections under the Fourth Amendment without actually altering the U.S. Constitution. The presumption in most of these pieces of legislation is that a reasonable expectation of privacy now exists in places where there has been no such expectation. As such, a warrant must be obtained before UAS can be utilized by public safety."

The ALEA believes that the Fourth Amendment of the Constitution of the United States of America is alive and well; and the protections contained therein against unreasonable searches and seizures have been supported through years of judicial opinions. We also believe in the Constitutional process of lawfully obtaining a search warrant when there are specific, articulable grounds to believe that the use

of an aircraft, UAS included, will intrude upon a reasonable expectation of privacy. However, in situations where time is of the essence and **NO** reasonable expectation of privacy exists, we would be opposed to restrictions that would limit the effectiveness of UAS.

We would encourage you to focus attention on the more basic issue at hand -- the storage, use, retention, and destruction of sensitive data; not the technology that gathers the data. Similar to law enforcement's use of Automated License Plate Readers (LPRs) and government and non-government surveillance camera's, the data captured and the use of this data is of concern to civil liberty advocates and others. As such, ALEA believes that law enforcement agencies must have solid policies that address, at a minimum, the following:

- How captured data is stored.
- Who has access to the data.
- How long the data is stored.
- How the data is purged.
- Audit controls to hold law enforcement employees accountable for the proper use of captured and stored data.
- Transparency in the inspection of stored data that is not evidence of a crime.

As stated above, these are the same privacy issues that we face concerning LPRs and surveillance cameras. However, unlike these two public safety tools, UAS is being treated differently, resulting in the creation of a separate and higher set of operating standards. If there is to be legislation, it needs to focus on public safety agencies utilization of sound policies that address the bullet points above, as opposed to developing different sets of legislated standards for each device that may be used to gather data.

In closing, ALEA, along with other organizations, have worked diligently with the FAA to develop procedures to operate UAS technology within the National Airspace. This includes the newly released FAA and Department of Justice Memorandum of Understanding that clearly explains the procedures to obtain a Certificate of Authorization to operate a UAS by a public safety agency. The ALEA continues to be committed to embracing this technology, working with others to see its safe integration into the National Airspace, and to developing training for public safety professionals who operate UAS. Our subsidiary, the Public Safety Aviation Accreditation Commission, is also committed to developing standards for the operation of UAS by public safety agencies.

On behalf of the Airborne Law Enforcement Association and its membership, thank you for the opportunity to participate in these deliberations.

NATIONAL ASSOCIATION OF CRIMINAL DEFENSE LAWYERS
COMMENTS ON PROPOSED DRONE LEGISLATION
MAY 31, 2013

Use of Domestic Drones

The increasing number of bills introduced in states across the country addressing the use of unmanned aerial vehicles, also known as drones, signal that not only are states concerned with intrusive government surveillance of their citizens without a warrant, but that domestic drone use is becoming more prevalent as the technology advances, signaling a sudden need for legislation. There are major Fourth Amendment and privacy implications that come with the use of drones in the United States, and the threats to privacy and civil liberties need to be properly addressed in any new drone legislation. Many outdated statutes are applied today in the digital age that undercut Fourth Amendment rights, and new regulations need to address the concerns of these rapidly advancing surveillance tools. That is why the National Association of Criminal Defense Lawyers (NACDL) created its own model legislation, promoting protection of fundamental Fourth Amendment rights. The model legislation is available here.[1]

Prohibited Use Without a Warrant and Suppression of Evidence

If drones are used by a person or entity of the government or funded in any way by the government, a warrant should be required for any surveillance of a person within a state, county, or municipality. A warrant should also be required for the surveillance of personal or business property located within the state to gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation, except in certain special circumstances. This prevents unwanted government intrusion into privacy, and protects Fourth Amendment and state privacy rights. Traditionally, an exception to the warrant requirement exists for evidence that is found in "plain view." The plain view doctrine becomes muddled, however, when drones are used because the drones have high-tech capabilities, that are not in the "general public use,"[2] to conduct surveillance on areas in plain view and not in plain view, such as the inside of a home.[3] The technology is evolving so rapidly that it is currently difficult to discern exactly what kind of private data may be collected by the government and private entities. Unmanned aircrafts may be outfitted with surveillance equipment to include high resolution cameras, thermal heat imaging devices, and geolocation tracking devices.

Additionally, any evidence obtained in violation of the legislation should be inadmissible in a criminal trial. It is important that this suppression remedy be included in state drone legislation, otherwise the only recourse an individual could have is civil, which does not benefit a defendant facing criminal charges. A warrant requirement may be toothless without such a suppression remedy.

Limit Exigent Circumstances

Reasonable exceptions to a warrant requirement for the use of a surveillance drone include exigent circumstances or the assessment of an environmental or weather related catastrophe. Exigent

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[1] http://www.nacdl.org/WorkArea/DownloadAsset.aspx?id=26568&libID=26537.
[2] Kyllo v. United States, 533 U.S. 27, 34 (2001) (reasoning that the police used a device, a thermal heat imaging device, not in the "general public use" to gather information about the inside of a private home.).
[3] *Id.* (holding that using thermal imaging to obtain information from inside a home constituted a search under the Fourth Amendment.).

circumstances exist when law enforcement possesses reasonable suspicion that absent swift preventative action, there is an imminent danger to life or imminent risk of threat or bodily harm. This should further be limited for use only until the danger and risk that prompted the use of the drone are no longer imminent.

Access to Third Party Records

Drone legislation should address the "third party doctrine." Third party records are records created and stored by private companies in their ordinary course of business. Today, these records go beyond bank records or dialed phone numbers, and can include all emails, geo-location information, a record of visited websites, and even internet search terms. The Supreme Court has held that individuals have no reasonable expectation of privacy in records shared or generated by a third party. By giving up information to a third party, a person "assumes the risk" that the company would reveal that information to the government. In other words, law enforcement may be able to access drone surveillance data, without a warrant, obtained by a private company for use as evidence in a criminal trial.

In a recent Supreme Court decision, *United States v. Jones*, which involved the placement of a GPS locator on a suspect's car by police officers without a valid warrant, the Court held that the use of a GPS device constituted a search under the Fourth Amendment.[4] Justice Sotomayor's concurrence in particular questioned the use of the third party doctrine in the digital age. She said "[t]his approach is ill suited to the digital age, in which people reveal a great deal of information about themselves to third parties in the course of carrying out mundane tasks."[5] This has great implications for the use of drones to monitor, collect, and store information that can then be shared with the Government under an outdated third party doctrine.

As all states can do, some states have provided greater protection than what the federal Constitution affords to third party records. Such protections may be found in legislation, court cases, or even state constitutions. Each individual state should be familiar with its own laws on third party records in determining whether or not such a provision needs to be included in that state's drone legislation.

Conclusion

NACDL encourages the implementation of the above suggestions into model legislation regulating the use of domestic drones. We look forward to working with you. Please contact NACDL's National Security and Privacy Counsel, Mason Clutter, with any questions. She may be reached at mclutter@nacdl.org or 202-465-7658.

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[4] United States v. Jones, 132 S.Ct. 945 (2012) ("We hold that the Government's installation of a GPS device on a target's vehicle, and its use of that device to monitor the vehicle's movements, constitutes a 'search'. . . The Government physically occupied private property for the purpose of obtaining information.).

[5] *Id*. at 10.

David R. Neel **6 March 2013**

(U) SUBJECT: Potential for Nefarious Use of Unmanned Aerial Vehicles (UAVs)

(U) UAVs can provide first responders, private industry, or government agencies with multiple advantages; from providing aerial imagery, use as a communications relay platform in remote areas, infrared (IR) detection during search and rescue operations, or monitoring the movement of a wildfire; UAV applications have only the limitations of the imagination. Within the year, the FAA must allow any "government public safety agency" to operate a UAV weighing 25 pounds or less, as long as certain conditions are met. The FAA predicts that after they allow commercial use of drones in U.S. airspace, 15,000 of the flying robots will be in the skies by 2015, and double that by 2030.

(U) Often, what benefits legal use of a tool has an equalizing balance of adding a burden to society when that same technology is used with nefarious intent. Unlawful use of UAV technology will be as diverse as the proposed legitimate applications. Criminal individuals and organizations will quickly identify the legal and operational gaps in law enforcement response to such an asymmetric vector. Additionally, criminals will recognize the initial legal and privacy constraints for law enforcement use of UAVs, and seek to exploit those boundaries. Terrorists will also understand the implications of a potentially low-cost, low-risk delivery of a kinetic attack on buildings, persons, or other manned aircraft. Individuals will also have the readily available, non-attributable means to stalk, spy, eavesdrop, or facilitate retribution violence or destruction of public or private property.

(U) Criminal use of UAVs will include, but not limited to:

- Circumventing checkpoints to move contraband
- Surveillance of law enforcement operations
- Jamming of law enforcement communications
- Act as an airborne communications repeater for "secure" communications
- Electronic eavesdropping platform for government/military/economic espionage
- Fish and Game guiding violations
- Kinetic attacks

(U) Potential for miss-use of this platform is great. Additionally, wrong-doers or those who believe that UAV use is violating their Privacy or Civil Rights-Civil Liberties, will seek ways to defeat, destroy, disable, or misappropriate (steal) UAV's that are conducting legal or commercial missions. New technologies, tactics, techniques and procedures will emerge to support this, and must be anticipated. There are already documents available on the open internet identifying "How to Kill UAVs." This also plays into current negative media coverage of the use of "drones" in the United States.

(U) Legislative bodies and policy makers, law enforcement leadership, and regulatory authorities need to begin now to anticipate how this UAV/UAS technology will be used for criminal activity and pass the appropriate legislation, develop effective operational countermeasures, and identify investigative strategies.

David Neel is the DHS Intelligence Officer assigned to the State of Alaska. This paper represents his personal viewpoint and should not be construed to reflect an official position by the U.S. Department of Homeland Security or the State of Alaska.

Scenarios Network
FOR ALASKA & ARCTIC PLANNING

October 22, 2013

Representative Shelley Hughes
Alaska State Legislature
600 East Railroad Avenue
Wasilla, Alaska 99654

Dear Representative Hughes

Please consider my concerns regarding the potential for "over" legistlation of unmanned aircraft systems (UAS) technology because of unwarranted fears.

UAS will provide many new capabilities for commercial, research, government, and even recreational users. In order to realize this potential, especially for commercial uses, it is important to acknowledge the tension that will occur among all parties, especially in the area of privacy. We need a better understanding of the technology's benefits before laws are created restricting their use.

A good example is the issue of public versus private airspace. For example, a manned aircraft flying at 500 feet altitude, in the National Airspace, over a person's private property is legally permitted to collect air photographs of the property. Is the same true for UAS? What if the altitude is less than 500 feet, i.e. 450 or even 50 feet? Does a property owner have rights to the airspace above their property and to what height? Can they shoot at the manned aircraft at 500 feet or the UAS at 100 feet?

On the otherhand, a significant cause of concern with UAS technology is privacy. Do voyeurism and peeping tom laws apply to UAS? What if the UAS is on your property but you are using the camera on the UAS to peer through a neighbor's window, perhaps above a privacy fence?

We can all acknowledge this tension created by privacy does exist. And will likely a source of future litigation. But the early uses of the technology, especially for search & rescue, research, and commercial innovation likely deserves some protection.

I can be reached at 907-474-6958 or kwcunningham@alaska.edu should you have any questions.

Cheers

Keith W. Cunningham

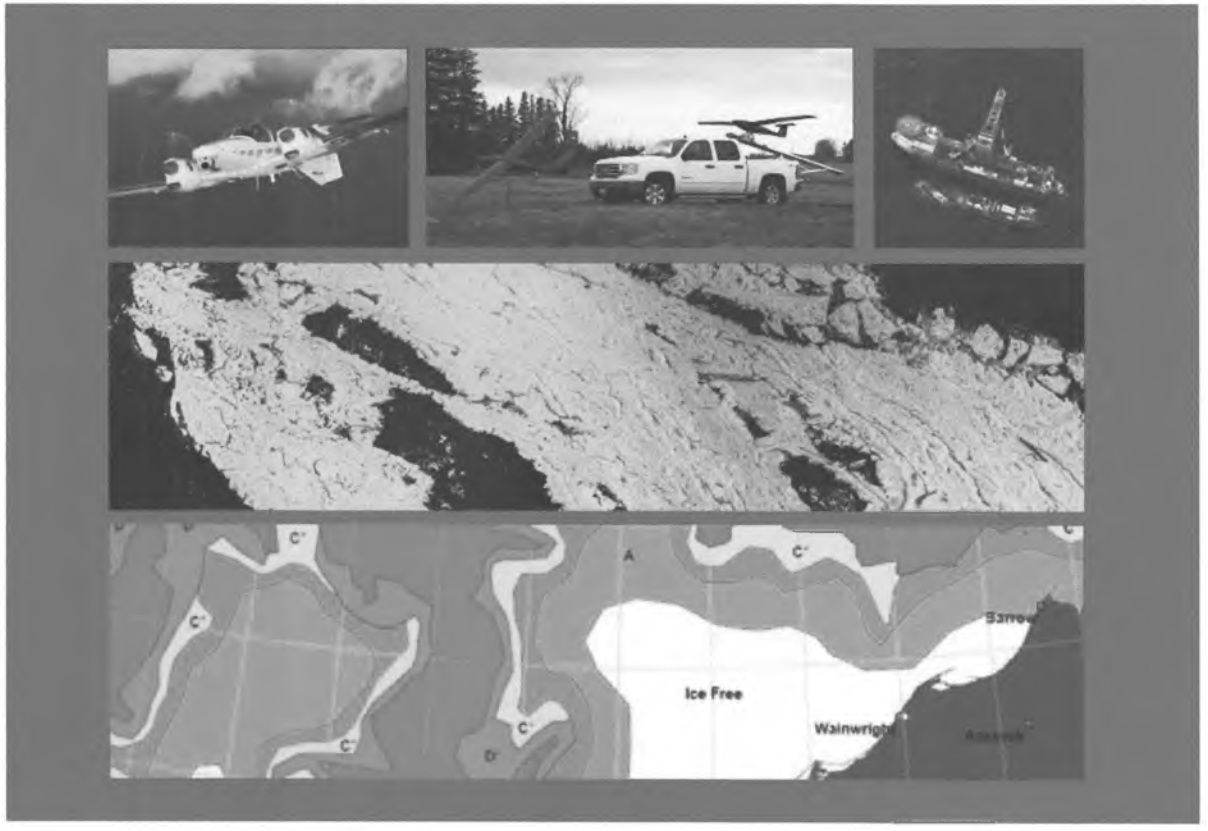
Keith W. Cunningham, PhD
Research Assistant Professor – Remote Sensing

TULUGAQ

FAIRWEATHERSCIENCE

Olgoonik Fairweather LLC

Kaktovik Inupiat Corporation
KAKTOVIK, ALASKA



Unmanned Aerial Systems Brief

Alaska Legislature - October 23, 2013

Steve Wackowski
Operations Manager, Tulugaq
Steve.Wackowski@fairweather.com

Personal Background

- Grew up in Anchorage
- 7 Years in Air Force Reserve
  - 3 Active Duty
- Several contingency deployments (Afghanistan, Iraq, Haiti)
- Air Force Trained and Certified SUAS operator
- NIU funded deployment to Arctic onboard USCGC HEALY and CGC LOUIS from August-September 2011
  - Conducted first ever Arctic SUAS flights from Icebreaker
- Civilian background in UAS policy and operations
  - Staffer for Sen Stevens on Senate Commerce, Science, and Transportation Committee
  - Current employment at Fairweather Science/Tulugaq
    - ***Responsible for development of unmanned remote sensing capabilities***

First launch of Arctic SUAS (82 N 168 W)

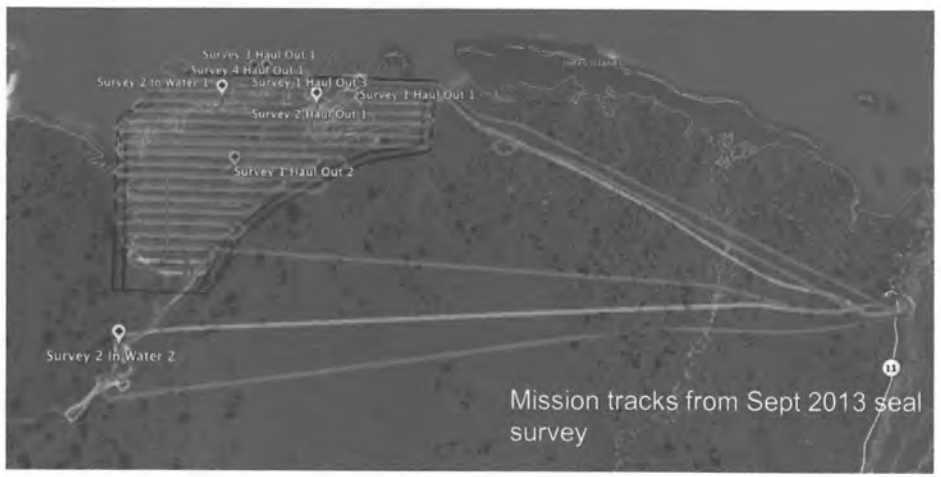
Our Team: Tulugaq

- Tulugaq II (*Inupiat for 'Raven'*) is a joint venture between Fairweather Science, Olgoonik Development Corporation and Kaktovik Inupiat Corporation. Tulugaq was formed to combine the strengths experience of these great Alaskan companies for operating manned and unmanned systems in the Arctic.

Team Background

- 40 + years of Arctic operations
- Complete focus on safety and accountability
- Extensive UAS and manned aviation operational experience in the Arctic
- Contracted Operations in Arctic Ocean, Bering, Beaufort and Chukchi Seas
- Deadhorse Aviation Center integration

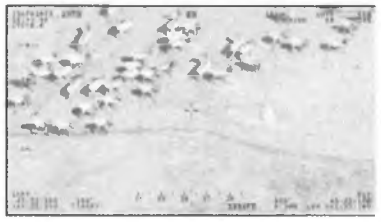
Stitched Infrared video of pipeline on North Slope taken July 19, 201

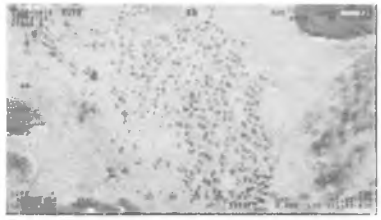


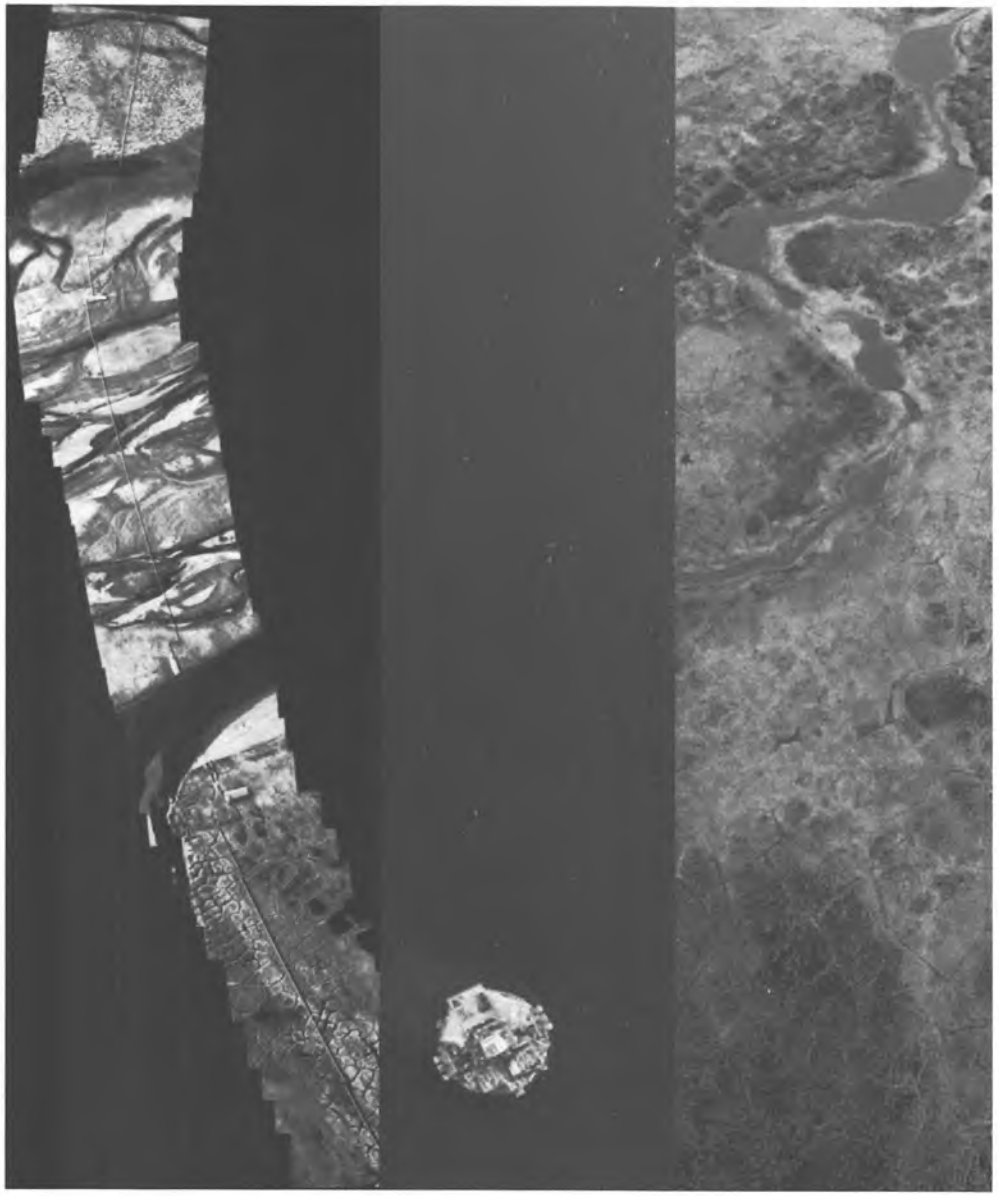
Mission tracks from Sept 2013 seal survey

Remote Sensing Mission Areas

- Pipeline Monitoring
- Sea Ice Mapping
- Oil Spill Detection
- Cetacean Monitoring
- Damage Survey
- Precision Mapping
- Environmental Research
- Communications Relay
- Search and Rescue
- Wildlife Surveys
- Wide Area Mapping
- Firefighting
- Humanitarian Response







DA – 42 MPP (Optionally Piloted)

- Operational in Alaska **Now**
- Safe Operational History
- Acoustic Signature Reduction
  - 58 db at 500' AGL, 0 db at 3000 'AGL
- Multiple Payload Configurations
  - TASE 400 HD Video/Infra Red
  - High resolution still camera
- Convertible to an Unmanned Platform

Questions?

NOTICE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8900.207

National Policy

Effective Date:
1/22/13

Cancellation Date:
1/22/14

SUBJ: Unmanned Aircraft Systems (UAS) Operational Approval

1. Purpose of this Notice. This notice provides policies necessary for reviewing and evaluating the safety and interoperability of proposed Unmanned Aircraft Systems (UAS) flight operations conducted within the United States (U.S.) National Airspace System (NAS) for the Aviation Safety (AVS) Flight Standards Service (AFS), UAS Integration Office (AFS-80), when assessing applications for a Certificate of Waiver or Authorization (COA) or special airworthiness certificate.

2. Audience. This notice applies to AFS divisions at the Federal Aviation Administration (FAA) Washington headquarters (HQ) and regional field offices.

3. Where You Can Find This Notice. You can find this notice on the MyFAA Web site at https://employees.faa.gov/tools_resources/orders_notices/. Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at http://fsims.avs.faa.gov. Air carriers and operators can find this notice on the FAA's Web site at: http://fsims.faa.gov. This notice is available to proponents and the public at http://www.faa.gov/regulations_policies/orders_notices.

4. Background.

a. UAS Operations. UAS operations have increased dramatically in both the public and private sectors. This proliferation has introduced greater exposure and elevated risk to the safety of operations within the NAS. This growth in UAS operations has increased the number of applications for operational approvals and increased demand on the FAA to process them. For these activities, the development of a notice is required for the FAA to use when evaluating applications for COAs and special airworthiness certificates.

b. Policy. Policy identifies Unmanned Aircraft (UA) as "aircraft" flown by a "pilot" regardless of where the pilot is located. Aircraft and pilots must demonstrate compliance with applicable sections of Title 14 of the Code of Federal Regulations (14 CFR) to operate in the NAS. However, UA are not compliant with certain sections of 14 CFR. For instance, the absence of an onboard pilot means that the "see-and-avoid" provisions of 14 CFR part 91, § 91.113, cannot be satisfied. Without an onboard pilot, there is a significant reliance on the command and control link, and a greater emphasis on the loss of functionality associated with lost link. Furthermore, for air traffic control (ATC) operations requiring visual means of maintaining

in-flight separation, the lack of an onboard pilot does not permit ATC to issue all of the standard clearances or instructions available under the current edition of FAA Order 7110.65, Air Traffic Control. Consequently, to ensure an equivalent level of safety, UAS flight operations require an alternative method of compliance (AMOC) or risk control to address their "see-and-avoid" impediments to safety of flight, and any problems they may generate for ATC. In the future, permanent and consistent methods of compliance will be needed for UAS operations in the NAS without the need for waivers or exemptions.

5. Consensus Opinion. This notice is subject to continuous review, will be updated when appropriate, is not meant as a substitute for any regulatory process, and was jointly developed by and reflects the consensus opinion of:

- Flight Technologies and Procedures Division (AFS-400);
- UAS Integration Office (AFS-80) and the ATO component of AFS-80; and
- Aircraft Certification Service, Production & Airworthiness Branch (AIR-240).

Note: In general, and as a minimum, proponents must observe all applicable regulations of 14 CFR parts 61 and 91. This notice identifies acceptable AMOC with the regulations when evaluating requests for approval of proposed UAS operations. Refer to the following Web site for a listing of regulations: http://www.faa.gov/regulations_policies/faa_regulations/.

6. Discussion. This notice represents the culmination of input from government agencies, industry, and user stakeholders along with best practices and procedures that have been used by FAA in prior approvals for UAS applications for COAs or special airworthiness certificates. The material presented in this notice represents the process and procedures necessary for approving applications for UAS flight operations. However, because of the uniqueness of various UAS flight operations, each application must be evaluated on its own technical merits, including operational risk management (RM) planning. Each application may require unique authorizations or limitations directly related to the specific needs or capabilities of the UAS and/or the proposed specific mission and operating location.

7. Applicability and Approval Process Criteria. The applicability and process to be used in UAS operational approval are dependent on whether the proposed UAS operation within the territorial airspace of the United States (the airspace above the contiguous United States, Alaska, Hawaii, U.S. territories, and U.S. territorial waters) is defined as public or civil (see 14 CFR part 1, § 1.1 and Public Law 110-181, "The National Defense Authorization Act of 2008"). UAS operations outside the territorial airspace of the U.S. will be classified as either state or civil operations in accordance with international law. A public operation is one that is intrinsically governmental in nature (i.e., Federal, State, and local agencies). Proponents requesting approval of public aircraft operations by UAS will use the COA application process. In contrast, proponents for civil operations approval will use the special airworthiness certificate process. Part 91, § 91.319(a)(2) specifically prohibits operation of an aircraft that has an experimental certificate from "carrying persons or property for compensation or hire."

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a. Coordination and Approval. Regardless of the process for the authorization approval, COA applications for UAS flight operation approvals will be coordinated through the ATO component of AFS-80 and AVS. Special airworthiness certificates will be coordinated through the Aircraft Certification (AIR-240) staff as well as the ATO and AFS component of AFS-80 for final approval and disposition.

b. Applicability and Methods of Authorization. Operational policy in this notice applies to both public and civil operations and certain state aircraft operations.

(1) Applicability. These procedures are applicable for all operations in the contiguous United States, Alaska, Hawaii, U.S. territories, and international airspace in the Flight Information Regions (FIR) delegated to the United States where the FAA is the Air Traffic Service (ATS) provider. These procedures do not apply to the territorial airspace of another sovereign country that lies within FIRs delegated to the United States where the FAA is the ATS provider, except by agreement with that country, or airspace in FIRs delegated to other countries. All UAS proponents, operators, and pilots must observe all applicable regulations of 14 CFR.

(a) In general, specific authorization to conduct UAS operations in the NAS outside of active Restricted and Warning Areas designated for aviation use, or approved Prohibited Areas, must be requested by the proponent. Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated. (Refer to the current edition of Order JO 7400.8, Air Traffic Organization Policy.)

(b) This notice and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating unmanned systems for sport and recreation. Those individuals should seek policy under the current edition of Advisory Circular (AC) 91-57, Model Aircraft Operating Standards. AC 91-57 is not to be used as a basis of approval for operation of any other aircraft, including by Federal, State, and local governments, commercial entities, or law enforcement.

(c) This notice and the processes prescribed also do not apply to UAS operations in FAA-controlled international airspace by an agency of, or a contractor to, the Federal government when those operations are appropriately designated as State aircraft operations and are operated under "due regard" rules and procedures established by the Federal agency responsible for the operation. The designation of flight operations as State aircraft operations normally are made in coordination with the U.S. Department of State. This notice and the processes prescribed do, however, apply where the responsible Federal agency either has not established a formal set of rules and procedures for "due regard" operations, or is not operating the UAS under "due regard" rules and procedures in FAA-controlled international airspace. This notice and the processes prescribed also apply to all UAS operations by an agency of, or a contractor to, the Federal government that transit through U.S. territorial airspace en route to or from international airspace. See Appendix F, UAS COA Requirement. The "due regard" option is not available for state aircraft operations transiting through U.S. territorial airspace en route to or from international airspace.

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(d) Oceanic Operations Within Warning Areas. UAS operations contained within Warning Areas are handled in the same manner as those operations conducted in active Restricted and approved Prohibited areas; that is, neither specific FAA approval nor observers or chase aircraft are required by the FAA.

(e) The only public aircraft that can fly under "due regard" are U.S. government aircraft designated as State aircraft.

(2) Methods. The two methods of approval are the issuance of either a COA for public aircraft operations or a special airworthiness certificate for civil operations. In the case of public aircraft operations, the operating entity applying to conduct the UAS operation must comply with its own processes, policies, and standards in the following areas, in addition to complying with all applicable safety provisions in all other parts of 14 CFR:

- Pilot certification,
- Crew certification,
- Recent pilot experience (or, currency),
- Medical certificates, and
- Airworthiness of public UAS.

Note: If no established public entity processes, policies, or standards exist, it is highly recommended that the public agency/department apply the specifics outlined in this notice and comply with the provisions of 14 CFR applicable to civil UAS operations.

8. COA for Public Operations.

a. Applications. Applications for a COA are only accepted from entities that intend to conduct public aircraft operations. An application may be referred to the FAA Office of the Chief Counsel (AGC-200) for determination of the status of a proponent as a government entity under the public aircraft statute. The duration of COAs complies with the time limitations specified under the current edition of FAA Order 7210.3, Facility Operation and Administration. COAs may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for operations conducted within active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited Areas with permission from the appropriate authority or using agency of that airspace. (Refer to the current edition of Order JO 7400.8, Special Use Airspace.)

b. Approving and Reviewing Authority. AFS-80 is responsible for determining whether the proponents' proposed UAS operations can be conducted safely and responsibly in the NAS, and that they comply with all COA limitations and provisions.

(1) In accordance with FAA Order 7210.3, "As a general rule, a waiver or authorization should be canceled when it is no longer required or there is an abuse of its provisions or unforeseen safety factors develop. Failure to comply with the waiver or authorization is cause for cancellation."

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(2) The FAA has the authority to suspend or cancel the COA, or to delay any activities if there is a violation of the terms in the COA, or if the safety of persons or property on the ground or in the air is determined to be in jeopardy. That may include, but is not limited to:

- Incidents or accidents occurring during UAS operations in the NAS;
- Habitual noncompliance with administrative requirements, such as failure to provide the FAA with monthly reports on the number of flights, pilot duty time, or unusual equipment malfunctions (e.g., a malfunction or failure of ground control station (GCS) flight control hardware or software (other than loss of control link); a power plant failure or malfunction; a deviation from any provision contained in the COA);
- Deviations from ATC instructions, operational, or coordination issues; and
- Events of intermittent or persistent lost-link as described in the COA or events determined to pose as a risk to the safety of the NAS.

(3) COA suspensions and cancellations are not automatic. Whenever possible, a documented conversation, between the FAA and the proponent, will happen before the suspension/cancellation is issued. Timely and transparent responses to accidents, deviations, and similar safety-related events are expected.

c. Accident and Incident Notification and Investigation. The current edition of FAA Order 8020.11C, Aircraft Accident and Incident Notification, Investigation, and Reporting, and Title 49 of the Code of Federal Regulations (49 CFR) part 830, outlines reporting procedures for accidents and incidents involving civil aircraft and certain public aircraft. All accidents and incidents involving fatalities, injuries, property damage, and fly-away by civil aircraft and those public aircraft subject to part 830 require FAA notification within 24 hours. No additional flights by those aircraft under this COA are allowed before notification. An immediate investigation is required, and when requested to do so, UAS proponents are expected to provide copies of written aircraft accident/incident reports to AFS-80 for review. In accordance with 49 CFR part 1520, § 1520.5, reports will not be released outside of government channels without originator permission.

d. General COA Process. The ATO component of AFS-80 is responsible for the COA process. Applications can be made two ways:

(1) On the Internet using the UAS COA Online System at https://ioeaaa.faa.gov. The UAS COA Online System requires a user name and password; a support desk phone number and e-mail address is provided to assist with obtaining an account.

(2) Using FAA Form 7711-2, Application for Certificate of Waiver or Authorization, available online at http://www.faa.gov/documentLibrary/media/form/faa7711-2.pdf. The completed form can be mailed to: FAA Headquarters, Unmanned Aircraft Systems Integration Office, 490 L'Enfant Plaza SW, Suite 3200, Washington, DC 20024. Mail submittal may encounter significant delay due to current U.S. Postal Service security screening procedures in place.

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e. Operational Review. Prior to issuance of a COA, air traffic specialist components of AFS-80 conduct an operational validation that addresses ATC processes. Next, an aviation safety inspector (ASI) evaluates each application to determine if risks to the NAS associated with the operation have been acceptably mitigated. Both the ASI and ATC requirements are merged into the final COA.

f. Safety Risk Management (SRM) Process. ASIs and other FAA personnel use SRM principles outlined in the current edition of AC 120-92, Safety Management Systems for Aviation Service Providers, to maintain or improve the safety of the NAS by identifying safety risks, hazards, and mitigations associated with proposed UAS operations. When deemed appropriate, Safety Risk Management Documents (SRMD) are created through SRM reviews of specific operations or of risks associated with UAS operations in various classes of airspace. SRM reviews may result in the incorporation of additional mitigations or controls into all or some COAs.

g. National Security Considerations. When appropriate levels of Department of Defense (DOD) or Department of Homeland Security (DHS) declare a UAS operation to be a matter of national security, the FAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this notice. In this case, national security may override risk mitigation requirements. Such requests to the FAA Administrator will originate from an equivalent level of authority from the proponent's parent organization.

h. Special COA.

(1) National Disaster COA. Due to the unpredictability of national disasters, a National Disaster COA is issued in two parts. In part 1 of the COA, AFS-80 completes an evaluation, excluding the location of the disaster. All known information is inserted into a template and signed by appropriate FAA authority. Once the specific location is identified, this information, along with the specific operation, is inserted into part 2 of the COA in the form of an attachment. Part 2 of the COA must then be signed by appropriate FAA authority, which completes and establishes a valid COA.

(2) Emergency COA. An emergency UAS COA may be considered when all of the following conditions apply:

(a) A situation exists that is defined as a condition of distress or urgency, where there is, or that has, the extreme possibility of loss of life, and

(b) The proponent has determined that manned flight operations cannot be conducted efficiently, and

(c) The proposed UAS is operating under a current approved COA for a different purpose or location.

Note: Requests for UAS COAs that fall outside of these parameters will be processed through the normal online COA application process. Emergency UAS COAs will not be considered for:

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- Demonstration flights,
- Flights to test capabilities,
- Training,
- Flights in Class B Airspace, or
- Flights over populated areas, unless a suitable mitigation strategy is proposed and found to be acceptable.

9. Special Airworthiness Certificate for Civil UAS Applicants.

a. Airworthiness Determination. Civil applicants may apply for a special airworthiness certificate from the FAA. The proponent is required to submit the requisite data to support a determination that the aircraft and its systems, including the control station (CS), are designed, built, and maintained in a safe and airworthy condition.

b. Special Airworthiness Certificate Issuance. Special airworthiness certificates are typically issued to proponents wishing to conduct UAS research and development (R&D), crew training, and market surveys under 14 CFR part 21, § 21.191. Special airworthiness certificates are issued in accordance with FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, current edition. Refer to Order 8130.34 for in-depth information on special airworthiness certificates.

c. Proponents with both a COA and Special Airworthiness Certification. In cases where a proponent has been issued a special airworthiness certificate, and is concurrently eligible to operate a corresponding UAS on a COA as a public aircraft operation, the proponent must elect, prior to each flight, which authority is to be used to conduct the flight. The use of both a special airworthiness certificate and a COA on a single flight is not permitted.

d. General Process for Civil UAS Operations. For civil UAS operations, the Aircraft Certification Service, Production and Airworthiness Division (AIR-200) at FAA HQ, is responsible for the issuance of special airworthiness certificates according to FAA Order 8130.34. The issuance of a special airworthiness certificate is coordinated with AIR-200, AFS-80 and the ATO component of AFS-80, and AVS at the HQ and regional levels. A thorough review is conducted by the FAA to evaluate the system's airworthiness and operational specifications. In addition, the FAA reviews and accepts mitigations developed by the proponent to meet acceptable standards of safety.

10. UAS Airworthiness. All UAS must be in an airworthy condition to conduct flight operations in the NAS. An "airworthy condition for UAS subject to a COA" means that the UAS meets the applicable standards and requirements of its operating agency and is capable of operating in compliance with the applicable requirements in 14 CFR part 91. The FAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined. As with airworthiness standards, maintenance technician requirements will be addressed as part of the review process.

a. Public Aircraft Proponents. The proponent must provide an airworthiness statement specifying compliance with the proponent's applicable airworthiness criteria. Airworthiness statements must be provided on agency letterhead and include:

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- The date the statement is effective,
- A signature of the responsible certifying authority within the agency,
- A point of contact (POC), and
- Any warnings/limitations.

(1) Airworthiness statements are generally written for one UAS. If more than one UAS model is included on a single airworthiness statement, each UAS will be listed and specific information for each UAS will be included in the statement. Airworthiness statements with an expiration date must remain current for the duration of the COA including extensions. If a new airworthiness statement is issued during the period the COA is active, a copy of the airworthiness certificate must be provided to AFS-80.

(2) Examples of acceptable policy/criteria include, but are not limited to:

- Department of Defense (DOD) Handbook, MIL-HDBK 516B, Airworthiness Certification Criteria;
- Air Force Policy Directive (AFPD) 62-6, USAF Aircraft Airworthiness Certification;
- Army Regulations (AR) 70-62, Airworthiness Qualification of Aircraft Systems; or
- Naval Air Systems Command Instruction, NAVAIRINST 13034.1 series, Flight Clearance Policy for Air Vehicles and Aircraft Systems.

b. Civil Aircraft Proponents. Approvals for civil applications using the special airworthiness certificate process receive their airworthiness certification from the FAA.

c. Continued Airworthiness.

(1) Public Aircraft. Proponents for UAS used in public aircraft operations should follow their own agency's procedures and guidelines to maintain continued airworthiness at a level which ensures they continue to operate the aircraft safely.

(2) Civil Aircraft. Proponents for civil UAS operational approvals must address continued airworthiness procedures as part of their application. Civil UAS should be maintained and must conform to the same airworthiness standards defined in 14 CFR parts under which UAS are intended to be operated. It is highly recommended that all proponents provide the following information:

- A Continuing Airworthiness Program,
- A maintenance training program,
- Any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation, and
- A process to report any applicable data relating to the operation and maintenance of the UAS.

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d. Database and Recordkeeping. All information received from UAS proponents aids the FAA in establishing a database for the existing UAS types and operations. This data is critical to our development of future certification criteria for both systems and pilots. It expedites the regulatory process for UAS and allows the FAA to have historical data from which to base current and future UAS policy. Accurate recordkeeping is essential in assuring positive operational and quality airworthiness control. In accordance with 49 CFR § 1520.5, reports will not be released outside of government channels without originator permission.

11. Flight Operations of a UAS.

a. Applicability and Requirements. This notice applies to UAS operations conducted in the NAS other than in active Restricted and Warning Areas designated for aviation use or approved Prohibited Areas. The FAA requires aircraft to operate safely among all users of the NAS, including non-cooperative aircraft (e.g., aircraft operated without a transponder), and other airborne operations not reliably identifiable by ATC radar (e.g., balloons, gliders, parachutists). Unless otherwise specifically authorized, UAS operators must use observers, either airborne or ground-based, to comply with 14 CFR part 91 requirements.

b. Risk Mitigation. While considerable work is ongoing to develop a certifiable detect, sense, and avoid system as an AMOC with the see-and-avoid aspect of §§ 91.113 and 91.115, no current solution exists. As a result, compliance with the see-and-avoid requirement and navigational awareness are primary concerns in UAS operational approvals leading to imposition of AMOC. Risk mitigation for these two issues is normally based on the use of observers or other methods of maintaining flight separation and collision avoidance or 'segregation'; however, they may also include other concepts or systems that a proponent may propose for FAA review. The FAA only approves UAS flight operations that can be conducted at an acceptable level of safety. Refer to the current editions of AC 120-92 and FAA Order 8000.369, Safety Management System Guidance.

> **Note:** Risk mitigations that depend on the establishment of new types and categories of airspace are extremely difficult and time-consuming. The NAS is established and configured through a rigorous regulatory process. Risk mitigations that result in the prohibition of the public's right to transit airspace will require a very long lead time with no guarantee that they will be approved.

(1) Proponents proposing see-and-avoid strategies in lieu of visual observers (VOs) are required to support proposed mitigations with system safety cases which indicate the operations can be conducted safely. Acceptable system safety cases must include a hazard analysis, risk assessment, and other appropriate documentation that identifies the level of risk.

(2) It is the proponent's responsibility to demonstrate that the risk of injury to persons or property along the flightpath is appropriately mitigated. Aircraft with performance characteristics that impede, delay, or divert other normal air traffic operations may be restricted in their operations.

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12. System Considerations for UAS.

a. Traffic Alert and Collision Avoidance Systems (TCAS). The use of TCAS by UAS has not been validated as an acceptable alternative for see-and-avoid requirements, and is not an approved means of mitigation for UAS see-and-avoid requirements or strategies.

b. Onboard Cameras/Sensors. Although onboard cameras and sensors positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of segregation is still quite limited. To date, these types of systems have not been approved as a sole mitigation in the see-and-avoid risk assessment.

c. Use of Equipment in Lieu of VOs.

(1) Any equipment proposed for use on UAS to accomplish the function of see-and-avoid in lieu of VOs must:

- Be certified as an aircraft system and equipment using standards, requirements, and processes commensurate with installation of equipment in aircraft by a recognized airworthiness authority, and
- Meet the requirements of 14 CFR part 25, § 25.1309, or equivalent process, for any UAS installation, regardless of its size, performance, or maximum takeoff weight.

Note: For other equipment that is not proposed for use in meeting see-and-avoid requirements, § 23.1309, or equivalent process, should be used.

(2) It is the responsibility of the proponent to show that the contemplated standards, requirements, and processes meet an equivalent level of safety.

d. Radar and Other Sensors. If special types of radar systems or other sensors are utilized to mitigate risk, the proponent must provide supporting data which demonstrates the following can be accomplished safely:

- Both cooperative and non-cooperative traffic can be detected and tracked to ensure appropriate separation and collision avoidance,
- The proposed system can effectively mitigate a potential collision,
- Operators are suitably trained and equipped to use them effectively, and
- Procedures are in place for the pilot in command (PIC) to effectively use the data.

e. Lost Link Procedures. There are many acceptable approaches to satisfy lost link requirements. The intent of any lost link procedure is to ensure airborne operations remain predictable. Proponents will comply with the UAS lost link procedures as specified in the COA.

Note: Lost link is not considered fly-away. Refer to definitions in Appendix A.

(1) Unless otherwise authorized, lost link solutions must comply with the last ATC clearance (if ATC clearance is required), for a period of time sufficient for ATC to ensure conflict resolution without loss of required separation.

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(2) Lost link procedures are pre-coordinated by AFS-80 with the appropriate ATC facility and included in the COA. They include, at a minimum, lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points (FTP) or other contingency planning measures in the event recovery of the UAS is not feasible.

(3) If lost link occurs within a Restricted Area, Warning Area, or Class A airspace, or lost link procedure takes aircraft into one of these areas, the aircraft will not exit that airspace, unless otherwise authorized, until link is re-established. All exceptions will be submitted as part of the COA application to AFS-80 for review.

(4) Unless otherwise authorized, lost link procedures will conform to the Contingency Planning Limitations in Appendix E and in general, include the following:

- Limiting of UAS operations to operations over water or sparsely populated areas over the ground to transit to another Restricted Area, Warning Area, or to a pre-planned lost link orbit point within visual line-of-sight to re-establish link. (The UAS lost link procedure will not transit over fixed structures on the water.)
- Lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.
- Lost link orbit points will not be contained within any published holding area, airway, Jet route, T route, or other area navigation (RNAV) published route.

(5) If the link is not re-established within a pre-determined time as defined by the FAA-approved COA, the aircraft may:

- Autoland; however, the aircraft will not exit the Restricted Area or Warning Area in accordance with subparagraph 12.e.(3) above,
- Proceed to another lost link point (LLP) in an attempt to regain communication link, or
- Proceed to an FTP or the location specified in other contingency planning measures for flight termination.

Note: LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is re-established or fuel exhaustion occurs.

- UAS without auto-land capability will proceed to a pre-planned FTP or other acceptable contingency planning option prior to fuel exhaustion.

(6) Refer to Appendix E for more Contingency Planning Limitations.

f. Flight Termination System (FTS). It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. UAS that lack system redundancies may be required to have an independent FTS that can be activated manually by the UAS PIC to safeguard the public.

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g. Spectrum Authorization.

(1) Every UAS proponent must have the appropriate National Telecommunications and Information Administration (NTIA) or Federal Communications Commission (FCC) authorization/approval to transmit on the radio frequencies (RF) used for UAS uplink and downlink of control, telemetry, and payload information.

(2) Non-Federal public agencies, such as universities and State/local law enforcement, and all civil UAS proponents generally require a license from the FCC as authorization to transmit on frequencies other than those in the unlicensed bands (900 megahertz (MHz), 2.4 gigahertz (GHz), and 5.8 GHz). This generally will be in the form of an Experimental Radio License or a Special Temporary Authority (STA) issued by the FCC. Non-Federal public agencies and civil UAS proponents that operate systems using frequencies assigned to the Federal government (e.g., the DOD) must demonstrate they have the proper authorization through FCC-issued documentation.

(3) DOD agencies will typically demonstrate UAS spectrum authorization through an STA issued by NTIA or a frequency assignment in the NTIA-administered Government Master File (GMF). Authorizations issued under Title 47 of the Code of Federal Regulations (47 CFR) part 300, in the NTIA Manual, Chapter 7, paragraph 7.11, Use of Frequencies by Certain Experimental Stations, are not appropriate for UAS operations.

(4) Federal public agencies other than DOD, such as National Aeronautics and Space Administration (NASA), U.S. Coast Guard (USCG), and U.S. Customs and Border Protection (USCBP), also need an STA issued by NTIA or a frequency assignment in the NTIA-administered GMF. This is especially important for systems designed to operate on frequencies assigned to DOD.

13. Operational Requirements for UAS. Unless operating in an active Restricted or Warning Area designated for aviation use, or approved Prohibited Areas, UAS operations must adhere to the following requirements.

a. Observer Requirement. Visual flight rules (VFR) UAS operations may be authorized utilizing either ground-based or airborne VOs onboard a dedicated chase aircraft. A VO must be positioned to assist the PIC, to exercise the see-and-avoid responsibilities required by §§ 91.111, 91.113, and 91.115 by scanning the area around the aircraft for potentially conflicting traffic and assisting the PIC with navigational awareness.

(1) VOs:

(a) Must assist the PIC in not allowing the aircraft to operate beyond the visual line-of-sight limit, and

(b) Must be able to see the aircraft and the surrounding airspace sufficiently to assist the PIC with:

- Determining the UA's proximity to all aviation activities and other hazards (e.g., terrain, weather, structures), and

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- Exercising effective control of the UA, and
- Complying with §§ 91.111, 91.113, and 91.115, and
- Preventing the UA from creating a collision hazard, and

(c) Must inform the PIC before losing sufficient visual contact with the UA or previously sighted collision hazard. This distance is predicated on the observer's normal vision. Corrective lenses, spectacles, and contact lenses are permitted.

(2) Because of field of view and distortion issues with aids to vision such as binoculars, field glasses, night vision devices, or telephoto lenses, these are allowed only for augmentation of the observer's visual capability; they cannot be used as the primary means of visual contact. When using other aids to vision, VOs must use caution to ensure the aircraft remains within normal visual line-of-sight of the observer. These aids to vision are not to be confused with corrective lenses or contact lenses, which do not alter the field of view or distort vision.

(3) The responsibility of ensuring the safety of flight and adequate visual range coverage to avoid any potential collisions remains with the PIC. The PIC for each UAS operation must identify a location from which the observer will perform his/her duties. This location will be selected to afford the best available view of the entire area within which the operation is to be conducted.

(4) Daisy-chaining of observers to increase operational distance is not normally approved; however, a proponent may provide a safety case for daisy-chaining in accordance with paragraph 16 by demonstrating an acceptable level of risk to the NAS.

(5) Observer(s) must be in place 30 minutes prior to night operations to ensure dark adaptation. Refer to subparagraph 13.i.(2)(b) for night operations information.

b. ATC Communications Requirements.

(1) The UAS pilot must establish and maintain direct two-way radio communication with appropriate ATC facilities anytime:

- The aircraft is being operated in Class A or D airspace (under §§ 91.135 or 91.129) or, when required, in Class E and G airspace (under §§ 91.127 or 91.126). See subparagraph 13.q.(2) and (3) for operations in Class B or C airspace; or
- The aircraft is being operated under instrument flight rules (IFR); or
- It is stipulated under the provisions of any issued COA or Special Airworthiness Certificate.

(2) It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay, however, for IFR flight this method of transmission is required.

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c. Inter-Communications Requirements. Any VO, sensor operator, or other person charged with providing see-and-avoid assistance must have immediate communication with the UAS pilot. If a chase aircraft is being utilized, immediate communication between the chase aircraft and the UAS pilot is required at all times. If the UAS pilot is in communication with ATC, monitoring of the ATC frequency by all UAS crew members (pilots, observers, and chase pilots) is recommended for shared situational and navigational awareness. However, unless it is approved for others to do so, the UAS PIC or the supplemental pilots are the only crewmembers that will communicate with ATC.

d. Electronic Devices. The use of electronic devices (including cell phones) other than for UAS flight- and mission-required usage is governed by § 91.21, which ensures these devices do not interfere with the UAS systems. The use of electronic devices (including cell phones) is not authorized for primary communication with ATC unless authorized under the Special Provisions of the COA.

e. Dropping Objects/Expendable Stores or Hazardous Materials. If the intended UAS operation includes the carriage, dropping, or spraying of aircraft stores outside of active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited Areas, the proponent must ensure that specific approval is listed in the special provisions, the operational risks have been sufficiently mitigated as required by 14 CFR § 91.15, and that the hazardous material requirements in 49 CFR have been met. Acceptable procedures for hung stores and loss of control link while carrying stores must be provided to the FAA. A similar case must be made for hazardous materials carried aboard the aircraft and, if approved, will be listed in the special provision section of the COA.

f. Flight Over Populated Areas. Routine UAS operations are prohibited over urban or populated areas, except where the level of airworthiness allows. UAS operations may be approved in emergency or national disaster relief situations if the proposed mitigation strategies are found to be acceptable. See Appendix A for definition of populated or urban area.

g. Air Shows. A proponent is required to provide a safety case in accordance with paragraph 16 that demonstrates an acceptable level of risk and must receive a separate Air Show Waiver in accordance with FAA Order 8900.1, Flight Standards Information Management System (FSIMS).

h. Flight Over Heavily Trafficked Roads or Open-Air Assembly of People. UAS operations must avoid these areas, except where level of airworthiness allows. If flight in these areas is required, the proponent is required to support proposed mitigations with system safety cases that indicate the operations can be conducted safely. Acceptable system safety cases must include information located in paragraph 16. Additionally, it is the proponent's responsibility to demonstrate that risk of injury to persons or property along the flightpath has been mitigated. UAS with performance characteristics that impede, delay, or divert other air traffic operations may be restricted in their operations. Refer to AC 120-92 and FAA Order 8000.369, current editions.

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i. Day/Night Operations.

(1) Day Operations. UAS operations outside of Class A airspace, active Restricted or Warning Areas designated for aviation use, or approved Prohibited Areas will be conducted during daylight hours unless otherwise authorized.

(2) Night Operations.

(a) Night operations may be considered if the proponent provides a safety case and sufficient mitigation to avoid collision hazards at night.

(b) UAS night operations are those operations that occur between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time. (Note: this is equal to approximately 30 minutes after sunset until 30 minutes before sunrise, except in Alaska.) External pilots and observers must be in place 30 minutes prior to night operations to ensure dark adaptation.

j. Flights Below Class A Airspace. All UAS operations outside of active Restricted/ Warning/Sensitive Security Information (SSI) airspace designated for aviation use, or approved Prohibited Areas must be conducted in visual meteorological conditions (VMC) if using ground or airborne VOs. In addition, the following weather requirements apply:

- If on IFR flight, remain clear of clouds. This requirement does not relieve the PIC from following the ATC clearance. According to § 91.3, the PIC retains responsibility for, and is the final authority as to the operation of that aircraft.
- If on VFR flight, maintain § 91.155 VFR cloud clearances, except in Class G airspace, where Class E airspace visibility requirements must be applied, but not less than 3 statute miles (SM) in-flight visibility.
- Special VFR is not permitted.
- For chase aircraft, 5 SM in-flight visibility.

k. Autonomous Operations. Although it is possible to have a completely manual (direct pilot intervention) UAS, the majority of UAS are autonomous to a certain degree. Only those UAS which have the capability of direct pilot intervention will be allowed in the NAS outside of active Restricted or Warning Areas designated for aviation use, or approved Prohibited Areas. Because the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.

l. Operations from Off-Airport Locations. In most cases, an off-airport location should be situated no closer than 5 nautical miles (NM) from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions; reasonable efforts should be made to keep operations away from structures.

m. Crew Resource Management (CRM). Proponents must train all UAS crewmembers in CRM. The current edition of FAA AC 120-51, Crew Resource Management Training, or an FAA-recognized equivalent applies to UAS operations. Proponents must implement the recommended training and procedures included in AC 120-51, or in an FAA-recognized

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equivalent. The PIC of a UAS must ensure no activities other than those duties required for safe flight operation are performed. No UAS crewmember may engage in any activities unrelated to those required for safe operation of the UAS during critical phases of flight such as launch/takeoff and landing/recovery.

n. Sterile Cockpit. Proponents must comply with the current edition of AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers, or the FAA-recognized equivalent, for ensuring the PIC implements sterile cockpit procedures. During critical phases of flight, including all ground operations involving taxi (movement of an airplane under its own power on the surface of an airport), takeoff and landing, and all other flight operations in which safety or mission accomplishment might be compromised by distractions, no crewmember may perform any duties not required for the safe operation of the aircraft. No crewmember may engage in, nor may any PIC permit, any activity during a critical phase of flight which could distract any crewmember from the performance of his/her duties or interfere in any way with the proper conduct of those duties.

o. Operating Under IFR. While operating on an instrument flight plan, the following must exist, be completed, or be complied with:

(1) The PIC must hold a current instrument rating or an FAA-recognized equivalent.

(2) The aircraft's airworthiness signature statement for flight release (not airworthiness document) must include IFR flight and indicate that all equipment required for IFR operations is certified and working (including pitot-static and transponder checks).

(3) Applicable navigation database and charts are current and available to the UAS pilot.

(4) An IFR flight plan is filed.

(5) An ATC clearance has been obtained and all clearances must be followed.

(6) Direct two-way radio communication between the UAS pilot and ATC is established and maintained. (A communication relay through the aircraft may be required.)

(7) Alternate communication capabilities with ATC for the purpose of lost link and/or lost communication are designated and operational during all phases of flight.

(8) The UAS is equipped with a certified operating mode C (mode S preferred) transponder.

(9) ATC radar services are obtained throughout the portion of the flight in Class A airspace whenever possible (overwater non-radar operations may be allowed in the special provisions section).

(10) All operations outside of Class A airspace and active Restricted, Prohibited, Warning Areas, or SSI airspace designated for aviation use, must remain clear of clouds. If operating under IFR, to comply with this provision, the PIC must have an ATC clearance to deviate.

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According to § 91.3, the PIC retains responsibility for, and is the final authority as to, the operation of that aircraft.

(11) VOs are not required in Class A airspace unless stipulated in the COA.

p. Chase Aircraft Operations. The chase aircraft:

(1) Must remain at a safe distance from UA to ensure collision avoidance if a malfunction occurs, and

(2) Must remain close enough to the UA to provide visual detection of any conflicting aircraft and advise the PIC of the situation.

(3) Must remain within radio control range of the UA, in the case of pilot operation from the chase aircraft, to maintain appropriate signal coverage for flight control or activation of the FTS.

(4) May be required to have communication with appropriate ATC facilities based on the proponent's application or mission profile.

(5) Is not required by FAA in active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited airspace.

(6) Is not required for Optionally Piloted Aircraft (OPA) if a qualified VO is on board.

(7) Is not required in Class A airspace unless stipulated in the COA.

(8) Operations must be conducted in accordance with the Special Provisions listed in the approved COA.

(9) Must maintain 5 SM in-flight visibility restrictions.

(10) Pilot/observer:

- Will not concurrently perform either observer or UAS pilot duties along with chase pilot duties unless otherwise authorized.
- Must maintain direct voice communication with the UAS pilot.

(11) Pilots operating as a formation flight will immediately notify ATC if they are using a non-standard formation. Non-standard formations must be pre-approved by ATC. Proponents adhere to the current edition of Order JO 7610.4, Special Operations, as applicable. Refer to Appendix A for definitions of standard and non-standard formations.

(12) Operations will not be conducted in IMC.

(13) Operations will be thoroughly planned and briefed.

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(14) Pilot, during a lost link situation, must be notified immediately along with ATC. The chase pilot will report to ATC that the UA is performing lost link procedures as planned or if deviations are occurring.

(15) Pilot will ensure safe separation with the UA, and immediately notify ATC and the UA PIC during loss of visual contact with the UA by both the chase pilot and observer, when such contact cannot be promptly re-established. The UA PIC will either execute lost link procedures to facilitate a rejoin, recover the UA, or terminate the flight as appropriate.

q. Airspace Considerations by Airspace Designation.

Note: UAS operating in airspace designated as reduced vertical separation minimum (RVSM) airspace must comply with § 91.180.

(1) Class A. Observers are not normally required in Class A. All UAS must be operating under IFR and on an instrument flight plan. UAS operations approved for Class A must comply with § 91.135.

(2) Class B. UAS operations are currently not authorized. Class B airspace contains terminal areas with the highest density of manned aircraft in the NAS. On a case-by-case basis, the FAA may consider exceptional circumstances. For public aircraft, a Letter of Agreement (LOA) between the affected ATC facility and the proponent describing UAS segregation procedures is required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class B operations.

(3) Class C (and airspace within 30 NM of an airport listed in Appendix D, section 1, § 91.215). UAS operations approved for Class C must comply with §§ 91.130 and 91.215. Requests for operations without this equipment will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class C operations.

(4) Class D. Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class D must comply with § 91.129. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class D operations.

(5) Class E. If there is an operating ATC tower, Class D rules may apply. UAS operations approved for Class E must comply with § 91.127. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class E operations.

(6) Class G. UAS operations approved for Class G must comply with § 91.126.

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r. ATC Visual Approach Clearances. The UAS PIC must not accept a visual approach clearance, an instruction to follow another aircraft by visual means, or a clearance to maintain visual separation from another aircraft.

s. In-Flight Emergencies.

- The PIC will notify ATC of any in-flight emergency or aircraft accident as soon as practical.
- The PIC will notify ATC of any loss of control link as soon as practical. Loss of control link scenarios may be handled by ATC as an emergency.

14. Contingency Planning Limitations. See Appendix E.

15. Personnel Qualifications. This paragraph addresses the qualifications of all UAS flightcrew members, observers, maintainers, and other personnel as appropriate. All references to a pilot certificate or FAA written examination refer to an FAA-issued private pilot certificate, higher certification, or an FAA-recognized equivalent.

a. UAS Pilot Qualifications. The FAA is focused on ensuring that UAS pilots have an appropriate level of understanding of 14 CFR applicable to the airspace where UAS operate. UAS pilots are responsible for controlling their aircraft to the same standards as the pilot of a manned aircraft. Civil UAS pilots may be required to have instruction by an FAA-certificated flight instructor.

b. UAS General Operational Requirements. The following operational restrictions apply to all UAS pilots:

- One PIC must be designated at all times.
- The PIC of an aircraft is directly responsible for, and is the final authority of the operation of that aircraft.
- Pilots must not perform crew duties for more than one UAS at a time.
- Pilots are not allowed to perform concurrent duties both as the pilot and the VO. In the case of OPA, the airborne pilot may assume the role of PIC at all times, but will only be the observer when the OPA is operated by the CS pilot.
- Unless undergoing initial qualification training, pilots must be qualified on the aircraft being flown.
- Only one PIC per aircraft is authorized, and the PIC must be in a position to assume control of the aircraft.

c. PIC.

(1) The designated PIC:

- Has been designated as PIC before or during the flight.
- Is responsible for the UAS flight operation as described under § 91.3, or FAA-recognized equivalent.
- Is responsible for determining whether the UAS is in condition for safe flight.

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- Must land as soon as safely practical when any condition occurs that causes operations to be unsafe.
- May be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the aircraft.
- Has the ability to assume the duties of an internal or an external UAS pilot at any point during the flight.
- May rotate duties as necessary to fulfill operational requirements.
- Operating under a public agency, must have a thorough knowledge of the COA issued to the organization and must retain a copy to reference during flight.
- Must be trained and qualified on the specific UAS for the conduct of the flight.
- May assume the duties of VO or PIC, if piloting an OPA when the OPA is being utilized as a UAS and being flown by the CS pilot.

(2) PIC Rating Requirements. Rating requirements for the UAS PIC depend on the type of operation conducted; they fall into two categories:

- Operations that require at least a private pilot certificate or FAA-recognized equivalent, or
- Operations that do not require at least a private pilot certificate or FAA-recognized equivalent.

(a) The requirement for the PIC to hold a pilot certificate or FAA-recognized equivalent is based on various factors including:

- The location of the planned operations,
- The mission profile,
- The size of the aircraft, and
- Whether or not the operation is conducted within or beyond visual line-of-sight.

(b) The PIC must hold, at a minimum, an FAA private pilot certificate or FAA-recognized equivalent for all operations listed below:

- Flight in Class A, B, C, D, E, and G (400 feet above ground level (AGL)) airspace.
- IFR (must have instrument rating) operations.
- Night operations.
- At joint use or public airfields.
- Requiring a chase aircraft.
- At any time the FAA has determined the need, based on the UAS characteristics, mission profile, or other operational parameters.

(c) Operations without a pilot certificate may be allowed when all of the following conditions are met:

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- The PIC has successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA-recognized equivalents. (Airman Test Reports are valid for the 24 calendar-month period preceding the month the exam was completed, at which time the instruction and written examination must be repeated.)
- Operations are during daylight hours.
- The operation is conducted in a sparsely populated location.
- Operations are approved and conducted solely within visual line-of-sight in Class G airspace.
- Visual line-of-sight operations are conducted no further than ½ NM laterally from the UAS pilot and at an altitude of no more than 400 feet AGL at all times. Refer to Appendix A for the visual line-of-sight definition.
- Operations are conducted no closer than 5 NM from any FAA-designated airport or heliport other than the airport from which the aircraft is operating.
- The operation is conducted from a privately owned airfield, military installation, or off-airport location.

(3) PIC Recent Flight Experience (Currency). The proponent must provide documentation showing the pilots maintain an appropriate level of recent pilot experience in the UAS being operated, or in an FAA-certified simulator. At a minimum, the PIC must conduct three takeoffs (launch) and three landings (recovery) in the specific UAS within the previous 90 days (excluding pilots who do not conduct launch/recovery during normal/emergency operations); or as prescribed by the proponent's accepted recurrent training and currency program.

(a) For those operations that require a certificated pilot, the PIC, to exercise the privileges of his certificate, must have flight reviews and maintain recent pilot experience in manned aircraft per 14 CFR part 61, as appropriate; or FAA-accepted equivalent.

(b) For flights approved for night operations, the PIC must conduct three takeoffs (launch) and three landings (recovery) each, in the specific UAS at night, to a full stop in the previous 90 days (excluding pilots who do not conduct launch/recovery during normal/emergency operations).

(c) For operations approved for night or IFR, the PIC must maintain recent pilot experience per § 61.57 or FAA-accepted equivalent as applicable.

(4) PIC Medical. The PIC must maintain, at a minimum, a valid FAA second-class medical certificate issued under 14 CFR part 67 or the FAA-recognized equivalent. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate listed in § 61.23.

(5) Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(6) PIC Training.

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(a) In addition to the training required for a pilot certificate, UAS PICs must have the following additional training (or FAA-recognized equivalent):

- Including normal, abnormal, and emergency procedures in all specific details of the UAS being operated,
- Manufacturer-specific training,
- Demonstrated proficiency, and
- Testing in the UAS being operated.

(b) Proponents must maintain individual training records of all UAS personnel. All training and testing will be documented in the individual's training record by the instructor and initialed by the trainee.

d. Supplemental Pilots. Supplemental pilots are those pilots assigned UAS flight duty to augment the PIC. It is common for proponents to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions.

(1) Ratings. Supplemental pilots must have, at a minimum, successfully completed private pilot ground school and passed the written test or FAA-recognized equivalents. The ground school written test results are valid for two years from the date of completion, at which time the instruction and written examination must be repeated. If a supplemental pilot assumes the role of PIC, he/she must comply with the PIC rating, currency, medical, and training requirements listed above in subparagraph 15c.

(2) Recent Pilot Experience. The proponent must provide a process that ensures that pilots maintain an appropriate level of recent pilot experience for the position they are assigned in the UAS being operated.

(3) Medical. Supplemental pilots must maintain, at a minimum, a valid FAA second-class medical certificate issued under part 67 or the FAA-recognized equivalent. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate, according to § 61.23. Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(4) Training.

(a) UAS supplemental pilots must have:

- Training in all specific details of the UAS being operated, including normal, abnormal, and emergency procedures;
- Manufacturer-specific training (or FAA-recognized equivalent);
- Demonstrated proficiency and successful testing in the UAS being operated.

(b) Proponents must maintain individual training records for all UAS personnel. All training must be documented by the instructor and initialed by the trainee.

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e. UAS Observer Qualifications. All observers must have an understanding of Federal aviation regulations applicable to the airspace where the UAS will operate. Observers are considered crewmembers. Observers must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as UAS pilot and observer.

(1) Medical. All observers must have a valid FAA second-class medical certificate issued under part 67; an FAA-recognized equivalent is an acceptable means of demonstrating compliance with this requirement. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate. Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(2) Training. Observers must complete sufficient training to communicate to the pilot any information required to remain clear of conflicting traffic, terrain, and obstructions, maintain proper cloud clearances, and provide navigational awareness. This training, at a minimum, must include knowledge of:

(a) Their responsibility to assist pilots in complying with the requirements of 14 CFR:

- § 91.111, Operating Near Other Aircraft;
- § 91.113, Right-of-Way Rules: Except Water Operations;
- § 91.115, Right-of-Way Rules: Water Operations; and
- § 91.155, Basic VFR Weather Minimums;

(b) Air traffic and radio communications, including the use of approved ATC/pilot phraseology; and

(c) Appropriate sections of the Aeronautical Information Manual (AIM).

f. UAS Maintenance Personnel Qualifications.

(1) Maintenance Ratings. Will be established as more data is collected and a regulatory guideline is developed.

(2) Recent Maintenance Experience. It is suggested that proponents follow applicable guidelines of 14 CFR part 65, § 65.83, as appropriate, until final UAS regulatory guidelines are available.

(3) Maintenance Medical Requirements. At a minimum, the requirements of § 91.17 or FAA-recognized equivalent must be met. No additional medical requirements have been defined at this time.

(4) Maintenance Training. It is highly recommended that a proponent of a UAS submit a training program. This requirement will be further defined as more data is collected and the regulatory process affects these guidelines.

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g. Other UAS Personnel Qualifications. Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, personnel must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel.

16. AMOC. This notice defines certain limitations and procedures to conduct UAS operations, but each application is evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems. When a proponent desires to deviate from these limitations and procedures, an AMOC that includes a safety case (recommended format provided in Appendix D), must be submitted for approval. For a proponent to make an acceptable safety case, information must be provided that outlines all hazards and risks associated with the requested AMOC. In addition, the proponent must provide a description of the methods and procedures or equipment for mitigating each hazard and risk. As such, deviations and AMOC may differ from the information presented in this notice. Therefore, if the proponent provides an acceptable safety case with sufficient data that supports the proposal, the AMOC will be considered and evaluated for approval.

a. Safety Case Information. The proponent should include at a minimum:

(1) A thorough description of the environment in which the aircraft will operate;

(2) Criteria for categorizing hazards (e.g., severity and likelihood);

(3) A detailed airworthiness description of the affected items associated with the proposed AMOC, which includes, as a minimum:

- Certification status of components and systems, or statement of airworthiness for public aircraft,
- Reliability data,
- Redundant systems,
- Failure modes and effects, including system response to loss of control link, and
- An airworthiness determination (for COA proponents only);

(4) Capabilities of the aircraft;

(5) Flight data;

(6) Accident data;

(7) Emergency procedures; and

(8) Pilot/crew roles and responsibilities.

b. Sample Safety Case. Appendix D represents the FAA's approach to documenting the process used for hazard identification and risk mitigation. It is provided as an example for proponents to use when developing and documenting a safety case. In addition to these

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guidelines, other government and industry methods similar to the FAA's approach to developing a safety case also provide acceptable hazard analysis tools. These include Preliminary Hazard Analysis, Operational Safety Assessment, Comparative Safety Assessment, and Fault Hazard Analysis. See Appendix D for a complete list.

17. Disposition. We will incorporate the information in this notice into FAA Order 8900.1 before this notice expires. Direct questions concerning the information in this notice to the Unmanned Aircraft Systems Integration Office, AFS-80, at 202-385-4835.

for John L. Duncan

John M. Allen
Director, Flight Standards Service

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APPENDIX A. DEFINITIONS

1. Aircraft. A device used or intended to be used for flight in the air, including unmanned aircraft (UA).

2. Airworthiness [UAS]. A condition in which the unmanned aircraft system (UAS) (including the aircraft, airframe, engine, propeller, accessories, appliances, and control station (CS)) conforms to its type certificate, if applicable, and is in condition for safe operation.

3. Airworthiness Certification. Process and aircraft qualification for civil UAS proponents to obtain a special airworthiness certificate.

4. Airworthiness Statement. Document required from public UAS proponents during a Certificate of Waiver or Authorization (COA) application process which confirms aircraft airworthiness.

5. Certificate of Waiver or Authorization (COA). An FAA grant of approval for a specific operation. The authorization to operate a UAS in the National Airspace System (NAS) as a public aircraft outside of Restricted, Warning, or Prohibited areas approved for aviation activities.

6. Chase Aircraft. A manned aircraft that carries its own pilot-in-command (PIC) and a separate qualified VO flying in proximity to a UA.

7. Civil Aircraft. Aircraft other than public aircraft.

8. Cooperative Aircraft. Aircraft that have an electronic means of identification (i.e., a transponder or ADS-B transceiver) aboard in operation.

9. Crewmember [UAS]. In addition to the crewmembers identified in 14 CFR part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and VOs, but may include other persons as appropriate or required to ensure safe operation of the aircraft.

10. Crew Resource Management (CRM). The effective use of all available resources including human, hardware, and information resources.

11. Daisy-Chaining. Aviation jargon for the use of multiple, successive observers to extend the flight of a UA beyond the direct visual line-of-sight of any other PIC or VO.

12. Experimental Certificate. A type of special airworthiness certificate issued for the purposes of research and development (R&D), crew training, exhibition, and market survey as defined in 14 CFR part 21, § 21.191(a), (c), and (f). Note: According to § 91.319(a)(2), experimental aircraft may not be used for carrying persons or property for compensation or hire.

a. R&D Aircraft. Aircraft testing new design concepts, equipment, installations, operating techniques, or uses for aircraft. Any unmanned aircraft system (UAS), including an Optionally Piloted Aircraft (OPA) is eligible for an experimental certificate under this purpose. Operations

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may be conducted by the proponent only as a matter of research or to determine whether an idea warrants further development.

b. Crew Training. Crew training is limited to the number of flight crews required by the proponent to conduct experimental aircraft operations.

c. Market Survey. Aircraft may be used for the purposes of conducting market surveys, sales demonstrations, and customer crew training of the manufacturer's customers as provided in part 21, § 21.195.

13. External Pilot. A UAS pilot who flies from outside a CS shelter with direct visual contact with the aircraft.

14. FAA-Recognized Equivalent. An FAA recognition that a public agency may exercise its own internal processes regarding airworthiness and pilot, aircrew, and maintenance personnel certification and training; furthermore, the agency has determined that its UAS is capable of safe operation in the National Airspace System (NAS) when conducting public aircraft operations under Title 49 of the United States Code (49 U.S.C.) §§ 40102(a)(41) and 40125.

15. Fly-Away. An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA is not operating in a predicable or planned manner.

16. Formation.

a. Non-standard formation. A formation operating under any of the following conditions:

- When the flight leader has requested and ATC has approved other than standard formation dimensions;
- When operating within an authorized block altitude or under the provisions of a letter of agreement (LOA);
- When the operations are conducted in airspace specifically designed for a special activity.

b. Standard formation. A formation in which proximity of no more than 1 NM laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman or UA.

17. Inspection. The routine performance of inspection tasks at prescribed intervals. The inspection must ensure the airworthiness of an aircraft up to and including its overhaul or life limits.

18. Internal Pilot. A UAS pilot who flies from inside a CS shelter without direct visual contact with the aircraft.

19. Lost Link. An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA will perform a predictable or planned maneuver. Loss of command and control link between CS and aircraft. There are two types of links:

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- An uplink which transmits command instructions to the aircraft, and
- A downlink which transmits the status of the aircraft and provides situational awareness to the pilot.

20. Missile. A non-recoverable, powered, guided munition that travels through the air or space.

- Ballistic missiles follow a ballistic trajectory.
- Cruise missiles generate lift.
- Guided missiles are launched from a ship or aircraft and serve as a self-contained precision bomb.

21. Non-Cooperative Aircraft. Aircraft that do not have an electronic means of identification (e.g., a transponder) aboard or that have inoperative equipment because of malfunction or deliberate action.

22. Non-Standard Formation. See Formation.

23. Observer. A trained person who assists a UAS pilot in the duties associated with collision avoidance and navigational awareness through electronic or visual means. (Collision avoidance includes, but is not limited to, avoidance of other traffic, clouds, obstructions, terrain and navigational awareness.) A visual observer (VO) is a trained person who assists the UAS pilot by visual means in the duties associated with collision avoidance. A VO includes the OPA pilot when the OPA is being operated as a UAS.

24. Off-Airport. Any location used to launch or recover aircraft that is not considered an airport (e.g., an open field).

25. Optionally Piloted Aircraft (OPA). An aircraft that can conduct operations as a traditional aircraft with a pilot aboard the aircraft, and can also operate as a UAS when the aircraft is operated and controlled by the CS pilot, allowing the pilot aboard the aircraft to become a qualified observer and remain a PIC. OPA operating as a UAS must meet UAS guidance requirements.

26. Pilot Duty Period. The period beginning when a flightcrew member is required to report for duty, with the intention of conducting a flight, and ending when the aircraft is parked after the last flight. It includes the period of time before a flight or between flights that a pilot is working without an intervening rest period.

27. Pilot-in-Command (PIC)-[UAS]. The person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the PIC as described by 14 CFR part 91, § 91.3 apply to the UA PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight. Note: The PIC can only be the PIC for one aircraft at a time. For OPA, PIC must meet UAS guidance requirements for training, pilot licensing, and medical requirements when operating OPA as a UAS.

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28. Populated or Urban Areas. Areas depicted in yellow on a Visual Flight Rules (VFR) sectional chart or as determined from other sources.

29. Proponent. A person or agency making an application for a Certificate of Waiver or Authorization (COA).

30. Public Aircraft. An aircraft operated by a governmental entity (including Federal, State, or local governments, and the U.S. Department of Defense (DOD) and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. See 14 CFR part 1, § 1.1 for a complete definition of a public aircraft.

31. Public Operator. An operator that is classified as government and/or otherwise qualifies for public aircraft operation under 49 U.S.C. §§ 40102(a)(41) and 40125. Not all flights by a public aircraft operator qualify as a public aircraft operation under the statute. Public aircraft operation status is not automatic for flights conducted by a government entity or a contractor to a government entity.

32. Rocket. A powered, unguided munitions (DOD); or an aircraft propelled by ejected expanding gases generated in the engine from self-contained propellants and not dependent on the intake of outside substances. It includes any part which becomes separated during the operation (14 CFR).

33. Safety Risk Management (SRM). A formalized, proactive approach to system safety. SRM is a methodology that ensures hazards are identified, risks are analyzed, assessed, and prioritized; and results are documented for FAA decision-makers to transfer, eliminate, accept, or mitigate risk.

34. Scheduled Maintenance (Routine). The performance of maintenance tasks at prescribed intervals.

35. Segregation. Setting apart from other air traffic operations in the NAS. Segregation is not synonymous with required air traffic separation standards. Therefore, segregation does not prescribe or mandate criteria such as vertical, lateral, or longitudinal distances.

36. Shells. Munitions that are fired from a gun whether guided or not.

37. Smart Bomb. Precision-guided munitions.

38. Standard formation. See formation.

39. Supplemental Pilot. Pilots assigned UAS flight duties to augment the PIC. It is common for proponents to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the PIC if the specified qualifications are met.

40. Torpedoes. Powered munitions that travel through water.

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41. Unmanned Aircraft (UA). A device used or intended to be used for flight in the air that has no onboard pilot. This devise excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR part 101), rockets, tethered aircraft and un-powered gliders.

42. Unmanned Aircraft System (UAS). A UA and its associated elements related to safe operations, which may include CSs (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems (FTS), and launch/recovery equipment.

43. Unscheduled Maintenance (Non-Routine). The performance of maintenance tasks when mechanical irregularities occur.

44. Visual Line-of-Sight. Unaided (corrective lenses and/or sunglasses exempted) visual contact between a PIC or a VO and a UAS sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.

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APPENDIX B. ACRONYMS

AC	Advisory Circular
AFPD	Air Force Policy Directive
AFS	Flight Standards Service
AGC	Chief Counsel
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AMOC	Alternative Means of Compliance
AR	Army Regulations
ASI	Aviation Safety Inspector
ATCAA	Air Traffic Control Assigned Airspace
ATCSCC	Air Traffic Control System Command Center
ATO	Air Traffic Organization
ATS	Air Traffic Service
AVS	Aviation Safety
CFIT	Controlled Flight Into Terrain
CFR	Code of Federal Regulations
COA	Certificate of Waiver or Authorization
CRM	Crew Resource Management
CS	Control Station
DCP	Divert/Contingency Points
DHS	Department of Homeland Security
DOD	Department of Defense
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FIR	Flight Information Regions
FL	Flight Level
FSIMS	Flight Standards Information Management System
FTP	Flight Termination Point
FTS	Flight Termination System
GCS	Ground Control Station
GHz	Gigahertz
GMF	Government Master File
HQ	Washington Headquarters
IFR	Instrument Flight Rules
LLP	Lost Link Points
LOA	Letter of Agreement
MHz	Megahertz
MSL	Mean Sea Level
NAS	National Airspace System
NASA	National Aeronautics And Space Administration
NAVAIRINST	Naval Air Systems Command Instruction
NM	Nautical Mile
NTIA	National Telecommunications And Information Administration

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OPA	Optionally Piloted Aircraft
PIC	Pilot in Command
POC	Point of Contact
R&D	Research and Development
RF	Radio Frequency
RM	Risk Management
RNAV	Area Navigation
RTB	Return to Base
RVSM	Reduced Vertical Separation Minimum
SM	Statute Mile
SRM	Safety Risk Management
SRMD	Safety Risk Management Document
SSI	Sensitive Security Information
STA	Special Temporary Authority
TAS	Traffic Advisory Systems
TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance Systems
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
U.S.	United States
USC	United States Code
USCBP	U.S. Customs and Border Protection
USCG	U.S. Coast Guard
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VO	Visual Observer

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APPENDIX C. RELATED REGULATIONS AND PUBLICATIONS

1. **Title 14 of the Code of Federal Regulations (CFR).**

   a. Part 1, Definitions and Abbreviations.

   b. Part 21, Certification Procedures for Products and Parts.

   - Section 21.191, Experimental certificates.
   - Section 21.193, Experimental certificates: general.
   - Section 21.195, Experimental certificates: Aircraft to be used for market surveys, sales demonstrations, and customer crew training.
   - Section 21.197, Special flight permits.
   - Section 21.199, Issue of special flight permits.

   c. Part 23, § 23.1309, Equipment, Systems, and Installations.

   d. Part 25, § 25.1309, Equipment, Systems, and Installations.

   e. Part 61, Certification: Pilots, Flight Instructors, and Ground Instructors.

   - Section 61.23, Medical Certificates: Requirement and Duration.
   - Section 61.56, Flight Review.
   - Section 61.57, Recent Flight Experience: Pilot in Command.
   - Section 61.58, Pilot-in-Command Proficiency Check: Operation of an Aircraft that Requires more than one Pilot Flight Crewmember or is Turbojet-Powered.

   f. Part 65, § 65.83, Recent Experience Requirements.

   g. Part 67, Medical Standards and Certification.

   h. Part 91, General Operating and Flight Rules.

   - Section 91.3, Responsibility and Authority of the Pilot in Command.
   - Section 91.13, Careless or Reckless Operation.
   - Section 91.15, Dropping Objects.
   - Section 91.17, Alcohol or Drugs.
   - Section 91.21, Portable Electronic Devices.
   - Section 91.111, Operating Near Other Aircraft.
   - Section 91.113, Right-of-Way Rules: Except Water Operations.
   - Section 91.115, Right-of-Way Rules: Water Operations.
   - Section 91.126, Operating on or in the Vicinity of an Airport in Class G Airspace.
   - Section 91.127, Operating on or in the Vicinity of an Airport in Class E Airspace.
   - Section 91.129, Operations in Class D Airspace.
   - Section 91.130, Operations in Class C Airspace.
   - Section 91.135, Operations in Class A Airspace.
   - Section 91.155, Basic VFR Weather Minimums.

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- Section 91.157, Special VFR Weather Minimums.
- Section 91.180, Operations within Airspace Designated as Reduced Vertical Separation Minimum Airspace.
- Section 91.203, Civil Aircraft: Certifications Required.
- Section 91.215, ATC Transponder and Altitude Reporting Equipment and Use.
- Section 91.319, Aircraft having Experimental Certificates: Operating Limitations.

2. Title 49 of the Code of Federal Regulations (CFR).

a. Chapter I, Subchapter C, Hazardous Materials Regulations.

b. Chapter VIII, Part 830, Notification and Reporting of Aircraft Accidents or Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records.

c. Chapter XII, Part 1520, § 1520.5, Sensitive Security Information.

3. Related Publications (current editions).

4. Advisory Circulars (AC).

- AC 00-1.1, Government Aircraft Operations.
- AC 91-57, Model Aircraft Operating Standards.
- AC 120-51, Crew Resource Management Training.
- AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers.
- AC 120-92, Introduction to Safety Management Systems for Air Operators.

5. FAA Notices. N JO 7210.766, Unmanned Aircraft Operations in the National Airspace System (NAS).

6. FAA Orders.

- JO 1000.37, Air Traffic Organization Safety Management System.
- JO 7110.65, Air Traffic Control.
- JO 7210.3, Facility Operation and Administration.
- JO 7400.8, Special Use Airspace.
- JO 7610.4, Special Operations.
- 8000.369, Safety Management System Guidance.
- 8020.11C, Aircraft Accident and Incident Notification, Investigation, and Reporting.
- 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft.
- 8900.1, Flight Standards Information Management System.

7. Other Documents.

- Title 47 CFR Part 300, National Telecommunications and Information Administration (NTIA) Manual, Chapter 7.11, Use of Frequencies by Certain Experimental Stations.
- Title 49 United States Code (49 U.S.C.) §§ 40102(a)(41), Definitions.

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- FAA Air Traffic Organization (ATO) Safety Management System Manual.
- Memorandum of Agreement Concerning the Operation of Department of Defense Unmanned Aircraft Systems in the National Airspace System (DOD-FAA MoA, September 24, 2007).
- Convention on International Civil Aviation ("Chicago Convention"). 7 December 1944, 61 Stat. 1180, 15 U.N.T.S. 295.

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APPENDIX D. SAFETY CASE FORMAT

1. **Signature Page.** Include the following information on the signature page:

   - Title: A clear and concise description of the proposed method for AMOC;
   - Originator Information: Originator's name, organization, contact information, etc.;
   - Safety Risk Management Document (SRMD) Information: Safety Case submission date, revision number, etc.

2. **Executive Summary.** The summary should give a general description of the proposed AMOC, including a list of the hazards with associated risk level (high, medium, low) and their corresponding initial and predicted residual risk. Include a high level system description, a summary of how the Safety Case was developed, and what process/method was used to move through the risk assessment process.

3. **Introduction.** Provide a brief reasoning/rationale for the initiative. The scope of the proposed AMOC, whether it is more complex or far-reaching, will determine the need for increased scope and detail of the analysis to be performed.

4. **Section 1.** Current System/System Baseline. Provide a description of the current system or existing procedures as well as the corresponding (operational) system states. If the proposal entails a procedural change, describe the current procedure and its operational environment. If the current system or procedure is unique and has challenges associated with its unique situation, be sure to delineate.

5. **Section 2.** Proposed Change. Provide a description of the proposed change/procedure, identifying which safety parameters are involved.

6. **Section 3.** Safety Risk Management (SRM) Planning and Impacted Organizations. Prior to initiation of the safety analysis, SRM planning is necessary. It is essential to select the appropriate SRM participants, identify the SRM Panel, schedule milestones, and assign tasks and responsibilities. With regard to the organizations that are impacted by the change, describe the method used for collaboration between those organizations during the identification, mitigation, tracking, and monitoring of hazards associated with the change.

7. **Section 4.** Assumptions. If in the process of developing a procedure to validate an AMOC, any assumptions are made to make the evaluation of the change more manageable, clearly define and document them in this section.

8. **Section 5.** Phase 1: System Description. The description of the system/procedure, its operational environment, the people involved/affected by the change/procedure, and the equipment required to accommodate the proposal must be provided.

9. **Section 6.** Phase 2: Identified Hazards. The SRM Panel identifies hazards as a collaborative effort. The tool(s) and technique(s) used to identify hazards should be specified and discussed. The identified hazards are documented as well as their corresponding causes, the corresponding system states considered and the consequent potential outcome. It is important to realize that while identification of the worst credible outcome and the system state in which the worst

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credible outcome occurs is required, system states with less severe outcomes should not be ignored.

10. Section 7. Phase 3 & 4: Risk Analysis & Risks Assessed. Describe the process used to analyze the risks associated with the identified hazards. Specify what type of data was used to determine the likelihood of risk occurrence (e.g., quantitative or qualitative) as well as the sources of the data. A risk matrix should provide an illustration of the predicted initial/current risk(s) associated with the identified hazards.

11. Section 8. Phase 5: Treatment of Risks/Mitigation of Hazards. If the existing controls and mitigations do not acceptably mitigate the hazards, then additional recommended safety requirements should be identified. An explanation of how the recommended safety requirements are expected to reduce the initial/current risk to an acceptable predicted residual risk level should be included. Low-risk hazards may still warrant recommended safety requirements.

12. Section 9. Tracking and Monitoring of Hazards. Once the proposal has been approved and implemented, tracking of hazards and verification of the effectiveness of mitigation controls throughout the lifecycle of the system or change are required. Also, the methodology for this tracking and monitoring should be outlined.

13. Appendices.

a. Documents Related to the SRMD. Include a list of documents (orders, directives, regulations, handbooks, and manuals) that pertain to the proposed change, which have been consulted in the development of the proposed change and the corresponding safety analysis.

b. Hazard Identification Tools. Provide information on the different tool(s), method(s), and technique(s) used during the safety analysis. (See Figure D-1, for a chart listing acceptable hazard analysis tools and techniques.)

c. Hazard Analysis and Risk Matrix. Depending on the analyses necessary, there might be one or more appendices with analyses. A risk matrix reflecting the initial and predicted residual risks should also be included.

d. Glossary. Include any acronyms and definitions for any terms you listed in the Safety Case.

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Figure D-1. Acceptable Hazard Analysis Tools and Techniques

This chart from the ATO Safety Management System Manual, available on the Internet, displays acceptable hazard analysis tools for developing safety cases.

Air Traffic Organization Safety Management System Manual - Version 2.1

Table 3.1: Selection of Hazard Identification and Analysis Tools and Techniques

Tool or Technique	Summary Description	Page in Appendix G
Preliminary Hazard Analysis (PHA)	The PHA provides an initial overview of the hazards present in the overall flow of the operation. It provides a hazard assessment that is broad, but usually not deep.	G-1
Operational Safety Assessment (OSA)	The OSA is a development tool based on the assessment of hazard severity. It establishes how safety requirements are to be allocated between air and ground components and how performance and interoperability requirements might be influenced.	G-3
Comparative Safety Assessment (CSA)	The CSA provides management with a listing of all of the hazards associated with a change, along with a risk assessment for each alternative hazard combination that is considered. It is used to rank the options for decision-making purposes. The CSA's broad scope is an excellent way to identify issues that may require more detailed hazard identification tools.	G-5
Fault Hazard Analysis (FHA)	The FHA is a deductive method of analysis that personnel can use exclusively as a qualitative analysis or, if desired, can expand to a quantitative one. The FHA requires a detailed investigation of the subsystems to determine component hazard modes, causes of these hazards, and resultant effects on the subsystem and its operation.	G-8
Failure Mode and Effect Analysis (FMEA)	The FMEA determines the results or effects of sub-element failures on a system operation and classifies each potential failure according to its severity.	G-9
Failure Modes, Effects, and Criticality Analysis (FMECA)	The FMECA is an essential function in design from concept through development. To be effective, the FMECA is iterative to correspond with the nature of the design process itself. The FMECA identifies component and sub-system failure modes, including the impact of human error; evaluates the results of the failure modes; determines rates and probability; and demonstrates compliance with safety requirements.	G-9
What-If Analysis	The What-If Analysis methodology identifies hazards, hazardous situations, or specific accident events that could produce an undesirable consequence. One can use the What-If Analysis as a brainstorming method.	G-10
Scenario Analysis	The Scenario Analysis identifies and corrects potentially hazardous situations by postulating accident scenarios in cases where it is credible and physically logical.	G-12
Change Analysis	The Change Analysis analyzes the hazard implications of either planned or incremental changes (e.g., operation, equipment, or procedure).	G-13
Cause-Consequence Analysis	The Cause-Consequence Analysis combines the bottom-up and top-down analysis techniques of Event Trees and Fault Trees. The result is the development of potential complex accident scenarios.	G-15

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Figure D-1. Acceptable Hazard Analysis Tools and Techniques, continued

Air Traffic Organization Safety Management System Manual - Version 2.1

Tool or Technique	Summary Description	Page in Appendix G
Hazard and Operability Tool (HAZOP)	A group uses the HAZOP to analyze hazards of completely new operations and to review the significance of all of the ways that a process element can malfunction or be incorrectly operated. The technique is essentially a structured brainstorming using specific guide words.	G-17
Interface Analysis	One uses the Interface Analysis to discover the hazardous linkages between interfacing systems.	G-18
Accident/Incident Analysis	The Accident/Incident Analysis uses data on recorded hazardous events. One groups these events in various ways according to a pre-established criterion, usually a common cause or outcome. One then identifies the groupings as hazards.	G-19
Job Safety Analysis (JSA)	One uses this technique to assess in detail the safety considerations in a single job or task..	G-20
Energy Trace and Barrier Analysis (ETBA)	The ETBA is highly structured. It documents all energy sources in system. One identifies the energy sources as hazards. One identifies the barrier between the energy sources and the operators, maintainers, and other systems as mitigations.	G-21
Fault Tree Analysis (FTA)	An FTA is a graphical design technique that can provide an alternative to block diagrams. It is a top-down, deductive approach structured in terms of events. One models faults in terms of failures, anomalies, malfunctions, and human errors.	G-22
Management Oversight and Risk Tree (MORT)	One uses the MORT technique to systematically analyze hazards to examine and determine detailed information about the process and accident contributors.	G-24
Human Error Analysis (HEA)	HEA, in a system context, involves assessing each human-machine interface point, decision, or action for the potential for human error to adversely impact system performance or safety of the system and its users. There are a variety of methodologies for conducting these analyses.	G-26
Job Task Analyses (JTA)	The foundation of the performance of HEA is a task analysis, which describes each human task/sub-task within a system in terms of the perceptual (information intake), cognitive (information processing and decision making), and manual (motor) behaviors required of an operator, maintainer, or support person. It should also identify the skills and information required to complete the tasks; equipment requirements; the task setting; time and accuracy requirements; and the probable human errors and consequences of these errors. There are several tools and techniques for performing task analyses, depending on the level of analysis needed.	G-28

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APPENDIX E. CONTINGENCY PLANNING LIMITATIONS

1. Point Identification. The proponent must submit contingency plans that address emergency recovery or flight termination of the unmanned aircraft (UA) in the event of unrecoverable system failure. These procedures will normally include Lost Link Points (LLP), Divert/Contingency Points (DCP) and Flight Termination Points (FTP) for each operation. LLPs and DCPs must be submitted in latitude/longitude (Lat/Long) format along with a graphic representation plotted on an aviation sectional chart (or similar format). FTPs or other accepted contingency planning measures must also be submitted in Lat/Long format along with a graphic representation plotted on an aviation sectional chart, or other graphic representation acceptable to the FAA. The FAA accepts the LLPs, DCPs, FTPs, and other contingency planning measures submitted by the proponent, but does not approve them. When conditions preclude the use of FTPs, the proponent must submit other contingency planning options for consideration and acceptance. At least one LLP, DCP, and FTP (or an acceptable alternative contingency planning measure) is required for each operation. The proponent must furnish this data with the initial Certification of Waiver or Authorization (COA) application. Any subsequent changes or modifications to this data must be provided to the Unmanned Aircraft Systems (UAS) Integration Office (AFS-80) for review and consideration no later than 30 days prior to proposed flight operations.

2. Risk Mitigation Plans. For all operations, the proponent must develop detailed plans to mitigate the risk of collision with other aircraft and the risk posed to persons and property on the ground in the event the UAS experiences a lost link, needs to divert, or the flight needs to be terminated. The proponent must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, Navigational Aids (NAVAIDS), and congested areas. In the event of a contingency divert or flight termination, the use of a chase aircraft is preferred when the UAS is operated outside of Restricted or Warning Areas. If time permits, the proponent should make every attempt to utilize a chase aircraft to monitor the aircraft to a DCP or to the FTP. In the event of a contingency divert or flight termination, the proponent will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

a. LLP Procedures.

(1) LLPs are defined as a point, or sequence of points, where the aircraft will proceed and hold at a specified altitude, for a specified period of time, in the event the command and control link to the aircraft is lost. The aircraft will autonomously hold, or loiter, at the LLP until the communication link with the aircraft is restored or the specified time elapses. If the time period elapses, the aircraft may autoland, proceed to another LLP in an attempt to regain the communication link, or proceed to an FTP for flight termination. LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is re-established or fuel exhaustion occurs.

(2) For areas where multiple or concurrent UAS operations are authorized in the same operational area, a segregation plan must be in place in the event of a simultaneous lost link scenario. The deconfliction plan may include altitude offsets and horizontal separation by using independent LLPs whenever possible.

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b. DCP Procedures.

(1) A DCP is defined as an alternate landing/recovery site to be used in the event of an abnormal condition that requires a precautionary landing. Each DCP must incorporate the means of communication with air traffic control (ATC) throughout the descent and landing (unless otherwise specified in the Special Provisions) as well as a plan for ground operations and securing/parking the aircraft on the ground. This includes the availability of control stations (CS) capable of launch/recovery, communication equipment, and an adequate power source to operate all required equipment.

(2) For local operations, the DCP specified will normally be the airport/facility used for launch and recovery; however, the proponent may specify additional DCPs as alternates.

(3) For transit and/or mission operations that are being conducted in Class A airspace or Class E airspace above flight level (FL) 600, DCPs will be identified during the flight to be no further than one hour of flight time at any given time, taking into consideration altitude, winds, fuel consumption, and other factors. If it is not possible to define DCPs along the entire flight plan route, the proponent must identify qualified FTPs along the entire route and be prepared to execute flight termination at one of the specified FTPs if a return to base (RTB) is not possible.

(4) It is preferred that specified DCPs are non-joint use military airfields, other government-owned airfields, or private-use airfields. However, the proponent may designate any suitable airfield for review and consideration.

c. Flight Termination Procedures.

(1) Flight termination is the intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination must be executed in the event that all contingencies have been exhausted and further flight of the aircraft cannot be safely achieved or other potential hazards exist that require immediate discontinuation of flight. FTPs or alternative contingency planning measures must be located within power-off glide distance of the aircraft during all phases of flight and must be submitted for review and acceptance. The proponent must ensure sufficient FTPs or other contingency plan measures are defined to accommodate flight termination at any given point along the route of flight. The location of these points is based on the assumption of an unrecoverable system failure and must take into consideration altitude, winds, and other factors.

(2) Unless otherwise authorized, FTPs must be located in sparsely populated areas. Except for on- or near-airport operations, FTPs will be located no closer than five nautical miles (NM) from any airport, heliport, airfield, NAVAID, airway, populated area, major roadway, oil rig, power plant, or any other infrastructure. For offshore locations, the proponent must refer to appropriate United States Coast Guard (USCG) charts and other publications to avoid maritime obstructions, shipping lanes, and other hazards. Populated areas are defined as those areas depicted in yellow on a Visual Flight Rules (VFR) sectional chart or as determined from other sources.

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(a) It is preferred that flight termination occurs in Restricted or Warning Areas, government-owned land, or offshore locations that are restricted from routine civil use. However, the proponent may designate any suitable location for review and consideration.

(b) The proponent is required to survey all designated areas prior to their use as an FTP. All FTPs will be reviewed for suitability on a routine and periodic basis, not to exceed six months. The proponent assumes full risk and all liability associated with the selection and use of any designated FTP.

(c) It is desirable that the proponent receive prior permission from the land owner or using agency prior to designation of this area as an FTP. The proponent should clearly communicate the purpose and intent of the FTP.

(d) For each FTP, plans must incorporate the means of communication with ATC throughout the descent as well as a plan for retrieval/recovery of the aircraft.

(e) Contingency planning must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, NAVAIDS, and congested areas to the maximum extent possible.

(f) In the event of a contingency divert or flight termination, if time permits, the use of a chase aircraft is preferred when the UA is operated outside of Restricted or Warning Areas.

(g) In the event of a contingency divert or flight termination or other approved contingency measures, the proponent will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

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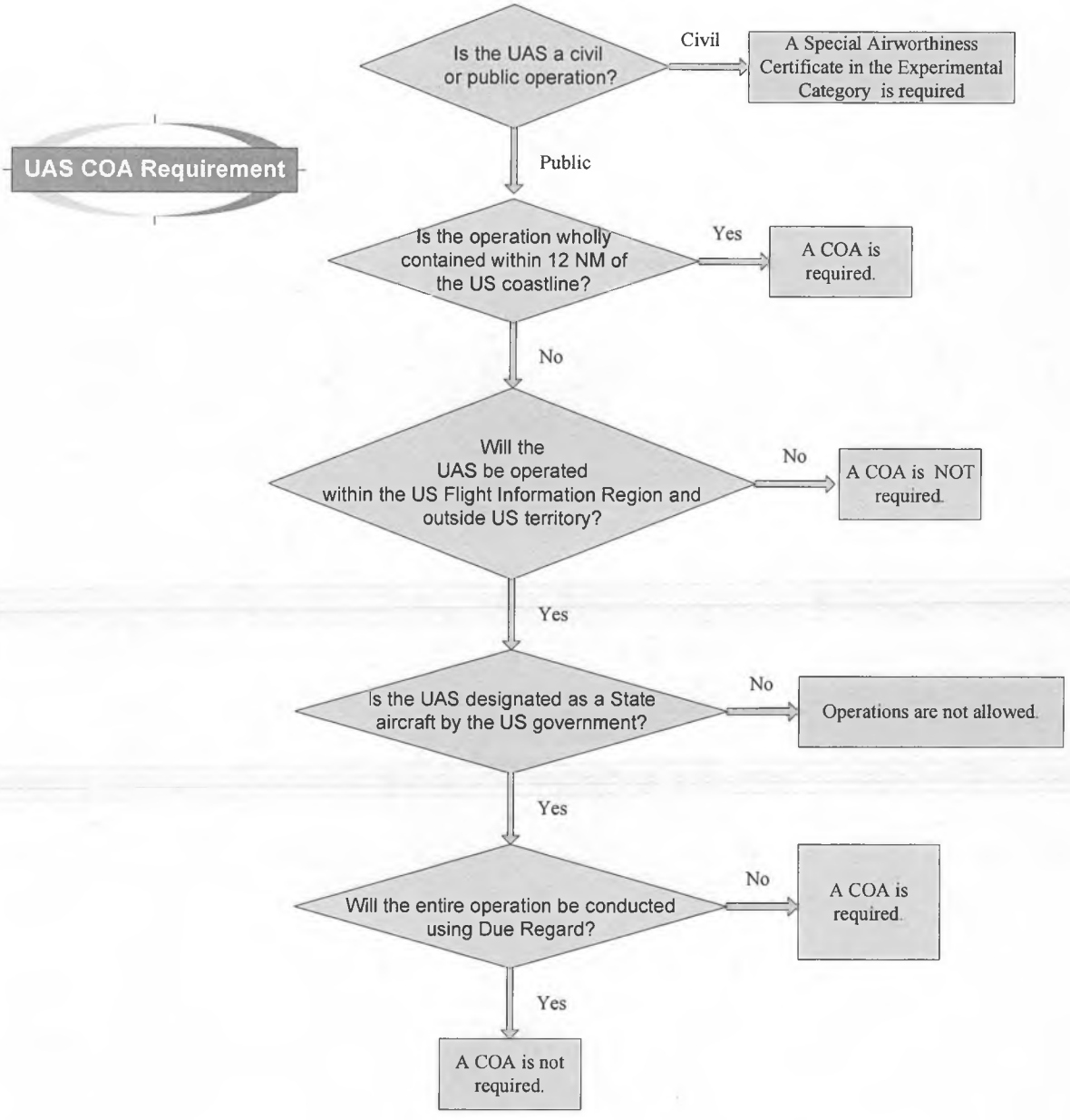
APPENDIX F. UAS COA REQUIREMENT FLOWCHART



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10/24/13 Task Force Meeting: Presentations and Public Testimony

<TARGET><BILL></BILL><SUBJECT>10-24-13 Task Force Meeting Presentations and Public Testimony</SUBJECT><COMM>JUNM28</COMM></TARGET>

Unmanned Aircraft Systems Legislative Task Force

October 24, 2013 Meeting at Anchorage LIO Room 220

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair
- Ginger Blaisdell, Staff to Rep. Hughes
- David Scott, Staff to Senator Donny Olson
- McHugh Pierre, Department of Military and Veterans' Affairs
- Greg Walker, University of Alaska Fairbanks
- Ro Bailey, University of Alaska Fairbanks
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics

Guest Attendee:

- Jay Skaggs, FAA
- Harry Kieling, Dept of InterioR

A G E N D A

8:30am Welcome and Introductions — Representative Shelley Hughes

Task Force responsibilities per HCR6

The duties of the task force shall include (1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems; (2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and (3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature.

Brief Remarks About October 23rd Testimony

- **General Theme of Remarks**
- **Lessons Learned by Testifiers**
- **Continue to accept public testimony in writing**

8:35am **List of Documents Provided** **Ginger Blaisdell, staff**

1. **FAA Guidelines document N8900**
2. **Legal Services Memo**: Alaska Laws Protecting Privacy
3. **Observations from Above**: Unmanned Aircraft Systems and Privacy
4. **Alaska Law Review**, June 1995
5. **Aerospace States Association**: UAS Privacy Considerations and correspondence from ACLU, AK Department of Law, Airborne Law Enforcement Association, International Association of Chiefs of Police Aviation Committee, American Legislative Exchange Council, AUVSI, Electric Frontier Foundation, Electronic Privacy Information Center, Douglas Marshall, NACDL, and a sample bill.
6. **International Association of Chiefs of Police Aviation Committee**
7. **Academy of Model Aeronautics Policy**
8. **State of Texas Privacy Act**
9. **Homeland Security:** Privacy Impact Assessment for the Aircraft Systems

8:40am-10:00am **Overview of FAA Guidelines** **Greg Walker and Ro Bailey, UAF**

US DOT, FAA N8900.207
Unmanned Aircraft Systems (UAS) Operational Approval

10:00am-10:30am **Law Enforcement Review** **Lt Steve Adams, AK State Troopers**

International Association of Chiefs of Police Aviation Committee
Recommendations from experience in Alaska

As we go through these documents and listen to presentations, the task force may want to consider the legislative approach to the following topics:

Report/Bill

- Does the Task Force want to introduce a report separate from the introduction of a bill as requested in HCR6?
- What does the task force want in a report to the legislature?
- What kind of supporting documentation should be provided with the bill?

Legal Services Memo: Page 2
"The Court might find the use of a technology that exceeds human observational capacity the sort of intrusion that constitutes a search requiring a warrant or an accepted exception."
State of Texas Privacy Act: Page 1
What exceptions may need to be considered in legislation? Should the legislation prohibit uses and allow exceptions – OR – allow everything and specify prohibited uses?

Legal Services Memo: Page 4 and 5
"If the data is gathered by a government agency, it is a public record. However, AS 40.25.120 provides certain protections for private information." Inadvertent capture of evidence of illegal activity: "Use of inadvertently captured information in a criminal prosecution may depend on who captures the information, and whether the person whose actions have been captured has a reasonable expectation of privacy."
Under what circumstances would a court grant a search warrant to follow up on information inadvertently obtained, but not in "plain view?"

Observations from Above: Page 487-488
As technology continues to advance beyond 'normal' application of current laws, drafting new laws must adopt a balanced approach that recognizes the inherent difficulty in predicting the future.
How should Alaska law address law enforcement activities that might be considered 'uncommon practice' or 'routine' in reference to advanced technological capabilities? (such as thermal imaging)

Observations from Above: Page 495
"... But future (technological) developments will make long-term surveillance with UAS possible."
Should duration of flight hours be a consideration for exemptions of warrantless observations and intelligence collection or general flight use for any purpose?

Observations from Above: Page 503
"... in common law, a plaintiff generally must establish, at a minimum, that the intrusion was intentional and that it would be highly offensive to a reasonable person."
Do we need to consider a definition for "highly offensive to a reasonable person?"

Observations from Above: Page 508
Voluntary approaches of self-managed rules of UAS.
Do we want to adopt specific guidelines from the International Association of Chiefs of Police, AUVSI, Academy of Model Aeronautics, etc.? What if these guidelines make changes that are in conflict with Alaska Constitution or Alaska Law?

Observations from Above: Page 511
Suggestions for legislation:

- Consider the role that could be played by unintentionally captured images

- Legislation that would include a blanket prohibition on government use of private UAS data in criminal investigations would also be ill advised, as well as inconsistent with what routinely occurs in noninvasive settings.
- Any new legislation should recognize that images of public spaces from UAS will sometimes also include images of private spaces (nearby homes).
- State statute and scope of Federal Preemption: does not prevent state from passing any laws relating to how aircraft are flown.
- A state does not have the authority to enact UAS privacy laws that would decrease the safety of flight operations.

Miscellaneous comments from the public for the task force to consider:

1. Certification of Aircraft – who would certify, license, fee associated, "FAA is short on inspectors"
2. UAS pilot's license with differing levels of certification (hobbyist – commercial pilot plus UAS training hours)
3. Education provisions to train UAS Pilots
4. Specialized (high visibility) marking of UAS or lighting so that other aircraft can spot them
5. Insurance needs for private UAS operators
6. Who is responsible in educating the public
7. Disclaimer or disclosure for hobbyists when they purchase UAS
8. How to market Alaska as "Open for Business" for UAS operations
9. Public reporting requirements of UAS missions
10. Audits of UAS operators
11.

1:30pm – 4:30pm Public Testimony

Calls limited to 3 minutes each

4:30pm **Wrap Up** **Representative Hughes**

Ginger will summarize the documents discussed at this meeting and request a bill draft for our next meeting.

Task Force Timeline and Next Meeting Date/Time

Adjournment

FAA Guidelines for UAS

Alaska Legislative Task Force

10-24-13
FAA GUIDELINES
RO BAILEY
AK CTR. FOR
UA SYSTEMS

Ro Bailey

Deputy Director

Alaska Center for Unmanned Aircraft Systems Integration

(907) 455-2104

Review

- Current Regulations
  - Definitions & Exceptions
- Guidelines, Policy, & COAs
- 2012 FAA Reauthorization Act
- How is Privacy Protected?
- What's Needed to Fully Integrate UAS into the National Airspace System

The Governments Authority to Regulate UAS Flight Operations

- The Government obtains its authority to regulate the NAS through statutes enacted by Congress.
- Based on statutory authority, the FAA's responsibility is to implement regulations which carry out Congress's intent.
- 49 USC § 40103(b) states that "The FAA Administrator shall prescribe air traffic regulations regarding the flight of aircraft for:
  - (A) Navigating, protecting, and identifying aircraft;
  - (B) Protecting individuals and property on the ground;
  - (C) Using the navigable airspace efficiently; and
  - (D) Preventing collision between aircraft, between aircraft and land or water vehicles, and between aircraft and airborne objects."

Definitions

- NAS = National Airspace System
- UAS = Unmanned Aircraft System (FAA official term)
  - Unofficial terms include UAVs, RPAS, drones
    - UAV = Unmanned Aircraft or Aerial Vehicle
    - RPAS = Remotely Piloted Aircraft System
- RC aircraft = Remotely controlled aircraft, refers to model aircraft
- AMOC = Alternate Mode of Compliance
- SA or S&A = See and Avoid or Sense and Avoid

What is an Aircraft?

- 49 USC § 40102 defines an aircraft as "any contrivance intended, used, or designed to navigate, or fly in, the air."
  - UAS are categorized as aircraft

- Therefore, all statutes and regulations relating to "aircraft" include UAS
- However, some contrivances that fit the definition above are actually defined out...

Examples

Aircraft

- Cessna 172
- Boeing 787
- ScanEagle
- Scout

Not Aircraft

- Balloon
- Ultralight
- Model aircraft
- Light Sport Aircraft
- Kites

Public vs Civil Aircraft

- Congress further defined aircraft by distinguishing between "civil" and "public"
  - A "civil aircraft" is any aircraft except a "public aircraft"
  - A "public aircraft" includes:
    - An aircraft that is used only for Government purposes, or
    - An aircraft that is leased or owned by the Government
- FAA authority differs between civil & public aircraft

49 USCS §44711

- Prohibits a person from operating a "civil aircraft" without an airworthiness certificate.
- Prohibits a person from acting as an "airman with respect to a civil aircraft."
  - Does not regulate public aircraft users
  - Public users expected to establish & follow adequate airworthiness determinations & training—and assume the liability for operations
- All aircraft must comply with rules-of-the-road (FAR91)

FAA Modernization & Reform Act of 2012
Subtitle B--Unmanned Aircraft Systems

- Sec. 331. Definitions
  - (1) Arctic
  - (3) Permanent Areas
  - (4) "Public" UAS
  - (5) Sense & Avoid
  - (6) "Small" UAS
- Sec. 332. Integration of civil unmanned aircraft systems into national airspace system
  - Required Planning for Integration
  - Rulemaking
  - Pilot Projects
  - Expanding the use of UAS in the Arctic
- Sec. 333. Special rules for certain unmanned aircraft systems
  - General
  - UAS Assessments
  - Requirements for Safe Operation
- Sec. 334. Public unmanned aircraft systems.
  - Guidance
  - Standards for Operation and Certification
  - Agreements with Government Agencies
- Sec. 335. Safety studies. The FAA shall carry out all safety studies necessary to support the integration of unmanned aircraft systems into the national airspace system.
- Sec. 336. Special rule for model aircraft.
  - General
  - Statutory Construction
  - Model Aircraft Defined
- Sec. 901. Authorizations or Appropriations
  - (b)(15) UAS Research
- Sec. 903. Unmanned Aircraft Systems.
  - Sec. 913. Review of FAA's Aviation Safety-Related Research Programs
  - (15) Unmanned aircraft systems research.

FAA Modernization and Reform Act of 2012

SEC. 332. INTEGRATION OF CIVIL UNMANNED AIRCRAFT SYSTEMS INTO NATIONAL AIRSPACE SYSTEM

REQUIRED PLANNING FOR INTEGRATION

- COMPREHENSIVE PLAN—Not later than 270 days after enactment ... to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system.
  - The plan shall provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015.
- REPORT TO CONGRESS—Not later than 1 year after the date of enactment ... a 5-year roadmap for the introduction of civil unmanned aircraft systems into the national airspace system

RULEMAKING

- Not later than 18 months ... a final rule on small unmanned aircraft

PILOT PROJECTS

- ESTABLISHMENT—Not later than 180 days after the date of enactment establish a program to integrate unmanned aircraft systems into the national airspace system at 6 test ranges.

Pilot Projects - continued

SEC. 332. INTEGRATION OF CIVIL UNMANNED AIRCRAFT SYSTEMS INTO NATIONAL AIRSPACE SYSTEM

TEST RANGE LOCATIONS—In determining the location of the 6 test ranges the Administrator shall—

(A) take into consideration geographic and climatic diversity;

(B) take into consideration the location of ground infrastructure and research needs; and

(C) consult with the National Aeronautics and Space Administration and the Department of Defense.

TEST RANGE OPERATION— operational not later than 180 days after the date on which the project is established.

Expanding Use of Unmanned Aircraft Systems in the Arctic

SEC 332 (d)

"…. the Secretary shall develop a plan and initiate a process to ….designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes."

- "Arctic" means the United States zone of the Chukchi Sea, Beaufort Sea, and Bering Sea north of the Aleutian chain.
- Designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes.
- Operations in these permanent areas shall include the development of processes to facilitate the safe operation of unmanned aircraft beyond line of sight.
- Such areas shall enable over-water flights from the surface to at least 2,000 feet in altitude, with ingress and egress routes from selected coastal launch sites.
- Approving the use of unmanned aircraft in the designated permanent areas in the Arctic without regard to whether an unmanned aircraft is used as a public aircraft, a civil aircraft, or a model aircraft.

Special Rules for Certain Unmanned Aircraft Systems

SEC 333 SPECIAL RULES FOR CERTAIN UNMANNED AIRCRAFT SYSTEMS.

IN GENERAL—not later than 180 days shall determine if certain unmanned aircraft may operate safely in the NAS before completion of the plan and rulemaking

ASSESSMENT OF UNMANNED AIRCRAFT SYSTEMS—the Secretary shall determine, at a minimum—

(1) which types of unmanned aircraft systems, if any, as a result of their size, weight, speed, operational capability, proximity to airports and populated areas, and operation within visual line of sight do not create a hazard to users of the national airspace system or the public or pose a threat to national security; and

(2) whether a certificate of waiver, certificate of authorization, or airworthiness certification is required for the operation of unmanned aircraft systems identified under paragraph (1).

REQUIREMENTS FOR SAFE OPERATION—If the Secretary determines under this section that certain unmanned aircraft systems may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft systems in the national airspace system.

Public Unmanned Aircraft Systems

SEC 334 PUBLIC UNMANNED AIRCRAFT SYSTEMS

GUIDANCE—Not later than 270 days after enactment, shall issue guidance regarding the operation of public unmanned aircraft systems to—

(1) expedite the issuance of a certificate of authorization process;

(2) provide for a collaborative process with public agencies to allow incremental expansion of access to the national airspace system as technology matures and the necessary safety analysis and data become available, and until standards are completed and technology issues are resolved;

(3) facilitate the capability of public agencies to develop and use test ranges, to test and operate unmanned aircraft systems; and

(4) provide guidance on a public entity's responsibility when operating an unmanned aircraft without a civil airworthiness certificate issued by the Administration.

STANDARDS FOR OPERATION AND CERTIFICATION—Not later than December 31, 2015, the Administrator shall develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system.

Agreements with Government Agencies

SEC 334 (c)

IN GENERAL—Not later than 90 days after enactment, the Secretary shall enter into agreements to simplify the process for issuing certificates of waiver or authorization

CONTENTS—The agreements shall—

(A) with respect to an application

(i) provide for an expedited review of the application;

(ii) require a decision by the Administrator on approval or disapproval within 60 business days of the date of submission of the application; and

(iii) allow for an expedited appeal if the application is disapproved;

(B) allow for a one-time approval of similar operations

(C) allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less, if operated—

within the line of sight of the operator; less than 400 feet above the ground, during daylight conditions;, within Class G airspace; and outside of 5 statute miles from location with aviation activities.

Safety Studies

SEC. 335 SAFETY STUDIES

The Administrator shall carry out all safety studies necessary to support the integration of unmanned aircraft systems into the national airspace system.

Authorizations or Appropriations

SEC 901 Authorizations or Appropriations

AUTHORIZATIONS.—The following programs described in the research, engineering, and development account of the national aviation research plan required under section 44501(c) are authorized:

(12) Unmanned Aircraft Systems Research

Unmanned Aircraft Systems

SEC 903 UNMANNED AIRCRAFT SYSTEMS

RESEARCH INITIATIVE—

in conjunction with other Federal agencies, as appropriate, to develop technologies and methods to assess the risk of and prevent defects, failures, and malfunctions of products, parts, and processes for use in all classes of unmanned aircraft systems that could result in a catastrophic failure of the unmanned aircraft that would endanger other aircraft in the national airspace system."

SYSTEMS, PROCEDURES, FACILITIES, AND DEVICES—

to develop a better understanding of the relationship between human factors and unmanned aircraft system safety; and to develop dynamic simulation models for integrating all classes of unmanned aircraft systems into the national airspace system without any degradation of existing levels of safety for all national airspace system users."

Special Rule for Model Aircraft

SEC 336 SPECIAL RULE FOR MODEL AIRCRAFT

IN GENERAL—Notwithstanding any other provision of law...the Administrator may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft, if—

(1) the aircraft is flown strictly for hobby or recreational use;

(2) the aircraft is operated in accordance with a community based set of safety guidelines and within the programming of a nationwide community-based organization;

(3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;

(4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and

(5) when flown within 5 miles of an airport, ...without a mutually-agreed upon operating procedure with the airport operator or the airport air traffic control tower.

Models vs UAS

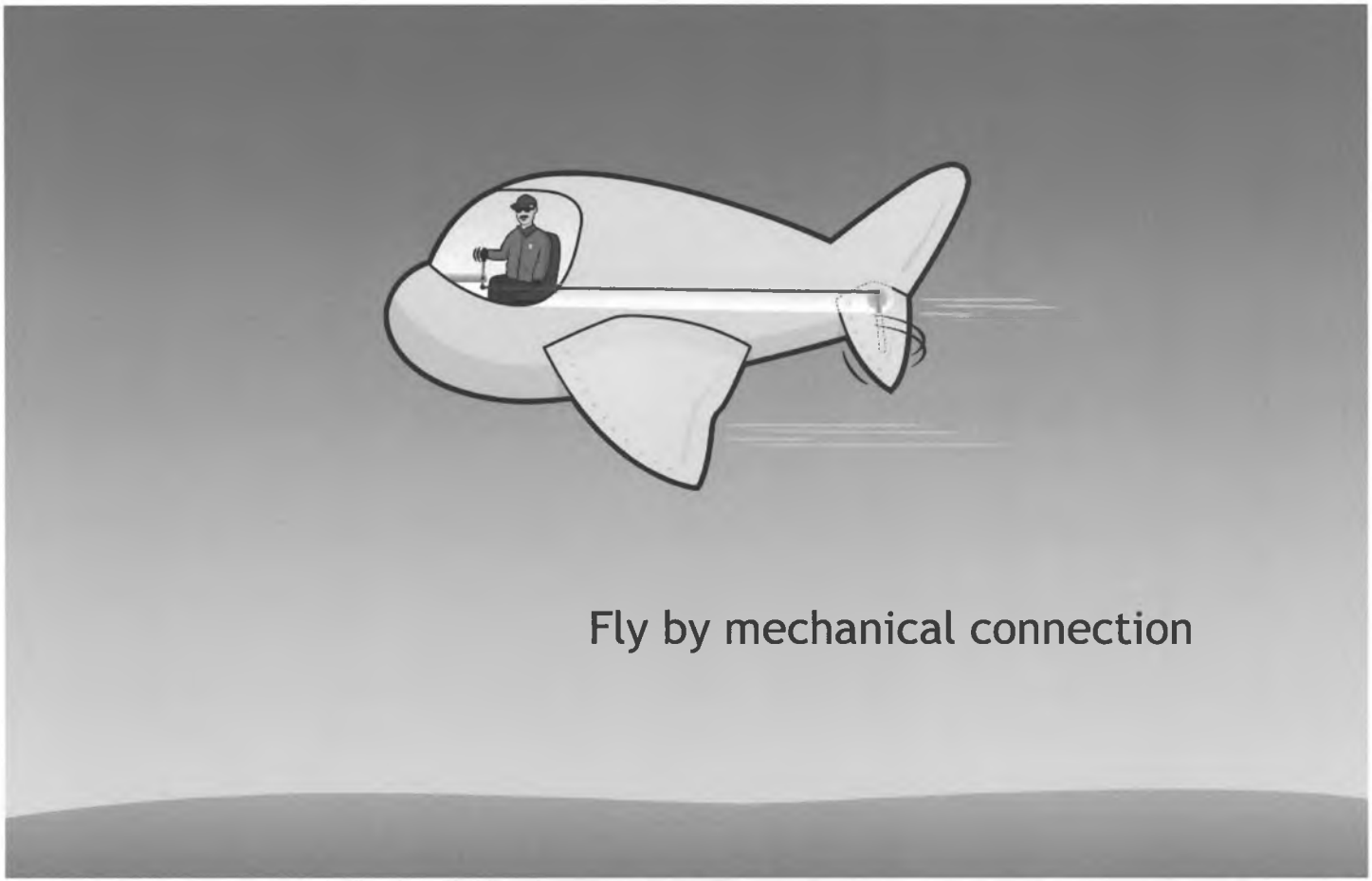
- The sole difference is how the equipment is used
  - Both may be hand controlled or autonomous
  - Both may carry complex payloads
  - Size and complexity vary in both
- A model, or hobbyist aircraft may only be used for non-business purposes
- The same equipment becomes a UAS if used for:
  - Paid services (surveying land for client)
  - Support your own business (photos for realtor)
  - Any activity that can be called "work"
- Governed by AC 91-57 published 6/9/1981 modified by 2012 reauthorization act

Pilot Licensing & Evaluation

14 CFR part 61

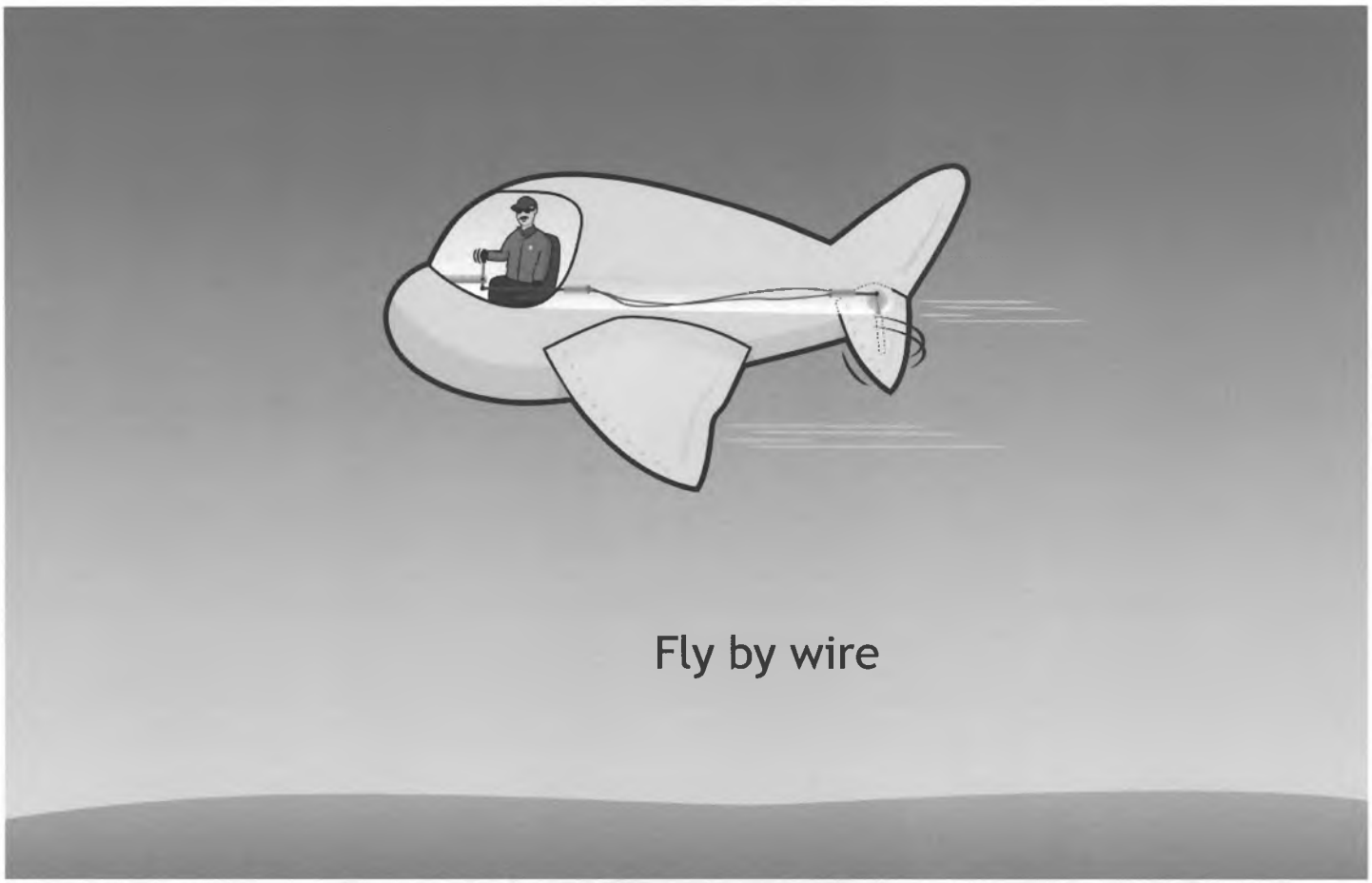
- Identifies applicability & requirements for eligibility, training, experience, currency, examination for all levels of pilots, instructors & examiners
- Part 67 identifies medical certificate requirements
- FAA policy 8900.227 provides interim requirements for UAS pilots, but no UAS-specific training or medical requirements have been incorporated into 14 CFR as yet

Manned vs Unmanned Control



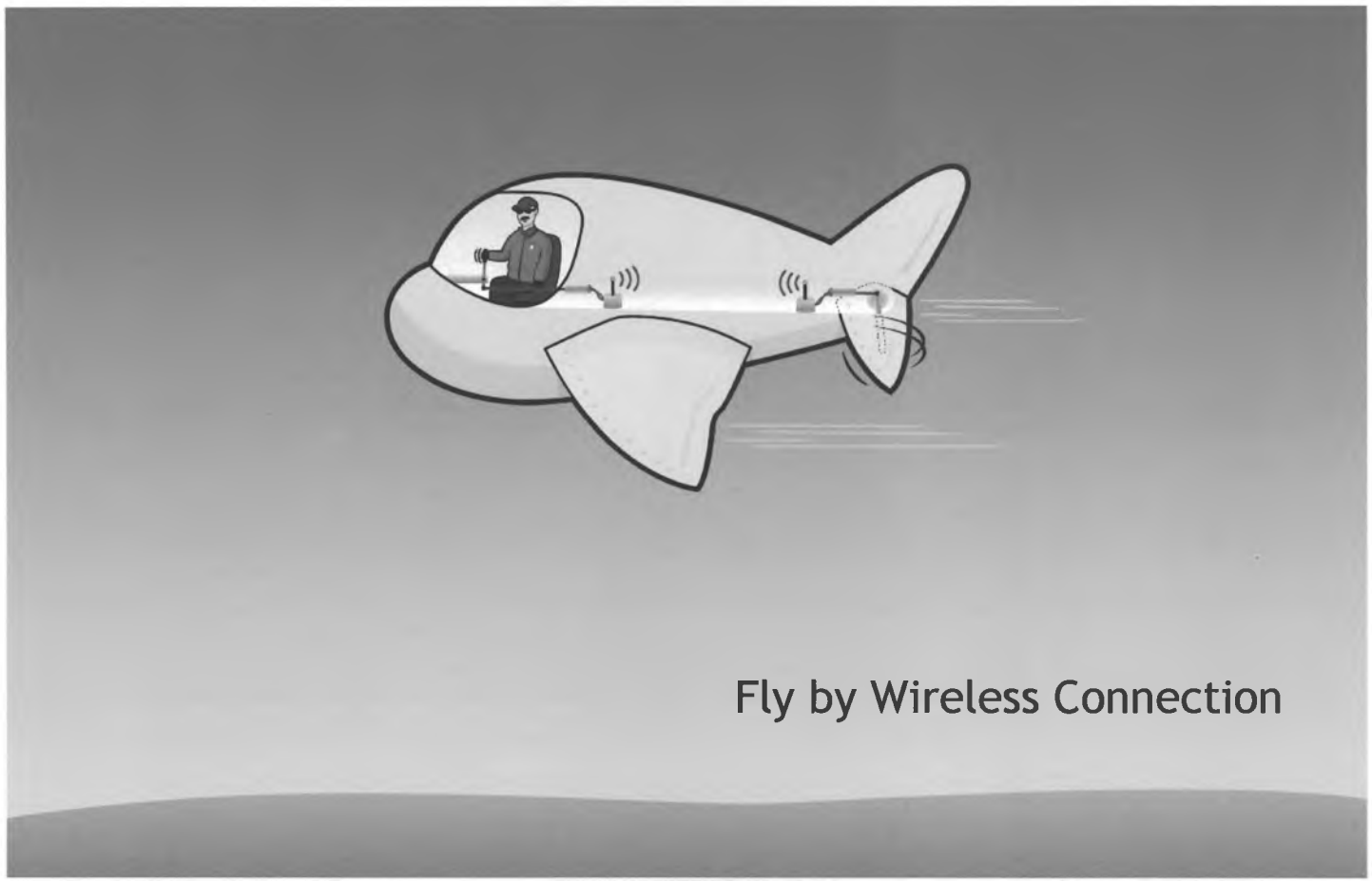
Fly by mechanical connection

Manned Control

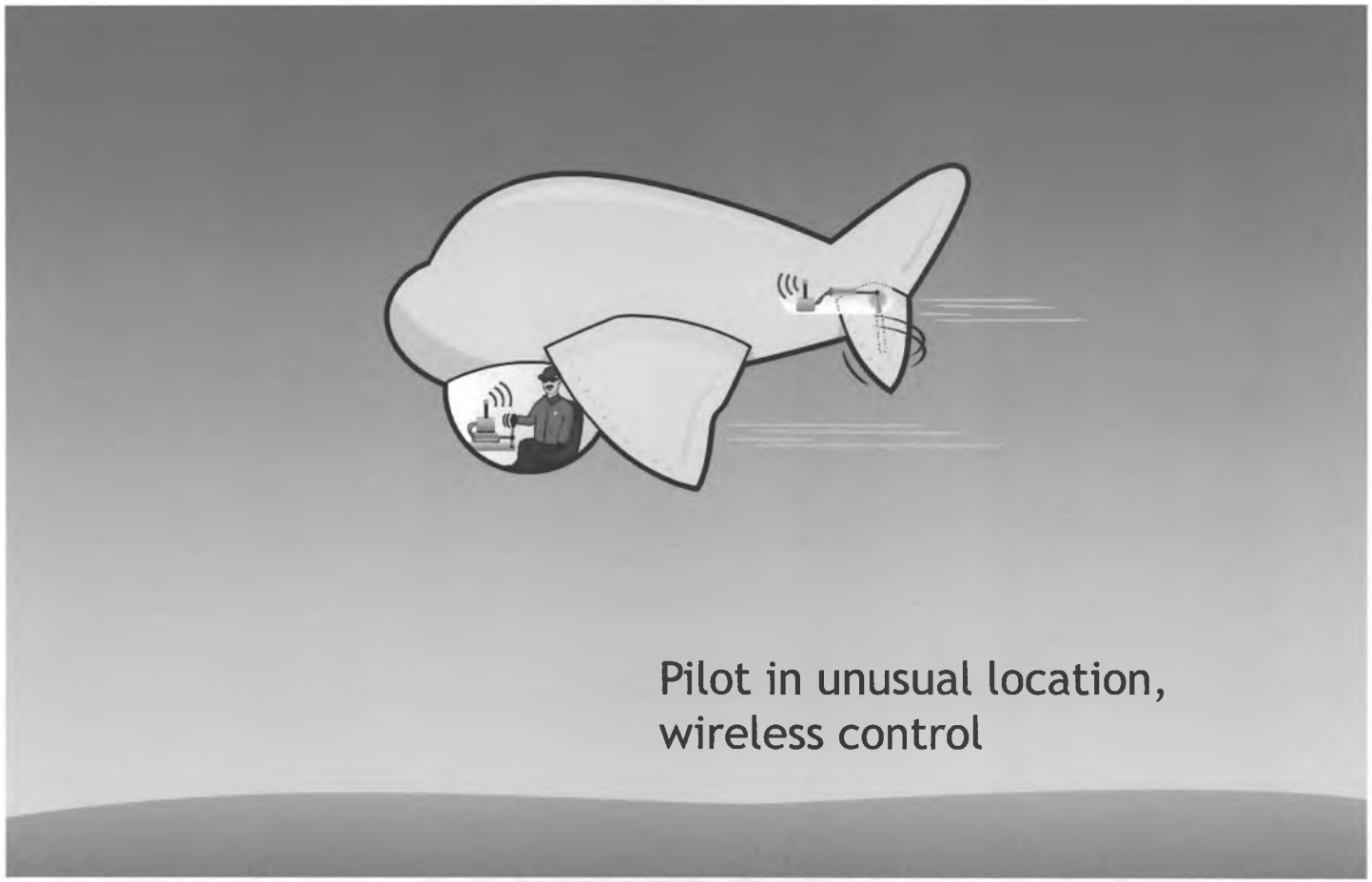


Fly by wire

Modern Manned Control



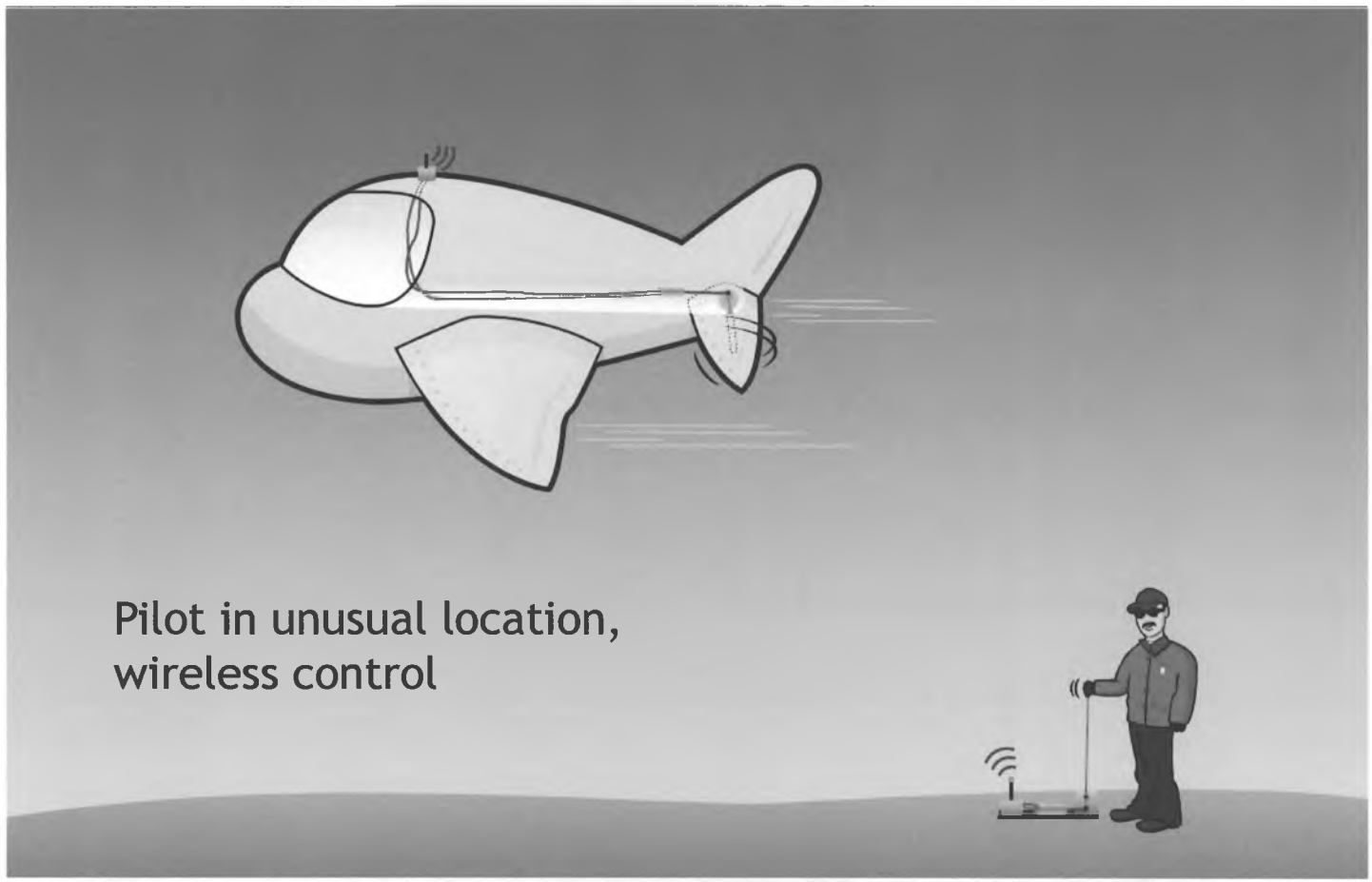
More Wireless Control



Pilot in unusual location,
wireless control

Unmanned Control

Beyond Line of Sight Becomes See & Avoid Issue



Challenges of See and Avoid for UAS

Issued for Part 91 Non-compliant Operations within the National Airspace.

These approvals are required due to the fact that unmanned aircraft (UA) are not compliant with various sections of Title 14 of the Code of Federal Regulations (14 CFR) and therefore, require an alternate means of compliance. *Most notably, the lack of an on-board pilot requires an alternate method of the "see-and-avoid"* provisions of 14 CFR 91.113, Right-of-Way Rules: Except Water Operations. - Interim Operational Approval Guidance 08-01

See and Avoid v. Sense and Avoid

- Alternate means of compliance must meet the reasonable standard of the eye of the onboard human pilot to "see and avoid" other objects.
- Bottom line is the pilot must make sure the airspace is clear.
- FAA approves alternative means of compliance for manned aircraft. Therefore "see and avoid" can be equated to "sense and avoid" which can be accomplished by technical means equal to or better than the human eye.
- Logic argues that the use of reliable primary radar, collision avoidance systems, or airspace studies showing no air traffic sufficiently demonstrate safe operations and comply with the spirit of CFR 91.113(b) and prior FAA decisions.

See and Avoid

The courts have ruled that CFR 91.113(b) requires "the reasonably prudent pilot need not be super-human in seeing and avoiding other aircraft, but he or she must scan the sky with such frequency and respond with such precision as is possible." Technology may assist the pilot, such as collision avoidance equipment or radar.

The FAA has acknowledged the following alternative means of compliance:

- In Class A (controlled) airspace the FAA authorizes Air Traffic Control (ATC) to provide separation guidance to aircraft (both manned and unmanned)
- The FAA approved use of primary radar to "sense" other aircraft
- FAA approves chase vehicles as acceptable replacement for an onboard pilot's eyes in which "eyes" are kept on the unmanned aircraft from another plane, a chase car, or a ground observer

Role of the Six Test Sites

- Assist FAA to resolve the issues preventing integration
  - Conduct safety studies
  - Develop potential policies, procedures
  - Establish their own training, certification, assess success, & report to FAA
  - Work toward standards for type certification, evaluate UAS offered by manufacturers
  - Propose changes/improvements to FAA regulations

Status of FAA Test Site

- Jan 2012: FAA Reauthorization Act directed FAA to select 6 Test Sites to research and test for safe integration of UAS into the national airspace
- Feb 14 2013: Solicitation was released
- Proposals final submittal was May 6
- Selection underway; rumors abound but no real news
- Selection targeted by FAA for Dec 31 2013
- Then Other Transactions Agreement negotiated
- Then 180 days to reach operational status

Pan Pacific UAS Test Range Complex

- UAF leads team for states of Alaska, Oregon, and Hawaii, plus 57 additional team members
  - Includes state agencies (DOT, DPS, Forestry of DNR, DHS&EM, National Guard)
  - Universities, EDCs, corporations, associations
- Fourteen ranges around the three states
  - Strong link with military ranges
  - Forging links with manned aviation safety specialists
- Key questions to answer:
  - Procedures to protect manned aviation
  - Policies to protect privacy
  - Technical testing to assure control, see & avoid, lost link procedures, airworthiness, etc

How is Privacy Protected?

- Intend to protect privacy so beneficial uses can be obtained
- Current statutory/case law strongly protects privacy while defining legal airborne activities (manned)
  - Unmanned a new technology, but subject to same restrictions
  - DHS & National Institute for Justice have taken on task of defining specific UAS privacy rules
  - FAA will incorporate into Test Site and future rules
  - DoD & Guard training on domestic privacy well underway

More on Privacy

- International Association of Chiefs of Police issued guidelines for law enforcement use of UAS
  - Provided to Task Force, available online
  - The essence:
    - Follow FAA rules
    - Use strict supervisory accountability
    - Get warrants if any possibility of use for surveillance or investigation
    - Notify locals of intent to fly over them
    - Delete recordings not authorized by warrant, training use, or as required by law

Where's the Gap?

- Gaps in privacy protection not yet apparent
- No incidents claiming UAS violated privacy so far
  - When it happens, propose letting the system work it
  - Existing law & prior manned case law likely adequate
  - Create law only to cover gaps discovered in practice, not in "what if" thinking

Summary

- Technology & FAA rules in flux
  - US behind other nations—could lose lead
  - Current rules restrictive, complex, limited to public entities
  - FAA compliance with 2012 Reauthorization Act driving toward UAS integration & comprehensive rules
- Alaska opportunities significant
  - Enhanced by directives in 2012 law

UAF
UNIVERSITY OF
ALASKA
FAIRBANKS
Questions?

UAF
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ALASKA
FAIRBANKS
Alaska Center for UAS Integration
Thanks for your time!

What Alaska Offers

- Vast open airspace with little traffic
- Wild, extreme, unpopulated, diverse terrain
- Access to large military ranges with data gathering ability
- History of pioneering aviation technology
- Culture of innovative use of aviation
- Close relationship with regional FAA
- Perhaps most important, willingness to be thoughtful and methodical in potential policy decisions
- Legislation setting Alaska airspace aside

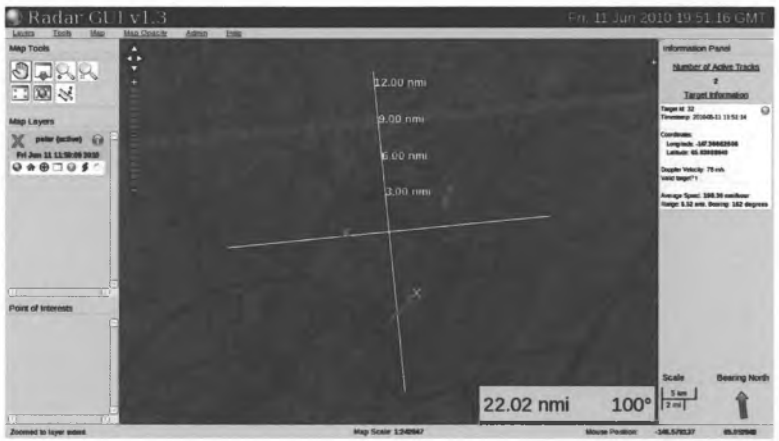
iPASS

UAF's Portable Airspace Surveillance System

Designed and built by UAF for Alaska's airspace monitoring needs

Status

Operational, used in Canada and NASA Certified



Airspace activity monitoring

Monitors airspace use patterns and validates traffic pattern assumptions

Enhanced situational awareness during aircraft or spacecraft operations

Provides real-time position and track of local airspace activity to assist in traffic avoidance

Alaska Center For UAS Integration RDT&E

- Created by Board of Regents Dec 2012
- Three integrated focus areas
  - Engineering - develop technical capabilities to meet new requirements
  - Application Development - drive system capabilities to expand uses and users
  - Training & Education - develop humans to develop, maintain & operate systems
- Within GI & UAF, but named as overall for UA
- Situated to exploit FAA opportunities - Arctic airspace, FAA Test Site

UNIVERSITY of ALASKA
Many Traditions One Alaska

POKER FLAT RESEARCH RANGE
FAIRBANKS, ALASKA

Volume Number: **VII**

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Applicant's Name: **University of Alaska**

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List of Acronyms

ACUASI	Alaska Center for Unmanned Aircraft Systems Integration
AUVSI	Association for Unmanned Vehicle Systems International
BMCC	Blue Mountain Community College
COA	Certificate of Authorization
COCC	Central Oregon Community College
ERAST	Environmental Research Aircraft and Sensor Technology
FAA	Federal Aviation Administration
FY	Fiscal Year
IMPLAN	Impact Analysis for Planning by MIG, Inc.
iPASS	Internet-Portable Aerial Surveillance System
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
OSU	Oregon State University
OTA	Other Transactional Agreement
PFRR	Poker Flat Research Range
PPUTRC	Pan-Pacific UAS Test Range Complex
SIR	Screening Information Request
UAF	University of Alaska Fairbanks
UAF CEM	University of Alaska Fairbanks College of Engineering and Mines
UAF CTC	University of Fairbanks Community and Technical College
UAF-GI	University of Alaska Fairbanks Geophysical Institute
UAS	Unmanned Aircraft System

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9.2.7. Economic Impact Assessment (SIR 9.2.7)

The Pan-Pacific Unmanned Aircraft Systems Test Range Complex (PPUTRC) is proposed as a Federal Aviation Administration (FAA) test site with 13 test ranges in Alaska, Hawaii, and Oregon. Successful PPUTRC designation would promote new construction, improve existing infrastructure, leverage current research institutions, and attract business investments for complementary assets throughout the service and supply chain in all three states. The economic impact of this activity would be substantial. The PPUTRC is projected by 2017 to increase employment in Alaska, Hawaii, and Oregon by approximately 1,429 jobs, labor income by $76 million, output by $334 million, total value added by $134 million, and government revenue via income taxes by $6 million. This new economic activity would represent significant benefits to the local economies surrounding the test ranges as well as throughout each state's economy.

UAS Activity in Alaska, Hawaii, and Oregon

Existing UAS activity in Alaska, Hawaii, and Oregon benefit from government facilities (e.g. numerous military bases, universities, and maritime assets), geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts), and wide open airspace in largely unpopulated areas.

The ACUASI at the University of Alaska Fairbanks (UAF) leads the PPUTRC. The formal PPUTRC team includes over 80 businesses, universities, tribes, and economic development organizations in Alaska. UAF has actively managed UAS operations since 2004. The ACUASI was formed in 2012 to enhance UAS research in Alaska. ACUASI and the UAF Geophysical Institute have developed and flown a variety of *in-situ* and remote sensing instruments on various UAS in Alaska and throughout the world. Scientific and research UAS campaigns undertaken in Alaska over the past decade include supporting observation and monitoring sea lions in the Aleutian Islands, weather forecasting, volcanic plume monitoring, atmospheric sampling during wildfires, monitoring of sea ice build ups, and oil spill mapping. Commercial applications trialed in Alaska include whale monitoring, cadastral mapping, maritime navigation support, industrial plant monitoring, and environmental clean-up. This experience, coupled with UAS Test Site status, would leverage a variety of new economic activities in Alaska.

Hawaii offers many unique qualities that make UAS operations appealing. These include: (1) expansive over-water areas unencumbered by other aviation uses, (2) proximity to U.S. Pacific Command - a significant user of future UAS systems, (3) opportunities for joint operations with the Pacific Missile Range Facility - a major test range on Kauai, and (4) opportunities for long-range point-to-point tests with partner ranges in Alaska and Oregon. The Hawaii ranges have proven an important focus for the development of scientific applications of UAS, with significant milestones including test flights of the Aerovironment Pathfinder, Pathfinder Plus, and Helios solar-hybrid propulsion high altitude long endurance UAS between 1997 and 2001. Scientific applications led by U.S. Federal agencies have recently seen Hawaii emerge as a focal point for NOAA's exploration of UAS as a tool for marine park surveillance. NOAA has used UAS to monitor Papahanaumokuakea Marine National Monument since 2007 and performed initial trials using small hand launched systems in mid-2012.

The Oregon-based PPUTRC team members include 16 businesses, universities, tribes, and economic development organizations. Additionally, six committed team partners will convert to

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formal team members upon FAA Test Site designation award to PPUTRC. Engagements are also planned with a wide ranging network in Oregon – including the 111 AUVSI members and numerous startup companies, primarily in sensor, robotics, and other supporting technologies. Oregon has historically been more engaged in design, development, and manufacture of UAS systems and subsystems. The two largest Oregon UAS firms are Insitu (manufacturing) and FLIR Systems (sensors). The main Oregon firm involved in UAS applications has been Near Space Corporation. NSC uses very high altitude unmanned balloons and gliders to perform scientific and commercial test activities, ranging from data gathering on behalf of government agencies to near-space testing of hardware and sensors for commercial firms. NSC is opening a new $6 million flight test and operations facility at the Tillamook airport on the Oregon coast. Existing UAS activity also includes the Oregon Army National Guard operations in Pendleton. Oregon's UAS efforts are synergistic with a separately funded ground vehicle innovation initiative, Drive Oregon, which requires systems that can be spun out of UAS: quiet, efficient motors, lightweight composite designs, and navigation systems. The potential economic benefits of the Test Sites as well as NAS integration are particularly strong for Oregon's already significant aircraft manufacturing sector.

Recent UAS Funding in Alaska, Hawaii, and Oregon

Since 2004, 9 Alaska contractors have received direct U.S. federal agency contracting for UAS goods and services. The largest federal contract in Alaska is a 5-year standing services award worth $47 million from the U.S. Navy to the University of Alaska in 2010 for UAS payload integration and flight test services. The second major award made since 2004 to an Alaska firm consists of a series of pacts totaling $17 million from the U.S. State Department to Anchorage-headquartered Kuk Construction (subsidiary of Olgoonik Development, an Alaskan Native Corporation) for the provision of UAS-based security surveillance services in Iraq in partnership with KBR, Inc. UAF has collaborated with commercial entities such as Idaho Power Company and manufacturers including AeroVironment to conduct surveys and observe environmental impacts. Additionally, UAF is collaborating with BP for oil spill response and flare stack monitoring as well as projects focused on detecting and locating gas and oil pipeline leaks and developing new sensors and processes to identify leaks. Each such project has led to more work as the clients discover the potential of UAS benefits to their businesses.

Hawaii's large military presence has resulted in defense spending as the primary source of federal funding to UAS vendors in the state. Direct defense contracts accounted for 94% of all awards in terms of obligated amounts from 2004-2012, with this rising to 97% when including awards placed by the GSA on behalf of the U.S. Air Force. The remaining awards were placed with Honolulu-based Referentia Systems by NOAA as part of the Papahanaumokuakea Marine National Monument monitoring project. Hawaii supports a dedicated UAS development and manufacturing company, Williams Aerospace, with this small firm currently developing new platforms in the fixed-wing, hand launched micro and medium altitude endurance classes. It is also working to create two commercial UAS services arms, addressing the defense, homeland security, and precision agriculture markets.

In Oregon, a consortium of industry, academia, and public entities has created a 7-year strategic plan to double the size of the UAS industry in the state, with the help of a $2.5 million State of Oregon grant scheduled for the 2013-14 biennium and additional investments of at least $1.15

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million from other sources for a total of $3.65 million. The plan specifically creates UAS solutions for commercial applications, and safely integrating those UAS solutions into the NAS. Projects include emergency response; weather; firefighting; search and rescue; wildlife and habitat management; law enforcement; physical and resource surveys (land and water); management of agriculture, livestock, and public lands; and management of public and private infrastructure. Oregon State University (OSU) has already begun UAS flights based on these research objectives.

Leveraging Current Research Institutes, Community Colleges, and Training Centers
ACUASI is collaborating with the College of Engineering and Mines (CEM) and the Community and Technical College (CTC) to integrate UAS engineering, science, and technology into UAF's teaching, research, and service activities. Additionally, ACUASI is working with the CEM to fill a full-time tenure track engineering faculty position with a professor focused on UAS engineering, science, and technology. ACUASI and CTC are working to include UAS technology courses in CTC's aviation curricula to train UAS developers, technicians, and pilots as well as to improve outreach to remote Alaskan villages that could benefit from UAS technologies. Cooperation with the CTC at UAA will add participation of air traffic controllers, offer training for UAS operators, and ultimately build a maintenance program similar to the current FAA certificated Aircraft and Powerplant program.

The University of Hawaii is testing UAS in several of its research programs, evaluating the utility and impact of UAS through analysis of coastal resource management, terrestrial and aquatic environmental monitoring, natural source management and inventory, and human impact studies. University of Hawaii is also developing programs to train students and research professionals on UAS, and plans to integrate this capacity into accredited degree programs.

The new OSU industry-university UAS consortium will depend on test site facilities for collaborative research and development in all phases of operations and applications. Through the Colleges of Engineering, Science, Agriculture, Forestry and Earth, Ocean and Atmospheric Sciences, OSU has expertise and supports ongoing research on control theory and robotics, flexible airframes and flight, sensors, and signal processing, and numerous applications in natural and environmental sciences and environmental monitoring, measuring and management. OSU-Cascades, located in Central Oregon near the Warm Springs and Juniper test ranges, has programs in energy engineering, computer science, natural resources, and business, and plans to add programs designed in conjunction with the UAS industry. OSU-Cascades can also provide on-site facilities for OSU-Corvallis researchers leading projects in the region. Central Oregon Community College (COCC) has one of the largest aviation flight training programs on the West Coast - both fixed wing and rotary. COCC is offering certifications for UAS flight training and plans to develop a program for data analysis of sensors, building on the school's strong geographic information systems program. Additionally, Blue Mountain Community College (BMCC) in Pendleton, Oregon is developing a UAS curriculum for instructional delivery and course certification.

Expansion of Existing Businesses and Attracting New Business Investment
The University of Alaska has spun off at least two companies who intend to test their products on the Pan-Pacific test range. These companies were created by University graduate students

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who were expanding their research in sensors for testing in UAS. UA recently received $5 million from the State of Alaska to support the development of a sustainable high-tech industry in Alaska. Already two companies have established satellite offices in Alaska, one of which is creating a new company for UAS aviation technology advancement.

Placement of a UAS Test Site in Hawaii will promote growth within Hawaii and reduce development cycles for manufacturers and researchers. Additionally, it would reduce or eliminate costs to ship sensors, and knowledgeable staff, to mainland test sites to operate and demonstrate systems. Close proximity to a test site in Hawaii will greatly benefit firms such as BAE Systems, Williams Aerospace, and others – including many military and government contractors working with Honolulu Fire Department, Honolulu Police Department, U.S. Civil Air Patrol, U.S. Coast Guard, U.S. Department of Defense, U.S. Department of Homeland Security, U.S. National Guard, and others.

In Oregon more than a dozen companies have said that they will begin testing their sensor packages, propulsion systems, and airframes in Oregon if the Pan-Pacific UAS Test Area is designated as a national Test Site. Additionally, two companies have informally pledged to open satellite offices at a state test range. The PPUTRC will benefit UAS businesses in the Columbia River Gorge. Over the past seven years, the Gorge's UAS industry grew from a small core of 30 people to an employment base of more than 1,400 employees. Many of these new jobs were created by the UAS companies' suppliers. The two largest Oregon UAS manufacturers are Insitu, manufacturer of UAS platforms and subsystems, and FLIR Surveillance Systems, a manufacturer of electro-optic and infrared imaging systems. Insitu is a major global supplier of high endurance, runway-independent UAS. FLIR Surveillance provides more ER and IR imaging systems for unmanned aircraft, unmanned ground, and unmanned maritime platforms than any other company. Activity in the Gorge from firms such as Insitu, FLIR Surveillance Systems, Cloud Cap Technology, and UTC Aerospace has spun off more than 20 local companies. Central Oregon's general aviation aircraft manufacturing industry had a similar growth pattern over a 15-year period, expanding from a core company of about 30 employees (Lancair) to a cluster of 25 companies that now employs nearly 1,200 people. It is anticipated the PPUTRC will help expand these existing businesses in the Gorge and Central Oregon.

Infrastructure

Alaska expects to invest $1.5 million to construct a test site center at its Poker Flat Research Range, as well as develop and acquire mobile test infrastructure such as fixtures, data collection devices and monitoring systems similar to its internet-Portable Aerial Surveillance System (iPASS), a web-based application that merges track information from radar, GPS, and a transponder interrogator/receiver. Additionally, large data collection requirements are expected to drive development of a data center for processing and storage. Venture capitalists have approached the team already, anticipating the value of investing in test site development.

Hawaii's test ranges link to military/restricted areas used for current UAS operations. These sites include the Pohakuloa training area on the Island of Hawaii, Bradshaw and Wheeler Army Airfields on Oahu, and the Pacific Missile Range Facility on Kauai. Other areas under consideration include Upolu and Dillingham Airfields (on the Big Island and Oahu, respectively). Test points within the range would be utilized to support both shore- and ship-

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based development, testing and certification of new UAS, training and crew certification of operational UAS, and development of expanded and joint capabilities involving existing communications systems and operations tactics using UAS.

The budget for the $2.5 million Oregon innovation grant envisions spending at least $1.2 million at test ranges for new equipment and/or infrastructure, with the grant providing $300,000, private enterprise providing $750,000, and public entities providing $150,000. Possible infrastructure development proposed with this funding include: portable ground radar units; an automatic dependent surveillance-broadcast ground station or a similar 'sense and avoid' technology system; one or more operations management buildings housing computers, calibration components, baseline sensors with a range of capabilities, data analysis equipment, supporting software, maintenance facilities and machine shops; and ground control stations, an observation tower, and ITAR facilities as needed. Additionally, as noted earlier, Near Space Corporation is preparing to open a new $6 million flight test and operations facility at the Tillamook airport.

Quantifying the PPUTRC's Economic Impacts

The following economic impact projections were developed by McDowell Group, Inc. utilizing flight activity, flight cost, and flight-related staffing data provided by PPUTRC team members. Direct economic activity was measured by approximating preflight administrative costs, site fees per day, operating costs per day, and total flight days from historical data provided by the applicant. Sector-level information was obtained from the applicant concerning number of UAS-related firms and jobs per firm. Direct employment estimates were then coupled with multipliers obtained from the IMPLAN economic impact model to estimate total direct, indirect and induced economic effects. Annual projections from 2014 to 2017 were calculated for each of the 13 ranges utilizing growth rates based on funding forecasts from the Teal Group UAS market profile and forecast report, historical flight activity, and projected growth in flight activity, research, and UAS-related manufacturing as provided by the applicant.

Table 7-1 Summary Impacts of PPUTRC Test Site Designation, 2012-2017

Impact of Test Site Designation				
	2014	2015	2016	2017
Total Employment	**1,065**	**1,260**	**1,335**	**1,429**
Direct Employment	490	571	602	642
Indirect Employment	198	243	259	279
Induced Employment	377	447	474	508
Total Labor Income ($ million)	**$56.9**	**$66.9**	**$70.8**	**$75.6**
Direct Labor Income ($ million)	$26.4	$30.5	$32.2	$34.2
Indirect Labor Income ($ million)	$10.4	$12.5	$13.3	$14.4
Induced Labor Income ($ million)	$20.1	$23.8	$25.3	$27.1
Output ($ million)	**$265.0**	**$301.8**	**$315.9**	**$333.5**
Total Value Added ($ million)	**$109.3**	**$121.9**	**$127.1**	**$133.5**
State Income Taxes ($ million)	**$4.3**	**$5.0**	**$5.3**	**$5.6**

Employment Resulting from UAS and Test Site Operations

In 2014, UAS activity in Alaska, Hawaii, and Oregon is expected to account for 581 direct jobs and a total of 1,254 jobs - including direct, indirect, and induced jobs – from PPUTRC

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designation. Approximately 85 percent of that total employment (1,065 jobs) is attributable to Test Site designation. The remaining 15 percent (189 jobs) is expected to occur in the absence of PPUTRC Test Site designation. By 2017, employment will rise to an estimated 904 direct jobs and 1,991 total jobs - with 72 percent of that total employment (1,429) attributable to Test Site designation. A significant number of these direct jobs are expected in smaller communities that tend to have higher unemployment – thus Test Site designation for the PPUTRC will help improve opportunities where they will provide the most benefits.

Table 7-2 Direct Employment, 2012-2017

	Direct Employment					
	2012	2013	2014	2015	2016	2017
Total Direct Employment						
PPUTRC	74	82	581	712	801	904
Alaska Ranges	43	47	129	142	157	173
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	31	35	452	498	549	605
Impact of Test Site Designation						
PPUTRC	-	-	490	571	602	642
Alaska Ranges	-	-	77	82	86	91
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	-	-	414	417	421	424

Oregon's relatively high direct employment numbers are due to the existing, well-developed aircraft manufacturing sector in Oregon. Oregon is well placed to supply the growing demand for UAS aircraft that will be triggered by UAS integration. Most of the new jobs created in Oregon due to PPUTRC designation include manufacturing jobs (many of which may be created due to designation of test sites anywhere in the U.S.),

Table 7-3 Indirect and Induced Employment, 2012-2017

	Indirect Employment						Induced Employment					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
Total Indirect or Induced Emp.												
PPUTRC	21	24	224	290	328	374	59	65	448	558	629	712
Alaska Ranges	7	8	22	24	27	30	35	39	106	117	129	142
Hawaii Ranges	-	-	-	42	56	74	-	-	-	64	84	111
Oregon Ranges	14	16	202	223	246	271	24	26	342	377	416	459
Impact of Test Site Designation												
PPUTRC	-	-	198	243	259	279	-	-	377	447	474	508
Alaska Ranges	-	-	-	42	56	74	-	-	63	67	71	75
Hawaii Ranges	-	-	185	187	188	190	-	-	-	64	84	111
Oregon Ranges	-	-	13	14	15	16	-	-	313	316	319	321

Labor Income Resulting from UAS and Test Site Operations

In 2014, UAS activity in Alaska, Hawaii, and Oregon is expected to account for $31 million in direct labor income and $67 million in total labor income - including direct, indirect, and induced - from PPUTRC designation. Approximately 84 percent of that total labor income ($57 million)

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is attributable to Test Site designation. The remaining 16 percent ($10 million) is that which is expected to occur even if the proposed PPUTRC does not become a Test Site. By 2017, labor income is expected to include $106 million in total direct, indirect and induced labor income - with 71 percent of that total labor income ($76 million) attributable to Test Site designation.

Table 7-4 Direct Income, 2012-2017 ($ million)

	Direct Income					
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	$4.0	$4.4	$31.3	$38.2	$42.9	$48.3
Alaska Ranges	$2.3	$2.6	$7.0	$7.7	$8.5	$9.4
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	$1.7	$1.9	$24.2	$26.7	$29.5	$32.5
Impact of Test Site Designation						
PPUTRC	-	-	$26.4	$30.5	$32.2	$34.2
Alaska Ranges	-	-	$4.2	$4.4	$4.7	$5.0
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	-	-	$22.2	$22.4	$22.6	$22.8

Table 7-5 Indirect and Induced Labor Income, 2012-2017 ($ million)

	Indirect Labor Income						Induced Labor Income					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
Total Indirect or Induced Emp.												
PPUTRC	$1.1	$1.3	$11.7	$15.0	$17.0	$19.3	$3.5	$3.8	$24.4	$30.1	$34.0	$38.4
Alaska Ranges	$0.4	$0.4	$1.2	$1.3	$1.5	$1.6	$2.2	$2.5	$6.7	$7.4	$8.2	$9.0
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	$0.7	$0.8	$10.5	$11.6	$12.8	$14.1	$1.2	$1.4	$17.6	$19.4	$21.4	$23.6
Impact of Test Site Designation												
PPUTRC	-	-	$10.4	$12.5	$13.3	$14.4	-	-	$20.1	$23.8	$25.3	$27.1
Alaska Ranges	-	-	$0.7	$0.8	$0.8	$0.9	-	-	$4.0	$4.3	$4.5	$4.8
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	-	-	$9.6	$9.7	$9.8	$9.9	-	-	$16.1	$16.3	$16.4	$16.6

Output, Value Added, & State Income Taxes Resulting from UAS and Test Site Operations

'Output' represents the value of industry production, and 'total value added' is the difference between an industry's total output and the cost of their intermediate inputs. Economic modeling conducted for purposes of this study indicates output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017. Value added would climb from $109 million to $134 million over the same period.

Designation of the PPUTRC will provide a four-year total of $20 million of income tax revenue to Hawaii and Oregon. The effective income tax rate for these calculations was approximated as 7.5 percent for Hawaii, and 9 percent for Oregon (Alaska has no income tax).

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what would you attempt to do if you knew you could not fail?

(unknown)

NOTICE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8900.207

National Policy

Effective Date:
1/22/13

Cancellation Date:
1/22/14

SUBJ: Unmanned Aircraft Systems (UAS) Operational Approval

1. Purpose of this Notice. This notice provides policies necessary for reviewing and evaluating the safety and interoperability of proposed Unmanned Aircraft Systems (UAS) flight operations conducted within the United States (U.S.) National Airspace System (NAS) for the Aviation Safety (AVS) Flight Standards Service (AFS), UAS Integration Office (AFS-80), when assessing applications for a Certificate of Waiver or Authorization (COA) or special airworthiness certificate.

2. Audience. This notice applies to AFS divisions at the Federal Aviation Administration (FAA) Washington headquarters (HQ) and regional field offices.

3. Where You Can Find This Notice. You can find this notice on the MyFAA Web site at https://employees.faa.gov/tools_resources/orders_notices/. Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at http://fsims.avs.faa.gov. Air carriers and operators can find this notice on the FAA's Web site at: http://fsims.faa.gov. This notice is available to proponents and the public at http://www.faa.gov/regulations_policies/orders_notices.

4. Background.

a. UAS Operations. UAS operations have increased dramatically in both the public and private sectors. This proliferation has introduced greater exposure and elevated risk to the safety of operations within the NAS. This growth in UAS operations has increased the number of applications for operational approvals and increased demand on the FAA to process them. For these activities, the development of a notice is required for the FAA to use when evaluating applications for COAs and special airworthiness certificates.

b. Policy. Policy identifies Unmanned Aircraft (UA) as "aircraft" flown by a "pilot" regardless of where the pilot is located. Aircraft and pilots must demonstrate compliance with applicable sections of Title 14 of the Code of Federal Regulations (14 CFR) to operate in the NAS. However, UA are not compliant with certain sections of 14 CFR. For instance, the absence of an onboard pilot means that the "see-and-avoid" provisions of 14 CFR part 91, § 91.113, cannot be satisfied. Without an onboard pilot, there is a significant reliance on the command and control link, and a greater emphasis on the loss of functionality associated with lost link. Furthermore, for air traffic control (ATC) operations requiring visual means of maintaining

in-flight separation, the lack of an onboard pilot does not permit ATC to issue all of the standard clearances or instructions available under the current edition of FAA Order 7110.65, Air Traffic Control. Consequently, to ensure an equivalent level of safety, UAS flight operations require an alternative method of compliance (AMOC) or risk control to address their "see-and-avoid" impediments to safety of flight, and any problems they may generate for ATC. In the future, permanent and consistent methods of compliance will be needed for UAS operations in the NAS without the need for waivers or exemptions.

5. Consensus Opinion. This notice is subject to continuous review, will be updated when appropriate, is not meant as a substitute for any regulatory process, and was jointly developed by and reflects the consensus opinion of:

- Flight Technologies and Procedures Division (AFS-400);
- UAS Integration Office (AFS-80) and the ATO component of AFS-80; and
- Aircraft Certification Service, Production & Airworthiness Branch (AIR-240).

Note: In general, and as a minimum, proponents must observe all applicable regulations of 14 CFR parts 61 and 91. This notice identifies acceptable AMOC with the regulations when evaluating requests for approval of proposed UAS operations. Refer to the following Web site for a listing of regulations: http://www.faa.gov/regulations_policies/faa_regulations/.

6. Discussion. This notice represents the culmination of input from government agencies, industry, and user stakeholders along with best practices and procedures that have been used by FAA in prior approvals for UAS applications for COAs or special airworthiness certificates. The material presented in this notice represents the process and procedures necessary for approving applications for UAS flight operations. However, because of the uniqueness of various UAS flight operations, each application must be evaluated on its own technical merits, including operational risk management (RM) planning. Each application may require unique authorizations or limitations directly related to the specific needs or capabilities of the UAS and/or the proposed specific mission and operating location.

7. Applicability and Approval Process Criteria. The applicability and process to be used in UAS operational approval are dependent on whether the proposed UAS operation within the territorial airspace of the United States (the airspace above the contiguous United States, Alaska, Hawaii, U.S. territories, and U.S. territorial waters) is defined as public or civil (see 14 CFR part 1, § 1.1 and Public Law 110-181, "The National Defense Authorization Act of 2008"). UAS operations outside the territorial airspace of the U.S. will be classified as either state or civil operations in accordance with international law. A public operation is one that is intrinsically governmental in nature (i.e., Federal, State, and local agencies). Proponents requesting approval of public aircraft operations by UAS will use the COA application process. In contrast, proponents for civil operations approval will use the special airworthiness certificate process. Part 91, § 91.319(a)(2) specifically prohibits operation of an aircraft that has an experimental certificate from "carrying persons or property for compensation or hire."

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a. Coordination and Approval. Regardless of the process for the authorization approval, COA applications for UAS flight operation approvals will be coordinated through the ATO component of AFS-80 and AVS. Special airworthiness certificates will be coordinated through the Aircraft Certification (AIR-240) staff as well as the ATO and AFS component of AFS-80 for final approval and disposition.

b. Applicability and Methods of Authorization. Operational policy in this notice applies to both public and civil operations and certain state aircraft operations.

(1) Applicability. These procedures are applicable for all operations in the contiguous United States, Alaska, Hawaii, U.S. territories, and international airspace in the Flight Information Regions (FIR) delegated to the United States where the FAA is the Air Traffic Service (ATS) provider. These procedures do not apply to the territorial airspace of another sovereign country that lies within FIRs delegated to the United States where the FAA is the ATS provider, except by agreement with that country, or airspace in FIRs delegated to other countries. All UAS proponents, operators, and pilots must observe all applicable regulations of 14 CFR.

(a) In general, specific authorization to conduct UAS operations in the NAS outside of active Restricted and Warning Areas designated for aviation use, or approved Prohibited Areas, must be requested by the proponent. Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated. (Refer to the current edition of Order JO 7400.8, Air Traffic Organization Policy.)

(b) This notice and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating unmanned systems for sport and recreation. Those individuals should seek policy under the current edition of Advisory Circular (AC) 91-57, Model Aircraft Operating Standards. AC 91-57 is not to be used as a basis of approval for operation of any other aircraft, including by Federal, State, and local governments, commercial entities, or law enforcement.

(c) This notice and the processes prescribed also do not apply to UAS operations in FAA-controlled international airspace by an agency of, or a contractor to, the Federal government when those operations are appropriately designated as State aircraft operations and are operated under "due regard" rules and procedures established by the Federal agency responsible for the operation. The designation of flight operations as State aircraft operations normally are made in coordination with the U.S. Department of State. This notice and the processes prescribed do, however, apply where the responsible Federal agency either has not established a formal set of rules and procedures for "due regard" operations, or is not operating the UAS under "due regard" rules and procedures in FAA-controlled international airspace. This notice and the processes prescribed also apply to all UAS operations by an agency of, or a contractor to, the Federal government that transit through U.S. territorial airspace en route to or from international airspace. See Appendix F, UAS COA Requirement. The "due regard" option is not available for state aircraft operations transiting through U.S. territorial airspace en route to or from international airspace.

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(d) Oceanic Operations Within Warning Areas. UAS operations contained within Warning Areas are handled in the same manner as those operations conducted in active Restricted and approved Prohibited areas; that is, neither specific FAA approval nor observers or chase aircraft are required by the FAA.

(e) The only public aircraft that can fly under "due regard" are U.S. government aircraft designated as State aircraft.

(2) Methods. The two methods of approval are the issuance of either a COA for public aircraft operations or a special airworthiness certificate for civil operations. In the case of public aircraft operations, the operating entity applying to conduct the UAS operation must comply with its own processes, policies, and standards in the following areas, in addition to complying with all applicable safety provisions in all other parts of 14 CFR:

- Pilot certification,
- Crew certification,
- Recent pilot experience (or, currency),
- Medical certificates, and
- Airworthiness of public UAS.

Note: If no established public entity processes, policies, or standards exist, it is highly recommended that the public agency/department apply the specifics outlined in this notice and comply with the provisions of 14 CFR applicable to civil UAS operations.

8. COA for Public Operations.

a. Applications. Applications for a COA are only accepted from entities that intend to conduct public aircraft operations. An application may be referred to the FAA Office of the Chief Counsel (AGC-200) for determination of the status of a proponent as a government entity under the public aircraft statute. The duration of COAs complies with the time limitations specified under the current edition of FAA Order 7210.3, Facility Operation and Administration. COAs may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for operations conducted within active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited Areas with permission from the appropriate authority or using agency of that airspace. (Refer to the current edition of Order JO 7400.8, Special Use Airspace.)

b. Approving and Reviewing Authority. AFS-80 is responsible for determining whether the proponents' proposed UAS operations can be conducted safely and responsibly in the NAS, and that they comply with all COA limitations and provisions.

(1) In accordance with FAA Order 7210.3, "As a general rule, a waiver or authorization should be canceled when it is no longer required or there is an abuse of its provisions or unforeseen safety factors develop. Failure to comply with the waiver or authorization is cause for cancellation."

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(2) The FAA has the authority to suspend or cancel the COA, or to delay any activities if there is a violation of the terms in the COA, or if the safety of persons or property on the ground or in the air is determined to be in jeopardy. That may include, but is not limited to:

- Incidents or accidents occurring during UAS operations in the NAS;
- Habitual noncompliance with administrative requirements, such as failure to provide the FAA with monthly reports on the number of flights, pilot duty time, or unusual equipment malfunctions (e.g., a malfunction or failure of ground control station (GCS) flight control hardware or software (other than loss of control link); a power plant failure or malfunction; a deviation from any provision contained in the COA);
- Deviations from ATC instructions, operational, or coordination issues; and
- Events of intermittent or persistent lost-link as described in the COA or events determined to pose as a risk to the safety of the NAS.

(3) COA suspensions and cancellations are not automatic. Whenever possible, a documented conversation, between the FAA and the proponent, will happen before the suspension/cancellation is issued. Timely and transparent responses to accidents, deviations, and similar safety-related events are expected.

c. Accident and Incident Notification and Investigation. The current edition of FAA Order 8020.11C, Aircraft Accident and Incident Notification, Investigation, and Reporting, and Title 49 of the Code of Federal Regulations (49 CFR) part 830, outlines reporting procedures for accidents and incidents involving civil aircraft and certain public aircraft. All accidents and incidents involving fatalities, injuries, property damage, and fly-away by civil aircraft and those public aircraft subject to part 830 require FAA notification within 24 hours. No additional flights by those aircraft under this COA are allowed before notification. An immediate investigation is required, and when requested to do so, UAS proponents are expected to provide copies of written aircraft accident/incident reports to AFS-80 for review. In accordance with 49 CFR part 1520, § 1520.5, reports will not be released outside of government channels without originator permission.

d. General COA Process. The ATO component of AFS-80 is responsible for the COA process. Applications can be made two ways:

(1) On the Internet using the UAS COA Online System at https://ioeaaa.faa.gov. The UAS COA Online System requires a user name and password; a support desk phone number and e-mail address is provided to assist with obtaining an account.

(2) Using FAA Form 7711-2, Application for Certificate of Waiver or Authorization, available online at http://www.faa.gov/documentLibrary/media/form/faa7711-2.pdf. The completed form can be mailed to: FAA Headquarters, Unmanned Aircraft Systems Integration Office, 490 L'Enfant Plaza SW, Suite 3200, Washington, DC 20024. Mail submittal may encounter significant delay due to current U.S. Postal Service security screening procedures in place.

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e. Operational Review. Prior to issuance of a COA, air traffic specialist components of AFS-80 conduct an operational validation that addresses ATC processes. Next, an aviation safety inspector (ASI) evaluates each application to determine if risks to the NAS associated with the operation have been acceptably mitigated. Both the ASI and ATC requirements are merged into the final COA.

f. Safety Risk Management (SRM) Process. ASIs and other FAA personnel use SRM principles outlined in the current edition of AC 120-92, Safety Management Systems for Aviation Service Providers, to maintain or improve the safety of the NAS by identifying safety risks, hazards, and mitigations associated with proposed UAS operations. When deemed appropriate, Safety Risk Management Documents (SRMD) are created through SRM reviews of specific operations or of risks associated with UAS operations in various classes of airspace. SRM reviews may result in the incorporation of additional mitigations or controls into all or some COAs.

g. National Security Considerations. When appropriate levels of Department of Defense (DOD) or Department of Homeland Security (DHS) declare a UAS operation to be a matter of national security, the FAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this notice. In this case, national security may override risk mitigation requirements. Such requests to the FAA Administrator will originate from an equivalent level of authority from the proponent's parent organization.

h. Special COA.

(1) National Disaster COA. Due to the unpredictability of national disasters, a National Disaster COA is issued in two parts. In part 1 of the COA, AFS-80 completes an evaluation, excluding the location of the disaster. All known information is inserted into a template and signed by appropriate FAA authority. Once the specific location is identified, this information, along with the specific operation, is inserted into part 2 of the COA in the form of an attachment. Part 2 of the COA must then be signed by appropriate FAA authority, which completes and establishes a valid COA.

(2) Emergency COA. An emergency UAS COA may be considered when all of the following conditions apply:

(a) A situation exists that is defined as a condition of distress or urgency, where there is, or that has, the extreme possibility of loss of life, and

(b) The proponent has determined that manned flight operations cannot be conducted efficiently, and

(c) The proposed UAS is operating under a current approved COA for a different purpose or location.

Note: Requests for UAS COAs that fall outside of these parameters will be processed through the normal online COA application process. Emergency UAS COAs will not be considered for:

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- Demonstration flights,
- Flights to test capabilities,
- Training,
- Flights in Class B Airspace, or
- Flights over populated areas, unless a suitable mitigation strategy is proposed and found to be acceptable.

9. Special Airworthiness Certificate for Civil UAS Applicants.

a. Airworthiness Determination. Civil applicants may apply for a special airworthiness certificate from the FAA. The proponent is required to submit the requisite data to support a determination that the aircraft and its systems, including the control station (CS), are designed, built, and maintained in a safe and airworthy condition.

b. Special Airworthiness Certificate Issuance. Special airworthiness certificates are typically issued to proponents wishing to conduct UAS research and development (R&D), crew training, and market surveys under 14 CFR part 21, § 21.191. Special airworthiness certificates are issued in accordance with FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, current edition. Refer to Order 8130.34 for in-depth information on special airworthiness certificates.

c. Proponents with both a COA and Special Airworthiness Certification. In cases where a proponent has been issued a special airworthiness certificate, and is concurrently eligible to operate a corresponding UAS on a COA as a public aircraft operation, the proponent must elect, prior to each flight, which authority is to be used to conduct the flight. The use of both a special airworthiness certificate and a COA on a single flight is not permitted.

d. General Process for Civil UAS Operations. For civil UAS operations, the Aircraft Certification Service, Production and Airworthiness Division (AIR-200) at FAA HQ, is responsible for the issuance of special airworthiness certificates according to FAA Order 8130.34. The issuance of a special airworthiness certificate is coordinated with AIR-200, AFS-80 and the ATO component of AFS-80, and AVS at the HQ and regional levels. A thorough review is conducted by the FAA to evaluate the system's airworthiness and operational specifications. In addition, the FAA reviews and accepts mitigations developed by the proponent to meet acceptable standards of safety.

10. UAS Airworthiness. All UAS must be in an airworthy condition to conduct flight operations in the NAS. An "airworthy condition for UAS subject to a COA" means that the UAS meets the applicable standards and requirements of its operating agency and is capable of operating in compliance with the applicable requirements in 14 CFR part 91. The FAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined. As with airworthiness standards, maintenance technician requirements will be addressed as part of the review process.

a. Public Aircraft Proponents. The proponent must provide an airworthiness statement specifying compliance with the proponent's applicable airworthiness criteria. Airworthiness statements must be provided on agency letterhead and include:

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- The date the statement is effective,
- A signature of the responsible certifying authority within the agency,
- A point of contact (POC), and
- Any warnings/limitations.

(1) Airworthiness statements are generally written for one UAS. If more than one UAS model is included on a single airworthiness statement, each UAS will be listed and specific information for each UAS will be included in the statement. Airworthiness statements with an expiration date must remain current for the duration of the COA including extensions. If a new airworthiness statement is issued during the period the COA is active, a copy of the airworthiness certificate must be provided to AFS-80.

(2) Examples of acceptable policy/criteria include, but are not limited to:

- Department of Defense (DOD) Handbook, MIL-HDBK 516B, Airworthiness Certification Criteria;
- Air Force Policy Directive (AFPD) 62-6, USAF Aircraft Airworthiness Certification;
- Army Regulations (AR) 70-62, Airworthiness Qualification of Aircraft Systems; or
- Naval Air Systems Command Instruction, NAVAIRINST 13034.1 series, Flight Clearance Policy for Air Vehicles and Aircraft Systems.

b. Civil Aircraft Proponents. Approvals for civil applications using the special airworthiness certificate process receive their airworthiness certification from the FAA.

c. Continued Airworthiness.

(1) Public Aircraft. Proponents for UAS used in public aircraft operations should follow their own agency's procedures and guidelines to maintain continued airworthiness at a level which ensures they continue to operate the aircraft safely.

(2) Civil Aircraft. Proponents for civil UAS operational approvals must address continued airworthiness procedures as part of their application. Civil UAS should be maintained and must conform to the same airworthiness standards defined in 14 CFR parts under which UAS are intended to be operated. It is highly recommended that all proponents provide the following information:

- A Continuing Airworthiness Program,
- A maintenance training program,
- Any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation, and
- A process to report any applicable data relating to the operation and maintenance of the UAS.

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d. Database and Recordkeeping. All information received from UAS proponents aids the FAA in establishing a database for the existing UAS types and operations. This data is critical to our development of future certification criteria for both systems and pilots. It expedites the regulatory process for UAS and allows the FAA to have historical data from which to base current and future UAS policy. Accurate recordkeeping is essential in assuring positive operational and quality airworthiness control. In accordance with 49 CFR § 1520.5, reports will not be released outside of government channels without originator permission.

11. Flight Operations of a UAS.

a. Applicability and Requirements. This notice applies to UAS operations conducted in the NAS other than in active Restricted and Warning Areas designated for aviation use or approved Prohibited Areas. The FAA requires aircraft to operate safely among all users of the NAS, including non-cooperative aircraft (e.g., aircraft operated without a transponder), and other airborne operations not reliably identifiable by ATC radar (e.g., balloons, gliders, parachutists). Unless otherwise specifically authorized, UAS operators must use observers, either airborne or ground-based, to comply with 14 CFR part 91 requirements.

b. Risk Mitigation. While considerable work is ongoing to develop a certifiable detect, sense, and avoid system as an AMOC with the see-and-avoid aspect of §§ 91.113 and 91.115, no current solution exists. As a result, compliance with the see-and-avoid requirement and navigational awareness are primary concerns in UAS operational approvals leading to imposition of AMOC. Risk mitigation for these two issues is normally based on the use of observers or other methods of maintaining flight separation and collision avoidance or 'segregation'; however, they may also include other concepts or systems that a proponent may propose for FAA review. The FAA only approves UAS flight operations that can be conducted at an acceptable level of safety. Refer to the current editions of AC 120-92 and FAA Order 8000.369, Safety Management System Guidance.

> **Note:** Risk mitigations that depend on the establishment of new types and categories of airspace are extremely difficult and time-consuming. The NAS is established and configured through a rigorous regulatory process. Risk mitigations that result in the prohibition of the public's right to transit airspace will require a very long lead time with no guarantee that they will be approved.

(1) Proponents proposing see-and-avoid strategies in lieu of visual observers (VOs) are required to support proposed mitigations with system safety cases which indicate the operations can be conducted safely. Acceptable system safety cases must include a hazard analysis, risk assessment, and other appropriate documentation that identifies the level of risk.

(2) It is the proponent's responsibility to demonstrate that the risk of injury to persons or property along the flightpath is appropriately mitigated. Aircraft with performance characteristics that impede, delay, or divert other normal air traffic operations may be restricted in their operations.

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12. System Considerations for UAS.

a. Traffic Alert and Collision Avoidance Systems (TCAS). The use of TCAS by UAS has not been validated as an acceptable alternative for see-and-avoid requirements, and is not an approved means of mitigation for UAS see-and-avoid requirements or strategies.

b. Onboard Cameras/Sensors. Although onboard cameras and sensors positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of segregation is still quite limited. To date, these types of systems have not been approved as a sole mitigation in the see-and-avoid risk assessment.

c. Use of Equipment in Lieu of VOs.

(1) Any equipment proposed for use on UAS to accomplish the function of see-and-avoid in lieu of VOs must:

- Be certified as an aircraft system and equipment using standards, requirements, and processes commensurate with installation of equipment in aircraft by a recognized airworthiness authority, and
- Meet the requirements of 14 CFR part 25, § 25.1309, or equivalent process, for any UAS installation, regardless of its size, performance, or maximum takeoff weight.

Note: For other equipment that is not proposed for use in meeting see-and-avoid requirements, § 23.1309, or equivalent process, should be used.

(2) It is the responsibility of the proponent to show that the contemplated standards, requirements, and processes meet an equivalent level of safety.

d. Radar and Other Sensors. If special types of radar systems or other sensors are utilized to mitigate risk, the proponent must provide supporting data which demonstrates the following can be accomplished safely:

- Both cooperative and non-cooperative traffic can be detected and tracked to ensure appropriate separation and collision avoidance,
- The proposed system can effectively mitigate a potential collision,
- Operators are suitably trained and equipped to use them effectively, and
- Procedures are in place for the pilot in command (PIC) to effectively use the data.

e. Lost Link Procedures. There are many acceptable approaches to satisfy lost link requirements. The intent of any lost link procedure is to ensure airborne operations remain predictable. Proponents will comply with the UAS lost link procedures as specified in the COA.

Note: Lost link is not considered fly-away. Refer to definitions in Appendix A.

(1) Unless otherwise authorized, lost link solutions must comply with the last ATC clearance (if ATC clearance is required), for a period of time sufficient for ATC to ensure conflict resolution without loss of required separation.

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(2) Lost link procedures are pre-coordinated by AFS-80 with the appropriate ATC facility and included in the COA. They include, at a minimum, lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points (FTP) or other contingency planning measures in the event recovery of the UAS is not feasible.

(3) If lost link occurs within a Restricted Area, Warning Area, or Class A airspace, or lost link procedure takes aircraft into one of these areas, the aircraft will not exit that airspace, unless otherwise authorized, until link is re-established. All exceptions will be submitted as part of the COA application to AFS-80 for review.

(4) Unless otherwise authorized, lost link procedures will conform to the Contingency Planning Limitations in Appendix E and in general, include the following:

- Limiting of UAS operations to operations over water or sparsely populated areas over the ground to transit to another Restricted Area, Warning Area, or to a pre-planned lost link orbit point within visual line-of-sight to re-establish link. (The UAS lost link procedure will not transit over fixed structures on the water.)
- Lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.
- Lost link orbit points will not be contained within any published holding area, airway, Jet route, T route, or other area navigation (RNAV) published route.

(5) If the link is not re-established within a pre-determined time as defined by the FAA-approved COA, the aircraft may:

- Autoland; however, the aircraft will not exit the Restricted Area or Warning Area in accordance with subparagraph 12.e.(3) above,
- Proceed to another lost link point (LLP) in an attempt to regain communication link, or
- Proceed to an FTP or the location specified in other contingency planning measures for flight termination.

Note: LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is re-established or fuel exhaustion occurs.

- UAS without auto-land capability will proceed to a pre-planned FTP or other acceptable contingency planning option prior to fuel exhaustion.

(6) Refer to Appendix E for more Contingency Planning Limitations.

f. Flight Termination System (FTS). It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. UAS that lack system redundancies may be required to have an independent FTS that can be activated manually by the UAS PIC to safeguard the public.

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g. Spectrum Authorization.

(1) Every UAS proponent must have the appropriate National Telecommunications and Information Administration (NTIA) or Federal Communications Commission (FCC) authorization/approval to transmit on the radio frequencies (RF) used for UAS uplink and downlink of control, telemetry, and payload information.

(2) Non-Federal public agencies, such as universities and State/local law enforcement, and all civil UAS proponents generally require a license from the FCC as authorization to transmit on frequencies other than those in the unlicensed bands (900 megahertz (MHz), 2.4 gigahertz (GHz), and 5.8 GHz). This generally will be in the form of an Experimental Radio License or a Special Temporary Authority (STA) issued by the FCC. Non-Federal public agencies and civil UAS proponents that operate systems using frequencies assigned to the Federal government (e.g., the DOD) must demonstrate they have the proper authorization through FCC-issued documentation.

(3) DOD agencies will typically demonstrate UAS spectrum authorization through an STA issued by NTIA or a frequency assignment in the NTIA-administered Government Master File (GMF). Authorizations issued under Title 47 of the Code of Federal Regulations (47 CFR) part 300, in the NTIA Manual, Chapter 7, paragraph 7.11, Use of Frequencies by Certain Experimental Stations, are not appropriate for UAS operations.

(4) Federal public agencies other than DOD, such as National Aeronautics and Space Administration (NASA), U.S. Coast Guard (USCG), and U.S. Customs and Border Protection (USCBP), also need an STA issued by NTIA or a frequency assignment in the NTIA-administered GMF. This is especially important for systems designed to operate on frequencies assigned to DOD.

13. Operational Requirements for UAS. Unless operating in an active Restricted or Warning Area designated for aviation use, or approved Prohibited Areas, UAS operations must adhere to the following requirements.

a. Observer Requirement. Visual flight rules (VFR) UAS operations may be authorized utilizing either ground-based or airborne VOs onboard a dedicated chase aircraft. A VO must be positioned to assist the PIC, to exercise the see-and-avoid responsibilities required by §§ 91.111, 91.113, and 91.115 by scanning the area around the aircraft for potentially conflicting traffic and assisting the PIC with navigational awareness.

(1) VOs:

(a) Must assist the PIC in not allowing the aircraft to operate beyond the visual line-of-sight limit, and

(b) Must be able to see the aircraft and the surrounding airspace sufficiently to assist the PIC with:

- Determining the UA's proximity to all aviation activities and other hazards (e.g., terrain, weather, structures), and

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- Exercising effective control of the UA, and
- Complying with §§ 91.111, 91.113, and 91.115, and
- Preventing the UA from creating a collision hazard, and

(c) Must inform the PIC before losing sufficient visual contact with the UA or previously sighted collision hazard. This distance is predicated on the observer's normal vision. Corrective lenses, spectacles, and contact lenses are permitted.

(2) Because of field of view and distortion issues with aids to vision such as binoculars, field glasses, night vision devices, or telephoto lenses, these are allowed only for augmentation of the observer's visual capability; they cannot be used as the primary means of visual contact. When using other aids to vision, VOs must use caution to ensure the aircraft remains within normal visual line-of-sight of the observer. These aids to vision are not to be confused with corrective lenses or contact lenses, which do not alter the field of view or distort vision.

(3) The responsibility of ensuring the safety of flight and adequate visual range coverage to avoid any potential collisions remains with the PIC. The PIC for each UAS operation must identify a location from which the observer will perform his/her duties. This location will be selected to afford the best available view of the entire area within which the operation is to be conducted.

(4) Daisy-chaining of observers to increase operational distance is not normally approved; however, a proponent may provide a safety case for daisy-chaining in accordance with paragraph 16 by demonstrating an acceptable level of risk to the NAS.

(5) Observer(s) must be in place 30 minutes prior to night operations to ensure dark adaptation. Refer to subparagraph 13.i.(2)(b) for night operations information.

b. ATC Communications Requirements.

(1) The UAS pilot must establish and maintain direct two-way radio communication with appropriate ATC facilities anytime:

- The aircraft is being operated in Class A or D airspace (under §§ 91.135 or 91.129) or, when required, in Class E and G airspace (under §§ 91.127 or 91.126). See subparagraph 13.q.(2) and (3) for operations in Class B or C airspace; or
- The aircraft is being operated under instrument flight rules (IFR); or
- It is stipulated under the provisions of any issued COA or Special Airworthiness Certificate.

(2) It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay, however, for IFR flight this method of transmission is required.

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c. Inter-Communications Requirements. Any VO, sensor operator, or other person charged with providing see-and-avoid assistance must have immediate communication with the UAS pilot. If a chase aircraft is being utilized, immediate communication between the chase aircraft and the UAS pilot is required at all times. If the UAS pilot is in communication with ATC, monitoring of the ATC frequency by all UAS crew members (pilots, observers, and chase pilots) is recommended for shared situational and navigational awareness. However, unless it is approved for others to do so, the UAS PIC or the supplemental pilots are the only crewmembers that will communicate with ATC.

d. Electronic Devices. The use of electronic devices (including cell phones) other than for UAS flight- and mission-required usage is governed by § 91.21, which ensures these devices do not interfere with the UAS systems. The use of electronic devices (including cell phones) is not authorized for primary communication with ATC unless authorized under the Special Provisions of the COA.

e. Dropping Objects/Expendable Stores or Hazardous Materials. If the intended UAS operation includes the carriage, dropping, or spraying of aircraft stores outside of active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited Areas, the proponent must ensure that specific approval is listed in the special provisions, the operational risks have been sufficiently mitigated as required by 14 CFR § 91.15, and that the hazardous material requirements in 49 CFR have been met. Acceptable procedures for hung stores and loss of control link while carrying stores must be provided to the FAA. A similar case must be made for hazardous materials carried aboard the aircraft and, if approved, will be listed in the special provision section of the COA.

f. Flight Over Populated Areas. Routine UAS operations are prohibited over urban or populated areas, except where the level of airworthiness allows. UAS operations may be approved in emergency or national disaster relief situations if the proposed mitigation strategies are found to be acceptable. See Appendix A for definition of populated or urban area.

g. Air Shows. A proponent is required to provide a safety case in accordance with paragraph 16 that demonstrates an acceptable level of risk and must receive a separate Air Show Waiver in accordance with FAA Order 8900.1, Flight Standards Information Management System (FSIMS).

h. Flight Over Heavily Trafficked Roads or Open-Air Assembly of People. UAS operations must avoid these areas, except where level of airworthiness allows. If flight in these areas is required, the proponent is required to support proposed mitigations with system safety cases that indicate the operations can be conducted safely. Acceptable system safety cases must include information located in paragraph 16. Additionally, it is the proponent's responsibility to demonstrate that risk of injury to persons or property along the flightpath has been mitigated. UAS with performance characteristics that impede, delay, or divert other air traffic operations may be restricted in their operations. Refer to AC 120-92 and FAA Order 8000.369, current editions.

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i. Day/Night Operations.

(1) Day Operations. UAS operations outside of Class A airspace, active Restricted or Warning Areas designated for aviation use, or approved Prohibited Areas will be conducted during daylight hours unless otherwise authorized.

(2) Night Operations.

(a) Night operations may be considered if the proponent provides a safety case and sufficient mitigation to avoid collision hazards at night.

(b) UAS night operations are those operations that occur between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time. (Note: this is equal to approximately 30 minutes after sunset until 30 minutes before sunrise, except in Alaska.) External pilots and observers must be in place 30 minutes prior to night operations to ensure dark adaptation.

j. Flights Below Class A Airspace. All UAS operations outside of active Restricted/ Warning/Sensitive Security Information (SSI) airspace designated for aviation use, or approved Prohibited Areas must be conducted in visual meteorological conditions (VMC) if using ground or airborne VOs. In addition, the following weather requirements apply:

- If on IFR flight, remain clear of clouds. This requirement does not relieve the PIC from following the ATC clearance. According to § 91.3, the PIC retains responsibility for, and is the final authority as to the operation of that aircraft.
- If on VFR flight, maintain § 91.155 VFR cloud clearances, except in Class G airspace, where Class E airspace visibility requirements must be applied, but not less than 3 statute miles (SM) in-flight visibility.
- Special VFR is not permitted.
- For chase aircraft, 5 SM in-flight visibility.

k. Autonomous Operations. Although it is possible to have a completely manual (direct pilot intervention) UAS, the majority of UAS are autonomous to a certain degree. Only those UAS which have the capability of direct pilot intervention will be allowed in the NAS outside of active Restricted or Warning Areas designated for aviation use, or approved Prohibited Areas. Because the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.

l. Operations from Off-Airport Locations. In most cases, an off-airport location should be situated no closer than 5 nautical miles (NM) from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions; reasonable efforts should be made to keep operations away from structures.

m. Crew Resource Management (CRM). Proponents must train all UAS crewmembers in CRM. The current edition of FAA AC 120-51, Crew Resource Management Training, or an FAA-recognized equivalent applies to UAS operations. Proponents must implement the recommended training and procedures included in AC 120-51, or in an FAA-recognized

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equivalent. The PIC of a UAS must ensure no activities other than those duties required for safe flight operation are performed. No UAS crewmember may engage in any activities unrelated to those required for safe operation of the UAS during critical phases of flight such as launch/takeoff and landing/recovery.

n. Sterile Cockpit. Proponents must comply with the current edition of AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers, or the FAA-recognized equivalent, for ensuring the PIC implements sterile cockpit procedures. During critical phases of flight, including all ground operations involving taxi (movement of an airplane under its own power on the surface of an airport), takeoff and landing, and all other flight operations in which safety or mission accomplishment might be compromised by distractions, no crewmember may perform any duties not required for the safe operation of the aircraft. No crewmember may engage in, nor may any PIC permit, any activity during a critical phase of flight which could distract any crewmember from the performance of his/her duties or interfere in any way with the proper conduct of those duties.

o. Operating Under IFR. While operating on an instrument flight plan, the following must exist, be completed, or be complied with:

(1) The PIC must hold a current instrument rating or an FAA-recognized equivalent.

(2) The aircraft's airworthiness signature statement for flight release (not airworthiness document) must include IFR flight and indicate that all equipment required for IFR operations is certified and working (including pitot-static and transponder checks).

(3) Applicable navigation database and charts are current and available to the UAS pilot.

(4) An IFR flight plan is filed.

(5) An ATC clearance has been obtained and all clearances must be followed.

(6) Direct two-way radio communication between the UAS pilot and ATC is established and maintained. (A communication relay through the aircraft may be required.)

(7) Alternate communication capabilities with ATC for the purpose of lost link and/or lost communication are designated and operational during all phases of flight.

(8) The UAS is equipped with a certified operating mode C (mode S preferred) transponder.

(9) ATC radar services are obtained throughout the portion of the flight in Class A airspace whenever possible (overwater non-radar operations may be allowed in the special provisions section).

(10) All operations outside of Class A airspace and active Restricted, Prohibited, Warning Areas, or SSI airspace designated for aviation use, must remain clear of clouds. If operating under IFR, to comply with this provision, the PIC must have an ATC clearance to deviate.

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According to § 91.3, the PIC retains responsibility for, and is the final authority as to, the operation of that aircraft.

(11) VOs are not required in Class A airspace unless stipulated in the COA.

p. Chase Aircraft Operations. The chase aircraft:

(1) Must remain at a safe distance from UA to ensure collision avoidance if a malfunction occurs, and

(2) Must remain close enough to the UA to provide visual detection of any conflicting aircraft and advise the PIC of the situation.

(3) Must remain within radio control range of the UA, in the case of pilot operation from the chase aircraft, to maintain appropriate signal coverage for flight control or activation of the FTS.

(4) May be required to have communication with appropriate ATC facilities based on the proponent's application or mission profile.

(5) Is not required by FAA in active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited airspace.

(6) Is not required for Optionally Piloted Aircraft (OPA) if a qualified VO is on board.

(7) Is not required in Class A airspace unless stipulated in the COA.

(8) Operations must be conducted in accordance with the Special Provisions listed in the approved COA.

(9) Must maintain 5 SM in-flight visibility restrictions.

(10) Pilot/observer:

- Will not concurrently perform either observer or UAS pilot duties along with chase pilot duties unless otherwise authorized.
- Must maintain direct voice communication with the UAS pilot.

(11) Pilots operating as a formation flight will immediately notify ATC if they are using a non-standard formation. Non-standard formations must be pre-approved by ATC. Proponents adhere to the current edition of Order JO 7610.4, Special Operations, as applicable. Refer to Appendix A for definitions of standard and non-standard formations.

(12) Operations will not be conducted in IMC.

(13) Operations will be thoroughly planned and briefed.

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(14) Pilot, during a lost link situation, must be notified immediately along with ATC. The chase pilot will report to ATC that the UA is performing lost link procedures as planned or if deviations are occurring.

(15) Pilot will ensure safe separation with the UA, and immediately notify ATC and the UA PIC during loss of visual contact with the UA by both the chase pilot and observer, when such contact cannot be promptly re-established. The UA PIC will either execute lost link procedures to facilitate a rejoin, recover the UA, or terminate the flight as appropriate.

q. Airspace Considerations by Airspace Designation.

Note: UAS operating in airspace designated as reduced vertical separation minimum (RVSM) airspace must comply with § 91.180.

(1) Class A. Observers are not normally required in Class A. All UAS must be operating under IFR and on an instrument flight plan. UAS operations approved for Class A must comply with § 91.135.

(2) Class B. UAS operations are currently not authorized. Class B airspace contains terminal areas with the highest density of manned aircraft in the NAS. On a case-by-case basis, the FAA may consider exceptional circumstances. For public aircraft, a Letter of Agreement (LOA) between the affected ATC facility and the proponent describing UAS segregation procedures is required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class B operations.

(3) Class C (and airspace within 30 NM of an airport listed in Appendix D, section 1, § 91.215). UAS operations approved for Class C must comply with §§ 91.130 and 91.215. Requests for operations without this equipment will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class C operations.

(4) Class D. Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class D must comply with § 91.129. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class D operations.

(5) Class E. If there is an operating ATC tower, Class D rules may apply. UAS operations approved for Class E must comply with § 91.127. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class E operations.

(6) Class G. UAS operations approved for Class G must comply with § 91.126.

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r. ATC Visual Approach Clearances. The UAS PIC must not accept a visual approach clearance, an instruction to follow another aircraft by visual means, or a clearance to maintain visual separation from another aircraft.

s. In-Flight Emergencies.

- The PIC will notify ATC of any in-flight emergency or aircraft accident as soon as practical.
- The PIC will notify ATC of any loss of control link as soon as practical. Loss of control link scenarios may be handled by ATC as an emergency.

14. Contingency Planning Limitations. See Appendix E.

15. Personnel Qualifications. This paragraph addresses the qualifications of all UAS flightcrew members, observers, maintainers, and other personnel as appropriate. All references to a pilot certificate or FAA written examination refer to an FAA-issued private pilot certificate, higher certification, or an FAA-recognized equivalent.

a. UAS Pilot Qualifications. The FAA is focused on ensuring that UAS pilots have an appropriate level of understanding of 14 CFR applicable to the airspace where UAS operate. UAS pilots are responsible for controlling their aircraft to the same standards as the pilot of a manned aircraft. Civil UAS pilots may be required to have instruction by an FAA-certificated flight instructor.

b. UAS General Operational Requirements. The following operational restrictions apply to all UAS pilots:

- One PIC must be designated at all times.
- The PIC of an aircraft is directly responsible for, and is the final authority of the operation of that aircraft.
- Pilots must not perform crew duties for more than one UAS at a time.
- Pilots are not allowed to perform concurrent duties both as the pilot and the VO. In the case of OPA, the airborne pilot may assume the role of PIC at all times, but will only be the observer when the OPA is operated by the CS pilot.
- Unless undergoing initial qualification training, pilots must be qualified on the aircraft being flown.
- Only one PIC per aircraft is authorized, and the PIC must be in a position to assume control of the aircraft.

c. PIC.

(1) The designated PIC:

- Has been designated as PIC before or during the flight.
- Is responsible for the UAS flight operation as described under § 91.3, or FAA-recognized equivalent.
- Is responsible for determining whether the UAS is in condition for safe flight.

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- Must land as soon as safely practical when any condition occurs that causes operations to be unsafe.
- May be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the aircraft.
- Has the ability to assume the duties of an internal or an external UAS pilot at any point during the flight.
- May rotate duties as necessary to fulfill operational requirements.
- Operating under a public agency, must have a thorough knowledge of the COA issued to the organization and must retain a copy to reference during flight.
- Must be trained and qualified on the specific UAS for the conduct of the flight.
- May assume the duties of VO or PIC, if piloting an OPA when the OPA is being utilized as a UAS and being flown by the CS pilot.

(2) PIC Rating Requirements. Rating requirements for the UAS PIC depend on the type of operation conducted; they fall into two categories:

- Operations that require at least a private pilot certificate or FAA-recognized equivalent, or
- Operations that do not require at least a private pilot certificate or FAA-recognized equivalent.

(a) The requirement for the PIC to hold a pilot certificate or FAA-recognized equivalent is based on various factors including:

- The location of the planned operations,
- The mission profile,
- The size of the aircraft, and
- Whether or not the operation is conducted within or beyond visual line-of-sight.

(b) The PIC must hold, at a minimum, an FAA private pilot certificate or FAA-recognized equivalent for all operations listed below:

- Flight in Class A, B, C, D, E, and G (400 feet above ground level (AGL)) airspace.
- IFR (must have instrument rating) operations.
- Night operations.
- At joint use or public airfields.
- Requiring a chase aircraft.
- At any time the FAA has determined the need, based on the UAS characteristics, mission profile, or other operational parameters.

(c) Operations without a pilot certificate may be allowed when all of the following conditions are met:

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- The PIC has successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA-recognized equivalents. (Airman Test Reports are valid for the 24 calendar-month period preceding the month the exam was completed, at which time the instruction and written examination must be repeated.)
- Operations are during daylight hours.
- The operation is conducted in a sparsely populated location.
- Operations are approved and conducted solely within visual line-of-sight in Class G airspace.
- Visual line-of-sight operations are conducted no further than ½ NM laterally from the UAS pilot and at an altitude of no more than 400 feet AGL at all times. Refer to Appendix A for the visual line-of-sight definition.
- Operations are conducted no closer than 5 NM from any FAA-designated airport or heliport other than the airport from which the aircraft is operating.
- The operation is conducted from a privately owned airfield, military installation, or off-airport location.

(3) PIC Recent Flight Experience (Currency). The proponent must provide documentation showing the pilots maintain an appropriate level of recent pilot experience in the UAS being operated, or in an FAA-certified simulator. At a minimum, the PIC must conduct three takeoffs (launch) and three landings (recovery) in the specific UAS within the previous 90 days (excluding pilots who do not conduct launch/recovery during normal/emergency operations); or as prescribed by the proponent's accepted recurrent training and currency program.

(a) For those operations that require a certificated pilot, the PIC, to exercise the privileges of his certificate, must have flight reviews and maintain recent pilot experience in manned aircraft per 14 CFR part 61, as appropriate; or FAA-accepted equivalent.

(b) For flights approved for night operations, the PIC must conduct three takeoffs (launch) and three landings (recovery) each, in the specific UAS at night, to a full stop in the previous 90 days (excluding pilots who do not conduct launch/recovery during normal/emergency operations).

(c) For operations approved for night or IFR, the PIC must maintain recent pilot experience per § 61.57 or FAA-accepted equivalent as applicable.

(4) PIC Medical. The PIC must maintain, at a minimum, a valid FAA second-class medical certificate issued under 14 CFR part 67 or the FAA-recognized equivalent. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate listed in § 61.23.

(5) Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(6) PIC Training.

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(a) In addition to the training required for a pilot certificate, UAS PICs must have the following additional training (or FAA-recognized equivalent):

- Including normal, abnormal, and emergency procedures in all specific details of the UAS being operated,
- Manufacturer-specific training,
- Demonstrated proficiency, and
- Testing in the UAS being operated.

(b) Proponents must maintain individual training records of all UAS personnel. All training and testing will be documented in the individual's training record by the instructor and initialed by the trainee.

d. Supplemental Pilots. Supplemental pilots are those pilots assigned UAS flight duty to augment the PIC. It is common for proponents to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions.

(1) Ratings. Supplemental pilots must have, at a minimum, successfully completed private pilot ground school and passed the written test or FAA-recognized equivalents. The ground school written test results are valid for two years from the date of completion, at which time the instruction and written examination must be repeated. If a supplemental pilot assumes the role of PIC, he/she must comply with the PIC rating, currency, medical, and training requirements listed above in subparagraph 15c.

(2) Recent Pilot Experience. The proponent must provide a process that ensures that pilots maintain an appropriate level of recent pilot experience for the position they are assigned in the UAS being operated.

(3) Medical. Supplemental pilots must maintain, at a minimum, a valid FAA second-class medical certificate issued under part 67 or the FAA-recognized equivalent. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate, according to § 61.23. Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(4) Training.

(a) UAS supplemental pilots must have:

- Training in all specific details of the UAS being operated, including normal, abnormal, and emergency procedures;
- Manufacturer-specific training (or FAA-recognized equivalent);
- Demonstrated proficiency and successful testing in the UAS being operated.

(b) Proponents must maintain individual training records for all UAS personnel. All training must be documented by the instructor and initialed by the trainee.

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e. UAS Observer Qualifications. All observers must have an understanding of Federal aviation regulations applicable to the airspace where the UAS will operate. Observers are considered crewmembers. Observers must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as UAS pilot and observer.

(1) Medical. All observers must have a valid FAA second-class medical certificate issued under part 67; an FAA-recognized equivalent is an acceptable means of demonstrating compliance with this requirement. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate. Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(2) Training. Observers must complete sufficient training to communicate to the pilot any information required to remain clear of conflicting traffic, terrain, and obstructions, maintain proper cloud clearances, and provide navigational awareness. This training, at a minimum, must include knowledge of:

(a) Their responsibility to assist pilots in complying with the requirements of 14 CFR:

- § 91.111, Operating Near Other Aircraft;
- § 91.113, Right-of-Way Rules: Except Water Operations;
- § 91.115, Right-of-Way Rules: Water Operations; and
- § 91.155, Basic VFR Weather Minimums;

(b) Air traffic and radio communications, including the use of approved ATC/pilot phraseology; and

(c) Appropriate sections of the Aeronautical Information Manual (AIM).

f. UAS Maintenance Personnel Qualifications.

(1) Maintenance Ratings. Will be established as more data is collected and a regulatory guideline is developed.

(2) Recent Maintenance Experience. It is suggested that proponents follow applicable guidelines of 14 CFR part 65, § 65.83, as appropriate, until final UAS regulatory guidelines are available.

(3) Maintenance Medical Requirements. At a minimum, the requirements of § 91.17 or FAA-recognized equivalent must be met. No additional medical requirements have been defined at this time.

(4) Maintenance Training. It is highly recommended that a proponent of a UAS submit a training program. This requirement will be further defined as more data is collected and the regulatory process affects these guidelines.

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g. Other UAS Personnel Qualifications. Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, personnel must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel.

16. AMOC. This notice defines certain limitations and procedures to conduct UAS operations, but each application is evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems. When a proponent desires to deviate from these limitations and procedures, an AMOC that includes a safety case (recommended format provided in Appendix D), must be submitted for approval. For a proponent to make an acceptable safety case, information must be provided that outlines all hazards and risks associated with the requested AMOC. In addition, the proponent must provide a description of the methods and procedures or equipment for mitigating each hazard and risk. As such, deviations and AMOC may differ from the information presented in this notice. Therefore, if the proponent provides an acceptable safety case with sufficient data that supports the proposal, the AMOC will be considered and evaluated for approval.

a. Safety Case Information. The proponent should include at a minimum:

(1) A thorough description of the environment in which the aircraft will operate;

(2) Criteria for categorizing hazards (e.g., severity and likelihood);

(3) A detailed airworthiness description of the affected items associated with the proposed AMOC, which includes, as a minimum:

- Certification status of components and systems, or statement of airworthiness for public aircraft,
- Reliability data,
- Redundant systems,
- Failure modes and effects, including system response to loss of control link, and
- An airworthiness determination (for COA proponents only);

(4) Capabilities of the aircraft;

(5) Flight data;

(6) Accident data;

(7) Emergency procedures; and

(8) Pilot/crew roles and responsibilities.

b. Sample Safety Case. Appendix D represents the FAA's approach to documenting the process used for hazard identification and risk mitigation. It is provided as an example for proponents to use when developing and documenting a safety case. In addition to these

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guidelines, other government and industry methods similar to the FAA's approach to developing a safety case also provide acceptable hazard analysis tools. These include Preliminary Hazard Analysis, Operational Safety Assessment, Comparative Safety Assessment, and Fault Hazard Analysis. See Appendix D for a complete list.

17. Disposition. We will incorporate the information in this notice into FAA Order 8900.1 before this notice expires. Direct questions concerning the information in this notice to the Unmanned Aircraft Systems Integration Office, AFS-80, at 202-385-4835.

for John M. Allen
John M. Allen
Director, Flight Standards Service

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APPENDIX A. DEFINITIONS

1. Aircraft. A device used or intended to be used for flight in the air, including unmanned aircraft (UA).

2. Airworthiness [UAS]. A condition in which the unmanned aircraft system (UAS) (including the aircraft, airframe, engine, propeller, accessories, appliances, and control station (CS)) conforms to its type certificate, if applicable, and is in condition for safe operation.

3. Airworthiness Certification. Process and aircraft qualification for civil UAS proponents to obtain a special airworthiness certificate.

4. Airworthiness Statement. Document required from public UAS proponents during a Certificate of Waiver or Authorization (COA) application process which confirms aircraft airworthiness.

5. Certificate of Waiver or Authorization (COA). An FAA grant of approval for a specific operation. The authorization to operate a UAS in the National Airspace System (NAS) as a public aircraft outside of Restricted, Warning, or Prohibited areas approved for aviation activities.

6. Chase Aircraft. A manned aircraft that carries its own pilot-in-command (PIC) and a separate qualified VO flying in proximity to a UA.

7. Civil Aircraft. Aircraft other than public aircraft.

8. Cooperative Aircraft. Aircraft that have an electronic means of identification (i.e., a transponder or ADS-B transceiver) aboard in operation.

9. Crewmember [UAS]. In addition to the crewmembers identified in 14 CFR part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and VOs, but may include other persons as appropriate or required to ensure safe operation of the aircraft.

10. Crew Resource Management (CRM). The effective use of all available resources including human, hardware, and information resources.

11. Daisy-Chaining. Aviation jargon for the use of multiple, successive observers to extend the flight of a UA beyond the direct visual line-of-sight of any other PIC or VO.

12. Experimental Certificate. A type of special airworthiness certificate issued for the purposes of research and development (R&D), crew training, exhibition, and market survey as defined in 14 CFR part 21, § 21.191(a), (c), and (f). Note: According to § 91.319(a)(2), experimental aircraft may not be used for carrying persons or property for compensation or hire.

a. R&D Aircraft. Aircraft testing new design concepts, equipment, installations, operating techniques, or uses for aircraft. Any unmanned aircraft system (UAS), including an Optionally Piloted Aircraft (OPA) is eligible for an experimental certificate under this purpose. Operations

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may be conducted by the proponent only as a matter of research or to determine whether an idea warrants further development.

b. Crew Training. Crew training is limited to the number of flight crews required by the proponent to conduct experimental aircraft operations.

c. Market Survey. Aircraft may be used for the purposes of conducting market surveys, sales demonstrations, and customer crew training of the manufacturer's customers as provided in part 21, § 21.195.

13. External Pilot. A UAS pilot who flies from outside a CS shelter with direct visual contact with the aircraft.

14. FAA-Recognized Equivalent. An FAA recognition that a public agency may exercise its own internal processes regarding airworthiness and pilot, aircrew, and maintenance personnel certification and training; furthermore, the agency has determined that its UAS is capable of safe operation in the National Airspace System (NAS) when conducting public aircraft operations under Title 49 of the United States Code (49 U.S.C.) §§ 40102(a)(41) and 40125.

15. Fly-Away. An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA is not operating in a predicable or planned manner.

16. Formation.

a. Non-standard formation. A formation operating under any of the following conditions:

- When the flight leader has requested and ATC has approved other than standard formation dimensions;
- When operating within an authorized block altitude or under the provisions of a letter of agreement (LOA);
- When the operations are conducted in airspace specifically designed for a special activity.

b. Standard formation. A formation in which proximity of no more than 1 NM laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman or UA.

17. Inspection. The routine performance of inspection tasks at prescribed intervals. The inspection must ensure the airworthiness of an aircraft up to and including its overhaul or life limits.

18. Internal Pilot. A UAS pilot who flies from inside a CS shelter without direct visual contact with the aircraft.

19. Lost Link. An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA will perform a predictable or planned maneuver. Loss of command and control link between CS and aircraft. There are two types of links:

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- An uplink which transmits command instructions to the aircraft, and
- A downlink which transmits the status of the aircraft and provides situational awareness to the pilot.

20. Missile. A non-recoverable, powered, guided munition that travels through the air or space.

- Ballistic missiles follow a ballistic trajectory.
- Cruise missiles generate lift.
- Guided missiles are launched from a ship or aircraft and serve as a self-contained precision bomb.

21. Non-Cooperative Aircraft. Aircraft that do not have an electronic means of identification (e.g., a transponder) aboard or that have inoperative equipment because of malfunction or deliberate action.

22. Non-Standard Formation. See Formation.

23. Observer. A trained person who assists a UAS pilot in the duties associated with collision avoidance and navigational awareness through electronic or visual means. (Collision avoidance includes, but is not limited to, avoidance of other traffic, clouds, obstructions, terrain and navigational awareness.) A visual observer (VO) is a trained person who assists the UAS pilot by visual means in the duties associated with collision avoidance. A VO includes the OPA pilot when the OPA is being operated as a UAS.

24. Off-Airport. Any location used to launch or recover aircraft that is not considered an airport (e.g., an open field).

25. Optionally Piloted Aircraft (OPA). An aircraft that can conduct operations as a traditional aircraft with a pilot aboard the aircraft, and can also operate as a UAS when the aircraft is operated and controlled by the CS pilot, allowing the pilot aboard the aircraft to become a qualified observer and remain a PIC. OPA operating as a UAS must meet UAS guidance requirements.

26. Pilot Duty Period. The period beginning when a flightcrew member is required to report for duty, with the intention of conducting a flight, and ending when the aircraft is parked after the last flight. It includes the period of time before a flight or between flights that a pilot is working without an intervening rest period.

27. Pilot-in-Command (PIC)-[UAS]. The person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the PIC as described by 14 CFR part 91, § 91.3 apply to the UA PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight. Note: The PIC can only be the PIC for one aircraft at a time. For OPA, PIC must meet UAS guidance requirements for training, pilot licensing, and medical requirements when operating OPA as a UAS.

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28. Populated or Urban Areas. Areas depicted in yellow on a Visual Flight Rules (VFR) sectional chart or as determined from other sources.

29. Proponent. A person or agency making an application for a Certificate of Waiver or Authorization (COA).

30. Public Aircraft. An aircraft operated by a governmental entity (including Federal, State, or local governments, and the U.S. Department of Defense (DOD) and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. See 14 CFR part 1, § 1.1 for a complete definition of a public aircraft.

31. Public Operator. An operator that is classified as government and/or otherwise qualifies for public aircraft operation under 49 U.S.C. §§ 40102(a)(41) and 40125. Not all flights by a public aircraft operator qualify as a public aircraft operation under the statute. Public aircraft operation status is not automatic for flights conducted by a government entity or a contractor to a government entity.

32. Rocket. A powered, unguided munitions (DOD); or an aircraft propelled by ejected expanding gases generated in the engine from self-contained propellants and not dependent on the intake of outside substances. It includes any part which becomes separated during the operation (14 CFR).

33. Safety Risk Management (SRM). A formalized, proactive approach to system safety. SRM is a methodology that ensures hazards are identified, risks are analyzed, assessed, and prioritized; and results are documented for FAA decision-makers to transfer, eliminate, accept, or mitigate risk.

34. Scheduled Maintenance (Routine). The performance of maintenance tasks at prescribed intervals.

35. Segregation. Setting apart from other air traffic operations in the NAS. Segregation is not synonymous with required air traffic separation standards. Therefore, segregation does not prescribe or mandate criteria such as vertical, lateral, or longitudinal distances.

36. Shells. Munitions that are fired from a gun whether guided or not.

37. Smart Bomb. Precision-guided munitions.

38. Standard formation. See formation.

39. Supplemental Pilot. Pilots assigned UAS flight duties to augment the PIC. It is common for proponents to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the PIC if the specified qualifications are met.

40. Torpedoes. Powered munitions that travel through water.

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41. Unmanned Aircraft (UA). A device used or intended to be used for flight in the air that has no onboard pilot. This devise excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR part 101), rockets, tethered aircraft and un-powered gliders.

42. Unmanned Aircraft System (UAS). A UA and its associated elements related to safe operations, which may include CSs (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems (FTS), and launch/recovery equipment.

43. Unscheduled Maintenance (Non-Routine). The performance of maintenance tasks when mechanical irregularities occur.

44. Visual Line-of-Sight. Unaided (corrective lenses and/or sunglasses exempted) visual contact between a PIC or a VO and a UAS sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.

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APPENDIX B. ACRONYMS

AC	Advisory Circular
AFPD	Air Force Policy Directive
AFS	Flight Standards Service
AGC	Chief Counsel
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AMOC	Alternative Means of Compliance
AR	Army Regulations
ASI	Aviation Safety Inspector
ATCAA	Air Traffic Control Assigned Airspace
ATCSCC	Air Traffic Control System Command Center
ATO	Air Traffic Organization
ATS	Air Traffic Service
AVS	Aviation Safety
CFIT	Controlled Flight Into Terrain
CFR	Code of Federal Regulations
COA	Certificate of Waiver or Authorization
CRM	Crew Resource Management
CS	Control Station
DCP	Divert/Contingency Points
DHS	Department of Homeland Security
DOD	Department of Defense
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FIR	Flight Information Regions
FL	Flight Level
FSIMS	Flight Standards Information Management System
FTP	Flight Termination Point
FTS	Flight Termination System
GCS	Ground Control Station
GHz	Gigahertz
GMF	Government Master File
HQ	Washington Headquarters
IFR	Instrument Flight Rules
LLP	Lost Link Points
LOA	Letter of Agreement
MHz	Megahertz
MSL	Mean Sea Level
NAS	National Airspace System
NASA	National Aeronautics And Space Administration
NAVAIRINST	Naval Air Systems Command Instruction
NM	Nautical Mile
NTIA	National Telecommunications And Information Administration

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OPA	Optionally Piloted Aircraft
PIC	Pilot in Command
POC	Point of Contact
R&D	Research and Development
RF	Radio Frequency
RM	Risk Management
RNAV	Area Navigation
RTB	Return to Base
RVSM	Reduced Vertical Separation Minimum
SM	Statute Mile
SRM	Safety Risk Management
SRMD	Safety Risk Management Document
SSI	Sensitive Security Information
STA	Special Temporary Authority
TAS	Traffic Advisory Systems
TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance Systems
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
U.S.	United States
USC	United States Code
USCBP	U.S. Customs and Border Protection
USCG	U.S. Coast Guard
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VO	Visual Observer

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APPENDIX C. RELATED REGULATIONS AND PUBLICATIONS

1. Title 14 of the Code of Federal Regulations (CFR).

a. Part 1, Definitions and Abbreviations.

b. Part 21, Certification Procedures for Products and Parts.

- Section 21.191, Experimental certificates.
- Section 21.193, Experimental certificates: general.
- Section 21.195, Experimental certificates: Aircraft to be used for market surveys, sales demonstrations, and customer crew training.
- Section 21.197, Special flight permits.
- Section 21.199, Issue of special flight permits.

c. Part 23, § 23.1309, Equipment, Systems, and Installations.

d. Part 25, § 25.1309, Equipment, Systems, and Installations.

e. Part 61, Certification: Pilots, Flight Instructors, and Ground Instructors.

- Section 61.23, Medical Certificates: Requirement and Duration.
- Section 61.56, Flight Review.
- Section 61.57, Recent Flight Experience: Pilot in Command.
- Section 61.58, Pilot-in-Command Proficiency Check: Operation of an Aircraft that Requires more than one Pilot Flight Crewmember or is Turbojet-Powered.

f. Part 65, § 65.83, Recent Experience Requirements.

g. Part 67, Medical Standards and Certification.

h. Part 91, General Operating and Flight Rules.

- Section 91.3, Responsibility and Authority of the Pilot in Command.
- Section 91.13, Careless or Reckless Operation.
- Section 91.15, Dropping Objects.
- Section 91.17, Alcohol or Drugs.
- Section 91.21, Portable Electronic Devices.
- Section 91.111, Operating Near Other Aircraft.
- Section 91.113, Right-of-Way Rules: Except Water Operations.
- Section 91.115, Right-of-Way Rules: Water Operations.
- Section 91.126, Operating on or in the Vicinity of an Airport in Class G Airspace.
- Section 91.127, Operating on or in the Vicinity of an Airport in Class E Airspace.
- Section 91.129, Operations in Class D Airspace.
- Section 91.130, Operations in Class C Airspace.
- Section 91.135, Operations in Class A Airspace.
- Section 91.155, Basic VFR Weather Minimums.

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- Section 91.157, Special VFR Weather Minimums.
- Section 91.180, Operations within Airspace Designated as Reduced Vertical Separation Minimum Airspace.
- Section 91.203, Civil Aircraft: Certifications Required.
- Section 91.215, ATC Transponder and Altitude Reporting Equipment and Use.
- Section 91.319, Aircraft having Experimental Certificates: Operating Limitations.

2. Title 49 of the Code of Federal Regulations (CFR).

a. Chapter I, Subchapter C, Hazardous Materials Regulations.

b. Chapter VIII, Part 830, Notification and Reporting of Aircraft Accidents or Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records.

c. Chapter XII, Part 1520, § 1520.5, Sensitive Security Information.

3. Related Publications (current editions).

4. Advisory Circulars (AC).

- AC 00-1.1, Government Aircraft Operations.
- AC 91-57, Model Aircraft Operating Standards.
- AC 120-51, Crew Resource Management Training.
- AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers.
- AC 120-92, Introduction to Safety Management Systems for Air Operators.

5. FAA Notices. N JO 7210.766, Unmanned Aircraft Operations in the National Airspace System (NAS).

6. FAA Orders.

- JO 1000.37, Air Traffic Organization Safety Management System.
- JO 7110.65, Air Traffic Control.
- JO 7210.3, Facility Operation and Administration.
- JO 7400.8, Special Use Airspace.
- JO 7610.4, Special Operations.
- 8000.369, Safety Management System Guidance.
- 8020.11C, Aircraft Accident and Incident Notification, Investigation, and Reporting.
- 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft.
- 8900.1, Flight Standards Information Management System.

7. Other Documents.

- Title 47 CFR Part 300, National Telecommunications and Information Administration (NTIA) Manual, Chapter 7.11, Use of Frequencies by Certain Experimental Stations.
- Title 49 United States Code (49 U.S.C.) §§ 40102(a)(41), Definitions.

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- FAA Air Traffic Organization (ATO) Safety Management System Manual.
- Memorandum of Agreement Concerning the Operation of Department of Defense Unmanned Aircraft Systems in the National Airspace System (DOD-FAA MoA, September 24, 2007).
- Convention on International Civil Aviation ("Chicago Convention"). 7 December 1944, 61 Stat. 1180, 15 U.N.T.S. 295.

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APPENDIX D. SAFETY CASE FORMAT

1. **Signature Page.** Include the following information on the signature page:

   - Title: A clear and concise description of the proposed method for AMOC;
   - Originator Information: Originator's name, organization, contact information, etc.;
   - Safety Risk Management Document (SRMD) Information: Safety Case submission date, revision number, etc.

2. **Executive Summary.** The summary should give a general description of the proposed AMOC, including a list of the hazards with associated risk level (high, medium, low) and their corresponding initial and predicted residual risk. Include a high level system description, a summary of how the Safety Case was developed, and what process/method was used to move through the risk assessment process.

3. **Introduction.** Provide a brief reasoning/rationale for the initiative. The scope of the proposed AMOC, whether it is more complex or far-reaching, will determine the need for increased scope and detail of the analysis to be performed.

4. **Section 1.** Current System/System Baseline. Provide a description of the current system or existing procedures as well as the corresponding (operational) system states. If the proposal entails a procedural change, describe the current procedure and its operational environment. If the current system or procedure is unique and has challenges associated with its unique situation, be sure to delineate.

5. **Section 2.** Proposed Change. Provide a description of the proposed change/procedure, identifying which safety parameters are involved.

6. **Section 3.** Safety Risk Management (SRM) Planning and Impacted Organizations. Prior to initiation of the safety analysis, SRM planning is necessary. It is essential to select the appropriate SRM participants, identify the SRM Panel, schedule milestones, and assign tasks and responsibilities. With regard to the organizations that are impacted by the change, describe the method used for collaboration between those organizations during the identification, mitigation, tracking, and monitoring of hazards associated with the change.

7. **Section 4.** Assumptions. If in the process of developing a procedure to validate an AMOC, any assumptions are made to make the evaluation of the change more manageable, clearly define and document them in this section.

8. **Section 5.** Phase 1: System Description. The description of the system/procedure, its operational environment, the people involved/affected by the change/procedure, and the equipment required to accommodate the proposal must be provided.

9. **Section 6.** Phase 2: Identified Hazards. The SRM Panel identifies hazards as a collaborative effort. The tool(s) and technique(s) used to identify hazards should be specified and discussed. The identified hazards are documented as well as their corresponding causes, the corresponding system states considered and the consequent potential outcome. It is important to realize that while identification of the worst credible outcome and the system state in which the worst

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credible outcome occurs is required, system states with less severe outcomes should not be ignored.

10. Section 7. Phase 3 & 4: Risk Analysis & Risks Assessed. Describe the process used to analyze the risks associated with the identified hazards. Specify what type of data was used to determine the likelihood of risk occurrence (e.g., quantitative or qualitative) as well as the sources of the data. A risk matrix should provide an illustration of the predicted initial/current risk(s) associated with the identified hazards.

11. Section 8. Phase 5: Treatment of Risks/Mitigation of Hazards. If the existing controls and mitigations do not acceptably mitigate the hazards, then additional recommended safety requirements should be identified. An explanation of how the recommended safety requirements are expected to reduce the initial/current risk to an acceptable predicted residual risk level should be included. Low-risk hazards may still warrant recommended safety requirements.

12. Section 9. Tracking and Monitoring of Hazards. Once the proposal has been approved and implemented, tracking of hazards and verification of the effectiveness of mitigation controls throughout the lifecycle of the system or change are required. Also, the methodology for this tracking and monitoring should be outlined.

13. Appendices.

a. Documents Related to the SRMD. Include a list of documents (orders, directives, regulations, handbooks, and manuals) that pertain to the proposed change, which have been consulted in the development of the proposed change and the corresponding safety analysis.

b. Hazard Identification Tools. Provide information on the different tool(s), method(s), and technique(s) used during the safety analysis. (See Figure D-1, for a chart listing acceptable hazard analysis tools and techniques.)

c. Hazard Analysis and Risk Matrix. Depending on the analyses necessary, there might be one or more appendices with analyses. A risk matrix reflecting the initial and predicted residual risks should also be included.

d. Glossary. Include any acronyms and definitions for any terms you listed in the Safety Case.

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Figure D-1. Acceptable Hazard Analysis Tools and Techniques

This chart from the ATO Safety Management System Manual, available on the Internet, displays acceptable hazard analysis tools for developing safety cases.

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Table 3.1: Selection of Hazard Identification and Analysis Tools and Techniques

Tool or Technique	Summary Description	Page in Appendix G
Preliminary Hazard Analysis (PHA)	The PHA provides an initial overview of the hazards present in the overall flow of the operation. It provides a hazard assessment that is broad, but usually not deep.	G-1
Operational Safety Assessment (OSA)	The OSA is a development tool based on the assessment of hazard severity. It establishes how safety requirements are to be allocated between air and ground components and how performance and interoperability requirements might be influenced.	G-3
Comparative Safety Assessment (CSA)	The CSA provides management with a listing of all of the hazards associated with a change, along with a risk assessment for each alternative hazard combination that is considered. It is used to rank the options for decision-making purposes. The CSA's broad scope is an excellent way to identify issues that may require more detailed hazard identification tools.	G-5
Fault Hazard Analysis (FHA)	The FHA is a deductive method of analysis that personnel can use exclusively as a qualitative analysis or, if desired, can expand to a quantitative one. The FHA requires a detailed investigation of the subsystems to determine component hazard modes, causes of these hazards, and resultant effects on the subsystem and its operation.	G-8
Failure Mode and Effect Analysis (FMEA)	The FMEA determines the results or effects of sub-element failures on a system operation and classifies each potential failure according to its severity.	G-9
Failure Modes, Effects, and Criticality Analysis (FMECA)	The FMECA is an essential function in design from concept through development. To be effective, the FMECA is iterative to correspond with the nature of the design process itself. The FMECA identifies component and sub-system failure modes, including the impact of human error; evaluates the results of the failure modes; determines rates and probability; and demonstrates compliance with safety requirements.	G-9
What-If Analysis	The What-If Analysis methodology identifies hazards, hazardous situations, or specific accident events that could produce an undesirable consequence. One can use the What-If Analysis as a brainstorming method.	G-10
Scenario Analysis	The Scenario Analysis identifies and corrects potentially hazardous situations by postulating accident scenarios in cases where it is credible and physically logical.	G-12
Change Analysis	The Change Analysis analyzes the hazard implications of either planned or incremental changes (e.g., operation, equipment, or procedure).	G-13
Cause-Consequence Analysis	The Cause-Consequence Analysis combines the bottom-up and top-down analysis techniques of Event Trees and Fault Trees. The result is the development of potential complex accident scenarios.	G-15

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Figure D-1. Acceptable Hazard Analysis Tools and Techniques, continued

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Tool or Technique	Summary Description	Page in Appendix G
Hazard and Operability Tool (HAZOP)	A group uses the HAZOP to analyze hazards of completely new operations and to review the significance of all of the ways that a process element can malfunction or be incorrectly operated. The technique is essentially a structured brainstorming using specific guide words.	G-17
Interface Analysis	One uses the Interface Analysis to discover the hazardous linkages between interfacing systems.	G-18
Accident/Incident Analysis	The Accident/Incident Analysis uses data on recorded hazardous events. One groups these events in various ways according to a pre-established criterion, usually a common cause or outcome. One then identifies the groupings as hazards.	G-19
Job Safety Analysis (JSA)	One uses this technique to assess in detail the safety considerations in a single job or task..	G-20
Energy Trace and Barrier Analysis (ETBA)	The ETBA is highly structured. It documents all energy sources in system. One identifies the energy sources as hazards. One identifies the barrier between the energy sources and the operators, maintainers, and other systems as mitigations.	G-21
Fault Tree Analysis (FTA)	An FTA is a graphical design technique that can provide an alternative to block diagrams. It is a top-down, deductive approach structured in terms of events. One models faults in terms of failures, anomalies, malfunctions, and human errors.	G-22
Management Oversight and Risk Tree (MORT)	One uses the MORT technique to systematically analyze hazards to examine and determine detailed information about the process and accident contributors.	G-24
Human Error Analysis (HEA)	HEA, in a system context, involves assessing each human-machine interface point, decision, or action for the potential for human error to adversely impact system performance or safety of the system and its users. There are a variety of methodologies for conducting these analyses.	G-26
Job Task Analyses (JTA)	The foundation of the performance of HEA is a task analysis, which describes each human task/sub-task within a system in terms of the perceptual (information intake), cognitive (information processing and decision making), and manual (motor) behaviors required of an operator, maintainer, or support person. It should also identify the skills and information required to complete the tasks; equipment requirements; the task setting; time and accuracy requirements; and the probable human errors and consequences of these errors. There are several tools and techniques for performing task analyses, depending on the level of analysis needed.	G-28

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APPENDIX E. CONTINGENCY PLANNING LIMITATIONS

1. Point Identification. The proponent must submit contingency plans that address emergency recovery or flight termination of the unmanned aircraft (UA) in the event of unrecoverable system failure. These procedures will normally include Lost Link Points (LLP), Divert/Contingency Points (DCP) and Flight Termination Points (FTP) for each operation. LLPs and DCPs must be submitted in latitude/longitude (Lat/Long) format along with a graphic representation plotted on an aviation sectional chart (or similar format). FTPs or other accepted contingency planning measures must also be submitted in Lat/Long format along with a graphic representation plotted on an aviation sectional chart, or other graphic representation acceptable to the FAA. The FAA accepts the LLPs, DCPs, FTPs, and other contingency planning measures submitted by the proponent, but does not approve them. When conditions preclude the use of FTPs, the proponent must submit other contingency planning options for consideration and acceptance. At least one LLP, DCP, and FTP (or an acceptable alternative contingency planning measure) is required for each operation. The proponent must furnish this data with the initial Certification of Waiver or Authorization (COA) application. Any subsequent changes or modifications to this data must be provided to the Unmanned Aircraft Systems (UAS) Integration Office (AFS-80) for review and consideration no later than 30 days prior to proposed flight operations.

2. Risk Mitigation Plans. For all operations, the proponent must develop detailed plans to mitigate the risk of collision with other aircraft and the risk posed to persons and property on the ground in the event the UAS experiences a lost link, needs to divert, or the flight needs to be terminated. The proponent must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, Navigational Aids (NAVAIDS), and congested areas. In the event of a contingency divert or flight termination, the use of a chase aircraft is preferred when the UAS is operated outside of Restricted or Warning Areas. If time permits, the proponent should make every attempt to utilize a chase aircraft to monitor the aircraft to a DCP or to the FTP. In the event of a contingency divert or flight termination, the proponent will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

a. LLP Procedures.

(1) LLPs are defined as a point, or sequence of points, where the aircraft will proceed and hold at a specified altitude, for a specified period of time, in the event the command and control link to the aircraft is lost. The aircraft will autonomously hold, or loiter, at the LLP until the communication link with the aircraft is restored or the specified time elapses. If the time period elapses, the aircraft may autoland, proceed to another LLP in an attempt to regain the communication link, or proceed to an FTP for flight termination. LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is re-established or fuel exhaustion occurs.

(2) For areas where multiple or concurrent UAS operations are authorized in the same operational area, a segregation plan must be in place in the event of a simultaneous lost link scenario. The deconfliction plan may include altitude offsets and horizontal separation by using independent LLPs whenever possible.

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b. DCP Procedures.

(1) A DCP is defined as an alternate landing/recovery site to be used in the event of an abnormal condition that requires a precautionary landing. Each DCP must incorporate the means of communication with air traffic control (ATC) throughout the descent and landing (unless otherwise specified in the Special Provisions) as well as a plan for ground operations and securing/parking the aircraft on the ground. This includes the availability of control stations (CS) capable of launch/recovery, communication equipment, and an adequate power source to operate all required equipment.

(2) For local operations, the DCP specified will normally be the airport/facility used for launch and recovery; however, the proponent may specify additional DCPs as alternates.

(3) For transit and/or mission operations that are being conducted in Class A airspace or Class E airspace above flight level (FL) 600, DCPs will be identified during the flight to be no further than one hour of flight time at any given time, taking into consideration altitude, winds, fuel consumption, and other factors. If it is not possible to define DCPs along the entire flight plan route, the proponent must identify qualified FTPs along the entire route and be prepared to execute flight termination at one of the specified FTPs if a return to base (RTB) is not possible.

(4) It is preferred that specified DCPs are non-joint use military airfields, other government-owned airfields, or private-use airfields. However, the proponent may designate any suitable airfield for review and consideration.

c. Flight Termination Procedures.

(1) Flight termination is the intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination must be executed in the event that all contingencies have been exhausted and further flight of the aircraft cannot be safely achieved or other potential hazards exist that require immediate discontinuation of flight. FTPs or alternative contingency planning measures must be located within power-off glide distance of the aircraft during all phases of flight and must be submitted for review and acceptance. The proponent must ensure sufficient FTPs or other contingency plan measures are defined to accommodate flight termination at any given point along the route of flight. The location of these points is based on the assumption of an unrecoverable system failure and must take into consideration altitude, winds, and other factors.

(2) Unless otherwise authorized, FTPs must be located in sparsely populated areas. Except for on- or near-airport operations, FTPs will be located no closer than five nautical miles (NM) from any airport, heliport, airfield, NAVAID, airway, populated area, major roadway, oil rig, power plant, or any other infrastructure. For offshore locations, the proponent must refer to appropriate United States Coast Guard (USCG) charts and other publications to avoid maritime obstructions, shipping lanes, and other hazards. Populated areas are defined as those areas depicted in yellow on a Visual Flight Rules (VFR) sectional chart or as determined from other sources.

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(a) It is preferred that flight termination occurs in Restricted or Warning Areas, government-owned land, or offshore locations that are restricted from routine civil use. However, the proponent may designate any suitable location for review and consideration.

(b) The proponent is required to survey all designated areas prior to their use as an FTP. All FTPs will be reviewed for suitability on a routine and periodic basis, not to exceed six months. The proponent assumes full risk and all liability associated with the selection and use of any designated FTP.

(c) It is desirable that the proponent receive prior permission from the land owner or using agency prior to designation of this area as an FTP. The proponent should clearly communicate the purpose and intent of the FTP.

(d) For each FTP, plans must incorporate the means of communication with ATC throughout the descent as well as a plan for retrieval/recovery of the aircraft.

(e) Contingency planning must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, NAVAIDS, and congested areas to the maximum extent possible.

(f) In the event of a contingency divert or flight termination, if time permits, the use of a chase aircraft is preferred when the UA is operated outside of Restricted or Warning Areas.

(g) In the event of a contingency divert or flight termination or other approved contingency measures, the proponent will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

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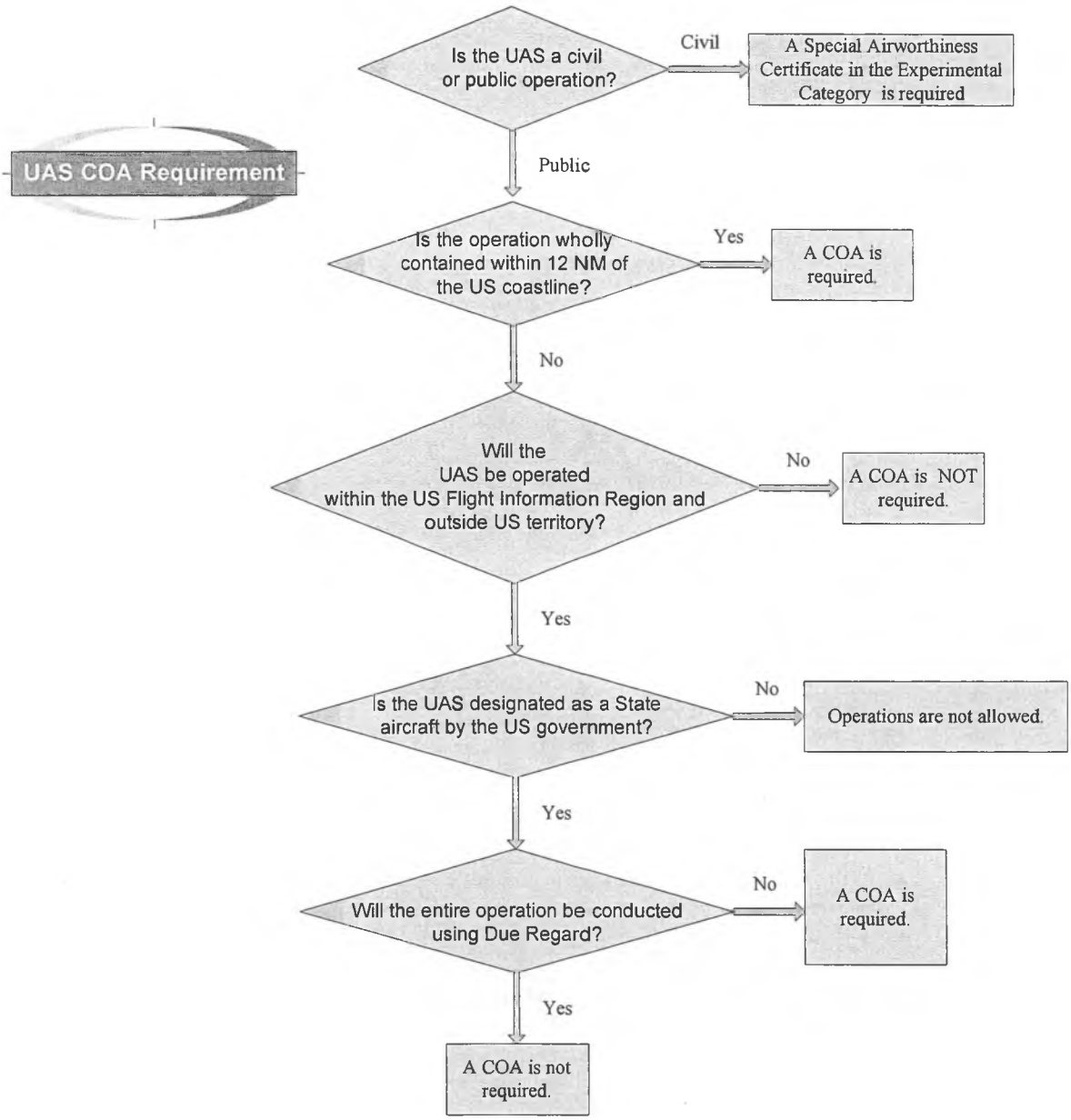
APPENDIX F. UAS COA REQUIREMENT FLOWCHART



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MEMORANDUM September 30, 2013

SUBJECT: Alaska Laws Protecting Privacy
(Work Order No. 28-LS0990)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Kathleen Strasbaugh
Legislative Counsel

You have asked for a review of Alaska's laws protecting individual privacy in preparation for a meeting of the Task Force on Unmanned Aircraft Systems. Among the Task Force's duties is providing written recommendations concerning, among other things, a state policy that protects privacy. 2013 Legislative Resolve No. 17 at 3. To that end, as I understand from Ms. Blaisdell, you would like to know what protections might already exist, with a view toward avoiding duplication of existing law. The Task Force has apparently expressed concern about how information gathered by unmanned aircraft could be used by private or public parties, and what use might be made of such information captured inadvertently.

This memo will outline constitutionally based protections of privacy and identify state statutes that might apply to conduct considered invasion of privacy. As you requested, this memo focuses on the protections afforded under Alaska law. A brief discussion of emerging federal law is included, but I haven't explored other states' case law, nor lower federal court cases that consider these issues. However, I have attached an excerpt of an *Alaska Law Review* which summarizes Alaska's privacy law as it has developed independently of federal constitutional law. I have also attached a recent *Harvard Law Review* article that specifically addresses this topic in great detail. The memo also briefly addresses scenarios set out in your request. Please note that it is very difficult to predict the outcome of litigation in this very new intersection of technology and privacy law.

1. Constitutional Protection of Privacy

The Constitution of the State of Alaska explicitly protects the right of privacy against government (but not private) intrusion. Art. I, sec. 22, provides:

> The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section.

This protection, although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. *Woods & Rohde, Inc. v. State, Department of Labor*, 565 P.2d 138, 149 (Alaska 1977).[1] Both the Alaska Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy. *Beltz v. State*, 221 P.3d 328, 333, 337 (Alaska 2009) (search of garbage placed out on the street for collection did not require warrant; expectation of privacy found not reasonable.)

Neither the Alaska Supreme Court nor the United States Supreme Court has ruled on whether surveillance by a government operated unmanned aerial vehicle is a search under the Fourth Amendment. Based on available precedent, it is possible that the courts will decide that the use of an unmanned aerial vehicle constitutes a search requiring either a warrant, or the application of a recognized exception to the warrant requirement.

The United States Supreme Court has considered law enforcement or other government agency use of aerial surveillance and the use of technological devices for surveillance purposes. The Court found that surveillance by manned aircraft is not an intrusion into a private area that renders an overflight a search under the Fourth Amendment to the United States Constitution; however the placement of a global positioning device on a person's vehicle is an intrusion that constitutes a search. Here is a brief summary of some of these cases: *United States v. Jones*, 565 U.S. ___, 132 S.Ct. 945 (2012): Attachment of global positioning device to automobile parked in public place is a search under the Fourth Amendment.

Dow Chemical Co. v. United States, 476 U.S. 227 (1986) EPA aerial surveillance and photography of chemical plant is not a search where the aircraft was manned and operating at a lawful altitude.

California v. Ciraolo, 476 U.S. 207 (1986) Manned aerial surveillance of a backyard marijuana grow at lawful altitude did not violate the Fourth Amendment.

The Court might find the use of a technology that exceeds human observational capacity the sort of intrusion that constitutes a search requiring a warrant or an accepted exception:

> Where, as here, the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a "search" and is presumptively unreasonable without a warrant.

Kyllo v. United States, 533 U.S. 27, 40 (2001) (internal citations omitted) (thermal

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[1] In Alaska, the right to privacy extends to protection of such activities as possession and use of marijuana in the home by an adult, which, while not a fundamental right, is protected because such possession and use does not implicate the public welfare in the manner that more harmful substances, or public ingestion, or use by minors might. *Ravin v. State*, 537 P.2d 494, 508-09 (Alaska 1975).

imaging of home from outside a search under the Fourth Amendment).

2. Alaska Statutory protections

There are a handful of criminal statutes that may apply to improper use of images obtained from unmanned aerial vehicle surveillance. These statutes would seem to apply for the most part to private actors. These are offenses that punish conduct that invades the privacy of a victim, and would require proof that images gathered by the unmanned aerial vehicle were disseminated. These offenses would probably not punish capturing the images inadvertently, although collecting and storing them might be a concern.

Alaska Statute	**Charge**	**Penalty**
11.41.270	Stalking in the second degree: nonconsensual conduct prohibited by statute prohibits monitoring by technical means.	Class A misdemeanor[2]
11.61.116	Sending an explicit image of a minor.	(1) class B misdemeanor if the person distributes the image to another person;[3] (2) a class A misdemeanor if the person distributes the image to an Internet website that is accessible to the public.
11.61.120(a)(6)	Harassment in the second degree: publishing or distributing images that show certain body parts or a sexual act.	Class B misdemeanor

[2] A class A misdemeanor is punishable by a fine of up to $10,000, and a sentence of imprisonment up to one year.

[3] A class B misdemeanor is punishable by a fine of up to $2,000, and a sentence of imprisonment up to 90 days.

11.61.123	Indecent viewing or photography (with certain law enforcement and security surveillance exceptions).	(1) class C felony if the person viewed or shown in a picture was, at the time of the viewing or production of the picture, a minor;[4] (2) class A misdemeanor if the person viewed or shown in the picture was, at the time of viewing or production of the picture, an adult.
11.76.113	Misconduct involving confidential information in the first degree: use of confidential information to commit a crime or obtain a benefit to which the person is not entitled to injure another, or deprive another of a benefit.	Class A misdemeanor
11.76.115	Misconduct involving confidential information in the second degree: knowingly and without legal authority obtaining confidential information about another.	Class B misdemeanor

In addition to the above criminal offenses, there are other provisions of law that might bear on the information obtained from data gathered by an unmanned aerial vehicles.

If the data is gathered by a government agency, it is a public record. However, AS 40.25.120 provides certain protections for private information. AS 40.25.120(a)(4) excepts records required by law to be kept confidential. *See Falcon v. APOC*, 570 P.2d 469 (Alaska 1977) (physician not required to disclose identity of certain patients to Alaska Public Offices Commission where the disclosure of the patients' identities might disclose the fact that they were being treated for conditions that patients would normally keep private); *Alaska Wildlife Alliance v. Rue*, 948 P.2d 976 (Alaska 1997) (payroll information may be kept private where disclosure might endanger employees or contractors, where those employees and contractors were threatened with harm). AS 40.25.120(a)(6)(C) protects information gathered by law enforcement the disclosure of which "could reasonably be expected to constitute an unwarranted invasion of the personal privacy of a suspect, defendant, victim, or witness."

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[4] A Class C felony is punishable by a fine of up to $50,000, and a sentence of imprisonment up to five years. Presumptive sentences based on whether the offense is a first or subsequent offense are set out at AS 12.55.155(e).

There may be civil liability for obtaining (and subsequently misappropriating) information on trade secrets or patented processes. *See, generally.* AS 45.50.

In addition, a person who is subject to surveillance that is unreasonable or unlawful could sue for the tort of invasion of privacy. *Compare Wal-Mart v. Stewart*, 990 P.2d 626, 634 (Alaska 1999) (daily search of employee's bags held an unreasonable invasion of privacy where not part of a random, nondiscriminatory policy, and where the employee feared that refusing the search might result in others suspecting him of theft, or result in a police call or firing).

3. Particular scenarios

Inadvertent capture of evidence of illegal activity. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information, and whether the person whose actions have been captured has a reasonable expectation of privacy. One of the scenarios mentioned in your request is the capture of evidence of poaching. Assuming that the poacher is a person taking game on property that is not the poacher's own, the poacher cannot reasonably expect privacy when present on another's land without authority.

If a law enforcement agency sends out an unmanned aerial vehicle for patrolling or surveillance, perhaps to look for illegal cultivation of marijuana or manufacture of methamphetamine on public land, and in the course of doing so, captures evidence of an industrial sized marijuana grow operation on private land, it might provide grounds to obtain a warrant to explore further.[5] Under Alaska law, if the observation of the event is lawful or in "plain view," the discovery inadvertent, and the incriminating nature of the evidence immediately apparent, a warrant might not be required. *Ahvakana v. State*, 283 P.3d 1284, 1288 (Alaska Ct. App. 2012) (entry into property where evidence found was authorized under the emergency aid exception to the warrant requirement). However, since the vehicle is not manned, the federal authorities discussed above suggest that the information might not be considered to be lawfully obtained unless some other exception to the requirement of a warrant is present. It is not clear to me whether and under what circumstances a court might grant a search warrant to follow up on information inadvertently obtained, but not in "plain view."

It is possible that the inadvertent capture of information that might otherwise be inadmissible under the exclusionary rule that bars admission of evidence obtained in violation of the United States Constitution will be treated as a good faith exception under *United States v. Leon*, 468 U.S. 897(1984). In *Leon*, the United States Supreme Court held that the Fourth Amendment exclusionary rule should not be applied so as to bar the use of evidence obtained by officers acting in reasonable reliance on a search warrant

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[5] *But see State v. Crocker*, 97 P.3d 93 (Alaska Ct. App. 2004) holding that because the application for the warrant did not affirmatively disclose information that the marijuana cultivation was beyond what was permitted under *Ravin*, there was no probable cause for a warrant.

issued by a detached and neutral magistrate but ultimately found to be invalid. A court could determine that information inadvertently captured in otherwise lawful surveillance is likewise a good faith exception. However, Alaska's appellate courts have not decided whether to adopt this exception. *Deemer v. State*, 244 P.3d 69, 72 (Alaska Ct. App. 2010). Thus it is impossible to predict the outcome of litigation on this subject under Alaska law, and it is not at all clear, given the federal case law developments discussed elsewhere in this memorandum, that the United States Supreme Court would apply the exception in a situation where there was no warrant.

Person intentionally gathers private information for personal use or distribution. A number of the criminal charges listed above might be available. In addition, if the images obtained are used in child pornography, a number of federal and state criminal statutes might apply.

Please advise if you require further assistance in this matter.

KJS:ray
13-008.ray

Enclosures

OBSERVATIONS FROM ABOVE: UNMANNED AIRCRAFT SYSTEMS AND PRIVACY

JOHN VILLASENOR*

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* Nonresident senior fellow in Governance Studies and the Center for Technology Innovation, the Brookings Institution; Professor of Electrical Engineering, University of California, Los Angeles. The author gratefully acknowledges the assistance of the Association for Unmanned Vehicle Systems International (AUVSI), Thomas Cifarelli, Catherine Crump, and Rich Hanson and Michael Smith of the Academy of Model Aeronautics.

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INTRODUCTION

Military aviation experts and model airplane hobbyists have known for decades that an airplane can be flown without a human in the cockpit. Until very recently, however, for most people the very concept of an aircraft was inextricably tied to that of the pilot it was presumed to carry. In the long run, that may turn out to be a historical aberration.

"Drones"—more accurately, unmanned aircraft—will dominate the future of aviation as thoroughly as manned aircraft have dominated its past. In the military the transition is well under way. In 2012, the United States military had close to 6,300 unmanned aircraft systems (UAS)[1] and is training hundreds of

1. UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS, DEPARTMENT OF DEFENSE REPORT TO CONGRESS ON FUTURE UNMANNED AIRCRAFT SYSTEMS TRAINING, OPERATIONS, AND SUSTAINABILITY 2 (2012), *available at* http://www.fas.org/irp/program/collect/uas-future.pdf. The

new pilots each year to fly them.[2] Civilian UAS use in the United States is also set to grow rapidly in the wake of a law enacted in February 2012 providing for the integration of unmanned aircraft into the national airspace over the next several years.[3]

UAS can be employed in an endless variety of civilian applications, the overwhelming majority of them beneficial. They can be used, for example, to help rescuers identify people in need of assistance following a natural disaster, or to provide vital overhead imagery to police officers attempting to defuse a hostage standoff. In the commercial world, UAS will be increasingly employed for tasks as diverse as surveying, crop spraying, and traffic congestion monitoring. Scientific applications include air quality assessment, wildlife tracking, and measuring the internal dynamics of violent storms. UAS will also generate a number of economic benefits, both by creating jobs that involve the design and production of UAS and by spurring advances in robotics that will apply well beyond aviation, in fields ranging from manufacturing to surgery.

However, like any technology, UAS can be misused. The most common concern regarding domestic UAS relates to their potential impact on privacy. This is a legitimate concern. Existing laws and jurisprudence provide an important foundation, but they also leave many questions unanswered. And although in some respects UAS simply represent one more manifestation of the always complex intersection between technology and privacy, they are also unique in making it possible, for the first time ever, to easily and inexpensively obtain observations from above.

As Justice Samuel Alito wrote in a concurrence in *United States v. Jones*, the January 2012 Supreme Court ruling that addressed the constitutionality of affixing a GPS tracking device

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term unmanned aircraft system (UAS) refers to an unmanned aircraft as well as the associated communication and control components used in its operation. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012). "UAS" is also sometimes expanded as "unmanned aerial system." The term unmanned aerial vehicle (UAV) refers to the aircraft itself. *See, e.g.*, Bart Elias, Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System 1 n. 1 (2012), *available at* http://www.fas.org/sgp/crs/natsec/R42718.pdf.

2. Elisabeth Bumiller, *A Day Job Waiting for a Kill Shot a World Away*, N.Y. TIMES, July 29, 2012, http://www.nytimes.com/2012/07/30/us/drone-pilots-waiting-for-a-kill-shot-7000-miles-away.html.

3. *See* FMRA §§ 331–336, 126 Stat. at 72–78.

to a vehicle without a valid warrant, "[i]n the pre-computer age, the greatest protections of privacy were neither constitutional nor statutory, but practical."[4] Although Justice Alito's statement was directed toward GPS tracking, it has direct relevance to UAS. In comparison with manned aircraft, UAS can be very inexpensive to procure and operate. As the practical barriers to obtaining aerial imagery fall away, the resulting privacy issues take on heightened importance.

This Article considers the constitutional, statutory, and common law frameworks that will inform privacy rights with respect to observations from unmanned aircraft.[5] The potential privacy challenges raised by unmanned aircraft are direct consequences of their capabilities and of the rules governing the manner in which they can be flown. Accordingly, Part I provides the historical context for UAS technology and describes the range of platforms available today. Part II addresses the current regulatory environment in the United States, with particular attention to those provisions of the FAA Modernization and Reform Act of 2012 (FMRA) that relate to UAS.

Part III discusses government operation of unmanned aircraft in light of the Supreme Court's Fourth Amendment jurisprudence. Although the Supreme Court has never specifically ruled on the question of UAS privacy, it has examined the Fourth Amendment implications of aerial surveillance on several occasions. Part III examines those cases in some detail, as well as *Jones*[6] and *Kyllo v. United States*,[7] and the interpretations they suggest with respect to the constitutionality of UAS observations.

Part IV addresses UAS operated by private entities, who are unconstrained by the Fourth Amendment restrictions that apply to the government. Private UAS users will enjoy strong First Amendment protections for gathering information in public spaces. But the rights conferred by the First Amendment are not unbounded, and it does not take much imagination to conclude

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4. United States v. Jones, 132 S. Ct. 945, 963 (2012) (Alito, J., concurring in the judgment).

5. For another treatment of some of the issues discussed here, see generally ALISSA M. DOLAN & RICHARD M. THOMPSON, II, INTEGRATION OF DRONES INTO DOMESTIC AIRSPACE: SELECTED LEGAL ISSUES (2013), *available at* http://www.fas.org/sgp/crs/natsec/R42940.pdf. Dolan and Thompson's report was released while this Article was in the process of revision for publication.

6. *Id.* at 945.

7. 533 U.S. 27 (2001).

that paparazzi, stalkers, and others could employ UAS in manners that pose clear violations of privacy. Part IV then explores some of the laws that can be used to address such behavior. Part V considers potential new voluntary and statutory privacy solutions and discusses some of the preemption issues that may arise when non-federal entities attempt to regulate UAS use.

Several overarching conclusions result from the analysis presented in this Article. First, a careful examination of Supreme Court privacy jurisprudence suggests that the Constitution will provide a much stronger measure of protection against government UAS privacy abuses than is widely appreciated. The Fourth Amendment has served us well since its ratification in 1791, and there is no reason to suspect it will be unable to do so in a world where unmanned aircraft are widely used. In addition, there are substantial statutory and common law protections that will limit the ability of non-government entities to violate privacy using unmanned aircraft.

This does not mean that there is no need for additional statutory UAS privacy protections. However, when drafting new laws it is critical to adopt a balanced approach that recognizes the inherent difficulty of predicting the future of any rapidly changing technology. In the early days of the Internet and mobile phones, it would have been nearly impossible to accurately foresee all of the uses—both positive and otherwise—to which these technologies have been applied. It is similarly difficult today to predict exactly how UAS will be used—or even what they will look like—in the coming decades. Although unmanned aircraft pose real and increasingly well recognized privacy concerns, they also offer real and much less widely appreciated benefits. A dialogue conducted with full awareness of this balance will be much more likely to lead to positive policy outcomes.

I. UNMANNED AIRCRAFT SYSTEMS TECHNOLOGY

In addressing UAS privacy, it is important to start with an understanding of the technology, including both the historical context and the range of platforms that exist today. Privacy approaches designed to address only the concerns raised by the larger unmanned aircraft that have dominated much of the current press coverage may be inadequate or inappropriate for unmanned aircraft weighing only a few pounds. And, as is clear from the history of unmanned aircraft, although near-

term predictions regarding emerging aviation technology are feasible, it can be exceedingly difficult to look more than a few years into the future.

A. Historical Context: The Nineteenth and Twentieth Centuries

Unmanned flight has a long history. In fact, early research in unmanned aviation laid some of the critical groundwork that was later used by pioneers in manned aviation,[8] including the Wright Brothers, who achieved sustained manned airplane flight in 1903.[9] As early as the 1830s, William Samuel Henson was exploring the fundamentals of airframe design,[10] and in 1848 John Stringfellow successfully carried out an indoor flight of a steam-powered unmanned airplane with a wingspan of ten feet.[11] In the 1870s Alphonse Penaud demonstrated the use of twisted rubber strands as an energy source for "model"-sized airplanes and helicopters.[12] In 1896, Samuel Pierpont Langley, then Secretary of the Smithsonian Institution, flew an unmanned twin-propeller, steam-engine-powered aircraft with a wingspan of slightly under fourteen feet.[13] The aircraft, called Aerodrome Number 5, was catapult launched from a houseboat on the Potomac River and made two test flights, in each case travelling several thousand feet before landing in the river.[14]

The Sperry Aerial Torpedo, developed during World War I and demonstrated in 1918, was a bomb-equipped biplane that used an on-board timer to shut off the engine and, in theory (it was never actually used in combat), send it diving onto a tar-

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8. Bill Hannan, *History in Models, Models in History*, MODEL AVIATION, Dec. 1986, at 78, 79–81.

9. *Milestones of Flight: 1903 Wright Flyer*, SMITHSONIAN NAT'L AIR AND SPACE MUSEUM, http://airandspace.si.edu/exhibitions/gal100/wright1903.html (last visited Jan. 28, 2013).

10. LOUIS H. HERTZ, THE COMPLETE BOOK OF MODEL AIRCRAFT SPACECRAFT AND ROCKETS 178 (1967).

11. *Id.* at 185. A two-pound steam-powered helicopter was flown even earlier, by W.D. Phillips in 1842. *Id.* at 178.

12. Hannan, *supra* note 8, at 79–81.

13. *Langley Aerodrome Number 5*, SMITHSONIAN NAT'L AIR AND SPACE MUSEUM, http://airandspace.si.edu/collections/artifact.cfm?id=A19050001000 (last visited Jan. 28, 2013).

14. *Id.*

get.[15] This was a very early example of "autonomous" flight, in which a UAS is controlled from within the aircraft, without intervention from a human on the ground.

The first unmanned airplane to be successfully flown by radio remote control was a modified N9 Navy seaplane that remained aloft for about twelve minutes during a September 1924 test, sometimes at a distance of several miles from the transmitter held by the pilot on the ground.[16] By the late 1930s, radio-controlled unmanned aircraft had started to gain significant attention in the hobbyist community[17] and in the military. During the ten-year period starting in 1934, the British military purchased hundreds of radio-controlled unmanned "Queen Bee" biplanes to use for target practice;[18] in fact, the term "drone" may have originally arisen to describe the unmanned aircraft used for this purpose.[19]

In the United States, the Radioplane Company was founded in the late 1930s[20] and during World War II built over 15,000 "drones" for the U.S. military to use in training antiaircraft gunners.[21] Radioplane was acquired by Northrop in 1952,[22] and continued to supply the U.S. military with unmanned aerial vehicles including, in the 1950s, models equipped with an on-board film-based camera.[23] Other countries with unmanned aircraft programs in the years during or shortly following World War II included Russia, France, Italy, Germany, and Japan.[24]

In the 1960s, military reconnaissance use of unmanned aircraft became increasingly common. Ryan Aeronautical Company,

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15. *Curtiss / Sperry Aerial Torpedo*, CRADLE OF AVIATION MUSEUM, http://www.cradleofaviation.org/exhibits/ww1/sperry_torpedo/index.html (last visited Jan. 28, 2013).

16. Walt Good, *History of RC Flying*, MODEL AVIATION, Mar. 1986, at 56, 126.

17. Walt Good, *History of RC Flying, Part 2*, MODEL AVIATION Apr. 1986, at 58, 148; Walt Good, *History of RC Flying, Part 3*, MODEL AVIATION, May 1986, at 76, 76–81.

18. STEVEN J. ZALOGAUNMANNED AERIAL VEHICLES: ROBOTIC AIR WARFARE 1917–2007, at 7 (2008).

19. LAURENCE R. "NOISE" NEWCOME, UNMANNED AVIATION: A BRIEF HISTORY OF UNMANNED AERIAL VEHICLES 4 (2004).

20. *Id.* at 57.

21. ZALOGA, *supra* note 18, at 7.

22. *Id.*

23. *Id.* at 10.

24. NEWCOME, *supra* note 19, at 49–56.

which won a contract with the U.S. Air Force in 1948,[25] was a major provider of U.S. military UAS for much of the 1950s and 1960s. Versions of the Ryan Firebee flew thousands of reconnaissance and electronic warfare missions over Vietnam.[26]

The 1970s and 1980s saw continued development of military UAS technology, with the United States, Russia, Canada, Israel, and Europe all possessing active programs.[27] In the conflict with Lebanon in 1982, Israel used a relatively small UAS called the Mastiff to provide reconnaissance imagery,[28] and during the 1991 Gulf War, the U.S. military flew over 500 missions using the Pioneer UAS.[29] The Gnat-750, a precursor to the Predator, was first flown in 1989 and was employed in the mid-1990s to acquire imagery during the conflict in the former Yugoslavia.[30]

B. Unmanned Aircraft Systems Today

Since 2000, worldwide UAS use for both military and civilian applications has increased dramatically. One key factor contributing to this growth is the continuing advance of computing, imaging, and communications technologies. Computational power and storage that would have filled multiple rooms in the 1960s can now easily fit within a single chip. In the context of UAS, this has made it possible to equip even very small platforms with sophisticated on-board computational systems for tasks such as navigation and image processing. The advent of high-resolution, low-cost digital imaging systems, when combined with high-bandwidth communications links, enables high-resolution images and video acquired by an unmanned aircraft to be transmitted in real time to an observer fifty feet—or 5000 miles—away. Thanks to continuing innovations in airframe design and flight control algorithms, the cameras that can be mounted on UAS are becoming smaller and more agile.

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25. ANTHONY FINN & STEVE SCHEDING, DEVELOPMENTS AND CHALLENGES FOR AUTONOMOUS UNMANNED VEHICLES: A COMPENDIUM 15 (2010).

26. JASJIT SINGH, AIR POWER IN MODERN WARFARE 198 (1988).

27. ZALOGA, *supra* note 18, at 16–24.

28. BENJAMIN S. LAMBETH, MOSCOW'S LESSONS FROM THE 1982 LEBANON AIR WAR 7 (1982), *available at* http://www.rand.org/pubs/reports/2007/R3000.pdf.

29. ZALOGA, *supra* note 18, at 26–28.

30. *Id.* at 29–33.

The American global positioning system (GPS),[31] which began development in 1973 and was completed in 1995,[32] has also helped to spur UAS growth. GPS makes it possible for UAS to determine their precise location using on-board systems, and therefore to perform missions involving much more complex navigational tasks than could be attempted in the pre-GPS era.[33]

Today, unmanned aircraft come in an incredible variety of shapes and sizes. Some, such as the Global Hawk used by the U.S. military, are as large and nearly as fast as business jets.[34] Others are small enough to fit in a backpack or even the palm of a hand. The video-capable Nano Hummingbird, developed by California-based AeroVironment, weighs only two-thirds of an ounce.[35] The solar-powered QinetiQ Zephyr, which weighs only slightly over 110 pounds despite having a wingspan of about 74 feet, stayed aloft for over two continuous weeks in Arizona during the summer of 2010.[36]

UAS can be controlled during flight in a variety of ways. A pilot on the ground who maintains visual contact with a UAS can fly it using a handheld or computer-based radio remote control interface. Alternatively, or in addition, in a "first-person-view" (FPV) system, a UAS-mounted camera transmits a real-time "cockpit" view to a pilot on the ground who flies

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31. The United States developed the GPS system and, in 1983, made it available for civilian applications. MICHAEL RUSSELL RIP & JAMES M. HASIK, THE PRECISE REVOLUTION: GPS AND THE FUTURE OF AERIAL WARFARE 9–10 (2002). Russia, the European Union, China, and India have also developed or are developing comparable satellite-based positioning systems. *See* UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, CURRENT AND PLANNED GLOBAL AND REGIONAL NAVIGATION SATELLITE SYSTEMS AND SATELLITE-BASED AUGMENTATIONS SYSTEMS, at v (2010), *available at* http://www.oosa.unvienna.org/pdf/publications/icg_ebook.pdf.

32. Randy James, *GPS*, TIME, May 26, 2009, http://www.time.com/time/magazine/article/0,9171,1901500,00.html.

33. *See, e.g.*, Rip & Hasik, *supra* note 31, at 191–275 (discussing the role of GPS in modern warfare).

34. *RQ-4 Global Hawk Factsheet*, THE OFFICIAL WEB SITE OF THE U.S. AIR FORCE, http://www.af.mil/information/factsheets/factsheet.asp?id=13225 (last visited Jan. 28, 2013).

35. Press Release, AeroVironment Inc., AeroVironment Develops World's First Fully Operational Life-Size Hummingbird-Like Unmanned Aircraft for DARPA, Feb. 17, 2011, *available at* http://www.avinc.com/resources/press_release/aerovironment_develops_worlds_first_fully_operational_life-size_hummingbird.

36. Andrew Chuter, *Solar UAV Lands After Record 2 Weeks Aloft*, DEFENSENEWS, July 23, 2010, http://www.defensenews.com/article/20100723/DEFSECT01/7230304/Solar-UAV-Lands-After-Record-2-Weeks-Aloft. The weight and length are reported in this article at 50 kilograms and 22.5 meters, respectively. *Id.*

the aircraft as if he or she were physically on-board. If the radio link between the UAS and the pilot is sufficiently strong, the UAS can be flown beyond the visual line of sight.

Autonomous flight using information from an on-board GPS receiver to perform navigation without any human intervention can also be used. Many UAS have the capability to operate in multiple modes—for example, navigating semi-autonomously to a destination based on a set of GPS waypoints input by a pilot, who then takes over active control using an FPV system. Of course, what is possible technologically and what is permitted by regulations are two very different things. At present, with very limited exceptions,[37] the Federal Aviation Administration (FAA) does not permit UAS flights in which the operator on the ground is unable to maintain continuous visual contact with the aircraft.

The UAS industry today is large, global, and rapidly growing. According to the Association for Unmanned Vehicle Systems International (AUVSI), the largest international association for unmanned systems, there are now over 400 active manufacturers of UAS globally, including 150 in the United States.[38] Other countries with significant UAS development include Australia, Brazil, Canada, China, France, Germany, India, Iran, Israel, Japan, Pakistan, Turkey, Russia, and the United Kingdom.[39] The Teal Group, an aerospace and defense consultancy based in Virginia, predicts that global annual UAS spending will rise from an estimated $6.6 billion in 2012 to over $11 billion over the next decade, corresponding to a total ten-year expenditure of nearly $90 billion.[40]

Even as overall spending is increasing, per-unit costs for the smaller platforms are dropping. Large military surveillance

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37. The FAA Modernization and Reform Act of 2012, discussed later in this Article, includes a provision (Section 332(d)) that will allow beyond-line-of-sight operation in the Arctic (northern Alaska). *See id.* at 11–15.

38. E-Mail from Melanie Hinton, Senior Commc'ns Manager, AUVSI, to author (Aug. 15, 2012, 12:44 PDT) (on file with author).

39. U.S. Gov't Accountability Office, GAO-12-536, Nonproliferation: Agencies Could Improve Information Sharing and End-Use Monitoring on Unmanned Aerial Vehicle Exports 10–16 (2012).

40. Press Release, Teal Group Corp., Teal Group Predicts Worldwide UAV Market Will Total $89 Billion in Its 2012 UAV Market Profile and Forecast (Apr. 11, 2012), *available at* http://www.prnewswire.com/news-releases/teal-group-predicts-worldwide-uav-market-will-total-89-billion-in-its-2012-uav-market-profile-and-forecast-147008115.html.

platforms such as the Global Hawk can cost many tens of millions of dollars or more to purchase[41] and require large teams of highly trained people using specialized equipment to fly.[42] However, there are increasing numbers of highly capable commercially available small UAS that can be purchased for under $1000. It is only a matter of time—and probably not much time—before GPS and video-equipped UAS drop below $100, and then below $10.

UAS can be used in law enforcement, search and rescue, surveying, scientific research, and many other civilian applications. Although many people equate the prospect of law enforcement use of UAS with surveillance, in practice this may be the exception rather than the rule. In this respect, the experience of the Mesa County, Colorado, Sheriff's Office is instructive. Mesa County has one of the only current FAA Certificates of Authorization for operational (as opposed to training) use of UAS.[43] The Mesa County Sheriff's Office has (as of February 2013) flown approximately 40 missions since 2011, and has never used them to perform surveillance.[44] Instead, typical operations have been for obtaining after-the-fact crime scene images, search and rescue, and providing imagery for structure fire suppression and arson investigations. Ben Miller, the Unmanned Aircraft Program Manager in Mesa County, puts the per-hour operating cost of Mesa County's UAS at $25;[45] a manned helicopter, by contrast, costs hundreds of dollars per hour to operate. The dramatically lower operating cost for unmanned aircraft provides a powerful economic incentive for their adoption. In addition, they can be used in circumstances where a manned helicopter would have been too dangerous or disruptive.

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41. A U.S Government Accountability Office report put the "unit cost" of a Global Hawk at $176 million as of July 2010. MICHAEL J. SULLIVAN, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-233SP, DEFENSE ACQUISITIONS: ASSESSMENTS OF SELECTED WEAPON PROGRAMS 69 (2011), *available at* http://www.gao.gov/assets/320/317081.pdf.

42. *See, e.g., RQ-4 Global Hawk*, U.S. AIR FORCE, http://www.af.mil/information/factsheets/factsheet.asp?id=13225 (last visited Jan. 28, 2013).

43. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Aug. 13, 2012, 10:45 PDT) (on file with author).

44. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Feb. 7, 2013, 7:02 PST) (on file with author).

45. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Aug 15, 2012, 13:19 PDT) (on file with author).

In Australia, where certain commercial operations using small unmanned aircraft have been permitted for over ten years,[46] applications have included mining surveys and transportation of equipment to drilling rigs.[47] In Japan, agricultural spraying is often performed using small unmanned helicopters.[48] In the United States, NASA researchers have used UAS for studying Hawaiian volcanoes.[49] UAS are also ideal platforms for identifying wildfire hotspots without putting a human pilot at risk.[50]

II. REGULATORY FRAMEWORK

A. The Federal Aviation Administration

When considering the regulatory framework applicable to UAS in the United States, it is helpful to start by briefly addressing how aircraft operations in general are regulated. The FAA, which was established in 1958 and has been part of the

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46. *See* Duncan Jefferies, *Drone journalism set for takeoff – once they're permitted to use our airspace*, THE GUARDIAN MEDIA NETWORK BLOG (Oct. 29, 2012, 7:09 AM), http://www.guardian.co.uk/media-network/media-network-blog/2012/oct/29/drone-journalism-take-off (noting that commercial drones have been licensed in Australia since 2002); *see also* Australia Civil Aviation Safety Authority Advisory Circular 101-1(0), *Unmanned Aircraft and Rockets: Unmanned Aerial Vehicle (UAV) Operations, Design Specification, Maintenance and Training of Human Resources* (July 2002), *available at* http://www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/101/101c01.pdf. The Advisory Circular states "Provided that a small UAV is operated not above 400ft AGL [above ground level] and remains clear of designated airspace, aerodromes and populous areas, there are no restrictions imposed upon the operation of a small UAV." *Id.* § 7.1.1. The Australia Civil Aviation Safety Authority defines "small" UAS as those weighing under 150 kilograms. *See* Gary Carr, *Unmanned Aircraft CASA Regulations* 2, Australian Gov't Civil Aviation Safety Auth., *available at* http://www.uatar.com/CASA%20Presentation%20-%20Unmanned%20Aircraft%20CASA%20Regulations.pdf.

47. Ry Crozier, *Australian miners send drones to work*, ITNEWS, May 28, 2012, http://www.itnews.com.au/News/302240,australian-miners-send-drones-to-work.aspx.

48. REG AUSTIN, UNMANNED AIRCRAFT SYSTEMS: UAVS DESIGN, DEVELOPMENT AND DEPLOYMENT 273–74 (2010).

49. Mark Brown, *Nasa sends UAV back to explore explosive Hawaiian volcano*, WIRED.CO.UK, Apr. 5, 2011, http://www.wired.co.uk/news/archive/2011-04/5/nasa-sends-out-volcano-spying-drone.

50. Brian Bennett, *Drones tested as tools for police and firefighters*, L.A. TIMES, Aug. 5, 2012, http://articles.latimes.com/2012/aug/05/nation/la-na-drones-testing-20120805.

Department of Transportation since the 1960s,[51] oversees nearly all[52] aircraft operations in the United States.[53] This is a complex task in a national airspace that has an "average of more than 100,000 aviation operations per day, including air carrier, air taxi, general aviation, and military aircraft."[54]

Like other administrative agencies of the United States government, the FAA makes and enforces rules to implement and interpret laws passed by Congress.[55] New rules,[56] such as those to be developed by the FAA to enable the integration of UAS into the airspace, are formulated through a rulemaking process that includes an internal drafting and review stage, publication of a draft rule in the Federal Register, a period of public comment, revisions based on the comments, and publication of a final rule.[57]

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51. *A Brief History of the FAA*, FED. AVIATION ADMIN., http://www.faa.gov/about/history/brief%5Fhistory/http://www.faa.gov/about/history/brief_history/ (last visited Nov. 10, 2012) [hereinafter *Brief History*].

52. There are a few exceptions. For example, the FAA does not have any responsibility to ensure the separation of military aircraft operating within "MARSA" airspace. MARSA is an acronym for "Military Assumes Responsibility for Separation of Aircraft." FED. AVIATION ADMIN., AIR TRAFFIC ORG. POLICY ¶ 2-1-11 (2012), *available at* http://www.faa.gov/air_traffic/publications/atpubs/atc/atc0201.html. In addition, the FAA does not oversee model aircraft operated in accordance with FAA Advisory Circular 91-57 or with Section 336 of the FAA Modernization and Reform Act of 2012, which creates a special rule for model aircraft. *See* FED. AVIATION ADMIN., ADVISORY CIRCULAR 91-57, MODEL AIRCRAFT OPERATING STANDARDS (1981) [hereinafter ADVISORY CIRCULAR 91-57], *available at* http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf; FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 336, 126 Stat. 11, 77 (2012).

53. Brief History, supra note 51.

54. *Fact Sheet: Unmanned Aircraft Systems (UAS)*, FED. AVIATION ADMIN., http://www.faa.gov/about/initiatives/uas/media/uas_fact_sheet.pdf (last visited Jan. 28, 2013) [hereinafter *Fact Sheet*].

55. Formally, a "rule" is "the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy. . . ." Administrative Procedure Act § 1, 5 U.S.C. § 551(4) (2012).

56. FAA "rules" are also called "regulations." *See, e.g.*, 49 U.S.C. § 40103 (directing that the Administrator of the FAA promulgate "regulations" governing the flight of aircraft).

57. There are actually various forms of rulemaking in accordance with the Administrative Procedure Act, which was enacted in 1946. The steps described in the text (and provided in 5 U.S.C. § 553) occur in association with what is referred to as informal rulemaking, which is by far the most common form. There is also a formal rulemaking process under 5 U.S.C. §§ 556–557 that includes a hearing and

FAA regulations[58] classify aircraft, without regard to whether they are manned, as either "public"[59] or "civil."[60] Public aircraft are those operated by local, state, and federal public entities, including law enforcement agencies.[61] Civil aircraft, typically, are operated by private companies, individuals, and other non-government entities. The public-civil distinction is extremely important both generally and with respect to UAS.

B. The FAA and Unmanned Aircraft Systems

On February 14, 2012, President Obama signed the FAA Modernization and Reform Act of 2012 (FMRA)[62] into law. FMRA provides, among other things, a set of overlapping deadlines for the integration of UAS into the national airspace over the next three years.[63] Although UAS integration has been on the proverbial radar screen of the FAA for a number of years, FMRA represents the first significant congressional legislation addressing the domestic use of UAS.

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a number of other steps. RAYMOND C. SPECIALE, FUNDAMENTALS OF AVIATION LAW 124–25 (2006).

58. FAA regulations are provided in the Code of Federal Regulations (CFR), Title 14 ("Aeronautics and Space"), Volumes 1–3, which comprise parts 1–199 (not all of the numbers in this range are currently used). "General Operating and Flight Rules" for aircraft are found in Volume 2, Subchapter F ("Air Traffic and General Operating Rules"), Part 91, denoted 14 C.F.R. § 91 and sometimes referred to as FAR Part 91. FAR is an acronym for "Federal Aviation Regulations." "General Definitions" are in 14 C.F.R. § 1.1. An unofficial version of the CFR is provided through the Electronic Code of Federal Regulations (e-CFR) by the government at http://ecfr.gov.

59. Section 331(4) of the FAA Modernization and Reform Act provides that "[t]he term 'public unmanned aircraft system' means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft . . . ." FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012). The term "public aircraft" is defined in 49 U.S.C.A. § 40102(a)(41) (2012), as well as in 14 C.F.R. § 1.1 (2012).

60. *See* 49 U.S.C. § 40102(a)(16).

61. *See* § 40102(a)(41). Whether an aircraft has "public aircraft status" depends, in part, on how it is being used. An aircraft that is owned by a government entity but engaged in an operation that replicates a service that could be obtained from a commercial air carrier does not have public aircraft status during that operation. As used in this Article, "public aircraft" and "government aircraft" refer to aircraft that satisfy the statutory qualifications for public aircraft status under § 40125.

62. Pub. L. No. 112-95, 126 Stat. 11 (2012).

63. *Id.* §§ 331–336, 126 Stat. at 72–78.

Recognizing that UAS raise unique issues that "may differ substantially from manned aircraft operations and systems,"[64] the FAA created a new Unmanned Aircraft Program Office in early 2006.[65] In accordance with policies established well before the enactment of FMRA, operators of UAS engaged in public aircraft operations are required to obtain a Certificate of Authorization (COA).[66] Civil (i.e. private) UAS operators need a "special airworthiness certificate."[67] Use of UAS for commercial purposes is currently prohibited,[68] though that is expected to change by 2014.

According to data released in early 2012 in response to a Freedom of Information Act lawsuit filed by the Electronic Frontier Foundation, the FAA had issued "about 700–750 authorizations since the program began in 2006," of which approximately 300 remained active as of April 2012.[69] Public entities that have been issued COAs include the U.S. Air Force,

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64. James Sizemore & Richard Posey, Fed. Aviation Admin., Unmanned Aircraft Systems (UAS) Certification Status 2 (2006), *available at* http://www.faa.gov/about/initiatives/uas/reg/media/uas_policyupdate.pdf.

65. *Id.* at 1.

66. *See* DEP'T. OF TRANSP., UNMANNED AIRCRAFT OPERATIONS IN THE NATIONAL AIRSPACE SYSTEM, DOCKET NO. FAA-2006-25714 (2007), *available at* http://www.faa.gov/about/initiatives/uas/reg/media/frnotice_uas.pdf. In addition to "Certificate of Authorization," COA is sometimes written in expanded form as "Certificate of Waiver or Authorization" or "Certificate of Authorization or Waiver." *See id.* An exception to the COA requirement is MARSA airspace. *See supra* note 52.

67. *See* 14 C.F.R. § 21.175 (2012). Although model aircraft are obviously unmanned, provided that they are flown for hobby or recreational use, they are not treated as "civil UAS" by the FAA. *See* ADVISORY CIRCULAR 91-57, *supra* note 52; FMRA § 336, 126 Stat. at 77.

68. Even though this prohibition is not explicit with respect to UAS, it is implicit in the list, provided in 14 C.F.R. § 21.191, of purposes for which experimental certificates can be issued. To date, special airworthiness certificates have been issued only in the experimental category. *Fact Sheet, supra* note 54, at 146 ("An SAC-EC is the only certification means available to civil operators for UAS and optionally-piloted aircraft (OPA)."). "SAC" is an acronym for special airworthiness certificate. The list in § 21.191 includes purposes such as "[r]esearch and development," "[a]ir racing," and "[c]rew training," but not commercial use. In addition, 14 C.F.R. § 91.319, which describes operating limitations for aircraft having experimental certificates, provides, among other things, that "[n]o person may operate an aircraft that has an experimental certificate—(1) For other than the purpose for which the certificate was issued; or (2) Carrying persons or property for compensation or hire."

69. Jennifer Lynch, *FAA Releases Lists of Drone Certificates—Many Questions Left Unanswered*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/deeplinks/2012/04/faa-releases-its-list-drone-certificates-leaves-many-questions-unanswered.

U.S. Army, the Defense Advanced Research Projects Agency (DARPA), FBI, NASA, some county and municipal law enforcement agencies, and various public universities.[70] The list of companies that have been issued special airworthiness certificates includes Raytheon, Honeywell, General Atomics, and other defense companies.[71]

COAs specify where and under what circumstances a UAS can be used. For example, a COA might require that the UAS only be flown during daylight hours, and only within the visual line of sight of the operator.[72] In the case of a UAS operated by a law enforcement agency, the COA might specify that flights must be performed only for training, as opposed to operational, purposes. In early 2008, the FAA began the process of developing recommendations for regulating "small" UAS (those weighing under fifty-five pounds).[73] Thus, by the time FMRA was signed into law in February 2012, the FAA had already been actively planning for UAS integration for several years.

FMRA sets a goal of integrating UAS into the national airspace system by late 2015.[74] Under the new law, public UAS operators have had access to expedited COAs since May 14, 2012.[75] UAS under these authorizations must weigh no more than twenty-five pounds[76] and be operated within the line of sight of the op-

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70. *FAA List of Certificates of Authorizations (COAs)*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/document/faa-list-certificates-authorizations-coas (last visited Jan. 28, 2013).

71. *FAA List of Special Airworthiness Certificates – Experimental Category (SACs)*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/document/faa-list-special-airworthiness-certificates-experimental-categorysacs (last visited Jan. 28, 2013).

72. *Fact Sheet*, *supra* note 54, at 2.

73. In April 2008, the FAA created the Small Unmanned Aircraft System Aviation Rulemaking Committee. *See* FED. AVIATION ADMIN., ORDER 1110.150, SMALL UNMANNED AIRCRAFT SYSTEM AVIATION RULEMAKING COMMITTEE (2008), http://www.faa.gov/documentLibrary/media/Order/1110.150.pdf. This committee is often referred to using the acronym sUAS ARC, and has members from both government and industry. The sUAS ARC issued a set of recommendations for sUAS regulatory development in April 2009. *See* FED. AVIATION ADMIN., SMALL UNMANNED AIRCRAFT SYST. AVIATION RULEMAKING COMM., COMPREHENSIVE SET OF RECOMMENDATIONS FOR SUAS REGULATORY DEVELOPMENT (2009), *available* at http://www.modelaircraft.org/faa/recommendations.pdf.

74. FMRA, Pub. L. No. 112–95, § 332(a)(3), 126 Stat. 11, 73 (2012).

75. *See id.* § 334(c), 126 Stat. at 76.

76. *FAA Makes Progress with UAS Integration*, FED. AVIATION ADMIN., http://www.faa.gov/news/updates/?newsId=68004 (last visited Jan. 28, 2012). Interestingly, with respect to weight, the FAA went further than was required by

erator, less than 400 feet above the ground, and during daylight conditions.[77] By December 31, 2015, the FAA is required to "develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system by September 30, 2015."[78]

For civil UAS, FMRA mandates the development of a "comprehensive plan" that will "provide for the safe integration of civil unmanned aircraft systems into the national airspace."[79] Additionally, regulations for the operation of small civil UAS (including allowing their use for commercial purposes) are due by August 2014.[80]

The FAA is in somewhat of a unique position with respect to deadlines laid out in legislation such as FMRA. FMRA requires that the FAA "provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015."[81] This language contains no explicit provision for what happens if, in the FAA's view, "as soon as practicable" is later than that date. However, Congress is unlikely to hold the FAA to a deadline that might risk jeopardizing airspace safety.

C. *The Impact of Safety Regulations on Privacy*

Though privacy and airspace safety are distinct UAS issues, they are in some respects closely intertwined. By placing limitations on where and how unmanned aircraft can be operated, airspace safety regulations can impact privacy.

For example, under the FAA regulations that prescribe "flight rules governing the operation of [both manned and un-

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FMRA, which provided that the authorizations must "allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less." FMRA § 334(c)(2)(C), 126 Stat. at 77.

77. These requirements are among those provided in FMRA § 334(c)(2)(C). Additional requirements in this Section restrict operation to Class G (uncontrolled) airspace more than five miles from airports and other locations with aviation activities. *See id.*

78. *Id.* § 334(b), 126 Stat. at 76.

79. *Id.* § 332(a)(1).

80. *Id.* § 332(b)(1).

81. *Id.* § 332(a)(3).

manned] aircraft within the United States,"[82] it is illegal to operate an aircraft "in a careless or reckless manner so as to endanger the life or property of another."[83] Aircraft must also be operated at a sufficiently high altitude to allow "an emergency landing without undue hazard to persons or property on the surface" in the event of an engine failure.[84] Compliance with these rules, which apply to both manned and unmanned aircraft,[85] could be called into question, for example, in the monitoring of a peaceful protest if a UAS is flown (either by law enforcement or by a protester) at very low altitudes directly above a crowd of people.[86]

The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of FMRA have a "line of sight" requirement.[87] The rules for civil small UAS due for implementation in August 2014 likely will also have this constraint. From the FAA's standpoint, any such requirement would be solely motivated by safety concerns related to the need to "sense and avoid" other aircraft and to problems that might arise if a UAS beyond the line of sight loses communication with its operator.[88] But there are privacy consequences as well.

It is easy for an operator standing on the street in front of a house to fly a UAS high enough to obtain overhead images of a fenced-in backyard while maintaining visual contact with the

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82. Subpart B of part 91 applies to "the operation of aircraft within the United States and within 12 nautical miles from the coast of the United States." 14 C.F.R. § 91.101 (2012).

83. 14 C.F.R. § 91.13(a).

84. 14 C.F.R. § 91.119(a).

85. *See* 14 C.F.R. § 91.1(a) (stating that part 91 "govern[s] the operation of aircraft . . . within the United States.").

86. *See* 14 C.F.R. § 91.13(a).

87. FMRA § 334(c)(2)(c).

88. *See Fact Sheet*, *supra* note 54, at 2. Not everyone in the unmanned aviation community is in agreement regarding the safety value of a line of sight requirement. Opponents of such a requirement could argue, among other things, that a UAS beyond the visual line of sight that loses communication with an operator can be programmed to land itself safely. Opponents could also argue that even if a UAS is within visual line of sight, if the ability of the operator to communicate with it is lost, being able to see it does little to mitigate any resulting risks. Nonetheless, this is an area in which regulators are likely to act very conservatively.

aircraft. It is far harder, by contrast, to maintain visual line of sight while lowering the UAS into the yard to obtain eye-level images through the back windows of the house. Thus, the questions of if, when, and under what circumstances non-visual line of sight operation will be permitted will have an impact on privacy.[89]

Even assuming that FAA regulations adopted in the next several years continue to require visual line of sight operation, in the longer term this requirement is likely to be relaxed for some specific classes of UAS operations. Some of the most promising applications of UAS, by their very nature, require non-visual line of sight operation. For example, UAS have enormous potential for search and rescue in large part because they can enable an operator to quickly and safely examine many square miles of potentially inhospitable terrain. Surveying of pipelines, long-distance electric transmission lines, and other extended structures can also entail large separations between an operator and a UAS. As "sense and avoid" technologies become more mature, these sorts of non-line of sight operations may eventually be permitted. This will expand ways in which a UAS flown in compliance with FAA regulations might be used to violate privacy.

III. GOVERNMENT UNMANNED AIRCRAFT AND THE FOURTH AMENDMENT

The Fourth Amendment is central to the privacy issues with respect to government UAS operation. Although the Supreme Court has never explicitly considered the question of UAS privacy, there is a long list of relevant precedents.[90] Among them

89. The term "line of sight" is more complex than it first appears. Some people in the UAS community use "line of sight" to refer to operation in which a radio signal can be transmitted directly from an operator to a UAS, without being relayed through a satellite, other aircraft, or ground-based communications network (sometimes also called "electronic line of sight"). This does not ensure that the operator can necessarily see the UAS, as radio signals can easily pass through trees and other objects, sometimes traveling for miles. The term "*visual* line of sight," by contrast, is unambiguous: The operator must be able to see, with his or her eyes, the UAS.

90. In addition to the cases discussed at greater length in Part III of this Article, see, e.g., City of Indianapolis v. Edmond, 531 U.S. 32 (2000), Minnesota v. Carter, 525 U.S. 83 (1998), United States v Karo, 468 U.S. 705 (1984), Oliver v. United States, 466 U.S. 170 (1984), United States v. Knotts, 460 U.S. 276 (1983), Steagald v.

are several cases from the 1980s that specifically considered aerial observations and the Fourth Amendment. The 2001 *Kyllo v. United States*[91] and 2012 *United States v. Jones*[92] decisions are also pertinent.

A. Dow Chemical Co. v. United States

In 1978, the Environmental Protection Agency, without Dow Chemical's consent, contracted with a commercial aerial photographer to provide images of a 2000-acre Dow Chemical manufacturing facility from altitudes of 1200, 3000, and 12,000 feet.[93] When Dow Chemical became aware of this, it filed suit in Federal District Court, which granted summary judgment, finding the aerial photography to be a search in violation of the Fourth Amendment.[94] The Sixth Circuit reversed the decision, ruling that even though the company had taken precautions, including installing a perimeter fence and alarm system[95] that provided a subjective expectation of privacy from ground-level intrusions, it did not have such an expectation with respect to aerial surveillance.[96] Thus, the Sixth Circuit concluded, the acquisition of aerial images without a warrant was not a Fourth Amendment search.[97]

In reviewing this ruling on certiorari, the Supreme Court affirmed the Sixth Circuit's decision, concluding in a 1986 ruling that the open areas in the 2000-acre industrial facility were more akin to an "open field"[98] than to the curtilage of a home,

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United States, 451 U.S. 204 (1981), Smith v. Maryland, 442 U.S. 735 (1979), Rakas v. Illinois, 439 U.S. 128 (1978), City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973), Katz v. United States, 389 U.S. 347 (1967), Camara v. Mun. Court, 387 U.S. 523 (1967), Griggs v. Allegheny Cnty., 369 U.S. 84 (1962), Silverman et al. v. United States, 365 U.S. 505 (1961), Johnson v. United States, 333 U. S. 10 (1948), United States v. Causby, 328 U.S. 256 (1946), Hester v. United States, 265 U.S. 57 (1924), and Boyd v. United States, 116 U.S. 616 (1886).

91. 533 U.S. 27 (2001).

92. 132 S. Ct. 945 (2012).

93. Dow Chem. Co. v. United States, 476 U.S. 227, 229 (1986).

94. *Id.* at 230.

95. *Id.* at 240–41 (Powell, J., concurring in part and dissenting in part).

96. *Id.* at 230.

97. *Id.* at 229.

98. The Court wrote that "open fields do not provide the setting for those intimate activities that the [Fourth] Amendment is intended to shelter from governmental interference or surveillance" and that "an individual may not legitimately demand privacy for activities out of doors in fields, except in the area immedi-

and, as a result, were "open to the view and observation of persons in aircraft lawfully in the public airspace immediately above or sufficiently near the area for the reach of cameras."[99] The Court also noted the role of technology diffusion as a factor, writing that "surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant."[100] However, the Court observed, "[a]ny person with an airplane and an aerial camera could readily duplicate"[101] the photographs at issue. "[T]he taking of aerial photographs of an industrial plant complex from navigable airspace is not a search prohibited by the Fourth Amendment."[102]

B. California v. Ciraolo

Ciraolo[103] was decided in 1986, on the same day as *Dow Chemical*. On September 2, 1982, police in Santa Clara, California, received a tip regarding backyard marijuana cultivation.[104] After finding the yard surrounded by high fencing obscuring the view from the street, they obtained a small airplane and flew over the residence at 1000 feet.[105] The officers on the airplane observed and photographed what they concluded to be marijuana plants growing in the backyard.[106] This evidence was used to obtain a search warrant to seize the plants.[107]

The Supreme Court granted certiorari after the California Court of Appeal ruled that the warrantless aerial observations violated the Fourth Amendment.[108] In May 1986, the Supreme Court issued a five-to-four decision reversing the lower court.[109] Writing for the majority, Chief Justice Burger framed

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ately surrounding the home." *Id.* at 235–36 (alteration in original) (quoting Oliver v. United States, 466 U.S. 170, 178–79 (1984)) (internal quotation marks omitted).

99. *Id.* at 239.

100. *Id.* at 238.

101. *Id.* at 231.

102. *Id.* at 239.

103. California v. Ciraolo, 476 U.S. 207 (1986).

104. *Id.* at 209.

105. *Id.*

106. *Id.*

107. *Id.*

108. People v. Ciraolo, 161 Cal. App. 3d 1081, 1090 (Ct. App. 1984).

109. *Ciraolo*, 476 U.S. at 215.

the analysis in terms of the "reasonable expectation of privacy"[110] articulated in Justice Harlan's concurrence in *Katz*.[111] For an expectation of privacy to be "reasonable" under *Katz*, two separate criteria must be satisfied. First, the person must "have exhibited an actual (subjective) expectation of privacy."[112] Second, the expectation must "be one that society is prepared to recognize as 'reasonable.'"[113]

With respect to the first criterion, the *Ciraolo* Court wrote that although the presence of fences clearly conveyed a "desire to maintain privacy," and indeed successfully did so with respect to "normal sidewalk traffic," the marijuana plants might well have been visible from a truck or two-level bus.[114] Thus, it was unclear that the respondent had "a subjective expectation of privacy from all observations of his backyard."[115]

With respect to the second criterion, the Court did not dispute that the backyard was in the curtilage of the home,[116] but noted that police observations of curtilage are not necessarily unconstitutional. "The Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares."[117] Moreover, "the mere fact that an individual has taken measures to restrict some views of his activities [does not] preclude an officer's observations from a public vantage

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110. *Id.* at 211.

111. Katz v. United States, 389 U.S. 347, 360 (1967) (Harlan, J., concurring).

112. *Id.* at 361.

113. *Id.* Much turns on the interpretation of "reasonable." For example, in *Illinois v. Caballes*, the Supreme Court explained that "the expectation 'that certain facts will not come to the attention of the authorities' is not the same as an interest in 'privacy that society is prepared to consider reasonable.'" 543 U.S. 405, 408–09 (2005) (quoting United States v. Jacobsen, 466 U.S. 109, 122 (1984)). In *Caballes*, the Court also distinguished between legitimate privacy expectations with respect to lawful, as opposed to unlawful, activity: "The legitimate expectation that information about perfectly lawful activity will remain private is categorically distinguishable from respondent's hopes or expectations concerning the nondetection of contraband in the trunk of his car." *Id.* at 410.

114. *Ciraolo*, 476 U.S. at 211.

115. *Id.* at 211–12.

116. *See, e.g.*, Oliver v. United States, 466 U.S. 170, 180 (1984) ("Thus, courts have extended Fourth Amendment protection to the curtilage; and they have defined the curtilage, as did the common law, by reference to the factors that determine whether an individual reasonably may expect that an area immediately adjacent to the home will remain private.").

117. *Ciraolo*, 476 U.S. at 213.

point where he has a right to be and which renders the activities clearly visible."[118] Because the observations were made from "public navigable airspace . . . in a physically nonintrusive manner," the respondent's expectation of privacy from such aerial observations was not one "that society is prepared to honor."[119] The Court concluded that "[i]n an age where private and commercial flight in the public airways is routine, it is unreasonable for respondent to expect that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet."[120]

The dissent, delivered by Justice Powell, criticized the Court's reliance on the absence of a "physical invasion of the curtilage" in finding no constitutional violation: "Since *Katz*, we have consistently held that the presence or absence of physical trespass by police is constitutionally irrelevant to the question whether society is prepared to recognize an asserted privacy interest as reasonable."[121] The dissent also disagreed with the Court's view that conducting an overflight with the specific goal of enabling trained officers to observe a suspect's backyard raised no more constitutional questions than overflights by members of the flying public: "[T]he actual risk to privacy from commercial or pleasure aircraft is virtually nonexistent. Travelers on commercial flights, as well as private planes used for business or personal reasons, normally obtain at most a fleeting, anonymous, and nondiscriminating glimpse of the landscape and buildings over which they pass."[122] And, in an observation that would foreshadow the *Kyllo* decision fifteen years later, Justice Powell warned that "[r]apidly advancing technology now permits police to conduct surveillance in the home itself, an area where privacy interests are most cherished in our society, without any physical trespass."[123]

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118. *Id.*

119. *Id.* at 213–14.

120. *Id.* at 215.

121. *Id.* at 223 (Powell, J., dissenting).

122. *Id.* In a footnote to this text, Justice Powell called the Court's "analogy to commercial and private overflights" "wholly without merit." *Id.* at 223 n.8.

123. *Id.* at 226.

C. Florida v. Riley

Just under three years after *Ciraolo*, the Supreme Court once again ruled on the constitutionality of aerial observations of a home's curtilage by law enforcement. Like *Ciraolo*, *Florida v. Riley*[124] arose from a tip involving marijuana cultivation behind a house, where the plants could not be seen from the street. In *Riley*, the observations were made from a helicopter at 400 feet, enabling officers to see the plants through openings in the roof and sides of a greenhouse located behind a mobile home.[125] A majority of the justices in *Riley* found these observations constitutional.

Writing for the plurality,[126] Justice White wrote that "our decision in *California v. Ciraolo* controls this case."[127] While Riley took steps that "protected against ground-level observation," "the sides and roof of his greenhouse were left partially open" and "what was growing in the greenhouse was subject to viewing from the air."[128] "Any member of the public could legally have been flying over Riley's property in a helicopter at the altitude of 400 feet and could have observed Riley's greenhouse. The police officer did no more."[129]

Despite Justice White's statement that "[w]e would have a different case if flying at that altitude had been contrary to law or regulation,"[130] his opinion also provided an important qualifier: "This is not to say that an inspection of the curtilage of a house from an aircraft will always pass muster under the Fourth Amendment simply because the plane is within the navigable airspace specified by law."[131] Specifically, in ruling that there was no violation of the Fourth Amendment in the present case, Justice White found it of note that "no intimate

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124. 488 U.S. 445 (1989).

125. *Id.* at 448.

126. The *Riley* decision comprised an opinion delivered by Justice White and joined by Chief Justice Rehnquist and Justices Scalia and Kennedy; an opinion from Justice O'Connor concurring in the judgment; a dissent from Justice Brennan joined by Justices Marshall and Stevens; and a separate dissent filed by Justice Blackmun. Thus, even though there was no majority opinion, a majority of the Justices found the observations constitutional.

127. *Id.* at 449 (plurality opinion) (internal citation omitted).

128. *Id.* at 450.

129. *Id.* at 451.

130. *Id.*

131. *Id.*

details connected with the use of the home or curtilage were observed, and there was no undue noise, and no wind, dust, or threat of injury."[132]

In her opinion concurring in the judgment, Justice O'Connor raised concerns about relying on "compliance with FAA regulations alone" as a litmus test for privacy from overhead surveillance.[133] Rather, she wrote, "consistent with *Katz*, we must ask whether the helicopter was in the public airways at an altitude at which members of the public travel with sufficient regularity that Riley's expectation of privacy from aerial observation was not 'one that society is prepared to recognize as reasonable.'"[134] She then concluded that because there is "considerable public use of airspace at altitudes of 400 feet and above," Riley did not have a reasonable expectation of privacy from naked-eye observations from that altitude.[135] However, she wrote, "public use of altitudes lower than that—particularly public observations from helicopters circling over the curtilage of a home—may be sufficiently rare that police surveillance from such altitudes would violate reasonable expectations of privacy, despite compliance with FAA air safety regulations."[136]

Justice Brennan's dissent also took issue with the tie between FAA safety regulations and privacy: "It is a curious notion that the reach of the Fourth Amendment can be so largely defined by administrative regulations issued for purposes of flight safety."[137] He observed that the police officer's "ability to see over Riley's fence depended on his use of a very expensive and sophisticated piece of machinery to which few ordinary citizens have access."[138] The question, in Justice Brennan's view, was not whether the flights were in compliance with the FAA regulations, "but whether public observation of Riley's curtilage was so commonplace that Riley's expectation of privacy in his backyard could not be considered reasonable."[139] And while privately owned helicopters occasionally fly over populated areas

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132. *Id.* at 452.
133. *Id.* at 453 (O'Connor, J., concurring in the judgment).
134. *Id.* at 454 (quoting Katz v. United States, 389 U.S. 347,361 (1967)).
135. *Id.* at 455.
136. *Id.*
137. *Id.* at 458 (Brennan, J., dissenting).
138. *Id.* at 460.
139. *Id.*

at 400 feet, "such flights are a rarity."[140] Justice Blackmun's dissent also cited the rarity of helicopter overflights at 400 feet and stated that for any observations below 1000 feet (the altitude of the fixed-wing aircraft in *Ciraolo*), the prosecution should have the burden of proving that a suspect whose curtilage was observed lacked a reasonable expectation of privacy.[141]

D. Kyllo v. United States

Although *Kyllo*[142] involved ground-based observations of a home, the case is nonetheless highly relevant to privacy from aerial observations; in fact, *Ciraolo* was invoked multiple times in the Court's 2001 *Kyllo* opinion. In January 1992, a government agent in a car used a thermal imaging device to measure the external temperature of the roof and outside wall of the home of Danny Lee Kyllo, who was suspected of growing marijuana.[143] The roof and wall were found to be abnormally warm, and a search warrant was issued based in part on this information.[144] Upon execution of the search warrant, marijuana plants were found and Kyllo was arrested.[145] A district court and the Ninth Circuit upheld the use of the thermal imager, in part on the grounds that it "merely indicated amorphous 'hot spots' on the roof and exterior wall and not the detailed images of private activity."[146]

The Supreme Court reversed the Ninth Circuit in a five-to-four opinion delivered by Justice Scalia.[147] The Court framed its analysis by noting that "well into the 20th century, our Fourth Amendment jurisprudence was tied to common-law trespass."[148] More recent rulings have "decoupled violation of a person's Fourth Amendment rights from trespassory violation of his property, but the lawfulness of warrantless visual surveillance of a home has still been preserved."[149] However, with

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140. *Id.* at 465.
141. *Id.* at 468 (Blackmun, J., dissenting).
142. Kyllo v. United States, 533 U.S. 27 (2001).
143. *Id.* at 29–30.
144. *Id.* at 30.
145. *See id.*
146. United States v. Kyllo, 190 F.3d 1041, 1047 (9th Cir. 1999).
147. *Id.* at 29.
148. *Id.* at 31.
149. *Id.* at 32 (citation omitted).

respect to searches of the interior of a home, "there is a ready criterion, with roots deep in the common law, of the minimal expectation of privacy that *exists*, and that is acknowledged to be *reasonable*."[150]

The Court expressed concern that allowing the government to freely collect any information "emanating from a house" would put people "at the mercy of advancing technology—including imaging technology that could discern all human activity in the home."[151] The Court also noted that "[w]hile the technology used in the present case was relatively crude, the rule we adopt must take account of more sophisticated systems that are already in use or in development."[152] The Court then concluded that when "the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a 'search' and is presumptively unreasonable without a warrant."[153]

In dissent, Justice Stevens criticized the Court for, in his view, failing to follow established principles providing that searches inside a home are presumptively unreasonable, while searches of property "in plain view" are not.[154] Justice Stevens also wrote that "any member of the public might notice that one part of a house is warmer than another part or a nearby building if, for example, rainwater evaporates or snow melts at different rates across its surfaces," and that "[h]eat waves, like aromas that are generated in a kitchen, or in a laboratory or opium den, enter the public domain if and when they leave a building."[155] Justice Stevens also criticized the Court's use of a standard that would diminish privacy protection as "intrusive equipment becomes more readily available."[156] Indeed, in the decade following *Kyllo*, thermal imagers have become less ex-

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150. *Id.* at 34.

151. *Id.* at 35–36.

152. *Id.* at 36.

153. *Id.* at 40.

154. *Id.* at 42 (Stevens, J., dissenting) (quoting Payton v. New York, 445 U.S. 573, 586–87 (1980)).

155. *Id.* at 43–44.

156. *Id.* at 47. Justice Stevens also disputed the Court's "assumption that the thermal imager used in this case" was not in general public use, and noted in a footnote that similar imagers were available for rental through a toll-free telephone number. *Id.* at 47 & n.5.

pensive and more widely available. Writing in 2010, Orin Kerr observed that "remote infrared temperature-sensing has become quite common in a wide range of applications" and "it seems to me that there's at least a plausible case that the police can now use thermal imaging devices—or at least the simple single-point infrared devices—without a warrant."[157]

E. United States v. Jones

The most recent major Supreme Court privacy ruling is *United States v. Jones*,[158] decided in January 2012. In September 2005, agents on a joint FBI and Metropolitan (Washington D.C.) Police Department task force installed, without a valid warrant,[159] a GPS tracking device on a vehicle used by a suspect in a narcotics investigation.[160] The GPS tracker collected location data for approximately one month, and was used to place the suspect, Antoine Jones, at a house at a date and time where drug sales allegedly occurred.[161] After two trials in the United States District Court for the District of Columbia (the first ended in a mistrial), Jones and another defendant were convicted on a drug conspiracy charge.[162]

On appeal, Jones' conviction was overturned.[163] While noting that a person's reasonable expectation of privacy is highest in his or her home, the District of Columbia Circuit Court of Appeal recognized that "[a] person does not leave his privacy behind when he walks out his front door . . . . On the contrary, in *Katz* the Court clearly stated 'what [one] seeks to preserve as private, even in an area accessible to the public, may be constitutionally

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157. Orin Kerr, Can the Police Now Use Thermal Imaging Devices Without a Warrant? A Reexamination of Kyllo in Light of the Widespread Use of Infrared Temperature Sensors, THE VOLOKH CONSPIRACY, (Jan. 4, 2010, 12:33 PM), http://www.volokh.com/2010/01/04/can-the-police-now-use-thermal-imaging-devices-without-a-warrant-a-reexamination-of-kyllo-in-light-of-the-widespread-use-of-infrared-temperature-sensors/.

158. 132 S. Ct. 945 (2012).

159. The agents had obtained a warrant, but it was for the District of Columbia and was valid for a ten-day period. The agents installed the tracking device in Maryland on the eleventh day. *See id.* at 948.

160. *Id.*

161. *Id.* at 948–49.

162. *Id.*

163. *Id.* at 949.

protected.'"[164] In using the warrantless GPS tracker to discover "the totality and pattern of his movements," the court concluded that the government violated the Fourth Amendment.[165]

The Supreme Court granted the government's petition of certiorari.[166] The Court's January 2012 decision was unanimous in finding the government's actions unconstitutional, but the Justices widely diverged in the bases for that finding. The majority opinion, delivered by Justice Scalia, found a Fourth Amendment violation in the physical trespass that occurred during the placement of the GPS device on the vehicle.[167] That intrusion, wrote Justice Scalia, "would have been considered a 'search' within the meaning of the Fourth Amendment when it was adopted."[168] The Court acknowledged that extended electronic surveillance "without an accompanying trespass" may be unconstitutional, but noted that the "present case does not require us to answer that question."[169]

In his opinion concurring in the judgment, Justice Alito criticized "the Court's reliance on the law of trespass" to decide the case.[170] Instead, he wrote, the question is whether the "respondent's reasonable expectations of privacy were violated by the long-term monitoring" of his vehicle.[171] Because "law enforcement agents tracked every movement that respondent made in the vehicle he was driving" for four weeks—a level of monitoring that Justice Alito felt impinged on reasonable expectations of privacy—Justice Alito concluded that the monitoring constituted a search.[172] Justice Sotomayor, in addition to joining the majority, provided a separate concurring opinion arguing that "the trespassory test . . . reflects an irreducible constitutional minimum."[173] Justice Sotomayor also expressed concern that the unchecked abil-

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164. United States v. Maynard, 615 F.3d 544, 563 (D.C. Cir. 2010) (second alteration in original) (citation omitted).

165. *Id.* at 558, 568.

166. *Jones*, 132 S. Ct. at 949.

167. *See id.*

168. *Id.*

169. *Id.* at 953–54.

170. *Id.* at 962 (Alito, J., concurring in the judgment).

171. *Id.* at 958.

172. *Id.* at 964. Justice Alito left open the possibility that some periods of GPS surveillance might not constitute a search, but noted that in this case "the line was surely crossed before the 4-week mark." *Id.*

173. *Id.* at 955 (Sotomayor, J., concurring).

ity of the government to conduct long-term monitoring of "the sum of one's public movements" could enable it to obtain private information regarding political and religious beliefs.[174]

F. Privacy and Unmanned Aircraft Systems in Light of Supreme Court Jurisprudence

In *Ciraolo*, *Riley*, and *Kyllo*, the Supreme Court expressed a view that the extent to which an expectation of privacy is "reasonable" is tied, at least in part, to the level of technology diffusion. In addition, with respect to the specific question of the constitutionality of aerial observations, in *Ciraolo*, *Riley*, and *Dow Chemical*, the Court considered the use of public navigable airspace to be important, though not necessarily determinative. In those three rulings the Court also explicitly or implicitly distinguished overhead observations made using the naked eye or widely available camera technology from those made using less common imaging systems. For UAS privacy, these three tests—whether a technology is in general public use, whether the observations are made from public navigable airspace, and the nature of the imaging (or other information-gathering) system—will play fundamental roles.

Jones is most relevant to UAS in relation to extended surveillance. Today, tethered blimps called "aerostats" are being stationed in the sky in some places along the U.S.-Mexico border.[175] In addition, in the future, it will become practical to utilize fixed-wing unmanned aircraft for long-term surveillance. Thus, the types of constitutional questions considered (though not resolved) in *Jones* have direct implications for some categories of UAS.

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174. *Id.* at 956.

175. Kathleen Hickey, *Former wartime blimp refitted for border surveillance*, GOV'T COMPUTER NEWS, Aug. 16, 2012, http://gcn.com/Articles/2012/08/16/CBP-aerostats-unmanned-blimps-border-surveillance.aspx.The government has increased search powers near the border. For example, within twenty-five miles of "any external boundary of the United States," 8 U.S.C. § 1357(a)(3) allows the government, without a warrant, "to have access to private lands, but not dwellings, for the purpose of patrolling the border to prevent the illegal entry of aliens into the United States."

1. *Technology in "General Public Use"*

In *Dow Chemical*, the Supreme Court wrote that warrantless "surveillance of private property by using highly sophisticated surveillance equipment *not generally available to the public*" may be unconstitutional.[176] But the Court also noted that the "photographs at issue in this case are essentially like those commonly used in mapmaking. Any person with an airplane and an aerial camera could readily duplicate them."[177]

In the *Ciraolo* ruling issued on the same day, the Court concluded that in an era when private and commercial flight is "routine," there is no reasonable expectation of privacy from naked-eye observations made from public navigable airspace.[178] The *Ciraolo* Court stopped short of stating whether or not similar overhead observations made using non-routine aircraft or imaging technology would pass constitutional muster.

Fifteen years later in *Kyllo*, the Court again viewed the extent to which a technology was publicly available as highly relevant to defining a Fourth Amendment "search." The *Kyllo* Court was clearly concerned about future developments that might enable the Government to "see" into the interior of the home from the outside.[179] This concern was reflected in the Court's expressed desire to protect people from "advancing technology" that might "discern all human activity in the home" and the resulting need to "adopt" a "rule" taking account "of more sophisticated systems that are already in use or in development."[180] Yet, in the end, the rule adopted was more narrowly crafted.

The *Kyllo* holding that a search occurs when "the Government uses a device that is not in general public use, to explore details

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176. Dow Chem. Co. v. United States, 476 U.S. 227, 238 (1986) (emphasis added).

177. *Id.* at 231.

178. California v. Ciraolo, 476 U.S. 207, 215 (1986).

179. *See* Kyllo v. United States, 533 U.S. 27, 34 (2001). Recently, there have been significant advances in "terahertz" imaging, which refers to the formation of images using electromagnetic waves with a frequency on the order of one trillion times per second. As described in a conference paper published in early 2012, researchers at University of Texas at Dallas "have designed an imager chip that could turn mobile phones into devices that can see through walls, wood, pastics, paper and other objects." *New Research Could Mean Cellphones That Can See Through Walls*, UNIV. OF TEXAS AT DALLAS NEWS CENTER, Apr. 18, 2012, http://www.utdallas.edu/news/2012/4/18-17231_New-Research-Could-Mean-Cellphones-That-Can-See-Th_article-wide.html.

180. *Kyllo*, 533 U.S. at 35–36.

of the home that would previously have been unknowable without physical intrusion"[181] clearly bars the use of uncommon technology for this purpose. However, sophisticated and uncommon are two different things. Indeed, the *Kyllo* Court called the thermal imager in question "crude"[182] while also recognizing that it was nonetheless not in general public use. Furthermore, the district court in *Dow Chemical* had found a Fourth Amendment violation, in part, because the images were taken with "the finest precision aerial camera available," permitting capture of "a great deal more than the human eye could ever see."[183] In upholding the Sixth Circuit's reversal of this decision, the Supreme Court considered the wide public availability of the camera to be more relevant than its sophistication.[184]

So how does *Kyllo* bear on the issue of "routine" technology? As the dissent in *Kyllo* noted, the Court's language raises at least the possibility that the protection offered "dissipates as soon as the relevant technology is in general public use."[185] However, to conclude from *Kyllo* that use of a widely available technology to examine a home will necessarily be constitutional is not an entirely fair reading of Justice Scalia's opinion. As Justice Scalia stated in a footnote, in response to the dissent on this specific point, thermal imaging is not routine (or at least was not in 1992, the year in which law enforcement officers used the thermal imager at issue in *Kyllo*).[186] Based on existing Supreme Court precedent, that was sufficient to find its use unconstitutional. To the extent that there is a loophole through which overhead surveillance using "routine" (and possibly but not necessarily sophisticated) technologies might slip, it was created by *Ciraolo* and *Dow Chemical*, and the Court in *Kyllo* declined to revisit it.[187]

And what about technology *not* in general public use, which at least for the moment describes the state of UAS in the United

181. *Id.* at 40.

182. *Id.* at 38.

183. Dow Chem. Co. v. United States, 476 U.S. 227, 230 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982)).

184. *See id.* at 238–39.

185. *Kyllo*, 533 U.S. at 47 (Stevens, J., dissenting) (internal quotation marks omitted).

186. *Id.* at 39–40 n.6 (majority opinion).

187. *See id.* ("Given that we can quite confidently say that thermal imaging is not 'routine,' we decline in this case to reexamine that factor.").

States? Under a fair reading of *Kyllo*, that fact alone would not automatically bar its use for surveillance of a home. *Kyllo* did not prevent government use of uncommon technology generally, but instead was focused on the use of such technology to "explore details of the home that would previously have been unknowable without physical intrusion."[188] Thus, although warrantless use of a UAS equipped with a sophisticated thermal imaging camera to "see" through the walls of a home would certainly run afoul of *Kyllo*, acquisition of visible-light images of a home's exterior or curtilage using a UAS-mounted consumer-grade, low-resolution imaging system in public navigable airspace would likely not. After all, the information those images would reveal could be acquired easily from manned aircraft, something that the Court has found multiple times to be constitutional. Perhaps most importantly, to the extent that a "not in general public use" test furnishes a measure of privacy protection with respect to UAS platforms, that protection inevitably will soon disappear as their use becomes more widespread.

2. *"Public Navigable Airspace"*

As is clear from *Ciraolo*, *Riley*, and *Dow Chemical*, the use of "public navigable airspace" is a threshold test for determining whether warrantless aerial observations are constitutional.[189] This does not imply that all such observations will be constitutional, but those that are made from outside public navigable airspace are almost certainly unconstitutional. The question of what constitutes "public navigable airspace" for UAS operated by the government is thus central to the privacy inquiry.

This is not as easy to answer as it might first appear. FAA regulations provide that, except as necessary for takeoff or landing, fixed-wing manned aircraft must generally operate above 1000 feet when over congested areas, and above 500 feet over most non-congested areas.[190] UAS operated above these

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188. *Id.* at 40.

189. *See* Florida v. Riley, 488 U.S. 445, 450 (1989); California v. Ciraolo, 476 U.S. 207, 213–14 (1986); *Dow Chem. Co.*, 476 U.S. at 239.

190. 14 C.F.R. § 91.119(b)–(c) (2012). The full set of minimum altitude rules is more complex. For example, for congested areas, the minimum is 1000 feet above the highest obstacle within a horizontal radius of 2000 feet of the aircraft. § 91.119(b). For noncongested areas other than over open water or sparsely popu-

minimums therefore are certainly in public navigable airspace.[191] In addition, the altitude must always be sufficiently high to allow "an emergency landing without undue hazard to persons or property on the surface."[192]

But this is not the whole story. The FAA regulations specifically exempt helicopters[193] from the minimums if "the operation is conducted without hazard to persons or property on the surface."[194] FAA regulations nonetheless provide a *de facto* impediment to very low altitude operation of manned helicopters over residential areas: In the event of an engine failure, it would be difficult to claim that the pilot of a manned helicopter hovering fifty feet over a home could perform an emergency landing without endangering persons or property on the ground. For an unmanned helicopter (or fixed wing aircraft) weighing only a few pounds, however, the risks posed to persons on the ground by an emergency landing, though not nonexistent, are certainly modest compared to those posed by manned aircraft. Thus, the combination of the helicopter rules and the "emergency landing" provision in current FAA minimum safe altitude regulations have little or no protective power with respect to UAS privacy concerns.

An additional complicating factor is that for at least some categories of unmanned aircraft, the traditional paradigm is inverted and the FAA imposes altitude *maximums* instead of minimums. Public unmanned aircraft operated in accordance with Section 334(c)(2)(C) of FMRA must be operated at a height lower than 400 feet.[195] Unless FMRA paradoxically is read to mandate navigation outside of "navigable airspace," with respect to this class of aircraft, altitudes of 350 feet, 300 feet, and 250 feet would almost always be within public navigable airspace. However, just as

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lated areas, the minimum is 500 feet. § 91.119(c). Over open water and sparsely populated areas, "the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure." *Id.*

191. Provided, of course, that there are no other restrictions associated with the airspace.

192. § 91.119(a).

193. § 91.119(d). A helicopter is "a rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors"; a rotorcraft, in turn, is "a heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors." *Id.* § 1.1 (2012).

194. § 91.119(d).

195. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 122-95, § 334(c)(2)(C), 126 Stat. 11, 77.

clearly, the air five feet above the ground in the backyard of a home is not within any reasonable definition of public navigable airspace. As the Supreme Court wrote in 1946 in *United States v. Causby*,[196] "[w]e have said that the airspace is a public highway. Yet it is obvious that if the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere."[197]

Attempts to identify a precise boundary where the "immediate reaches" under the "exclusive control" of a landowner end and the area available to the public begins can lead to complex questions.[198] For example, it could be argued that a warrantless government-operated UAS that dips into a backyard at eye level to obtain photographs into the house through a back window would be operating outside of public navigable airspace, and that the images it acquired would be unconstitutional for that reason (among others).[199]

Interestingly, airspace that may not be "publicly navigable" can still be subject to governmental control. In places such as the Washington, D.C. Metropolitan Area Flight Restricted Zone, the FAA prohibits *all* outdoor flight operations (including UAS), at any altitude, unless authorized by the FAA/Transportation Security Administration.[200] Thus, the FAA can and does promulgate regulations that control the air all the way down to the ground, even over private property. However, that the government has a right to *prohibit* certain flight operations in the air a few feet above private land does not mean that the government (or a private party) has an affirma-

196. 328 U.S. 256 (1946).

197. *Id.* at 264.

198. The definition of "navigable airspace" in 49 U.S.C. § 40102 does little to resolve this question. "Navigable airspace" is defined as the "airspace above the minimum altitudes of flight prescribed by regulations under this subpart and subpart III of this part, including airspace needed to ensure safety in the takeoff and landing of aircraft." § 40102(a)(32).

199. The Supreme Court considered the more general question of whether looking into a home through a window constitutes a Fourth Amendment search in *Minnesota v. Carter*, 525 U.S. 83 (1998). In that case, police had observed of a drug transaction through a gap in the closed blinds of a window. Because the respondents "were essentially present for a business transaction and were only in the home a matter of hours," the relevant expectation of privacy was that tied to commercial premises, not residential property. As a result, the Court found that the police observations were not a Fourth Amendment violation. *Id.* at 90.

200. *See* 14 C.F.R. § 93.341 (2012).

tive right to *conduct* flight operations in that same airspace without the property owner's consent.

In the dense urban cores of cities such as New York, Chicago, and Boston, public navigable airspace can unquestionably extend *below* the level of many residences. In New York, for example, manned helicopters routinely fly over the Hudson River at altitudes significantly lower than the taller buildings in Manhattan. The air 550 feet over the Hudson River is in public navigable airspace.[201] But there is a good argument that the air six inches outside the window of a fiftieth-floor apartment in midtown Manhattan is not. As noted above, in *Causby* the Court recognized the importance of providing a landowner with "exclusive control of the immediate reaches of the enveloping atmosphere."[202] A high-rise apartment dweller should have at least as much control over the enveloping atmosphere of his or her home.[203] That control, however, will only extend a modest distance. Thus, a UAS operated at several hundred feet above the ground and at a reasonable horizontal standoff from any nearby buildings would almost always be in public navigable airspace.[204]

Will warrantless UAS surveillance from public navigable airspace always be constitutional? Certainly not. The holding in *Ciraolo* addressed naked eye observations from "public airways."[205] *Ciraolo* would provide little support for use of an imaging system capturing much more detail than could the human eye.[206] The opinions in the (slightly) more recent *Riley* decision also imply the existence of some limits. Both of the *Riley* opinions that found in favor of the government expressed concern about using operation in public navigable airspace as

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201. Although the airspace 550 feet above the Hudson near Manhattan is publicly navigable, there are special flight rules that apply within the "Hudson River Exclusion." *See* 14 C.F.R. § 93.352 (2012). Altitudes below 1000 feet within the Hudson River Exclusion are available to aircraft conducting a "local operation" as defined in § 93.350(a).

202. *Causby*, 328 U.S. at 264.

203. An additional complication with respect to control over the air surrounding buildings in cities like New York relates to the "air rights" that are commonly transacted in association with real estate development. *See Zoning Glossary*, NEW YORK CITY DEPARTMENT OF CITY PLANNING, http://www.nyc.gov/html/dcp/html/zone/glossary.shtml#development_rights (last visited Jan. 29, 2013).

204. An exception would occur in locations subject to temporary or permanent flight restrictions.

205. California v. Ciraolo, 476 U.S. 207, 215 (1986).

206. *See id.* at 214–15.

the only threshold for constitutionality. Writing for the plurality, Justice White noted that "simply because the plane is within the navigable airspace specified by law," it does not follow that the observations it makes will always "pass muster under the Fourth Amendment."[207] Justice O'Connor also warned against relying on "compliance with FAA regulations alone,"[208] and Justice Brennan's dissent raised the same issue.[209]

Justice White's opinion in *Riley* also identifies some specific tests beyond simply being in public navigable airspace that might be applied. For example, the opinion implies that observations from legally operated aircraft that generated undue noise, wind, dust, or threat of injury could be unconstitutional.[210] Although a UAS weighing a few pounds or less would generate very little noise, wind, or dust, if it loses power it could certainly cause injuries. This could occur both directly, if it lands on a person, or indirectly, if it lands in traffic or becomes caught in power lines and initiates an injury causing event. Interestingly, the language of the opinion ties privacy expectations in part to the freedom from being subjected to a *threat* of injury, as distinct from an actual injury itself.

3. *The Role of Imaging Technology*

In *Ciraolo* and *Riley*, the aerial observations of the curtilage of a home were performed with the naked eye, a fact specifically noted by the *Ciraolo* Court[211] and by both of the *Riley* opinions that found against the government.[212] But in *Dow Chemical*, the use of a camera permitting capture of "a great deal more than the human eye could ever see" did not render the observations

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207. Florida v. Riley, 488 U.S. 445, 451 (1989).

208. *Id.* at 453 (O'Connor, J., concurring in the judgment).

209. *Id.* at 464 (Brennan, J., dissenting).

210. *See id.* at 452 (plurality opinion).

211. "[I]t is unreasonable for respondent to expect that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet." *Ciraolo*, 476 U.S. at 215.

212. Justice White's opinion stated that the investigating officer in *Riley* "circled twice over respondent's property in a helicopter at the height of 400 feet. With his naked eye, he was able to see through the openings in the roof and one or more of the open sides of the greenhouse and to identify what he thought was marijuana growing in the structure." *Riley*, 488 U.S. at 448. Justice O'Connor wrote that "I conclude that Riley's expectation that his curtilage was protected from naked-eye aerial observation from that altitude was not a reasonable one." *Id.* at 455 (O'Connor, J., concurring in the judgment).

unconstitutional; it was the public availability of the camera that mattered.[213]

What is the constitutionality of warrantless use of an extremely high-resolution (but widely available) camera on a UAS to observe the curtilage of a suspect's home? The Court has never grappled with this specific question, and existing case law is unclear on this point. A suspect could find support in *Ciraolo* and *Riley* when arguing that a Fourth Amendment violation occurred; the government could also find support in *Ciraolo* as well as in *Dow Chemical* and *Kyllo* in arguing that it did not.[214] That *Kyllo* is more recent is not dispositive in light of, among other things, the discussion of *Ciraolo* it contains.

Imaging technology is also relevant given Justice White's opinion in *Riley* that found no Fourth Amendment violation in part because "no intimate details connected with the use of the home or curtilage were observed."[215] Even though he was not speaking for a majority, Justice White's language is nonetheless intriguing, as it indicates that there may be some level of detail beyond which warrantless UAS observations, even if conducted from public navigable airspace, may cross the line into a Fourth Amendment search.

With present-day imaging capabilities, it would be an easy matter to use a UAS (or a manned aircraft) within navigable airspace to acquire imagery that includes "intimate details." For example, a government UAS at an altitude of several hundred feet could identify the topic of an electronic or paper news article being read by a person sitting in his or her fenced-in backyard. A strong case could be made that these observations, even when made from public navigable airspace, would be unconstitutional in the absence of a warrant.

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213. Dow Chem. Co. v. United States, 476 U.S. 227, 230 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982)) (internal quotation marks omitted). Another key factor in *Dow Chemical* was the Court's conclusion that the observed areas were more akin to "open fields" than to the curtilage of a home. *See id.* at 239.

214. Aspects of *Ciraolo* could be cited to support both positions. A suspect could cite the reference in *Ciraolo* to "naked eye" observations. The government could in response point to the *Ciraolo* language regarding the "routine" nature of the technology of flight, which was also referenced in *Kyllo*. *See Ciraolo*, 476 U.S. at 215; Kyllo v. United States, 533 U.S. 27, 39–40 n.6.

215. *Riley*, 488 U.S. at 452.

4. *Extended Surveillance Using Unmanned Aircraft in Light of* Jones

For financial, regulatory, and logistical reasons, law enforcement agencies will usually use small UAS. Today, these platforms generally have flight durations measured in hours, rendering their continuous use for days or weeks to perform surveillance impractical. But future developments will make long-term surveillance with UAS possible. In addition, at least along the U.S.-Mexico border, aerostats already are in use today.[216]

Some of the most vexing constitutional questions will arise in association with the use of high-altitude long-endurance (HALE) UAVs. These solar-powered UAVs can stay aloft for extraordinarily long periods of time. As noted above, the QinetiQ Zephyr stayed aloft for over two weeks in a 2010 demonstration.[217] Boeing is under contract with DARPA to develop the SolarEagle, which will be able to stay aloft in the stratosphere for five continuous years.[218] Because they fly at such high altitudes, HALE UAS could potentially track every car trip in a city, or the times when lights in residences were turned on and off.[219] It will likely be much later in the decade before HALE technology becomes sufficiently advanced and cost-effective to make it practical to install a permanent HALE presence above an American city. Currently, there is no indication that any government agency plans to do so.

No Supreme Court case is directly on point with respect to the type of extended surveillance that could be performed using a HALE platform, though some of the issues involved arose in *Jones*. The *Jones* opinions contain extensive discussion of the Court's 1983 holding in *United States v. Knotts* that a "person

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216. Hickey, *supra* note 175.

217. Chuter, *supra* note 36.

218. Press Release, Boeing Co., Boeing Wins DARPA Vulture II Program (Sept. 15, 2010), *available at* http://boeing.mediaroom.com/index.php?s=43&item=1425.

219. Satellites are not well-suited to perform extended, continuous high-resolution surveillance. The only satellites that can remain in place over one spot are in geostationary orbits, which are over 22,000 miles above the Earth—much too far to gather images revealing details of a home or curtilage. Satellites in lower orbits can acquire very detailed images, but not on a continuous basis. *See Phoenix, Tactical Technology Office*, DARPA, http://www.darpa.mil/our_work/tto/programs/phoenix.aspx (last visited Feb. 8, 2013).

traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements."[220]

Justice Scalia's majority opinion in *Jones* states that performing extended surveillance "through electronic means, without an accompanying trespass" *may* be unconstitutional, "but the present case does not require us to answer that question."[221] In his concurrence in the judgment, Justice Alito expressed a view that extended electronic surveillance of public movements *is* unconstitutional, writing, "the use of longer term GPS monitoring in investigations of most offenses impinges on expectations of privacy."[222] Justice Sotomayor's concurrence also expressed doubts about the constitutionality of extended electronic surveillance: "I do not regard as dispositive the fact that the Government might obtain the fruits of GPS monitoring through lawful conventional surveillance techniques."[223] In the end, however, it was the physical trespass involved in installing the GPS tracker, not the tracking itself, that formed the basis for the *Jones* decision.[224]

While HALE UAS surveillance is like GPS tracking in that it gathers information using technology that would have required a "large team of agents"[225] in the past, in one respect it is very different: A GPS tracker only identifies the movement of the single vehicle or other object to which it is attached, whereas HALE platforms equipped with banks of cameras could easily capture images of all the vehicle movements in an entire city. The prospect that the government might be able to capture—and then use at will—this level of information about the travels of private individuals is sobering. But if that is unconstitutional, where does that leave the networks of ground-level cameras and license plate readers that are increasingly being deployed along public streets and intersections? Those ground-level systems collect information that, when aggregated, can

220. 460 U.S. 276, 276 (1983).

221. United States v. Jones, 132 S. Ct. 945, 954 (2012).

222. *Id.* at 964 (Alito, J., concurring in the judgment).

223. *Id.* at 956 (Sotomayor, J., concurring).

224. *See id.* at 949 (majority opinion).

225. In his concurrence in the judgment in *Jones*, Justice Alito wrote that "constant monitoring of the location of a vehicle for four weeks" using traditional surveillance methods from the pre-computer age "would have required a large team of agents, multiple vehicles, and perhaps aerial assistance." *Id.* at 963 (Alito, J., concurring in the judgment).

track automobile trips just as thoroughly as a solar-powered HALE UAS making slow circles in the stratosphere.[226] An argument against the constitutionality of HALE systems would need to be reconciled with the information available through aggregated street-level traffic surveillance data. If government tracking of effectively all traffic in a city is unconstitutional, that holding should apply regardless of whether the technology used is on the ground or in the air.[227]

In future years it may also be necessary to revisit the assumption that widely available small, low-altitude UAS can only stay aloft for several hours. UAV Factory, a company based in Latvia, announced in the summer of 2012 that its "Penguin B" small UAS had stayed aloft for over fifty-four hours.[228] Future technological advances presumably will lead to flights of even longer durations. From a purely technological standpoint, platforms such as these conceivably could be used to survey a target for several days. Whether this is likely to happen in practice is another matter. At least under current regulations, this UAS class can only be operated by a government agency within line of sight of an operator.[229] A law enforcement agency could thus use rotating shifts of operators to fly this class of small UAS for several continuous days.

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226. Depending on where the cameras on the aerostats along the U.S.-Mexico border are aimed, similar questions regarding long-term surveillance are raised. An important difference between aerostats and HALE UAS is the altitude. HALE platforms fly many times higher, and can survey a much larger area than can aerostats.

227. Jurisprudence related to traffic checkpoints is relevant to this issue. In *City of Indianapolis v. Edmond*, the Court noted that it "is well established that a vehicle stop at a highway checkpoint effectuates a seizure within the meaning of the Fourth Amendment." 531 U.S. 32, 40 (2000). Recording a license plate of a passing car—or tracking the car using a HALE UAS—is certainly not a seizure. However, the *Edmond* ruling also noted that "stops can only be justified by some quantum of individualized suspicion," a test that would not be met by systems that perform pervasive tracking of all vehicles in a city. *Id.* at 47.

228. *UAV Factory Touts Endurance Flight Record*, UNMANNED SYSTEMS MAGAZINE, Aug. 2012, at 13; Press Release, UAV Factor, New Endurance Record for Small Unmanned Aircraft (July 7, 2012), *available at* http://www.uvs-interntional.org/index.php?option=com_docman&task=doc_view&gid=1969&Itemid=25.

229. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 334(c)(2)(C), 126 Stat. 11, 77.

5. *Residual Privacy Rights When a Warrant Is Obtained?*

When law enforcement officers wiretap a phone pursuant to a warrant, a great deal of privacy is lost, but ultimately some minimal privacy is still maintained. For example, a tapped phone does not provide images of the interior of a home.

But with UAS, the implication that a search warrant should have some limits is not unreasonable. Imagery acquired by UAS pursuant to a warrant could lead to profound violations of privacy for both a suspect and the other residents of a house. It is one thing for a wiretap to capture the private conversations of a suspect's spouse. It is quite another for a UAS, hovering in a backyard and taking pictures through a window (or in the future, hiding unseen inside the house), to acquire images that might show an occupant of the house in a state of undress. To assert that the government, even when armed with a warrant, has an unfettered right to acquire, store, and view such images raises significant concerns. Thus, questions of UAS privacy do not end with the issuance of a warrant.

IV. NON-GOVERNMENT UNMANNED AIRCRAFT AND THE FIRST AMENDMENT

Although much of the attention regarding UAS privacy has focused on government use and the Fourth Amendment, it is non-government use that is likely to raise some of the most significant privacy challenges in the coming years. For private entities, which are not bound by Fourth Amendment restrictions that apply to the government, the key constitutional question is the extent of their First Amendment privilege to gather information.

As the Supreme Court recognized in its 1972 *Branzburg v. Hayes* decision, "[w]ithout some protection for seeking out the news, freedom of the press could be eviscerated."[230] Furthermore, the freedom to gather information is not limited to the press. In a 2011 ruling upholding the right of a citizen to record the actions of police in a public space, the First Circuit wrote that "[i]t is firmly established that the First Amendment's aegis extends further than the text's proscription on laws 'abridging the freedom of speech,

230. 408 U.S. 665, 681 (1972).

or of the press,' and encompasses a range of conduct related to the gathering and dissemination of information."[231]

However, the freedoms conferred by the First Amendment are not unlimited. In *Branzburg*, for example, the Supreme Court recognized the existence of some bounds: "It is clear that the First Amendment does not invalidate every incidental burdening of the press that may result from the enforcement of civil and criminal statutes of general applicability."[232]

Even though almost all companies and individuals will endeavor to operate UAS responsibly, there undoubtedly exist some classes of potential UAS users who will perceive observe less restraint. If paparazzi are willing to engage in high-speed freeway chases to capture images of a celebrity,[233] it would be optimistic to the point of naïveté to expect them to always operate UAS in a manner respectful of privacy considerations and in compliance with FAA safety regulations. When, as will inevitably occur, a paparazzo or stalker flies a UAS into a backyard and takes pictures through a back window, what laws will come into play?

A. Trespassing

Common sense would suggest that a homeowner[234] has the right to prevent a UAS from being flown around his or her backyard at eye level. And indeed, in some states, trespassing statutes are worded in a manner that would encompass trespassory use of a UAS. In Arizona, for example, "entry" in association with criminal trespass is defined as "the intrusion of any part of any instrument or any part of a person's body inside the external boundaries of a structure or unit of real property."[235] Unless an argument could be made that a UAS is not an "instrument," this statute would cover intrusion by a UAS

231. Glik v. Cunniffe, 655 F.3d 78, 82 (2011).

232. 408 U.S. at 682.

233. For an example of one alleged such incident, see Kate Mather, *Photographer who allegedly chased Justin Bieber charged*, L.A. TIMES, July 26, 2012, http://articles.latimes.com/2012/jul/26/local/la-me-bieber-paparazzi-20120726.

234. Or other person legally occupying the property, such as a lessee.

235. ARIZ. REV. STAT. § 13-1501 (West 2012).

at extremely low altitudes (for example, at eye level) that are under the control of a property owner.[236]

In Oregon, by contrast, "enter" as defined in association with criminal trespass is, among other things, "[t]o enter or remain in or upon premises . . . when the entrant is not otherwise licensed or privileged to do so."[237] While this somewhat circular definition is clearly intended to criminalize unauthorized entry by a person, it leaves open the question of whether entry by a very low-flying UAS would be covered. California's trespassing laws prohibit driving a vehicle on another person's property without consent,[238] but define vehicle in a manner that excludes UAS.[239]

The general lack of attention to the potential trespassory use of UAS in current state criminal statutes is not at all surprising. In the future, it almost certainly will be necessary to add specific language to criminal trespassing statutes addressing UAS.

B. Invasion of Privacy

Use of a UAS to invade an individual's privacy could result in civil or criminal liability. With respect to civil liability, courts in most jurisdictions recognize the two forms of common law invasion of privacy most likely to arise in connection with UAS: intrusion upon seclusion and public disclosure of private

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236. As discussed above, the question of the altitude at which a landowner's control over the air above the ground in his or her backyard ends, and the public's access begins, was at issue in *United States v. Causby*. Under any reasonable reading of *Causby* (and other relevant case law), the space in a backyard at eye level is certainly within the "immediate reaches of the enveloping atmosphere" that are under the "exclusive control" of the landowner. *See Causby*, 328 U.S. 256, 256 (1946). This interpretation is also supported by the manner in which overhanging tree branches from a neighbor's property are often handled. In many states, a homeowner has the right (subject to some exceptions) to trim tree branches in the air above his or her land. *See, e.g.*, Macero v. Busconi Corp., 12 Mass. L. Rep. 521 (Super. Ct. 2000) ("Massachusetts law recognizes a right of self-help by which a property owner can cut the limbs or branches of a tree that invade his property as long as such cutting is done at the property line.").

237. OR. REV. STAT. § 164.205(3)(a) (West 2012).

238. CAL. PENAL CODE § 602(n) (West 2012).

239. California Vehicle Code § 670, referenced in the criminal trespassing statute, defines a vehicle as "a device by which any person or property may be propelled, moved, or drawn upon a highway, excepting a device moved exclusively by human power or used exclusively upon stationary rails or tracks." CAL. VEH. CODE § 670 (West 2012).

facts.[240] In addition, some states also have civil or criminal statutes, or both, related to invasion of privacy.[241]

1. Intrusion Upon Seclusion

The potential of a UAS to intrude upon seclusion in the home is obvious. A person who is unwillingly photographed in his or her own home by a UAS hovering just outside an otherwise inaccessible window would have strong grounds for a valid cause of action. Even public figures, whose privacy rights are presumptively lower than those of private individuals,[242] can nonetheless reasonably expect views into the interior of their residences from their own backyards to be private.

Although privacy expectations are greatly reduced outside the home, the non-governmental use of a UAS to capture images and other information taken while the individual is in a public setting could nonetheless constitute an invasion of privacy. *Shulman v. Group W Productions, Inc.*,[243] a 1998 California Supreme Court ruling regarding filming that occurred following a car accident, is instructive in this regard. In *Shulman*, the victims of an accident were captured on video and audio recording, without their consent, for a television program called *On Scene: Emergency Response*.[244] The recording occurred both at the scene of the accident as well as in a rescue helicopter during transport to a hospital.[245]

The California Supreme Court affirmed the court of appeals' decision to reverse the trial court's summary judgment finding that the television program producers' activities were protected

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240. Prosser articulated four forms of the common law invasion of privacy tort in 1960: (1) "[i]ntrusion upon the plaintiff's seclusion or solitude, or into his private affairs;" (2) "[p]ublic disclosure of embarrassing private facts about the plaintiff;" 3) "[p]ublicity which places the plaintiff in a false light in the public eye;" and 4) "[a]ppropriation, for the defendant's advantage, of the plaintiff's name or likeness." William L. Prosser, *Privacy*, 48 CALIF. L. REV. 383, 389 (1960); *see also* RESTATEMENT (SECOND) OF TORTS §§ 652A–652E (1997).

241. *See, e.g.*, CAL. CIV. CODE § 1708.8 (West 2011); N.J STAT. ANN. §§ 2C:14-9, 2A:58D-1 (2004).

242. *See generally* Hustler Magazine, Inc. v. Falwell, 485 U.S. 46 (1988); Gertz v. Robert Welch, Inc., 418 U.S. 323 (1974); New York Times Co. v. Sullivan, 376 U.S. 254 (1964).

243. 955 P.2d 469 (Cal. 1998).

244. *Id.* at 475.

245. *Id.* at 474–75.

under the First Amendment.[246] The court held that a woman injured in the accident "was entitled to a degree of privacy in her conversations with [the nurse] and other medical rescuers at the accident scene."[247] It was improper, the ruling stated, to conclude that the "plaintiffs had no reasonable expectation of privacy at the accident scene itself because the scene was within the sight and hearing of members of the public."[248] At the time of the rescue, the vehicle was located "in a ditch many yards from and below" a highway, rendering it "unlikely . . . that any passersby on the road could have heard" the conversation of the victim with the nurse and other rescuers.[249]

The *Shulman* decision provides important guidance regarding newsgathering and UAS with respect to intrusion upon seclusion by drawing a distinction between the information about a newsworthy event available to passersby and the potentially greater amount of information available only to those intimately involved in the event itself. Under some circumstances, there will be no difference: If a crowd of people has gathered around an assault victim who is being treated by paramedics, the conversation between the victim and the paramedics may well be audible to all, and the victim's reasonable expectation of privacy correspondingly lower. But there will be many cases in which, as in *Shulman*, passersby have far from complete information about an unfolding event. Using a UAS to fill in the gaps would carry a risk of crossing the line into intrusion.

Just as the First Amendment does not provide an impenetrable shield for all uses of video, audio, and other electronic monitoring in public areas, intrusion upon seclusion is not automatically implicated for all observations of activities occurring in a home. A passerby on the street at night who happens to glance up and notice that the light in a nearby home has just been turned off is certainly not violating privacy rights. Likewise, courts will be very unlikely to consider a fleeting, acci-

246. *See id.* at 497–98.

247. *Id.* at 491.

248. *Id.*

249. *Id.* In addition to considering whether the audio and video recorded at the scene of the accident intruded on the victim's expectation of privacy, the California Supreme Court also considered the recording that took place within the helicopter, ruling that the "Court of Appeal correctly found [that] triable issues exist as to whether defendants invaded plaintiffs' privacy by accompanying plaintiffs in the helicopter." *Id.* at 477.

dental capture of imagery of a home's curtilage or (through a window) interior acquired by a passing UAS to be an invasion of privacy. Although the specifics vary from state to state, to prevail in a common law or statutory intrusion upon seclusion claim, a plaintiff generally must establish, at a minimum, that the intrusion was intentional and that it would be "highly offensive to a reasonable person."[250]

Some highly offensive intrusions upon seclusion have nonetheless been protected under the First Amendment. Most notably, in *Snyder v. Phelps*[251] the Supreme Court ruled in favor of members of the Westboro Baptist Church who had picketed the funeral of a serviceman killed in Iraq. A jury in Maryland had found members of Westboro Baptist Church liable for damages based on claims including intrusion upon seclusion.[252] However, in affirming the Fourth Circuit's reversal, the Supreme Court ruled that "the First Amendment bars Snyder from recovery for intentional infliction of emotional distress or intrusion upon seclusion" against Westboro Baptist Church members and that "we must likewise hold that Snyder cannot recover for civil conspiracy based on those torts."[253]

2. *Publication of Private Facts*

Precedents from state court rulings unrelated to aviation indicate that UAS could also figure into invasion of privacy through the publication of private facts. This could be particularly important with respect to UAS images of private individuals who become involuntarily caught up in newsworthy events.

In September 1999, *Sports Illustrated* published a story entitled "Every Parent's Nightmare" that included a photograph of a Little League team.[254] There were eighteen people in the photograph, including a team manager who had been convicted of molestation

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250. Restatement (Second) of Torts § 625B (1977).

251. 131 S. Ct. 1207 (2011).

252. *Id.* at 1214. The District Court reduced the damages award but left the verdict intact. *Id.*

253. *Id.* at 1220.

254. William Nack & Don Yaeger, *Every Parent's Nightmare*, SPORTS ILLUSTRATED, Sept. 13, 1999, at 40, 42–43, *available at* http://sportsillustrated.cnn.com/vault/edb/reader.html?magID=SI&issueDate=19990913&mode=reader_vault.

charges in 1971 and who pled guilty in April 1998 to charges of molesting five of the children he coached in Little League.[255]

Ten of the people in the photograph filed suit against Time Warner, Inc., the then-owner of *Sports Illustrated*, for invasion of privacy and infliction of emotional distress.[256] In 2001, the California Court of Appeal upheld a lower court decision to deny Time Warner's motion to strike the complaint, writing that the "plaintiffs have demonstrated a prima facie case for invasion of privacy," particularly in relation to public disclosure of a private fact.[257] The court recognized that while the identity of the molester was publicly known and certainly newsworthy, the identities of the other coaches and the players on the team were not.[258]

Publication of private facts via imagery was also at issue in a Florida case involving a woman who suffered from a poorly performed plastic surgery.[259] The woman consented to be interviewed for a television program under the condition that the video would be edited to alter her voice and obscure her face.[260] When the broadcast took place without these two things occurring as promised, thereby revealing her identity, she filed suit.[261] In reversing a summary judgment in favor of the defendant, the Florida Court of Appeals held that "while the topic of the broadcast was of legitimate public concern, the plaintiff's identity was not."[262]

Images acquired by UAS could easily convey facts not previously known to the public, and, upon publication, could be an actionable invasion of privacy in many states. While news organizations are well aware of the tension between the privacy rights of their subjects and the organizations' First Amendment right to gather news, they will almost certainly need to reexamine existing policies in light of the unique imaging and other information gathering capabilities (such as monitoring of wire-

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255. *Id.* at 43.

256. M.G. v. Time Warner, Inc., 89 Cal. App. 4th 623, 626 (2001).The same photograph had also been broadcast on the HBO program *Real Sports*. HBO was also owned by Time Warner.

257. *Id.*

258. *Id.* at 632.

259. Doe v. Univision Television Grp., Inc., 717 So. 2d 63, 64 (Fla. Dist. Ct. App. 1998).

260. *Id.*

261. *Id.*

262. *Id.* at 65.

less signals) of UAS. In addition, given the ease with which anyone—not only news organizations—can now publish content, all users of UAS who contemplate publishing aerial images or other information from UAS would be well advised to give careful consideration to the common law and statutory invasion of privacy frameworks that apply in their jurisdictions.

C. Stalking and Harassment

In January 2009, the U.S. Department of Justice released a report based on data collected from over three million stalking victims and two million harassment victims.[263] About 245,000 of the stalking victims and 70,000 of the harassment victims stated that they had been subjected to electronic monitoring using one or more of the following devices: video or digital cameras, computer spyware, listening devices, and GPS tracking.[264] Stalkers will have no qualms about adding UAS to this list.

It was not until 1990 that California became the first state to criminalize stalking.[265] Today, statutes addressing stalking (and typically harassment) are now on the books in all fifty states and in Washington, D.C. Fortunately, many of these statutes are worded broadly enough that use of a UAS to persistently follow a person or peer into his or her car or home would be considered, at the very least, harassment. Stalking often carries the additional connotation of causing the victim to fear for his or her safety.[266] Under some circumstances, UAS use alone could constitute stalking (for example, if it is used to chase or corner a person).[267] More often, a stalker using a UAS would also be engaged in a larger constellation of behaviors consistent with stalking. To the extent that anti-harassment and anti-stalking statutes specifi-

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263. Katrina Baum et al., U.S. Dep't. of Justice, Bureau of Justice Statistics Special Report, Stalking Victimization in the United States (2009), http://bjs.ojp.usdoj.gov/content/pub/pdf/svus.pdf.

264. *Id.* at 5.

265. *See* Christine B. Gregson, Comment, *California's Antistalking Statute: The Pivotal Role of Intent*, 28 GOLDEN GATE U. L. REV. 221, 221 (1998).

266. *See, e.g.*, CAL. PENAL CODE § 646.9 (West 2008): "Any person who willfully, maliciously, and repeatedly follows or willfully and maliciously harasses another person and who makes a credible threat with the intent to place that person in reasonable fear for his or her safety, or the safety of his or her immediate family is guilty of the crime of stalking . . . ."

267. Obviously, the other requirements of the legal definition of stalking must be met. As such, a child who momentarily chases his or her sibling using a 9-ounce toy remote control helicopter is clearly not engaging in stalking.

cally enumerate the technologies that might be exploited, UAS should be added to the list. If a stalker employing a UAS crosses state lines (or operates a UAS, with the assistance of someone local to the victim, from a different state), then federal anti-stalking statutes could also be implicated.[268]

D. Unmanned Aircraft and Business Privacy

In 2011, a Texas man flew an unmanned aircraft over land near a Dallas-area meat packing plant and acquired images appearing to show environmental violations.[269] He contacted the Coast Guard, and in early 2012 the Texas Environmental Crimes Task Force served a search warrant on the company.[270] Once on the property, investigators found a pipe that "originate[d] in the back of the slaughterhouse" that appeared to be channeling pigs' blood into a nearby river and "[was] not linked to a waste water system."[271]

Though few would rush to defend a slaughterhouse that may be in violation of environmental codes, the ability of private citizens or groups to easily inspect for such violations via overflights raises complex issues. To the extent that such overflights are lawfully conducted and reveal activities that may be endangering public health, they are obviously valuable. But what happens if a well-meaning but overzealous environmental group conducts daily flights over a large, fenced-in manufacturing facility and repeatedly reports "violations" to the government that turn out, after costly and time-consuming on-the-ground inspections, not to be violations after all? Does the company that owns the facility have grounds to ask a court to enjoin the environmental group from further overflights? What if the group posts pictures from its daily aerial surveillance missions on the Internet, and in doing so exposes information that the company regards as a trade secret? Could the group use a UAS to examine the interior of buildings at the facility using an advanced thermal imager that, if in government

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268. *See, e.g.*, 18 U.S.C. §§ 2261, 2261A, 2262, 2265 (2006).

269. Meghan Keneally, *Drone plane spots a river of blood flowing from the back of a Dallas meat packing plant*, MAILONLINE, Jan. 24, 2012, http://www.dailymail.co.uk/news/article-2091159/A-drone-plane-spots-river-blood-flowing-Dallas-meat-packing-plant.html.

270. *Id.*

271. *Id.*

hands and used to inspect a home, would be unconstitutional under *Kyllo*? More generally, to what extent does a corporation have common law or constitutional privacy rights that parallel those accorded to individuals?

This last question was raised but not fully resolved in a recent Supreme Court case, *FCC v. AT&T, Inc.*[272] While noting that "this case does not call upon us to pass on the scope of a corporation's 'privacy' interests as a matter of constitutional or common law,"[273] the Court ruled that the "protection in [the Freedom of Information Act] against disclosure of law enforcement information on the ground that it would constitute an unwarranted invasion of personal privacy does not extend to corporations."[274] The Court also expressed skepticism regarding arguments that corporations have a common law right to personal privacy, writing that "[o]n the contrary, treatises in print around the time that Congress drafted the exemptions at hand reflect the understanding that the specific concept of 'personal privacy,' at least as a matter of common law, did not apply to corporations."[275] Corporate privacy rights are related in part to the much broader question regarding the extent to which constitutional protections extend to corporations.[276] UAS represent one of the many ways in which those rights may be tested in the coming years.

The fact that UAS might be used to perform corporate espionage is another important issue. Observations of a competing company's facilities and activities—whether made from the ground or the air—are not necessarily illegal. For example, consider a person who drives by a competing company on public roads as part of his or her regular commute to work. If this person notices that there are suddenly far fewer cars in the company's parking lot than in previous months, he or she might infer that there have been significant layoffs. Under this scenario, visual observations have yielded potentially valuable information about a competitor without breaking any laws. Analogous scenarios involving incidentally acquired UAS imagery can also be envisioned.

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272. 131 S. Ct. 1177 (2011).
273. *Id.* at 1184.
274. *Id.* at 1185.
275. *Id.* at 1183–84.
276. *See, e.g.*, Citizens United v. FEC, 558 U.S. 310 (2010).

By contrast, circling a UAS over the roof of a competing company to intercept wireless signals emanating from the building would represent something similar to an "illegal wiretap" and violate the Stored Communications Act.[277] Photographs taken from a UAS without authorization that both (1) convey a trade secret, and (2) are obtained for the purpose of benefiting a "foreign government, foreign instrumentality, or foreign agent" would violate economic espionage statutes.[278]

V. NEW FRAMEWORKS FOR UNMANNED AIRCRAFT SYSTEMS AND PRIVACY

Many of the most important UAS privacy questions relate directly to the scope and interpretation of the First and Fourth Amendments. Those questions will be addressed in the inevitable court tests that will arise with increased UAS use. But there are also proactive steps that can be taken, including the adoption of voluntary policies by law enforcement agencies as well as new federal, state, and local legislation.

A. Voluntary Approaches

Several voluntary approaches for addressing UAS privacy have been proposed. These include the Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct, which calls for a commitment to "respect the privacy of individuals,"[279] as well as a set of model guidelines released by the International Association of Chiefs of Police (IACP).[280]

Although the IACP guidelines are not binding, many American law enforcement agencies likely will adopt the guidelines or use them as a starting point to develop more extensive guidelines. The IACP guidelines recommend that "[w]here there are specific and articulable grounds to believe that the UA [unmanned aircraft] will collect evidence of criminal

277. *See* 18 U.S.C. § 2511(1)(a) (2006).

278. *See, e.g.*, 18 U.S.C. § 1831(a)(2) (2006).

279. *Unmanned Aircraft System Operations Industry "Code of Conduct"*, ASS'N FOR UNMANNED VEHICLE SYS. INT'L, www.auvsi.org/conduct/ (last visited Feb. 1, 2013).

280. *Recommended Guidelines for the use of Unmanned Aircraft*, INT'L ASS'N OF CHIEFS OF POLICE: AVIATION COMM. http://www.theiacp.org/portals/0/pdfs/IACP_UAGuidelines.pdf (last visited Feb. 1, 2013).

wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight."[281] The guidelines also address data minimization, community involvement and feedback regarding policies for UAS use, and documentation of UAS flights.[282] Some of these recommendations are consistent with recommendations provided by the American Civil Liberties Union in a December 2011 report on "Protecting Privacy From Aerial Surveillance."[283] Voluntary frameworks will play a vital role in addressing UAS privacy concerns both directly, in terms of encouraging law enforcement agencies to use UAS responsibly, and indirectly, by spurring an important dialog between law enforcement agencies and their communities.

B. Federal Legislation

There were multiple bills related to UAS privacy introduced in the 112th Congress, though none were enacted.[284] In June 2012, Senator Rand Paul introduced the "Preserving Freedom from Unwarranted Surveillance Act of 2012,"[285] a bill that, subject to a small number of exceptions (such as preventing "imminent danger to life"), would have required a warrant for gov-

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281. *Id.* at 3.

282. *Id.* at 2–3. In the context of privacy, "data minimization" refers to the practice of collecting only relevant information, and destroying data that has ceased to become relevant. *See, e.g.*, ANDREAS PFITZMANN, MARIT HANSEN, & HANNES TSCHOFENIG, INTERNET ENGINEERING TASK FORCE, TERMINOLOGY FOR TALKING ABOUT PRIVACY BY DATA MINIMIZATION: ANONYMITY, UNLINKABILITY, UNDETECTABILITY, UNOBSERVABILITY, PSEUDONYMITY, AND IDENTITY MANAGEMENT (2010), http://tools.ietf.org/id/draft-hansen-privacy-terminology-00.html.

283. *See* Jay Stanley & Catherine Crump, Protecting Privacy From Aerial Surveillance: Recommendations for Government Use of Drone Aircraft, Am. Civil Liberties Union 15–16 (2011), http://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf.

284. Some of these UAS privacy legislative initiatives, as well as more general Fourth Amendment UAS issues are discussed in Richard M. Thompson II, Cong. Research Serv., R42701, Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses (2012), *available at* http://www.fas.org/sgp/crs/natsec/R42701.pdf.

285. Preserving Freedom from Unwarranted Surveillance Act of 2012, S. 3287, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/s3287. Essentially the same bill was introduced in the House by Representative Austin Scott. *See* Preserving Freedom from Unwarranted Surveillance Act of 2012, H.R. 5925, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr5925.

ernment use of UAS to "gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation."[286] A week later, Representative Shelley Capito introduced H.R. 5961, which would have limited "aerial surveillance of agricultural land."[287] The next month, Representative Ted Poe introduced the "Preserving American Privacy Act of 2012,"[288] which would have prohibited the use of UAS "for law enforcement purposes or for surveillance of a United States national or real property owned by that national . . . except pursuant to warrant and in the investigation of a felony."[289]

In December 2012, Representative Edward J. Markey introduced the "Drone Aircraft Privacy and Transparency Act of 2012." The bill would have required all entities seeking a "grant of authority to operate an unmanned aircraft system in the national airspace system" to provide a "data collection statement" specifying, among other things, "whether the unmanned aircraft system will collect information or data about individuals or groups of individuals," and if so, how it will be used.[290] Applications from law enforcement agencies would also have had to provide a "data minimization statement" describing the agencies' policies for minimizing data collection unrelated to a crime investigation and "requir[ing] the destruction of such information and data, as well as of information and data collected by the unmanned aircraft system that is no longer relevant to the investigation of a crime under a warrant."[291] With some exceptions for exigent circumstances, the bill would also have required law enforcement agencies to obtain a warrant for "generalized surveillance."[292]

There will undoubtedly be a new set of UAS privacy bills and privacy related amendments introduced (or reintroduced) in the 113th Congress and beyond. It is relatively easy to draft

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286. *Id.*

287. Farmer's Privacy Act of 2012, H.R. 5961, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr5961.

288. Preserving American Privacy Act of 2012, H.R. 6199, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr6199.

289. *Id.* § 2.

290. Drone Aircraft Privacy and Transparency Act of 2012, H.R. 6676, 112th Cong. § 339 (2012), *available at* http://www.govtrack.us/congress/bills/112/hr6676/text.

291. *Id.* § 339(c).

292. *Id.* § 341.

legislative language that will increase privacy from UAS observations. It is far harder to do so without negatively impacting the use of UAS in applications that raise few or no privacy concerns. For example, as part of an arson investigation, police might want to employ a UAS to acquire overhead images of a formerly vacant industrial building that has been damaged by a suspicious fire. Requiring police to first obtain a warrant would delay the investigation and increase the burden on the courts with no benefit to privacy.

When drafting legislation, it is also important to consider the role that could be played by unintentionally captured images. Suppose that a brutal assault that takes place on a sidewalk is captured on video by a government-operated UAS that happens to be monitoring traffic on the adjacent street. Suppose further that the video from the UAS turns out to be the only available evidence that can identify the perpetrator. It would defy common sense if the police or prosecutors were barred by new UAS privacy rules from making use of this information.

Legislation that would include a blanket prohibition on government use of private UAS data in criminal investigations would also be ill advised, as well as inconsistent with what routinely occurs in nonaviation settings. Investigators often use images collected from privately owned surveillance cameras to help solve crimes, including, in many cases, cameras that were not owned or operated by the victim of the crime. In June 2012, a man suspected of killing three people in New York was arrested thanks in large part to images captured by a surveillance camera down the street from the scene of the crime.[293] What mattered most was that the camera captured the images vital to identifying the suspect, not whether it was publicly or privately owned. If, in the example in the previous paragraph, the images of the assault on the street had been captured by a UAS operated by a television station instead of by the government, it would make no sense to place them beyond the legal reach of investigators.

Any new legislation should also recognize that images of public spaces from government (or private) UAS will sometimes also include images of nearby homes. Residences next to a freeway are often within the frame of view of video from

293. *Police arrest suspect accused of executing three men outside Columbia University*, MAILONLINE, June 23, 2012, http://www.dailymail.co.uk/news/article-2163776/Police-arrest-suspect-accused-executing-men-outside-Columbia-University.html.

manned traffic helicopters reporting on a freeway problem. Video from UAS used to monitor traffic will be no different. Thus, a law stating that no UAS images of any nonpublic spaces can ever be acquired by the government without a warrant would, at least on its face, effectively ban government UAS use in almost any suburban or urban setting.

UAS privacy legislation, either at the federal or state level, should also avoid creating collateral damage for the operation of model aircraft. The Academy of Model Aeronautics, which, with over 150,000 members,[294] constitutes the world's largest model aviation organization, has an exemplary seventy-five-year safety record and a safety code that requires pilots of radio-controlled model airplanes to "avoid flying directly over unprotected people, vessels, vehicles or structures."[295] Aircraft operated in this manner are ill-suited for surveillance. Impeding their operation in the name of privacy would benefit no one.

"Drone" hobbyists should similarly be protected from legislation that leaves them as collateral damage. If, five years from now, a parent and child acting in compliance with applicable FAA regulations wish to fly a very small UAS in a backyard or public park, new privacy laws should not force the parent to file paperwork with the government documenting the date, time, duration, location, and image collection status of every flight.

As is clear from the above, there is no shortage of unsuitable legislative approaches. The best solutions are those that increase privacy protections without impeding reasonable, non-privacy-violating uses. Laws addressing data retention by government UAS users are one possible example. It is also reasonable to require law enforcement agencies to keep thorough records identifying the details of flight operations, including the date and time, location, who was operating the aircraft, and what sort of data was collected.[296]

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294. *What is AMA?*, ACAD. MODEL AERONAUTICS, http://www.modelaircraft.org/files/102.pdf (last visited Feb. 1, 2013).

295. *Academy of Model Aeronautics National Model Aircraft Safety Code* para. B(1), ACAD. MODEL AERONAUTICS, http://www.modelaircraft.org/files/105.pdf (last visited Feb. 1, 2013).

296. Laws specifically addressing UAS image data retention would raise the issue of consistency with respect to retention of data from ground-level, government-operated surveillance cameras.

C. *State and Local Legislation and the Scope of Federal Preemption*

The prospect of state and local UAS privacy regulation raises the issue of federal preemption.[297] Higher courts have repeatedly ruled that aircraft safety regulation has been preempted by the federal government. In 2007, the Ninth Circuit held that "[t]he [Federal Aviation Act] and regulations promulgated pursuant to it establish complete and thorough safety standards for air travel, which are not subject to supplementation by, or variation among, state laws."[298] Similarly, a 1999 Third Circuit ruling stated "[b]ecause the legislative history of the FAA and its judicial interpretation indicate that Congress's intent was to federally regulate aviation safety, we find that *any* state or territorial standards of care relating to aviation safety are federally preempted."[299]

Aircraft noise is another aviation-related field that has been federally preempted. In a 1973 decision involving Burbank's right to establish an airport curfew to address noise concerns, the Supreme Court ruled that the federal government "has full control over aircraft noise, preempting state and local control."[300] And in 1978, the Airline Deregulation Act included an express preemption prohibiting states from enacting laws "related to a price, route, or service of an air carrier that may provide air transportation."[301]

Yet this does not prevent states from passing any laws relating to how aircraft are flown. Reckless operation of aircraft is

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297. As the Supreme Court explained in a 1987 ruling, "when acting within constitutional limits, Congress is empowered to pre-empt state law by so stating in express terms." Cal. Fed. Sav. & Loan Ass'n v. Guerra, 479 U.S. 272, 280 (1987). In addition, "congressional intent to pre-empt state law in a particular area may be inferred where the scheme of federal regulation is sufficiently comprehensive to make reasonable the inference that Congress 'left no room' for supplementary state regulation. . . . As a third alternative, in those areas where Congress has not completely displaced state regulation, federal law may nonetheless pre-empt state law to the extent it actually conflicts with federal law." *Id.* at 280–81 (citation omitted).

298. Montalvo v. Spirit Airlines, 508 F.3d 464, 468 (9th Cir. 2007).

299. Abdullah v. Am. Airlines, 181 F.3d 363, 371 (3d Cir. 1999).

300. City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624, 633 (1973).

301. 49 U.S.C. § 41713(b)(1) (2006); *see also* John Maggio & Allison M. Surcouf, *Federal Preemption in The Field of Aviation*, 78 J. TRANSP. L., LOGISTICS & POL'Y 243, 249–50 (2011).

prohibited by both FAA regulations[302] and criminal statutes in many states. In ruling that a Maryland law making it a crime to "operate an aircraft . . . in a careless or reckless manner so as to endanger the life or property of another"[303] was not preempted by federal law, the Maryland Court of Appeals wrote that it "would be incongruous indeed, in light of the federal purposes and objectives, if Maryland were to be constitutionally precluded from the criminal prosecution of a person for such conduct because a federal regulation authorized civil penalties."[304] More generally, the court observed, "[w]e have no difficulty whatever in deciding that Congress has not occupied the entire field of aeronautics by the Federal Aviation Act of 1958."[305] Thus, federal preemption is complex both generally[306] and with respect to aviation.[307]

A state does not have the authority to enact UAS privacy laws that would decrease the safety of flight operations. A state law aiming to prevent UAS from hovering for too long over a home by requiring a certain minimum speed would raise concerns with respect to airspace safety, and would be unlikely to withstand a legal challenge. On the other hand, although it would be unadvisable, a state or municipality could enact legislation forbidding the use of any public funds to purchase or operate unmanned aircraft. There is also a gray area between these two extremes. State laws attempting to limit where and how government UAS can be operated, the resolution of the cameras they carry, or the retention of the data they collect would almost certainly be subject to preemption challenges.

From a preemption standpoint, the safest legislative role for states with respect to UAS privacy lies in minimizing privacy abuses by non-government UAS operators. State power to address trespass, invasion of privacy, harassment, and stalking is well established. Current civil and criminal statutes in those areas were drafted in an era, which is now ending, when UAS

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302. 14 C.F.R. § 91.13 (2006).

303. Ward v. State, 374 A.2d 1118, 1118 (Md. 1977) (quoting MD. ANN. CODE. art. 38, § 1 (1971), *repealed by* Acts 2004, Ch. 26, § 1 (2004)).

304. *Id.* at 1125.

305. *Id.* at 1123–24.

306. See Geoffrey C. Hazard, Jr., Quasi-Preemption: Nervous Breakdown in Our Constitutional System, 84 TUL. L. REV. 1143, 1145 (2010).

307. *See* Maggio & Surcouf, *supra* note 301, at 243.

were not widely accessible to private citizens. As a result, in many cases these laws fail to anticipate some of the unique ways in which UAS in the hands of irresponsible operators could be used to threaten privacy. These statutes should be reexamined to identify and close any loopholes that might be exploited.

State UAS privacy regulations also run the risk of being undermined by the physics and geometry of flight. Consider a UAS operated over Maryland, at the Virginia border, and at a high enough altitude to obtain very precise imagery of activities in Virginia five miles south of the Potomac River.[308] While the operators of the UAS would certainly need to comply with federal and Maryland laws, they could very credibly argue that their data collection practices should not be subject to Virginia law.[309] The scenarios that could play out in relation to municipal-level regulations are even more varied. If Berkeley, California, were to prohibit its police department from purchasing or using UAS, a UAS owned and operated by the City of Oakland, which is adjacent to Berkeley, could easily remain over Oakland while acquiring video of portions of Berkeley. The Oakland UAS could also freely cross into the airspace over Berkeley.

The early months of 2013 have seen a significant increase in UAS-related legislative activity at the state and local levels. To cite some of the many examples, in February 2013 the Virginia General Assembly passed a bill that, if signed into law by the Governor, would place broad restrictions on state and local law enforcement UAS use until July 2015.[310] An Oregon Senate bill, if enacted, would prohibit certain UAS uses within what it defines as the "Airspace of Oregon"; that is, "the space above the ground that is not part of airspace governed by federal law." [311]

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308. In this hypothetical scenario, it is assumed that the flight would occur outside the restricted zone in the Washington, D.C., area. *See Notice to Airmen 0/8326*, FED. AVIATION ADMIN., http://tfr.faa.gov/save_pages/detail_0_8326.html (last visited Feb. 1, 2013).

309. The ability of state law to reach high into the sky is questionable even in its "own" airspace. It is doubtful, for example, that a state could enact a valid law prohibiting passengers in commercial airliners flying over the state at 36,000 feet from taking pictures through the aircraft windows of the scenery below.

310. Jason Koebler, *Virginia Becomes First State to Pass Drone Regulations*, US NEWS, Feb. 5, 2013, http://www.usnews.com/news/articles/2013/02/05/virginia-becomes-first-state-to-pass-drone-regulations-.

311. S.B. 71, 77th Legis. Assemb., Reg. Sess. (Or. 2013), *available at* http://www.leg.state.or.us/13reg/measures/sb0001.dir/sb0071.intro.html.

Other states in which UAS-related measures have been introduced include California,[312] Florida,[313] and Texas.[314]

CONCLUSION

The only certain aspect of the debate about unmanned aircraft and privacy is that it will be contentious. Some people believe that there is no need to create new laws,[315] whereas others believe that UAS "could be just the visceral jolt society needs to drag privacy law into the twenty-first century."[316]

In the quarter of a century since *Ciraolo*, the cost of sophisticated imaging technology has plummeted. UAS will make it easy to put that technology in the air. Thus, the constitutionality of government UAS observations of a home or its curtilage using imaging technology that is both sophisticated and in general public use is certain to be tested.

None of the key Supreme Court precedents definitively resolve this issue. *Ciraolo* and *Riley* involved naked eye observations. *Dow Chemical* involved a camera that was both widely available and sophisticated for its time, but did not concern a home or curtilage. In *Kyllo*, the Court considered the thermal imager to be non-routine. And *Jones* concerned GPS, not imaging.

In combination, however, these rulings indicate that the Fourth Amendment is likely to provide significantly more protection from government UAS observations than is commonly assumed. At the very least, the Court will not grant the government the unconstrained power to perform warrantless UAS surveillance. Instead, the Court is more likely to adopt a test tied to the amount of detail revealed as opposed to the level of technology diffusion. Under that standard, even unsophisticated imag-

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312. S. B. 15, 2013–2014 Legis., Reg. Sess. (Cal. 2013), *available at* http://www.leginfo.ca.gov/pub/13-14/bill/sen/sb_0001-0050/sb_15_bill_20121203_introduced.html.

313. S.B. 92, 2013–2014 Legis., Reg. Sess. (Fla. 2013), *available at* http://www.flsenate.gov/Session/Bill/2013/0092/BillText/Filed/PDF.

314. *See* Robert Stanton, *Bill wants to make sure drone owners aren't neighborhood spies*, HOUSTON CHRONICLE, Feb. 6, 2013, http://www.chron.com/news/houston-texas/houston/article/Bill-wants-to-make-sure-drone-owners-aren-t-4256365.php.

315. *E.g.*, Jim Harper, *Old Laws Can Cover New Technologies*, N.Y. TIMES, Feb. 22, 2012, http://www.nytimes.com/roomfordebate/2012/02/20/civilian-drones-in-the-united-states/old-laws-can-cover-new-technologies.

316. M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 STAN. L. REV. ONLINE 29, 29 (2011), http://www.stanfordlawreview.org/online/drone-privacy-catalyst.

ing technology might lead to a Fourth Amendment violation if it is misused in a low-flying government UAS, while images from a sophisticated camera flown at a high altitude might reveal very few details and raise no constitutional concerns.

When considering potential new statutory UAS privacy protections, it is helpful to keep in mind what has occurred with the Internet and mobile telephones, two technologies that are associated with privacy threats that are in some respects much more significant than those that will arise from unmanned aircraft. Both the Internet and mobile phones grew as fast as their underlying technologies enabled. As a result, the public and legislative dialogue regarding how best to address the privacy issues they raise has been conducted with a strong appreciation of their benefits. By contrast, while the privacy concerns associated with domestic UAS are real and deserving of attention, they are getting significant focus long before the potential benefits of the technology are widely recognized.

This early consideration creates both opportunities and risks. The opportunities lie in the ability to proactively address the privacy issues associated with a new technology before it becomes common. The risks lie in letting this information imbalance—in which the privacy downsides are well-known but the benefits are not—lead to correspondingly imbalanced legislative approaches.

If, in 1995, comprehensive legislation to protect Internet privacy had been enacted, it would have utterly failed to anticipate the complexities that arose after the turn of the century with the growth of social networking and location-based wireless services. The Internet has proven useful and valuable in ways that were difficult to imagine over a decade and a half ago, and it has created privacy challenges that were equally difficult to imagine. Legislative initiatives in the mid-1990s to heavily regulate the Internet in the name of privacy would likely have impeded its growth while also failing to address the more complex privacy issues that arose years later.

Thus, while it is important to proactively consider how to protect against the privacy abuses UAS could make possible, in doing so it is important to recognize the near impossibility of predicting all of the ways that a rapidly developing technology can be used—for good or for ill—in future years. Maintaining that perspective will be vital in achieving good UAS policy outcomes.

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*1 WELCOME TO THE "LAST FRONTIER," PROFESSOR GARDNER: ALASKA'S INDEPENDENT APPROACH TO STATE CONSTITUTIONAL INTERPRETATION

Alaska Law Review

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Ronald L. Nelson[a1]
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This article rebuts recent criticism of efforts by state supreme courts to interpret state constitutional provisions differently than the United States Supreme Court interprets analogous provisions in the United States Constitution. This area of law, sometimes called New Judicial Federalism, has been the subject of considerable comment over the last twenty years. By focusing on equal protection, privacy, religious freedom and access to natural resources, the article examines Alaska's unique constitutional background and independent interpretation. This analysis of Alaskan constitutional rights reveals a viable and active brand of New Judicial Federalism. The article concludes that Alaska's independent approach to state constitutional law is an example of a constitutional discourse that is both uniquely local and nationally valuable.

Ronald L. Nelson, *Welcome to the "Last Frontier," Professor Gardner: Alaska's Independent Approach to State Constitutional Interpretation*, 12 Alaska L. Rev. 1 (1995)

. . .

B. Privacy

Alaska's right to privacy, particularly in the non-criminal context, has undergone development similar to Alaska's equal protection doctrine.[82] In fact, this right to privacy may be one of the most well-known indicators of Alaska's judicial independence. While the right to privacy is now embodied in a specific provision of the state constitution, it was not included in the original Declaration of Rights. Instead, article I, section 22 was added to the constitution in 1972. Prior to 1972, the right to privacy was viewed by most state courts as a matter of federal protection and not routinely addressed at the state level. In the federal courts, however, the concept was not well-defined and was found primarily in the right "to be let alone," the right of marital privacy, the privacy of the home, or some other penumbral definition.[83]

In 1972, the Alaska Supreme Court addressed the privacy issue when it decided a pre-amendment case, *Breese v. Smith*.[84] Breese involved a challenge by a student to school hair length regulations. After examining federal privacy protection and various state and federal cases, the court decided not to resolve the case on federal grounds because of the unsettled state of the privacy issue at the federal level. The Breese court instead decided that "avoidance of *18

the federal thicket [was] the better course,"[85] and struck down the regulations on independent state grounds. Citing a general liberty right under article I, section 1 of the state constitution,[86] and noting the state's duty to open and maintain public schools,[87] the court found that the student had a "fundamental . . . right to select [his] own individual hair style[ ] without governmental direction."[88] It then determined that the state's interest in maintaining the regulation was insufficiently "compelling" to overcome the student's privacy right.[89]

The *Breese* court examined cases from federal and state courts as well as notes and articles by various commentators.[90] Citing *Roberts v. State*[91] and *Baker v. City of Fairbanks*,[92] the court characterized its decision as a matter of fulfilling its judicial obligation to move forward and develop additional rights under the state constitution without being constrained by federal decisions.[93] *Breese* therefore set the stage for the development of the right to privacy law under the explicit language of section 22.

In 1975 the Alaska Supreme Court decided the first major case under the 1972 privacy amendment. In *Ravin v. State*,[94] the court recognized the fundamental right to privacy in one's home. In reviewing a state statute that prohibited the possession of marijuana by an adult for personal use in the home, the court inquired whether the statute was designed to accomplish a legitimate governmental interest and whether the means chosen bore a close and substantial relationship to that interest.[95]

After an extensive review of the available scientific evidence,[96] the court found that the potential harm was not great ***19** enough to show a close and substantial relationship between the state's interest in public welfare and marijuana use in the home.[97] However, the court did not find constitutional protection for the buying or selling of marijuana, the use of marijuana in a public place, or the possession of a large amount of marijuana at home.[98] Furthermore, the court did not hold that the possession or ingestion of marijuana was a fundamental right itself; rather, the court found that the privacy of one's home afforded protection from this type of governmental intrusion.[99]

In his concurring opinion in *Ravin*, Justice Boochever noted that federal privacy law was particularly unsettled and, citing *Baker v. City of Fairbanks*,[100] argued that it was therefore appropriate for the court to use independence and initiative in interpreting the privacy provision of the state constitution.[101] He also urged a broader interpretation than that found under the United States Constitution because, unlike the United States Constitution, "the citizens of Alaska, with their emphasis on individual liberty, enacted an amendment to the Alaska Constitution expressly providing for a right to privacy not found in the United States Constitution."[102] To achieve such broad protection, Justice ***20** Boochever argued for the use of "a single flexible test,"[103] which was, in reality, a sliding-scale analysis.

A follow-up case to *Ravin* was decided by the Alaska Supreme Court in 1978. In *State v. Erickson*,[104] the court ruled on whether the ingestion of cocaine in the home was protected by the right to privacy. The court's approach was substantially similar to the sliding-scale test used to address equal protection issues.[105] The test balances the infringing governmental conduct with the privacy interest in question. In Erickson, the privacy interest was similar to the one previously addressed in Ravin because it involved the use of illicit drugs in the defendant's own

home.[106] In Erickson, however, the drug in question was cocaine rather than marijuana. The court found the dangers presented by cocaine to exceed those posed by marijuana use.[107] Accordingly, the drug user's privacy interest was outweighed by the societal need to regulate the demonstrated dangers of cocaine.[108]

In the area of informational privacy, the Alaska Supreme Court has also employed a balancing test that appears to be yet another form of the sliding-scale standard. For example, in the 1977 case of *Falcon v. Alaska Public Offices Commission*,[109] a doctor challenged the requirement that he, as a member of a school board, had to release a list of the names of his patients to the commission. The court found that, while the doctor did not have a personal privacy stake in the list, the patients did.[110] The court balanced the state's interest in promoting fair and honest government ***21** with the patients' interest in concealing their identity and held that, until the state's means to its valid purpose provided some form of screening, the regulation must be suspended.[111] Moreover, in more recent cases involving information and privacy, the court has cited the Falcon balancing approach in applying a "compelling interest" test. The test applied in these privacy cases, however, is not the old two-prong test, but rather reflects a balancing approach as used in Falcon.[112]

Privacy law in Alaska is still developing. With respect to privacy in the home, a balancing or sliding-scale type of test is fairly well established. Nevertheless, in areas such as informational privacy, the court appears to be working to develop a balancing analysis.[113] Alaska's discourse on the right to privacy reflects both the state's independence and its unique tradition of emphasizing individual liberties. Alaska's discourse concerning privacy ***22** rights has involved not only an examination of the right itself but also the development of the test for judicial evaluation of the right. In cultivating this discourse, Alaska exemplifies the essence of NJF as well as the benefits of departing from the federal path.

Nelson, *supra, at* 17-22

. . . .

82
For a ten-year perspective on the development of the right to privacy in Alaska, see John F. Grossbauer, Note, *Alaska's Right to Privacy Ten Years After Ravin v. State* : Developing a Jurisprudence of Privacy, 2 Alaska L. Rev. 159 (1985).
83
See, e.g., *Griswold v. Connecticut*, 381 U.S. 479, 484 (1985).
84
501 P.2d 159 (Alaska 1972).
85
Id. at 166.
86
Id. at 166-67; see Alaska Const. art. I, s 1, set forth in the Appendix.
87
Breese, 501 P.2d at 174.
88
Id. at 169.

89
Id. at 174.
90
See, e.g., id. at 166 n.26.
91
458 P.2d 340 (Alaska 1969).
92
471 P.2d 386 (Alaska 1970).
93
See *Breese*, 501 P.2d at 166-67.
94
537 P.2d 494 (Alaska 1975).
95
Id. at 504.
96
As part of its analysis, the court considered evidence, including the state's justifications that marijuana is a psychoactive drug, it is harmful, heavy use entails a concomitant risk, it is capable of precipitating a psychotic reaction in at least some circumstances and its use adversely affects the user's ability to operate an automobile. Id. at 504-11.
97
Id. at 511.
98
Id.
99
Id. at 504. In 1990, Alaskans approved an initiative for a new statute recriminalizing the possession of marijuana in a private location. The 1990 Elections: State by State, N.Y. Times , Nov. 8, 1990, at B9. The resultant statute, see Alaska Stat. s 11.71.060 (Supp. 1994), while not yet before the state supreme court, would probably survive a constitutional challenge on the same grounds as the cocaine regulation in *Erickson*. New evidence as to the dangers of marijuana produced during the initiative drive has changed the balance from that present in 1975, when *Ravin* was decided.

Interestingly, Professor Gardner cites the *Ravin* case and the subsequent 1990 initiative for the proposition that "the Alaskan character for rugged individuality did not hold out for long against the nationwide hardening in attitudes against drug use." Gardner, supra note 2, at 828 n. 283. Perhaps if Gardner had examined the constitutional development surrounding this issue, he might have seen the case and initiative as part of a lively constitutional discourse rather than a sign of Alaskans' lost individuality.
100
471 P.2d 386 (Alaska 1970).
101
See *Ravin*, 537 P.2d at 513 (Boochever, J., concurring).
102
Id. at 514-15. The *Ravin* majority also noted the unique lifestyle in Alaska:
Our territory and now state has traditionally been the home of people who prize their individuality and who have chosen to settle or continue to live here in order to achieve a measure

of control over their own lifestyles which is now virtually unattainable in many of our other sister states.

Id. at 504 (majority opinion).

103

Id. at 515 (Boochever, J., concurring).

104

574 P.2d 1 (Alaska 1978).

105

See supra part IV.A.

106

See *Erickson*, 574 P.2d at 21.

107

Id. at 21-22.

108

While the discourse regarding the standards for equal protection and privacy claims has been complicated by cases raising both issues, the standards that have emerged are very similar, that is, a balancing test in both instances. The standard for equal protection claims as articulated in *Alaska Pacific Assurance Co. v. Brown*, 687 P.2d 264, 269-70 (Alaska 1984), is the substantial equivalent of the privacy test laid out in *Erickson*, namely, "[w] here the right to privacy is manifested in terms of interests more squarely within personal autonomy, the balance requires a heavier burden on the State to sustain the legislation in light of the right involved." *Erickson*, 574 P.2d at 22 n.144.

109

570 P.2d 469 (Alaska 1977).

110

See id. at 478-79.

111

Id. at 480.

112

See *Messerli v. State*, 626 P.2d 81 (Alaska 1980) (challenging campaign disclosure law on privacy, free speech and free press grounds). With this combination of rights, the *Messerli* court applied a strict compelling interest standard on the state's interest in general. The court held that the disclosures could be required only if adequate procedural safeguards were established. In discussing privacy, the court cited *Breese* for the proposition that the right to privacy is not absolute. Id. at 84. Given the combination of rights involved, *Messerli* can be viewed to illustrate balancing at the upper end or compelling interest level of review. The case also illustrates several areas where the Alaska constitution provides broader protections than the United States Constitution. Id. at 83.

State v. Oliver, 636 P.2d 1156 (Alaska 1981) also illustrates the court's application of a compelling interest test by balancing the privacy interests of a tax protestor claiming that a state requirement for the filing of a W-2 form violated the state right to privacy. The *Oliver* court noted that the information was neither highly sensitive nor intended to be kept confidential, and the court therefore concluded that the state's interest outweighed the protestor's. Id. at 1167-68. The court used language similar to that found in Falcon regarding the balancing of interests. Id. at 1167.

Nelson, *supra* at 41

UAS Privacy Considerations

Unmanned Aircraft Systems (UAS) are emerging technologies that have the potential to transform America by providing wide ranging economic, environmental, safety, and security benefits. A recent study[i] by the Association for Unmanned Vehicle Systems International conservatively estimates that 103,776 high paying jobs could be created and state tax revenue could exceed $482 million by 2025. They believe that every year the integration of UAS into the aviation system[ii] is delayed, America will lose more than $10 billion in potential economic impact.

UAS applications and benefits include assisting these civil government and commercial tasks: emergency deployment at accident scenes, search and rescue, barricade situations, structure or other fire emergencies, terror threats, firefighting, chemical and HAZMAT detection, crop dusting, agricultural development, monitoring of pollution, pipelines, wildlife, traffic, and floods, aerial news coverage, delivering medical supplies to remote areas, aerial photography, forensic photography, real-estate photography, filmmaking, communications, broadcasting, Arctic and volcanic research, damage assessment, cargo transportation, port, border, and event security, etc. In addition to these direct benefits, UAS implementation has the potential to spawn many new industries and provide an incredible array of manufacturing, operation, and other high paying job opportunities.

Along with these benefits come concerns about individual privacy. There is an existing body of federal, state and local law relating to privacy. The question is whether existing law is adequate, absent extensive judicial review, to alleviate the concerns of state legislators and citizens regarding privacy rights in light of this new technology. Because this technology can use a variety of sensors and some can potentially loiter for long periods of time without detection, there is a concern that government can use these systems to monitor individuals in a way that was not imagined in Supreme Court 4th Amendment rulings based on the presumption of privacy[iii]. Because state law interacts with Federal 4th Amendment rulings, states may choose to enact legislation addressing this issue. The challenge is to provide privacy protection while allowing the use of UAS to achieve UAS' many benefits, as described above.

Because of the complexity of this issue and the importance of privacy to citizens in every state, representatives of the Aerospace States Association (ASA)[iv], the Council of State Governments (CSG)[v], and the National Conference of State Legislatures (NCSL)[vi], have joined together to create considerations for states to evaluate in developing UAS legislation. As part of our impartial deliberative process, UAS privacy stakeholder associations including the ACLU, EPIC, and IACP Aviation Committee [vii], AUVSI – the industry trade association[viii] – as well as academics[ix] responded to our request to submit their suggestions for state privacy legislation to an independent law firm, Cadwalader, Wickersham & Taft LLP[x]. These submissions can be seen at http://aerostates.org/events/uas-privacy-submissions. Our review also included the Congressional Research Service's report, "Integration of Drones into Domestic Airspace: Selected Legal Issues," from April 4, 2013, and a memorandum for the Secretary from the Office of Civil Rights and Civil Liberties, U.S. Department of Homeland Security, dated September 14, 2012. After deliberation, ASA, CSG, and NCSL provide the following considerations:

1. Warrants: States may consider requiring a warrant for government surveillance of an individual or their property where the individual is specifically targeted for surveillance in advance without their permission. All other observation activities should not require a warrant, to the extent allowed under Supreme Court rulings. Additionally, if there is not a specific person identified for surveillance in advance, it is generally not possible to obtain a warrant. Requiring one would eliminate UAS benefits, but can be addressed per recommendation number two, below.

2. Data Concerns: Some are worried about government use of data derived from warrantless observations. States may consider addressing this by prohibiting the repurposing of data collected from Government use of UAS in warrantless observation unless a warrant allows the repurposing.

3. States may consider prohibiting commercial UAS and model aircraft flights from tracking specific, identifiable individuals without their consent.

4. States can consider prohibiting weapons to be carried by any UAS in commercial airspace.

5. States may consider endorsing the International Association of Chiefs of Police Aviation Committee (IACP) "Recommended Guidelines for the use of Unmanned Aircraft[xi]." These guidelines define UAS and provide guidance for community engagement, system requirements, operational procedures, and image retention for UAS operations by law enforcement organizations.

6. States may consider emphasizing that the FAA regulates commercial UAS[xii], and that they and model aircraft operations should be operated in a manner not to present a nuisance to people or property.

End Notes

[i] Economic Impact of Unmanned Aircraft Systems in the United States, March 2013, http://www.auvsi.org/econreport

[ii] The Federal Aviation Administration regulates all civil airspace, vehicles, and operators within the U.S. for safety and efficient airspace use through federal preemption. UAS safety regulations are being developed by the FAA. Until such regulations are in place, civil UAS operations must be specifically approved by the FAA. Government operations must comply with civil air traffic control directives. A lack of FAA permissive regulation and state prohibitions of UAS use delay integration of UAS into the aviation system and adversely affect America's global competitiveness in the development of this industry.

[iii] The crucial inquiry for Fourth Amendment protection is whether a person has a reasonable expectation of privacy that society is prepared to recognize. Courts have found that individuals may have a Fourth Amendment right against the unreasonable search and seizure of the area surrounding a house, referred to as the "curtilage." The Supreme Court has found that aerial surveillance over private property does not violate the Fourth Amendment if conducted by an aircraft in legally navigable airspace.

However, UAV's can fly lower, often undetected, and this holding might not apply to UAVs and their unique capabilities, and arguably remains an open question.

[iv] ASA is a bipartisan organization that represents the grassroots of American aerospace. It is a 501(c)(3) scientific and educational organization of lieutenant governors, governor-appointed delegates, and associate members from industry and academia. ASA was formed to promote a state-based perspective in federal aerospace policy development and to support education outreach and economic development opportunities.

[v] Founded in 1933, The Council of State Governments is our nation's only organization serving all three branches of state government. CSG is a region-based forum that fosters the exchange of insights and ideas to help state officials shape public policy. This offers unparalleled regional, national and international opportunities to network, develop leaders, collaborate and create problem-solving partnerships.

[vi] The National Conference of State Legislatures is a bipartisan organization that serves the legislators and staffs of the nation's 50 states, its commonwealths and territories. NCSL provides research, technical assistance and opportunities for policymakers to exchange ideas on the most pressing state issues. NCSL is an effective and respected advocate for the interests of state governments before Congress and federal agencies.

[vii] In response to our request for information, papers were received from the Airborne Law Enforcement Association (including and referencing the guidelines from the International Association of Chiefs of Police Aviation Committee), the American Civil Liberties Union, the American Legislative Exchange Council, the Electronic Frontier Foundation, the Electronic Privacy Information Center and the National Association of Criminal Defense Lawyers.

[viii] The Association for Unmanned Vehicle Systems International is the world's largest non-profit organization devoted exclusively to advancing the unmanned systems and robotics community. Serving more than 7,500 members from government organizations, industry and academia, AUVSI is committed to fostering, developing, and promoting unmanned systems and robotic technologies. AUVSI members support defense, civil and commercial sectors.

[ix] Douglas Marshall of New Mexico State University and Paul Voss of Smith College responded to our requests.

[x] Cadwalader, Wickersham & Taft LLP, established in 1792, is one of the world's leading international law firms, with offices in New York, Washington, D.C., Charlotte, Houston, London, Hong Kong, Beijing and Brussels. Cadwalader has provided pro bono legal services to ASA for over 20 years.

[xi] http://www.theiacp.org/portals/0/pdfs/IACP_UAGuidelines.pdf

[xii] Code of Federal Regulations Title14, as amended.

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Tennessee
Texas
Utah
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May 3, 2013

Ms. Allie Bohm, American Civil Liberties Union

Dear Allie,

I am writing to invite you to join with the Aerospace States Association (ASA), the Council of State Governments (CSG), and the National Conference of State Legislatures (NCSL) in an important and timely dialogue on privacy issues related to incorporating Unmanned Aircraft Systems (UAS) into the national airspace.

I believe we all view privacy as a serious issue that our constituents are concerned about, yet we also see the long-term benefits in the use of unmanned aircraft for carrying out missions that are otherwise dirty, dull or dangerous. Commercial use could also create high paying jobs and environmental benefits that could transform our economy.

Many states have begun drafting legislation to address the privacy concerns related to UAS. We want to give thorough, thougtful consideration to all sides of the issues in order to develop suggested legislation for consideration by the states.

Please be a part of this effort by reviewing the attached plan we've developed and **submitting your comments to Bob Davis by Email to bob.davis@cwt.com, fax to 202-862-2400 or mailed by post to Cadwalader, 700 6th Street, NW, Suite 300, Washington, DC 20001 by June 1.** Your submission should address civil, commercial and personal use of UAS and contain your views on the "assumption of privacy" in UAS use. Your submission should not exceed three pages. An independent law firm, Cadwalader, Wickersham & Taft LLP, and leaders of state government associations will review your submission and draft best practices and suggested legislation based on your comments, to be presented at a roundtable discussion in Washington, D.C. on August 14. You are invited to participate in the roundtable to personally discuss the results of our drafting effort.

Thank you for your leadership, and for taking the time to participate in this dialogue.

Sincerely,

Mead Treadwell
Lieutenant Governor, State of Alaska
Chair, Aerospace States Association

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May 30, 2013

Bob Davis
Cadwalader
700 6th Street, NW, Suite 300
Washington, DC 20001

Dear Mr. Davis:

On behalf of the American Civil Liberties Union (ACLU), a non-partisan organization with more than a half million members, countless additional activists and supporters, and fifty-three affiliates nationwide, we appreciate the opportunity to comment on the privacy and civil liberties implications of domestic use of unmanned aircraft systems (UAS), also known as drones, and to recommend new protections for use of the technology.

Like any powerful surveillance tool, UAS have the potential to be used for good or ill. With implementation of good privacy ground rules, we can enjoy the benefits of this technology without bringing our country closer to a "surveillance society" in which every move is monitored, tracked, recorded, and scrutinized by the authorities.

UAS share some characteristics with manned aerial surveillance, such as planes and helicopters, but their threat to privacy is substantially greater in both scope and volume. Manned aircraft are expensive to purchase, operate, and maintain. They require trained pilots and ground crews and must land in order for pilots to rest. The expense both in dollars and in staffing has always imposed a natural limit on the government's aerial surveillance capacity. UAS's low cost and flexibility erode that natural limit. As technology improves, small, hovering devices will be able to explore hidden spaces, peer in windows, or even, potentially, enter homes, and large static blimps will enable continuous, long-term monitoring – all for much less than the cost of a helicopter or plane.

In our society, it is a core principle that the government does not collect information about individuals' innocent activities just in case they do something wrong. But UAS threaten to turn that principle on its head. What would be the effect on our society if everyone felt the keen eye of the government at all times? Psychologists have repeatedly found that people who are being observed tend to behave differently than when they are not being watched. This effect is so great that a recent study found that "merely hanging up posters of staring human eyes is enough to significantly change people's behavior."[1] There is a real danger that, if faced with the prospect of unregulated UAS, people will change how they behave in public – whether at a political rally or in their own backyards.

[1] Sander van der Linden, "How the Illusion of Being Observed Can Make You a Better Person," Scientific American, May 3, 2011, online at http://www.scientificamerican.com/article.cfm?id=how-the-illusion-of-being-observed-can-make-you-better-person; M. Ryan Calo, "People Can Be So Fake: A New Dimension to Privacy and Technology Scholarship," 114 Penn St. L. Rev. 809, online at http://www.pennstatelawreview.org/articles/114/114%20Penn%20St.%20L.%20Rev.%20809.pdf.

UAS may also suffer from the problems we've seen with video surveillance – voyeurism,[2] racial profiling by operators,[3] and automated law enforcement.[4]

The Supreme Court has not yet had occasion to consider whether the Fourth Amendment places limits on government use of UAS. However, it has allowed some warrantless aerial surveillance from *manned* aircraft. Most notably, in the 1986 decision *California v. Ciraolo*, the Court ruled that there was no intrusion into Ciraolo's privacy when police borrowed an airplane, flew it over his backyard and spotted marijuana plants growing there, because "[a]ny member of the public flying in this airspace who glanced down could have seen everything that these officers observed."[5]

Nonetheless, because of their potential for pervasive use and their capacity for revealing far more than the naked eye, there are good reasons to believe that UAS may implicate Fourth Amendment rights in ways that manned flights do not. In both *Dow Chemical Co. v. United States*[6] and *Kyllo v. United States*,[7] the Supreme Court suggested that using sophisticated technology not generally available to the public may be considered a search under the Fourth Amendment.

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Further, the Supreme Court has suggested that the continuous use of a surveillance technology may heighten Fourth Amendment concerns. In *United States v. Knotts*, although the Court concluded that the use of the beeper in that case did not violate the Fourth Amendment, it held that if "such dragnet type law enforcement practices" as "twenty-four hour surveillance of any citizen of this country" ever arose, it would determine if different constitutional principles would be applicable.[8] Similarly, in *United States v. Jones*, five justices agreed (in two concurrences) that when the government engages in prolonged location tracking, it conducts a search under the Fourth Amendment.[9] While this decision may eventually play a role in regulating drone usage, the technology is moving far more rapidly than our jurisprudence, and it is critical that state legislatures act to protect their constituents' privacy.

State legislation should reflect the following key principles:

First, no one should be spied upon unless the government believes that person has committed a crime. Drone use over private property should occur only with a search warrant based on probable cause – the same standard used to search someone's house or business. It might be permissible to monitor individuals in public at a lower standard – perhaps reasonable suspicion – but the key is to prevent mass, suspicionless searches of

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[2] "Did NYPD Cameras Invade A Couple's Privacy?" WCBS-TV report, Feb. 24, 2005, video no longer available online; Jim Dwyer, "Police Video Caught a Couple's Intimate Moment on a Manhattan Rooftop," *New York Times*, Dec. 22, 2005, online at http://www.nytimes.com/2005/12/22/nyregion/22rooftop.html.
[3] Clive Norris and Gary Armstrong, "The Unforgiving Eye: CCTV Surveillance in Public Spaces," Centre for Criminology and Criminal Justice at Hull University, 1997.
[4] Danielle Keats Citron, "Technological Due Process," 85 Washington University Law Review 1249 (2008), online at http://lawreview.wustl.edu/inprint/85/6/Citron.pdf.
[5] 476 U.S. 207 (1986).
[6] 476 U.S. 227 (1986).
[7] 533 U.S. 27 (2001).
[8] 460 U.S. 276, 283-84 (1983).
[9] 132 S. Ct. at 964 (Alito, J., concurring in judgment), 955 (Sotomayor, J., concurring).

the general population, including for intelligence gathering. Exceptions to this rule should be limited to emergencies connected to life and safety or narrowly drawn administrative exceptions in order to prevent pretextual use of drones.

Additionally, while the Constitution may permit UAS surveillance of public spaces on less than a probable cause standard, the vast majority of the 96 different drone bills being considered in 43 states this legislative session[10] require law enforcement to get a probable cause warrant before using a drone in an investigation, whether that investigation occurs in private or public space, a good indicator that a warrant requirement for drone use is both workable and palatable. Already, warrant requirements have been enacted in Florida,[11] Idaho,[12] Montana,[13] and Tennessee.[14]

Second, images of identifiable individuals captured by law enforcement UAS should not be retained or shared unless they are of the target of the investigation that justified drone deployment, and there is reasonable suspicion that the images contain evidence of criminal activity or are relevant to an ongoing investigation or pending criminal trial.

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Third, while drone use should be permitted for reasonable non-law enforcement purposes where privacy will not be substantially affected, such as geological inspections or environmental surveys, information collected by drones for one purpose should not be used for another purpose such as general law enforcement or enforcing administrative laws.

Fourth, drones should not carry weapons.

Finally, oversight is crucial. Communities must play a central role in deciding whether to purchase drones, and the policies and procedures for the use of UAS should be explicit and written, and should be subject to public review and comment. Similarly, like any new technology, drone use must be monitored to make sure it's a wise investment that works.

Placing reasonable limitations on law enforcement is by no means a new idea – for example, authorities may take a thermal image of someone's home only when they get a warrant – and it is imperative that we implement a system of rules to ensure that we can take advantage of UAS technology without sacrificing our privacy. If you have any questions, would like to discuss the issue further, or would like to see ACLU's model state legislation, please don't hesitate to reach out to me at abohm@aclu.org or (212) 284-7335.

Sincerely,

Allison S. Bohm, Advocacy & Policy Strategist

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[10] "States with UAS Legislation" National Conference of State Legislatures. May 29, 2013. http://www.ncsl.org/issues-research/justice/unmanned-aerial-vehicles.aspx.
[11] S.B. 92 (Fla. 2013)
[12] S.B. 1134, 62nd Legislature (Idaho 2013)
[13] S.B. 196, 63rd Legislature (Mont. 2013)
[14] S.B. 796 (Tenn. 2013)

MEMORANDUM

State of Alaska
Department of Law

TO: Mead Treadwell
Lieutenant Governor
State of Alaska

FROM: Libby Bakalar
Assistant Attorney General
Transportation Section

CC: Jim Cantor
Deputy Attorney General
Department of Law

Margie Vandor
Chief Assistant Attorney General
Department of Law

Michaela Goertzen
Speechwriter
Office of the Lieutenant Governor

DATE: May 20, 2013

FILE NO.: JU2011200514

TEL. NO.: 907.465.3600 main
907.465.2520 fax

SUBJECT: Legal issues related to unmanned aircraft systems

I. Introduction and background.

In your capacity as chair of the Aerospace States Association, you asked me to provide you with a brief description and analysis of the core legal issues related to the civilian use of Unmanned Aircraft Systems (UAS), also known as "drones." The context for your inquiry is the University of Alaska's pending application with the Federal Aviation Administration (FAA) to become one of a limited number of testing sites in the nation for UAS. Please note that this document is not legal opinion of the Office of the Attorney General, but rather simply a compendium of my research and a preliminary analysis.

UAS are unmanned aircraft designed to do tasks that are too difficult, dull, dangerous, or expensive for manned aviation, and are designed to carry a "system payload" such as a camera or sensor.[1] Traditionally, UAS have been used for military

[1] Association for Unmanned Vehicle Systems International ("AUVSI"), UAS Privacy Issues Document.

purposes, but they are being increasingly deployed in domestic civilian contexts such as law enforcement, disaster relief, fire-fighting, agriculture, energy, industry, wildlife tracking, and others.[2] Commercial use of UAS is currently prohibited, but that is expected to change by 2014.[3] UAS can range in size from smaller than a cell phone to larger than a commercial jetliner.[4] Research sponsored by the Association for Unmanned Vehicle Systems International (AUVSI), a non-profit trade association that supports the civilian use of UAS, concluded that the integration of UAS into the national airspace has the potential to create more than 100,000 new jobs and $82 billion of economic impact by 2025.[5]

The legal issues surrounding the civilian use of UAS relate mainly to privacy and property interests, and are relatively untested in the courts because of the novelty of the technology involved and the regulatory vacuum in which that technology operates. Fortunately, there has been significant legal scholarship as well as congressional reporting[6] in in this area, all of which I rely upon heavily in this memorandum. I have also reviewed all the materials Charles Huettner emailed me after our April 5th teleconference. Some limited case law also exists on the privacy concerns raised by aerial surveillance and similar technologies. These cases telegraph how the Supreme Court might view the privacy implications of UAS. Following is the requested description, summary, and analysis of the issues that have arisen and been analyzed by legal scholars to date. I also discuss the Alaska-specific implications of these issues, which are not discussed in any of the law reviews, journals, or reports.

II. Core legal issues raised by the use of UAS/drones.

The FAA oversees all aircraft operations in the United States and makes and

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2 *See* Villasenor, John, *Observations from Above: Unmanned Aircraft Systems and Privacy*, 36 Harv. J.L. & Pub. Pol'y 458, 459 (2013).

3 *Id.* at 471.

4 *Id.* at 465.

5 "The Economic Impact of Unmanned Aircraft Systems Integration in the United States," AUVSI, March, 2013.

6 *See* Integration of Drones into Domestic Airspace: Selected Legal Issues, Congressional Research Service, CRS Report for Congress (April 4, 2013).

enforces rules to implement and interpret laws passed by Congress governing aviation.[7] Federal law enacted in February 2012 (The Federal Aviation Administration Modernization and Reform Act of 2012) requires the FAA to devise a comprehensive plan to integrate all civilian UAS into the national airspace system by September 30, 2015, appropriates billions of dollars in funding, and creates the six UAS test sites for which many states, including Alaska, are vying.[8]

The federal government is still struggling with the regulation of UAS, specifically, how to define these vehicles, how to clarify which—if any—existing regulations apply to them, how to craft future regulations to encompass vehicles not governed by existing regulations, and how to ensure that future regulations do not inadvertently regulate other industries such as model or hobby aircraft.[9] The FAA will need to identify technology (*e.g.* cameras and radar) that will obviate the need for regulations requiring pilots to "see and avoid" other aircraft, address appropriate training for UAS operators, devise proper procedures for when a UAS loses contact with an operator or is hacked, coordinate with other countries and agencies in adopting regulations, and ensure that there is sufficient wireless spectrum to accommodate the communication needs of these vehicles.[10] Presently, UAS operators engaged in both public aircraft operations and private operations are required to have special certifications from the FAA.[11]

There is no legislation yet governing UAS in Alaska, although there is model legislation that AUVSI is compiling, and according to news reports, at least one other state—Florida—has begun to legislate UAS. Two bills were introduced in Alaska last session that touch upon UAS: HB 159, "An Act relating to the admissibility of evidence acquired through the use of an unmanned aerial vehicle; establishing a crime for certain uses of unmanned aerial vehicles; and restricting the use of unmanned aerial vehicles for collection of information or investigation by peace officers and other government agents;" and HCR 6, "Recognizing the Alaska Center for Unmanned Aircraft Systems

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7 Villasenor, *supra* note 2, at 469.

8 P.L. No. 112-095 (Feb. 14, 2012).

9 *See* Kapnik, Benjamin, *Unmanned but Accelerating: Navigating the Regulatory and Privacy Challenges of Introducing Unmanned Aircraft into the National Airspace System*, 77 J. Air L. & Com. 439, 443 (2012).

10 *Id.* at 448-49.

11 Villasenor, *supra* note 2, at 471.

Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development; and relating to a Task Force on Unmanned Aircraft Systems." Presumably, these bills could be revisited next session.

Any discussion of UAS legislation must also consider federal pre-emption and the interplay between state and federal law. Although aircraft safety, trade, and noise regulation is the established provenance of the federal government, states may still pass laws governing how aircraft are flown.[12] Both Alaska and federal law prohibit the reckless operation of aircraft, but Alaska could not enact privacy laws that would decrease or implicate in any way the safety of flight operations, such as laws governing aircraft speed or altitude.[13] From a pre-emption standpoint, the safest area for state legislation is in the realm of privacy laws aimed at non-government actors that address trespass, invasion of privacy, stalking, and harassment, because state power to legislate in this area is well-established.[14]

In short, there is both a mandate and pressing need to legislate and regulate UAS at both the state and federal level. However, the precise parameters and scope of that legislation and regulation remain nebulous at best.

III. Constitutional rights.

A. The Fourth Amendment.

Probably the biggest legal issue surrounding UAS is the implications of these devices for individual privacy rights. The Fourth Amendment to the United States Constitution guarantees to the people the right to be free from unreasonable search and seizure by the government.[15] The Alaska Constitution contains an analogous search and seizure provision, as well as an explicit clause guaranteeing to its citizens the right to privacy.[16] Because the FAA is primarily a regulating agency whose mandate is to ensure

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12 Villasenor, *supra* note 2, at 513.

13 *Id.*

14 *Id.*

15 *See* U.S. Const. amdt. IV.

16 Alaska Const. art. I, §§ 14 and 22. Note that these provisions bind only government actors—not private citizens.

the efficient and safe operation of U.S. airspace, questions have arisen whether this agency is really the appropriate entity to ensure that government actors using UAS are not violating these basic constitutional principles or whether constitutional privacy compliance should be spearheaded at the state or federal level by some other agency. It is clear, however, that no government actor may commit such violations.

The crucial inquiry for Fourth Amendment and state constitutional privacy purposes is whether a person has a reasonable expectation of privacy that society is prepared to recognize. One scholar notes that "[w]here a [UAS] captures images that could have been obtained from civilian aircraft traveling in a legally authorized manner, privacy claims are limited. Consumers lack a reasonable expectation of privacy with respect to areas already exposed to civilian over-flights."[17] However, novel imaging technologies such as thermal and infrared imaging could raise concerns. Indeed, as noted by another scholar who has examined the issue, "[t]he privacy issues raised by the potential ubiquity of [UAS] go beyond the current Fourth Amendment jurisprudence."[18] Indeed, "[t]here is no precedent that squarely addresses privacy implications of governmental use of a technology that allows essentially permanent, multi-dimensional, multi-sensory surveillance of citizens twenty-four hours a day."[19]

However, there has been some judicial guidance. *Katz v. U.S.*[20] was a landmark Fourth Amendment case in which the Supreme Court held for the first time that a Fourth Amendment violation could occur absent a physical intrusion—specifically, through a listening device the police had affixed to the outside of a public phone booth. This was the first "remote sensing" case, soon to be followed by a trilogy of key "aerial surveillance cases."

The "remote sensing" cases fall into two categories: "open fields" and "curtilage." Remote sensing in "open fields" does not implicate the Fourth Amendment because open

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17 Geoffrey Christopher Rapp, *Unmanned Aerial Exposure: Civil Liability Concerns Arising from Domestic Law Enforcement Employment of Unmanned Aerial Systems*, 85 N.D.L. Rev. 623, 641 (2009).

18 Joseph J. Vacek, *Big Brother Will Soon Be Watching—Or Will He?*, 85 N.D. L. Rev. 673, 674 (2009).

19 *Id.* at 675.

20 389 U.S. 347 (1967).

fields are areas of public and private property that "do not provide the setting for those intimate activities that the [Fourth] Amendment is intended to shelter from government surveillance or interference."[21] However, "curtilage" is a legal "penumbra" surrounding a home where the Fourth Amendment may be implicated.[22] Whether a given area constitutes "curtilage" depends on the proximity of the area to the home, whether the area is enclosed, the nature of the use to which the area is put, and the steps taken by the resident to protect the area from observation.[23] Although a person may have reasonable expectations of privacy in curtilage, remote sensing of curtilage "does not require law enforcement officers to shield their eyes when passing by a home on public thoroughfares."[24] The bottom line is that remote sensing will not implicate the Fourth Amendment "if it is done from a public vantage point where law enforcement officers can make open observations."[25]

The Supreme Court's "aerial surveillance" trilogy consists of *California v. Ciraolo*,[26] *Florida v. Riley*,[27] and *Dow Chemical Company v. U.S.*[28] All three cases were decided in the 1980s. Together, they stand for the proposition that aerial surveillance of any kind over private or commercial property from aircraft that are lawfully in navigable airspace is not a Fourth Amendment search, because there is no reasonable expectation of privacy in an area that is openly visible from above, regardless whether the area is curtilage or an open field.[29]

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21 *Oliver v. U.S.*, 466 U.S. 170, 179 (1984).

22 *U.S. v. Dunn*, 480 U.S. 294, 300 (1987).

23 *Id.* at 301.

24 *California v. Ciraolo*, 476 U.S. 207, 213 (1986).

25 Vacek, *supra* note 18, at 680.

26 476 U.S. 207 (1986).

27 488 U.S. 445 (1989).

28 476 U.S. 227 (1986).

29 Vacek, *supra* note 18, at 682.

In *Ciraolo*, police flew a fixed-wing aircraft 1,000 feet over a defendant's backyard, the minimum safe altitude required by FAA regulations, and observed marijuana plants with the naked eye. The backyard was not visible due to an extensive fencing system, so the aerial search provided the basis for a search warrant and marijuana plants were found after a physical search. The Court held that a ground fence does not create an expectation of privacy to be free from aerial searches because routine flights exposed the backyard to public view.[30]

Riley reached the same holding when officers flew a helicopter 400 feet overhead to peer through openings in a greenhouse and determined marijuana was growing inside the defendant's fenced-in home. Again, the Court found that there was no reasonable expectation of privacy because helicopter flight in navigable airspace was a routine, expected occurrence.[31]

And in *Dow Chemical*, the Environmental Protection Agency, acting without a warrant, hired a private commercial pilot to fly over Dow's property to take aerial photos of suspected regulatory violations. The Court upheld this conduct because "such an industrial complex is more comparable to an open field and as such it is open to the view and observation of persons in aircraft lawfully in the public airspace."[32]

However, decades later in 2001, in *Kyllo v. United States*,[33] the Supreme Court reminded us that the Fourth Amendment protects people—not just places—from unreasonable searches and seizures. *Kyllo* involved law enforcement's warrantless use of thermal imaging to detect unusual amounts of heat radiating from the defendant's home, indicating the presence of marijuana. *Kyllo* held that this surveillance violated the Fourth Amendment because the technology was not in widespread use. Currently, *Kyllo* limits the ability of law enforcement to rely on infrared/thermal imaging technology, but because the Court's decision was directly linked to the prevalence of the technology, it's an open question whether the Court's limitation would persist if these technologies went into more "widespread use." As one scholar put it, "the test seems to turn on whether

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30 476 U.S. at 215.

31 488 U.S. at 450-51.

32 476 U.S. at 239.

33 553 U.S. 27 (2001).

Wal-Mart sells it or not."[34] Such a question would most likely be tested in a criminal context, where the prosecution seeks to admit evidence obtained through the use of these technologies.

Finally, just last year, in *United States v. Jones*,[35] the Supreme Court held that the installation of a GPS tracking device on a suspect's car for eight days constituted a search under the Fourth Amendment. Although *Jones* did not deal with aerial surveillance, the Court held that the placement of the device was a physical intrusion onto private property for the purposes of obtaining information, as well as the extended monitoring of a person in a public space, both of which constituted a Fourth Amendment "search." Some scholars have predicted that one potential result of *Jones* is that extended UAS surveillance could constitute a search within the meaning of the Fourth Amendment.[36]

It is clear from a review of the scholarship and the limited case law that the rate of advancement of these technologies often outpaces the ability of courts to rule upon the validity of their use under the Fourth Amendment. The overall conclusion so far is that aerial surveillance by any method, at a legal altitude, is constitutional if the technology is in general public use and does not trespass upon private property for extended periods of time. Still, the legal landscape has been characterized as "an aeronautical Wild West," and the current regulatory scheme as "inadequate to deal with the novel issues raised" by the use of UAS, particularly by law enforcement.[37]

In Alaska, we must consider an additional important factor: Article I, section 22 of the Alaska Constitution guarantees an explicit individual right to privacy. There is no state case law interpreting this clause (or any part of the state constitution) in the context of UAS. However, it is highly possible that the Alaska Supreme Court would interpret the right in favor of the individual asserting it as opposed to deferring to the government. For example, our Supreme Court has interpreted the privacy clause to create a constitutional right to privacy in garbage placed for collection, which contrasts with both state and

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34 Vacek, *supra* note 18, at 683.

35 132 S. Ct. 945 (2012).

36 Kapnik, *supra* note 9, at 495.

37 Vacek, *supra* note 18, at 675-77.

federal case law on the Fourth Amendment.[38] The take-away point here is that government conduct that complies with the Fourth Amendment under either the state or federal constitution could *nonetheless* violate the state constitutional right to privacy. And in 2002, at least one member of the Alaska Court of Appeals, albeit in a concurring and unreported opinion, expressed constitutional skepticism at law enforcement's surreptitious use of infrared helicopter technology of the type prohibited under *Kyllo* the year before.[39]

B. The First Amendment & individual privacy.

In addition to the Fourth Amendment implications of government-operated UAS, these vehicles may also implicate the First Amendment rights of private citizens to collect and gather information. One scholar has recently addressed this issue, noting that for private entities and persons not bound by the Fourth Amendment, the key constitutional question is the extent of these persons' First Amendment right to access information.[40] The Supreme Court long ago held that the First Amendment protects the act of seeking out news, otherwise "freedom of the press could be eviscerated."[41] And at least one circuit court of appeals has recently held that the First Amendment permits a private citizen to record the actions of people in a public space.[42] Congress could potentially enact laws to protect individuals from intrusive UAS surveillance by private actors, which would be considered in a First Amendment context of the right to gather and receive information.[43] Such bills have been introduced, but none have yet been enacted.[44] Because the civilian use of UAS is nascent, and there is no controlling Supreme Court

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38 *Cf. Beltz v. State*, 221 P.3d 328 (Alaska 2009) and *California v. Greenwood*, 486 U.S. 35 (1988).

39 *See Johnston v. State*, 2002 WL 563609 (April 17, 2002) (Mannheimer, J., concurring) (unpublished opinion).

40 Villasenor, *supra* note 2, at 498.

41 *Branzburg v. Hayes*, 408 U.S. 665, 681 (1972).

42 *Glik v. Cunniffe*, 655 F.3d 78, 82 (1st Cir. 2011).

43 *See* Integration of Drones into Domestic Airspace: Selected Legal Issues, Congressional Research Service, CRS Report for Congress (April 4, 2013).

44 *Id.*

case law, it remains to be seen how far First Amendment protections will extend in this area.

The privacy rights of individuals and businesses exist in perpetual tension with the First Amendment rights of non-government actors to gather information, and that tension could give rise to actionable claims for privacy violations. Common law invasions of privacy could occur if UAS use "intrudes upon seclusion" in the home or results in the "publication of private facts," which are the two main categories of invasion of privacy claims. Intrusion upon seclusion occurs where the intrusion was intentional and would be highly offensive to a reasonable person.[45] A publication of private facts claim could arise where a UAS takes images of private individuals involuntarily caught up in newsworthy events, and those images conveyed facts not previously known to the public.[46] Similarly, the use of UAS could potentially give rise to criminal liability under both federal and state anti-stalking and harassment laws.[47] Finally, UAS could be used by private citizens to investigate or monitor potential health and safety violations by businesses, or engage in corporate espionage. Such conduct raises complex and unanswered questions about a private citizen's right to do under the First Amendment what the government could not do under the Fourth.

In short, the above concepts are nothing new to the First Amendment and privacy arena, but they must and will be revisited in light of UAS enhanced imaging capabilities, ease of use, and ever-increasing availability. As discussed in detail above, the strong privacy protections of the Alaska Constitution make it highly likely that individual privacy rights implicated by UAS will be more zealously legislated and enforced in Alaska than in other jurisdictions.

C. Property rights, & tort liability; nuisance, trespass, & ground damage.

Property owners could potentially file tort claims for nuisance and/or trespass against operators of UAS. According to a preeminent torts treatise, a trespass claim against an aircraft operator is viable only when the aircraft "enters into the immediate reaches of the air space next to the land" and "interferes substantially with . . . the use and

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45 Restatement (Second) of Torts § 625B (1977).

46 Villasenor, *supra* note 2, at 503.

47 *Id.* at 505.

enjoyment" of the property by the landowner."[48] The navigable airspace regulated by the FAA is considered a public highway, but it appears that anywhere between 50 to 150 feet above the property owner could be considered impermissible interference with private property.[49] Accordingly, UAS that operate within this window of airspace could potentially raise trespass claims, and UAS that generate noise, light, pollution, or vibration could lead to viable nuisance claims by homeowners.[50] Additional tort claims could arise if a UAS caused ground damage to personal or real property.

Title 2 of the Alaska Statutes is devoted entirely to the regulation and operation of aircraft ("Aeronautics"). Alaska Statute 02.30.030 provides that "A person may not operate an aircraft in the air or on the ground or water in a careless or reckless manner so as to endanger the property of another." This statute directs the court, when evaluating such claims, to consider "the standards for safe operation of aircraft prescribed by federal statutes or regulations governing aeronautics." The phrase "operate aircraft" is defined in AS 02.30.050 as "to use, navigate, pilot, or taxi an aircraft in the airspace over this state, or upon the land or water inside the state." This chapter does not contain a definition of "aircraft." However, "aircraft" is defined in the general provisions of Title 2 (Alaska Aeronautics Act of 1949) as "a contrivance used or designed for navigation of flight in the air,"[51] which could be read to include UAS, although this definition was enacted prior to the burgeoning use of civilian UAS. Accordingly, I am uncertain whether UAS would fit into the current statutory definition of "aircraft," and therefore I think it's an open question whether a court would find that the foregoing provisions regarding liability for aircraft operation would automatically apply to operation of UAS or whether additional statutory language would be necessary to expand that definition. My instinct is that UAS should be specifically legislated in this manner.

If Alaska chooses to enter this arena by passing laws or regulations, it is advisable for the legislature to also enact a statutory immunity provision. That way, the state may

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48 American Law Institute, Restatement (Second) of Torts § 159 (2009) cmt. i.

49 Rapp, *supra* note 17, at 645 (citing *id.*). See also *United States v. Causby*, 328 U.S. 256 (1946) (rejecting the common law concept that a homeowner owns all the airspace above his property up to the heavens, but rather owns "at least that much space above the ground as he can occupy or use in connection with the land.").

50 *Id.*

51 AS 02.15.260(2).

avoid liability for damages in tort when two private UAS collide and fragments cause damage to people or property. Such immunity clauses are common and can deflect an argument that the state is liable simply because it has chosen to legislate in a particular topic area.[52]

D. Environmental concerns.

Scholars have observed the potential of UAS to generate environmental concerns, which could be starker in Alaska than elsewhere. Alaska is already a hotbed of environmental litigation. Many UAS contain batteries, circuitry, and chemicals that could leach into the ground, and the flight of UAS and the noise they cause could disrupt birds and other wildlife habitats.[53] Environmental groups and private citizens could potentially raise federal claims regarding the operation of UAS under the National Environmental Policy Act, the Endangered Species Act, or the Noise Control Act.[54]

In Alaska, to the extent UAS and the execution of implementing statutes interfere with state fish, wildlife, and waters, the government could be found in violation of the "common use" and "sustained yield" provisions of the Alaska Constitution, which provide, respectively, that the state, fish, wildlife and waters of the state are reserved to the people for their common use and that replenishable resources belonging to the state must be utilized, developed, and maintained according to the sustained yield principle.[55]

E. Communications interference.

UAS also have the potential to interfere with existing civilian communications systems used to operate cell phones, satellite TV signals, and other wireless and telecommunications technology.[56] Further, signal loss between UAS and its ground

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52 *See, e.g.*, AS 09.65.215 (Immunity of peace officer for use of body wire eavesdropping device); AS 09.65.235 (Immunity for negotiated regulation making committee and its members); AS 09.65.250 (Immunity for certain actions related to child support); AS 09.65.330 (Immunity: Use of defensive force).

53 Rapp, *supra* note 17, at 632.

54 *Id.*

55 Alaska Const. art. VIII, §§3, 4.

56 Rapp, *supra* note 17, at 640-41.

control operations could result in a mid-air collision or ground damage.[57] This problem could be somewhat mitigated by the assignation of UAS to specific frequencies once UAS are fully integrated into the national airspace, but the potential for interference still remains.[58]

Under state law, the Department of Transportation and Public Facilities is responsible for supervising, developing, and promoting "aeronautics and communications inside the state . . ."[59] The Department could be held responsible for ensuring, through properly adopted regulations and in conjunction with the federal government, that UAS do not unduly interfere with existing civilian communications systems in the state.

F. Mid-air collisions.

Finally, mid-air collisions of UAS with other aircraft and with each other are always a possibility. Most UAS lack the sophisticated collision avoidance systems required of many manned aircraft, and the absence of an on-board pilot who can physically observe other aircraft exacerbates the risk of a mid-air collision.[60] Furthermore, the "small size and radar profile of [UAS] create significant risk that such craft would damage civilian aircraft, causing both property loss and human casualties."[61]

As described above, individual citizens could file tort claims under state law for damages against operators of UAS or the government associated with such accidents. Collisions and near-collisions have already resulted from the use of UAS at the military level, and the scholarship predicts that "[i]t is hard to imagine widespread integration of [UAS] into populated airspace without some level of air-to-air accidents rising."[62]

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57 *Id.*

58 *Id.*

59 AS 02.10.010(a)-(b).

60 Rapp, *supra* note 17, at 629; 640-41.

61 *Id.*

62 *Id.*

IV. Conclusion.

There are many more questions than answers surrounding the increased civilian use and operation of UAS, because there is no case law that definitively resolves any of the issues discussed above, and there is a regulatory vacuum. Indeed, "[t]he only certain aspect of the debate about unmanned aircraft and privacy is that it will be contentious."[63] However, identifying and analyzing these issues at the executive level is the first step to crafting legislation that attempts to address them. Only when those laws are tested in the courts will we fully come to understand the interplay between the technological advantages offered by UAS, the reach of constitutional protections, and the scope of actionable legal claims.

EMB/tjd

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63 Villasenor, *supra* note 2, at 516.

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June 5, 2013
Mr. Bob Davis
Cadwalader, Wickersham & Taft LLP
700 6th Street, NW, Suite 300
Washington, DC 20001

Dear Mr. Davis:

On behalf of the Airborne Law Enforcement Association (ALEA) and the International Association of Chiefs of Police (IACP) Aviation Committee, we are pleased to submit the following comments regarding the "Privacy Legislation Plan 2013."

To begin, our respective organizations support and promote the IACP Aviation Committee's *Recommended Guidelines for the use of Unmanned Aircraft* (see Exhibit A) and the Association for Unmanned Vehicle Systems International's (AUVSI) *Unmanned Aircraft System Operations Industry "Code of Conduct"* (see Exhibit B). We do not concur with privacy advocates who claim that public safety agencies' utilization of unmanned aerial systems (UAS) poses a greater threat to "privacy rights" than manned aviation. Similarly, we do not concur that said uses pose a greater threat to privacy "rights" than other technologies currently utilized by public safety agencies, both in manned aircraft and on the ground. Furthermore, we do not accept that any legislation is necessary as there are long-standing court rulings upholding our Fourth Amendment protections; but we are particularly opposed to legislation that focus their attention on one technology based on fears of what could occur tomorrow, however unlikely. Aside from recent laws enacted that place outright bans on UAS use, such as that in Charlottesville, VA, many current "anti-drone" bills appear to be more of an attempt to increase protections under the Fourth Amendment without actually altering the U.S. Constitution. The presumption in most of these pieces of legislation is that a reasonable expectation of privacy now exists in places where there has been no such expectation. As such, a warrant must be obtained before UAS can be utilized by public safety.

While U.S. Customs and Border Protection (CBP) has unique operational needs that require larger, longer flight duration aircraft, local, state, and other federal agencies, even if they could afford to acquire and operate similar systems, have no interest in utilizing these types of assets. What they are interested in obtaining are small unmanned aerial systems (sUAS) that are inexpensive, lightweight, portable, and quickly and easily deployable.

sUAS come in two forms: gas powered and battery powered. Within these categories, there are fixed-wing and rotory-wing models. Gas powered sUAS tend to be heavy, loud, and can fly for greater periods of time. Battery powered sUAS are lightweight, relatively quiet, slower, and have short flight durations, especially for the rotory-wing models.

As such, sUAS that are available to public safety, coupled with the Federal Aviation Administration's (FAA) regulations governing the use of UAS by public safety (e.g., cannot exceed 4.4 pounds, cannot exceed 400 feet above ground level (AGL), can only be operated during daylight conditions, and must remain within line of sight of the operator at all times), make this new technology a poor candidate for "spying," as well as for persistent surveillance operations. The fact of the matter is, "spying" and persistent surveillance can be done much more effectively by manned aircraft and ground personnel, than with any sUAS.

With that said, if legislation is to be drafted, we suggest that the following be considered:

1. The courts have determined in their interpretations of Fourth Amendment cases, that citizens have a "reasonable expectation of privacy." Be cognizant that changing the circumstances under which people have reasonable expectations of privacy can have unintended consequences. If a law enforcement agency determined that the use of a sUAS during a public event was necessary to maintain public safety (assuming that such use would even be permissible under FAA rules), but there is a law requiring that a warrant be issued prior to its use in that capacity, the sUAS could not be used because a judge would have no one to write a warrant for. At the same time, law enforcement conducts these operations regularly with manned aircraft. Why? Because the courts have already determined that there is no reasonable expectation of privacy in such a setting. Does it make sense to have a law that creates a different reasonable expectation of privacy for a UAS from anything else? Will we be seeing legislation developed then for cell phones? GPS? Video cameras? Having more than one "reasonable expectation of privacy" standard is unworkable in law enforcement.

2. Concentrate on sensitive data collection, use, distribution, storage, and purging of data and not on the technology that was used to obtain the data originally. If a person's "reasonable expectation of privacy" is violated by an "unreasonable search and seizure," the device used to create that violation, whether it's a global satellite positioning system, computer, cell phone, video pole camera, manned aircraft camera, unmanned aircraft camera, etc., is irrelevant.

3. Legislation needs to focus on the law enforcement agency utilizing sound policy to govern the use of sUAS technology. The policy should be in accordance with the IACP Guidelines; these Guidelines are a solid starting point for the development of policies for the use of sUAS.

We appreciate the opportunity to have input into this process and look forward to participating in the upcoming roundtable meeting in Washington, DC on August 14.

Sincerely,

Stephen J. Ingley
Executive Director
Airborne Law Enforcement Association

Don R. Roby
Captain
Baltimore County Police Department
Chair
IACP Aviation Committee

Cc: ALEA Board of Directors
IACP Aviation Committee

EXHIBIT A

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE

AVIATION COMMITTEE

Recommended Guidelines for the use of Unmanned Aircraft

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of their lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. **Model Aircraft** - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. **Unmanned Aircraft (UA)** – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. **UAS Flight Crewmember** - A pilot, visual observer, payload operator or other person assigned duties for a UAS for the purpose of flight.
4. **Unmanned Aircraft Pilot** - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, the agency will operate the aircraft in full compliance with the mandates of the Constitution, federal, state and local law governing search and seizure.
4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UAS should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.

4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (CAO) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UAS will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training, or demonstration purposes.
4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.

ALEC American Legislative Exchange Council

LIMITED GOVERNMENT • FREE MARKETS • FEDERALISM

Proposal for American Legislative Exchange Council (ALEC)
Unmanned Aerial Vehicle Proposal

Program Objective

The objective of ALEC's Unmanned Aerial Vehicle (UAV) program is to educate our policy makers about the issues surrounding the use of UAVs for domestic purposes. We will inform our state legislator members about considered uses for UAVs in law enforcement, border control, firefighting, search and rescue operations and myriad other uses. We will explore the privacy issues involved and would like to present our members a balanced overview of the topic that addresses some of the misconceptions about UAV capabilities and the benefits of UAV use in the domestic sphere.

Situational Overview

State legislatures are rapidly enacting legislation on domestic UAV use without a complete understanding of the issues involved. As of this writing, 35 states had considered or were considering legislation, including Virginia which passed legislation restricting the use of UAVs, including a two-year moratorium on using UAVs except in university research and search and rescue missions.

State legislators are concerned that UAV surveillance could threaten the civil liberties, especially the privacy of their constituents, so the trend in the legislatures is to err on the side of highly restrictive regulations. Unfortunately, these restrictions might ultimately prevent civilian institutions from taking advantage of UAVs as a cost-effective tool to perform their duties more efficiently during a time of shrinking state budgets. In many cases, ALEC legislators are spearheading these restrictive policies, often due to an incomplete understanding of the issues involved and UAV capabilities.

If misconceptions are not corrected in the immediate future, misguided policy will continue to proliferate throughout state legislatures, and this policy is likely to inform future *national* policy on the domestic use of UAVs. As appropriate UAV implementation could help states meet their public safety objectives in a fiscally responsible way, we would like to see the issues surrounding their use explored in a complete and objective manner.

Program Description

A two-pronged approach would be the most effective way to deal with the issue.

ALEC International Relations Task Force (IRTF) Membership

Model policy on the domestic use of UAVs falls under the jurisdiction of ALEC's International Relations Task Force/National Security Subcommittee, and we anticipate that the task force will consider such policy in the very near future. Issues that capture our members' attention the way this one has are generally brought to ALEC. ALEC task force membership would afford the member

the opportunity to participate in the discussions on the model policy and to inform and enrich the debate. The IRTF is relatively small (well over 100 legislators and 6 private sector members) and has the flexibility to consider and vote on model policy for domestic UAV use rapidly. If this policy is passed within the task force and approved by ALEC's Legislative Board of Directors, it becomes official ALEC model policy and can be accessed by all of our state legislators. Other issues that the task force has explored and continues to discuss include Sequestration, Civilian/Commercial Applications for NASA Research, Sustainable Energy Best Practices in the Military and Overseas, H1B visa expansion, Earth Observation, Expanding the Commercial Marketplace for Space Launches, etc.

The issue of our bimonthly magazine *Inside ALEC* that will be distributed at our Annual Meeting in August 2013 in Chicago will focus on International and Energy issues. An article on domestic uses for UAVs would be a welcome addition to the magazine and would automatically be distributed to those in attendance at the meeting – roughly 1,000 state legislators as well as 1,000 policy and business leaders from across the country. Such distribution would give the issue a deserved spotlight. An article in ALEC's blog, *The American Legislator*, could appear before the Annual Meeting.

UAV Educational Sponsorship Opportunity at ALEC Spring Task Force Summit
ALEC's Communications and Technology Task Force will host a panel discussion/lunch to explore the domestic uses of UAVs at ALEC's Spring Task Force Summit on May 3 in Oklahoma City, OK. We expect 30-40 state legislators to attend. Two speakers who favor more restrictions on the use of UAVs have already been confirmed – Jim Harper a noted privacy expert from the Cato Institute and Ryan Kiesel a noted privacy advocate from the American Civil Liberties Union (ACLU). Both will thoroughly cover the privacy challenges UAV technology poses. This will be our members' first exposure to this issue at an ALEC event, and ALEC wants to ensure that we approach the issue in a balanced fashion. We will have presenters who will emphasize some of the benefits of the domestic uses of UAVs, and the sponsor would be able to select two presenters that would offer this point of view. We would also ask the additional panelists to address the general aviation challenges facing domestic UAVs. We would provide travel expenses for four additional ALEC public sector members from the International Relations Task Force to attend and/or moderate the panel from select states currently considering UAV policy.

Annual Meeting Workshop Sponsorship
This year's Annual Meeting will take place in Chicago, IL August 7-10, 2013 where we expect roughly 2,000 state legislators, policy experts and business leaders to be in attendance. Workshops are panel discussions open to all attendees at our Annual Meeting, and we are confident that a panel discussion on the domestic uses of UAVs would be exceedingly popular. We also have workshop sponsorships at our States and Nation Policy Summit in early December 2013 which generally has attendance of 700-800 state legislators, policy experts and business leaders.

<u>Additional Thoughts</u>
This is a timely issue where our members need a better understanding to make informed decisions. However, this topic is also an excellent opportunity to introduce the concept of civilian applications for products that were originally intended for military and/or space applications and to highlight the critical role that public private partnerships in research play in innovation and economic growth.

AUVSI
ASSOCIATION FOR UNMANNED EHICLE SYSTEMS INTERNATIONAL

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1 June 2013

COMMENTS OF THE ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL ON THE AEROSPACE STATES ASSOCIATION SUGGESTED PRIVACY LEGISLATION PLAN 2013

I. Executive Summary

The Association for Unmanned Vehicle Systems International (AUVSI)[1] supports the expanded use of unmanned aircraft systems (UAS) and encourages open discussion of privacy concerns and proposed changes to existing rules, regulations, and laws. These discussions should occur concurrently with the integration of UAS into the National Airspace System (NAS)[2] in order to fully realize the benefits of rapidly advancing UAS technology and so that a greater understanding of UAS technology's potential can be achieved. Enactment of legislation now – before sufficient experience with integration of UAS into the NAS exists – is premature, and will hinder the creation and development of this new industry. Barring unnecessary delays, AUVSI estimates that this new industry is poised to create over 70,000 new jobs and $13.6 billion in economic impact within the first three years of integration alone.[3]

New legislation at the federal or state level that is not technology neutral or that is inconsistent with existing privacy rules, regulations, and laws would stifle innovation and cause delay, and may prevent or discourage the use of UAS by public safety agencies and other potential users. Fourth Amendment jurisprudence, existing federal and state privacy laws, and comprehensive Federal Aviation Administration (FAA) regulations already provide extensive guidance that would allow for initial integration of UAS operations. The FAA, for example, has taken steps to address privacy concerns relating to the use of UAS at test sites, which will help gather knowledge and best practices about UAS operations. If the FAA completes its required and pending rulemaking activities for UAS integration, there will be ample opportunities for multi-stakeholder input.

II. Existing Fourth Amendment Protections

The Fourth Amendment and related case law already governs UAS operations by government users, ensures accountability, and guides the use of aircraft in which the cockpit and pilot are on the ground. Federal, state, and local government agents must obtain search warrants when their use of any technology, including UAS, may violate an individual's reasonable expectation of privacy protected by the Fourth Amendment.[4] These protections are well-established and address many different privacy concerns relating to government adoption and use of advancing technologies, such as UAS. For more than 220 years, the Fourth Amendment has been applied to new technologies used in warrantless

[1] AUVSI – the world's largest non-profit organization dedicated to the advancement of unmanned systems – represents more than 7,000 members from 55 allied countries and 2,500 organizations involved in fields of government, industry and academia.

[2] The FAA Modernization and Reform Act of 2012 requires FAA to safely integrate UAS into the NAS by September 2015, and mandates, among other things, the creation of UAS test sites and rulemaking proceedings addressing the integration of civil UAS operations. P.L. 112-95, §§ 331-334, 126 Stat. 11, 72-77 (2012).

[3] AUVSI, *The Economic Impact of Unmanned Aircraft Systems Integration in the United States* (Mar. 2013), at 2, http://www.auvsi.org/econreport.

[4] *See Katz v. United States*, 389 U.S. 347 (1967).

observations – including several Supreme Court decisions on aerial observations[5] and, more recently, thermal imaging[6] and GPS technologies[7] – and it will continue to be applied to UAS and other future technologies that have not yet been invented. The Court, in a 2013 decision, held that law enforcement use of a highly-trained drug sniffing dog, roaming outside a home, was "an unlicensed physical intrusion" distinguishable from "Girl Scouts and trick-or-treaters," and was thus an unreasonable search.[8] UAS technology is not so distinct from other advanced technologies as to require supplemental legislation.[9] On the contrary, UAS-specific legislation and laws may have unintended effects, including confusing and complicating the application of existing search warrant requirements[10] that have been carefully developed over two centuries.

AUVSI strongly supports the International Association of Chiefs of Police (IACP) recommended guidelines for UAS operations and associated data collection,[11] which the Airborne Law Enforcement Association (ALEA)[12] and others have adopted and even the American Civil Liberties Union (ACLU) has praised.[13] Like IACP, AUVSI recognizes the "proven effectiveness" of UAS and that the "potential benefits [to public safety] are irrefutable."[14] AUVSI opposes any legislation that hamstrings first-responders.

III. FAA's Approach to Privacy and Rulemaking

The Congressionally-mandated FAA rulemaking processes for the integration of small UAS (sUAS) will provide ample opportunities for the public to comment on privacy issues relating to UAS operations.[15] Unlike government operators, who are permitted to operate UAS, albeit through a cumbersome process,[16] civilian operators have no practical, legal means of doing so until the FAA

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[5] *See Florida v. Riley*, 488 U.S. 445 (1989) (naked-eye observations through greenhouse roof from helicopter at 400 feet not an unreasonable search); *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986) (precision aerial photographs of industrial complex from 1,200-12,000 feet not a prohibited search); *California v. Ciraolo*, 476 U.S. 207 (1986) (no reasonable expectation of privacy from naked-eye observations of yard from fixed-wing aircraft flying at 1,000 feet).

[6] *See Kyllo v. United States*, 533 U.S. 27 (2001) (warrantless use of thermal imaging device to see heat emanating from inside home deemed an unreasonable search).

[7] *See United States v. Jones*, 132 S. Ct. 945 (2012) (month-long tracking with GPS required a warrant).

[8] *Florida v. Jardines*, 133 S.Ct. 1409, 1415 (2013).

[9] "In combination, however, [the *Ciraolo, Riley, Dow Chemical, Kyllo and Jones*] rulings indicate that the Fourth Amendment is likely to provide significantly more protection from government UAS observations than is commonly assumed." John Villasenor, *Observations from Above: Unmanned Aircraft Systems and Privacy*, 36 HARV. J.L. & PUB. POL'Y 457, 516 (2013).

[10] *See* Richard M. Thompson II, CONG. RESEARCH SERV., R42701, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses* (Apr. 3, 2013), at 18-21 (reviewing several bills that "establish arguably greater constraints on [UAS] usage than the Fourth Amendment requires." *Id.* at 18).

[11] IACP, *Recommended Guidelines for the Use of Unmanned Aircraft* (Aug. 2012) ("IACP Guidelines").

[12] ALEA, *Resolution in Support of the International Association of Chiefs of Police Aviation Committee's Recommended Guidelines for the Use of Unmanned Aircraft* (Aug. 29, 2012), http://www.alea.org/assets/cms/files/Resolutions/In%20Support%20of%20UAS%20Guidelines.pdf.

[13] *See* Jay Stanley, *Police Chiefs Issue Recommendations on Drones: A Look at How they Measure Up*, ACLU (Aug. 17, 2012, 9:39 AM), http://www.aclu.org/blog/technology-and-liberty/police-chiefs-issue-recommendations-drones-look-how-they-measure.

[14] IACP Guidelines, at 1. What appears to be the first documented instance of a human life being saved with a UAS occurred in Canada earlier this year. *See Single Vehicle Rollover - Saskatoon RCMP Search for Injured Driver with Unmanned Aerial Vehicle,* ROYAL CANADIAN MOUNTED POLICE (May 9, 2013), http://www.rcmp-grc.gc.ca/sk/news-nouvelle/video-gallery/video-pages/search-rescue-eng.htm. It will certainly not be the last.

[15] P.L. 112-95, § 332 (requiring the sUAS and integration final rules by August 14, 2014 and December 14, 2015, respectively).

[16] FAA, *Unmanned Aircraft Systems (UAS): Certifications and Authorizations*, http://www.faa.gov/about/initiatives/uas/cert/; *see also* Felicity Barringer, *F.A.A.'s Concerns Hold Up Use of Wildfire Drones*, N.Y. TIMES (May 21, 2013), http://www.nytimes.com/2013/05/22/us/faas-concerns-hold-up-use-of-wildfire-

completes its legally required, and long-delayed, rulemakings.[17] Recognizing the importance of addressing privacy concerns, the FAA has taken extraordinary measures to permit public participation in determining the privacy policies that will govern UAS test sites – the agency's first major step toward integration.[18] Indeed, FAA "aim[ed] to assure maximum transparency of privacy policies associated with UAS test site operations in order to engage all stakeholders in discussion about which privacy issues are raised by UAS operations and how law, public policy, and operators should respond to those issues in the long run."[19] Rather than passing uninformed[20] and potentially unenforceable[21] legislation now, Congress and state lawmakers should wait for the FAA to complete its rulemaking processes.

The FAA's primary mission is, and must remain, aviation safety. Still, insofar as privacy issues are inextricably linked to the agency's creation of a regulatory framework for the integration and operation of UAS, the FAA rulemaking process is the appropriate forum to address privacy concerns. The FAA has properly recognized the role that federal and state law enforcement agencies play in enforcing laws regarding the protection of an individual's right to privacy, as well as its complementary authority to revoke or suspend a UAS operator's license. Like the Fourth Amendment jurisprudence applicable to public UAS operators, analogous state laws relevant to civil operators that "address trespass, invasion of privacy, harassment, and stalking [are] well established."[22] AUVSI supports the FAA's position that Fair Information Practice Principles (FIPPs) should inform UAS privacy policies on the collection, storage, and use of data.[23] Clearly, the registration of certain UAS and pilots with the FAA, the equipage of UAS with identification/position broadcast capability, and the guidelines set forth in AUVSI's UAS Operations Code of Conduct[24] could all contribute to the creation of an overall approach to managing privacy concerns. FAA rulemaking proceedings are the proper forum to address all of these important considerations.

IV. Conclusion

AUVSI supports the integration of UAS into the NAS in a safe and responsible manner, while safeguarding the existing right to privacy and ensuring transparency and accountability. Existing federal and state privacy protections should extend to the operations of UAS, just as they do to the operations of any other advanced technology. But before consideration of any supplemental technology neutral privacy legislation, the FAA should be allowed to gain experience through the UAS test site program and to then complete the well-established regulatory processes for UAS integration that Congress has already mandated. Fourth Amendment jurisprudence, federal and state privacy protections, and other existing laws and regulations are sufficiently robust to guide this effort.

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drones.html?_r=0.

[17] *See* Alissa M. Dolan and Richard M. Thompson II, CONG. RESEARCH SERV., R42940, *Integration of Drones into Domestic Airspace: Selected Legal Issues* (Apr. 4, 2013), at 4 (internal citations omitted). Indeed, the FAA's sUAS notice of proposed rulemaking has already been delayed more than two years beyond the agency's initially projected publication date of March 10, 2011. DEPT. TRANSP., *Report on DOT Significant Rulemakings* (May 10, 2013), at 13.

[18] *See* Unmanned Aircraft Test Site Program, 78 Fed. Reg. 12,259 (Feb. 22, 2013); *see also* FAA, *Transcript of Online Session on UAS Test Site Privacy Policy* (Apr. 3, 2013), http://www.faa.gov/about/initiatives/uas/media/UAStranscription.pdf.

[19] 78 Fed. Reg. at 12,260.

[20] *See supra* note 9, at 517 (contrasting UAS with other emerging technologies in that the focus on privacy concerns has come before the benefits are widely recognized).

[21] *See supra* note 17, at 27-29 (noting that state and local regulation of UAS may be subject to challenge on federal preemption grounds).

[22] *See supra* note 9, at 514.

[23] 78 Fed. Reg. at 12,260.

[24] http://www.auvsi.org/conduct.

AUVSI
ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

Unmanned Aircraft System Operations

Industry "Code of Conduct"

The emergence of unmanned aircraft systems (UAS) as a resource for a wide variety of public and private applications quite possibly represents one of the most significant advancements to aviation, the scientific community, and public service since the beginning of flight. Rapid advancements in the technology have presented unique challenges and opportunities to the growing UAS industry and to those who support it. The nature of UAS and the environments which they operate, when not managed properly, can and will create issues that need to be addressed. The future of UAS will be linked to the responsible and safe use of these systems. Our industry has an obligation to conduct our operations in a safe manner that minimizes risk and instills confidence in our systems.

For this reason, the Association for Unmanned Vehicle Systems International (AUVSI), offers this Code of Conduct on behalf of the UAS industry for UAS operation. This code is intended to provide our members, and those who design, test, and operate UAS for public and civil use, a set of guidelines and recommendations for safe, non-intrusive operations. Acceptance and adherence to this code will contribute to safety and professionalism and will accelerate public confidence in these systems.

The code is built on three specific themes: Safety, Professionalism, and Respect. Each theme and its associated recommendations represent a "common sense" approach to UAS operations and address many of the concerns expressed by the public and regulators. This code is meant to provide UAS industry manufacturers and users a convenient checklist for operations and a means to demonstrate their obligation to supporting the growth of our industry in a safe and responsible manner. By adopting this Code, UAS industry manufacturers and users commit to the following:

Safety

- We will not operate UAS in a manner that presents undue risk to persons or property on the surface or in the air.
- We will ensure UAS will be piloted by individuals who are properly trained and competent to operate the vehicle or its systems.
- We will ensure UAS flights will be conducted only after a thorough assessment of risks associated with the activity. This risks assessment will include, but is not limited to:
    - Weather conditions relative to the performance capability of the system

- Identification of normally anticipated failure modes (lost link, power plant failures, loss of control, etc) and consequences of the failures
- Crew fitness for flight operations
- Overlying airspace, compliance with aviation regulations as appropriate to the operation, and off-nominal procedures
- Communication, command, control, and payload frequency spectrum requirements
- Reliability, performance, and airworthiness to established standards

Professionalism

- We will comply with all federal, state, and local laws, ordinances, covenants, and restrictions as they relate to UAS operations.
- We will operate our systems as responsible members of the aviation community.
- We will be responsive to the needs of the public.
- We will cooperate fully with federal, state, and local authorities in response to emergency deployments, mishap investigations, and media relations.
- We will establish contingency plans for all anticipated off-nominal events and share them openly with all appropriate authorities.

Respect

- We will respect the rights of other users of the airspace.
- We will respect the privacy of individuals.
- We will respect the concerns of the public as they relate to unmanned aircraft operations.
- We will support improving public awareness and education on the operation of UAS.

As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct.

ELECTRONIC FRONTIER FOUNDATION
Protecting Rights and Promoting Freedom on the Electronic Frontier

May 31, 2013

Mr. Robert Davis
Cadwalader, Wickersham & Taft LLP
700 6th Street, NW, Suite 300,
Washington, DC 20001

Lt. Gov. Mead Treadwell
The Aerospace States Association
107 S. West Street, Suite 510
Alexandria, VA 22314

Dear Mr. Davis and Lieutenant Governor Treadwell,

Thank you for the invitation to participate in the Aerospace States Association's efforts to draft model privacy legislation to regulate unmanned aerial systems (UAS).

EFF is a non-profit organization that has worked for more than 20 years to protect civil liberties, privacy, consumer interests, and innovation in new technologies. Our organization has, for the last few years, been extensively involved in privacy and civil liberties issues raised by unmanned aircraft (UA),[1] commonly referred to as drones. This work has included consulting with state and federal legislators on legislation that would place appropriate limits on law enforcement's abilities to use drones for surveillance; commenting on government and private use of drones on EFF's website, in the press, and in other public fora; and obtaining, reporting on and making accessible to the public drone authorization records received from the FAA pursuant to the Freedom of Information Act.[2]

Legislation regulating drone use to protect privacy must, at a minimum, address three main points:

1. Law enforcement use of drones requires a warrant;
2. Commercial drone use must be subject to privacy protections and reporting requirements;
3. Regulations on private and media use of drones must strike an appropriate balance between the First Amendment and privacy.

Law Enforcement Drone Use Requires a Warrant
UAS have the potential to fundamentally change the nature of policing in the United States. The technological advances in surveillance provided by drones may provide important benefits to law enforcement. For example, drones could be employed in dangerous situations to avoid risk of harm to an officer or to search in areas challenging to traverse. Drones will also make aerial surveillance much less costly for cash-strapped law enforcement agencies.

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[1] For links to EFF's drone-related work, s*ee generally Drone Flights in the U.S.,* EFF.org, https://www.eff.org/foia/faa-drone-authorizations.

[2] *See* Jennifer Lynch, *Are Drones Watching You?*, EFF.org (Jan. 10, 2012) https://www.eff.org/deeplinks/2012/01/drones-are-watching-you.

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However, these same advances will also present significant privacy and civil liberties risks. UAS are capable of highly advanced and near-constant surveillance through live-feed video cameras, thermal imaging, communications intercept capabilities, and backend software tools such as license plate recognition, GPS tracking, and facial recognition. They can amass large amounts of data on private citizens, which can then be linked to data collected by the government and private companies in other contexts. Without strong limitations on how this sophisticated technology can be used, we risk a society where we may all be subject to government surveillance at any time.

For this reason, any legislation regulating law enforcement UAS use must require that officers obtain a warrant based on probable cause before using the UAS for criminal investigations. Such a warrant must have limitations on duration and content recorded, much like a wiretap order does today,[3] and must apply whether the drone flies over private or public space.[4] The warrant requirement must also apply when law enforcement seeks access to data gathered by a drone that is owned or flown by a separate entity, whether that entity is a private party, commercial entity or another public agency.[5]

The warrant requirement can only be subject to limited exceptions for emergency situations such as imminent threats to life or of great bodily harm and only where a warrant could have been obtained but for the time constraints of the situation. And legislation establishing a warrant requirement must have a meaningful enforcement mechanism that allows persons subject to drone surveillance to move to suppress the evidence in any case brought against them.

Commercial Drone Use Must Be Subject to Privacy Protections and Reporting Requirements

Congress has mandated that by 2015, the skies will be open to commercial drone flights.[6] In fact, the FAA has predicted that, in addition to the hundreds of drones currently used domestically by the military and law enforcement, there will be roughly 10,000 commercial drones flying in the US skies in just five years.[7] In reality, many small drone operators are already flying UAVs for

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[3] *See, e.g., Berger v. New York*, 388 U.S. 41 (1967) (describing particularity requirements for wiretap warrants). In *Berger*, the Supreme Court indicated that the Fourth Amendment triggers heightened scrutiny when surveillance is undertaken as "a series or a continuous surveillance" rather than as "one limited intrusion." *See id.* at 57. Therefore, a statute that regulates "a series or a continuous surveillance" must include special privacy protections or risk invalidity under the Fourth Amendment. *See id.* at 56.

[4] *See, e.g., U.S. v. Jones*, 132 S.Ct. 945 (2012) (Alito, J., concurring; Sotomayor, J. concurring) In *Jones*, which held law enforcement must get a warrant before affixing a GPS tracking device to a car, five justices took issue with the pervasive nature of surveillance possible with the device, even though the device tracked travel that occurred in public.

[5] Legislatures must also establish laws limiting the use of drones by non-law enforcement public agencies such as departments of forestry or agriculture. These should include requirements that images, footage or data pertaining to humans obtained by a public agency should not be disseminated outside the collecting agency and should not be used for purposes other than that for which it was collected. And all public agencies, including law enforcement, should be subject to annual reporting requirements to the public on any UAV purchases and how UAVs have been used.

[6] *See* FAA Modernization and Reform Act of 2012, Pub. L. 112–95.

[7] *FAA Aerospace Forecast Fiscal Years 2012-2032: Unmanned Aircraft Systems, available at* http://www.faa.gov/about/office_org/headquarters_offices/apl/aviation_forecasts/aerospace_forecasts/2012-2032/media/Unmanned%20Aircraft%20Systems.pdf.

commercial purposes.[8]

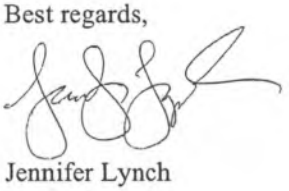
For these reasons, it is critical that legislatures enact laws establishing privacy protections for commercial drone flights. These laws should set out standards that limit the collection, use, sharing, retention and disclosure of data gathered by UAVs. They should also include requirements that the commercial entity establish notice procedures on the type of data gathered by a UAV, how it's gathered and for what purpose, as well as the location the UAV is flown, how long data is retained, with whom it's shared, and how it's disclosed.[9]

Balancing the First Amendment and Privacy in Private and Media Use of Drones
Regulations on private and media use of drones need to strike a balance between protecting privacy and not hampering First Amendment protected speech and associated activities.

As UAV use becomes more prevalent throughout society, private parties and the media will likely also want to fly UAVs for their own and for newsgathering purposes. Some of these activities might include using a UAV to report on a public figure, to monitor law enforcement activities at a political rally, or to record the aftermath of a natural disaster in an urban area. Each of these may impact privacy interests—of the public figure, of the police officer, or of the victims of the natural disaster—but also involve First Amendment-protected activities.[10] For this reason, any law designed to protect privacy must be sufficiently cabined to provide room for these activities. Acceptable limitations could include, for example, duration limits (such as limitations on how long a drone may be used to monitor a specific person), location limits (such as restrictions on monitoring of private spaces like a home or backyard) or could require a finding that the monitoring impinges on an objectively reasonable privacy interest, is highly offensive to a reasonable person, and causes emotional distress.

Conclusion
EFF welcomes the ASA's efforts to craft model legislation to regulate public and private drone use. Please let me know if I can answer any questions or provide further information.

Best regards,



Jennifer Lynch
Staff Attorney
Electronic Frontier Foundation

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[8] *See, e.g.,* Chris Francescani, *From Hollywood to Kansas, Drones are Flying Under the Radar*, Reuters (Mar 3, 2013) http://www.reuters.com/article/2013/03/03/us-usa-drones-domestic-idUSBRE92206M20130303.

[9] *See, e.g.,* Drone Aircraft Privacy and Transparency Act of 2013, H.R. 1262, 113th Cong. 1st Sess. (1st Sess. 2013) § 339 (b).

[10] For more information, *see, e.g.,* Bill Kenworthy, *Photography & the First Amendment*, First Amendment Center (Jan. 1, 2012), http://www.firstamendmentcenter.org/photography-the-first-amendment; Alissa Dolan & Richard Thompson, *Integration of Drones into Domestic Airspace: Selected Legal Issues*, 17-19, Congressional Research Service (Apr. 4, 2013) *available at* http://www.fas.org/sgp/crs/natsec/R42940.pdf.

epic.org

ELECTRONIC PRIVACY INFORMATION CENTER

Statement of

Amie Stepanovich, Director
EPIC Domestic Surveillance Project[1]

for the

Aerospace States Association

regarding

Privacy Legislation Plan 2013

May 31, 2013

On February 14, 2012, President Barack Obama signed the Federal Aviation Administration Reauthorization Act of 2012 ("FAA Act"). The Act provided for funding for the Federal Aviation Administration ("FAA"), advanced the Next Generation Air Transportation System ("NextGen"), and implemented several other aviation-related provisions to increase air traffic safety and reduce accidents.

The FAA Act also provided for the increased and expedited licensing of drones within the United States National Airspace System ("NAS"). Prior to the FAA Act, drones licenses were uncommon, and could only be obtained by a government entity, or, even more rare, by a private entity with an "experimental" limitation. Less than seven formatted pages in length, the relevant sections of the FAA Act fail to address many of the problems inherent in increased domestic drone use. The most significant of these issues is that of privacy.

There are significant privacy concerns involved in the use of drones over domestic soil. Drones are uniquely designed to carry invasive technology that may potentially erode the rights of individuals in the United States to be free of government surveillance under the Fourth Amendment of the Constitution. In addition, drones operated by private entities open new doors to spying, harassment,

[1] EPIC law clerks Adam Marshall and Heather Nodler helped with the drafting of this statement.

and stalking that are not addressed under current law. Finally, the failure of the FAA to implement a drone licensing system that implements the principles of transparency and public access means that many of these intrusions into our private lives will go unnoticed and undocumented.

EPIC'S PETITION TO THE FEDERAL AVIATION ADMINISTRATION

In February 2012, EPIC, joined by over 100 organizations, experts, and members of the public, petitioned the FAA to consider privacy as a key factor in its efforts to streamline and increase drone licensing in the United States. The FAA responded to EPIC's petition in February 2013 and agreed to make privacy a primary factor in its selection of six nationwide test sites for drones in the United States. The FAA requested public comment on its proposed privacy policy and guidelines for these test sites. In response, EPIC asked the FAA to maintain a public database for drone operators, including their geographic area of operation and the surveillance equipment that the drone will carry. EPIC also asked that the FAA implement data collection and retention policies to ensure public notice of domestic drone surveillance operations.

The FAA's actions indicate that the Agency has recognized that new protections are necessary to remedy the privacy threats proposed by drone surveillance. Effective solutions require affirmative action not only from the FAA, but also from other federal agencies and law enforcement bureaus seeking to operate drones domestically, state and local governments, and Congress.

DEVELOPMENTS IN THE STATES

There has been a recent surge in state drone legislation. In total, 43 states have introduced laws that relate to drone surveillance and privacy. Governors of six of these states have now signed measures into law, including Florida, Idaho, Montana, North Dakota, Tennessee, and Virginia. Moreover, six additional states have adopted resolutions on drones: Alabama, Alaska, Idaho, Indiana, Nevada, and Pennsylvania. A drone law in Texas has passed both chambers and awaits the Governor's signature.

The laws in Florida, Tennessee, and Idaho define what drones are and restrict drone use by law enforcement. They require either a warrant or an emergency situation. In Idaho, the law also allows drone use with reasonable suspicion of criminal conduct. The proposed Texas law details numerous situations in which law enforcement may use drones, with and without a warrant. The laws in Florida, Tennessee, and Montana limit the admissibility of evidence obtained by drones, with the standard varying from requiring a warrant to reasonable suspicion.

The law passed in Idaho and the proposed Texas laws restrict private drone use. The Texas draft law carves out numerous exceptions for both public and private use, including border security, mapping, scholarly research, real estate brokerage,

and maintenance of utilities. The laws in Florida, Tennessee, Montana, Virginia, and North Dakota place no restrictions on private use.

The laws in Florida, Idaho, Tennessee, and Texas are written to provide remedies for parties harmed by improper drone use.

In April 2013, Virginia passed legislation prohibiting the use of drones by state agencies dealing with law enforcement or regulatory violations. There are exceptions for Amber and Blue Alerts, search and rescue operations, and uses by the National Guard and educational institutions. The ban lasts until July 2015. In the interim, state agencies have been asked to develop model protocols for drone use. The Alaska and Indiana legislatures have also adopted resolutions calling for the creation of drone task forces to study and make recommendations on their use.

A bill in North Dakota was recently sent to the Governor that would apportion one million dollars to pursue having the FAA designation as a drone test site, and an additional four million in operations funds if it is chosen.

EPIC'S RECOMMENDATIONS TO CONGRESS

In testimony before the Senate Judiciary Committee in 2013, EPIC proposed numerous recommendations for protections that Congress could adopt in order to build privacy protections in to U.S. drone operations. These recommendations include:

- A requirement for drone operators to submit detailed public reports on drones' intended use. Issuance of a license should be contingent on the completion of this reporting, and a privacy right of action and other penalties should ensure that the operators' behaviour complies with the representations made in the report;

- Warrant requirements for law enforcement use of drones, with narrow exemptions for exigent circumstances. The use of drones by law enforcement should be subject to mandatory public reporting requirements, such as those found in the Wiretap Act;

- A prohibition on broad and untargeted drone surveillance by law enforcement;

- A federal Peeping Tom statute, recognizing the enhanced capabilities of aerial drones, should be implemented in order to provide baseline privacy protections for individuals in the home;

- Random independent audits and third-party oversight should be mandated for all drone operators within the United States.

As drone surveillance technology continues to leap ahead, the United States needs to be ready with accompanying measures to ensure that individual rights are not eroded. EPIC looks forward to participating in a public conversation about how to best protect privacy and civil liberties in the development and sue of drones throughout the Country.

RESOURCES

- EPIC, *Domestic Unmanned Aerial Vehicles (UAVs) and Drones*, http://epic.org/privacy/drones/.

- EPIC Spotlight on Surveillance, *"Unmanned Planes Offer New Opportunities for Clandestine Government Tracking"* (Aug. 2005), http://epic.org/privacy/surveillance/spotlight/0805/.

- EPIC, *Comments to the Federal Aviation Administration of the Department of Transportation* (April 23, 2013), http://epic.org/privacy/drones/EPIC-Drones-Comments-2013.pdf.

- EPIC, *Comments to the Federal Aviation Administration of the Department of Transportation* (May 8, 2012), http://epic.org/apa/comments/EPIC-FAA-2012-0252.pdf.

- *Hearing on "Using Unmanned Arial Systems Within the Homeland: Security Game Changer?" Before the Subcomm. on Oversight, Investigations, and Management of the H. Comm. on Homeland Security*, 112th Cong. (2012) (statement of Amie Stepanovich, Associate Litigation Counsel, Electronic Privacy Information Center), *available at* http://epic.org/privacy/testimony/EPIC-Drone-Testimony-7-12.pdf.

- *Field Forum on the Impact of Domestic Use of Drone Technology on Privacy and Constitutional Rights of All Americans, Sanctioned by the Subcomm. on Crime, Terrorism, and Homeland Security of the H. Comm. on the Judiciary*, 112th Cong. (2012) (statement of Amie Stepanovich, Associate Litigation Counsel, Electronic Privacy Information Center), *available at* http://epic.org/privacy/drones/EPIC-Drones-Testimony-102512.pdf.

- EPIC, *Domestic Drones Petition* (March 2013), http://epic.org/drones_petition/.

- EPIC *Petition to the Federal Aviation Administration* (Feb 24, 2012), http://epic.org/privacy/drones/FAA-553e-Petition-03-08-12.pdf.

Douglas Marshall ASA Privacy

Two major issues have captured the public's attention over the last two years regarding unmanned aerial vehicles (UAVs), (also known as UAS, or unmanned aircraft systems, RPAs, or remotely piloted aircraft, or "drones," as they are often misleadingly referred in the mass media). The first is the controversial use of UAV-launched missiles and bombs to neutralize threats to U.S. security from terrorists or others hostile to the United States, which have included U.S. citizens. The second arises from concerns over potential violations of privacy or indiscriminate, warrantless surveillance by law enforcement agencies using small, non-tactical fixed-wing or rotorcraft UAVs. A related concern is the perceived threat that U.S. intelligence agencies and military units will "bring home" the sophisticated ISR (Intelligence, Surveillance, Reconnaissance) UAVs that are currently used for counterterrorism and military operations in theater and deploy them to spy on U.S. citizens (although such activity is clearly prohibited by federal law).

Caught up in the whirlwind of popular culture, media hysteria, and political forces is a large international community of scientists, researchers, government agencies and civilian or private operators of UAS who promote and support the peaceful use of the technology for a wide variety of humanitarian and potential commercial applications that have nothing to do with law enforcement or national defense and security.

By way of example, the Arctic is a critically important environment, exerting strong influence on the global climate. The effect of climate change is exaggerated in the Arctic, and, as a result, the Arctic region (north of the Arctic Circle, $66^0\,33'$N latitude) is undergoing very rapid change. Because of these rapid changes, scientists are urgently trying to understand the many climate processes and mechanisms of the Arctic. Use of UAS for environmental research in the Arctic has been ongoing since 1999, and continues to this day. More examples of scientific applications of UAS abound, and a comprehensive list would fill a multi-page appendix.

As a result of similar activities around the globe, the UAS sector has been a growth industry for over a decade, fueled primarily by the Department of Defense and the U.S. intelligence services, but supplemented by a rapidly growing civilian sector devoted to non-military applications such as law enforcement, agricultural remote sensing, atmospheric science, wildlife management, power line and pipe line inspection, fisheries observation and enforcement, border protection, firefighting, flood protection, disaster response, and the like.

A major challenge for the UAS community is identifying the public policies that should drive the next phase of technical development, and, more recently, the influence that the question of personal privacy should have, if any, in the evolution of those policies. State and local governments are grappling with the role that government should or will play in this public debate. The choices for local and state government are: To be active advocates for UAS technology, thereby supporting the anticipated economic impacts from the creation of highly skilled, high paying jobs, but taking no position on the legal and privacy issues; to devote the necessary time

and resources to develop a model privacy policy that could be adopted by other governmental entities; or to do nothing and take no position on privacy, thereby conceding the policy question to the federal government or the private sector.

The issue of privacy and the potential for invasions of personal privacy by individuals and/or government by the use or misuse of remotely piloted aircraft equipped with cameras and other surveillance devices has generated proposed legislation, both state and federal, and aggressive publicity campaigns intended to drastically limit or even outlaw RPAs for any purpose whatsoever. Indeed, the "right to privacy," or the "right to be let alone," has been recognized by the U.S. Supreme Court in a number of cases as being among the fundamental rights guaranteed American citizens by the U.S. Constitution. The seminal treatment of the subject was an article published in the Harvard Law Review, authored by Louis Brandeis and Samuel Warren ("The Right to Privacy" HLR 4, no. 5 (1890): 193-220), in which the authors argued that the time had come for the courts to recognize a common law right to privacy. The article can be read today with virtually no changes and still be as relevant and prescient as it was in 1890.

In our age of electronic exhibitionism and voyeurism, it can be argued that privacy no longer has the meaning that it did over 75 years ago when laws were passed to prohibit the government from wiretapping telephones without a search warrant (although illegal wiretapping in violation of the requirements of the Fourth Amendment apparently still occurs). Dean Prosser's four invasion of privacy torts (intrusion upon a person's seclusion or solitude, or into his private affairs; public disclosure of embarrassing private facts about a person; publicity that places the person in a false light in the public eye; and appropriation, for the someone's advantage, of another person's name or likeness), are no less important concepts now than they were when he described them in his landmark article in the California Law Review over 50 years ago (*Privacy,* 48 Calif. L. Rev. 383 (1960)). But these four categories of invasions of privacy are civil wrongs that provide the basis for an award of monetary damages against the violator. The current media-driven angst over the potential for privacy intrusions from the utilization of unmanned aircraft by law enforcement agencies at all levels (federal, state and local) seems to derive from fear of "Big Brother" (apologies to Orwell) type of broad area, warrantless surveillance of the general population, although no law enforcement agency has publicly stated that it has any intention of ever using UAS for that purpose. Yet, manned aircraft (primarily helicopters), have been used for decades for that precise purpose, with little objection from the public. News helicopters hover over every event from a traffic jam in Los Angeles to a natural disaster in Oklahoma, state highway patrols enforce speed limits with aviation assets, and police departments and first responders routinely use aircraft (often equipped with cameras) to support their law enforcement and firefighting activities.

Some also argue that there is no fundamental difference between carrying a high resolution or infrared camera or some other sensing device on a UAS and deploying the same payload on a manned aircraft, and the Supreme Court has repeatedly held

that observations of law violations from a manned aircraft in the navigable airspace do not violate the Fourth Amendment, even when a warrant is not first obtained.

As a result of pressures applied to legislators, local governments and policy makers by these diverse interests, laws have been proposed in a number of states that are intended to either restrict the use of UAS in many applications or ban them outright, whether the intended use is by law enforcement agencies, or civilians. The FAA has been compelled to conduct public forums on the privacy issue as a result of language in the FAA Modernization and Reform Act of 2012, and is being pressured to propose rules or publish guidelines dealing with the privacy issue.

Thus, the evolving legal issue is whether any local legislation can legitimately regulate an activity that heretofore has fallen under the exclusive jurisdiction of the Federal Aviation Administration. A related policy issue is whether the FAA's statutory mandate dictates that it should have any interest in privacy, or whether it should limit its oversight to traditional aviation concerns such as safety, airworthiness, certification, production standards and airspace rules. The overarching issue is whether there should be any legal restrictions beyond the Fourth and Fifth Amendments on the use of unmanned aircraft by law enforcement agencies or private individuals or entities.

The principle stakeholders in the ongoing privacy debate are a diverse and sometimes unlikely assortment of advocacy partners, often entities or organizations that might ordinarily occupy opposite extremes in philosophy, joining forces to oppose something that they both find threatening or unacceptable. At one extreme lies the UAS industry, represented by many small entrepreneurs, as well as the large defense and aerospace concerns that largely serve the needs of the U.S. military and intelligence services. At the other extreme are civil liberties advocates such as the ACLU, EPIC (Electronic Privacy Information Center), EFF (Electronic Frontier Foundation) and others, who represent the concerns for potential intrusions into personal privacy by government, as well as private citizen exploitation of technology to engage in spying, eavesdropping, data mining, and identity and financial data theft, among others. In the middle of the debate resides the FAA, which has jurisdiction over all activities in the navigable airspace of the U.S.

Potential customers of the industry consist of public safety agencies desiring to acquire small UAS as affordable supplements to existing law enforcement and first responder technology; state and federal science and technology agencies that view UAS as an additional tool to carry out their missions; public and private research universities that similarly seek the use of the technology for a wide variety of research purposes; and, advocacy organizations like AUVSI whose members are engaged in the research and development of this rapidly evolving technology.

The stakeholders are many, the issues are fundamental, and the collective wisdom of all concerned will be needed to solve the problem. ASA is an ideal facilitator to fill that role.

NATIONAL ASSOCIATION OF CRIMINAL DEFENSE LAWYERS
COMMENTS ON PROPOSED DRONE LEGISLATION
MAY 31, 2013

Use of Domestic Drones

The increasing number of bills introduced in states across the country addressing the use of unmanned aerial vehicles, also known as drones, signal that not only are states concerned with intrusive government surveillance of their citizens without a warrant, but that domestic drone use is becoming more prevalent as the technology advances, signaling a sudden need for legislation. There are major Fourth Amendment and privacy implications that come with the use of drones in the United States, and the threats to privacy and civil liberties need to be properly addressed in any new drone legislation. Many outdated statutes are applied today in the digital age that undercut Fourth Amendment rights, and new regulations need to address the concerns of these rapidly advancing surveillance tools. That is why the National Association of Criminal Defense Lawyers (NACDL) created its own model legislation, promoting protection of fundamental Fourth Amendment rights. The model legislation is available here.[1]

Prohibited Use Without a Warrant and Suppression of Evidence

If drones are used by a person or entity of the government or funded in any way by the government, a warrant should be required for any surveillance of a person within a state, county, or municipality. A warrant should also be required for the surveillance of personal or business property located within the state to gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation, except in certain special circumstances. This prevents unwanted government intrusion into privacy, and protects Fourth Amendment and state privacy rights. Traditionally, an exception to the warrant requirement exists for evidence that is found in "plain view." The plain view doctrine becomes muddled, however, when drones are used because the drones have high-tech capabilities, that are not in the "general public use,"[2] to conduct surveillance on areas in plain view and not in plain view, such as the inside of a home.[3] The technology is evolving so rapidly that it is currently difficult to discern exactly what kind of private data may be collected by the government and private entities. Unmanned aircrafts may be outfitted with surveillance equipment to include high resolution cameras, thermal heat imaging devices, and geolocation tracking devices.

Additionally, any evidence obtained in violation of the legislation should be inadmissible in a criminal trial. It is important that this suppression remedy be included in state drone legislation, otherwise the only recourse an individual could have is civil, which does not benefit a defendant facing criminal charges. A warrant requirement may be toothless without such a suppression remedy.

Limit Exigent Circumstances

Reasonable exceptions to a warrant requirement for the use of a surveillance drone include exigent circumstances or the assessment of an environmental or weather related catastrophe. Exigent

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[1] http://www.nacdl.org/WorkArea/DownloadAsset.aspx?id=26568&libID=26537.
[2] Kyllo v. United States, 533 U.S. 27, 34 (2001) (reasoning that the police used a device, a thermal heat imaging device, not in the "general public use" to gather information about the inside of a private home.).
[3] *Id.* (holding that using thermal imaging to obtain information from inside a home constituted a search under the Fourth Amendment.).

circumstances exist when law enforcement possesses reasonable suspicion that absent swift preventative action, there is an imminent danger to life or imminent risk of threat or bodily harm. This should further be limited for use only until the danger and risk that prompted the use of the drone are no longer imminent.

Access to Third Party Records

Drone legislation should address the "third party doctrine." Third party records are records created and stored by private companies in their ordinary course of business. Today, these records go beyond bank records or dialed phone numbers, and can include all emails, geo-location information, a record of visited websites, and even internet search terms. The Supreme Court has held that individuals have no reasonable expectation of privacy in records shared or generated by a third party. By giving up information to a third party, a person "assumes the risk" that the company would reveal that information to the government. In other words, law enforcement may be able to access drone surveillance data, without a warrant, obtained by a private company for use as evidence in a criminal trial.

In a recent Supreme Court decision, *United States v. Jones*, which involved the placement of a GPS locator on a suspect's car by police officers without a valid warrant, the Court held that the use of a GPS device constituted a search under the Fourth Amendment.[4] Justice Sotomayor's concurrence in particular questioned the use of the third party doctrine in the digital age. She said "[t]his approach is ill suited to the digital age, in which people reveal a great deal of information about themselves to third parties in the course of carrying out mundane tasks."[5] This has great implications for the use of drones to monitor, collect, and store information that can then be shared with the Government under an outdated third party doctrine.

As all states can do, some states have provided greater protection than what the federal Constitution affords to third party records. Such protections may be found in legislation, court cases, or even state constitutions. Each individual state should be familiar with its own laws on third party records in determining whether or not such a provision needs to be included in that state's drone legislation.

Conclusion

NACDL encourages the implementation of the above suggestions into model legislation regulating the use of domestic drones. We look forward to working with you. Please contact NACDL's National Security and Privacy Counsel, Mason Clutter, with any questions. She may be reached at mclutter@nacdl.org or 202-465-7658.

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[4] United States v. Jones, 132 S.Ct. 945 (2012) ("We hold that the Government's installation of a GPS device on a target's vehicle, and its use of that device to monitor the vehicle's movements, constitutes a 'search'. . . The Government physically occupied private property for the purpose of obtaining information.).

[5] *Id*. at 10.

113TH CONGRESS
1ST SESSION

BILL NUMBER

[Purpose]: To protect individual privacy against unwarranted governmental intrusion through the use of unmanned aerial systems commonly called drones, and for other purposes.

IN THE [CHAMBER] OF THE UNITED STATES

DATE
Xx introduced the following bill; which was read twice and referred to the Committee on the Judiciary

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A BILL

To protect individual privacy against unwarranted governmental intrusion through the use of unmanned aerial systems commonly called drones, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "[Insert Short Title"]

SECTION 2. DEFINITIONS.

In this Act---

(a) the term "unmanned aircraft" means any aircraft that is operated without the possibility of direct human intervention from within or on the aircraft (as defined in section 331 of the FAA Modernization and Reform Act of 2012 (49 U.S.C. 40101 note). and
(b) the term "law enforcement agency" means a person or entity authorized by law, or funded by the Government of the United States, to investigate or prosecute offenses against the United States.
(c) the term "unmanned aircraft system" means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.

(d) the term "anti-personnel device" means any projectile, chemical substance, electrical or directed-energy emission, whether visible or invisible, designed to harm, incapacitate, or otherwise negatively impact a human being.

SEC. 3. PROHIBITED USE OF UNMANNED AIRCRAFT SYSTEMS

Except as provided in section 4, a person or entity acting under the authority, or funded in whole or in part by, the Government of the United States shall not use an unmanned aircraft for surveillance of a person within the United States or for the surveillance of personal or business property located within the borders of the United States to gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation except to the extent authorized in a warrant that satisfies the requirements of the Fourth Amendment to the Constitution of the United States.

SEC. 4. EXCEPTIONS

This Act does not prohibit any use of an unmanned aircraft for surveillance during the course of the following:

(a) PATROL OF NATIONAL BORDERS - The use of an unmanned aircraft to patrol within 25 miles of a national border for purposes of policing the border to prevent or deter illegal entry of any persons, illegal substances, or contraband.

(b) EXIGENT CIRCUMSTANCES - The use of an unmanned aircraft by a law enforcement agency is permitted when exigent circumstances exist. For the purposes of this paragraph, exigent circumstances exist when a law enforcement agency possesses reasonable suspicion that absent swift preventative action, there is an imminent danger to life or imminent risk of threat of bodily harm.

(c) DURING AN ENVIRONMENTAL OR WEATHER RELATED CATASTROPHE – The use of an unmanned aircraft by federal and state authorities to preserve public safety, protect property, and conduct surveillance for the assessment and evaluation of environmental or weather related damage, erosion, flood or contamination during a lawfully declared state of emergency.

SEC. 5. PROHIBITED SURVEILLANCE UNDER THIS ACT

This Act prohibits any use of an unmanned aircraft for the following:

(a) USE OF FORCE - No Federal agency may authorize the domestic use, including granting a permit for use, of an unmanned aircraft while armed with a lethal weapon or anti-personnel device.

(b) DOMESTIC USE IN PRIVATE SURVEILLANCE - No Federal agency may authorize the domestic use, including granting a permit for use, of an unmanned aircraft

to permit any private person to conduct surveillance upon any other private person without the express, informed consent of the private person or persons to be made subject to surveillance, or the owner or lessee of any real property on which that other private person is present.

(c) SURVEILLANCE OF THE EXERCISE OF 1ST AMMENDMENT RIGHTS - No Federal agency may authorize the domestic use, including granting a permit for use, of an unmanned aircraft for the purpose of the surveillance of persons engaged in the lawful exercise of First Amendment rights and or the Right of Freedom of Assembly.

SEC. 6. REMEDIES FOR VIOLATION.

Any aggrieved party may in a civil action obtain all appropriate relief to prevent or remedy a violation of this Act.

SEC. 7. PROHIBITIONS ON THE CONDUCT OF UNMANNED AIRCRAFT SURVEILLANCE AND THE USE OF ACQUIRED SURVEILLANCE AS EVIDENCE.

This Act prohibits the following:

(a) No evidence obtained or collected in violation of this Act may be admissible as evidence in a criminal prosecution during trial, at sentencing, before a grand jury, as rebuttal evidence, or during administrative hearings in any court of law in the United States.

(b) No imaging or other forms of observational data gathered by unmanned aircraft surveillance from or concerning the parties or places subjected to surveillance in violation of this Act may be preserved by law enforcement or government agencies for any purpose unless required by a Federal Court.

(c) No imaging or any other forms of data lawfully obtained under this Act for which there is not a reasonable and articulable suspicion that such images or data contain evidence of a crime, or are relevant to an ongoing investigation or trial, may be retained for more than 90 days, unless such retention is attendant to general agency guidelines regarding the retention of evidence in criminal cases. In such cases, the imaging or other data may not be distributed to agencies, entities, or individuals where such distribution is not necessary to meet general agency guidelines regarding the retention of evidence in criminal cases. A court order must be obtained before imaging or other forms of data may be retained lawfully for more than 90 days.

(d) No unmanned aircraft may conduct any type of surveillance that would violate Federal laws regarding the interception of aural communications, electronic communications and transmissions, personal location data, or the acquisition of video or still images of a person or conditions existing within a home or place without first obtaining all required warrants in compliance with the Federal or state statutes applying to such interceptions.

SEC. 8. DOCUMENTATION OF DRONE SURVEILLANCE

(a) All use of unmanned aircraft for surveillance shall be documented by the person or entity authorized to conduct the surveillance. All surveillance flights shall be documented as to:

(i) duration, flight path;
(ii) mission objectives, and
(iii) the names of places or persons authorized to be subject to surveillance.

(b) This flight information noted will be certified as accurate and complete by the supervising person authorized by a court to conduct the surveillance.

(c) This flight information must be retained for a period of five years.

(d) Persons seeking relief before a court of law or an administrative agency who have been a target of unmanned aircraft surveillance may obtain by proper motion to the court all information relating to them acquired in the course of such surveillance, excepting only the operational capabilities of the unmanned aircraft, unmanned aircraft system, and other operational information strictly related to the technical conduct and physical security of the surveillance operation.

EXHIBIT A

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE

AVIATION COMMITTEE

Recommended Guidelines for the use of Unmanned Aircraft

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of their lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. **Model Aircraft** - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. **Unmanned Aircraft (UA)** – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. **UAS Flight Crewmember** - A pilot, visual observer, payload operator or other person assigned duties for a UAS for the purpose of flight.
4. **Unmanned Aircraft Pilot** - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, the agency will operate the aircraft in full compliance with the mandates of the Constitution, federal, state and local law governing search and seizure.
4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UAS should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.

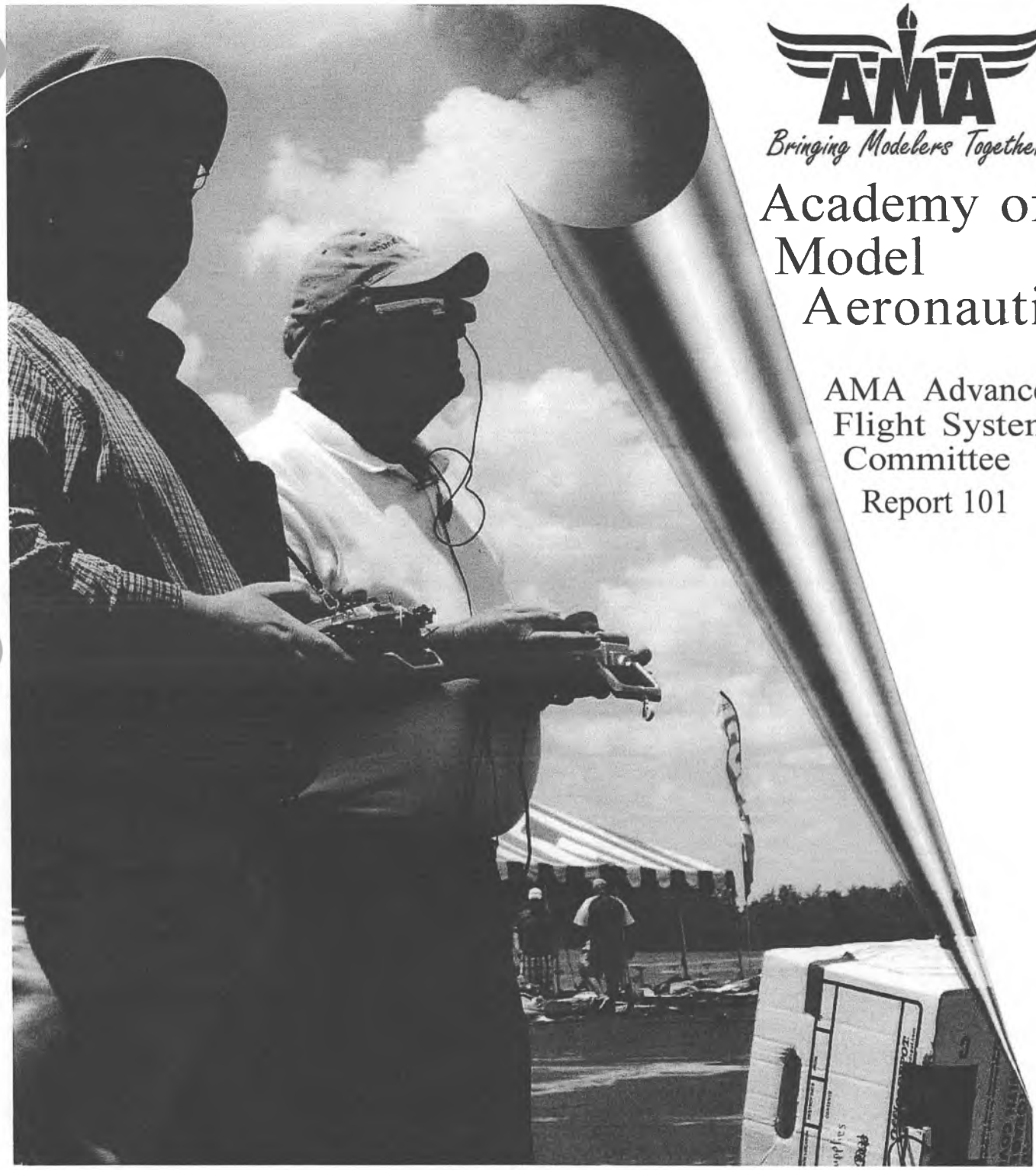
4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (CAO) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UAS will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor director's office and must be for a legitimate public safety mission, training, or demonstration purposes.
4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.



Bringing Modelers Together

Academy of Model Aeronautics

AMA Advanced Flight Systems Committee

Report 101

AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems

(Revision 07/20/2013)

Academy of Model Aeronautics
"AMA Advanced Flight Systems Committee"
amaflightsystems@gmail.com

October 21, 2012
RE: AMA Flight Systems Policies
AMA Documents #550 and #560

Greetings,

In June of 2012 the AMA Advanced Flight Systems Committee (AFSC) was created for the purpose of developing operational policies and guidelines for advanced flight systems used in radio controlled model aircraft.

The committee's first project was to evaluate and revise AMA's current policies for *"R/C Model Aircraft Operations Utilizing First Person View Systems"* (AMA Document #550) and *"R/C Model Aircraft Operations Utilizing Failsafe, Stabilization & Autopilot Systems"* (AMA Document #560).

The committee in a collaborative effort with leading members of the hobby industry and FPV community revised these documents and presented this report to the Executive Council during the October 20, 2012 council meeting. Revisions were made and the report and documents were adopted by the council.

As new aeromodeling technologies emerge the AFSC will develop and/or revise AMA operational documents/policies. A footer to each document page contains the latest revision date.

Thank you,

Bob Brown
AMA President

Academy of Model Aeronautics
AMA Advanced Flight Systems Committee
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operations
AMA Documents #550 and #560

Additional Updates of AMA Flight System Documents #550 and #560:

The AMA posted on the AMA website its revised policies for R/C model aircraft operations utilizing First Person View (FPV) systems (AMA document # 550) and Failsafe, Stabilization and Autopilot Systems (AMA document #560) on November 2, 2012.

After a two month review by aeromodeling stakeholders, including members of the AMA and FPV community, the AMA Advanced Flight Systems Committee responded to questions for additional clarification for some operational statements within the documents. As a result of this collaboration several items within AMA documents #550 and #560 were revised on 01/14/2013 and the updated documents have been posted in the AMA website Document section titled "Advanced Flight Systems".

The committee appreciates those FPV enthusiasts and stakeholders who offered suggestions for operational changes to enhance the documents and improve clarity.

The AMA recognizes the importance of providing relevant and up-to-date operational policies and guidelines enabling members to utilize and participate in new aeromodeling technologies and disciplines. The AFS committee welcomes continued collaboration with aeromodeling stakeholders in efforts to improve the quality of AMA's safety programing.

Andy Argenio
AMA Chairman
Advanced Flight Systems Committee
amaflightsystems@gmail.com

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Radio Controlled Model Aircraft Operation Utilizing Failsafe, Stabilization and Autopilot Systems AMA Document 560

Frequently Asked Questions

Department of Transportation Federal Aviation Administration 14 CFR Part 91
Docket No. FAA-2006-25714
Unmanned Aircraft Operations in the National Airspace System

FAA Modernization and Reform Act of 2012

Academy of Model Aeronautics
"AMA Advanced Flight Systems Committee"
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Introduction
Radio Controlled Model Aircraft Operations
Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems

1. Background:

AMA created its "*First Person View*" (FPV) policy (*AMA Document #550*) in 2008 *and "Manually Controllable Programed Outdoor Model Flight Operations"* policy (*AMA Document #560*) in 2011. These policies were adopted to provide operational guidelines for AMA members that would enable them to participate in these disciplines within the parameters of AMA's safety programming.

In recent years FPV, stabilization, and autopilot systems have become more reliable and safer for flying model aircraft. Advancements in technology, as well as the increased number of people participating in FPV flying prompted AMA members and nonmembers to request a review of documents #550 and #560 to consider revisions that would relax some requirements.

In June of 2012, AMA President Bob Brown established an AMA committee to evaluate and revise AMA's current policy documents #550 and #560. Subsequently, a decision was made to broaden the objectives of the committee to evaluate and/or develop policies for any new aeromodeling technologies resulting in the following committee name and mission.

Advanced Flight Systems Committee (AFSC)
amaflightsystems@gmail.com

Mission Statement: "*To analyze advanced flight systems for the purpose of developing program-specific operational requirements, procedures, guidelines, and recommendations to ensure compliance with or updating of AMA's National Model Aircraft Safety Code.*"

Committee members were chosen because of their knowledge and expertise of the AMA National Safety Code and Insurance program, FAA and Government Relations, Public Relations, Unmanned Aerial Systems, and/or Engineering/Technology.
Chairman: Andy Argenio
Committee Members: Bob Brown, Dave Mathewson, Rich Hanson, Jim Rice, Lawrence Tougas, and Chris Brooks.

The committee's objectives are to develop operational procedures for advanced model aircraft flight systems and to ensure AMA safety standards are maintained when embracing new technologies.

2. Considerations:

In the process of revising #550 and #560, the committee considered input from members including comments made in a petition from the FPV community sent to AMA leadership. Policy decisions had to comply with or address the requirements, issues, concerns and suggestions from the following documents, laws, members and membership groups:

- AMA's National Model Aircraft Safety Code
- Federal Bill H.R. 658/Public Law 112-95
- AMA's Liability Insurance Program • Existing Aeromodeling Disciplines
- FPV Community and AMA Members

A review/comparison was done of other aeromodeling association's FPV policies. It included Model Aeronautics Association of Canada (MAAC), British Model Flying Association (BMFA), and Model Aeronautical Association of Australia (MAAA) and revealed that all required a spotter for the FPV pilot, range of flights were limited by law to VLOS, and buddy boxes were required at all times.

3. Membership Education:

The committee recognized a need to educate members on FPV and autopilot system by including in the revised documents a section for definitions, recommendations, and general information. Members often times mistakenly associate FPV and autopilot activities with their knowledge of drones. AMA modelers are not building or purchasing UAVs or drones whose flights are mission oriented, or flown beyond VLOS, or computer controlled for nearly their entire flight. AMA members are attracted to the recreational visual experience of FPV flying and the use of stabilization and autopilot systems to improve flight performance.

Without a basic understanding of these systems and AMA's rules for implementation and operation, erroneous assumptions have been made that these systems present a greater risk for model aircraft accidents/incidents and the AMA should exclude these types of operations for AMA members. The fact is stabilization and autopilot systems in model aircraft have the capability to reduce the risk and severity of model aircraft accidents. Several examples follow:

- AMA FPV flying involves two persons, a pilot and spotter, providing a higher level of situational awareness surrounding the model aircraft to identify and prevent conflicts or collisions.
- R/C Pilots have direct transmitter control to activate or deactivate programmable autopilot systems to recover an out of control model aircraft to level flight, maintain a heading, return an aircraft to a selected location, or initiate a programmed flight path.
- Autopilot systems may be programmed to prevent a flyaway by safely returning a model aircraft to a selected safe location when a radio link is lost.

Radio Controlled Model Aircraft Operation Utilizing "First Person View" Systems

1. DEFINITION OF TERMS:

Please refer to Page 5 section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

FPV flying of radio control model aircraft by AMA members is allowed only for noncommercial purposes as a hobby/recreational and/or competition activity and must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA *FPV novice pilots* must use a buddy-box system with an *FPV spotter* while learning to fly *FPV*.

b) All *FPV* flights require an AMA *FPV pilot* to have an AMA *FPV spotter* next to him/her maintaining *VLOS* with the *FPV aircraft* throughout its flight.

c) The *FPV pilot* must brief the *FPV spotter* on the *FPV spotter's* duties, communications and hand-over control procedures before *FPV flight*.

d) The AMA *FPV spotter* must communicate with the *FPV pilot* to ensure the *FPV aircraft* remains within *VLOS*, warning the *FPV pilot* of approaching aircraft, and when avoidance techniques are necessary.

e) During an FPV flight, the FPV spotter must be prepared to acquire the transmitter/control from the *FPV pilot* and assume *VLOS* control of the model aircraft at any time safe operation of the flight is in question.

f) If the *FPV pilot* experiences a problem due to a loss of video link, orientation, or is unable to safely fly, he/she must abandon *FPV* mode and fly *VLOS* or pass the RC transmitter to the *FPV spotter* to assume *VLOS* control of the model aircraft.

g) Before the initial *FPV* flight of an *FPV model aircraft* and/or after any changes or repairs *to essential flight systems*, the *FPV model aircraft* must have an *R/C test flight* by conventional *VLOS*.

h) *FPV model aircraft* must use frequencies approved by the FCC for both the RC system and the wireless video system. Pilots must meet applicable FCC licensing requirements if they choose to operate the RC flight control system or the wireless video system on Amateur Band frequencies.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft must be flown within *VLOS* of the operator.

b) Model aircraft flown using *FPV* must remain at or below 400 feet AGL when within 3 miles of an airport as specified in the AMA Safety Code.

c) Model aircraft flown *FPV* are limited to a weight (including fuel, batteries, and onboard *FPV* equipment) of 15lbs. and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) AMA *FPV novice pilots* should consider using a cockpit view flight simulator to become accustomed to *FPV* flight.

b) AMA *FPV pilots* should consider using a programmable *autopilot* (AMA Document #560) with a failsafe "return to launch" (RTL) feature that will maintain control of the aircraft in the event of signal loss.

c) An onboard camera equipped with a pan and tilt mount that is positioned by head tracking goggles, will improve the *FPV pilot's* situational awareness of airspace surrounding the *FPV aircraft* during flight, but does not replace the requirement for an AMA *FPV spotter.*

d) When purchasing *FPV* operational systems, always try to select quality equipment, verify its compatibility, install components for interference rejection, and determine that signal range is adequate for maximum VLOS range.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA FPV Pilot is an AMA member who is capable of maintaining stable flight of a model aircraft within its intended flight envelope when flown FPV without losing control or having a collision.

Buddy-Box System is a system that has one transmitter operating as the master controller, while a second transmitter is linked/slaved to it allowing dual control of an aircraft. The operator of the master transmitter allows one or the other transmitter to control the aircraft through the use of a spring-loaded switch. The switch provides instantaneous transfer of control from one transmitter to the other. The buddy-box system is an efficient and effective means of achievinga position transfer of control from one pilot to another. Although this system is commonly used for training novice fliers, it is also useful in

situations where an experienced pilot may have an increased likelihood of needing a second pilot's assistance in maintaining control of the aircraft. The use of the buddy-box may be helpful in assisting pilots with physical limitations, flying in congested environments, during times of reduced visibility, or anytime during FPV when a timely transfer of control may be beneficial.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's flight envelope. (This includes primary radio control systems and any stabilization or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft.

Flight Envelope is defined as the range of airspeeds, attitudes, and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

FPV Aircraft is an RC model aircraft equipped with a video transmitter to send real-time video images from an onboard camera to a ground based receiver for display on a pilot's video monitor/goggles. (*FPV model aircraft* types include: Fixed Wing, Rotary Wing, and Multi-Rotor Platforms).

FPV Novice Pilot is an AMA member learning to fly *FPV* utilizing a buddy-box system with an experienced AMA *RC pilot* operating the master transmitter and serving as the *FPV spotter*.

FPV Spotter is an experienced AMA *RC pilot* who has been briefed by the *FPV pilot* on the tasks, responsibilities and procedures involved in being a spotter; is capable and mature enough to perform the duties and is able to assume conventional *VLOS* control of the aircraft.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's *flight envelope*. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting stable flight).

R/C Test Flight requires an *AMA Pilot* to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its *flight envelope*.

Visual Line Of Sight (VLOS) is the distance at which the pilot is able to maintain visual contact with the aircraft and determine its orientation without enhancements other than corrective lenses.

Academy of Model Aeronautics
AMA Advanced Flight Systems Committee
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Radio Controlled Model Aircraft Operation Utilizing Failsafe, Stabilization and Autopilot Systems

1. DEFINITION OF TERMS:

Please refer to Page 8 section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

All model aircraft flights utilizing *stabilization* and *autopilot* control systems must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA members flying radio controlled model aircraft equipped with flight *stabilization* and *autopilot* systems must maintain *VLOS* with the aircraft at all times including programmed autopilot waypoint flight.

b) *AMA Pilots* must be able to instantaneously deactivate programmed flight of *autopilot systems* at any time during flight and resume manual control of the model aircraft.

c) *AMA Pilots* must perform an *R/C Test Flight* of a model aircraft before activating a newly installed *autopilot* or *stabilization system* and/or after any repairs or replacement of model aircraft *essential flight systems*.

d) Model aircraft exceeding 15lbs and/or 70mph may only use an *autopilot* for a programmed "return to launch" (RTL) flight and not for programmed waypoint flying of a predetermined course.

e) STABILIZATION & AUTOPILOT SYSTEMS MAY BE USED FOR/TO:

- Stabilization/automatically stabilize aircraft to level flight when control sticks are centered.
- Recovery/activate TRX switch to recover an out of control aircraft to level flight.
- Heading/activate TRX switch to hold a model aircraft's heading for precision flight path.
- Altitude/activate TRX switch to maintain fixed aircraft altitude while allowing directional control.
- Return GPS/activate TRX switch to return aircraft via GPS to launch point.
- Return FSS/failsafe activated from radio signal loss to return aircraft via GPS to launch point.
- Fixed circle/activate TRX switch to circle aircraft at point of activation at fixed altitude.
- Waypoint/activate TRX switch to initiate an autopilot programmed flight path via waypoints.
- Fencing/autopilot programed to display site unique boundaries on video monitor/goggles.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft be flown within *VLOS* of the operator.

b) Model aircraft must be flown at or below 400 feet AGL when within 3 miles of an airport as stated in the AMA Safety Code.

c) Model aircraft utilizing an *autopilot* for waypoint flying are limited to a maximum weight (including fuel, batteries, and onboard *autopilot systems*) of 15lbs and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) If your radio system lacks *failsafe* capability, consider using programmable digital servos or auxiliary *failsafe* modules. In the event of a radio signal failure these components will activate desired safe servo settings or an *autopilot* for return to base/launch (RTL).

b) When using an *autopilot system* the "return to launch" (RTL) feature should be programmed to return the aircraft to a safe location and safely terminate the flight should manual control of the aircraft be lost. When using RTL, pay particular attention to the manufacturer's throttle recommendations to prevent stalling.

c) The use of *stabilization systems* is recommended when flying FPV to improve flight stability and video quality.

d) Pilots usually choose to incorporate *stabilization* and *autopilot systems* for model aircraft flying to enhance flight performance, correct bad tendencies of the model aircraft, maintain stability in windy weather, establish precision heading holds for takeoffs/landings, flight training for novice pilots, create a steady flight platform for cameras, and generally just to make an airplane easier and safer to fly.

e) When purchasing *stabilization* and *autopilot systems*, always try to select quality equipment from reputable dealers, ensure for compatibility with other onboard systems, and install components according to manufacturers' instructions.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data or information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA Pilot is an AMA member who is capable of manually operating an R/C transmitter to control a model aircraft's flight path within its safe intended *flight envelope* without losing control or having a collision.

Autopilot Systems incorporate programmable flight *stabilization* with an altitude sensor and a GPS receiver for accurate positioning and to navigate/control a radio controlled model aircraft's flight path. Advanced systems offer software for entering navigable waypoints. The flight data waypoints may be saved to autopilot's/GPS memory for programmed flight.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's *flight envelope*. (This includes primary R/C systems and any *stabilization* or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

Failsafe Systems are designed to minimize or prevent damage and safely terminate a flight when a radio controlled model aircraft loses radio signal. Modern radio systems can be programmed to position servos to a desired control setting in the event of radio signal failure.

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft. (AMA Document #550).

Flight Envelope is defined as the range of airspeeds, attitudes and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's intended flight envelope. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting manually controlled stable flight).

R/C Test Flight requires an AMA Pilot to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its safe intended *flight envelope*.

Stabilization Systems are designed to maintain intended model aircraft flight attitudes. The pilot can install, program and/or activate a system to stabilize yaw, pitch, or roll or any one attitude or combination of attitudes. Systems are often based on rate/heading hold gyros or inertial motion sensors utilizing multi-axis gyros and accelerometers for attitude stabilization.

Visual Line of Sight (VLOS) is the distance at which the pilot is able to maintain visual contact with the aircraft and determine its orientation and attitude without enhancements other than corrective lenses.

FREQUENTLY ASKED QUESTIONS

Model Aircraft Radio Control Operations Utilizing FIRST PERSON VIEW, STABILIZATION, AND AUTOPILOT SYSTEMS

1. **I thought it was AMA's policy to stay clear of Drone type flying using programmed flight control systems?**

   There are distinct differences between R/C FPV autopilot equipped model aircraft flying and Drone flying. Drone flights are mission oriented, flown beyond VLOS, and computer controlled for nearly their entire flight. AMA members fly R/C FPV autopilot equipped model aircraft as a recreational visual/video experience. The AMA FPV pilot is required to fly within VLOS and manually controls the aircraft via R/C for nearly the entire flight.

2. **Why has AMA chosen to limit FPV flying to VLOS when it is not currently required in the law?**

   Section 4-a of AMA document 550 and 560 states that one of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft be flown within VLOS of the operator. The AMA has chosen the exclusionary path to protect and advocate for the interest of its members rather than be subject to potentially onerous governmental regulations.

3. **Will AMA pilots flying FPV beyond VLOS be covered by AMA liability insurance?**

   Coverage under the policy will be determined by the specific facts and details relating to the claim. As intentionally flying FPV aircraft beyond VLOS of the operator violates AMA Safety Code and documents 550 and 560, the AMA pilot should not rely on AMA insurance for coverage.

4. **Why were weight and speed limits set at 15lbs and 70mph for FPV flying or when using an autopilot for waypoint flying?**

   FPV aircraft speed limits were set lower than other R/C model aircraft to allow for easier visual tracking of model aircraft by the FPV Spotter and to provide extra time for the FPV Pilot to handover a transmitter to the FPV Spotter in the event of an approaching aircraft or incident.

   Model aircraft weight while flying FPV and/or the use of autopilot systems for waypoint flying was limited to 15lbs to reduce the potential or perception that someone could use these types of aircraft to carry a destructive payload beyond VLOS. Flying model aircraft while using stabilization and/or failsafe systems and/or activating an autopilot system for return to launch does not limit the aircraft to a weight of 15lbs.

5. **Why did the AMA decide to eliminate the buddy-box requirement for FPV flying**?

   The FPV Pilot is often more experienced and able to maneuver his FPV aircraft out of problem status with verbal cues from the FPV Spotter rather than having the FPV Spotter take over control using a buddy-box. The FPV Pilot will know when the video link is lost before the FPV Spotter and will hand over the transmitter to the FPV Spotter. The cost and availability of compatible and programmable radiotransmitters for use as a buddy-box for complex FPV aircraft systems may also preclude the use of a buddy-box. It is also possible that some of the more complex systems might require the buddy box port for flight/camera operations.

6. **Does the FPV Spotter need to be an experienced FPV Pilot?**

   The FPV Spotter is required to be an experienced R/C Pilot but doesn't need to be an experienced FPV Pilot since he will only be required to fly the FPV Aircraft by conventional VLOS in the event of an incident.

7. **When will an FPV Novice Pilot assume FPV Pilot status?**

   When an FPV Novice Pilot is able to consistently maintain control of stability and orientation while flying an FPV aircraft, without losing control or having a collision, he/she may assume FPV Pilot status. The buddy-box is no longer required for FPV Pilots.

8. **Will my AMA club have to allow FPV flying at the club's AMA chartered club field?**

   Each AMA club and/or site owner or property manager decides what can or cannot be flown at a particular flying site.

9. **I have heard that FPV flying and the use of complex autopilot systems will create a much greater risk of accidents occurring at my club's flying site. If this is true, shouldn't the AMA exclude FPV and Autopilot flying at all AMA chartered flying sites?**

   Educating members so they understand the basics of these systems and AMA's requirements for use and implementation should alleviate these erroneous assumptions. The fact is FPV flying and the use of Stabilization and Autopilot systems in model aircraft have the capability to reduce the risk and severity of model aircraft accidents.

10. **Was there any consideration given to having a proficiency system for FPV Pilots similar to what jet pilots have to undergo?**

    When necessary, as with high energy and high risk turbine powered aircraft, pilot testing was implemented into our safety programming to mitigate the risks involved. The committee felt that requiring a Spotter for FPV and providing a transmitter hand-over protocol for FPV Pilots and a buddy-box for novice pilots, would ensure AMA Safety Standards were maintained.

11. **Who qualifies AMA FPV Pilots?**

    Except for AMA members piloting turbine powered model aircraft, the AMA doesn't require pilot proficiency testing. Individual AMA Clubs may establish their own pilot testing requirements for their members which may require the members to demonstrate and be judged on their flying proficiency. The AMA does expect members to use their good judgment to decide for themselves whether or not they can fly a model aircraft safely. With regard to FPV flying this would be when the AMA FPV Novice Pilot was satisfied that he/she was capable of maintaining control of stability and orientation of FPV model aircraft when flown FPV without losing control or having a collision. The FPV novice pilot would now have AMA FPV Pilot status.

12. **Will elimination of the buddy-box requirement and hand-over control to the FPV Spotter create a greater risk of accidents?**

We discovered in our observations that FPV flying for the most part took place at either higher altitudes or lower "near ground" altitudes then typical model aircraft flying. Hand-over transferring of the transmitter from the FPV Pilot to the Spotter provided sufficient time for recovery at the higher altitudes. Transference via the buddy-box for an out of control FPV aircraft at the lower altitudes didn't provide a better chance of preventing a crash than handing over control to the spotter. Both methods proved inadequate at these near ground or lower altitudes.

13. **Are AMA members covered by AMA insurance when their model aircraft's FPV flight goes beyond the AMA chartered club's flying site boundaries?**

AMA insurance liability protection is not limited to AMA charted club flying sites or the flight boundaries of the site. It applies to accidents arising from AMA member modeling activities of model aircraft conducted in accordance with AMA's National Safety Code. As long as AMA pilots don't fly at locations where model airplane flying is prohibited and avoid flying directly over unprotected people, vessels, vehicles or structures and avoid endangering life or property, AMA insurance coverage will be extended. This coverage also extends to an accidental model aircraft fly-away beyond the permitted flying site that may cause bodily injury or property damage at any location where the crash occurs.

14. **Can FPV model aircraft be flown by AMA members at altitudes above 400' and is there any chance that we might someday be able to fly beyond VLOS?**

In 1981 FAA Advisory Circular AC 91-57 advised that model aircraft not exceed altitudes of 400ft. At this time there is no FAA regulation/rule preventing model aircraft from flying above 400' AGL. For the past 32 years the AMA applied this FAA advisory only within 3 miles of an airport in the AMA National Safety Code. The AMA will continue to use all its resources to prevent the FAA from making 400' a regulation/rule for all locations of model aircraft flying. Public Law 112-95 Sec 336 requires model aircraft be flown within VLOS. As you might expect this is acceptable by the majority of AMA members but limiting to FPV activity. We are looking into alternative methods to support FPV activity beyond VLOS as new FPV technology (perhaps sense and avoid) becomes available and risks assessed and mitigated to a safe and acceptable level to perhaps someday fly beyond VLOS.

15. **Why were privacy protection requirements included in the revised documents?**

These safeguards were included to provide 4th Amendment rights to privacy protection for individuals and their property from model aircraft equipped with imaging technology ***when used for surveillance.*** *One of the provisions in Federal Law 112-95 Sec 336-2 for model aircraft to be excluded from FAA regulations requires model aircraft are operated within the programming of a nationwide community-based organization (CBO) that has been accepted/approved for CBO status by the FAA. The AMA has chosen this path in order to operate under its accepted Safety Code and Operational Requirements including Privacy Protection Safeguards rather than be subject to potentially onerous governmental regulations with respect to Privacy Protection for those operating model aircraft outside of the CBO default path. We also had a responsibility to provide operational standards that are acceptable and compliant within our insurance programming, requiring members to operate their model aircraft without violating existing laws which could include first and fourth amendment rights of citizens to privacy protection in cases where a suit is filed for invasion of privacy as a result of unauthorized aerial surveillance.*

16. Does the AMA Privacy Protection Statement essential outlaw aerial photography and videoing?

The AFS committee views the updated AMA Privacy Protection Statement as not at all outlawing aerial photographing or videoing. We believe it's better for us to have written our own Privacy Protection Safeguard then leave it unattended; waiting for what very well may be onerous government privacy regulation. In the US anyone may take photos/videos in public places except when a legal statute or ordinance exist and when individuals are in places where they have a reasonable expectation of privacy such as restrooms, dressing rooms, medical facilities and inside their homes. Property owners may legally prohibit video/photography on their premises but have no right to prohibit others from videoing/photographing their property from other locations (which may include from airspace near their property or 400' above their property without the use of telephoto lenses while not flying directly over people or structures). In most locations you may reasonably assume that taking video/photographs is allowed and that you do not need explicit permission. However, this is a judgment call and you should request permission when the circumstances suggest that the owner is likely to object. Taking aerial photos/videos that include a person's house and property may be fine but doing so in the fenced in pool area when someone is skinny dipping would not be permissible.

[4910-13] DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
14 CFR Part 91
Docket No. FAA-2006-25714

Unmanned Aircraft Operations in the National Airspace System
AGENCY: Federal Aviation Administration (FAA), DOT.
ACTION: Notice of policy; opportunity for feedback.
SUMMARY: This notice clarifies the FAA's current policy concerning operations of unmanned aircraft in the National Airspace System.

FOR FURTHER INFORMATION CONTACT: Kenneth D. Davis, Manager, Unmanned Aircraft Program Office, Aircraft Certification Service, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, (202) 385-4636, email: kenneth.d.davis@faa.gov.

Background

Simply stated, an unmanned aircraft is a device that is used, or is intended to be used, for flight in the air with no onboard pilot. These devices may be as simple as a remotely controlled model aircraft used for recreational purposes or as complex as surveillance aircraft flying over hostile areas in warfare. They may be controlled either manually or through an autopilot using a data link to connect the pilot to their aircraft. They may perform a variety of public services: surveillance, collection of air samples to determine levels of pollution, or rescue and recovery missions in crisis situations. They range in size from wingspans of six inches to 246 feet; and can weigh from approximately four ounces to over 25,600 pounds. The one thing they have in common is that their numbers and uses are growing dramatically. In the United States alone, approximately 50 companies, universities, and government organizations are developing and producing some 155 unmanned aircraft designs. Regulatory standards need to be developed to enable current technology for unmanned aircraft to comply with Title 14 Code of Federal Regulations (CFR). The Federal Aviation Administration's current policy is based on whether the unmanned aircraft is used as a public aircraft, civil aircraft or as a model aircraft.

Unmanned Aircraft Systems Operating as Public Aircraft

The most common public use of unmanned aircraft today in the United States is by the Department of Defense. U.S. operations in Iraq, Afghanistan and elsewhere have fueled a huge increase in unmanned aircraft demand. In Iraq alone, more than 700 unmanned aircraft are in use for surveillance and weapons delivery. Other agencies have also found public uses for unmanned aircraft. For example, the Customs and Border Protection uses them to patrol along the US/Mexican border. In the future, unmanned aircraft could be used to provide first responder reports of damage due to weather or other catastrophic causes. In response to this growing demand for public use unmanned aircraft operations, the FAA developed guidance in a Memorandum titled "Unmanned Aircraft Systems Operations in the U.S. National Airspace System – Interim Operational Approval Guidance" (UAS Policy 05-01). In this document, the FAA set out guidance for public use of unmanned aircraft by defining a process for evaluating applications for Certificate(s) of Waiver or Authorization (COA's) for unmanned aircraft to operate in the National Airspace System.

The concern was not only that unmanned aircraft operations might interfere with commercial and general aviation aircraft operations, but that they could also pose a safety problem for other airborne vehicles, and persons or property on the ground. The FAA guidance supports unmanned aircraft flight activity that can be conducted at an acceptable level of safety. In order to ensure this level of safety, the operator is required to establish the Unmanned Aircraft System's (UAS) airworthiness either from FAA certification, a DOD airworthiness statement, or by other approved means. Applicants also have to demonstrate that a collision with another aircraft or other airspace user is extremely improbable as well as complying with appropriate cloud and terrain clearances as required. Key to the concept is the roles of pilot-in-command (PIC) and observer. The PIC concept is essential to the safe operation of manned aircraft. The FAA's UAS guidance applies this PIC concept to unmanned aircraft and includes minimum qualifications and currency requirements. The PIC is simply the person in control of, and responsible for, the UAS. The role of the observer is to observe the activity of the unmanned aircraft and surrounding airspace, either through line-of-sight on the ground or in the air by means of a chase aircraft. In general, this means the pilot or observer must be, in most cases, within 1 mile laterally and 3,000 feet vertically of the unmanned aircraft. Direct communication between the PIC and the observer must be maintained at all times. Unmanned aircraft flight above 18,000 feet must be conducted under Instrument Flight Rules, on an IFR flight plan, must obtain ATC clearance, be equipped with at least a Mode C transponder (preferably Mode S), operating navigation lights and / or collision avoidance lights and maintain communication between the PIC and Air Traffic Control (ATC). Unmanned aircraft flights below 18,000 feet have similar requirements, except that if operators choose to operate on other than an IFR flight plan, they may be required to pre-coordinate with ATC.

The FAA has issued more than 50 COA's over the past 2 years and anticipates issuing a record number of COA's this year. For more information, Memorandum on UAS Policy (05-01) and other policy guidance is available at the FAA Website: http://www.faa.gov/uas.

Unmanned Aircraft Systems Operating as Civil Aircraft

Just as unmanned aircraft have a variety of uses in the public sector; their application in commercial or civil use is equally diverse. This is a quickly growing and important industry. Under FAA policy, operators who wish to fly an unmanned aircraft for civil use must obtain an FAA airworthiness certificate the same as any other type aircraft. The FAA is currently only issuing special airworthiness certificates in the experimental category. Experimental certificates are issued with accompanying operational limitations (14 CFR §91.319) that are appropriate to the applicant's operation. The FAA has issued five experimental certificates for unmanned aircraft systems for the purposes of research and development, marketing surveys, or crew training. UAS issued experimental certificates may not be used for compensation or hire. The applicable regulations for an experimental certificate are found in 14 CFR§§21.191, 21.193, and 21.195. In general, the applicant must state the intended use for the UAS and provide sufficient information to satisfy the FAA that the aircraft can be operated safely. The time or number of flights must be specified along with a description of the areas over which the aircraft would operate. The application must also include drawings or detailed photographs of the aircraft. An on-site review of the system and demonstration of the area of operation may be required. Additional information on how to apply for an experimental airworthiness certificate is available from Richard Posey, AIR-200, (202) 267-9538; email: richard.posey@faa.gov

Recreational/Sport Use of Model Airplanes

In 1981, in recognition of the safety issues raised by the operation of model aircraft, the FAA published Advisory Circular (AC) 91-57, Model Aircraft Operating Standards for the purpose of providing guidance to persons interested in flying model aircraft as a hobby or for recreational use. This guidance encourages good judgment on the part of operators so that persons on the ground or other aircraft in flight will not be endangered. The AC contains among other things, guidance for site selection. Users are advised to avoid noise sensitive areas such as parks, schools, hospitals, and churches. Hobbyists are advised not to fly in the vicinity of spectators until they are confident that the model aircraft has been flight tested and proven airworthy. Model aircraft should be flown below 400 feet above the surface to avoid other aircraft in flight. The FAA expects that hobbyists will operate these recreational model aircraft within visual line-of-sight. While the AC 91-57 was developed for model aircraft, some operators have used the AC as the basis for commercial flight operations.

Policy Statement

The current FAA policy for UAS operations is that no person may operate a UAS in the National Airspace System without specific authority. For UAS operating as public aircraft the authority is the COA, for UAS operating as civil aircraft the authority is special airworthiness certificates, and for model aircraft the authority is AC 91-57. The FAA recognizes that people and companies other than modelers might be flying UAS with the mistaken understanding that they are legally operating under the authority of AC 91-57. AC 91-57 only applies to modelers, and thus specifically excludes its use by persons or companies for business purposes. The FAA has undertaken a safety review that will examine the feasibility of creating a different category of unmanned "vehicles" that may be defined by the operator's visual line of sight and are also small and slow enough to adequately mitigate hazards to other aircraft and persons on the ground. The end product of this analysis may be a new flight authorization instrument similar to AC 91-57, but focused on operations which do not qualify as sport and recreation, but also may not require a certificate of airworthiness. They will, however, require compliance with applicable FAA regulations and guidance developed for this category. Feedback regarding current FAA policy for Unmanned Aircraft Systems can be submitted at www.faa.gov/uas. (Scroll down to the bottom of the page and find Contact UAPO. Click into this link.)

Issued in Washington, DC on February 6, 2007/s/ Nick Sabatini

Nicholas Sabatini
Associate Administrator for Aviation Safety

FAA Modernization and Reform Act of 2012

Senate Bill, Section 607(g) ...exempts most model airplanes used for recreational or academic use from any UAS regulations established by the FAA

Conference Committee Report

Senate bill with modifications... *Language including model aircraft for the purposes of sports, competitions and academic purposes is removed and replaced with ``hobby''. The modified section includes language requiring that the model aircraft must be operated in a manner that does not interfere with and gives way, to all manned aircraft. In addition, language that requires that model aircraft flown within five miles of an airport will give prior notification to the airport and the air traffic control (ATC), and that model aircraft that are flown consistently within five miles of the ATC will do so under standing agreements with the airports and ATC. Lastly, language is added that will ensure that nothing in this provision will interfere with the Administrator's authority to pursue enforcement action against persons operating model aircraft who endanger the safety of the national airspace system. In this section the term ``nationwide community-based organization'' is intended to mean a membership based association that represents the aeromodeling community within the United States; provides its members a comprehensive set of safety guidelines that underscores safe aeromodeling operations within the National Airspace System and the protection and safety of the general public on the ground; develops and maintains mutually supportive programming with educational institutions, government entities and other aviation associations; and acts as a liaison with government agencies as an advocate for its members.*

SEC. 336. SPECIAL RULE FOR MODEL AIRCRAFT.

(a) In General.--Notwithstanding any other provision of law relating to the incorporation of unmanned aircraft systems into Federal Aviation Administration plans and policies, including this subtitle, the Administrator of the Federal Aviation Administration may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft, if--

(1) the aircraft is flown strictly for hobby or recreational use;

(2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;

(3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;

(4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and

(5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation (model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport)).

(b) Statutory Construction.--Nothing in this section shall be construed to limit the authority of the Administrator to pursue enforcement action against persons operating model aircraft who endanger the safety of the national airspace system.

(c) Model Aircraft Defined.--In this section, the term ``model aircraft'' means an unmanned aircraft that is--

(1) capable of sustained flight in the atmosphere;

(2) flown within visual line of sight of the person operating the aircraft; and

(3) flown for hobby or recreational purposes.

LEGISCAN

Bill Text: TX HB912 | 2013-2014 | 83rd Legislature | Enrolled

Texas House Bill 912 ***(Adjourned Sine Die)***

Bill Title: Relating to images captured by unmanned aircraft and other images and recordings; providing penalties. [**Track Bill**]

Status: 2013-06-14 - Effective on 9/1/13 [HB912 Detail]

Download: Texas-2013-HB912-Enrolled.html

H.B. No. 912

AN ACT

relating to images captured by unmanned aircraft and other images and recordings; providing penalties.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. This Act shall be known as the Texas Privacy Act.

SECTION 2. Subtitle B, Title 4, Government Code, is amended by adding Chapter 423 to read as follows:

CHAPTER 423. USE OF UNMANNED AIRCRAFT

Sec. 423.001. DEFINITION. In this chapter, "image" means any capturing of sound waves, thermal, infrared, ultraviolet, visible light, or other electromagnetic waves, odor, or other conditions existing on or about real property in this state or an individual located on that property.

Sec. 423.002. NONAPPLICABILITY. (a) It is lawful to capture an image using an unmanned aircraft in this state:

(1) for purposes of professional or scholarly research and development by a person acting on behalf of an institution of higher education, as defined by Section 61.003, Education Code, including a person who:

(A) is a professor, employee, or student of the institution; or

(B) is under contract with or otherwise acting under the direction or on behalf of the institution;

(2) in airspace designated as a test site or range authorized by the Federal Aviation Administration for the purpose of integrating unmanned aircraft systems into the national airspace;

(3) as part of an operation, exercise, or mission of any branch of the United States military;

(4) if the image is captured by a satellite for the purposes of mapping;

(5) if the image is captured by or for an electric or natural gas utility:

(A) for operations and maintenance of utility facilities for the purpose of maintaining utility system reliability and integrity;

(B) for inspecting utility facilities to determine repair, maintenance, or replacement needs during and after construction of such facilities;

(C) for assessing vegetation growth for the purpose of maintaining clearances on utility easements; and

(D) for utility facility routing and siting for the purpose of providing utility service;

(6) with the consent of the individual who owns or lawfully occupies the real property captured in the image;

(7) pursuant to a valid search or arrest warrant;

(8) if the image is captured by a law enforcement authority or a person who is under contract with or otherwise acting under the direction or on behalf of a law enforcement authority:

(A) in immediate pursuit of a person law enforcement officers have reasonable suspicion or probable cause to suspect has committed an offense, not including misdemeanors or offenses punishable by a fine only;

(B) for the purpose of documenting a crime scene where an offense, not including misdemeanors or offenses punishable by a fine only, has been committed;

(C) for the purpose of investigating the scene of:

(i) a human fatality;

(ii) a motor vehicle accident causing death or serious bodily injury to a person; or

(iii) any motor vehicle accident on a state highway or federal interstate or highway;

(D) in connection with the search for a missing person;

(E) for the purpose of conducting a high-risk tactical operation that poses a threat to human life; or

(F) of private property that is generally open to the public where the property owner consents to law enforcement public safety responsibilities;

(9) if the image is captured by state or local law enforcement authorities, or a person who is under contract with or otherwise acting under the direction or on behalf of state authorities, for the purpose of:

(A) surveying the scene of a catastrophe or other damage to determine whether a state of emergency should be declared;

(B) preserving public safety, protecting property, or surveying damage or contamination during a lawfully declared state of emergency; or

(C) conducting routine air quality sampling and

monitoring, as provided by state or local law;

(10) at the scene of a spill, or a suspected spill, of hazardous materials;

(11) for the purpose of fire suppression;

(12) for the purpose of rescuing a person whose life or well-being is in imminent danger;

(13) if the image is captured by a Texas licensed real estate broker in connection with the marketing, sale, or financing of real property, provided that no individual is identifiable in the image;

(14) of real property or a person on real property that is within 25 miles of the United States border;

(15) from a height no more than eight feet above ground level in a public place, if the image was captured without using any electronic, mechanical, or other means to amplify the image beyond normal human perception;

(16) of public real property or a person on that property;

(17) if the image is captured by the owner or operator of an oil, gas, water, or other pipeline for the purpose of inspecting, maintaining, or repairing pipelines or other related facilities, and is captured without the intent to conduct surveillance on an individual or real property located in this state;

(18) in connection with oil pipeline safety and rig protection; or

(19) in connection with port authority surveillance and security.

(b) This chapter does not apply to the manufacture, assembly, distribution, or sale of an unmanned aircraft.

Sec. 423.003. OFFENSE: ILLEGAL USE OF UNMANNED AIRCRAFT TO CAPTURE IMAGE. (a) A person commits an offense if the person uses an unmanned aircraft to capture an image of an individual or privately owned real property in this state with the intent to conduct surveillance on the individual or property captured in the image.

(b) An offense under this section is a Class C misdemeanor.

(c) It is a defense to prosecution under this section that the person destroyed the image:

(1) as soon as the person had knowledge that the image was captured in violation of this section; and

(2) without disclosing, displaying, or distributing the image to a third party.

(d) In this section, "intent" has the meaning assigned by Section 6.03, Penal Code.

Sec. 423.004. OFFENSE: POSSESSION, DISCLOSURE, DISPLAY, DISTRIBUTION, OR USE OF IMAGE. (a) A person commits an offense if the person:

(1) captures an image in violation of Section 423.003; and

(2) possesses, discloses, displays, distributes, or

otherwise uses that image.

(b) An offense under this section for the possession of an image is a Class C misdemeanor. An offense under this section for the disclosure, display, distribution, or other use of an image is a Class B misdemeanor.

(c) Each image a person possesses, discloses, displays, distributes, or otherwise uses in violation of this section is a separate offense.

(d) It is a defense to prosecution under this section for the possession of an image that the person destroyed the image as soon as the person had knowledge that the image was captured in violation of Section 423.003.

(e) It is a defense to prosecution under this section for the disclosure, display, distribution, or other use of an image that the person stopped disclosing, displaying, distributing, or otherwise using the image as soon as the person had knowledge that the image was captured in violation of Section 423.003.

Sec. 423.005. ILLEGALLY OR INCIDENTALLY CAPTURED IMAGES NOT SUBJECT TO DISCLOSURE. (a) Except as otherwise provided by Subsection (b), an image captured in violation of Section 423.003, or an image captured by an unmanned aircraft that was incidental to the lawful capturing of an image:

(1) may not be used as evidence in any criminal or juvenile proceeding, civil action, or administrative proceeding;

(2) is not subject to disclosure, inspection, or copying under Chapter 552; and

(3) is not subject to discovery, subpoena, or other means of legal compulsion for its release.

(b) An image described by Subsection (a) may be disclosed and used as evidence to prove a violation of this chapter and is subject to discovery, subpoena, or other means of legal compulsion for that purpose.

Sec. 423.006. CIVIL ACTION. (a) An owner or tenant of privately owned real property located in this state may bring against a person who, in violation of Section 423.003, captured an image of the property or the owner or tenant while on the property an action to:

(1) enjoin a violation or imminent violation of Section 423.003 or 423.004;

(2) recover a civil penalty of:

(A) $5,000 for all images captured in a single episode in violation of Section 423.003; or

(B) $10,000 for disclosure, display, distribution, or other use of any images captured in a single episode in violation of Section 423.004; or

(3) recover actual damages if the person who captured the image in violation of Section 423.003 discloses, displays, or distributes the image with malice.

(b) For purposes of recovering the civil penalty or actual damages under Subsection (a), all owners of a parcel of real

property are considered to be a single owner and all tenants of a parcel of real property are considered to be a single tenant.

(c) In this section, "malice" has the meaning assigned by Section 41.001, Civil Practice and Remedies Code.

(d) In addition to any civil penalties authorized under this section, the court shall award court costs and reasonable attorney's fees to the prevailing party.

(e) Venue for an action under this section is governed by Chapter 15, Civil Practice and Remedies Code.

(f) An action brought under this section must be commenced within two years from the date the image was:

(1) captured in violation of Section 423.003; or

(2) initially disclosed, displayed, distributed, or otherwise used in violation of Section 423.004.

Sec. 423.007. RULES FOR USE BY LAW ENFORCEMENT. The Department of Public Safety shall adopt rules and guidelines for use of an unmanned aircraft by a law enforcement authority in this state.

Sec. 423.008. REPORTING BY LAW ENFORCEMENT AGENCY. (a) Not earlier than January 1 and not later than January 15 of each odd-numbered year, each state law enforcement agency and each county or municipal law enforcement agency located in a county or municipality, as applicable, with a population greater than 150,000, that used or operated an unmanned aircraft during the preceding 24 months shall issue a written report to the governor, the lieutenant governor, and each member of the legislature and shall:

(1) retain the report for public viewing; and

(2) post the report on the law enforcement agency's publicly accessible website, if one exists.

(b) The report must include:

(1) the number of times an unmanned aircraft was used, organized by date, time, location, and the types of incidents and types of justification for the use;

(2) the number of criminal investigations aided by the use of an unmanned aircraft and a description of how the unmanned aircraft aided each investigation;

(3) the number of times an unmanned aircraft was used for a law enforcement operation other than a criminal investigation, the dates and locations of those operations, and a description of how the unmanned aircraft aided each operation;

(4) the type of information collected on an individual, residence, property, or area that was not the subject of a law enforcement operation and the frequency of the collection of this information; and

(5) the total cost of acquiring, maintaining, repairing, and operating or otherwise using each unmanned aircraft for the preceding 24 months.

SECTION 3. The change in law made by this Act applies only to the capture, possession, disclosure, display, distribution, or

other use of an image that occurs on or after the effective date of this Act.

SECTION 4. The provisions of this Act or the applications of those provisions are severable as provided by Section 311.032(c), Government Code.

SECTION 5. This Act takes effect September 1, 2013.

President of the Senate

Speaker of the House

I certify that H.B. No. 912 was passed by the House on May 10, 2013, by the following vote: Yeas 128, Nays 11, 2 present, not voting; that the House refused to concur in Senate amendments to H.B. No. 912 on May 21, 2013, and requested the appointment of a conference committee to consider the differences between the two houses; that the House adopted the conference committee report on H.B. No. 912 on May 26, 2013, by the following vote: Yeas 140, Nays 4, 2 present, not voting; and that the House adopted H.C.R. No. 217 authorizing certain corrections in H.B. No. 912 on May 27, 2013, by the following vote: Yeas 145, Nays 3, 2 present, not voting.

Chief Clerk of the House

I certify that H.B. No. 912 was passed by the Senate, with amendments, on May 17, 2013, by the following vote: Yeas 29, Nays 1; at the request of the House, the Senate appointed a conference committee to consider the differences between the two houses; that the Senate adopted the conference committee report on H.B. No. 912 on May 26, 2013, by the following vote: Yeas 26, Nays 5; and that the Senate adopted H.C.R. No. 217 authorizing certain corrections in H.B. No. 912 on May 27, 2013, by the following vote: Yeas 31, Nays 0.

Secretary of the Senate

APPROVED: _____

Date

_____

Governor

Privacy Impact Assessment
for the

Aircraft Systems

DHS/CBP/PIA-018

September 9, 2013

Contact Point
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Abstract

The Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP) employs several types of aircraft including manned helicopters and fixed-wing aircraft, and Unmanned Aircraft Systems (UAS) for border surveillance and law enforcement purposes. These aircraft are equipped with video, radar, and/or other sensor technologies to assist CBP in patrolling the border, conducting surveillance as part of a law enforcement investigation or tactical operation, or gathering raw data that may assist in disaster relief or responses to other emergencies. Video, images, and sensor data collected through these Aircraft Systems alone cannot be used to identify a person, but they may later be associated with a person as part of a law enforcement investigation or encounter with CBP officers or agents. DHS/CBP is conducting this Privacy Impact Assessment to evaluate the privacy impact of these technologies on persons.

Introduction

The Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP) is responsible for guarding nearly 7,000 miles of land border the United States shares with Canada and Mexico and 2,000 miles of coastal waters surrounding the Florida peninsula and off the coast of Southern California. The agency also protects 95,000 miles of maritime border in partnership with the United States Coast Guard. To achieve these missions, CBP employs several types of aircraft, including manned helicopters and fixed-wing aircraft, and Unmanned Aircraft Systems (UAS) for border surveillance and law enforcement purposes. These aircraft are equipped with video, radar, and/or other sensor technologies to assist CBP in patrolling the border, conducting surveillance as part of a law enforcement investigation or tactical operation, or gathering raw data that may assist in disaster relief or other emergencies. This Privacy Impact Assessment (PIA) is necessary because the aircraft are equipped with technology that captures information that may be associated with persons whom CBP encounters.

Overview

CBP employs several types of aircraft to achieve its mission objectives. All aircraft, manned or unmanned, have some type of imaging capability such as video, still images collection, and/or radar. The UAS differ from CBP's manned aircraft only in that the pilot controls the aircraft from the ground and the aircraft are capable of flying farther distances and longer hours continuously. All aircraft are owned and operated by the Office of Air and Marine (OAM); the Office of Intelligence and Investigative Liaison (OIIL) is responsible for processing, exploitation, and dissemination (PED) of imagery transmitted from aircraft.

CBP aircraft, both manned and unmanned, are used in the following scenarios: (1) to patrol the border; (2) to conduct surveillance for investigative operations; (3) to conduct damage assessment in disaster situations; and (4) in response to officer safety scenarios. While CBP also

allocates its air assets in a manner that reflects this prioritization, CBP reviews and considers all requests for assistance. Lastly, CBP does not equip its aircraft with weapons. While the crew in all manned aircraft and the officers and agents onboard the aircraft during tactical missions do carry weapons, the various aircraft are not equipped with armaments.

Helicopters

CBP operates several types of manned rotary-wing aircraft (helicopters) in support of its mission, notably, the American Eurocopter AS-350, Augusta Westland AW-139, Bell Huey UH-1, and Sikorsky UH-60. CBP uses helicopters for observation, for tracking suspects and supporting ground units, aerial reconnaissance of moving objects and persons, external lift capability for seizures and equipment delivery, and tactical support and transportation for law enforcement activities. Areas of operation include the border environment, both land and sea, to observe and interdict unlawful crossings of persons and goods, the airspace surrounding defined DHS National Special Security Events or critical venues, and populated or unpopulated areas that are the subject of defined law enforcement activity or investigation. CBP's helicopter fleet operates out of 30 locations maintained by OAM across the United States.

Fixed-wing Aircraft

CBP has manned fixed-wing P-3 AEW/LRT Orion aircraft operating out of specific operations centers in Corpus Christi, TX and Jacksonville, FL. CBP practices a defense in depth strategy of the borders of the United States and in active prosecution of attempts to smuggle persons or contraband by extending surveillance over international and coastal waters. As part of this strategy and as a means of integrating with the overall U.S. Government strategy to interdict the flow of narcotics and controlled substances across the U.S. southern borders, this defense in depth includes expanding the area of patrol to include the Caribbean and Eastern Pacific waters that border Source and Transit Zone countries.[1] Together the operations centers operate the P-3 aircraft primarily in Central and South America. Certain P-3s are used to intercept and track both aircraft and vessels for hours at a time while maintaining a covert standoff. CBP also operates several smaller, manned, fixed-wing aircraft out of OAM operational locations. These fixed-wing aircraft include piston-engine propeller-powered aircraft (Cessna models), larger turbo-prop powered aircraft (Bombardier Dash Eight, Pilatus, and Beechcraft Super King Air), and jet aircraft (Cessna Citation). These aircraft variously perform surveillance, tracking, interdiction, intercept, and information gathering roles. Fixed-Wing Aircraft employ various types of sensor technology including video, still, and radar images, and Law Enforcement Technical Collection (LETC) (electronic signals information across the electromagnetic spectrum).

[1] Source and Transit Zone countries are those nations working in partnership with the United States to interdict the flow of narcotics and controlled substances to the United States through the Caribbean Basin and along the coastal waters of the eastern Pacific Ocean. http://www.whitehouse.gov/ondcp/transit-zone-operations.

UAS

A UAS encompasses an unmanned aircraft, digital network, and personnel on the ground who operate the aircraft. CBP currently owns and operates ten such aircraft. The UAS aircraft include the Predator B[2] and the maritime variant of the Predator B, the Guardian, which allows CBP to conduct missions in areas that are remote, too rugged for ground access, or otherwise considered too high-risk for manned aircraft or personnel on the ground. The aircraft are stationed and principally controlled at four locations: Sierra Vista, AZ (4 aircraft); Grand Forks, ND (2 aircraft); Corpus Christi, TX (2 aircraft); and Cape Canaveral, FL (2 aircraft). CBP's UAS operate in accordance within the Federal Aviation Administration (FAA) Certificate of Authorization (COA) process. CBP works with the FAA to develop the COAs to define airspace for UAS operation. Consistent with the primary mission for the UAS, these COAs, which are in effect for a period of two years, define airspace (altitude, latitude, and longitude (geography)) along the border and outside of urban areas to support CBP UAS flight operations. As the FAA develops its roadmap to integrate UAS into the National Airspace System (NAS)[3], CBP will adjust to these new requirements and continue to employ UAS in pursuit of its primary border security mission.

Uses of Aircraft

Patrol

CBP uses all of its aircraft to patrol different parts of the border based on the specific strengths of the different aircraft. CBP P-3s patrol in a 42-million square mile area of the Western Caribbean and Eastern Pacific, known as the Source and Transit Zone, in search of drugs that are in transit towards U.S. shores. The P-3's distinctive detection capabilities allow highly-trained crews to identify emerging threats well beyond U.S. land borders. By providing surveillance of known air, land, and maritime smuggling routes in an area that is twice the size of the continental U.S., the P-3s detect, monitor, and disrupt smuggling activities before they reach shore.[4] As part of this patrol responsibility, images and radar information obtained in detecting, monitoring, or supporting activities is collected and maintained either for direct case support or to permit historical trend analysis regarding smuggling routes.

Along both the northern and southern borders CBP also employs UAS and smaller manned aircraft to help agents detect, identify, apprehend, and remove individuals and

[2] The General Atomics Aeronautical Systems MQ-9 Predator B is a mid-size Unmanned Aerial Vehicle (UAV) approximately thirty-six feet in length, with a maximum gross weight of 10,500 pounds and a wing span of sixty-six feet.

[3] See, *FAA Modernization and Reform Act of 2012*, Pub. L. No.112-95, sec. 331, 126 Stat. 11, 72, which mandates that the FAA prepare a roadmap to integrate UAS into the NAS by 2015.

[4] The Anti-Drug Abuse Act of 1988 established the Office of National Drug Control Policy (ONDCP) to set priorities, implement a national strategy, and certify Federal drug-control budgets. Interdiction of the flow of illicit drugs through the Source and Transit Zone is a critical component of the National Drug Control Strategy prepared annually by ONDCP.

contraband illegally entering the United States at and between Ports of Entry (POE). The COA defined airspace establishes operational corridors for UAS activity both along and within 100 miles of the border for the northern border, and along and within 25 to 60 miles of the border for the southern border, exclusive of urban areas. CBP helicopters and manned fixed-wing aircraft may operate in and around urban areas; however, the principal mission remains focused on those areas between the POE. Images, LETC, and radar information, specifically with respect to border areas between the POEs, are collected in support of case development or to permit trend analysis.

Following a flight, the images are provided to OIIL for processing, exploitation, and dissemination. Subsequently, and only upon request, OIIL provides access to the forensic analysis of a particular image and area to authorized persons who have a "need to know;" when the dissemination is in response to a particular law enforcement activity or case, that analysis may include PII.

Persons who are apprehended and who were video recorded from a UAS or a manned aircraft may have the video of their crossing and/or apprehension associated with a case file that contains their PII.

Separately, CBP also deploys manned fixed-wing aircraft with LETC sensors over the border area in support of its counter-terrorism and interdiction of smuggling operations. The LETC sensors permit surveillance of the electromagnetic spectrum for the purpose of identifying organized border crossing activity between the ports of entry.

Investigative Operations

CBP uses both UAS and manned aircraft in support of other DHS components, such as U.S. Immigration and Enforcement (ICE), or other federal law enforcement agencies, such as the Federal Bureau of Investigation (FBI) or Drug Enforcement Agency (DEA). Requests for aircraft support that are related to the border surveillance must be directed to the Assistant Commissioner, OIIL, for authorization. Each request for information follows a standard process and is reviewed and considered in terms of the requesting agencies' authorities to receive the sought after information, CBP's own authority to lend assistance, and CBP's ability to integrate the information collection into its mission. Separately, OAM must determine the availability of aircraft type and the integration of the requested activity into its flight operations.

Typical support missions include overhead observation of previously identified persons, specified locations, and particular conveyances for enhanced situational awareness and increased officer safety. For example, the UAS could conduct surveillance over a building to inform ground units of the general external layout of the building or provide the location of vehicles or individuals outside the building. When flying a UAS in support of another component or government agency for an investigative operation, CBP may provide the other agency with a direct video feed through access controls or with a downloaded video recording of the operation,

in whole or in part, based on the request. Similarly, CBP may deploy a helicopter or manned fixed-wing aircraft to provide over top visibility into a developing incident. Video images from the Electrical Optical/Infrared ball (EO/IR) ball are fed through the DHS firewall to "Big Pipe," a video and image distribution network operating within the CBP/DHS firewall, to identified users, analysts, and decision makers for real-time mission support and border protection.

Disasters

The P-3 may be used to conduct reconnaissance missions during natural disasters in support of FEMA. During these missions, P-3s can provide near real-time, high quality video of affected areas to first responders and FEMA. P-3s are equipped with similarly capable EO/IR Ball cameras; the images are also fed through a transmission to a ground station where the video is decrypted and fed to Big Pipe to disseminate inside the DHS firewall to authorized users within DHS and any other requesting agency.

UAS may also be used outside existing COAs during natural disasters once the government has issued a disaster declaration. For example, the UAS may fly missions in support of other government agencies such as the National Oceanic and Atmospheric Administration (NOAA) or FEMA to provide video or radar images of flooding. In disaster situations, CBP works with the FAA to construct a COA defining the airspace where a CBP UAS may operate. The UAS may provide a real-time feed during flight through Big Pipe or, subsequently, an analyzed image comparing the raw feed to an image with identified details, noting changes, to FEMA, state emergency operations centers, United States Geological Survey (USGS), and/or the Army Corps of Engineers. Video from these operations are not used to identify individuals. As with other requests for support, disaster area overflight requests are assigned in accordance with the national policy regarding the tasking of CBP air assets.

Officer Safety and Support to State and Local Law Enforcement

State and local law enforcement officials may request aircraft support (e.g., UH-60, P-3, UAS) in emergency situations; often this involves circumstances when officer safety is implicated, and in which aerial surveillance is necessary or the terrain would be too difficult for law enforcement personnel to navigate. OIIL reviews each request to determine whether to respond and OAM reviews how and in what context it may respond. Based on both organizations within CBP, a decision is made whether to provide assistance. Access to video taken during emergency situations may be provided, either at a DHS/CBP facility or by temporarily granting direct access through the DHS firewall. Sharing of this information with state, local, or other government agencies is on a case by case basis as determined through CBP's Request for Information process.

As in the mission uses discussed above, UAS and manned aircraft offer several options for deploying information gathering equipment. The UAS can serve as force multiplier insofar as the UAS enables the monitoring of large areas of land more efficiently and with fewer

personnel than other aviation assets. UAS can enhance situational awareness and increase officer safety by providing aerial support to officers on the ground by monitoring a fixed location while flying at a high altitude to reduce the likelihood of detection. Manned aircraft offer the ability to fly in more congested airspace and to transport officers, agents, equipment, and seized assets.

Technology on Board the Aircraft

The various aircraft have different types of surveillance technology. Most aircraft, manned and unmanned have an EO/IR ball attached to provide a means of collecting information. The EO/IR ball installed on the UAS also assists the pilot during take-off and landing. While the cameras on each aircraft are not identical, they have almost identical performance specifications. The EO/IR ball is a camera, which employs a fixed-focus lens, that is capable of providing video at any altitude and allows operators, using digital zooming (software based image enhancement), to take small-scale aerial video images of buildings, vehicles, and people. Aircraft altitude directly affects a fixed-focus camera's performance; the higher the aircraft's altitude, the less detail an operator is able to see.

A lower altitude permits the EO/IR ball to provide greater detail in an image, which may permit identification; this observation activity, however, does not occur unnoticed or subject to attempts at evasion, and therefore is more often part of a defined law enforcement operation. Persons are often successful at hiding their identity from known surveillance aircraft by simply looking away.

At present, the flight and mission parameters for the UAS place their operation within an altitude block of 19,000 to 28,000 feet, thereby effectively limiting the altitude for the EO/IR ball on a UAS to a minimum of 19,000 feet. At this minimum altitude, the camera does not provide enough detail for an operator to identify a person (that is to discern physical characteristics such as height, weight, eye color, hair style, or a facial image). The camera operator may have enough detail to identify whether an individual is carrying a long gun or wearing a back pack. At an altitude of 19,000 feet the camera operator cannot read a license plate, nor are license plate readers effective.

Conversely, the flight parameters for helicopters and fixed-wing aircraft are broader in terms of altitude and geography; their flight operations are integrated into the NAS and do not require a COA. The mission parameters and physical capabilities for helicopters and manned fixed-wing aircraft, however, place different operational restrictions upon the aircraft.

The EO/IR ball can provide daytime or nighttime visual video observation of movement or objects on the ground. The images, depending upon the aircraft deploying the camera, tend to be small in scale, to provide environmental context. A principal purpose for tracking a person or vehicle from an aircraft with an EO/IR ball is to assist CBP or law enforcement personnel on the ground with information to permit a safe encounter—this requires environmental context more

than a best possible close-up of a face. When viewing vehicles, an operator can distinguish a car from a truck, and depending on the altitude at which the aircraft is flying, may be able to identify the model of the vehicle. During daytime flights, an operator may also be able to determine the color of the vehicle. The images of vehicles and/or individuals recorded by the EO/IR ball are not associated with any biographical information unless the individual is apprehended, at which point the video may be associated with the Personally Identifiable Information (PII) contained within the individual's case file.

In addition to EO/IR CBP deploys a UAS stationed along the Southwestern border in Sierra Vista, AZ, with the Wide Area Surveillance System (WASS). WASS uses a sensor mounted to the wing of a UAS to sweep large areas of border territory (approximately six kilometers in width) as the aircraft moves along its flight path. WASS alerts CBP to the existence of persons and/or vehicles along the border and provides coordinates to determine their location. The UAS pilot and sensor operator can then inform ground units of the location so that Border Patrol may coordinate an interdiction of the persons or vehicles. WASS provides a radar sensor image, which CBP may share through Big Pipe during operation.

Some manned and unmanned aircraft are also equipped with synthetic aperture radar that can provide black and white images in all weather. This radar can provide silhouettes of people and vehicles, but provides no identifying details. Using this technology, an operator is not able to pick up identifying characteristics of a person or a vehicle. The synthetic aperture radar is primarily used for change detection. For example, the operator can identify tire tracks on the ground that were not present in prior images provided by the radar. Similarly, an operator can use the synthetic aperture radar to determine the extent of flooding in a particular region by noting the changes to the topography.

Certain manned fixed-wing aircraft deploy LETC sensors used to detect electronic signals in the electromagnetic spectrum. These specifically designed aircraft operate in support of counter-terrorism efforts and to interdict organized smuggling (people, contraband, and controlled substances) operations within the border area. Like with the EO/IR ball, information from LETC sensors may be employed to support officers and agents on the ground as they move to a position where they can safely encounter observed persons. LETC aircraft sensors are solely deployed on manned fixed-wing aircraft.

Data on the digital video recorders on CBP aircraft are maintained for a maximum of 30 days and then overwritten by new data. The images and related data from CBP aircraft, both manned and unmanned, are provided through Big Pipe to identified users, analysts, and decision makers for real-time mission support and border protection. Images from the EO/IR ball mounted on the UAS are sent by an encrypted transmission, first to the satellite providing the control signals, and then, again by encrypted transmission, to the ground control station where the pilot and sensor operator are located. The image data is decrypted and brought inside the

DHS firewall at the ground control station, where Big Pipe can ingest the data and provide a feed to assigned users and analysts.

Big Pipe is a fully distributed network hosted by CBP and supports not only event-based law enforcement missions, but also FEMA's National Response Framework.[5] Big Pipe employs role-based access controls to provide users possessing a need to know access to distinct video feeds at command centers, other CBP/DHS locations, and for authorized persons with technical access through the DHS firewall. OAM retains control over defining users for Big Pipe and assigning access. After the creation of live mission data, Big Pipe manages the transmission, processing, distribution, consumption, and storage of the live mission data. Big Pipe archives selective mission data on a Big Pipe server hard drive for a maximum of 7 days, after which the data is deleted. Big Pipe does not use PII to retrieve stored mission data. Stored data is retrieved based on the date and time of the mission and only by authorized users on a need to know basis. If data is used for investigative purposes, and associated with a particular individual it goes into a case management system, which is covered by the corresponding Privacy Act System of Records Notice (SORN) for the case management system. Big Pipe, separately, provides a feed of video and radar images from UAS to the Air and Marine Operations Center (AMOC), where OIIL operates one of several PED cells to review this data over time to perform trend analysis and change detection. Video and radar images maintained by a PED cell, such as at the AMOC, are stored on a separate server dedicated to the PED cell mission for up to five years. The analyzed images may be shared by OIIL in response to law enforcement needs.

Summary of Privacy Risks

The use of these aircraft and accompanying surveillance technologies presents several privacy concerns. The first concern is ensuring that CBP's collection and use of data from aerial surveillance remains within the scope of its authorities to protect the border and provide support for law enforcement activities, while continuing to preserve a person's right to privacy. CBP's border security mission has a broad mandate to determine the admissibility of persons and ensure that goods are not introduced into the United States contrary to law.[6] Similarly, the statutory language in CBP's annual appropriations directs CBP Air and Marine to provide integrated and coordinated border interdiction and law enforcement support for homeland security missions, including assistance to federal, state, and local agencies and emergency humanitarian efforts; to provide airspace security for high-risk areas or National Special Security Events[7]; and to combat

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[5] The National Response Framework is a DHS/FEMA led effort, which provides the guiding principles that establish a comprehensive, national, all-hazards approach to domestic incident response—from the smallest incident to the largest catastrophe. http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf.

[6] Title 8, United States Code (U.S.C.), sections 1225, 1357, other pertinent provisions of the immigration laws and regulations; 19 U.S.C. §§ 482, 507, 1461, 1496, 1581, 1582, 1595a(d), and other pertinent provisions of customs laws and regulations.

[7] See Title 18 U.S.C. Section 3056, which authorizes the designation of National Special Security Events.

efforts to smuggle narcotics and other contraband into the United States[8]. Deploying OAM's various air assets to support these missions improves DHS/CBP's capability to obtain streaming video, and to assess critical infrastructure before and after events.

CBP's use of manned and unmanned aircraft to conduct aerial observations is consistent with CBP's authorities and obligations. To the extent that aircraft flying in support of tactical operations overfly private residences, there is a minimal risk that a person's privacy might be unintentionally violated. The images captured are not personally identifiable without further investigative information. Neither manned nor unmanned aircraft physically intrude upon or disturb the use of private property. Further, the cameras deployed on UAS or manned aircraft do not have the capability to see through walls or otherwise collect information regarding what occurs in the interior of a building, nor is that their purpose. UAS operate primarily at an altitude between 19,000 and 28,000 feet pursuant to their COA approved by the FAA, and are focused as previously described.

A second privacy concern, specific to UAS, is that they present a perceived risk to privacy because they are able to fly for longer hours than manned aircraft and conduct surveillance undetected. Like other aircraft, UAS are useful for monitoring remote land border areas where patrols cannot easily travel and infrastructure is difficult or impossible to build. Unlike manned aircraft, UAS are operated by personnel on the ground, allowing the crew to be relieved while the UAS is still in the air. This capability allows UAS to provide long-range surveillance for greater lengths of time than manned aircraft. Because of their small size compared to manned aircraft, and the altitude at which UAS can operate, these physical attributes may serve to conceal the presence of a UAS and reduce detection of their operating noise while still being able to maneuver over a small area and provide surveillance. Other OAM operated long range fixed-wing aircraft cannot steadily monitor a set location because of their size and turning radius. Helicopters are more easily detected because of their noise and lower operational altitudes. This means that, unlike fixed-wing aircraft and helicopters, UAS can monitor either a moving target or a fixed location for relatively longer periods of time without the likelihood of detection.

While UAS can fly for longer periods of time, they are equipped with the same technology to conduct surveillance that is presently deployed on CBP manned aircraft. The only sensor available on UAS that is not used by CBP manned aircraft currently is the WASS sensor. The WASS sensor can only detect the presence of a person and track his or her movements (much the same way other radar technology can detect an object and track its movement); it cannot be used to identify a person. The WASS sensor is designed to sweep large areas of land and is only used to patrol along the southwest border and to assist with interdictions. Other technologies on the UAS are shared by CBP's manned aircraft. Putting these technologies on a

[8] See National Drug Control Strategy, http://www.whitehouse.gov/ondcp/2013-national-drug-control-strategy.

UAS only enhances CBP's ability to perform its existing functions. For instance, CBP's surveillance video of a location used to smuggle persons or contraband using a UAS instead of a P-3 may be longer in duration with less interruption and less likelihood of detection.

To mitigate the risk presented by longer sustained surveillance of an individual or residence without the individual's knowledge, CBP has strict mission priorities for UAS and all aircraft operations. For instance, CBP aircraft may only be used in support of an authorized mission or investigation, the video or other data collected from CBP aircraft may only be accessed by authorized personnel with an authorized need to know, and the CBP-held video or other data is controlled through chains of custody and stored in secure locations until it is destroyed. In addition, the FAA requires CBP to construct a COA, in the instance of deploying a UAS, for a duration determined by the investigative activity or emergency circumstance, before conducting an operation away from the border and already established COAs.

The third privacy concern, unique to UAS, pertains to the security of the system itself and the potential for hijacking of the unmanned aircraft. CBP has taken several steps to protect UAS against potential hackers. All UAS are controlled and monitored at all times by operators in ground control stations using satellite communication that is relayed through an encrypted data feed. The ability to interfere with such an encrypted data feed requires disrupting the signal from satellite to UAS, for the purpose of acquiring the data feed or controlling the UAS. In the event that the ground control station loses its ability to control the UAS, another ground control station can pick up control of that UAS. The UAS use redundant navigation systems and GPS receivers so that if a signal is lost or someone attempts to override the signal, the UAS relies on these other systems and the GPS receivers for flight operations. In order to protect the airspace, the FAA is notified immediately if a UAS loses its signal. Furthermore, if communication between ground control and the UAS is ever interrupted or lost, the UAS are pre-programmed to fly to a pre-coordinated point in a remote location to orbit while waiting for the signal to be reestablished, or to continue to orbit this Flight Termination Point until the aircraft runs out of fuel and crashes.

Because of the unique privacy concerns raised by CBP's use of Aircraft Systems, CBP has conducted this PIA to evaluate the privacy risks associated with the use of Aircraft Systems and to enhance public understanding of the authorities, policies, procedures, and privacy controls related to that use.

Fair Information Practice Principles (FIPPs)

The Privacy Act of 1974 articulates concepts of how the Federal government should treat individuals and their information and imposes duties upon Federal agencies regarding the collection, use, dissemination, and maintenance of personally identifiable information. Section 222(2) of the Homeland Security Act of 2002 states that the Chief Privacy Officer shall assure

that information is handled in full compliance with the fair information practices as set out in the Privacy Act of 1974.

In response to this obligation, the DHS Privacy Office developed a set of Fair Information Practice Principles (FIPPs) from the underlying concepts of the Privacy Act to encompass the full breadth and diversity of the information and interactions of DHS.[9] The FIPPs account for the nature and purpose of the information being collected in relation to DHS's mission to preserve, protect, and secure.

DHS conducts Privacy Impact Assessments on both programs and information technology systems, pursuant to the E-Government Act of 2002, Section 208, and the Homeland Security Act of 2002, Section 222. Given that Aircraft Systems and their associated devices are mechanical and operational systems rather than a distinct information technology system or collection of records pertaining to an individual that would be subject to the parameters of the Privacy Act, this PIA is conducted to relate the use of these observation and data collection platforms to the DHS construct of the FIPPs. This PIA examines the privacy impact of Aircraft Systems operations as it relates to the DHS FIPPs.

1. Principle of Transparency

Principle: *DHS should be transparent and provide notice to the individual regarding its collection, use, dissemination, and maintenance of PII. Technologies or systems using PII must be described in a SORN and PIA, as appropriate. There should be no system the existence of which is a secret.*

This PIA provides a level of transparency to the public about the current surveillance programs undertaken by CBP. The video, still images, signals information, and/or radar images do not clearly identify individuals. The only information about individuals that is collected and/or retained is the indication of a human form. These images, however, may be associated with a person if the person is apprehended. For example, video collected by an EO/IR ball may show several individuals traversing the land border and being intercepted by officers or agents of CBP. While the video resolution or radar mapping images are not sufficiently precise to permit actual identification, the circumstances of CBP interdiction and apprehension of a suspect in conjunction with the aerial surveillance are sufficient to link the indistinct images of persons traversing the ground to the case file. Individuals who are apprehended by CBP as a result of observation by aircraft at or near the border may have video of their crossing and apprehension associated with their enforcement case file. CBP obtains biographical data pertaining to the apprehended person at the moment of apprehension. CBP stores all biographical information

[9] DHS Privacy Policy Guidance Memorandum 2008-01, *The Fair Information Practice Principles: Framework for Privacy Policy at the Department of Homeland Security*, December 29, 2008.

obtained from apprehended individuals and any video or radar images of their movement obtained from the aircraft in the appropriate law enforcement case management system.

When CBP associates video, still images, signals information, and/or radar images with an individual after apprehension, that information becomes subject to the requirements of the Privacy Act in the same manner and to the same extent that the apprehension of the individual becomes a record in a Privacy Act system. The Privacy Act requires that agencies publish a SORN in the Federal Register describing the nature, purpose, maintenance, use, and sharing of the information. This PIA serves as notice to the public that information captured by Aircraft Systems may become subject to the Privacy Act once it is associated with an individual.[10] Additionally, the video images associated with an individual's case file are covered by the appropriate law enforcement case management SORN, which maintains the case file. CBP will periodically re-assess the means by which the images from the aircraft are retrieved to determine whether the requirement for a SORN is triggered.

2. Principle of Individual Participation

Principle: *DHS should involve the individual in the process of using PII. DHS should, to the extent practical, seek individual consent for the collection, use, dissemination, and maintenance of PII and should provide mechanisms for appropriate access, correction, and redress regarding DHS's use of PII.*

Individual participation provides complementary benefits for the public and the government. The government is able to maintain the most accurate information about the public, and the public is given greater access to the amount and uses of the information maintained by the government. A traditional approach to individual participation is not always practical or possible for CBP, which has law enforcement and national security missions. Aircraft are primarily used to sweep the border area to locate individuals who are crossing the border illegally. Allowing an individual to consent to the collection, use, dissemination, and maintenance of video, still images, and/or radar images would compromise operations and would interfere with the U.S. government's ability to protect its borders, thereby lessening overall homeland security.

Individuals do not have the opportunity to restrict CBP's ability to collect information in the public sphere. Any information associated with an individual is part of a case file that is created as part of a law enforcement investigation or encounter.[11] Providing individuals of interest access to information about them in the context of a pending law enforcement

[10] For example, video information from an aircraft of an apprehension of a person at the border that is identified to that person would be referenced in the case notes pertaining to that person's apprehension in TECS (DHS/CBP – 011 TECS System of Records Notice December 19, 2008 73 FR 77778)

[11] CBP also incorporates images from surveillance or encounters into reports and analyses maintained in the Analytical Framework for Intelligence (AFI) (DHS/CBP – 017 System of Records June 7, 2012 77 FR 13813).

investigation may alert them to or otherwise compromise the investigation. Consequently, there is no mechanism for correction or redress for the video collected by the aircraft. Once that video is associated with an individual's case file, the individual must follow the procedure outlined in the corresponding privacy documents for that system. While individuals cannot participate in the initial collection of this information, they may contest or seek redress through any resulting proceedings brought against them. More information on redress is provided below.

3. Principle of Purpose Specification

Principle: *DHS should specifically articulate the authority which permits the collection of PII and specifically articulate the purpose or purposes for which the PII is intended to be used.*

The purpose specification principle requires DHS to 1) articulate the authority to retain the PII in question; and 2) articulate the purpose(s) for which DHS uses the PII.

CBP is authorized to collect video, other images, signals information, and data using aircraft in support of its border security mission and pursuant to the appropriations language mandating support for law enforcement as part of the mission of CBP Air and Marine.[12] Together, these authorities allow CBP to obtain information in support of border interdiction of narcotics and other contraband, the prevention of the illegal entry of aliens into the United States, the security of airspace for high-risk areas or National Special Security Events, and in support of federal, state, and local law enforcement, counterterrorism, and emergency humanitarian efforts.

CBP may use video, still images, signals information, and/or radar images, obtained from aircraft, to apprehend individuals and to provide evidence of an illegal border crossing or other violation of law. Consistent with applicable laws and SORNs, the information may be shared with other state, local, federal, tribal, and foreign law enforcement agencies in furtherance of enforcement of their laws.[13]

Video, still images, and/or radar images collected during investigative operations as part of a law enforcement investigation are used for enhanced situational awareness and increased officer safety, and may be used to provide evidence of a violation of law. These images are maintained in association with the investigative or case file that they support; their retention is managed by the same SORN and follows the handling of the investigative or case file.

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[12] *See, e.g.*, H.R. REP. No. 112-91, at 46 (2011) stating "CBP Air and marine provides integrated and coordinated border interdiction and law enforcement support for homeland security missions; provides airspace security for high risk areas or National Special Security Events upon request; and combats efforts to smuggle narcotics and other contraband into the United States. CBP Air and Marine also support counterterrorism efforts of many other law enforcement agencies."

[13] *See* Consolidated Appropriations Act of 2012, Pub. L. No. 112-74 (2011), providing for "the interdiction of narcotics and other goods; the provision of support to Federal, State, and local agencies in the enforcement or administration of laws enforced by the Department of Homeland Security; and at the discretion of the Secretary of Homeland Security, the provision of assistance to Federal, State, and local agencies in other law enforcement and emergency humanitarian efforts…."

Video, still images, and/or images collected in natural disaster and/or emergency situations are used for relief work and disaster reconnaissance. CBP typically provides a direct feed of the video captured by aircraft in these scenarios to provide support to FEMA or state emergency operating centers. Video, still images, and/or radar images are not associated with an individual and are only used to indicate where an individual or group of individuals may be for emergency response purposes.

4. Principle of Data Minimization

Principle: *DHS should only collect PII that is directly relevant and necessary to accomplish the specified purpose(s) and only retain PII for as long as is necessary to fulfill the specified purpose(s). PII should be disposed of in accordance with DHS records disposition schedules as approved by the National Archives and Records Administration (NARA).*

CBP seeks to minimize the collection and retention of video, signals information, and radar to that which is necessary and relevant to carry out CBP's mission. Accordingly, when aircraft are flown to patrol the border, they are authorized to fly the designated border surveillance mission area to ensure they are only capturing images and information necessary to detect, identify, apprehend, and remove persons and their possessions illegally entering the United States at and between POE. When aircraft are flown for investigative operations, officer safety incidents, or natural disaster reconnaissance, CBP approves and defines the specific mission that is authorized, and in the case of UAS, works with the FAA to construct a COA to establish airspace for that specific UAS operation. The video (that has not been associated with a case) remains on the digital video recorder originally used for recording until it over-written through re-use, which is after approximately 30 days.

After the creation of live mission data, Big Pipe manages the transmission, processing, distribution, consumption, and storage of the live mission data. Big Pipe archives selective mission data on a Big Pipe server hard drive for a maximum of 7 days, after which the data is deleted. Big Pipe does not use PII to retrieve stored mission data.

The information collected by the aircraft is not subject to the Privacy Act unless it is retrieved by using an individual's name or other unique identifier. If an individual is apprehended by CBP as a result of observation by aircraft or subsequent association from the presence of CBP assets, CBP may have video of that individual's apprehension associated with his or her enforcement case file. That video is retained according to the retention schedule of the SORN of the corresponding case management system. Video and Radar images obtained from UAS patrols of the border are also provided to PED cells operated by OIIL for use in analyses and intelligence products concerning historical, change detection (e.g., natural and man-made alterations to geography) along the border, and patterns of movement of persons across the border. This unassociated data, in conjunction with meta-data (such as latitude, longitude, date and time of the imagery) is retained for a maximum of five years.

5. Principle of Use Limitation

Principle: *DHS should use PII solely for the purpose(s) specified in the notice. Sharing PII outside the Department should be for a purpose compatible with the purpose for which the PII was collected.*

CBP only collects video and/or radar images, and signals information via aircraft pursuant to its law enforcement authority, as part of its border security mission, or when flying a mission in support of another agency, and when that other agency's authority covers the mission either through delegation of authority or direct control of the information collected. For example, CBP has provided support to the U.S. Forest Service in response to large scale wild fires to permit an overview of the extent and scale of the fire and identification of hot spots; this activity is pursuant to a request from the Forest Service, is performed pursuant to their authority, and the images are conveyed through designated access to the Big Pipe video distribution service. While the video resolution, radar mapping images, and signals information are not sufficiently precise to permit actual identification of a person, the images or information may be associated with an individual from context within the image, circumstances surrounding the activity occurring in the image, or additional information obtained directly from the person by an officer or agent. The images or information are only associated with an individual if the individual is apprehended or if the images are taken as part of an ongoing law enforcement investigation. Accordingly the data can only be used for the purposes specified in section 3 of this PIA.

CBP has procedures and processes in place for sharing any data collected by aircraft, including when that information becomes associated with a case and is used as evidence against an apprehended individual. In addition, all requests for aerial surveillance for intelligence gathering purposes must receive prior approval by the Assistant Commissioner, OIIL, before the air asset can conduct the flight. Similarly, requests for analytical products incorporating historical analysis of the border topography must be approved by the Assistant Commissioner, OIIL.

6. Principle of Data Quality and Integrity

Principle: *DHS should, to the extent practical, ensure that PII is accurate, relevant, timely, and complete, within the context of each use of the PII.*

As explained in section 4 (above), to ensure that the PII captured by aircraft is relevant and timely, any video, still images, signals information, and/or radar images must be associated within 30 days with the individual CBP apprehends, or the video/digital image is overwritten by OAM. Video and/or radar images are of no continuing value in a law enforcement support context unless they are associated with an individual during an apprehension because the video resolution or radar mapping images are not sufficiently precise to permit actual identification of

individuals. Video and/or radar images that are not associated with a person provide value in an intelligence context for helping to demonstrate the state of change occurring over time along the border. These unassociated images are separately maintained by OIIL for a maximum of five years.

To preserve the quality and integrity of the information collected that is used as evidence, CBP requires its officer/agents to successfully complete training on the proper operation of the recording equipment on its aircraft. The training includes correct techniques to copy recorded evidence from a non-portable hard drive to portable digital media and procedures to ensure that such evidence is not co-mingled with data from other investigations. The training also includes procedures to maintain an adequate chain of custody for all recorded evidence. Each officer/agent making a recording must ensure that the time and date shown in the original recording is accurate. After a mission is completed, the officer/agent must ensure that the original record is transferred entirely, in its original format, to portable media. The transferred data must not be edited or altered in any way. The officer/agent making the recording must label all copies of portable media with the corresponding case number (if available), the date and place of the original recording, and the names of the officer/agent and aircraft commander. The officer/agent making the recording must also label, initial, and maintain possession of the evidence until custody is properly transferred to the appropriate designated evidence custodian, case agent, Assistant United States Attorney, or other appropriate government official. As with any information associated with a case file, once the images are cross referenced to an investigation or case, they become covered by the system of records for that case file system and subject to the access and amendment provision of that system.

7. Principle of Security

Principle: *DHS should protect PII (in all forms) through appropriate security safeguards against risks such as loss, unauthorized access or use, destruction, modification, or unintended or inappropriate disclosure.*

CBP has taken steps to protect live video feeds, signals information, and recorded video, radar, and/or still pictures captured by its aircraft. Live video and flight information, which are sent from the UAS, are passed along an encrypted feed from the UAS through the satellite relay to the ground control station. Similarly, control information from the ground control station to the UAS also passes along an encrypted feed. Video and data transmitted in real time via Big Pipe, a closed system with restricted access, is subject to access controls and an approval process requiring clearance by one of two CBP/OAM system administrators to ensure that only authorized users with a need to know have access to the video feeds. The real time video feeds are not recorded and archived. Any recorded images that are saved to be used as evidence or for intelligence gathering must be handled in accordance with CBP policy. Images that are used as evidence must be handled according to the procedures detailed in section 6 of this PIA. All

recorded evidence must be kept in a locked container, segregated from other property and/or equipment. Video that is collected during an investigative operation that contains sensitive analytical surveillance, or reconnaissance related data may not be disclosed unless a request for disclosure has been submitted to the OIIL Collections Division Director. The request must include a copy of the information that is to be disclosed, must clearly specify the name of the intended recipient, how the information will be used, and the reasons justifying the disclosure. In the event that the information is disclosed, the OIIL Collections Division Director or his/her designee is required to redact law enforcement sensitive information, PII, and other sensitive related data unless the requestor has a need-to-know.

8. Principle of Accountability and Auditing

Principle: *DHS should be accountable for complying with these principles, providing training to all employees and contractors who use PII, and should audit the actual use of PII to demonstrate compliance with these principles and all applicable privacy protection requirements.*

All CBP employees are required to complete annual privacy awareness training, in addition to training on ethics and the CBP Code of Conduct. Access controls, both physical and technological, are in place to ensure only authorized access to the aircraft systems and the collected data/images.

Moreover, CBP requires its employees to successfully complete training on techniques to copy recorded evidence to portable digital media and requires them to follow procedures to ensure that such evidence is not co-mingled with data from other investigations. Employees must follow procedures to maintain an adequate chain of custody in the event that the information is used as evidence.

OIIL has a process in place for restricting the dissemination of video, still images, and radar images and keeps a log of the disclosures. Also, OIIL redacts law enforcement sensitive information, PII, and other sensitive related data unless the requestor has a valid need-to-know. Separately, CBP periodically reviews the logs or disclosure records to ensure compliance with established privacy policies, practices, and procedures for associated systems.

Conclusion

CBP operates aircraft systems in support of its border protection and law enforcement support missions. These systems provide a variety of mobile platforms from which to obtain signals information, video, still, and radar images of persons and vehicles in the border area or that are the subject of an investigation or law enforcement activity. The collection of these images and signals information complies with the same internal procedures and practices required of any surveillance using any means by CBP officers and agents. The distinct capabilities of the different aircraft operated by OAM enhance CBP's ability to conduct certain missions pertaining to information collection, surveillance, or reconnaissance; however, the processes and procedures for authorizing and accounting for how, when, and where information is obtained remain consistent with CBP's traditional border security and law enforcement practices and policy. As technology improves, operating environments change, and policies adapt, this PIA will be updated and amended to refresh the analysis of these changes on the privacy of persons, who directly or indirectly come into contact with the information and data collection activities associated with CBP Air operations.

Responsible Officials

Lothar Eckardt
Executive Director, National Air Security Operations
Office of Air & Marine
U.S. Customs and Border Protection
202-344-3950

Laurence Castelli
CBP Privacy Officer
Office of Privacy and Diversity
Office of the Commissioner
U.S. Customs and Border Protection
202-325-0280

Approval Signature Page

Original signed and on file with the DHS Privacy Office.

_____

Jonathan R. Cantor
Acting Chief Privacy Officer
Department of Homeland Security

11/26/13 Task Force Meeting: Minutes and Background Information

<TARGET><BILL></BILL><SUBJECT>11-26-13 Task Force Meeting Minutes and Background Information</SUBJECT><COMM>JUNM28</COMM></TARGET>

1 AGENDA
Draft bill and memos
Draft Report to Legislature

2 FAA Roadmap

3 FAA Comprehensive Plan

4 FAA Privacy Requirements

5 Commonwealth of Virginia
Law Enforcement Protocols

6 News Articles

7 Public Testimony

8 McDowell Group Economic Impact Study

AVERY® READY INDEX® 600084

1

Unmanned Aircraft Systems Legislative Task Force

November 26, 2013 Meeting at Mat Su LIO

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair
- Ginger Blaisdell, Staff to Rep. Hughes
- David Scott, Staff to Senator Donny Olson
- McHugh Pierre, Department of Military and Veterans' Affairs
- Greg Walker, University of Alaska Fairbanks
- Ro Bailey, University of Alaska Fairbanks
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics

Guest Attendee:

- Kathleen Strasbaugh, Legislative Legal Services

AGENDA

1:00pm Welcome and Introductions — Representative Shelley Hughes

Task Force responsibilities per HCR6

The duties of the task force shall include (1) reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems; (2) providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and (3) submitting, not later than January 15, 2014, an initial report to the legislature and, not later than July 1, 2014, submitting a final report to the legislature.

Review of October 23 – 24, 2013 Task Force Meeting Minutes

Introduction of Items in Notebook and Online

Tab 1

- DRAFT Report to the Legislature (Jan 15, 2014)
- Draft legislation and accompanying memo

Tab 2 - FAA Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap
Tab 3 – FAA Unmanned Aircraft Systems (UAS) Comprehensive Plan
Tab 4 – FAA Draft Privacy Requirements
Tab 5 – Commonwealth of Virginia, Protocols for the Use of Unmanned Aircraft Systems (UAS) by Law Enforcement Agencies
Tab 6 – News articles
Tab 7 – Written public testimony

1:15pm **Public Testimony** **Representative Shelley Hughes**

In respect to the time limitation of the Task Force, public testimony will be limited to 3 minutes. We encourage anyone to provide additional testimony in writing to Rep.Shelley.Hughes@akleg.gov

2:30pm **Review of Legislation Work Draft**

Responses may be addressed by Kathleen Strasbaugh, Legislative Legal Services
Task Force recommendations to exclude any section of the bill work draft or include new section(s)

3:00pm **Review of Draft Report**

Task Force recommendations to exclude any section of report or include new information and formatting preferences.

4:00pm **Closing Remarks and Adjourn**

The Task Force will continue to finalize its report and legislation via email. The final report is due to the Legislature on January 15, 2014 and will be made available to the public at that time. The final bill will be made public at the time it is introduced to the legislature.

SITE: MatSu LIO	SUBJECT OF MEETING:	TESTIFY KEY:
COMMITTEE:	BILL#	Y = yes LO = Listen only ? = Available for questions
DATE:	UPDATE #:	

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TO TESTIFY
Jamie Patterson-Simes - Public		please email info to: jsimes@alaska.net	
Public Testimony			
Mike Coons			
Dan Haam		- Citizen Review Panel	
Pat Martin			
JC Coffey		- NOAA work independent contractor	
Steve Poirot		- BP (first overland commercial operation)	

SITE: MatSu LIO	SUBJECT OF MEETING:	TESTIFY KEY:
COMMITTEE:	BILL#	Y = yes LO = Listen only ? = Available for questions
DATE:	UPDATE #:	

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TO TESTIFY
Robert Hess	Palmdale, CA	Lockheed Martin, Advanced Dev. Prog.	No-LO/?

SITE: MatSu LIO	SUBJECT OF MEETING:	TESTIFY KEY:
COMMITTEE:	BILL#	Y = yes LO = Listen only ? = Available for questions
DATE:	UPDATE #:	

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TO TESTIFY
JC Coffey	WASHINGTON	NOAA	Y
Kathleen Strausbaugh		Leg Liaison	

SITE: MatSu LIO	SUBJECT OF MEETING:	TESTIFY KEY:
COMMITTEE:	BILL#	Y = yes LO = Listen only ? = Available for questions
DATE:	UPDATE #:	

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TO TESTIFY
David Palmer	Palmer	MatSu Aviation Adv Board / Alaska Aviation Coordination Council	LO - NO
Mike Coons	Palmer	self	Yes
Jen Hamm	Palmer	PEAK 3	~~written~~/NO
Barbara Johnson	Fairbanks	Fairbanks North Star Borough	NO
Daniel Hamm	Palmer	self	Yes
Jerri Sumpter	MATSU	Sen Lisa Murkowski Mat-Su Office	NO
Casey Steinau	Mat Su	Sen Mark Begich	NO
Patrick Martin	WASILLA	A.M.A	YES

SITE: ANC LIO COMMITTEE: JUNM DATE: 11/26/2013	SUBJECT OF MEETING: Bill # UPDATE #:	TESTIFY KEY: Y = yes LO = Listen only ? = Available for questions

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TO TESTIFY
JC Coffey	Washington, DC	NOAA	Y
Sgt. Megoon	Colorado	US Airforce Base	LO
Josh Nadell	ANC	Chugach AK Native Corp	LO
Steve Perry		Peterson AFB	LO
Steve Poirot	ANC	BP	LO
Zach Wilkenson	JNU	Economic Council on Development	LO
Comm. Jason Mansour	Florida	NOAA	LO
Rep. Isaacson			
Rep. Hughes			
Cameron Eggers	ANC	Lt. Gv. Treadwell's Office	LO
David Scott	Ketchikan	Sen. Olson's Office	LO
Tracy Hegna		FAA,Congressional Liason for AK	

Carol Anderson	**ANC**		**LO**
Connie McKenzie			**LO**
Suzanna Caldwell			**LO**

Unmanned Aircraft Systems Legislative Task Force

October 24, 2013 Meeting at Anchorage LIO Room 220

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair
- Ginger Blaisdell, Staff to Rep. Hughes
- David Scott, Staff to Senator Donny Olson
- McHugh Pierre, Department of Military and Veterans' Affairs
- Greg Walker, University of Alaska Fairbanks
- Ro Bailey, University of Alaska Fairbanks
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics

Guest Attendee:

- Kathleen Strasbaugh, Legislative Legal Services

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LEGAL SERVICES

DIVISION OF LEGAL AND RESEARCH SERVICES
LEGISLATIVE AFFAIRS AGENCY
STATE OF ALASKA

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FAX (907) 465-2029
Mail Stop 3101

State Capitol
Juneau, Alaska 99801-1182
Deliveries to: 129 6th St., Rm. 329

MEMORANDUM November 25, 2013

SUBJECT: Unmanned Aircraft Systems
(Work Order No. 28-LS1068\A)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Kathleen Strasbaugh
Legislative Counsel

This memo accompanies the draft bill you requested relating to legislation requested by the Task Force on Unmanned Aircraft Systems (Task Force) created by Legislative Resolve 17 (2013). I have attempted to cover the topics set out in the Task Force request -- however, for the most part, they do not lend themselves to state legislation, either because they are covered by federal law, for example, safety marking, or because legislation is not needed. For example, the University of Alaska's Center for Unmanned Aircraft Systems Integration arose from the University's already authorized research mission. Further, the issues raised by the list of topics will require substantial further policy direction. As a result, the draft is basically an outline that requires substantial detail for completion.

As requested by Ms. Blaisdell, I have also drafted two additional provisions that you would like to present to the Task Force which may be sent separately.

Encouraging a pilot training program at the University of Alaska Fairbanks.
The pilot training section encourages the University to establish a training program at the Fairbanks campus. However you may want to consider allowing the Board of Regents to determine where to place the program and whether to provide the course at more than one campus. Compare AS 14.40.080.

Establishment of a position to manage unmanned aircraft systems.
Rather than creating a particular position, I have drafted the function as a duty of the Commissioner of DOTPF. Since you want this co-ordination of functions to be performed by different state agencies, I considered placing the function in the governor's office. However, because the bill involves aircraft, and because the use of airfields is at issue, AS 02, Aeronautics, which is administered by the Department of Transportation and Public Facilities (DOTPF), seems a better fit. Because the University is already deeply engaged in the field, it too is a possibility. However, the effect of unmanned aircraft systems on other aviation operations already administered by DOTPF make

DOTPF a more appropriate choice.[1] The Task Force will need to decide what tasks will predominate and place the function accordingly. If the Task Force wants to assign certain functions to another department, additional work will be needed to assure that the assigned department has the necessary authority.

You also requested that the bill include a provision to prevent a vacancy in a particular position. The bill is currently drafted to assign the function to a commissioner who may designate a particular employee to perform the UAS manager function. The commissioner will be obligated to assure that the function is performed.

Requirement for high visibility marking; lighting requirements.
As I understand the federal regulatory scheme, unmanned aircraft systems (UAS) must meet federal marking requirements, unless the configuration of the aircraft is incompatible with existing regulations. 14 CFR 45.21. Currently the operator of a UAS must seek permission to depart from existing specifications if "due to the configuration of an aircraft, it is impossible for a person to mark it in accordance with §§ 45.21 and 45.23 through 45.33. . ." 14.CFR 45.22(d). *See* also Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, FAA Order No. 8130.34C (August 2, 2013); Unmanned Aircraft Systems (UAS) Operational Approval, FAA Order No. 8900.227 (July 30, 2013), (governing the assessment of applications for certificates of airworthiness relating to, among other things, safety). I am not entirely certain, but it appears to me that any marking would be within the jurisdiction of the FAA to prescribe.

It is not clear to me whether the Task Force wanted to have safety provisions in addition to those prescribed by the FAA. This might be troublesome under the Supremacy Clause of art. VI, par. 2 of the United States Constitution, as aviation safety is an area in which Congress intends federal law to preempt state law. *Montalvo v. Spirit Airlines*, 508 F.3d 464, 470 - 71 (9th Cir. 2007). Is there some area of aviation safety not covered by federal law that the Task Force is concerned about? I assume that the Task Force did not want to duplicate federal law in this bill, but perhaps I misunderstand what is being requested.

Marketing responsibility for UAS industry; increasing business operations and educating the public.
I am not sure what the Task Force has in mind here. I included some generic language in the AS 02 provisions in the bill regarding UAS operations and promotion of the industry. Similar language is included in the mission of DOTPF in AS 44.42, and the provisions that require the affected agencies to co-operate in the endeavor.[2] I was not certain whether you wanted to specify the particulars of a marketing or educational program, or allow the department to develop a program with a general mandate. For now I have

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[1] DOTPF's current powers are duties, set out in AS 44.42, specifically include the supervision of aeronautics and air safety. *See also* AS 02.10, AS 02.15, and AS 02.30.

[2] Compare ch. 71, SLA 2013, which assigns one department responsibility for a function, and requires another department to cooperate in the endeavor.

added a provision to the powers and duties of the Department of Commerce, Community, and Economic Development related to the marketing and promotion of the UAS industry. If the task force envisions particular functions for other departments, new sections can be added to the legislation that specifically add those functions to those departments' statutory duties.

State internal review process for UAS; reporting requirements.
The draft contains a provision that requires the development of internal review of UAS missions. A section on this subject is included in proposed AS 02.45. It was not clear to me if the intention was to have reporting to a single authority, or to require an agency to have a procedure. I drafted the section on the assumption that it was the latter. You will want to decide what approvals are necessary. I included a provision requiring a commissioner's approval, but this may not be what you have in mind. Please let me know if the Task Force had a centralized review function in mind, and whether the Task Force would like to have the review performed before or after the mission. It might also be a good idea to decide whether you want to exempt emergency operations from the review if it is to occur before the mission.

Definitions relating to UAS operational technology.
I am not certain whether the Task Force wants to duplicate existing federal definitions, industry definitions, or definitions from another source. I have provided a definition of "unmanned aircraft systems" based in part on FAA terminology, but I don't have enough information to know what the Task Force wants covered. We usually don't include definitions of technical terms that do not otherwise appear in the draft.

Additional items.
The following items will be in a separate document, as you requested. For a citizen review board, I reviewed the background information you supplied from the University of North Dakota, but it addresses academic activity, and is not clear to me whether you really want to have each agency report to a single board. I drafted a bill section involving commissioner approval of activities previously reviewed under the internal review process in the main bill.

With respect to airspace over correctional facilities, I drafted a separate section and included a penalty. However, please note that a person can be charged with the more serious offenses of promoting contraband,[3] or being an accomplice to an escape or an attempted escape.[4] I have some concern that the new offense may overlap with existing law in some cases. Please advise if this is what you had in mind. The operator of a UAS may be able to challenge it as preempted by the FAA's comprehensive regulation of national airspace, but it may be that since the provision requires an intent to communicate

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[3] AS 11.56.375 and 11.56.380.

[4] AS 11.56.300 - 11.56.370. See also AS 11.16 (accomplice liability), AS 11.31.100 (attempt), AS 11.31.120 (conspiracy).

unlawfully with a prisoner, it will be upheld against a preemption challenge.

In summary, there are a number of areas where further policy direction is needed in order to develop meaningful legislation. Please let me know how I may be of further assistance.

KJS:lnd
13-372.lnd

Enclosure

28-LS1068\A
Strasbaugh
11/25/13

HOUSE BILL NO.

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-EIGHTH LEGISLATURE - SECOND SESSION

BY REPRESENTATIVE HUGHES

Introduced:
Referred:

A BILL

FOR AN ACT ENTITLED

"An Act relating to unmanned aircraft systems."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

Innovation and Industry could include other industries of

*** Section 1.** AS 02 is amended by adding a new chapter to read:

Chapter 45. Unmanned Aircraft Systems.

Sec. 02.45.010. Duties and powers of department related to unmanned aircraft systems. (a) To provide for the development of an unmanned aircraft system industry and the safe use of unmanned aircraft systems in the state, the department shall cooperate with other state departments, the University of Alaska, and the Federal Aviation Administration and other agencies of the federal government for the purpose of

(1) managing the use of state facilities by unmanned aircraft systems;

(2) ensuring the safe use of unmanned aircraft systems in the state;

(3) promoting and marketing an unmanned aircraft system industry;

(4) educating the public about unmanned aircraft systems.

(b) The department may

(1) accept gifts, grants, or loans from and enter into contracts or other transactions with a federal agency, an agency or instrumentality of the state, a municipality, a private organization, or other source for the purposes set out in (a) of this section;

(2) construct, improve, and operate, in cooperation with the University of Alaska, facilities appropriate to meet the requirements of unmanned aircraft systems; and

(3) construct, provide, or improve public safety facilities related to unmanned aircraft systems.

Sec. 02.45.020. Coordination of uses of unmanned aircraft systems. (a) The commissioner shall coordinate governmental and civil uses of unmanned aircraft systems at state facilities.

(b) The commissioner may designate another employee of the department to coordinate governmental and civil uses of unmanned aircraft systems at state facilities.

Sec. 02.45.030. Internal review. The University of Alaska or a department that uses an unmanned aircraft system to conduct an activity shall develop a program for review of the activity that includes procedures for

(1) determining whether the activity is consistent with the public interest;

(2) ensuring that the activity is conducted in a manner that does not unnecessarily intrude on the privacy of a person;

(3) ensuring that the activity is carried out in a manner that is consistent with state and federal laws and regulations; and

(4) obtaining the approval of the president of the University of Alaska or the commissioner of the department using the unmanned aircraft system.

Sec. 02.45.090. Definitions. In this chapter,

(1) "commissioner" means the commissioner of transportation and public facilities;

(2) "department" means the Department of Transportation and Public Facilities;

(3) "unmanned aircraft system" means an unmanned aircraft that is

operated without direct human intervention from inside or on the aircraft and includes the associated support equipment, control station, data links, and telemetry, communications, and navigation equipment necessary to operate the unmanned aircraft.

* **Sec. 2.** AS 14.40 is amended by adding a new section to read:

Sec. 14.40.082. Unmanned aircraft pilot training. The University of Alaska may establish a training program in the operation of unmanned aircraft and unmanned aircraft systems and related fields at the Fairbanks campus.

* **Sec. 3.** AS 44.33.020(a) is amended by adding a new paragraph to read:

(46) in cooperation with the Department of Transportation and Public Facilities, assist in the development, promotion, and marketing of an unmanned aircraft system industry and the safe use of unmanned aircraft systems in the state under AS 02.45; in fulfilling that duty, the department may cooperate with other state departments, the University of Alaska, and the Federal Aviation Administration and other federal agencies.

* **Sec. 4.** AS 44.42.020(a) is amended to read:

(a) The department shall

(1) plan, design, construct, and maintain all state modes of transportation and transportation facilities and all docks, floats, breakwaters, buildings, and similar facilities;

(2) study existing transportation modes and facilities in the state to determine how they might be improved or whether they should continue to be maintained;

(3) study alternative means of improving transportation in the state with regard to the economic costs of each alternative and its environmental and social effects;

(4) develop a comprehensive, long-range, intermodal transportation plan for the state;

(5) study alternatives to existing modes of transportation in urban areas and develop plans to improve urban transportation;

(6) cooperate and coordinate with and enter into agreements with

federal, state, and local government agencies and private organizations and persons in exercising its powers and duties;

(7) manage, operate, and maintain state transportation facilities and all docks, floats, breakwaters, and buildings, including all state highways, vessels, railroads, pipelines, airports, and aviation facilities;

(8) study alternative means of transportation in the state, considering the economic, social, and environmental effects of each alternative;

(9) coordinate and develop state and regional transportation systems, considering deletions, additions, and the absence of alterations;

(10) develop facility program plans for transportation and state buildings, docks, and breakwaters required to implement the duties set out in this section, including but not limited to functional performance criteria and schedules for completion;

(11) supervise and maintain all state automotive and mechanical equipment, aircraft, and vessels, except vessels and aircraft used by the Department of Fish and Game or the Department of Public Safety; for state vehicles maintained by the department, the department shall, every five years, evaluate the cost, efficiency, and commercial availability of alternative fuels for automotive purposes, and the purpose for which the vehicles are intended to be used, and convert vehicles to use alternative fuels or purchase energy efficient vehicles whenever practicable; the department may participate in joint ventures with public or private partners that will foster the availability of alternative fuels for all automotive fuel consumers;

(12) supervise aeronautics inside the state, under AS 02.10;

(13) implement the safety and financial responsibility requirements for air carriers under AS 02.40;

(14) inspect weights and measures;

(15) at least every four years, study alternatives available to finance transportation systems in order to provide an adequate level of funding to sustain and improve the state's transportation system;

(16) provide for the development of an unmanned aircraft system industry and the safe use of unmanned aircraft systems in the state under

AS 02.45.

28-LS1068\A.1
Strasbaugh
11/25/13

AMENDMENT

OFFERED IN THE HOUSE BY REPRESENTATIVE HUGHES

TO: Work Draft 28-LS1068\A

Page 2, following line 25:

Insert a new section to read:

"**Sec. 02.45.040. Unmanned Aircraft Systems Review Board.** The Unmanned Aircraft Systems Review Board is created in the department. The board consists of

(1) the commissioner of transportation and public facilities or the commissioner's designee;

(2) the commissioner of commerce, community, and economic development or the commissioner's designee;

(3) the commissioner of military and veterans' affairs or the commissioner's designee;

(4) the commissioner of public safety or the commissioner's designee; and

(5) the president of the University of Alaska or the president's designee.

(b) A department or the University of Alaska may not use an unmanned aircraft system for an activity unless the use of unmanned aircraft systems for that activity has been reviewed and approved by the board.

(c) The Unmanned Aircraft Systems Review Board shall review an activity conducted by a department or the University of Alaska that uses an unmanned aircraft system. The board may approve the activity if

(1) the department or University of Alaska has conducted an internal review in accordance with AS 02.45.030 and approved the activity; and

(2) the board finds that the activity is in the best interest of the state."

Page 3, following line 4:

Insert a new bill section to read:

"* **Sec. 2.** AS 11.56 is amended by adding a new section to read:

Sec. 11.56.385. Unlawful flight of an unmanned aircraft system over a correctional facility. (a) A person commits the crime of unlawful flight of an unmanned aircraft system over a correctional facility if the person knowingly causes an unmanned aircraft system to fly over the airspace of a correctional facility with the intent to communicate with a prisoner in the correctional facility.

(b) In this section, "unmanned aircraft system" has the meaning given in AS 02.45.090.

(c) Unlawful flight of an unmanned aircraft system over a correctional facility is a class A misdemeanor."

Renumber the following bill sections accordingly.

LEGAL SERVICES

DIVISION OF LEGAL AND RESEARCH SERVICES
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Deliveries to: 129 6th St., Rm. 329

MEMORANDUM November 22, 2013

SUBJECT: Outline of Issues Requiring Task Force Police Choices for Legislation Concerning Unmanned Aerial Vehicles (Work Order No. 28-LS1068)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Kathleen S. Trasbaugh
Legislative Counsel

The draft legislation you have requested concerning unmanned aircraft systems (UAS) and the accompanying memo are in process, but as I mentioned in a voice message to Ms. Blaisdell, the estimated time of arrival is uncertain. As you will see when you receive the draft legislation and memo, there are a number of issues that cannot be fully addressed without further policy direction from the task force. This memo outlines those issues. Perhaps this outline will be of use in framing discussion of the legislation.

1. Unmanned aircraft systems manager position.

The task force requested that the bill establish a position that has the responsibility to coordinate among the federal, military, state, and private use of test sites. These functionalities should be assigned to the commissioner of a department, probably the Department of Transportation and Public Facilities (DOTPF).

a. *Where should the position be placed*?

On the assumption that the task force is concerned about managing UAS development in a coordinated fashion, you may want to establish the function in the Department of Transportation and Public Facilities, since it has statutory authority to manage aviation. However, the task force may have a different view. If the focus is on interdepartmental coordination, the governor's office may be the best place for the function. If the focus is exclusively on the test site applied for by the University of Alaska and the University's research mission, the University might be the best placement, provided any broader responsibilities are given to some other executive branch agency.

2. Requirement for high visibility marking; lighting requirements.

In my opinion, the FAA fully occupies the field of aviation safety in the national airspace, and that under the Supremacy Clause of the United States Constitution. Thus, if the state adopts safety laws addressing visibility and lighting, those laws may draw a

challenge on the basis of preemption. This is especially so where the FAA has already adopted specific rules regarding marking. However, if the task force does want to adopt standards in this area:

a. *Does the task force want a state agency to adopt regulations setting such standards, does it want particular standards enshrined in statute?*

b. *What are the standards the task force wishes to have adopted*?

3. Marketing responsibility for UAS industry; increasing business operations and educating the public.

a. *Do you want one department to manage all UAS related matters, or do you want to assign different tasks to different departments?*

DOTPF already has aviation authority, you may want to assign other functions to other departments.

b. *What functions are meant to increase business operations?*

The draft may assign marketing functions to the Department of Commerce, Community and Economic Development but it is not clear how you want the other functions performed.

4. State internal review process for UAS; reporting requirements.

a. *Do you want all agencies using UAS to submit reports to a central authority, or do you want each agency to have an internal review process?*

b. *Do you want to specify whether the review is to occur before or after the mission? If before, do you want to make an exception for emergencies?*

5. Definitions relating to UAS operational technology.

Generally, definitions are placed in statute to define terms that are used in the statute, and the topics you wish to have covered by the statute don't involve much of the technical terminology in use in the industry.

a. *Is there a technical topic you want covered in the bill?*

KJS:lnd
13-373.lnd

LEGAL SERVICES

DIVISION OF LEGAL AND RESEARCH SERVICES
LEGISLATIVE AFFAIRS AGENCY
STATE OF ALASKA

(907) 465-3867 or 465-2450
FAX (907) 465-2029
Mail Stop 3101

State Capitol
Juneau, Alaska 99801-1182
Deliveries to: 129 6th St., Rm. 329

MEMORANDUM November 25, 2013

SUBJECT: Unmanned aircraft systems amendment (28-LS1068\A.1)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Kathleen Strasbaugh
Legislative Counsel

Regarding the provision you requested prohibiting the flight of unmanned aircraft systems over correctional facilities, there is a brief discussion of this in the main memo, but I wanted to add a note about a potential problem. It is not (to my knowledge) unlawful for a piloted vehicle (such as a helicopter, hang glider, etc.) to fly over a correctional facility with, for example, a banner, or leaflets, or otherwise communicate with a prisoner.

KJS:lnd
13-375.lnd

Enclosures

Ginger Blaisdell

From: Mulligan, Ben (DFG) <ben.mulligan@alaska.gov>
Sent: Wednesday, November 13, 2013 9:32 AM
To: Ginger Blaisdell
Subject: RE: legislative request from Rep Hughes

Ginger,

In examining the use of unmanned aircraft in hunting and fishing ADF&G has found at this time that additional statutes are not necessary to regulate their use. The use of unmanned aircraft for hunting and fishing can be governed by regulation and would need to be handled by either the Board of Fisheries or Game through their process. I have broken down how manned aircraft is currently managed from the perspectives of sport fishing, commercial fishing, and hunting and how that may or may not apply to unmanned aircraft for your reference.

Sport Fishing

In discussions with the Sport Fish Division we could not come up with a way in which an unmanned aircraft would be directly used to fish. There are potential ways in which a person could use an unmanned aircraft to assist in already approved methods of sport fishing but these are all anecdotal methods coming from other states. The other way in which they could be used is in the locating of fish to then fishing for them in a conventional way. This method is currently allowed when it comes to manned aircraft so unless the Board of Fisheries feels that unmanned aircraft shouldn't be used I don't suspect they will ban its use. In general when it comes to the methods and means in which sport fishing is regulated in Alaska the Board of Fisheries has to establish regulations giving that method and mean approval for use. So if a person thinks of a way to use an unmanned aircraft to sport fish that method would have to be approved by the Board of Fisheries before it can be legally used.

Commercial Fisheries

The main way in which unmanned aircraft could be used in commercial fisheries would be to be used to spot schools of fish for commercial fishermen to harvest. This spotting of schools of fish by conventional aircraft has been addressed by the Board of Fisheries over the years as the issue arose in certain areas and fisheries. For example, in the regulations pertaining to commercial fishing in the Bristol Bay area there is a regulation, 5 AAC 06.379, that states that "A person may not use or employ an aircraft to locate salmon for the commercial taking of salmon or to direct commercial fishing operations in the Bristol Bay area one hour before, during, and one hour after a commercial salmon fishing period." There are similar regulations in place for the Alaska Peninsula, Kodiak, Cook Inlet, and Prince William Sound areas also. These regulations would most likely also encompass the use of unmanned aircraft for the purposes of locating salmon for commercial harvest and so no additional regulations would be needed.

Hunting

The first idea in how an unmanned aircraft may be used is to actually hunt using the aircraft. As we had discussed in a follow up conversation to your inquiry, you stated that the FAA has said that there are existing rules in place which already prohibit weapons from being installed on civil aircraft which would encompass unmanned aircraft. Additionally, there is already existing in state statute is AS 16.05.797 which bans computer assisted remote hunting, adding another layer to a prohibition on using an unmanned aircraft to hunt. This leaves the use of unmanned aircraft to the spotting of game animals. In the traditional use of aircraft, same day airborne hunting has been banned in Alaska with some exceptions for Board of Game approved intensive management programs . The language contained within the ban only refers to a person being airborne, not the use of aircraft, so this would not cover unmanned aircraft. The Dept. of Law and DPS have discussed as to whether or not the prohibition on using "radio communication" to aid in the taking of game might bar the use of unmanned aircraft. Unamnned aircraft use a variety of different technology to send and receive signals and data so it may depend on the nuances of the particular situation in which an unmanned aircraft is used. The use of unmanned aircraft for spotting of game is largely an issue of fair chase and is best left to the discretion

of the Alaska Board of Game, who has authority to address this issue. Allowing the Board to use their discretion will allow the establishment of regulations that are tailored to address unique problems/issues associated with the use of unmanned aircraft across the state, similar to how the Board addresses similar issues through establishment of controlled use areas.

If you have any questions or need any follow up information please let me know.

Best regards,

Ben Mulligan
Legislative Liaison
ADF&G
(907) 267-2311

From: Ginger Blaisdell [mailto:Ginger.Blaisdell@akleg.gov]
Sent: Monday, October 28, 2013 10:16 AM
To: Mulligan, Ben (DFG)
Subject: legislative request from Rep Hughes

Good morning Ben,

You may know that Rep Hughes is co-chairing the Unmanned Aircraft Task Force and we are preparing legislation for the upcoming session. We don't have anything drafted for review yet but will share it with you when available.

A question from one of the task force members: Will additional law/regulation be needed regarding unmanned aircraft and hunting/fishing? Can you provide the task force with the department's position or concerns regarding unmanned aircraft use for recreational or commercial hunting/fishing?

Thanks

ginger

Legislative Task Force on Unmanned Aircraft Systems Report to the Legislature (January 15, 2014)

DRAFT November 25, 2013

Task Force Members

Representative Shelley Hughes, Co-Chair

Senator Donny Olson, Co-Chair

Lt. Steve Adams, Department of Public Safety

McHugh Pierre / Mike O'Hare, Department of Military and Veterans' Affairs

Greg Walker and Ro Bailey, Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks

Steve Colligan, Academy of Model Aeronautics – Alaska Chapter

Steve Strait, Aviation Advisory Board

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EXECUTIVE SUMMARY

The Legislative Task Force on Unmanned Aircraft Systems (UAS) was formed under House Concurrent Resolution No. 6 to review regulations and guidance regarding UAS and provide recommendations for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications.

Being sensitive to public concern, the Legislative Task Force on UAS (LTFUAS) reviewed multiple potential UAS scenarios focusing on economic development, law enforcement, anticipated mission types, and safety. The Task Force evaluated existing privacy laws for Alaska without recommending duplicative law for UAS, considered ways to encourage the economic development and safe uses of UAS in Alaska, and supported public education to reduce fear and embrace UAS to be used in life safety and other beneficial applications.

The Task Force concluded that the FAA is adequately addressing the safety concerns of integrating unmanned aircraft systems in the National Air Space (NAS). Existing guidelines clearly state the requirements of the aircraft, pilot training and responsibilities, and the expectations of the Test Sites (to be selected). The rules outlined in the guidelines provided the Task Force assurance that unmanned aircraft can be operated safely in Alaska.

The Task Force recommends the following:

- Law enforcement agencies adopt the IACP guidelines
- Formation of a public review panel to establish broad categories of approved UAS use
- Require high visibility paint scheme for aircraft

As we move forward, particularly but not exclusively in the event Alaska is chosen as an FAA test site for UAS Integration, LTFUAS further recommends immediate emphasis on:

1) management of the test ranges,
2) economic development opportunities, and
3) public education regarding UAS.

Shelley Hughes

Donny Olson

INTRODUCTION

The Legislative Task Force on Unmanned Aircraft Systems (UAS) was formed under House Concurrent Resolution No. 6 and charged with the duties of:

1. reviewing regulations and guidance from the Federal Aviation Administration (FAA) regarding UAS;

2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications; and

3. submitting a final report to the legislature.

The Legislative Task Force on UAS (LTFUAS) met **[include dates]** twice via teleconference and twice in person to respond to the concerns Alaskans have raised regarding unmanned aircraft use in Alaska. This *DRAFT* report presents the findings of the Task Force as required by HCR6, SLA13. The LTFUAS:

1. reviewed regulations and guidance from the FAA, International Association of Chiefs of Police, and many other recommendations for UAS operations;

2. received hours of public testimony and written public testimony; and

3. compiled recommendations and suggested legislation for the use of unmanned aircraft systems for public and private applications in Alaska that are protective of privacy.

The result of these meetings is this Executive Summary, report of findings, and documentation supporting the decisions of the LTFUAS.

The LTFUAS considered two approaches to regulating the use of UAS in Alaska:

- Restrict the industry and adopt exemptions for specific kinds of approved uses, or
- Generally allow UAS operations in Alaska and adopt the necessary privacy, operations, and other guidelines that seem necessary to protect Alaskans.

The Task Force adopted the second approach and emphasized that educating the public will be an important part of integrating this technology safely and for the benefit of Alaskans.

The Task Force concluded that the FAA is adequately addressing the safety concerns of integrating unmanned aircraft systems in the National Air Space (NAS). FAA Guideline N 8900-227 spells out the details of operating UAS by clearly stating the requirements of the aircraft, pilot training and responsibilities, and the expectations of the Test Sites (to be selected). The rules outlined in the guidelines provided the Task Force assurance that unmanned aircraft can be operated safely in Alaska.

The FAA also recently released its Final Privacy Requirements, November 2013. The privacy document from the FAA clearly identified that while it governs the NAS, local governments will assume the responsibility of addressing privacy concerns.

Alaskans are fortunate to live in a state where the constitution and state law provide some of the greatest privacy protections compared to other states. As the Task Force reviewed multiple scenarios for misuse of the UAS, we determined that existing laws would apply, are sufficiently protective of privacy, and penalties are already in place to address inappropriate behavior.

When studying the many possible scenarios for misuse, the Task Force returned repeatedly to the premise that an unmanned aircraft is a tool; the operator needs to be considered for breaches of privacy or harming another.

This report presents the findings of the LTFUAS resulting from task force meetings, public testimony, research, and information from industry experts in pursuit of the assigned duties listed above.

Background

This technology is growing rapidly worldwide, and UAS are currently used across the United States for a variety of beneficial purposes. The Task Force approach is to responsibly embrace the positive uses without overregulating the industry and thus hindering economic opportunity. In addition to accepting the use of UAS in Alaska, the Task Force recognizes that public perception is greatly influenced through media reports, such as military flights in war zones. The public appear hesitant to allow UAS in Alaska due to fear of invasion of personal privacy and overreaching law enforcement.

REVIEW SUMMARY

"Since the early 1990s, unmanned aircraft systems (UAS) have operated on a limited basis in the National Airspace System (NAS). Until recently, UAS mainly supported public operations, such as military and border security operations. The list of potential uses is now rapidly expanding to encompass a broad range of other activities, including aerial photography, surveying land and crops, communications and broadcast, monitoring forest fires and environmental conditions, and protecting critical infrastructures.

The FAA created the Unmanned Aircraft Systems Integration Office to facilitate integration of UAS safely and efficiently into the NAS. Toward that goal, the FAA is collaborating with a broad spectrum of stakeholders, which includes manufacturers, commercial vendors, industry trade associations, technical standards organizations, academic

FAA 'Roadmap'

"Ultimately, UAS must be integrated into the NAS without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies."

institutions, research and development centers, governmental agencies, and other regulators."[1]

SAFETY GUIDELINES

The Task Force studied the FAA Guidelines for the Operations of Unmanned Aircraft Systems and participated in a presentation of the guidelines from Ro Bailey, Deputy Director of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks and comments from representatives of the FAA. Document number N 8900.227 provides the most current guidelines for federal approval of operating unmanned aircraft.[2]

The Task Force recognizes that the FAA manages the safety of the national airspace and has adopted extensive guidelines regarding aircraft certification, pilot training and certification, and approval process for flights (or missions). N 8900.227 also provides detailed requirements for the operations of pending test sites and the current approval of flights in designated areas for specific purposes. The FAA pre-approves UAS missions and awards a Certificate of Authorization (COA) that identifies the details of the mission. This process is tightly scrutinized, and the entity flying the UAS is accountable to the FAA under the details of the COA.

The COA approval process gives the Task Force confidence that safety of the national airspace is adequately considered and that UAS missions will not invade personal privacy or operate inappropriately.

It is the opinion of the Task Force that no additional statutory or regulatory requirements are needed for FAA-approved missions.

PRIVACY CONCERNS

Federal Aviation Administration Final Privacy Requirements, November 7, 2013

The FAA recently published its Final Privacy Requirements, Nov 7, 2013 (Appendix X) regarding unmanned aircraft. The FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the Test Sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

FAA Final Privacy Requirements

On February 22, 2013 the FAA published and requested public comment on the proposed privacy requirements for UAS test sites that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012.

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session.

The public comments were grouped into ten categories, and the FAA provided a response to each category. You can view all categories, comments and responses in the document provided in Appendix X titled ...

[1] Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. 2013. U.S. Department of Transportation, Federal Aviation Administration. First Edition—2013.

[2] FAA documents (2) [footnote-reference – get ref data]; Notice N 8900.227, Subj: Unmanned Aircraft Systems (UAS) Operation Approval. Effective Date 7/30/13, Cancellation Date 7/30/14.

Excerpts from the FAA Final Privacy Requirements:

There was substantial difference of opinion among commenters as to whether the UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy restrictions on UAS operations at the Test Sites. In addition, there was substantial difference of opinion regarding what elements would be appropriate for a Test Site privacy policy.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons. ***First****, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the Test Sites.*

Second*, the FAA believes that the Test Sites operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each Test Site.* ***Third****, if UAS operations at a Test Site raise privacy concerns that are not adequately addressed by the Test Site's privacy policies, elected officials can weigh the benefits and costs of additional privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS.*

Conclusion:

Based on the comments submitted, the FAA intends to require each Test Site operator to comply with all of the privacy requirements included in the Draft Privacy Requirements as well as the following additional privacy requirements:

Test Site Requirements

1. *Test site operators must maintain a record of all UAS operating in the test sites;*
2. *Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and*
3. *Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.*

1. *Test site operators must maintain a record of all UAS operating in the test sites;*
2. *Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and*
3. *Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.*

It is the opinion of the Task Force that privacy policy is adequate through the FAA requirements for the use of UAS in the Test Sites.

Privacy and Civil Liberties Consideration

The FAA is implementing a UAS test site program to help the FAA gain better understanding of operational issues relating to UAS. Although the FAA's mission does not include developing or

enforcing policies pertaining to privacy or civil liberties, experience with the UAS test sites will present an opportunity to inform the dialogue in the Interagency Policy Committee (IPC) and other interagency forums concerning the use of UAS technologies and the areas of privacy and civil liberties.

> *The Fourth Amendment is central to the privacy issues with respect to government UAS operation. Although the Supreme Court has never explicitly considered the question of UAS privacy, there is a long list of relevant precedents. Among them are several cases from the 1980s that specifically considered aerial observations and the Fourth Amendment.*

Homeland Security Privacy Impact Assessment

U.S. Customs and Border Protection (CBP) is responsible for guarding nearly 7,000 miles of land border, 2,000 miles of coastal waters and 95,000 miles of maritime border. CBP employs several types of aircraft to achieve its mission objectives including UAS. COAs have been authorized in Arizona, Texas, Florida and North Dakota. When deploying resources for operations, the Office of Air and Marine must determine the availability of aircraft type and the integration of the requested activity into its flight operations.

Homeland Security addressed privacy in the Privacy Impact Assessment published September 9, 2013. A summary of privacy concerns addressed in this document includes:

Homeland Security

95,000 miles of maritime border security includes joint operations with the United States Coast Guard. Some of those miles include Alaska coastline.

1. The collection and use of data from aerial surveillance remains within the scope of its authorities to protect the border and provide support for law enforcement for law enforcement activities, while continuing to preserve a person's right to privacy.
2. UAS present a perceived risk because they are able to fly for longer periods of time and conduct surveillance relatively undetected. While UAS can fly for longer periods of time, they are equipped with the same technology to conduct surveillance that is presently deployed on manned aircraft.
3. Concern for the security of the UAS itself and the potential for hijacking of the unmanned aircraft is managed by the close monitoring of ground control and satellite communication by encrypted data. If one ground station were to lose contact, a second ground station is equipped to pick up the UAS and continue operations.

Alaska State Law and Personal Privacy

The State of Alaska and its local governments cannot dictate the use of the national airspace but can consider rules that better define the FAA guidelines, can consider legal repercussion for entities found in violation of adopted laws, and can provide for specific privacy laws regarding the use of UAS in Alaska.

The State of Alaska Constitution provides privacy protection, "although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. Both the Alaska Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy."[3]

Although much attention regarding UAS privacy focuses on government use and the Fourth Amendment, it is non-governmental use that is likely to raise some of the most significant privacy challenges in coming years. For private entities, the key constitutional question is the extent of their First Amendment privilege to gather information.

Civil use of unmanned aircraft will fall under the federal and state laws including such provisions as trespassing, invasion of privacy, intrusion upon seclusion, publication of private facts, stalking and harassment, and business privacy.

The Task Force, with guidance from Legislative Legal Services, considered many scenarios of possible violations of state and federal law that might occur with the use of unmanned aircraft. The Legal Services memo outlining the areas of statute that protect personal privacy can be found in Appendix X.

Privacy protection scenarios considered by the Task Force include but are not limited to:

Legal Services

Constitutional Protection of Privacy: *The Constitution of the State of Alaska explicitly protects the right of privacy against government intrusion. Art. I, sec. 22 provides: "The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section."*

Alaska Statutory Protections:

AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means

AS 11.61.116 Sending an explicit image of a minor

AS 11.61.120(a)(6) Harassment: publishing or distributing certain images

AS 11.61.123 Indecent viewing or photography

AS 11.76.113 Misconduct involving confidential information in the first degree

AS 11.76.115 Misconduct involving confidential information in the second degree

1. **If data is gathered by a government agency, it is a public record. However, AS 40.20.120 provides certain protections for private information. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information and whether the person whose actions have been captured has a reasonable expectation of privacy.**

It was discussed that data captured by a UAS would be treated similarly to data captured by other technology such as cell phones, manned aircraft, satellite images, voice recorders, etc. Case law is substantial in determining if the person would be considered to have a reasonable expectation of privacy and when a warrant would be required to obtain and use any data collected.

2. **As technology continues to advance beyond 'normal' application of current laws, drafting new laws must adopt a balanced approach that recognizes the inherent difficulty in predicting the future.**

[3] Legal memo [footnote-reference – get ref data]

The Task Force determined that we cannot foresee the future applications of technology (of UAS or other technologies) therefore, creating restrictions in law based on assumptions is not recommended.

3. How should Alaska manage unintentionally captured images or data?

Discussion concluded that there are adequate statute, case law and data retention guidelines that resolved the concerns of the Task Force.

Observations From Above: UAS and Privacy

This document was published in the Harvard Journal of Law and Public Privacy by John Villasenor, a senior fellow in Governance Studies and the Center for Technology Innovation, the Brookings Institution.

The Task Force discussed many of the scenarios posed by the author when considering the need for Alaska law.

4. The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of FMRA have a "line of sight" requirement.

The Task Force assumes that FAA regulations adopted in the next several years will continue to require visual line of sight operation. "Sense and avoid" technology will become more mature and some non-line-of-sight missions may be permitted by the FAA. Non-line-of-sight operations and other unknown technological advances may bring new challenges that will require the legislature to review industry guidelines and state laws in the future.

5. Unmanned aircraft may bring efficient advances to law enforcement; however, the public seems to be highly sensitive to law enforcement using unmanned aircraft.

After reviewing many possible uses of UAS, the Task Force determined that existing law already affords the public with adequate protections.

- Routine Technology: The use of UAS is treated much the same as any other technological tool used to protect the public. The Department of Public Safety has adopted the IACP Guidelines for UAS, and the Task Force found those guidelines to be superior for rules of law enforcement use.
- Public Navigable Airspace: The question of what constitutes "public navigable airspace" for UAS operated by the government is central to privacy policy. The Task Force found that almost every law enforcement scenario discussed was already protected by existing law.
- Role of Imaging Technology: Rules and case law exist that protect citizens from inappropriate use of capturing data that is a "great more than the human eye could ever see."

Law Enforcement

Public protection will benefit greatly from unmanned aircraft for the purposes of search and rescue, crash scene documentation time, natural disaster monitoring, wildfire management, amber and silver alerts, hostage situations and other life safety extremes. Some efforts will require warrants to proceed and some will be allowed under a COA.

- Extended Surveillance: Law enforcement does not intend to use UAS for standard patrol activities at this time. Limiting flight hours was not seen as an acceptable control because long flights may be necessary in the event of search and rescue or natural disaster remediation operations.
- Obtaining a Warrant: After much discussion, it was decided that using UAS to gather data would require a warrant in similar situations as using any other data gathering device (such as voice recording, photography, and thermal imaging with manual technology). No additional laws are required to obtain a warrant for UAS data gathering.
- Under no circumstance would a UAS be armed. FAA guidelines do not allow anything to be dropped from an unmanned aircraft.
- Law enforcement is planning to use high-visibility marking on any UAS they will use. Application of lights and/or hi-vis paint is being considered.
- It is apparent that public education is necessary for all agencies using UAS but sensitivity is heightened for law enforcement uses.

It is the opinion of the Task Force that existing privacy laws are adequate to govern the use of unmanned aircraft.

It is the opinion of the Task Force that if Alaska is chosen as one of the FAA Test Sites, we will have the opportunity to participate in the use of UAS in a variety of ways that would put Alaska in the position to establish policy guiding the use of UAS for the rest of the United States to consider.

Voluntary Approaches

The International Association of Chiefs of Police (IACP) adopted model guidelines for the use of UAS for law enforcement purposes.

The Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct calls for a commitment to "respect the privacy of individuals."

Academy of Model Aeronautics has also adopted operational policies and guidelines for advanced flight systems used in radio controlled model aircraft.

Self-Regulation by Three National Organizations

The Task Force adopted the IACP with one modification and excerpts from the AUVSI Code of Conduct.

IACP – International Association of Chiefs of Police
Recommended Guidelines for the use of Unmanned Aircraft was adopted in August 2012. The Alaska Department of Public Safety has also adopted these guidelines as their doctrine with the exception of increasing the flight approval responsibility from a "supervisor" to the director's office.

AUVSI – Association for Unmanned Vehicle Systems International; "As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct."

AMA – Academy of Model Aeronautics Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems guides model aircraft operators.

The same way that the FAA does not regulate model aeronautics, the Task Force does not intend to adopt requirements of hobbyist activities using UAS.

It was discussed that a notice should be provided at the time of purchase of each model aircraft to review the AMA flight operation guidelines for appropriate use of model aeronautics. The Task Force did not adopt a requirement for notice regarding hobbyists because so many aircraft are purchased outside of Alaska and would not be required to provide the notice.

[Need to add something about integrating model aeronautics and UAS policy.]

1. Should Alaska adopt some industry-relevant voluntary approaches of self-managed rules of UAS?

International Association of Chiefs of Police Guidelines for UAS, AUVSI Code of Conduct, and the Academy of Model Aeronautics rules were considered and generally accepted by the Task Force.

Technical Operations Guidelines

International Civil Aviation Organization (ICAO), a special agency of the United Nations, promotes "the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency, and regularity, as well as aviation environmental protection."

The goal of the ICAO in addressing unmanned aviation is to provide the fundamental international regulatory framework to support routine operation of UAS throughout the world in a safe, harmonized, and seamless manner comparable to that of manned operations.

"A number of Civil Aviation Authorities have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft... In general, UAS should be operated in accordance with the rule governing the flight of manned aircraft and meet equipment requirements applicable to the class of airspace within which they intent to operate... To safely integrate UAS in non-segregated airspace, the UAS must act and respond as manned aircraft do. Air Traffic, Airspace and Airport standards should not be significantly changed. The UAS must be able to comply with existing provisions to the greatest extent possible."[4]

UAS Operations Guidelines

Technical rules for operating unmanned aircraft systems are clearly identified at a global and federal level. "A number of Civil Aviation Authorities have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft..."

FAA Guidelines for the Operations of Unmanned Aircraft N 8900-227 specifically sets the rules for the technical operations of flying unmanned aircraft.

The FAA has established guidelines for the certification and airworthiness of the aircraft, certification of the pilot including additional instruction in operating specific UAS, flight operations

[4] Roadmap page 11 [get footnote ref data]

with the Test Sites, management of the Test Site and certificates of authorization for particular missions.

The Task Force is confident in the FAA guidelines in protecting the safety of the national airspace.

UAF Center for Unmanned Aircraft Systems Integration, RT&D is a nationally recognized program that has shown responsible use of UAS for more than ten years. The University has applied to the FAA to be selected as one of the six federal test sites.

(Was selected as one of the FAA's six Test Sites... December 31, 2013)

Benefits to Alaska

Economic Benefit

Policy Development

Expedited Timeline for Test Range Use and Approved Missions

Encourage UAF pilot training program for UAS

Hi-vis markings for law enforcement

Insurance for civil operators (license and bonding)

Education – public awareness

Market Alaska "open for business" for UAS

Audits of missions – FAA Privacy Policy requirement

Test Site operations manager position – FAA Privacy Policy requirement also requires a Chief Privacy Officer at Test Site

Incentive grants

Research appropriation to UAF

Definitions

University of Alaska Fairbanks Center for Unmanned Aircraft Systems Integration, Research Testing and Development

The University of Alaska Fairbanks has been involved in UAS missions for more than ten years. It has participated in research and data gathering operations from Prudhoe Bay to South Africa.

The Alaska Legislature indicated its support in the University's efforts by passage of HCR6 in the 2013 session. The resolution identified many of the good uses of UAS in Alaska and established this task force to recommend statutory changes.

RECOMMENDATIONS

The Task Force supports its recommendations to the legislature by considering and adopting general guidelines from the following reports from the FAA: (1) Guidelines for Operations of UAS N 8900-227, (2) Comprehensive Plan to integrate UAS in National Airspace, and (3) Final Privacy Requirements. The Task Force also adopted the International Association of Chiefs of Police (IACP) UAS Guidelines as appropriate rules for law enforcement in Alaska (Appendix A).

In addition to the FAA documents, the Task Force considered a report from Legal Services that identified Alaska's privacy laws and Constitutional protections of privacy to determine if there might be a scenario created through the use of UAS that would not be protected by existing privacy laws. The Task Force also recognized that in the event Alaska is chosen as an FAA test site for UAS Integration, an emphasis on management of the test ranges, economic development, and public education needed immediate attention.

In summary, the Task Force recommends the following:

- law enforcement agencies adopt the IACP guidelines
- form a public review panel that will establish broad categories of approved UAS use
- require high visibility paint scheme for aircraft
- If Alaska is chosen as an FAA Test Site for UAS Integration, emphasize
    - management of the test ranges,
    - economic development opportunities, and
    - public education regarding UAS.

Appendix X

Unmanned Aircraft System Operations Industry "Code of Conduct"

Unmanned Aircraft System Operations

Industry "Code of Conduct"

The emergence of unmanned aircraft systems (UAS) as a resource for a wide variety of public and private applications quite possibly represents one of the most significant advancements to aviation, the scientific community, and public service since the beginning of flight. Rapid advancements in the technology have presented unique challenges and opportunities to the growing UAS industry and to those who support it. The nature of UAS and the environments which they operate, when not managed properly, can and will create issues that need to be addressed. The future of UAS will be linked to the responsible and safe use of these systems. Our industry has an obligation to conduct our operations in a safe manner that minimizes risk and instills confidence in our systems.

For this reason, the Association for Unmanned Vehicle Systems International (AUVSI), offers this Code of Conduct on behalf of the UAS industry for UAS operation. This code is intended to provide our members, and those who design, test, and operate UAS for public and civil use, a set of guidelines and recommendations for safe, non-intrusive operations. Acceptance and adherence to this code will contribute to safety and professionalism and will accelerate public confidence in these systems.

The code is built on three specific themes: Safety, Professionalism, and Respect. Each theme and its associated recommendations represent a "common sense" approach to UAS operations and address many of the concerns expressed by the public and regulators. This code is meant to provide UAS industry manufacturers and users a convenient checklist for operations and a means to demonstrate their obligation to supporting the growth of our industry in a safe and responsible manner. By adopting this Code, UAS industry manufacturers and users commit to the following:

Safety

- We will not operate UAS in a manner that presents undue risk to persons or property on the surface or in the air.
- We will ensure UAS will be piloted by individuals who are properly trained and competent to operate the vehicle or its systems.
- We will ensure UAS flights will be conducted only after a thorough assessment of risks associated with the activity. This risks assessment will include, but is not limited to:
- Weather conditions relative to the performance capability of the system
- Identification of normally anticipated failure modes (lost link, power plant failures, loss of control, etc.) and consequences of the failures
- Crew fitness for flight operations

- Overlying airspace, compliance with aviation regulations as appropriate to the operation, and off-nominal procedures
- Communication, command, control, and payload frequency spectrum requirements
- Reliability, performance, and airworthiness to established standards
- Professionalism
- We will comply with all federal, state, and local laws, ordinances, covenants, and restrictions as they relate to UAS operations.
- We will operate our systems as responsible members of the aviation community.
- We will be responsive to the needs of the public.
- We will cooperate fully with federal, state, and local authorities in response to emergency deployments, mishap investigations, and media relations.
- We will establish contingency plans for all anticipated off-nominal events and share them openly with all appropriate authorities.

Respect

- We will respect the rights of other users of the airspace.
- We will respect the privacy of individuals.
- We will respect the concerns of the public as they relate to unmanned aircraft operations.
- We will support improving public awareness and education on the operation of UAS.

As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct.

Appendix XX

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE

AVIATION COMMITTEE

Recommended Guidelines for the use of Unmanned Aircraft

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of our lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. Model Aircraft - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. Unmanned Aircraft (UA) – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. UA Flight Crewmember - A pilot, visual observer, payload operator or other person assigned duties for a UA for the purpose of flight.
4. Unmanned Aircraft Pilot - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, that the agency will operate the aircraft in full compliance

with the mandates of the Constitution, federal, state and local law governing search and seizure.

4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UA should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.
4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UA will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training, or demonstration purposes.

4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.

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Press Release – FAA Releases Unmanned Aircraft Systems Integration Roadmap

For Immediate Release

November 7, 2013
Contact: Les Dorr or Alison Duquette
Phone: (202) 267-3883

Also Finalizes Privacy Policy for UAS Test Sites

WASHINGTON –The U.S. Department of Transportation's Federal Aviation Administration (FAA) today released its first annual Roadmap outlining efforts needed to safely integrate unmanned aircraft systems (UAS) into the nation's airspace. The Roadmap addresses current and future policies, regulations, technologies and procedures that will be required as demand moves the country from today's limited accommodation of UAS operations to the extensive integration of UAS into the NextGen aviation system in the future.

"Government and industry face significant challenges as unmanned aircraft move into the aviation mainstream," said U.S. Transportation Secretary Anthony Foxx. "This Roadmap is an important step forward that will help stakeholders understand the operational goals and safety issues we need to consider when planning for the future of our airspace."

The Roadmap outlines the FAA's approach to ensuring that widespread UAS use is safe, from the perspective of accommodation, integration, and evolution. The FAA's main goal for integration is to establish requirements that UAS operators will have to meet in order to increase access to airspace over the next five to 10 years. The Roadmap discusses items such as new or revised regulations, policies, procedures, guidance material, training and understanding of systems and operations to support routine UAS operations.

"The FAA is committed to safe, efficient and timely integration of UAS into our airspace," said FAA Administrator Michael Huerta. "We are dedicated to moving this exciting new technology along as quickly and safely as possible."

The Roadmap also addresses the evolution of UAS operations once all requirements and standards are in place and are routinely updated to support UAS operations as the National Airspace System evolves over time. The document stresses that the UAS community must understand the system is not static, and that many improvements are planned for the airspace system over the next 15 years.

The FAA plans to select six UAS test sites to begin work on safely integrating UAS into the airspace. These congressionally-mandated test sites will conduct critical research into how best to safely integrate UAS systems into the national airspace over the next several years and what certification and navigation requirements will need to be established.

The use of UAS, both at the designated test sites and in the national airspace generally, raises the issue of privacy and protection of civil liberties. In February, the FAA asked for public comments specifically on the draft privacy requirements for the six test sites. Today, the agency sent a final privacy policy to the *Federal Register* that requires test site operators to comply with federal, state, and other laws on individual privacy protection, to have a publicly available privacy plan and a written plan for data use and retention, and to conduct an annual review of privacy practices that allows for public comment. Information about the test site selection process and final test site privacy policy is available at: http://www.faa.gov/about/initiatives/uas/

For the next several years, the FAA will continue to use special mitigations and procedures to safely accommodate limited UAS access to the nation's airspace on a case-by-case basis. The Roadmap notes that this case-by-case accommodation will decline significantly as integration begins and expands, but will continue to be a practical way to allow flights by some UAS operators in certain circumstances.

In addition to the FAA's Roadmap, as required in the 2012 FAA Reauthorization, the Joint Planning and Development Office (JPDO) has developed a comprehensive plan to safely accelerate the integration of civil UAS into the national airspace system.. That plan details a multi-agency approach to safe and timely UAS integration and coordination with the NextGen shift to satellite-based technologies and new procedures.

The UAS Roadmap (PDF) and UAS Comprehensive Plan is available on our website.

"UAS Roadmap"
Michael Huerta, Washington, DC
November 7, 2013

AIA – Unmanned Aircraft Systems Forum

Remarks as Prepared for Delivery

Good morning, Marion, and thank you for that introduction. It's great to be here today.

Aviation and aerospace hold a special place in the American consciousness. They are a symbol of American innovation. And innovation is what makes this country grow and prosper.

As we move into the second century of flight, we are transforming our airspace to take advantage of technological breakthroughs, and to maintain our position as a global leader. Through NextGen, we are transitioning from a system of ground-based radar and navigational aids, to a system that uses satellites and GPS for greater precision, more direct routes, greater fuel efficiency and better predictability.

NextGen is about taking the enormous advances that are taking place today in communications, computing and navigation, and incorporating these advances into our nation's aviation system.

With the growth of the Internet, of data-sharing, and of precise mapping, we have no choice but to leverage these benefits in the world of flight. NextGen is bringing these advances to aviation and allowing us to create the airspace of the future. And in that airspace of the future, we will have new users. We will have more commercial space launches and we'll have more unmanned aircraft systems. As you know, it requires significant work to build consensus on how to safely integrate game-changing technologies such as these.

I'm pleased to say that we have made solid progress. Today I would like to announce that the FAA has released its first Unmanned Aircraft Systems roadmap. This document, developed with key stakeholders, outlines what we need to do to safely integrate unmanned aircraft into our national airspace. It provides a five-year outlook and will have annual updates.

The roadmap addresses the policies, the regulations, the technologies, and procedures that we will need to integrate unmanned aircraft on a routine basis. To accomplish this, we must change the way we do business. We have operational goals as well as safety issues that we must consider when planning to expand the use of unmanned aircraft.

As the provider of air traffic services, we must ensure the safety and efficiency of the entire airspace, including all aircraft, people and property – both manned and unmanned – in the air and on the ground.

Unmanned aircraft are inherently different from manned aircraft. They run a very wide range, with a number of different physical and operational characteristics. Some are the size of a fist, and fly at low altitudes. Others have glider-like bodies with the wing span of a 737 and can fly above 60,000 feet. Many can fly longer and hover longer than manned aircraft. They are also lighter and slower than traditional aircraft and have more lift and not as much drag. What unites them all is that the pilot is on the ground and not on board the aircraft.

Our FAA forecast estimates that we can expect 7,500 small unmanned aircraft in our national airspace in the next five years, provided the regulations are in place to handle them.

Right now, almost all of the unmanned aircraft operations we approve for public use and research purposes are on a case by case basis.

For the last two decades, the FAA has authorized the limited use of unmanned aircraft for important missions in the public interest. These include firefighting, disaster relief, search and rescue, law enforcement, border patrol, military training, and testing and evaluation.

About 80 law enforcement agencies operate unmanned aircraft now under special certificates of authorization. Universities also use unmanned aircraft for research into weather, agriculture, and industrial uses.

And more recently, in September, the first commercial flight of an unmanned aircraft took place in the rainy skies above the Arctic Circle. A Scan Eagle completed a 36-minute flight to view marine mammals and survey ice. These surveys are needed to meet environmental and safety requirements before drilling on the sea floor.

This flight was coordinated by ConocoPhillips, the FAA, the manufacturer of the Scan Eagle, and other federal and international agencies. This Arctic region is the only area to date where we have authorized the use of small unmanned aircraft for commercial purposes.

In moving forward, we recognize that the expanded use of unmanned aircraft presents great opportunities, but it's also true that integrating these aircraft presents significant challenges.

There are operational issues that we need to address, such as pilot training. We also need to make sure that unmanned aircraft sense and avoid other aircraft, and that they operate safely if they lose the link to their pilot.

This is why developing more test data is so important. By the end of the year, we plan to choose six test sites for civil unmanned aircraft. Congress required us to do so, and we need to make sure we use these sites to obtain the best data that we can. The test sites will provide invaluable information to help us develop policies and procedures to ensure safe, responsible and transparent integration.

Today, we are also releasing the privacy policy that will apply to the UAS test sites. This policy requires operators to comply with all local, state and federal laws concerning privacy and civil liberties. We're requiring the test site operators to create a privacy policy that is available to the public. And they must require anyone operating unmanned aircraft at the test sites to have a written plan for how they will use and retain any test data acquired. On a broader level, agencies across the government are coming together to work on privacy issues that may arise with the increasing use of unmanned aircraft beyond these test sites.

Our airspace system is not static. And it's important for industry to understand that unmanned operations will evolve over time.

In addition to the roadmap, the Department of Transportation is releasing a Comprehensive Plan that dovetails with the FAA's roadmap. This Comprehensive Plan details the multi-agency approach to the safe and timely integration of unmanned aircraft. The plan establishes goals to integrate both small and larger unmanned aircraft, and to foster America's leadership in advancing this technology.

All three of these new documents – the Comprehensive Plan, the Roadmap and the privacy policy for the test sites – are available today on our web site at FAA.GOV.

We are dedicated to working with stakeholders in this growing industry and with our government partners – the Departments of Defense and Homeland Security, as well as NASA and the Joint Planning and Development Office – to define parameters to safely integrate these very diverse systems into the world's most complex airspace.

Rest assured the FAA will fulfill its statutory obligations to integrate unmanned systems. But we must fulfill those obligations in a thoughtful, careful manner that ensures safety and promotes economic growth.

While aviation is unquestionably an industry known for innovation, it is also an industry with a strong history of collaboration between government and industry. This collaboration has enabled us to achieve a position of international leadership. The U.S. is recognized as the "gold standard" for aviation safety, efficiency and technology.

And we need to keep it that way.

Together, we need to address the many areas where we need standards for these new unmanned aircraft. This includes standards for manufacturing and standards for pilot training.

We have a challenging task ahead and we all have a stake in this goal.

For us to be effective, funding for the government needs to happen in a predictable and reliable way so that we can consistently work towards the greater good. Short-term, stop-gap funding is no way to run a government or an aviation system.

We must move forward with NextGen and the rollout of new technologies, such as modern communications, navigation, and surveillance systems for our nation's airspace. The integration of unmanned aircraft relies on these kinds of NextGen advancements. We are building a complex and inter-related airspace. We need to join together again and vocally support the priorities that we have established.

By working together, government and industry will overcome the challenges that face us, and open the door to a more diverse and dynamic aviation future.

Thank you.

U.S. Department
of Transportation
**Federal Aviation
Administration**

Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap

First Edition – 2013

November 7, 2013

Dear Members of the Aviation Community:

I am pleased to present the Federal Aviation Administration's (FAA) Roadmap for *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS)*. The FAA and the UAS Aviation Rulemaking Committee (ARC) worked together for the past year to produce this roadmap. Unmanned aircraft offer new ways for commercial enterprises and public operators to increase operational efficiency, decrease costs, and enhance safety; and this roadmap will allow us to safely and efficiently integrate them into the NAS.

The FAA is committed to the safe and efficient integration of UAS into the NAS. However, as safety is our top priority, UAS integration must be accomplished without reducing existing capacity, decreasing safety, impacting current operators, or placing other airspace users or persons and property on the ground at increased risk. We have made great progress in accommodating public UAS operations, but challenges remain for the safe, long-term integration of both public and civil UAS in the NAS.

This roadmap outlines the actions and considerations needed to enable UAS integration into the NAS. The roadmap also aligns proposed FAA actions with Congressional mandates from the *FAA Modernization and Reform Act of 2012*. This plan also provides goals, metrics, and target dates for the FAA and its government and industry partners to use in planning key activities for UAS integration.

We will update the specific implementation details (goals, metrics, target dates) as we learn from our current UAS operations, leverage ongoing research, and incorporate the work of our government and industry partners in all related areas.

Thank you for your continued support and active participation in the safe and efficient integration of UAS in the NAS.

Michael P. Huerta
Administrator

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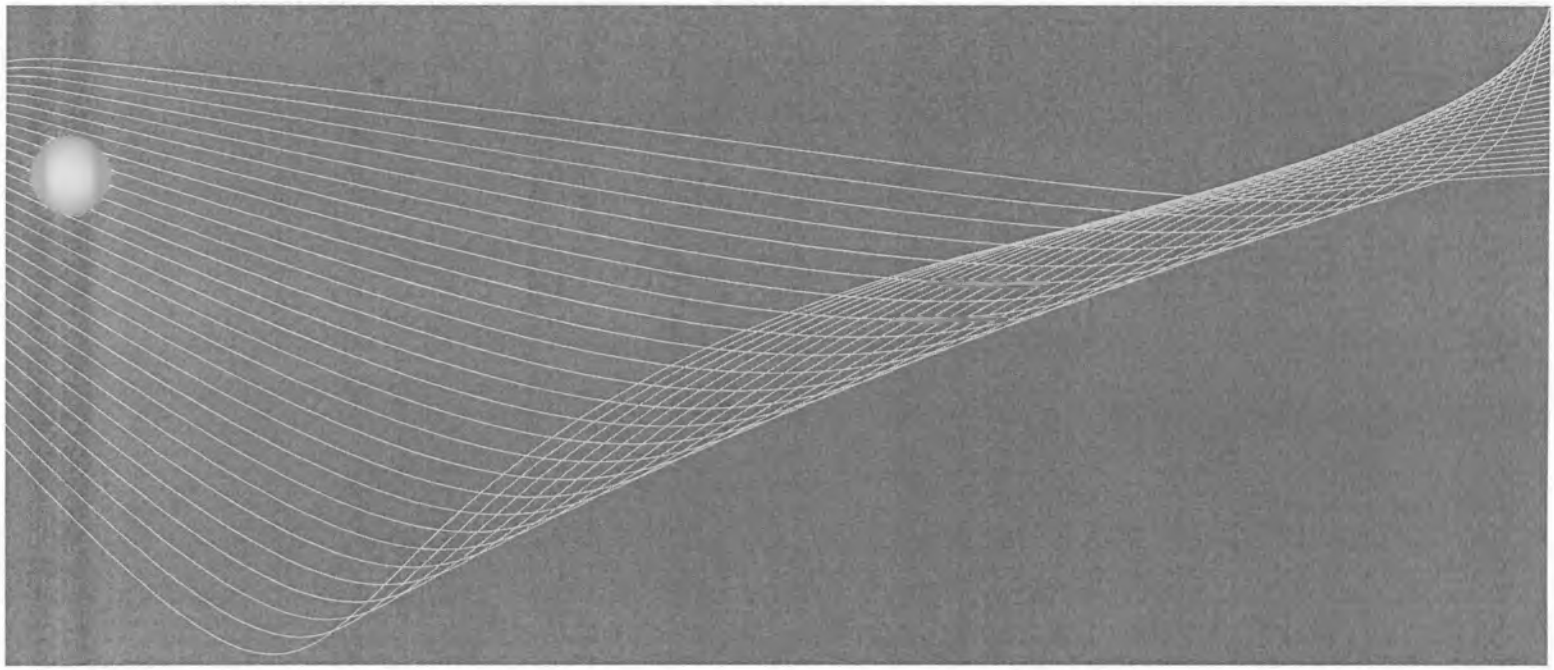

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Executive Summary

Expanding Operations of Unmanned Aircraft Systems in the NAS

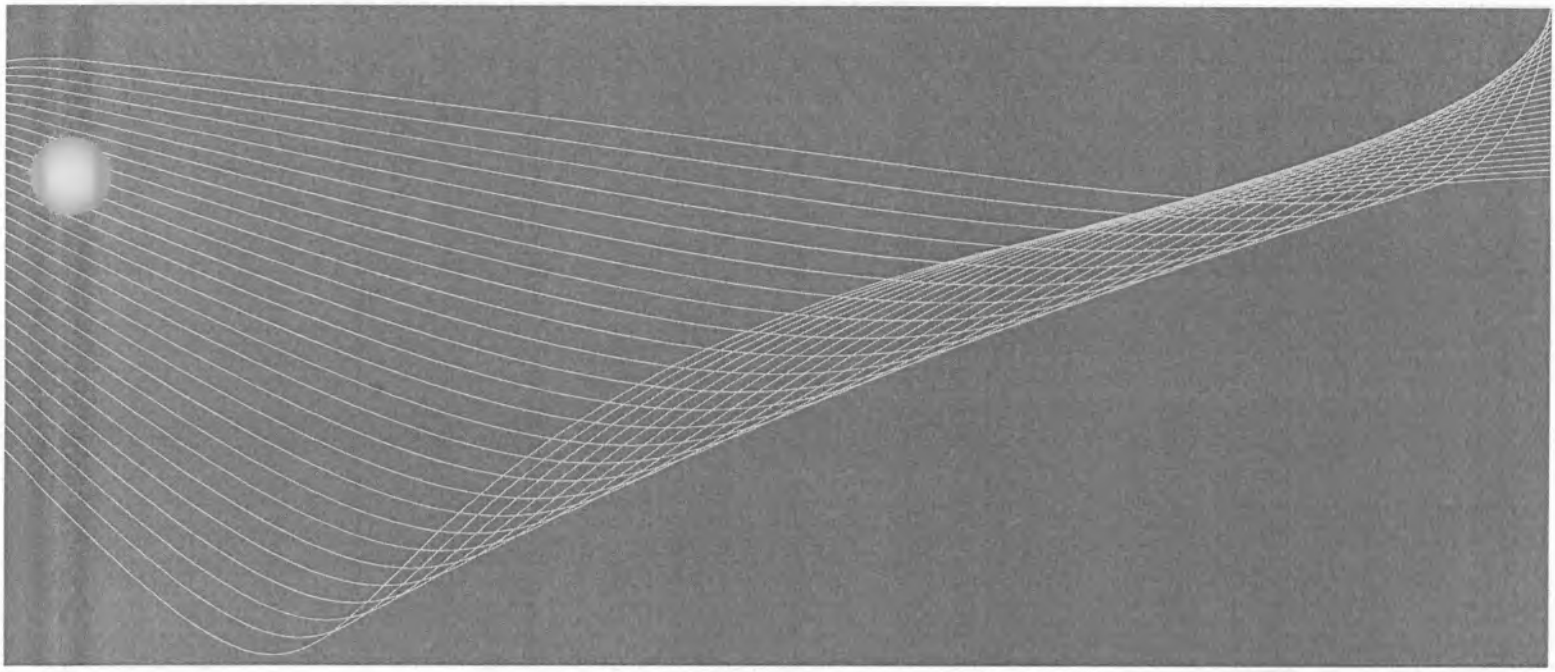
Since the early 1990s, unmanned aircraft systems (UAS) have operated on a limited basis in the National Airspace System (NAS). Until recently, UAS mainly supported public operations, such as military and border security operations. The list of potential uses is now rapidly expanding to encompass a broad range of other activities, including aerial photography, surveying land and crops, communications and broadcast, monitoring forest fires and environmental conditions, and protecting critical infrastructures. UAS provide new ways for commercial enterprises (civil operations) and public operators to enhance some of our nation's aviation operations through increased operational efficiency and decreased costs, while maintaining the safety of the NAS.

As stated in *Destination 2025* (2011):

> *"The Federal Aviation Administration's (FAA) mission is to provide the safest, most efficient aviation system in the world. What sets the United States apart is the size and complexity of our infrastructure, the diversity of our user groups, our commitment to safety and excellence, and a history of innovation and leadership in the world's aviation community. Now we are working to develop new systems and to enhance a culture that increases the safety, reliability, efficiency, capacity, and environmental performance of our aviation system."*

Ultimately, UAS must be integrated into the NAS without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies.

The FAA created the Unmanned Aircraft Systems Integration Office to facilitate integration of UAS safely and efficiently into the NAS. Toward that goal, the FAA is collaborating with a broad spectrum of stakeholders, which includes manufacturers, commercial vendors, industry trade associations, technical standards organizations, academic institutions, research and development centers, governmental agencies, and other regulators. Ultimately, UAS must be integrated into the NAS without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies. Significant progress has been made toward UAS-NAS integration, with many challenges and opportunities ahead.



A key activity of the FAA is to develop regulations, policy, procedures, guidance material, and training requirements to support safe and efficient UAS operations in the NAS, while coordinating with relevant departments and agencies to address related key policy areas of concern such as privacy and national security. Today, UAS are typically given access to airspace through the issuance of Certificates of Waiver or Authorization (COA) to public operators and special airworthiness certificates in the experimental category for civil applicants. Accommodating UAS operations by the use of COAs and special airworthiness certificates will transition to more routine integration processes when new or revised operating rules and procedures are in place and UAS are capable of complying with them. The FAA has a proven certification process in place for aircraft that includes establishing special conditions when new and unique technologies are involved. This process will be used to evaluate items unique to UAS. In those parts of the NAS that have demanding communications, navigation, and surveillance performance requirements, successful demonstration of UAS to meet these requirements will be necessary.

The process of developing regulations, policy, procedures, guidance material, and training requirements, is resource-intensive. This roadmap will illustrate the significant undertaking it is to build the basis for the NAS to transition from UAS *accommodation* to UAS *integration*. Government and industry stakeholders must work collaboratively and apply the necessary resources to bring this transition to fruition while supporting evolving UAS operations in the NAS.

The purpose of this roadmap is to outline, within a broad timeline, the tasks and considerations needed to enable UAS integration into the NAS for the planning purposes of the broader UAS community. The roadmap also aligns proposed Agency actions with the Congressional mandate in the *FAA Modernization and Reform Act of 2012,* Pub. L. 112-95. As this is the first publication of this annual document, the FAA will incorporate lessons learned and related findings in subsequent publications, which will include further refined goals, metrics, and target dates.

The FAA is committed to the safe and efficient integration of UAS into the NAS, thus enabling this emerging technology to safely achieve its full potential.

Purpose and Background of Civil UAS Roadmap

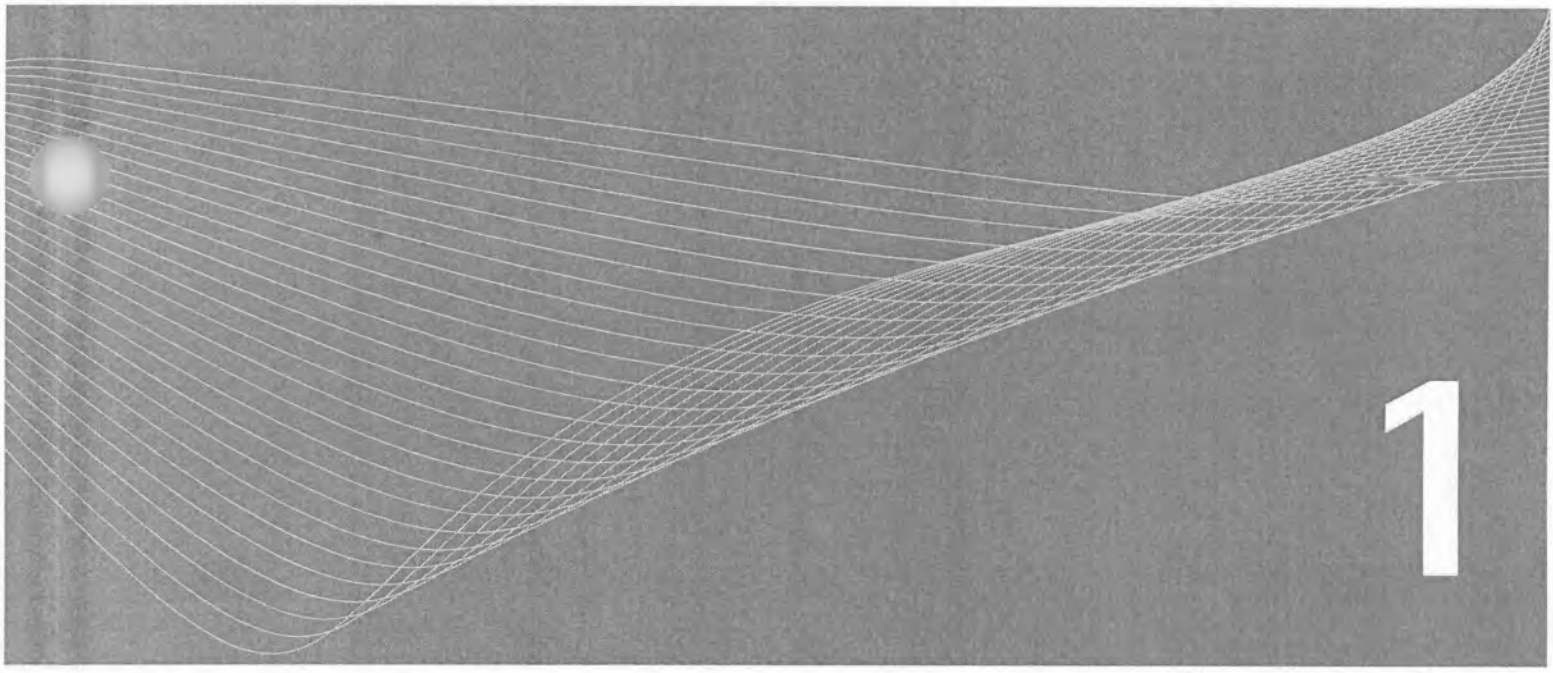
1 Purpose and Background of Civil UAS Roadmap

Unmanned aircraft systems (UAS) and operations have significantly increased in number, technical complexity, and sophistication during recent years without having the same history of compliance and oversight as manned aviation. Unlike the manned aircraft industry, the UAS community does not have a set of standardized design specifications for basic UAS design that ensures safe and reliable operation in typical civilian service applications. As a result, the UAS community often finds it difficult to apply existing FAA guidance. In some cases, interpretation of regulations and/or standards may be needed to address characteristics unique to UAS. Ultimately, the pace of integration will be determined by the ability of industry, the user community, and the FAA to overcome technical, regulatory, and operational challenges. The purpose of this roadmap is to outline, within a broad timeline, the tasks and considerations needed to enable UAS integration into the National Airspace System (NAS) for the planning purposes of the broader UAS community. The roadmap also aligns proposed Agency actions with the Congressional mandate in the *FAA Modernization and Reform Act of 2012,* Pub. L. 112-95.

To gain full access to the NAS, UAS need to be able to bridge the gap from existing systems requiring accommodations to future systems that are able to obtain a standard airworthiness certificate

This five-year roadmap, as required by the *FAA Modernization and Reform Act of 2012* (FMRA), is intended to guide aviation stakeholders in understanding operational goals and aviation safety and air traffic challenges when considering future investments. The roadmap is organized into three perspectives that highlight the multiple paths used to achieve the milestones outlined, while focusing on progressive accomplishments. These three perspectives — *Accommodation, Integration,* and *Evolution* — transcend specific timelines and examine the complex relationship of activities necessary to integrate UAS into the NAS. These three perspectives will be explored in more detail in Section 2.2.4.

Although the FMRA requires a five-year UAS roadmap, it is important to view UAS-NAS integration not only in terms of near-term activities and objectives, but also in the context of mid- and long-term timeframes. The timeframes used in this roadmap are defined in the President's National Aeronautics Research and Development Plan, which specifies less than 5 years as the near-term, 5-10 years as the mid-term, and greater than 10 years as the long-term. For this roadmap, the long-term is defined as



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2022-2026, which is consistent with the Joint Planning and Development Office (JPDO) *National Airspace System Concept of Operations and Vision for the Future of Aviation and NextGen Air Transportation System Integrated Plan.*

Integration of UAS into the NAS will require: review of current policies, regulations, environmental impact, privacy considerations, standards, and procedures; identification of gaps in current UAS technologies and regulations, standards, policies, or procedures; development of new technologies and new or revised regulations, standards, policies, and procedures; and the associated development of guidance material, training, and certification of aircraft systems, propulsion systems, and airmen. The FAA will coordinate these integration activities with other United States Government agencies, as needed, through the Interagency Planning Committee (IPC).

1.1 History of UAS

Historically, unmanned aircraft have been known by many names including: "drones," "remotely piloted vehicles (RPV)," "unmanned aerial vehicles (UAV)," "models," and "radio control (R/C) aircraft." Today, the term UAS is used to emphasize the fact that separate system components are required to support airborne operations without a pilot onboard the aircraft. Early UAS operations received little attention from the FAA and its predecessor agencies due to the infrequency of operations, which were mostly conducted in remote locations or in special use airspace and were not deemed to impact the safety of the NAS. In the past two decades, the number of unmanned aircraft operations has been increasing dramatically, highlighting the need for a structured approach for safe and efficient integration.

1.2 Proposed Civil and Commercial Applications

The use of UAS in commercial applications is expected to expand in a number of areas (see Operational Services and Environment Definition (OSED) for Unmanned Aircraft Systems (UAS), RTCA DO-320, 2010). Some of the currently proposed civil and commercial applications of UAS include:

- Security awareness;
- Disaster response, including search and support to rescuers;
- Communications and broadcast, including news/sporting event coverage;
- Cargo transport;
- Spectral and thermal analysis;
- Critical infrastructure monitoring, including power facilities, ports, and pipelines;
- And commercial photography, aerial mapping and charting, and advertising.

1.3 Definitions

Several terms used in this document are defined below as a common point of reference:

Unmanned Aircraft (UA): A device used or intended to be used for flight in the air that has no onboard pilot. This device excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR Part 101), rockets, tethered aircraft and un-powered gliders.

Crewmember [UAS]: In addition to the crewmembers identified in 14 CFR Part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and visual observers (VO), but may include other persons as appropriate or required to ensure safe operation of the aircraft.

Unmanned Aircraft System (UAS): An unmanned aircraft and its associated elements related to safe operations, which may include control stations (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems, and launch/recovery equipment. As shown in Figure 1, it consists of three elements:

- Unmanned Aircraft;
- Control Station;
- And Data Link.

National Airspace System (NAS): The common network of U.S. airspace — air navigation facilities, equipment, and services; airports or landing areas; aeronautical charts, information and services; rules, regulations, and procedures; technical information; and manpower and material. (see Figure 2)

Next Generation Air Transportation System (NextGen): According to the FAA's *Destination 2025,* (2011):

> *"NextGen is a series of inter-linked programs, systems, and policies that implement advanced technologies and capabilities to dramatically change the way the current aviation system is operated. NextGen is satellite-based and relies on a network to share information and digital communications so all users of the system are aware of other users' precise locations."*

Unmanned Aircraft System (UAS)

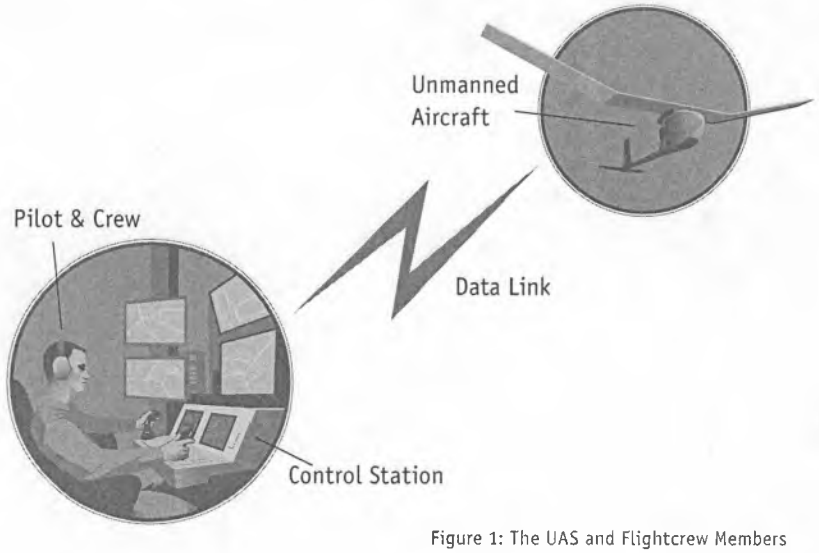


Figure 1: The UAS and Flightcrew Members

1.4 Policy

The FAA is responsible for developing plans and policy for the safe and efficient use of the United States' navigable airspace. This responsibility includes coordinating efforts with national security and privacy policies so that the integration of UAS into the NAS is done in a manner that supports and maintains the United States Government's ability to secure the airspace and addresses privacy concerns. Further, the FAA will harmonize, when appropriate, with the international community for the mutual development of civil aviation in a safe and orderly manner. Components of existing FAA and International Civil Aviation Organization (ICAO) policy are outlined below.

National Airspace System

Figure 2: The NAS

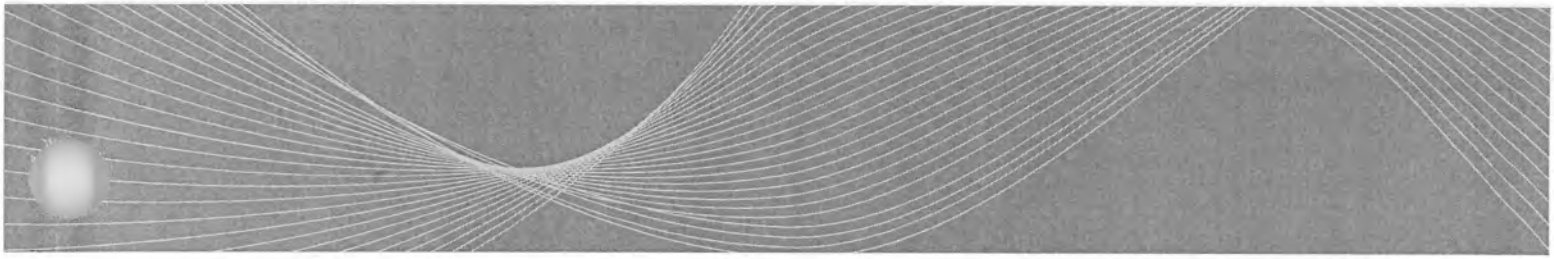
1.4.1 FAA UAS Policy Basis

Established FAA aviation policies support an acceptable level of safety for the NAS. At the core of these policies is the concept that each aircraft is flown by a pilot in accordance with required procedures and practices. This same policy applies to UAS.

Aviation policies and regulations focus on overall safety being addressed through three primary areas: equipment, personnel, and operations and procedures. Each of these areas has standards and minimum levels of safety that must be met, independent of each other. As a matter of regulation, for example, a new civil aircraft must be able to independently obtain an airworthiness certificate, regardless of the airspace class where it might be flown. However, as a result or part of this certification, new procedures may be required for flightcrew members and air traffic control (ATC) in order to maintain the minimum level of safety of the NAS while accommodating the new technology. Under special certifications and authorizations, limited operations may be authorized for equipment unable to meet current standards.

The application of these established aviation policies to UAS is summarized in the following key points excerpted from the FAA Notice of Policy: Unmanned Aircraft Operations in the National Airspace System (72 Fed. Reg. 6689 (Feb. 13, 2007)):

- Regulatory standards need to be developed to enable current technology for unmanned aircraft to comply with Title 14 Code of Federal Regulations;



- In order to ensure safety, the operator is required to establish the UAS airworthiness either from FAA certification, a Department of Defense (DoD) airworthiness statement, or by other approved means;
- Applicants also have to demonstrate that a collision with another aircraft or other airspace user is extremely improbable;
- And the pilot-in-command concept is essential to the safe operation of manned operations. The FAA's UAS guidance applies this pilot-in-command concept to unmanned aircraft and includes minimum qualification and currency requirements.

These policies have enabled the accommodation of UAS into the NAS on a limited basis on the foundation that operations are conducted safely, present an acceptable level of risk to the general public, and do no harm to, or adversely impact, other users. To gain full access to the NAS, UAS need to be able to bridge the gap from existing systems requiring accommodations to future systems that are able to obtain a standard airworthiness certificate. These UAS will also need to be flown by a certified pilot in accordance with existing, revised, or new regulations and required standards, policies, and procedures.

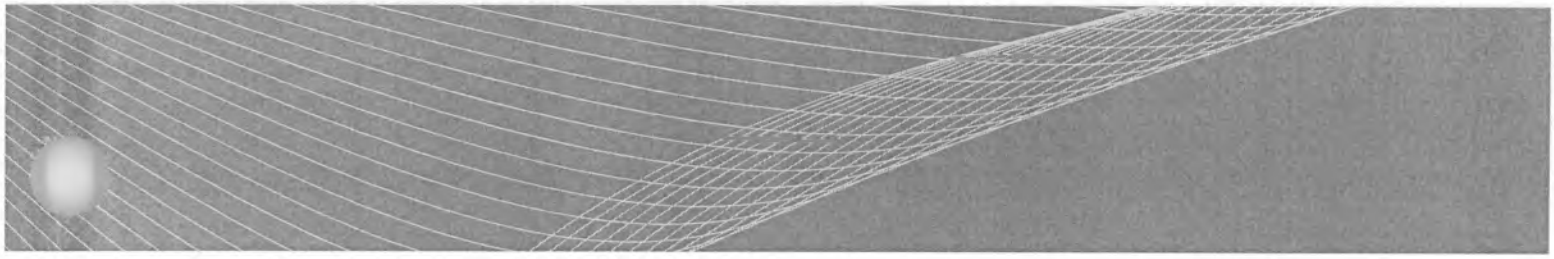
1.4.2 International Civil Aviation Organization (ICAO) Policy

ICAO, a special agency of the United Nations, promotes "the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency, and regularity, as well as aviation environmental protection."

The goal of ICAO in addressing unmanned aviation is to provide the fundamental international regulatory framework to support routine operation of UAS throughout the world in a safe, harmonized, and seamless manner comparable to that of manned operations. Current ICAO guidance material for UAS is published in ICAO Circular 328, "Unmanned Aircraft Systems (UAS) Circular," which provides basic guidelines for Member States to introduce and integrate UAS into airspace in a consistent manner, to ensure global interoperability and regulatory compatibility, when possible. The document's guiding policy on UAS is:

> *"A number of Civil Aviation Authorities (CAA) have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft... In general, UAS should be operated in accordance with the rule governing the flight of manned aircraft and meet equipment requirements applicable to the class of airspace within which they intend to operate...To safely integrate UAS in non-segregated airspace, the UAS must act and respond as manned aircraft do. Air Traffic, Airspace and Airport standards should not be significantly changed. The UAS must be able to comply with existing provisions to the greatest extent possible."*

ICAO develops Standards and Recommended Practices (SARP), which are generally followed by national civil aviation authorities of the Member States. The United States is an ICAO Member State, and the FAA plans to harmonize with international efforts and adhere to ICAO SARPs when possible.



1.4.3 Industry Policy Recommendations

RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management system issues. RTCA functions as a Federal Advisory Committee, and the FAA considers RTCA recommendations when making policy, program, and regulatory decisions. RTCA Special Committee 203 (SC-203) was established in 2004 to help assure the safe, efficient, and compatible operation of UAS with other aircraft operating within the NAS. This Special Committee has developed and documented guiding principles for UAS integration, which are summarized below:

- UAS must operate safely, efficiently, and compatibly with service providers and other users of the NAS so that overall safety is not degraded;
- UAS will have access to the NAS, provided they have appropriate equipage and the ability to meet the requirements for flying in various classes of airspace;
- Routine UAS operations will not require the creation of new special use airspace, or modification of existing special use airspace;
- Except for some special cases, such as small UAS (sUAS) with very limited operational range, all UAS will require design and airworthiness certification to fly civil operations in the NAS;
- UAS pilots will require certification, though some of the requirements may differ from manned aviation;
- UAS will comply with ATC instructions, clearances, and procedures when receiving air traffic services;
- UAS pilots (the pilot-in-command) will always have responsibility for the unmanned aircraft while it is operating;
- And UAS commercial operations will need to apply the operational control concept as appropriate for the type of operation, but with different functions applicable to UAS operations.

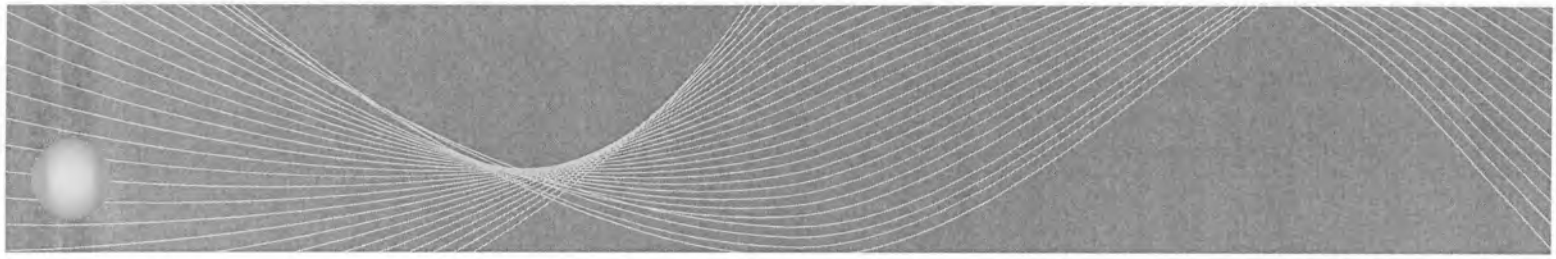
Through an FAA-established UAS Aviation Rulemaking Committee (ARC), the FAA continues to collaborate with government and industry stakeholders for recommendations regarding the path toward integration of UAS into the NAS. This effort will harmonize with the work being done by international organizations working toward a universal goal of safe and efficient UAS airspace operations.

1.4.4 Privacy and Civil Liberties Considerations

The FAA's chief mission is to ensure the safety and efficiency of the entire aviation system. This includes manned and unmanned aircraft operations. While the expanded use of UAS presents great opportunities, it also raises questions as to how to accomplish UAS integration in a manner that is consistent with privacy and civil liberties considerations.

As required by the FMRA, the FAA is implementing a UAS test site program to help the FAA gain a better understanding of operational issues relating to UAS. Although the FAA's mission does not include developing or enforcing policies pertaining to privacy or civil liberties, experience with the UAS test sites will present an opportunity to inform the dialogue in the IPC and other interagency forums concerning the use of UAS technologies and the areas of privacy and civil liberties.

As part of the test site program, the FAA will authorize non-federal public entities to establish and operate six test sites in the United States. The FAA recognizes that there are privacy considerations regarding the use of UAS at the test sites. To ensure that these concerns are taken into consideration at the test sites, the FAA plans to require each test site operator to establish a privacy policy that will apply to operations at the test site. The test site's privacy

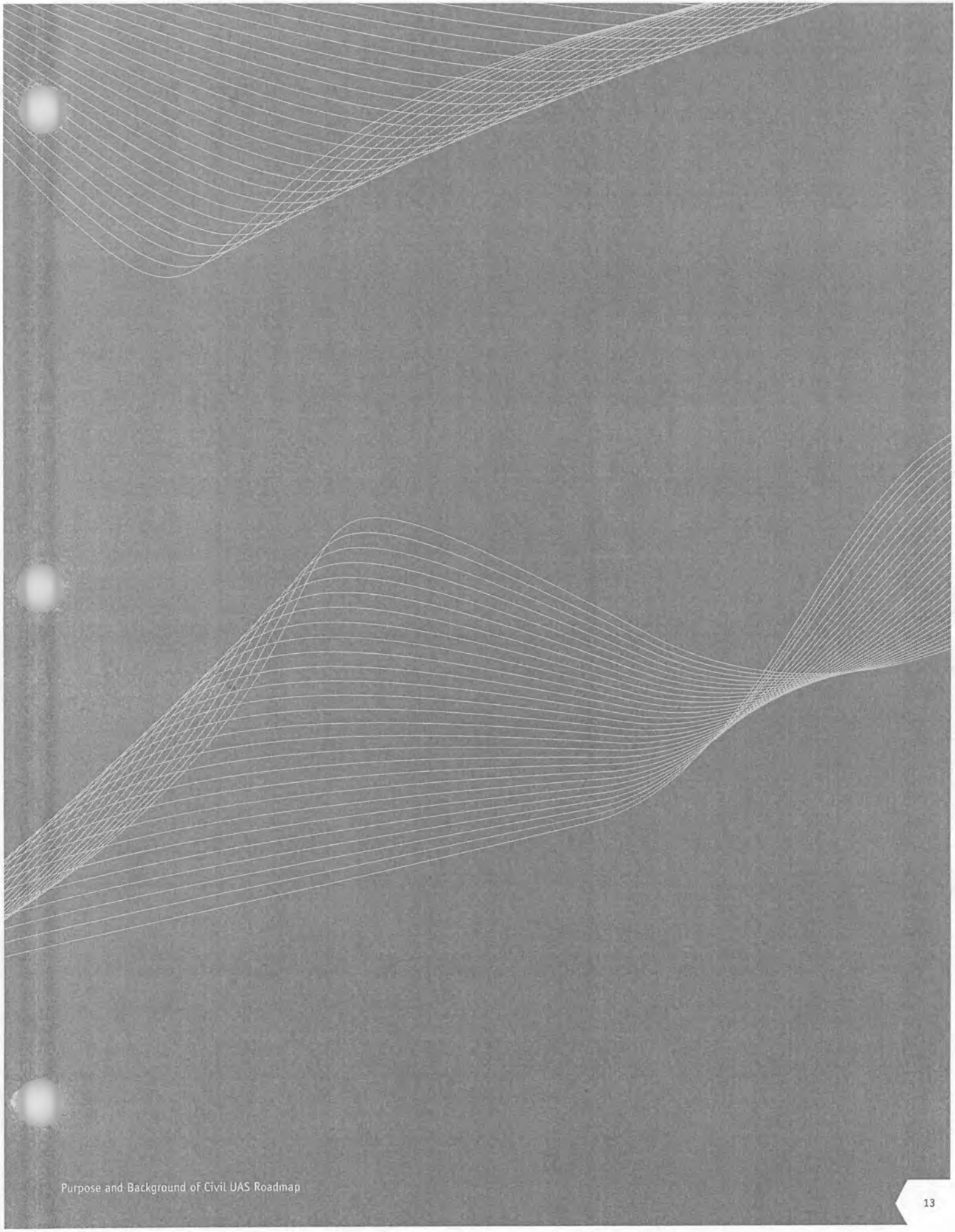


policy must be publicly available and informed by Fair Information Practice Principles. In addition, each site operator must establish a mechanism through which the operator can receive and consider comments on its privacy policy.

The privacy requirements proposed for the UAS test sites are specifically designed for the operation of the test sites and are not intended to predetermine the long-term policy and regulatory framework under which UAS would operate. However, the FAA anticipates that the privacy policies developed by the test site operators will help inform the dialogue among policymakers, privacy advocates, and the industry regarding broader questions concerning the use of UAS technologies in the NAS.

1.4.5 National Security Issues

Integrating public and civil UAS into the NAS carries certain national security implications, including security vetting for certification and training of UAS-related personnel, addressing cyber and communications vulnerabilities, and maintaining/enhancing air defense and air domain awareness capabilities in an increasingly complex and crowded airspace. In some cases, existing security frameworks applied to manned aircraft may be applicable. Other security concerns may require development of new frameworks altogether. The FAA will continue to work with relevant United States Government departments and agencies, and with stakeholders through coordinating bodies such as the IPC and JPDO, to proactively address these areas of concern.



UAS Operations in the NAS

This roadmap focuses on civil UAS access to the NAS. To this end, the FAA and the UAS community are working to address the myriad challenges associated with this effort.

2.1 FAA's Dual Role for UAS Integration

For UAS, as with all aircraft, the FAA acts in a dual role. As the regulator, the FAA ensures aviation safety of persons and property in the air and on the ground. As the service provider, the FAA is responsible for providing safe and efficient air traffic control services in the NAS and the other portions of global airspace delegated to the United States by ICAO.

As part of its regulator role, the Office of Aviation Safety (AVS) efforts are led by the UAS Integration Office. The main focus of the UAS Integration Office is to provide, within the existing AVS structure, subject matter expertise, research, and recommendations to develop policy, regulations, guidance, and procedures for UAS airworthiness and operations in support of safe integration of UAS into the NAS.

As the service provider, the Air Traffic Organization (ATO) efforts are led by the Air Traffic Emerging Technologies Group, which considers operational authorizations for UAS flights that are unable to meet current regulations and procedures. A Certificate of Waiver or Authorization (COA) is issued with limitations and provisions that mitigate the increased risks resulting from the use of uncertified technology. The ATO is responsible for the safe and efficient handling of aircraft and the development of the airspace rules, procedures, and air traffic controller training to support routine operations in the NAS.

2.2 UAS Challenges

A number of issues that impact the integration of UAS into the NAS are being considered across the regulatory and service provider roles of the FAA. To ensure the FAA meets the goals set forth in this roadmap, these offices will be addressing the challenges as outlined in the following subsections.

2.2.1 Policy, Guidance, and Regulatory Product Challenges

To ensure the FAA has the appropriate UAS framework, many policy, guidance, and regulatory products will need to be reviewed and revised to specifically address UAS integration into the NAS. UAS technology and operations will need to mature, and new products may be required in order to meet applicable regulations and standards. Figure 3 depicts policy, guidance, and regulatory product areas requiring research and development. This information is derived from the RTCA notional architecture and is primarily related to airmen and UAS certification.

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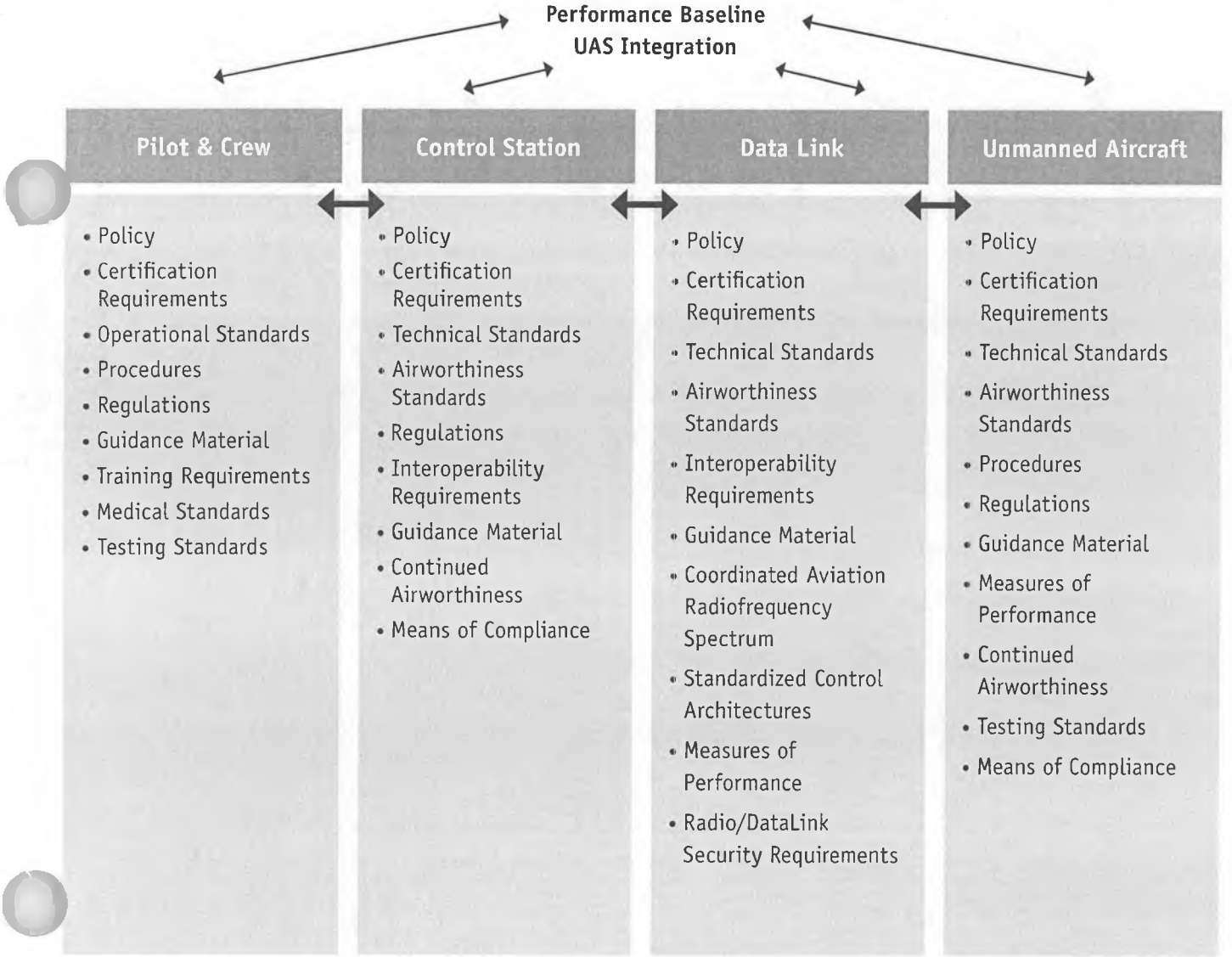


Figure 3: AVS Products to Regulate UAS Operations

The challenge is to identify and develop the UAS regulatory structure that encompasses areas listed in Figure 3. Other regulatory drivers include:

- Developing minimum standards for Sense and Avoid (SAA), Control and Communications (C2), and separation assurance to meet new or existing operational and regulatory requirements for specified airspace;
- Understanding the privacy, security, and environmental implications of UAS operations and working with relevant departments and agencies to proactively coordinate and align these considerations with the UAS regulatory structure;
- And developing acceptable UAS design standards that consider the aircraft size, performance, mode of control, intended operational environment, and mission criticality.

Although aviation regulations have been developed generically for all aircraft, until recently these efforts were not done with UAS specifically in mind. This presents certain challenges because the underlying assumptions that existed during the previous efforts may not now fully accommodate UAS operations. As an example, current regulations address security requirements for cockpit doors. However, these same regulations lack a legal definition for what a "cockpit" is or where it is located. This presents a challenge for UAS considering that the cockpit or "control station" may be located in an office building, in a vehicle, or outside with no physical boundaries. Applying current cockpit door security regulations to UAS may require new rulemaking, guidance, or a combination of both.

The regulatory process is designed to provide transparency to the public and an opportunity to understand and comment on proposed rules before being issued. Additional checks and balances are in place to ensure that final regulations are not unnecessarily burdensome to the public. Because of these requirements, and lacking any exceptions, an average regulatory effort might span a number of years. These timeframes may be longer for high visibility or complex regulations. FAA experience to date with the development of a Notice of Proposed Rulemaking (NPRM) for small UAS indicates that UAS rulemaking efforts may be more complex, receive greater scrutiny, and require longer development timeframes than the average regulatory effort.

2.2.2 Air Traffic Operational Challenges

Numerous Air Traffic products, policies, and procedures also need to be reviewed and refined or developed through supporting research to permit UAS operations in the NAS. The UAS Integration Office coordinates efforts with the ATO to complete these tasks.

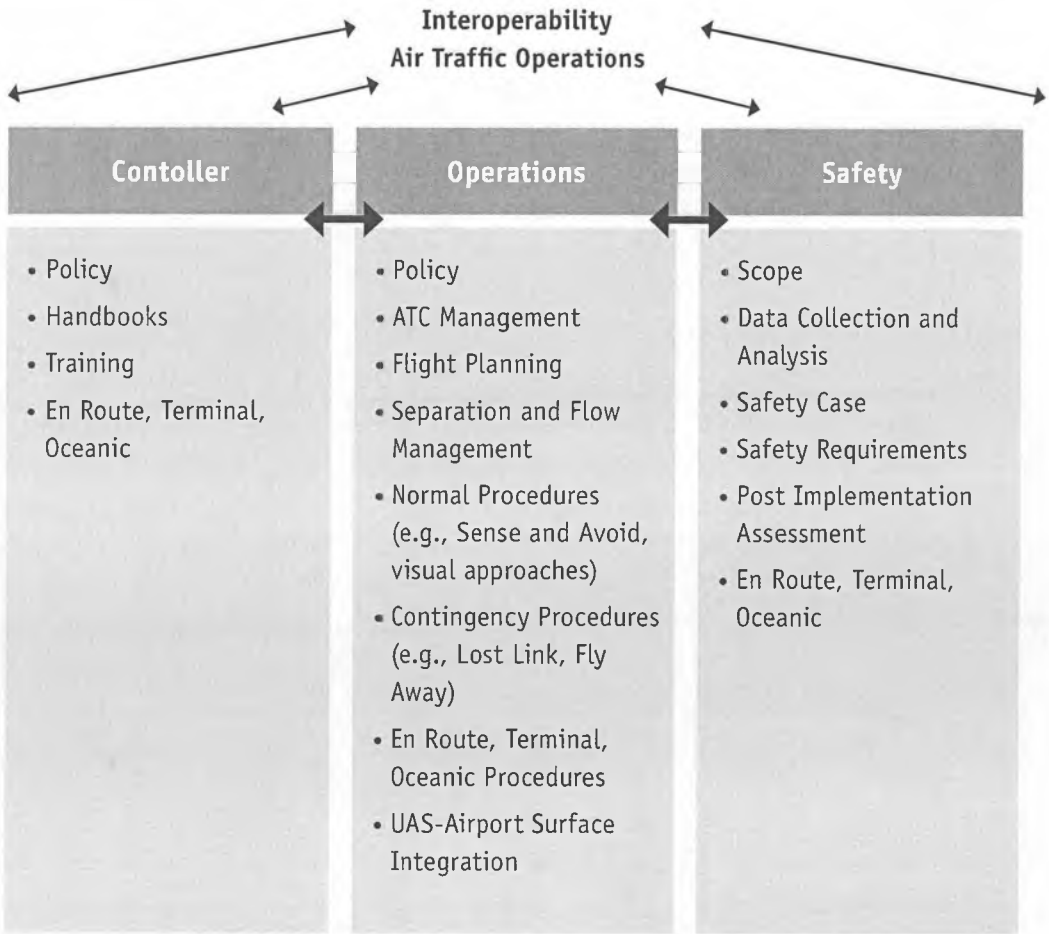


Figure 4: ATO UAS Operational Area

The goal of safely integrating UAS without segregating, delaying, or diverting other aircraft and other users of the system presents significant challenges in the areas outlined in Figure 4 above. For NAS integration, this also includes:

- Identifying policies and requirements for UAS to comply with ATC clearances and instructions commensurate with manned aircraft (specifically addressing the inability of UAS to comply directly with ATC visual clearances or to operate under visual flight rules);
- Establishing procedures and techniques for safe and secure exchange of voice and data communication between UAS pilots, air traffic controllers, and other NAS users;
- Establishing wake vortex and turbulence avoidance criteria needed for UAS with unique characteristics (e.g., size, performance, etc.);
- And reviewing environmental requirements (e.g., the National Environmental Policy Act).

2.2.3 Technological Challenges

The FAA recognizes that current UAS technologies were not developed to comply with existing airworthiness standards. Current civil airworthiness regulations may not consider many of the unique aspects of UAS operations. Materials properties, structural design standards, system reliability standards, and other minimum performance requirements for basic UAS design need to be evaluated against civil airworthiness standards for existing aircraft. Although significant technological advances have been made by the UAS community, critical research is needed to fully understand the impact of UAS operations in the NAS. There has also been little research to support the equipment design necessary for UAS airworthiness certification. In the near- to mid-term, UAS research will need to focus on technology deemed necessary for UAS access to the NAS.

As UAS are introduced, their expected range of performance will need to be evaluated for impact on the NAS. UAS operate with widely varying performance characteristics that do not necessarily align with manned aircraft performance. They vary in size, speed, and other flight capabilities. Similarly, the issue of performance gap between the pilot and the avionics will impact NAS operations. For example, a quantitative time standard for a pilot response to ATC directions (such as "turn left heading 270, maintain FL250") does not exist – there is an acceptable delay for the pilot's verbal response and physical action, but there is no documented required range of acceptable values. Avionics that perform the corresponding function cannot be designed and built without these performance requirements being established.

Existing standards ensure safe operation by pilots actually on board the aircraft. These standards may not translate well to UAS designs where pilots are remotely located off the aircraft. Removing the pilot from the aircraft creates a series of performance considerations between manned and unmanned aircraft that need to be fully researched and understood to determine acceptability and potential impact on safe operations in the NAS. These include the following considerations:

- The UAS pilot is not onboard the aircraft and does not have the same sensory and environmental cues as a manned aircraft pilot;
- The UAS pilot does not have the ability to directly comply with see-and-avoid responsibilities and UAS SAA systems do not meet current operational rules;
- The UAS pilot must depend on a data link for control of the aircraft. This affects the aircraft's response to revised ATC clearances, other ATC instructions, or unplanned contingencies (e.g., maneuvering aircraft);
- UAS cannot comply with certain air traffic control clearances, and alternate means may need to be considered (e.g., use of visual clearances);
- UAS present air traffic controllers with a different range of platform sizes and operational capabilities (such as size, speed, altitude, wake turbulence criteria, and combinations thereof);

Removing the pilot from the aircraft creates a series of performance considerations between manned and unmanned aircraft that need to be fully researched and understood to determine acceptability and potential impact on safe operations in the NAS.

- And some UAS launch and recovery methods differ from manned aircraft and require manual placement and removal from runways, a lead vehicle for taxi operations, or dedicated launch and recovery systems.

Therefore, it is necessary to develop new or revised regulations/ procedures and operational concepts, formulate standards, and promote technological development that will enable manned and unmanned aircraft to operate cohesively in the same airspace. Specific technology challenges include two critical functional areas:

- **"Sense and Avoid" (SAA) capability** must provide for self-separation and ultimately for collision avoidance protection between UAS and other aircraft analogous to the "see and avoid" operation of manned aircraft that meets an acceptable level of safety. SAA technology development is immature. In manned flight, see and avoid, radar, visual sighting, separation standards, proven technologies and procedures, and well-defined pilot behaviors combine to ensure safe operation. Unmanned flight will require new or revised operational rules to regulate the use of SAA systems as an alternate method to comply with "see and avoid" operational rules currently required of manned aircraft. SAA system standards must be developed to assure both self-separation and collision avoidance capability for UAS. Interoperability constraints must also be defined for safe and secure interactions between SAA-enabled UAS and other airborne and ground-based collision avoidance systems. While SAA may be an independent system, it must be designed to be compatible across other modes (e.g., ATC separation services). See Appendix C.3 and C.4 for specific goals and metrics.

Unmanned flight will require new or revised operational rules to regulate the use of SAA systems as an alternate method to comply with "see and avoid" operational rules currently required of manned aircraft.

- **Control and Communications (C2) system performance requirements** are needed and RTCA is developing consensus-based recommendations for the FAA to consider in C2 policy, program, and regulatory decisions. The resulting C2 requirements need to support the minimum performance required to achieve higher-level (UAS level) performance and safety requirements. Third-party communication service providers are common today (e.g., ARINC, Harris, etc.) and the FAA has experience with setting and monitoring performance of third parties. The use of third parties is dependent on the UAS architecture chosen, but these are still being evaluated in terms of feasibility from a performance, cost, and safety perspective. See Appendix C.5 for specific goals and metrics.

2.2.4 Managing the Challenges

To provide the UAS community insight into the FAA process for fostering UAS flight in the NAS, Figure 5 highlights the intended shift in focus over time from Accommodation to Integration, and then to Evolution. This method is consistent with the approach used for new technologies on manned aircraft introduced into the NAS.

Current design standards reflect the focus in the COA process on allowing existing designs, embodying some experimental design philosophies, to fly in the NAS. Progress toward standard airworthiness will also increase as design standards mature, but not before.

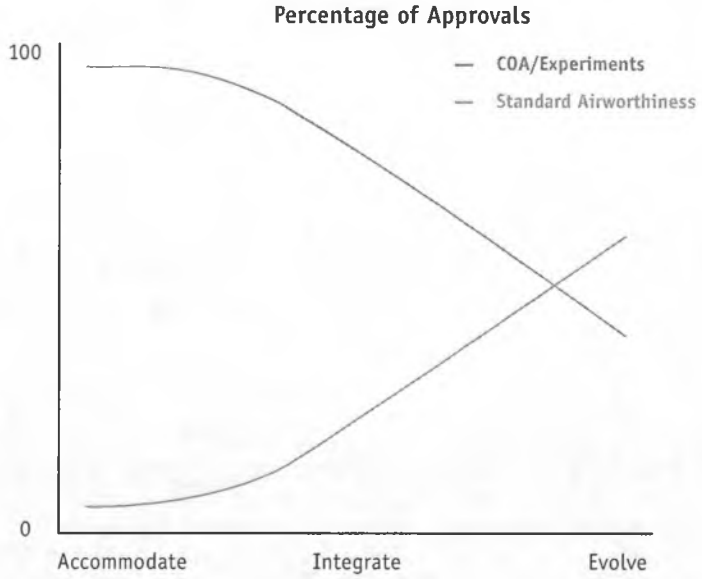


Figure 5: Transition from COA/Experimental to Standard Airworthiness Approvals

Recognizing the challenges and the complex coordination required for integration, the UAS roadmap addresses the efforts needed to move forward incrementally toward the goal of full NAS integration.

Timely progress on products, decisions, research, development, testing, and evaluation will be needed to successfully move from accommodation to integration in the evolving NAS.

The approach to managing the challenges discussed in this section focuses on the following interdependent topics:

- Standards;
- Rules and Regulations;
- Certification of the UAS;
- Procedures and Airspace;
- Training (Pilot, Flightcrew Member, Mechanic, and Controller);
- And Research and Development (R&D) and Technology.

The roadmap discusses the activities and transitions for the above interdependent topic areas from the vantage point of Accommodation, Integration, and Evolution, as summarized below and described in more detail in subsequent sections of this roadmap. These perspectives transcend the near-, mid-, and far-term timeframes and provide additional insight into the task of integrating UAS into the NAS.

Perspective 1: Accommodation. Take current UAS and apply special mitigations and procedures to safely facilitate limited access to the NAS. UAS operations in the NAS are considered on a case-by-case basis. Accommodation will predominate in the near-term, and while it will decline significantly as integration begins and expands in the mid-term, it will continue to be a viable means for NAS access with appropriate restrictions and constraints to mitigate any performance shortfalls. During the near-term, R&D will continue to identify challenges, validate advanced mitigation strategies, and explore opportunities to progress UAS integration into the NAS.

Perspective 2: Integration. Establishing threshold performance requirements for UAS that would increase access to the NAS is a primary objective of integration. During the mid- to far-term, the Agency will establish new or revised regulations, policies, procedures, guidance material, training, and understanding of systems and operations to support routine NAS operations. Integration is targeted to begin in the near- to mid-term with the implementation of the sUAS rule and will expand further over time (mid- and far-term) to consider wider integration of a broader field of UAS.

Perspective 3: Evolution. All required policy, regulations, procedures, guidance material, technologies, and training are in place and routinely updated to support UAS operations in the NAS operational environment as it evolves over time. It is important that the UAS community maintains the understanding that the NAS environment is not static, and that there are many improvements planned for the NAS over the next 13-15 years. To avoid obsolescence, UAS developers will need to maintain a dual focus: integration into today's NAS while maintaining cognizance of how the NAS is evolving.

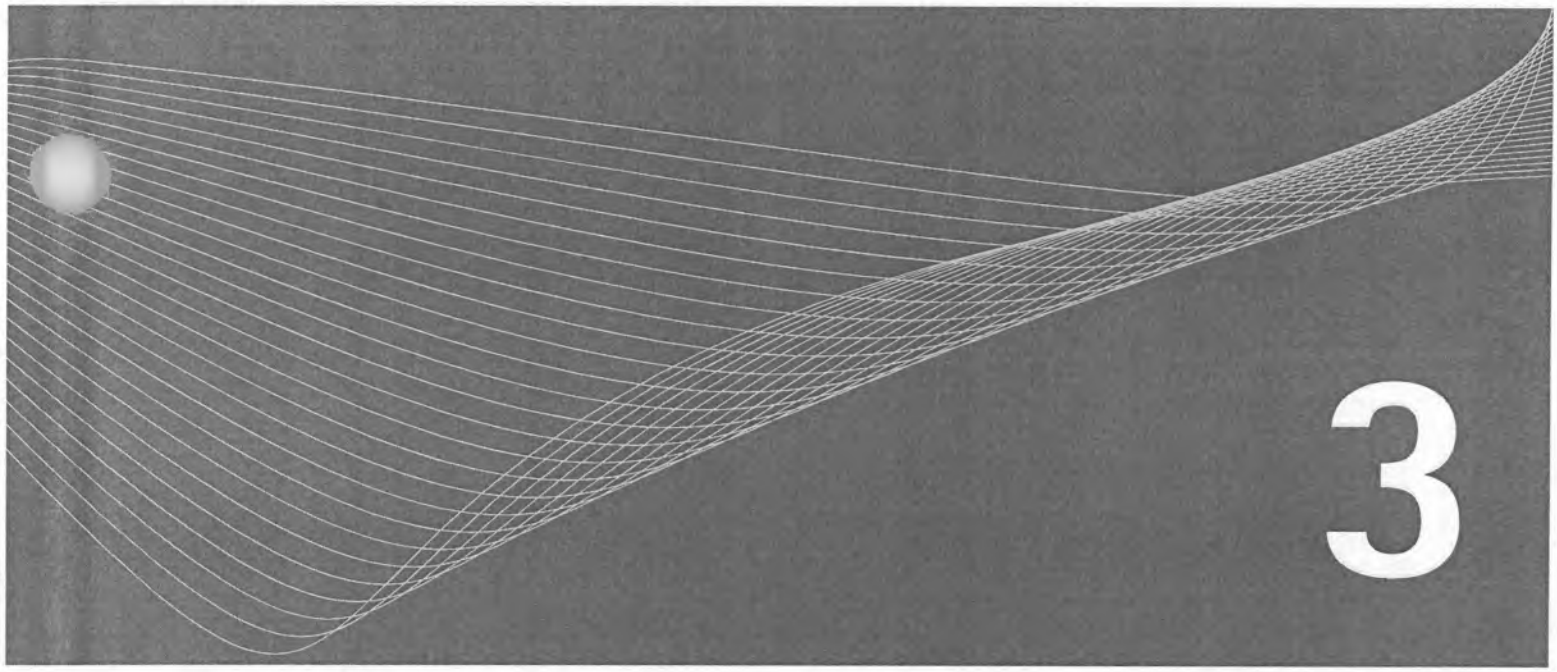
Perspective 1: Accommodation

3.1 Overview

The FAA's near-term focus will be on safely allowing for the expanded operation of UAS through accommodation. Enhanced procedures and technology, over time, will increase access to the NAS through accommodation made possible by improvements to current mitigations and the introduction of advanced mitigations. The need to maintain this avenue for NAS access will continue. Research and development on current and advanced mitigations is necessary to maintain this avenue for access with appropriate restrictions and constraints to mitigate performance shortfalls and address privacy, security, and environmental concerns. The consideration and planning for integration of UAS into the NAS will continue simultaneously.

There has been a growing interest in a wide variety of civil uses for unmanned aircraft. A number of paths can be used to apply for airworthiness certification of UAS. One method that the UAS civil community is currently using to access the NAS is with a special airworthiness certificate in the experimental category, which requires specific, proven capabilities to enable operations at a constrained level. Each application is reviewed for approval on a case-by-case basis that allows a carefully defined level of access that is limited and dependent on risk mitigations that ensure safety and efficiency of the NAS is not diminished. The use of special airworthiness certificates for UAS is similar to their use for manned aircraft and they are normally issued to UAS applicants for the purposes of research and development, crew training or market surveys per 14 CFR 21.191(a), (c), and (f).

Through August 2012, the FAA had issued 114 special airworthiness certificates (i.e., 113 experimental certificates and one special flight permit) to 22 different models of civil aircraft. Of these 22 different models, 16 are unmanned aircraft and 6 are Optionally Piloted Aircraft (OPA). These experimental certificates have been useful for UAS research and development (R&D), and as R&D efforts subside, the use of experimental certificates may decrease. While the FAA continues to accommodate special access to the NAS, existing airworthiness standards are also an avenue for full-type certification. The FAA is working with the UAS ARC to gain feedback to potential changes to airworthiness standards for UAS, as necessary. In the long-term, UAS that are designed to a standard and built to conform to the design may be integrated into the NAS as fully certificated aircraft.



3.2 Standards

If UAS are to operate routinely in the NAS, they must conform to an agreed-upon set of standards. Requirements will vary depending on the nature and complexity of the operation, aircraft or component system limitations, pilot and other crewmember qualifications, and the operating environment.

A technical (or operational) standard is an established norm or requirement about a technical (or operational) system that documents uniform engineering or technical criteria, methods, processes, and practices. A standard may be developed privately or unilaterally, by a corporation, regulatory body, or the military. Standards can also be developed by organizations such as trade unions and associations. These organizations often have more diverse input and usually develop voluntary standards that may be adopted by the FAA as a means of regulatory compliance.

To operate an aircraft safely and efficiently in today's NAS, a means of complying with applicable parts of Title 14 of the Code of Federal Regulations must be developed. Aircraft certification standards govern the design, construction, manufacturing, and continued airworthiness of aircraft used in private and commercial operations. These standards were developed with an underlying assumption that a person would be onboard the aircraft and manipulating the controls. This has led to numerous requirements that make aircraft highly reliable and safe for their intended operations and flightcrew protection.

While UAS share many of the same design considerations as manned aircraft, such as structural integrity and performance, most unmanned aircraft and control stations have not been designed to comply with existing civil airworthiness or operational standards. Beyond the problem of meeting existing aircraft certification standards, other components of the UAS, such as the equipment and software associated with the data link (control and communications) and the launch and recovery mechanisms, are not currently addressed in civil airworthiness or operational standards.

Since 2004, the FAA has developed close working relationships with several standards development organizations. Most of these organizations plan to complete their UAS standards development efforts in the near- to mid-term timeframe. When accepted, these standards development products may provide a means of compliance for rules established in the mid-term. The FAA has also been either the lead or an important participant in cross-agency efforts that influence standards development and has coordinated and harmonized these activities with international efforts such as the ICAO UAS Study Group.

Standardization efforts have already produced a number of useful definitions, guidance documents, and considerations that provide common understanding and add insight and data to UAS integration efforts:

- RTCA/SC-203's Guidance Material (DO-304) and numerous position papers
- RTCA/SC-203's Operational Services and Environment Definition For Unmanned Aircraft Systems (OSED, DO-320), which documents definitions and operating scenarios for different UAS operations in the NAS
- RTCA Air Traffic Management Advisory Committee, Requirements and Planning Work Group Report "Airspace Considerations for UAS Integration in the National Airspace System," March 26, 2008
- SAA Workshop Reports that have documented SAA timelines and definitions

Standards development will continue with the goal of producing Minimum Aviation System Performance Standards (MASPS) by the end of the near-term. RTCA products will be taken under consideration by the FAA in the development of policy and guidance products such as Advisory Circulars. Minimum Operational Performance Standards (MOPS) may be used to define Technical Standard Orders (TSO) in the mid- to long-term timeframe.

Additional coordination and input from the stakeholder community (industry and trade associations, manufacturers, academia, research organizations, and public agencies) is being provided with the recent establishment of the UAS ARC.

Although the need to develop standards cannot be overstated, detailed policy, guidance, technical performance requirements, and operational procedures are also needed to enable manned and unmanned aircraft to fly safely and efficiently in the NAS. See Appendix C for specific goals and metrics.

3.3 Rules and Regulations

Unmanned aircraft operations have significantly increased in number, technical complexity, and sophistication during recent years without specific regulations to address their unique characteristics. For a person wishing to design, manufacture, market, or operate a UAS for a commercial mission and seeking FAA approval for that aircraft, its pilot and the operations, existing rules have not been fully tailored to the unique features of UAS.

The FAA has published a Notice which replaced the previous interim operational guidance material used to support UAS accommodation. Since accommodation is not envisioned to be eliminated entirely, this Notice will need to be updated periodically, even as progress continues simultaneously on development of UAS rules and regulations for integration.

The FAA is also developing an NPRM to allow sUAS to conduct operations. This rulemaking effort includes an associated industry effort to develop consensus standards needed for rule implementation. Assuming the sUAS NPRM effort proceeds to a final rule, associated guidance will also be completed to allow the FAA to approve operations and civil and public UAS operators to apply for and safely implement these sUAS operations. All sUAS rule development and implementation will be in accordance with the FMRA.

During this period, the appropriate regulations are also being reviewed for applicability to UAS operations by the FAA, industry groups, and the

The emphasis will be on the need for new or revised rules for UAS to operate under instrument flight rules (IFR), including rules to allow UAS operations analogous to manned aircraft using visual capabilities.

UAS ARC. The results of this review will determine any regulatory gaps that need to be addressed in the development of specific UAS guidance and rulemaking. The emphasis will be on the need for new or revised rules for UAS to operate under instrument flight rules (IFR), including rules to allow UAS operations analogous to manned aircraft using visual capabilities. Based on the findings of this review, a determination will be made regarding the need to modify, supplement, or create specific new regulations to support UAS beyond the near-term. UAS rulemaking will follow these steps.

3.4 Airworthiness Certification of the UAS

Airworthiness certification is a process that the FAA uses to ensure that an aircraft design complies with the appropriate safety standards in the applicable airworthiness regulations. FAA type design approval indicates the FAA has evaluated the safety of the unmanned aircraft design and all its systems, which is more rigorous than simply making a determination that the UAS is airworthy.

Airworthiness standards for existing aircraft are codified in Title 14 of the Code of Federal Regulations, with processes described for FAA type certification in FAA Order 8110.4 and airworthiness certification in FAA Order 8130.2. The FAA has the authority and regulations in place to tailor the design standards to specific UAS applications, and plans to use this authority until further experience is obtained in addressing the design issues that are unique to UAS.

Civil UAS are currently accommodated with experimental certificates under FAA Order 8130.34. The FAA and the UAS industry will need to work together to move away from the existing experimental or expendable design philosophy, toward a design philosophy more consistent with reliable and safe civilian operation over populated areas and in areas of manned aircraft operation.

Existing airworthiness standards have been developed from years of operational safety experience with manned aircraft and may be too restrictive for UAS in some areas and inadequate in others. For example, existing structural requirements that ensure safe operation in foreseeable weather conditions that are likely to be encountered represent an example of well-established design requirements that existing UAS designs will most likely need to consider. Structural failures have nearly been eliminated from manned aircraft operations and must be mitigated to a similar level of likelihood in UAS operations.

Detailed consideration of UAS in the certification process will be limited in number until such time as a broad and significant consideration is given to existing standards, regulations, and policy. This will be facilitated by UAS manufacturers making application for type design approval to the FAA. For type design approval, UAS designers must show they meet acceptable safety levels for the basic UAS design, and operators must employ certified systems that enable compliance with standardized air traffic operations and contingency/emergency procedures for UAS.

The FAA believes that the UAS community will be best served by the use of an incremental approach to gaining type-design and airworthiness approval. This incremental approach (see Figure 6) could involve the following steps:

- First, allowing existing UAS designs to operate with strict airworthiness and operational limitations to gain operational experience and determine their reliability in very controlled circumstances, as under the existing COA concept or through regulations specific to sUAS;
- Next, developing design standards tailored to a specific UAS application and proposed operating environment. This step would enable the development of useful unmanned aircraft and system design and operational standards for the UAS to facilitate safe operation, without addressing all potential UAS designs and applications. This would lead to type certificates (TC) and production certificates with appropriate limitations documented in the aircraft flight manual;

- And lastly, defining standards for repeatable and predictable FAA type certification of a UAS designed with the redundancy, reliability, and safety necessary to allow repeated safe access to the NAS, including seamless integration with existing air traffic.

Because the UAS community is well established under its current operational assumptions, it is unlikely the FAA or UAS industry will establish an entire set of design standards from scratch. As additional UAS airworthiness options are considered and UAS airworthiness design and operational standards are developed, type certification may be more efficiently and effectively achieved. The UAS industry will continue to build capabilities into the mid- and long-term timeframes. See Appendix C.1 for specific goals and metrics.

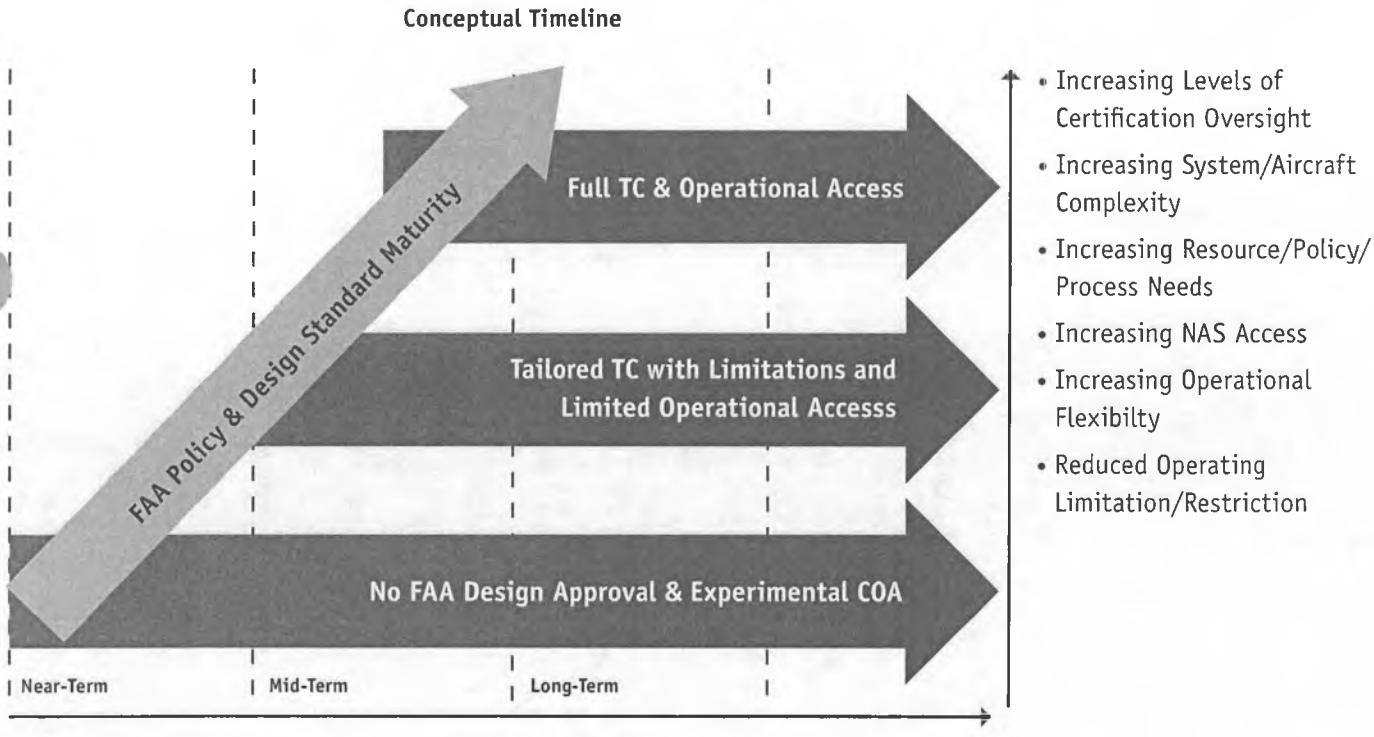


Figure 6: Potential Airworthiness Path for UAS Industry

3.5 Procedures and Airspace

A procedure is a series of actions or operations that have to be executed in the same manner to always obtain the same result under the same circumstances (for example, emergency procedures). The NAS depends on the structure of its airspace and the use of standard procedures to enable safe and efficient operations. ATO directives and other FAA policy and guidance define how UAS are permitted to operate in the NAS today:

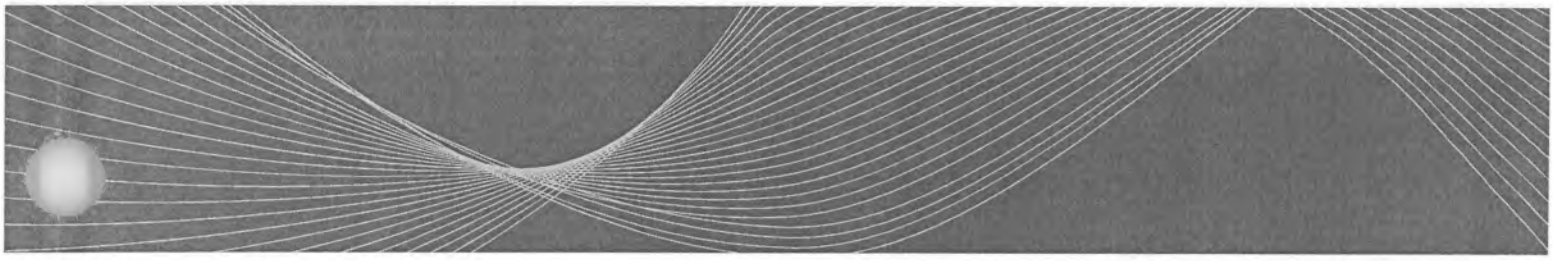
- COAs for public access to the NAS – Notice 8900.207 has been released for these operations;
- Experimental Certificates for civil access to the NAS;
- AND AC 91-57 for modeler (recreation) access to the NAS (June 1981) and Section 336 (Special Rule for Model Aircraft) of FMRA.

Experimental certificates and COAs will always be viable methods for accessing the NAS, but typically come with constraints and limitations. Expanded, easier access to the NAS will occur after new or revised operational rules and UAS certification criteria are defined and the FAA develops specific methods for appropriately integrating UAS into NAS operations.

Another requirement is the baselining activity to assess the applicability of existing air traffic control regulations and orders to UAS operations. Any identified gaps will need to be analyzed, and decisions on accommodation or changes to UAS or regulations will be completed. Some sample differences that affect UAS interoperability with the air traffic system are:

- En Route—Current UAS are not able to meet requirements to fly in reduced vertical separation minimum (RVSM) airspace. They do not fly traditional trajectory-based flight paths and require non-traditional handling in emergency situations.
- Terminal—UAS cannot comply with ATC visual separation clearances and cannot execute published instrument approach procedures.
- Facilities—The introduction of UAS at existing airports represents a complex operational challenge. For the near-term, it is expected that UAS will require segregation from mainstream air traffic, possibly accommodated with UAS launch windows, special airports, or off-airport locations where UAS can easily launch and recover. Initial rulemaking for UAS may not address the requirements for UAS at airport facilities, since sUAS are not expected to routinely use airports for takeoff and landing. However, as civil UAS are developed that require airport access, airport integration requirements will need to be developed. These requirements will include environmental impact and/or assessments (when required) concerning noise, emissions, and any unique fuels and other associated concerns. The current Airport Cooperative Research Project (ACRP 03-30) will address the impacts of commercial UAS on airports. The results of the study will be a publication to help airports and communities gain an understanding of UAS, including a description of how various areas of the aviation system, particularly airports, could be affected. The results should be helpful in addressing the airport integration requirement.

ICAO has issued guidance requiring Member States to implement Safety Management System (SMS) programs. These programs are essential to manage risk in the aviation system. The FAA supports this and is a leader in the design and implementation of SMS. Technical challenges abound, including the ability to analyze massive amounts of data to provide useful information for oversight and assessment of risk.



A key input to a Safety Management methodology is the use of safety data. Valuable data collection is underway, but development of a safety-reporting database is currently limited to reporting requirements from existing COAs and experimental certificate holders. Data collection will expand when additional agreements are finalized for sharing public UAS data and new rules and associated safety data reporting requirements are implemented for sUAS. The strategy will use UAS incident, accident, and operational data from public, experimental, and sUAS operations to iteratively support the basis for and define appropriate UAS operating requirements. The availability and quality of this data may directly determine how fast or slow UAS are integrated into the NAS.

3.6 Training (Pilot, Flightcrew Member, Mechanic, and Air Traffic Controller)

UAS training standards will mirror manned aircraft training standards to the maximum extent possible, including appropriate security and vetting requirements, and will account for all roles involved in UAS operation. This may include the pilot, required crew members such as visual observers or launch and recovery specialists, instructors, inspectors, maintenance personnel, and air traffic controllers. See Appendix C.2 and C.8 for specific goals and metrics.

Accident investigation policies, processes, procedures, and training will be developed near-term, and will be provided to Flight Standards District Offices (FSDO) for implementation. Existing manned procedures will be leveraged as much as possible, though differences will need to be highlighted and resolved (e.g., when an unmanned aircraft accident occurs, there may be a need to impound the control station as well as the aircraft).

3.7 Research and Development (R&D) / Technology

Research in the areas of gaps in current technology and new UAS technologies and operations will support and enable the development of airworthiness and operational guidance required to address new and novel aspects of UAS and associated flight operations. The FAA will continue to establish requirements for flight in the NAS so R&D efforts are not duplicative. Additionally, the FAA's research needs are considered within the JPDO NextGen Research Development and Demonstration Roadmap to prevent overlap and provide opportunities for research collaboration.

R&D efforts with industry support the establishment of acceptable performance limits in the NAS and enable the development of performance parameters for today's NAS, while evaluating future concepts, technologies, and procedures for NextGen. The UAS Technical Community Representative Group (TCRG) is sponsoring broad-based UAS research (SAA, C2, and control station studies) aimed at integration with NextGen and validation of concepts. Near-term expected progress is described here:

Sense and Avoid:

Significant research into SAA methods is underway by both government and industry through a variety of approaches and sensor modes. Specifically the FAA is researching:

- Establishment of Sense and Avoid system definitions and performance levels;
- Assessment of Sense and Avoid system multi-sensor use and other technologies;
- And Minimum Sense and Avoid information set required for collision avoidance maneuvering.

Some public agencies and commercial companies are seeking to develop advanced mitigations, such as Ground Based Sense and Avoid (GBSAA) systems, as a strategy for increased access. Concept-of-use demonstrations are underway at several locations to use GBSAA as a mitigation to see-and-avoid requirements for public UAS COA operators in limited operational areas. GBSAA research and the test evaluations will help develop the sensor, link, and algorithm

requirements that could allow GBSAA to function as a partial solution set for meeting the SAA requirement and will help build the overall SAA requirements in the long-term. Additionally, as GBSAA technology matures, GBSAA could be used to provide localized UAS NAS integration in addition to being used as an advanced accommodation tool. See Appendix C.3 for specific goals and metrics.

Research is underway on Airborne Sense and Avoid (ABSAA) concepts. Due to complexity, significant progress in ABSAA is not expected until the mid-term. Research goals for the near-term include a flight demonstration of various sensor modes (electro-optic/infrared, radar, Traffic Alert and Collision Avoidance System (TCAS) and Automatic Dependent Surveillance-Broadcast (ADS-B)). Actual fielding of a standardized ABSAA system is a long-term objective. See Appendix C.4 for specific goals and metrics.

Control and Communications:

A primary goal of C2 research is the development of an appropriate C2 link between the unmanned aircraft and the control station to support the required performance of the unmanned aircraft in the NAS and to ensure that the pilot always maintains a threshold level of control of the aircraft. Research will be conducted for UAS control data link communications to determine values for latency, availability, integrity, continuity, and other performance measures.

UAS contingency and emergency scenarios also require research (e.g., how will a UAS in the NAS respond when the command link is lost either through equipment malfunction or malicious jamming, etc.). This research will drive standards that are being established through:

- Development and validation of UAS control link prototype
- Vulnerability analysis of UAS safety critical communications
- Completion of large-scale simulations and flight testing of initial performance requirements

Spectrum and civil radio frequency (RF) identification requires global coordination. The International Telecommunication Union (ITU) through the 2015 World Radiocommunication Conference (WRC-2015) will consider spectrum for UAS beyond-line-of-sight (BLOS) applications. Within the United States, the Federal Communications Commission (FCC) manages and authorizes all non-federal use of the radio frequency spectrum, including state and local government as well as public safety. The National Telecommunications and Information Administration (NTIA) manages and authorizes all federal use of the radio frequency spectrum. UAS spectrum operations within the United States need either the approval of the FCC or NTIA and shall not transmit without being properly authorized. Government agencies and industry need to investigate link security requirements, such as protection against intended and unintended jamming, RF interference, unauthorized link takeover, and spoofing. See Appendix C.5 for specific goals and metrics.

Modeling and Simulation:

The FAA is working with other government agencies and industry to develop a collaborative UAS modeling and simulation environment to explore key challenges to UAS integration. The near-term modeling goals are to:

- Validate current mitigation proposals;
- Establish a baseline of end-to-end UAS performance measures;
- Establish thresholds for safe and efficient introduction of UAS into the NAS;
- And develop NextGen concepts, including 4-dimensional trajectory utilizing UAS technology.

These modeling and simulation efforts will address NAS integration topics for UAS, such as latency in executing ATC clearances, inability to accept ATC visual clearances or comply with visual flight rules, priority and equity of NAS access, lost link, and flyaway scenarios.

Human Factors:

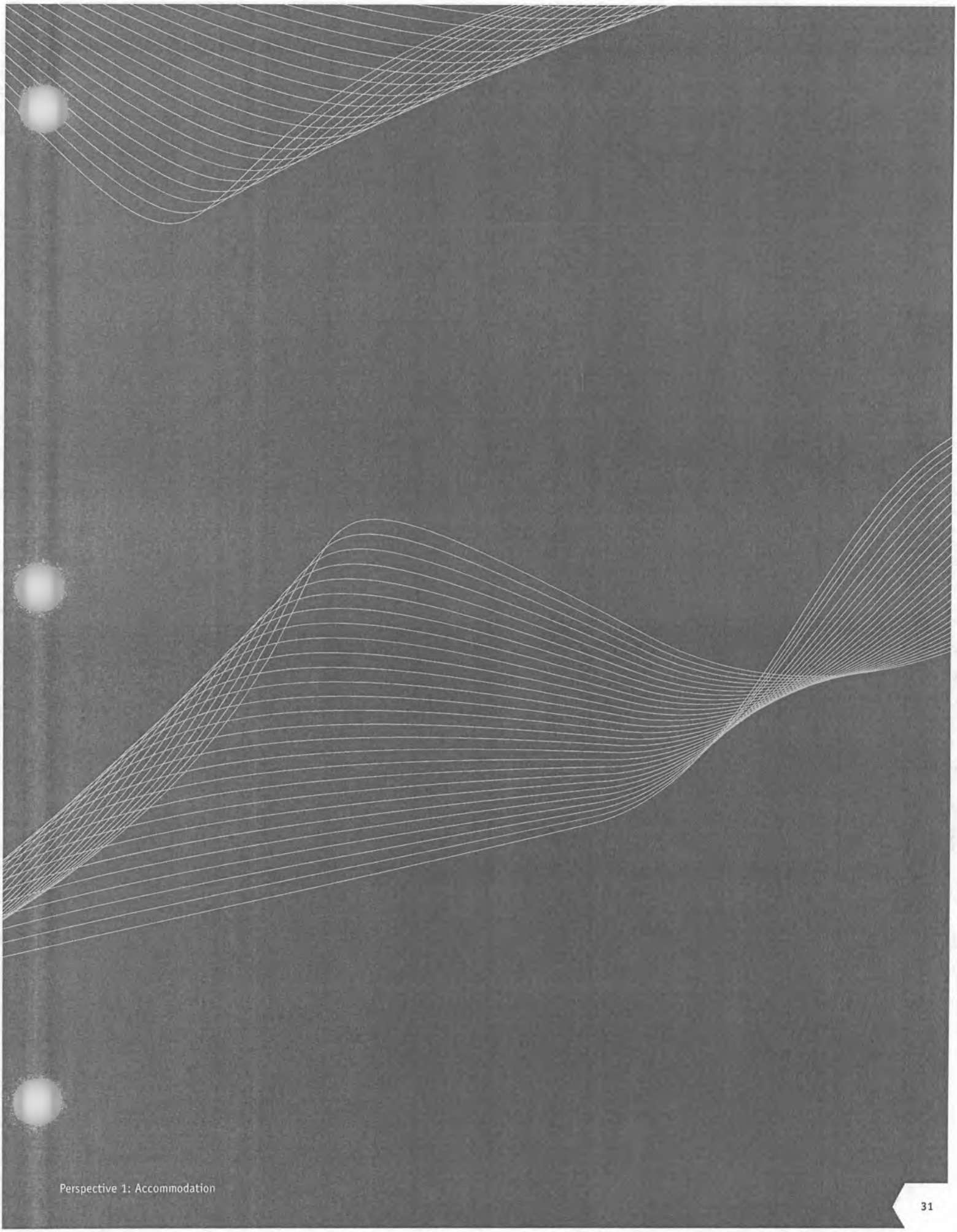
With the pilot controlling the aircraft from beyond the aircraft, several human factors issues emerge related to both the pilot and ATC, and how they will interact to safely operate unmanned aircraft in the NAS. Human factors issues in manned aviation are well known, but there needs to be further analyses regarding integration of UAS into the NAS. In the near-term, data will be collected to permit analysis of how pilots fly UAS, how controllers provide service involving a mix of manned aircraft and UAS, and how pilots and controllers interact with each other, with the goal of developing pilot, ATC, and automation roles and responsibilities concepts. The JPDO, in collaboration with government, academia, and industry researchers, identified several interrelated research challenges:

- Effective human-automation interaction (level; trust; and mode awareness);
- Pilot-centric ground control station design (displays; sensory deficit and remediation; and sterile cockpit);
- Display of traffic/airspace information (separation assurance interface);
- Predictability and contingency management (lost link status; lost ATC communication; and ATC workload);
- Definition of roles and responsibilities (communication flow among crew, ATC, and flight dispatcher);
- System-level issues (NAS-wide human performance requirements);
- And airspace users' and providers' qualification and training (crew/ATC skill set, training, certification, and currency).

Other research in this phase includes activities to support safety case validation and the associated mitigations. This includes case-by-case assessments to determine the likelihood that a system/operation can achieve an acceptable safety level. The research will consider UAS operational and technical risks including:

- Inability to avoid a collision;
- Inability to maintain positive control;
- Inability to meet the operational environment's expected behavior (e.g., self-separate);
- And Inability to safeguard the public.

Summary of "Accommodation" Priorities
Accommodation of UAS in the NAS through evaluation and improvement of safety mitigations
Work with industry and the ARC to review the operational, pilot, and airworthiness regulations
Development of required standards to support technological solutions to identified operational gaps (MOPS)
Safety case validation for UAS operations in NAS—collect/analyze operational and safety data
Robust research, modeling, and simulation for UAS Sense and Avoid, C2, and human factors



Perspective 2: Integration

4.1 Overview

In the mid-term, emphasis will shift significantly from accommodation to integration. For the residual accommodation requirements, it is expected that operational lessons learned and technological advances will lead to more sophisticated mitigations with increased safety margins. Thus, COAs and experimental certificates will remain avenues for accessing the NAS with appropriate restrictions and constraints. Emphasis will shift toward integration of UAS through the implementation of civil standards for unmanned aircraft pilots and new or revised operational rules, together with necessary policy guidance and operational procedures.

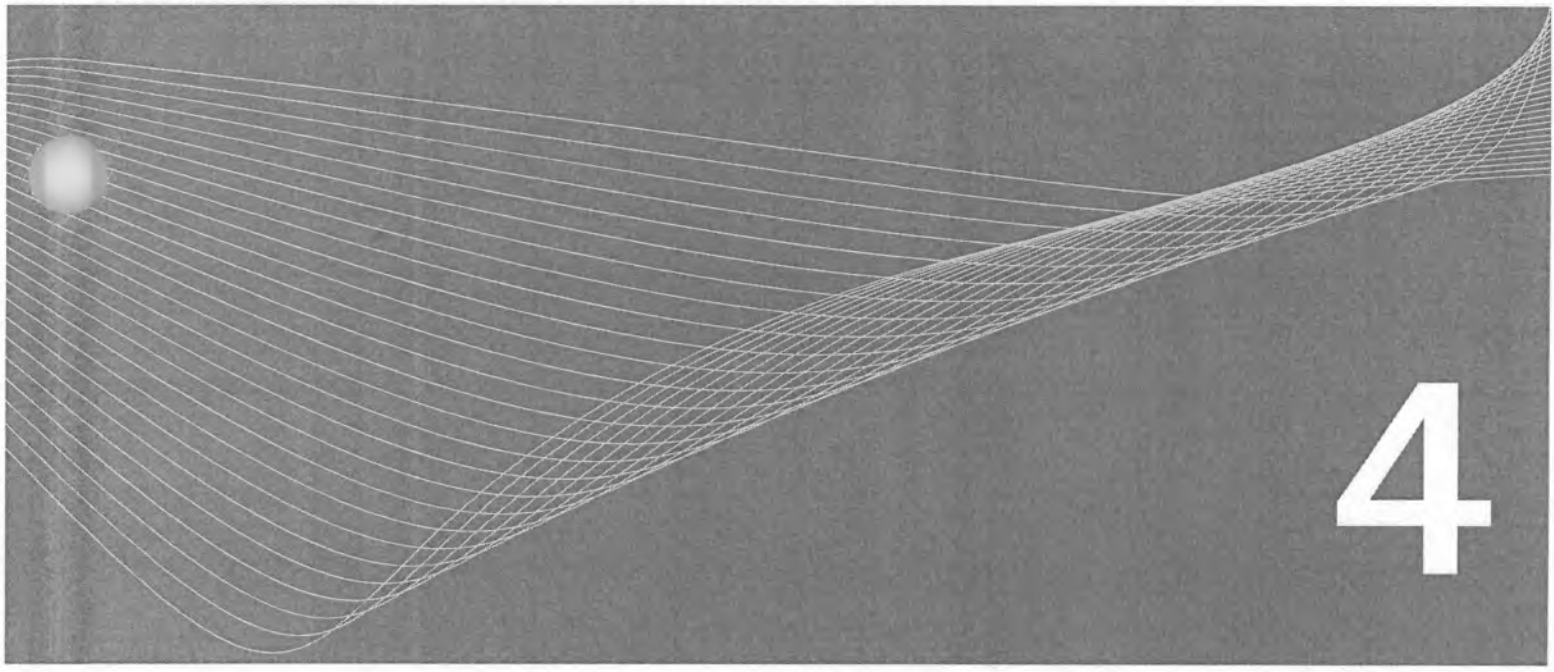
Integration efforts will focus on sequentially developing and implementing the UAS system requirements established by the FAA as a result of R&D and test range outputs:

- Finalize the integrated set of FAA rulemaking, policy, operational guidance, procedures, and standards;
- Define continued airworthiness methodologies;
- Complete training and certification standardization;
- Continue the research and technology development and assessment work that underpins the ability of UAS to operate safely and efficiently in the NAS;
- And address the privacy, security, and environmental implications of UAS operations.

To receive civil certification under existing or adapted/expanded regulations, guidance, and standards, research is needed that will assist in defining the certification basis for unique UAS features. While current regulations, guidance, and standards ensure safe operation of aircraft with pilots in the cockpit, these current regulations may not represent the necessary and sufficient basis for the design criteria and operation of UAS.

Integration efforts will provide a foundation for creating and modifying FAA policies and procedures to permit more routine forms of UAS access and bridge the gap to the long-term goal of developing the policy, guidance, and operational procedures required to enable manned and

Integration efforts will focus on sequentially developing and implementing the UAS system requirements established by the FAA as a result of R&D and test range outputs.



unmanned aircraft to fly together in an environment that meets or exceeds today's level of safety and efficiency. As new UAS evolve, more specific training will be developed for UAS pilots, crew members, and certified flight instructors. See Appendix C.2 for specific goals and metrics.

UAS operations comingled at airports with manned aircraft is one of the more significant challenges to NAS integration. The UAS must be able to operate within airport parameters and comply with the existing provisions for aircraft. As with airspace operational requirements, the airport standards are not expected to change with the introduction of UAS, and their operation must be harmonized in the provision of air traffic services.

The following general requirements and assumptions will pertain to all UAS operations that are integrated into the NAS (with the exception of sUAS operating exclusively within visual line-of-sight (LOS) of the flight crew):

1. UAS operators comply with existing, adapted, and/or new operating rules or procedures as a prerequisite for NAS integration.
2. Civil UAS operating in the NAS obtain an appropriate airworthiness certificate while public users retain their responsibility to determine airworthiness.
3. All UAS must file and fly an IFR flight plan.
4. All UAS are equipped with ADS-B (Out) and transponder with altitude-encoding capability. This requirement is independent of the FAA's rule-making for ADS-B (Out).
5. UAS meet performance and equipage requirements for the environment in which they are operating and adhere to the relevant procedures.
6. Each UAS has a flight crew appropriate to fulfill the operators' responsibilities, and includes a pilot-in-command (PIC). Each PIC controls only one UA.*
7. Autonomous operations are not permitted.** The PIC has full control, or override authority to assume control at all times during normal UAS operations.
8. Communications spectrum is available to support UAS operations.
9. No new classes or types of airspace are designated or created specifically for UAS operations.
10. FAA policy, guidelines, and automation support air traffic decision-makers on assigning priority for individual flights (or flight segments) and providing equitable access to airspace and air traffic services.

11. Air traffic separation minima in controlled airspace apply to UA.
12. ATC is responsible for separation services as required by airspace class and type of flight plan for both manned and unmanned aircraft.
13. The UAS PIC complies with all ATC instructions and uses standard phraseology per FAA Order (JO) 7110.65 and the Aeronautical Information Manual (AIM).
14. ATC has no direct link to the UA for flight control purposes.

* This restriction does not preclude the possibility of a formation of UA (with multiple pilots) or a "swarm" (one pilot controlling a group of UA) from transiting the NAS to/from restricted airspace, provided the formation or swarm is operating under a COA.

** Autonomous operations refer to any system design that precludes any person from affecting the normal operations of the aircraft.

4.2 Standards

After MASPS are completed, the emphasis of standards activities will be geared toward the development of MOPS, which will contribute to the basis for regulatory changes and the equipment standards for UAS-specific systems and equipment. The development of MOPS may provide requirements the FAA may invoke as TSO to support airworthiness approval on certificated unmanned aircraft and may lead to the development of improved systems, potentially applicable to all civil aircraft. See Appendix C for specific goals and metrics.

4.3 Rules and Regulations

Recognizing that the UAS community might be better served by specific rules, the FAA is initially proposing to amend its regulations to adopt specific rules for the operation of sUAS in the NAS. These changes will address the classification of sUAS, certification of sUAS pilots, registration of sUAS, approval of sUAS operations, and sUAS operational limits.

Operations of sUAS under new regulations may have operational, airspace, and performance constraints, but will provide experience for pilots and additional data to inform subsequent rulemaking, standards, and training development for safe and efficient integration of other UAS in the NAS.

When the final rule is published and in effect, it will reduce the need for sUAS operators to conduct operations under either a COA or the constraints of an experimental certificate. This will allow operators and the FAA to shift the focus of resources to solutions that will better enable UAS integration. See Appendix C.6 for specific goals and metrics.

As integration continues, new or revised operational rules and associated standards and policies will allow compliant UAS to access additional airspace throughout the NAS.

4.4 Airworthiness Certification of the UAS

The FAA will work with the UAS community in defining policy and standards that facilitate agreement on an acceptable UAS certification basis for each applicant. This may involve the development of new policy, guidance, rulemaking, special conditions, and methods of compliance. See Section 3.4 for a more detailed discussion and Appendix C.1 for specific goals and metrics.

4.5 Procedures and Airspace

There will be incremental increases in NAS access based on rigorous safety mitigations of current UAS that were previously developed and built without approved industry or governmental standards. As integration begins, there will be approved airspace and procedures for sUAS, which will provide a basis for developing plans for increased NAS access as UAS are certified. As integration continues, new or revised operational rules and procedures, and associated standards and policies, will allow compliant UAS to access additional airspace throughout the NAS. The ATO will use procedures with these UAS similar to those used for manned aircraft, but may also delegate separation responsibility to UAS for some operations. To support this, ATO goals will be:

- Standardize air traffic operations and contingency/emergency procedures for UAS operators to ensure certified aircraft systems are interoperable with air traffic procedures and airspace requirements;
- Develop airport facility integration plans. This will require research and the development of procedures that address critical issues such as low visibility, taxi spacing, light gun signals, and compatibility with NextGen operations;
- Establish UAS operating requirements with associated ATC procedures for airport conditions;
- And coordinate with the Department of Defense (DoD) and all other appropriate departments and agencies on the development of any new parallel procedures and requirements for air domain awareness and defense.

See Appendix C.8 for specific goals and metrics.

4.6 Training (Pilot, Flightcrew Member, Mechanic, and Air Traffic Controller)

The FAA's role in training is to establish policy, guidance, and standards. Airmen training standards are under development and will be synchronized with the regulatory guidance. Civil operators normally develop a training regimen that allows pilots and flight support to meet regulatory standards. For any UAS operation, training regimens analogous to those that exist for manned aircraft will need to be considered, including relevant areas such as written tests, practical examinations, and currency and proficiency requirements.

Standards for airmen will proceed following the sUAS regulation. The FAA will issue UAS airman certificates and support activities to enable UAS operations to include:

- Development of practical test standards (PTS) and UAS airmen knowledge test question banks;
- Development of a UAS handbook for airmen;
- Training of aviation safety inspectors (ASI) at the FSDO level to provide practical test oversight;
- Identification of designated pilot examiners (DPE) to assist the FSDOs;
- Development of a UAS handbook for pilot and instructors;
- Development of PTS and UAS pilot knowledge test question banks;
- Development of UAS mechanic training and certificate process;
- And development of flight crew security requirements by the relevant United States Government agencies.

Pilot endorsements may be developed for specific UAS makes and models to permit commercial operations. Pilot qualifications by make and model will be built into training and will be expanded based on pilot experience.

Training standards development will be more complex for UAS with unique operating parameters and will continue into the long-term as these UAS are certified.

Regardless of the UAS platform, similar types of training regimens are expected, consisting of a written knowledge test, practical test standards, and a flight evaluation. There will be a requirement for currency and proficiency; qualified ASIs will be fielded to regional offices across the country.

With the introduction of UAS into the NAS, additional training requirements specific to different types of UAS characteristics will probably be required for ATC personnel, including UAS performance, behavior, communications, unique flight profiles, ATC standardized procedures, lost link/fly away profiles, operating limitations, and emergency procedures. Controller training will include differences in interoperability between manned and UAS flights, with a focus on specific handling issues of the aircraft. This training must be administered to ATC facilities throughout the NAS. It is expected that controllers will handle UAS the same as manned aircraft; therefore, no special ATC certification would be required. See Appendix C.2 and C.8 for specific goals and metrics.

4.7 Research and Development (R&D) /Technology

Sense and Avoid:

Research on SAA sensor performance, data communication, and algorithms must provide solutions for safe separation for integration of UAS into the NAS. Research to develop separation algorithms will be accomplished with the JPDO R&D plan goals of:

- Flight demonstration of self-separation and collision avoidance algorithms, with multiple sensors and intruders;
- Assessment of the performance of various self-separation concepts as a function of surveillance data configurations, and evaluation of risk-based self-separation algorithms and policy issues;
- Assessment of the performance of various separation assurance concepts, and flight demonstration of separation assurance algorithms, with criteria-based separation;
- And assessment of UAS performance for delegated spacing applications (e.g., defined interval clearances).

Although research will continue, fully certified UA-based collision avoidance solutions may not be feasible until the long-term and are deemed to be a necessary component for full UAS NAS integration. This will include research on safe and efficient terminal airspace and ground operations, followed by ground demonstrations of autonomous airfield navigation and ATC interaction. See Appendix C.4 and C.8 for specific goals and metrics.

Control and Communications:

Advanced research is required in data link management, spectrum analysis, and frequency management. Efforts will focus on completing development of C2 link assurance and mitigation technologies and methods for incorporating them into the development of certification of the UAS. This will include:

- Identification of satellite communication spectrum from the ITU through its WRC;
- Verification and validation of control communication final performance requirements;
- Establishment of UAS control link national/international standards;
- And development and validation of technologies to mitigate vulnerabilities.

Complete characterization of the capacity, performance, and security impacts of UAS on ATC communication systems will be completed. See Appendix C.5 and C.8 for specific goals and metrics.

Human Factors:
Human factors research will continue in the areas of human-machine interface (both control station displays and ATC displays), automation, and migration of control. Human factors data collected in the near-term and mid-term will be analyzed to determine the safest technologies and best procedures for pilots and ATC controllers to interact with each other and with the aircraft; these results will influence technology and operations research. For separation and collision avoidance capability, the contribution of human decision making versus automation must be identified. See Appendix C.8 for specific goals and metrics.

4.8 Test Ranges

Per the FMRA, the FAA will establish six test ranges. The test ranges will take into consideration climate and geographic diversity, the location of ground infrastructure and research needs. See Appendix C.7 for specific goals and metrics.

The test range program will address and account for:

- Manned-unmanned operations,
- Certification standards and air traffic requirements,
- Coordination and leveraging of National Aeronautics and Space Administration (NASA) and DoD resources,
- Civil and public unmanned aircraft systems,
- And coordination with NextGen.

The test ranges will help provide a verification mechanism for safe operations before unmanned aircraft are integrated into the NAS.

The FAA anticipates test range operator privacy practices, as discussed in their privacy policies, will help inform the dialogue among policymakers, privacy advocates, and the industry regarding broader questions concerning the use of UAS technologies. Transparency of privacy policies associated with UAS test range operations will engage all stakeholders in discussions about which privacy issues are raised by UAS operations and how law, public policy, and the industry practices should respond to those issues in the long run.

Summary of "Integration" Priorities
New operational rules and associated standards, policies, and procedures established for small UAS
New operational rules and associated standards, policies, and procedures established for other UAS
C2 link standards defined for integrity, latency, and continuity
FAA acceptance of MASPS to enable development of detailed MOPS
Published FAA policy and operational guidance to define acceptable methods to comply with operational rules in accordance with an acceptable UAS certification basis for each applicant
Published FAA flightcrew training and certification standards

Perspective 3: Evolution

5.1 Overview

Overlaying the integration of UAS is the need to remain aware of the changing characteristics and requirements of the evolving NAS. The long-term focus for UAS operations is the refinement and updating of regulation, policy, and standards. The end-state is to implement streamlined processes for the continued integration of UAS into the NAS.

These efforts will include:

- Policy, operational guidance, and standards for civil aircraft airworthiness and NAS operations and with consideration for privacy and security concerns and frameworks;
- Continued airworthiness methodologies;
- Training and certification standardization;
- And certification of key technologies to enable continued operations of UAS in the NAS.

5.2 Standards

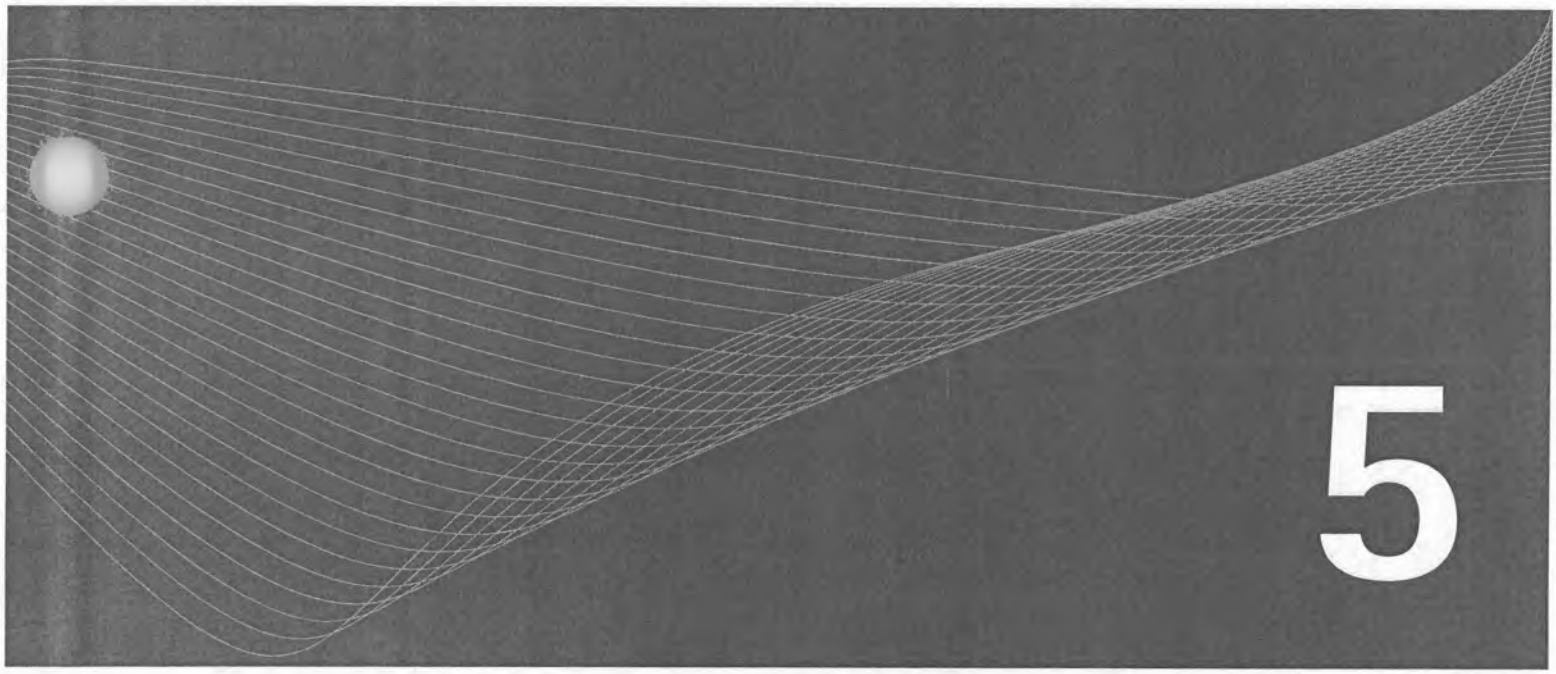
Unique UAS certification requirements will have been determined. MASPS, MOPS, and TSOs will support the regulations and certification of key systems for each UAS. Additionally, all standards will be evaluated and modified, as needed. See Appendix C.1 for specific goals and metrics.

5.3 Rules and Regulations

Lessons learned from previous rulemaking efforts may be applicable to the development of new UAS regulations. The process should become more efficient as UAS experience is gained and data analysis proves safety cases more quickly. UAS rulemaking activities will be more likely to involve revisions to existing rules, as needed, rather than the creation of new rules.

5.4 Airworthiness Certification of the UAS

Certification of UAS will evolve as future technologies evolve and will be consistent with all other aircraft airworthiness and operational approval processes, adding more capability to the UAS through data analyses and trending, which will identify areas for change and improvement in operations, human factors, communication links, and maintenance. See Section 3.4 for a more detailed discussion and Appendix C.1 for specific goals and metrics.



5.5 Procedures and Airspace

Certified pilots and UAS will be permitted access into the NAS under seamless operating procedures. The need to accommodate special NAS access will be dramatically reduced, and will be limited to research and development or test operations.

UAS operations will continue to evolve based on NextGen requirements. See Appendix C.8 for specific goals and metrics.

5.6 Training (Pilot, Flightcrew Member, Mechanic, and Air Traffic Controller)

As new UAS evolve, more specific training will be developed for UAS pilots, crew members, and certified flight instructors based on lessons learned and data collection. See Appendix C.2 and C.8 for specific goals and metrics.

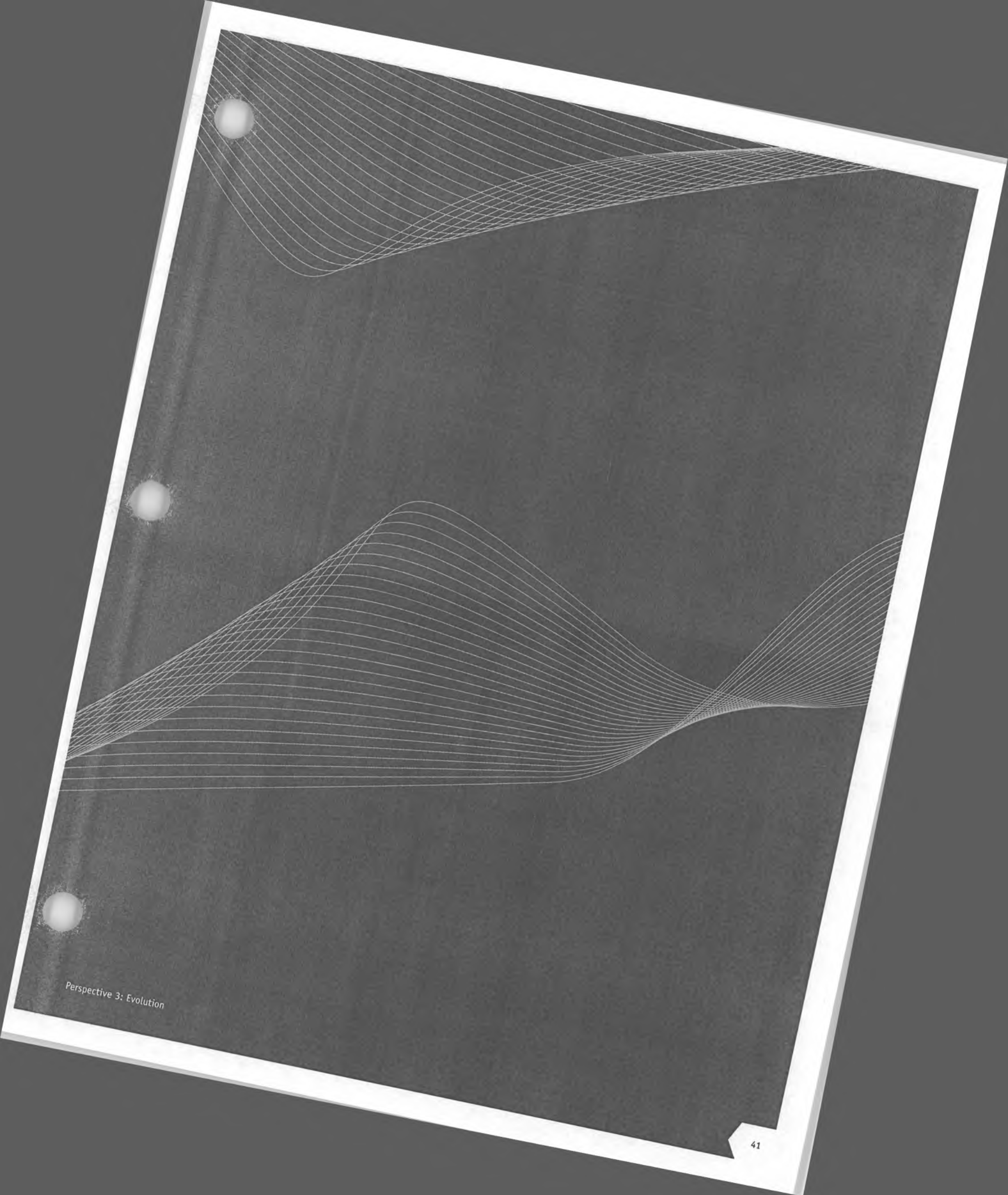
5.7 Research and Development (R&D) / Technology

Identified limitations and gaps will be closed via research and development of required technologies that meet standards established by the FAA. Planned activities include:

- Sense and Avoid research that focuses on algorithm development and compatibility with current and future manned aircraft collision avoidance systems such as TCAS II/ACAS X and surveillance systems (e.g., ADS-B), as well as compatibility with ATC separation management procedures and tools;
- Research on UAS system safety and levels of automation for the improvement of UAS into the future;
- Examination of potential concepts for the widespread integration of UAS into the future NextGen environment;
- AND research on new tools and techniques to support avionics and control software development and certification, to ensure their safety and reliability.

Organized studies will continue to investigate the evolution of UAS operations into the NextGen environment. Detailed research on SAA flight operations, using certified sensor systems, could allow aircraft to maintain safe distances from other aircraft during flight conditions that would not be appropriate for visual flight in a manned aircraft. This capability would rely heavily on network-enabled information, precision navigation, and cooperative surveillance, and would require the development and integration of NextGen-representative technologies for traffic, weather, and terrain avoidance. This conceptual model will be enlarged with sensors that expand the ability to maintain separation from other aircraft past the current visual spectrum and flight conditions restrictions. See Appendix C.8 for specific goals and metrics.

Summary of "Evolution" Priorities
Seamless operations of certified UAS and crew members in the evolving NAS
Published FAA TSOs based on system level MOPS
Certified Sense and Avoid algorithms for collision avoidance and self-separation that are interoperable with evolving NextGen ATC systems and manned collision avoidance systems



Conclusions

6.1 Summary

The safe integration of unmanned aircraft into the NAS is a significant challenge. The FAA is dedicated to developing the technical and regulatory standards, policy guidance, and operational procedures on which successful UAS integration depends.

The application of financial and human resources by academia and industry to support critical FAA initiatives will shorten the time required to develop technical and regulatory standards. Together, all stakeholders can overcome the challenge of integrating UAS into the NAS and leverage UAS and associated technologies for the greater benefit of society.

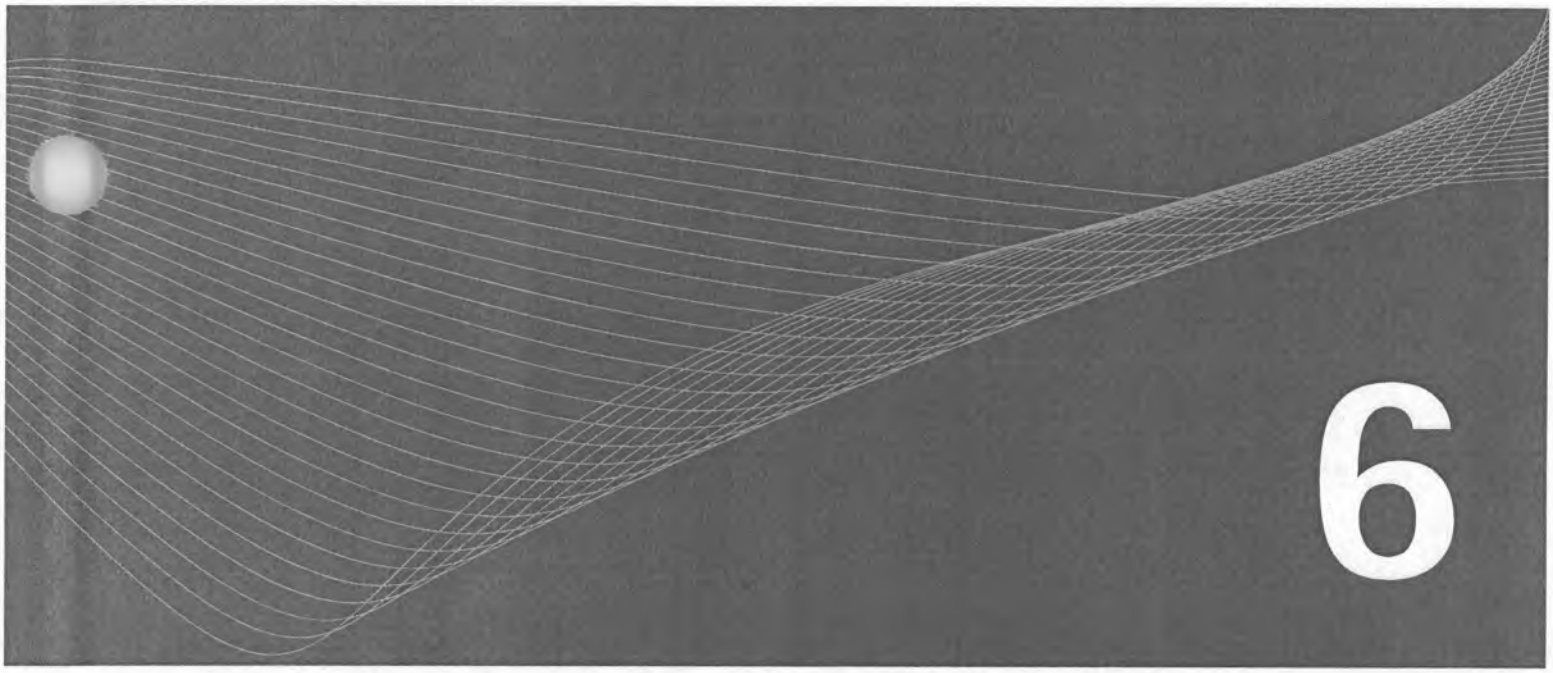
6.2 Outlook

Based on FAA policy and the challenges that need to be addressed, this roadmap has focused on the activities required to achieve integration of UAS into the evolving NAS. Throughout the process, the key messages below reflect the basis for the FAA's consideration of requirements to integrate civil UAS into the NAS:

1) **Government-industry collaboration is paramount to success and must focus on process, quality, and timely results.**
   The FAA expects to gain experience in applying the existing airworthiness regulations during the type certification process with early UAS adopters. We also expect input from industry and the ARC. Taking into account industry and ARC inputs, and future experience with UAS type certification projects, the FAA will review and revise as necessary the existing airworthiness regulations to ensure UAS safety.

2) **The FAA must remain committed to the development of technical and regulatory standards, policy guidance, and operations procedures on which successful UAS integration depends.**
   With this roadmap, the FAA has outlined initiatives that must be accomplished. Because unmanned aircraft are considered aircraft that are flown by pilots, existing regulations and procedures are largely applicable. However, the complete integration of UAS at airports and in the various airspace classes may necessitate the development of new or revised regulations and supplemental procedures. These will be developed and implemented in coordination with relevant agencies to address related security and privacy implications.

3) **Global standards encourage harmonization and yield cost-effective development.**
   The FAA is not bound by international policies and standards. However, harmonizing efforts with the international aviation community will allow for more seamless operations of UAS across national boundaries. Synchronizing



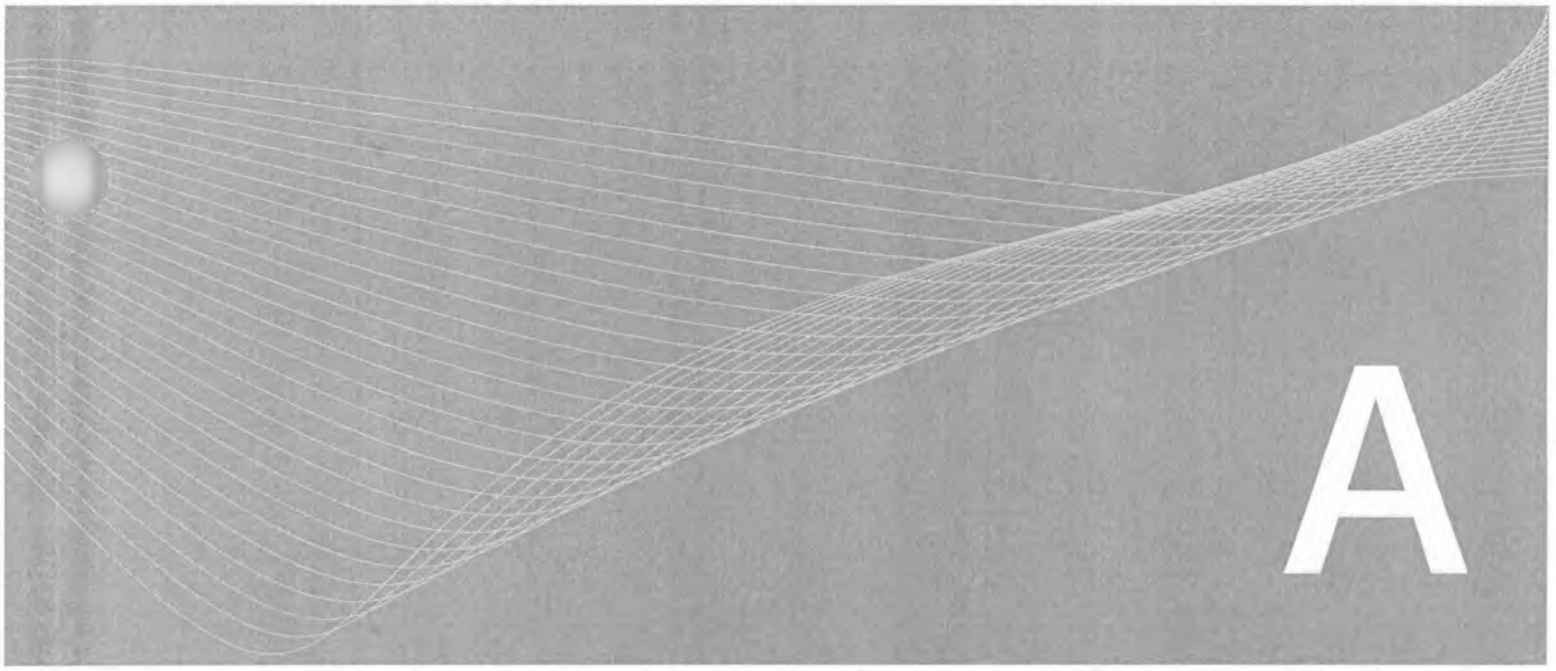
efforts within the aviation community will also permit better use of limited human and fiscal resources, thereby reducing the time required to produce regulatory guidance, policy, and standards.

4) **The FAA is focused on increased access for UAS without impacting the safety or efficiency of the NAS, while managing environmental impacts.**
The FAA has placed a high priority on the development of rules for small UAS that will increase access to the NAS and provide an initial opportunity for commercial operations. In the long-term, the principal objective of the aviation regulatory framework is to achieve and maintain the highest possible uniform level of safety while maintaining or increasing the efficiency and the environmental performance of the NAS. In the case of UAS, this means ensuring the safety of all airspace users as well as the safety of persons and property on the ground.

5) **Progress must be made on the development of technology to enable NAS access.**
Because of many distinct differences between UAS and manned aircraft, there are required technologies that must be matured to enable the safe and seamless integration of UAS in the NAS. Research will be focused in the areas of sense and avoid, control and communications, and human factors.

Appendix A: Acronyms

ABSAA	Airborne Sense and Avoid
ACAS X	Airborne Collision Avoidance System X
ADS-B	Automatic Dependent Surveillance–Broadcast
AIM	Aeronautical Information Manual
AMA	Academy of Model Aeronautics
ARC	Aviation Rulemaking Committee
ASI	Aviation Safety Inspector
ASTM	American Society for Testing and Materials
ATC	Air Traffic Control
ATO	Air Traffic Organization
AVS	Office of Aviation Safety
BLOS	Beyond-Line-of-Sight
C2	Control and Communications
COA	Certificate of Waiver or Authorization
DAA	Detect and Avoid
DHS	Department of Homeland Security
DoD	Department of Defense
DOJ	Department of Justice
DPE	Designated Pilot Examiner
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FMRA	FAA Modernization and Reform Act of 2012
FSDO	Flight Standards District Office
GBSAA	Ground Based Sense and Avoid
GSE	Ground Support Equipment
IFR	Instrument Flight Rules
ICAO	International Civil Aviation Organization
IPC	Interagency Planning Committee
ITU	International Telecommunication Union
JPDO	Joint Planning and Development Office
LOS	Line-of-Sight
MASPS	Minimum Aviation System Performance Standard
MOPS	Minimum Operational Performance Standard
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NextGen	Next Generation Air Transportation System
NIJ	National Institute of Justice
NOAA	National Oceanic and Atmospheric Administration



NPRM	Notice of Proposed Rulemaking
NTIA	National Telecommunications and Information Administration
OPA	Optionally Piloted Aircraft
OSED	Operational Services and Environmental Definition
PIC	Pilot-in-Command
PTS	Practical Test Standards
R/C	Radio Control
R&D	Research and Development
RF	Radio Frequency
RPV	Remotely Piloted Vehicle
RVSM	Reduced Vertical Separation Minimum
SAA	Sense and Avoid
SARP	Standards and Recommended Practices
SMS	Safety Management System
S&T	Science and Technology
sUAS	Small Unmanned Aircraft Systems
TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance System
TCRG	Technical Community Representative Group
TSO	Technical Standard Order
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
VO	Visual Observer
WRC	World Radiocommunication Conference
14 CFR	Title 14 of the Code of Federal Regulations

Appendix B: Glossary

The following definitions were obtained from several sources, including:

1. Title 14 of the Code of Federal Regulations, Part 1.1
2. FAA Pilot/Controller Glossary (P/CG)
3. RTCA DO-320: Operational Services and Environmental Definition for Unmanned Aircraft Systems
4. Notice 8900.207, "Unmanned Aircraft Systems (UAS) Operational Approval," January 22, 2013
5. FAA Modernization and Reform Act of 2012
6. "Sense and Avoid (SAA) for Unmanned Aircraft Systems (UAS)" – Second Caucus Workshop Report 2013
7. FAA Order 8130.34B – Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft

Note: Applicable sources are shown at the end of each definition in parentheses (e.g. (1), (2), etc.). Terms without a specific source definition are defined in this Roadmap.

Terminology	Definition
Air Traffic Control	A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic. (1)
Aircraft	A device that is used or intended to be used for flight in the air. (1)
Airspace	Any portion of the atmosphere sustaining aircraft flight and which has defined boundaries and specified dimensions. Airspace may be classified as to the specific types of flight allowed, rules of operation, and restrictions in accordance with International Civil Aviation Organization standards or State regulation. (3)
Airworthiness Certification	A process that the FAA uses to ensure that an aircraft design complies with the appropriate safety standards in the applicable airworthiness regulations.
Certificate of Waiver or Authorization	An FAA grant of approval for a specific flight operation. The authorization to operate a UAS in the National Airspace System as a public aircraft outside of Restricted, Warning, or Prohibited areas approved for aviation activities. (4)

B

Terminology	Definition
Civil Aircraft	Aircraft other than public aircraft. (4)
Collision Avoidance	The Sense and Avoid system function where the UAS takes appropriate action to prevent an intruder from penetrating the collision volume. Action is expected to be initiated within a relatively short time horizon before closest point of approach. The collision avoidance function engages when all other modes of separation fail. (6)
Communication Link	The voice or data relay of instructions or information between the UAS pilot and the air traffic controller and other NAS users. (3)
Control Station	The equipment used to maintain control, communicate with, guide, or otherwise pilot an unmanned aircraft. (3)
Crewmember [UAS]	In addition to the crewmembers identified in 14 CFR Part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and visual observers, but may include other persons as appropriate or required to ensure safe operation of the aircraft. (4)
Data Link	A ground-to-air communications system which transmits information via digital coded pulses. (3)
Detect and Avoid	Term used instead of Sense and Avoid in the Terms of Reference for RTCA Special Committee 228. This new term has not been defined by RTCA and may be considered to have the same definition as Sense and Avoid when used in this document.
International Civil Aviation Organization	A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport. (2)
Manned Aircraft	Aircraft piloted by a human onboard. (3)
Model Aircraft	An unmanned aircraft that is capable of sustained flight in the atmosphere; flown within visual line-of-sight of the person operating the aircraft and flown for hobby or recreational purposes. (5)

Terminology	Definition
National Airspace System	The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military. (2)
Optionally Piloted Aircraft	An aircraft that is integrated with UAS technology and still retains the capability of being flown by an onboard pilot using conventional control methods. (7)
Pathfinder	An initial UAS airworthiness certification program that will aid the FAA in the establishment of certification requirements.
Pilot-in-Command	Pilot-in-command means the person who: 1) has final authority and responsibility for the operation and safety of the flight; 2) has been designated as pilot-in-command before or during the flight; and 3) holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. (1)
Public Aircraft	An aircraft operated by a governmental entity (including federal, state, or local governments, and the U.S. Department of Defense and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. See 14 CFR Part 1, § 1.1 for a complete definition of a public aircraft. (4)
RTCA	RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management system issues. RTCA functions as a Federal Advisory Committee. Its recommendations are used by the FAA as the basis for policy, program, and regulatory decisions and by the private sector as the basis for development, investment and other business decisions. (www.rtca.org)
See and Avoid	When weather conditions permit, pilots operating instrument flight rules or visual flight rules are required to observe and maneuver to avoid another aircraft. Right-of-way rules are contained in 14 CFR Part 91. (2)
Self-Separation	Sense and Avoid system function where the UAS maneuvers within a sufficient timeframe to remain well clear of other airborne traffic. (6)
Sense and Avoid	The capability of a UAS to remain well clear from and avoid collisions with other airborne traffic. Sense and Avoid provides the functions of self-separation and collision avoidance to establish an analogous capability to "see and avoid" required by manned aircraft. (6)
Small Unmanned Aircraft	An unmanned aircraft weighing less than 55 pounds. (5)

Terminology	Definition
Special Airworthiness Certificate – Experimental Category (UAS)	Airworthiness certification for experimental UAS and optionally piloted aircraft.
Test Range	A defined geographic area where research and development are conducted in accordance with Sections 332 and 334 of the FMRA. Test ranges are also known as test sites in related documents such as the FAA's Screening Information Request. (5)
Unmanned Aircraft	1) A device used or intended to be used for flight in the air that has no onboard pilot. This devise excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR Part 101), rockets, tethered aircraft and un-powered gliders. (4) 2) An aircraft that is operated without the possibility of direct human intervention from within or on the aircraft. (5)
Unmanned Aircraft System	An unmanned aircraft and its associated elements related to safe operations, which may include control stations (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems, and launch/recovery equipment. (4) An unmanned aircraft and associated elements (including communications links and the components that control the unmanned aircraft) that are required for the pilot-in-command to operate safely and efficiently in the national airspace system. (5)
Visual Line-of-Sight	Unaided (corrective lenses and/or sunglasses exempted) visual contact between a pilot-in-command or a visual observer and a UAS sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground. (4)

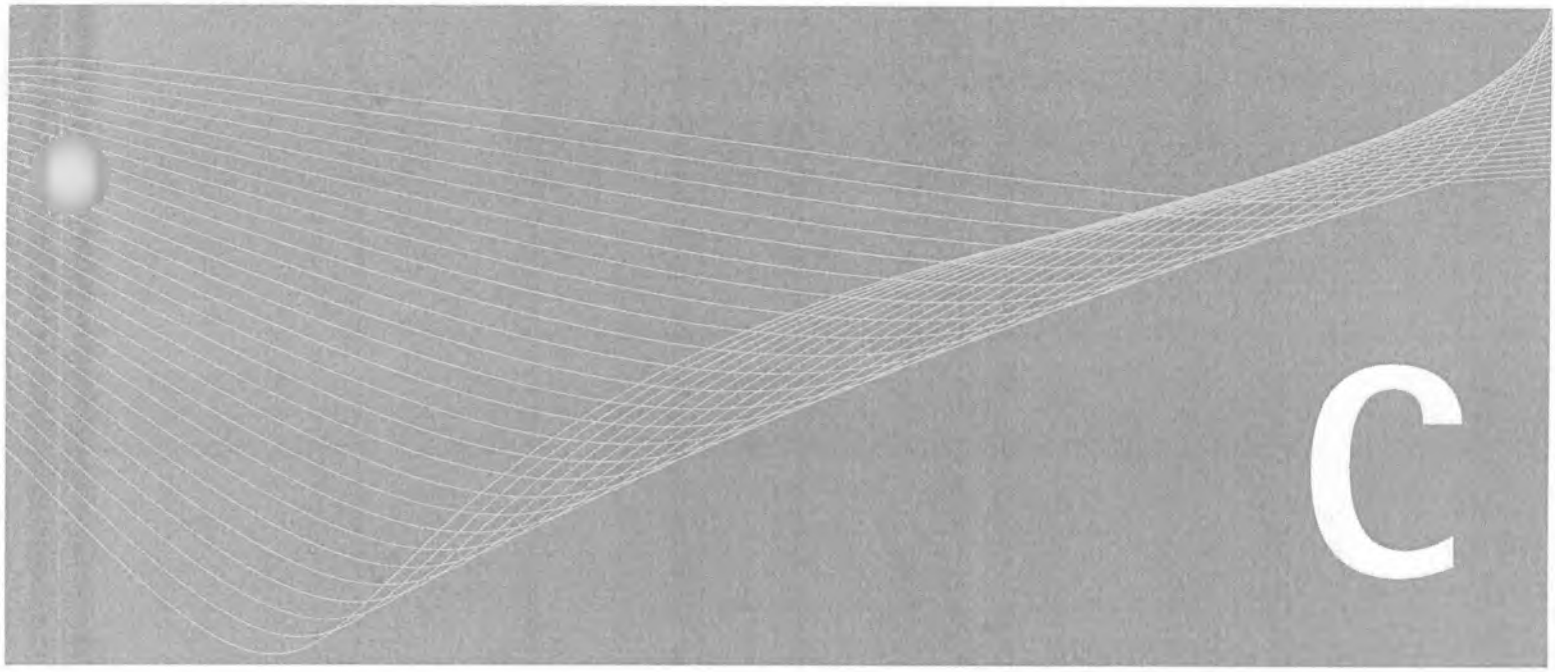
Appendix C: Goals, Metrics, and Target Dates

This appendix contains FAA-developed goals, metrics, and target dates (date ranges) and incorporates many related Unmanned Aircraft Systems (UAS) Aviation Rulemaking Committee (ARC) recommendations. The target dates in this appendix are generally limited to a five-year planning horizon. The FAA will continue its effective dialogue with the UAS ARC as it makes changes to the existing set of goals, metrics, and target dates in yearly updates to this roadmap. These annual updates will track and report progress, as recommended by the Government Accountability Office.

The following material identifies the key goals and related activities to be accomplished in accommodating, integrating, and evolving UAS operations in the National Airspace System (NAS). The goals are, for the most part, intended to be addressed concurrently. For each goal, a set of metrics (i.e., well-defined milestones with target completion dates) is defined. The metrics help establish and maintain common government and industry expectations, and enable objective assessments of the progress made toward the accomplishment of each goal. The goals and metrics reflect the incremental approach to UAS certification and integration described in this roadmap.

The goals and metrics in and of themselves do not constitute a UAS integration roadmap implementation plan; however, they do establish a set of strategic objectives that can guide the definition of activities, schedules, and resource requirements in such a plan. Many of the goals and metrics are not under the FAA's direct control and are dependent upon industry efforts such as participation in civil UAS standards development activities and execution of initial certification (a.k.a. "Pathfinder") programs to aid the establishment of certification requirements. Goals and metrics addressing FMRA requirements are identified and the FMRA Subtitle B (Unmanned Aircraft Systems) is included as a reference in Appendix D.

Target dates for near-term metrics (i.e., those with dates prior to October 2015) are identified by the calendar quarter and year targeted for metric completion (e.g., "3rd Quarter of 2014" means targeted for completion by the end of September 2014). Mid-term metrics may only have a target year or year range specified. In this case, "2016" means the metric's completion target is the end of calendar year 2016. Far-term metrics are outside the five-year horizon of this roadmap and have no target dates. Target dates shown as "from 201x to 201y" indicate related activity is expected throughout this time period. Unless the target dates are required by law (e.g., FMRA), they are exactly that – targets. They are not commitments, either by the FAA, other government organizations, or industry. The target dates consider ongoing and planned government and industry activities and schedules; however, they are not always constrained by these activities and schedules. Some of the target dates are aggressive and will require additional industry or government resources if they are to be met.



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Although this roadmap is focused on the integration of civil UAS in the NAS, some of the recommended goals and metrics address public UAS integration activities – primarily those of the Department of Defense (DoD). Public entities may have their own certification processes, but the requirements typically build upon those established by the FAA for civil aviation. The DoD's significant activities to develop public UAS that meet airspace and regulatory requirements can and should be leveraged in the FAA's establishment of civil UAS certification requirements.

C.1 Certification Requirements (Airworthiness)

Note: The term "Operator" is used here as defined by the FAA for passenger/cargo carrying and other "for hire and compensation" operations. Not all UAS operations conducted for hire and compensation will require an Operator Certificate. One outcome of this effort will be to establish which UAS operations will or will not require an Operator Certificate.

Goal 1: FAA initial certification process established for one or more civil applicants by 2014.

A. One or more Pathfinder certification projects were defined through government-industry plans (e.g., Project Specific Certification Plans (PSCP)) in the 2nd Quarter of 2013.

- Explanation. Three UAS manufacturers have already applied for type certification and two of these applications were released from delayed sequencing to proceed with restricted category airworthiness certification. Restricted category type certifications for these two applicants have now been completed. Completion of these type certification projects under appropriate, existing certification regulations, will act as a catalyst to establish the process to be used for similar UAS type certification projects. Note: Some UAS type certifications may be in the restricted category with operating restrictions to maintain an equivalent level of safety for the public, but the goal is to certify the respective UAS to meet all integration requirements, if practical.

B. One or more Pathfinder standard airworthiness certification projects complete initial certification planning by 2014.

- Explanation. If the FAA and one or more industry partners complete initial certification planning as recommended in The FAA and Industry Guide to Product Certification, the groundwork will be in place for an efficient certification project that will help establish the process for similar UAS certification projects. One manufacturer has made application and the project will proceed per FAA sequencing processes.

Goal 2: FAA's initial issue papers for one or more standard airworthiness certification projects are available by 2014.

A. One or more Pathfinder certification projects underway by the 4th Quarter of 2013.

- Explanation. One manufacturer has made application for a standard airworthiness certificate and the project will proceed per FAA sequencing processes.

B. FAA's initial certification issues defined for the certification basis or new and novel systems (e.g., UAS control station, airframe, control system, propulsion system, ground support equipment (GSE), etc.) by the 4th Quarter of 2013.

- Explanation. The certification basis and any unique requirements for new and novel systems must be established. Requirements can be identified and refined as a result of Pathfinder efforts or publication by standards organizations (e.g., RTCA, Inc., ASTM International).

Goal 3: FAA's unique certification requirements identified through issue papers that have matured for one or more standard airworthiness certification projects by 2015.

A. FAA's unique certification requirements for new and novel systems (e.g., UAS control station, airframe, control system, propulsion system, GSE, etc.) published by 2015.

- Explanation. Lessons learned from certification of Pathfinder systems, publication of consensus standards, and additional operational experience gained as a result of small UAS (sUAS) rule publication will provide additional requirement information for future applicants.

B. One or more Pathfinder standard airworthiness certification projects completed by 2017 if all associated activities are completed per the nominal certification process.

- Explanation. It is expected that type certifications will be granted only when all requirements have been met under existing rules and requirements and this target date is a best-case scenario.

C. Other certification programs completed by 2017–2020, based on timely applications and system commonality/complexity.

- Explanation. Lessons learned from certification activities of Pathfinder systems, publication of consensus standards, and operations under the sUAS rule will provide data and experience to support other certification efforts.

Goal 4: FAA certification requirements updated and systems certified as necessary.

A. Certification requirements updated as necessary.

B. UAS certified as necessary.

C.2 Certification Requirements (Pilot/Crew)

Goal 1: FAA certification requirements for pilots and crew members for sUAS classes (including medical requirements, training standards, etc.) published as part of a sUAS rule by 2014 in accordance with the FMRA. Note: These requirements include coordination with other government agencies on security/vetting requirements.

Goal 2: Necessary changes to record keeping systems established as part of a sUAS rule and in accordance with the FMRA.

- Explanation. Once the final requirements are established, some changes to existing record keeping systems will be necessary.

Goal 3: FAA certification requirements for pilots and crew members for UAS classes other than those addressed under the sUAS rule (including medical requirements, training standards, etc.) published by 2014–2017.

C.3 Ground Based Sense and Avoid (GBSAA)

Goal 1: FAA draft Advisory Circular on GBSAA systems and requirements released by 2015.

A. FAA approvals for use of GBSAA at one or more DoD GBSAA test sites granted by the 3rd Quarter of 2015, subject to timely application and completion of Certificate of Waiver or Authorization (COA) or other approval processes.

- Explanation. Use U.S. Army and U.S. Air Force developed solutions at DoD UAS test sites. (Note: These are existing DoD GBSAA test sites, not the new test ranges discussed in Section 4.8 and Appendix C.7.)

B. FAA approvals for use of GBSAA for educational and other public applications granted by 2016–2018, subject to timely application and completion of COA or other approval processes.

- Explanation. As above, but expanded beyond the DoD to include public use at other locations equipped with suitable GBSAA systems.

Goal 2: GBSAA operations fully approved by the FAA for routine use by all aviation, including both public and civil entities (if needed).

A. FAA approvals for use of GBSAA for limited civil applications granted.

- Explanation. As with FAA operational approvals for use of GBSAA at all DoD GBSAA test sites and operational approvals for use of GBSAA for educational and other public applications, expanded approvals are expected to be granted for limited civil use at select locations. These approvals will incorporate relevant data from UAS test site operations with GBSAA.

B. FAA's initial GBSAA certification standards for civil operations established.

- Explanation. Assimilate prior deployment experience for DoD, public, and limited civil use, and develop Minimum Aviation System Performance Standards (MASPS) for GBSAA. These approvals will incorporate relevant data from UAS test site operations with GBSAA.

C. FAA approvals for use of GBSAA for civil applications granted.

D. FAA's final GBSAA certification standards for civil operations established.

E. GBSAA certification standards updated as necessary.

C.4 Airborne Sense and Avoid (ABSAA)

Goal 1: Initial FAA certification of ABSAA that facilitates UAS operations without the requirement for a visual observer by 2016–2020.

A. Initial industry proposal for Sense and Avoid (SAA) implementation, integration, and operation in a Pathfinder program provided by the 2nd Quarter of 2014. (See Appendix C.1 for the Pathfinder program goals and metrics.)

- Explanation. This industry proposal will address: a) general UAS operations requirements, b) UAS sense-and-avoid requirements for all proposed operations, including proposed launch and recovery sites, c) proposed UAS ABSAA equipage, and d) planned installation and integration of the proposed ABSAA system(s). ("System" includes both hardware and software.)

B. FAA Stage 2 issue paper on UAS SAA implementation in one or more Pathfinder programs completed by the 2nd Quarter of 2015, subject to applicant provision of sufficient information in certification application and ongoing processes.

- Explanation. An FAA Stage 2 issue paper will provide the "FAA Position" indicating the FAA's concerns, opinions, and actions the applicant is required to accomplish to resolve the issue. This position gives the applicant direction that will enable compliance to the requirements without dictating design

Goal 2: Installation and certification of ABSAA developed to meet industry standards for use by the DoD and other public and civil entities that provide the SAA functions required in the NAS for Classes A, E, and G airspace, and operations approved without the requirement for a visual observer or a COA. Note: the RTCA Program Management Committee established a new Special Committee 228 and working group for Detect and Avoid (DAA). SAA and DAA may be used interchangeably until SC-228 provides a unique definition for DAA. Special Committee 228's Terms of Reference acknowledge that the requirements for UAS DAA in some airspace will require rulemaking.

A. RTCA Operational and Functional Requirements and Safety Objectives (OFRSO) for UAS, Volume 1 was released in the 2nd Quarter of 2013.

- Explanation. The OFRSO "provides recommendations for UAS system level operational and functional requirements and safety objectives for UAS flown in the United States National Airspace System (NAS) under the rules and guidelines for civil aviation." This document provides a framework to support the development of future UAS performance standards and "will prove useful to designers, manufacturers, installers, service providers and users in the development of future standards."

B. RTCA preliminary Phase 1 Detect and Avoid (DAA) Minimum Operational Performance Standards (MOPS) developed to establish performance standards that can be verified and validated for UAS DAA equipment in specified airspace by the 3rd Quarter of 2015.

- Explanation. Emphasis for this initial phase will be standards development on civil UAS equipped to operate into Class A airspace under IFR. A second phase of MOPS development may include DAA equipment to support extended UAS operations in Class D, E and perhaps G airspace. This work effort includes recommendations for a verification and validation test program to be completed before the release of the DAA MOPS. Note: RTCA has sunset Special Committee 203 and Special Committee 228; has a new Detect and Avoid working group developing these DAA MOPS.

C. RTCA Phase 1 DAA MOPS released by the 3rd Quarter of 2016.

- Explanation. This document includes the avionics onboard the UAS and required elements of ground control systems and is based on the results of verification and validation activities on the preliminary Phase 1 DAA MOPS.

D. FAA DAA Technical Standard Order (TSO) issued by the 1st Quarter of 2017.

- Explanation. This document includes the avionics onboard the UAS and required elements of ground control systems.

E. FAA DAA TSO-required equipment used operationally.

Goal 3: DoD or other public entity certification of initial ABSAA systems that enable the DoD and other public entities to safely operate ABSAA-equipped UAS in all NAS airspace classes without the need for a COA. Note: RTCA Special Committee 228's Terms of Reference acknowledge that the requirements for UAS DAA in some airspace will require rulemaking.

A. Initial proposal for ABSAA implementation, integration, and operation in one or more programs released by 2016.

- Explanation. This proposal will address the requirements for ABSAA system(s), including the SAA avionics onboard the unmanned aircraft and required elements of ground control systems. "System" includes both hardware and software.

B. FAA issue paper(s) on UAS SAA implementation in one or more programs for UAS operations in one or more airspace classes released.

- Explanation. The FAA issue paper(s) will document the special considerations for certification of UAS airborne systems that include SAA functions. They also will document special considerations for operating UAS that employ these ABSAA systems and special considerations (including avionics equipage requirements) for manned aircraft operating in the same airspace.

Goal 4: Installation and certification of ABSAA systems for use by the DoD and other public and civil entities that provide the SAA functions that facilitate integrated operation of manned and unmanned aircraft in all NAS airspace classes.

A. RTCA OFRSO for UAS, Volume 1 was released in the 2nd Quarter of 2013.

- Explanation. The OFRSO "provides recommendations for UAS system level operational and functional requirements and safety objectives for UAS flown in the NAS under the rules and guidelines for civil aviation." This document provides a framework to support the development of future UAS performance standards.

B. RTCA Phase 1 DAA MOPS released by the 3rd Quarter of 2016.

- Explanation. This document includes the SAA avionics onboard the aircraft and required elements of ground control systems for IFR flight in Class D, E, and G airspace as noted in the Terms of Reference.

C. RTCA DAA MOPS released for other classes of airspace.

- Explanation. The second phase of DAA MOPS may specify DAA equipment to support extended UAS operations in Class D, E, G, and other airspace as noted in the Terms of Reference.

D. FAA initial DAA TSO released by the 1st Quarter of 2017.

- Explanation. This document will include the avionics onboard the aircraft and required elements of ground control systems as invoked from requirements specified in the Phase 1 DAA MOPS.

E. FAA DAA TSO-required equipment used operationally.

- Explanation. UAS will receive operational approval to use DAA equipment through standard operational approval processes that may include exemptions to Part 91 and/or rulemaking activities as defined by FMRA.

F. RTCA UAS OFRSO and DAA MOPS updated as necessary.

G. FFAA DAA TSO(s) updated as necessary.

C.5 Control and Communications (C2)

Note: For purposes of this section, line-of-sight (LOS) means radio LOS, not visual LOS.

Goal 1: International agreements, industry standards, and FAA regulations and guidance material established by 2015 for civil UAS Control and Communications (C2) capabilities such that C2 subsystems can be certified by the FAA for use in FAA-approved UAS operations.

Note: C2 includes communications internal to the UAS for pilots to operate unmanned aircraft from ground control stations.

A. International agreement was reached in February 2012 at the International Telecommunication Union's (ITU) World Radiocommunication Conference (WRC) on spectrum identified for radio LOS UAS C2 links (or in ITU terminology, Control and Non-Payload Communications links).

- Explanation. Internationally harmonized radio spectrum is needed to help ensure protection from unintentional radio frequency interference, to help ensure adequate spectral bandwidth is available, and to facilitate operation of UAS across international borders. While spectrum is also needed for beyond-line-of-sight (BLOS) C2 links, the initial focus was on radio line-of-sight for civil UAS because demand for LOS links is expected to be greater.

B. RTCA OFRSO for UAS, Volume 1 was released in the 2nd Quarter of 2013.

- Explanation. The OFRSO "provides recommendations for UAS system level operational and functional requirements and safety objectives for UAS flown in the NAS under the rules and guidelines for civil aviation." This document provides a framework to support the development of future UAS performance standards.

C. RTCA's initial MOPS for all the UAS subsystems involved in providing or enabling C2 Data Link using L-Band and C-Band Terrestrial data links are available to be verified and validated by the 3rd Quarter of 2015.

- Explanation. These preliminary MOPS and associated recommendations for a verification and validation test program are needed for the FAA and industry to mature the final Terrestrial data link standards before the release of the final MOPS. RTCA is expected to define MOPS that include L-Band and C-Band frequencies identified at WRC 2012. The resulting MOPS form the basis upon which the FAA can certify systems and services used in providing C2 capabilities for civil UAS.

D. RTCA final Phase 1 C2 Terrestrial Data Link MOPS released by the 3rd Quarter of 2016.

- Explanation. These performance standards in both L-Band and C-Band spectrum are based on the results of the verification and validation test program activities. RTCA is expected to define MOPS that include L-Band and C-Band frequencies identified at WRC 2012.

E. FAA's initial regulations and guidance material (such as TSOs and Advisory Circulars) to enable the production, sale, installation, and maintenance of FAA-certified systems and services used in providing radio LOS C2 capabilities for civil UAS published by 2016–2017.

- Explanation. For the commercial marketplace to offer FAA-certified systems and services for use in providing C2 capabilities for civil UAS, the FAA must establish the necessary regulations and guidance material. These are expected to be based on and largely incorporate the consensus industry standards defined in the RTCA MOPS.

F. Initial FAA-certified Terrestrial C2 Data Link subsystems intended for civil UAS operations are available commercially.

- Explanation. FAA-certified Terrestrial C2 Data Link subsystems for civil UAS are needed for operators and manufacturers to incorporate in their UAS, and for operators to obtain FAA approval for their UAS operations.

Goal 2: Beyond-Line-of-Sight C2 links and capabilities are addressed in international agreements, industry standards, and FAA regulations and guidance material.

A. International agreement reached at the ITU's WRC 15 on radio spectrum identified for BLOS UAS C2 links by 2015.

- Explanation. Internationally harmonized radio spectrum is needed for UAS C2 links to help ensure their protection from unintentional radio frequency interference, to help ensure adequate spectral bandwidth is available for meeting the projected C2 link capacity demands, and to facilitate operation of UAS across international borders. In the far-term, an increasing number of civil UAS operations are expected to require BLOS C2 links.

B. RTCA's second phase MOPS for all the UAS subsystems involved in providing or enabling radio BLOS C2 capabilities for civil UAS published. These elements will include the necessary portion of avionics onboard the unmanned aircraft, the voice and data links, and the necessary portion of ground control systems.

- Explanation. This second phase of MOPS will be needed to provide standards for the use of SATCOM in multiple bands as a C2 Data Link to support UAS. This development will be based on the results of the ITU's WRC 15 as well as lessons learned from industry application of the initial MOPS during product development and FAA certification activities.

C. FAA's final regulations and guidance material to enable the production, installation, and maintenance of FAA-certified systems and services used in providing radio BLOS C2 capabilities for civil UAS published.

- Explanation. A revised set of FAA regulations and guidance material will be needed to address BLOS C2 Data Link systems. These regulations and guidance material will apply lessons learned from application of the initial set.

D. Initial FAA-certified BLOS C2 subsystems intended for civil UAS operations are available commercially.

- Explanation. FAA-certified BLOS C2 subsystems for civil UAS are needed for operators and manufacturers to incorporate in their UAS, and for operators to obtain FAA approval for their UAS operations.

Goal 3: Adequate spectrum is available for both radio LOS and BLOS C2 links to meet the current and projected demand generated by civil UAS operations in the NAS.

A. International spectrum identified for LOS and BLOS UAS C2 links reviewed for possible modification at a future WRC by 2020.

C.6 Small UAS (sUAS) and Other Rules

Goal 1: sUAS rule adopted to allow for both civil and public operations.

A. Agreements (Memorandums of Understanding (MOU), Memorandums of Agreement (MOA), COA, etc.) among the FAA and the DoD, the Department of Homeland Security (DHS), the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the Department of Justice (DOJ) and other public entities finalized and signed in conjunction with the release of the sUAS Notice of Proposed Rulemaking (NPRM). (The sUAS NPRM is expected to be released in early 2014).

- Explanation. The sUAS proposed rule has undergone a risk assessment by the FAA through its Safety Management System (SMS) process. Adopting or applying the provisions of the proposed rule for public operations is necessary and will accelerate NAS integration of sUAS. It will also reduce the number of COAs the FAA will need to process and free up FAA resources to address other time-critical UAS in the NAS integration issues.

B. sUAS follow-on night operations experiments and study accepted by the FAA for review by the 3rd Quarter of 2014.

- Explanation. NASA completed an initial study at New Mexico State University in 2012. The FAA reviewed the report on this initial study and provided questions and other inputs for inclusion in NASA's planned follow-on study. The FAA will review the report of these focused experiments and may consider DoD and other night operational data.

C. If night operations are deemed as safe as or safer by the FAA, increased night operations for public entities are allowed by the 3rd Quarter of 2015.

- Explanation. Public entities are requesting night operations as a means to fully exploit the capability of sUAS.

D. D. Drafts of all required consensus standards necessary for the implementation of 14 CFR Part 107 available to the public in conjunction with the release of the sUAS NPRM (currently expected to be released in 2013).

- Explanation. More than three years of consensus standard development have occurred. When completed, these standards will provide meaningful guidance to manufacturers and end users for the design, construction, and operation of sUAS. The timely release of the standards will permit industry an opportunity to fully prepare for publication of a final rule, and provide useful guidance to public entities desiring UAS deployment prior to final rule release.

Goal 2: sUAS rule adoption for public and civil operations.

A. 14 CFR Part 107 published, consensus-based standards accepted by the FAA, and the FAA able to issue permits to operate in accordance with requirements of the FMRA.

- Explanation. In order for operations to be conducted under 14 CFR Part 107, the FAA will issue a Notice of Applicability of referenced consensus-based standards and will be able to issue permits to operate.

B. Update sUAS rules, guidance, and/or consensus-based standards after sufficient data have been gathered and analyzed.

- Explanation. Assuming a final rule implementation, the FAA will gain experience with sUAS operating under 14 CFR Part 107. Advancements in technology and analysis of operational and safety data will provide the catalyst for refinement and improvement of Part 107 guidance and/or standards.

C. Update sUAS rules, guidance, and/or consensus-based standards as necessary.

- Explanation. As more operational and safety data is accumulated it will provide a catalyst for refinement and improvement of 14 CFR Part 107 guidance and/or standards as necessary.

Goal 3: sUAS rule supports ATC interoperability to ensure safe and efficient NAS operations.

A. Train air traffic control workforce within six months after sUAS rule enactment.

B. Ensure consistency between sUAS rule proposed operational expectations and proposed changes to ATC Handbook and the Aeronautical Information Manual (AIM).

C. sUAS operations are aligned with ATC Handbook and AIM when the sUAS rule is published and effective.

D. Employ existing strategies to conduct UAS integration safety analysis within SMS Manual guidance to ongoing safety analyses supporting ATC interoperability.

- Explanation. The FAA will enhance ATC interoperability under sUAS rule operations with safety analyses, as required.

Goal 4: Other Rulemaking per the FMRA.

A. Notice of Proposed Rulemaking published to implement the recommendations of the plan required by FMRA by the 3rd Quarter of 2014.

- Explanation. Section 332, subsection (a)(1) of the FMRA specifies plan requirements and subsection (b) requires publication of an NPRM.

B. Final rule published to implement the recommendations of the plan required by the FMRA by the 4th Quarter of 2015.

- Explanation. Section 332, subsection (a)(1) of the FMRA specifies plan requirements and subsection (b) requires publication of a final rule not later than 16 months after publication of the associated NPRM.

C. C. Update to the Administration's most recent policy statement on unmanned aircraft systems contained in Docket No. FAA–2006–25714 required by the FMRA by the 3rd Quarter of 2014.

- Explanation. Section 332, subsection (b) requires publication of this update.

C.7 Test Ranges

Goal 1: FAA program to integrate UAS into the NAS at six test ranges established in accordance with the FMRA.

- Explanation. To establish this program, selection criteria and procedures were developed and communicated to prospective site operators. Test areas criteria consider geographic and climate diversity, the location of ground infrastructure, and research needs. FAA dialogue with prospective site operators clarified criteria and procedures by gathering prospective site operator questions and documenting answers for use by all.

Goal 2: Test ranges selected by FAA in accordance with the FMRA.

- Explanation. The FAA received applications from prospective site operators in the 1st Quarter of 2013 and is evaluating the applications per the established selection criteria and procedures. Any test range selected should provide the FAA, NASA, DoD, industry and academia with the opportunity for UAS prototype development and deployment.

Goal 3: Selected test ranges operational in accordance with the FMRA

- Explanation. The FMRA states that "the test range shall be operational no later than 180 days after the date on which a project is established."

Goal 4: Test range program operational until February 2017.

- Explanation. The FMRA requires the test range program to be terminated by February 2017.

Goal 5: Report findings and conclusions concerning projects in accordance with the FMRA.

- Explanation. The FMRA states that "Not later than 90 days after the date of the termination of the program...the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure and the Committee on Science, Space, and Technology of the House of Representatives a report setting forth the Administrator's findings and conclusions concerning the projects."

C.8 Air Traffic Interoperability

Goal 1: Safety and Interoperability—The overall level of safety in the NAS is preserved through NAS integration, which requires adherence to rigorous airworthiness standards and airspace regulations. While they apply equally to manned aircraft, they also recognize the distinguishing characteristics of UAS.

A. Conduct research that validates the required functional and performance capabilities for safe operation of UAS within the various airspaces of the NAS from 2012 to 2017.

B. Air Traffic interoperability requirements will be allocated to appropriate Air Traffic program and UAS integration efforts from 2012 to 2017.

C. Employ existing strategies to conduct UAS integration safety analysis within SMS Manual guidance to ongoing safety analyses supporting ATC interoperability.

D. Conduct research on Sense and Avoid algorithms for collision avoidance and self-separation that are interoperable with evolving Next Generation Air Transportation System (NextGen) ATC systems and manned collision avoidance systems.

E. Analyze human factors data to determine the safest technologies and best procedures for air traffic controllers to provide services to UAS pilots.

F. Track safety and operational data to use as a basis for policy decisions from 2012 to 2017.

Goal 2: Procedures and Training

A. Develop ATC training requirements specific to different types of UAS characteristics, including UAS performance, behavior, communications, unique flight profiles, ATC standardized procedures, lost link/ fly away profiles, operating limitations, and emergency procedures. Initial training produced in 2009, first revision to be available in 3rd Quarter of 2013. Subsequent training development will occur through 2020.

B. B. Administer UAS training to ATC facilities throughout the NAS from 2013 to 2020.

C.9. Miscellaneous

Goal 1: Develop more detailed plans for safely integrating UAS operations in the NAS by 2015.

A. UAS ARC reviewed FAA and industry plans, including the 2006 Airspace Integration Plan, in 2012.

- Explanation. The 2006 Airspace Integration Plan modified the airspace integration plan developed under the government-industry Access 5 program to more directly address the eight major challenges with UAS integration in the NAS. The UAS ARC will review the 2006 plan and update recommendations consistent with current thinking, including goals and metrics documented in this roadmap.

B. UAS ARC made recommendations for changes to FAA and industry programs and provided them to the FAA in the 2nd Quarter of 2013.

- Explanation. The UAS ARC completed its review of FAA and related industry plans and sent the FAA recommendations for additional planning elements and details. These recommendations include proposed changes to existing and planned programs.

C. Updated FAA UAS Integration Roadmap published annually in accordance with the FMRA.

Goal 2: Identify air traffic management system changes required to be implemented in NextGen.

A. UAS are addressed in the FAA's 2012 *NextGen Implementation Plan* by the 4th Quarter of 2013.

- Explanation. This requires explicitly addressing the operation of UAS in the NAS and the evolution of enabling system capabilities in the various NextGen Segment Implementation Plans (NSIP). Although no significant changes to the current NAS and future NextGen are expected for the integration of UAS operations in unrestricted airspace, some system and procedure changes may be necessary. Any changes need to be incorporated in the *NextGen Implementation Plan,* so that appropriate adjustments to program baselines can be made.

B. UAS are addressed in FAA's NextGen Enterprise Architecture by the 4th Quarter of 2013.

- Explanation. This requires explicitly addressing the integration of UAS operations in the NAS, including the necessary operational concepts and system capabilities. The NextGen Enterprise Architecture identifies whatever is needed to integrate UAS operations in unrestricted airspace. The CY 2012 update to the NextGen Enterprise Architecture depicted FMRA milestones in the aircraft roadmap component.

Goal 3: Review and revise and/or develop new UAS operational scenarios to mature UAS operational concept elements, update operational requirements, and validate key concept elements for UAS integration into the NAS.

A. FAA initiates an effort to review existing UAS operational scenarios/concept elements and revise them and/or develop new scenarios, if needed, for use in UAS operational concept development per established air traffic system engineering practices by the 1st Quarter of 2014.

- Explanation. A rich set of operational scenarios and mature concept elements is needed to develop a complete set of operational requirements, from which system functional and performance requirements can be derived. Off-nominal operations may also be defined for conceivable contingency situations.

B. FAA uses vetted operational scenarios and other concept maturation products to update UAS operator and NAS operational requirements by the 3rd Quarter of 2014.

- Explanation. This process uses vetted scenarios and other mature concept elements to update and document the set of UAS operator and NAS operational requirements associated with integrating UAS operations into the NAS per established air traffic system engineering analyses and related processes.

C. FAA uses vetted operational scenarios, updated UAS operator and NAS requirements and other mature concept elements to validate key concept elements and requirements associated with integrating UAS operations into the NAS.

- Explanation. Air traffic system engineering processes continue to validate concept elements and requirements based on priority need for their validation. Concept element validation priorities will determine resource allocations and schedule for validation of respective concept elements.

Goal 4: Develop UAS integration in the Arctic Region in accordance with the FMRA

A. A. FAA evaluates key operational concepts for potential inclusion into appropriate operational policy and procedures documents (e.g., FAA Order 8900.1 (Flight Standards Information Management System), state Aeronautical Information Publication (AIP) supplements, Notices to Airmen (NOTAM), etc.) by the 2nd Quarter of 2015.

B. FAA and Arctic UAS operators examine the costs (e.g., aircraft certification, mandatory equipage requirements, etc.) and benefits (i.e., value of main business cases for use) by the 3rd Quarter of 2015.

C. FAA begins Air Traffic Organization (ATO) process to establish UAS Arctic Areas, including airspace designation and DoD notice, by the 3rd Quarter of 2015.

D. FAA completes safety studies in accordance with Section 335 of the FMRA by the 3rd Quarter of 2015. (Note: The first safety risk management (SRM) panel for initial projects convened in 2013 and has drafted the associated SRM document.)

E. FAA develops UAS restricted category special airworthiness certificate standards by the 3rd Quarter of 2015.

F. FAA reviews planning and approval documents (e.g., COA template, FAA Destination 2025, FAA Flight Plan 2012, other FAA/International Civil Aviation Organization (ICAO) documents) and evaluates or adapts their use for Arctic Area operations by 2015.

G. Begin international UAS scientific experiments (Marginal Ice Zone Observations and Processes Experiment (MIZOPEX)) with NASA, NOAA, and the University of Alaska), commercial UAS photography missions, or other expanded use/demonstration of UAS in accordance with the Arctic Plan by the 3rd Quarter of 2013.

Goal 5: Develop implementation of Common Strategy for DOJ and associated law enforcement, fire, and first responder agency use of sUAS in the NAS in accordance with the FMRA.

Note: Progress on original metrics is documented below along with metrics to be completed.

A. FAA began collaboration with the DHS Science and Technology (S&T) Directorate during the 4th Quarter of 2012 to support FAA testing and evaluation program of sUAS for law enforcement and first responders, with high-level suitability criteria.

B. FAA formally accepted and signed the MOU with the DOJ National Institute of Justice (NIJ) in the 1st Quarter of 2013.

C. FAA established a working group to examine validity of legacy pilot-in-command (PIC) and observer medical qualifications currently stipulated in COA guidelines in the 2nd Quarter of 2013.

D. FAA established a liaison with DOJ NIJ and U.S. Fire Administration on the development of common strategies for the deployment of sUAS technologies in support of fire enforcement agencies in the 2nd Quarter of 2013.

E. FAA established a working group to examine validity and alternatives to PIC certification requirements established in the 2nd Quarter of 2013.

F. FAA established a collaborative working group with DOJ NIJ and federal law enforcement agencies to examine, plan, and develop a nationwide COA process/approval for the Federal Bureau of Investigation, Bureau of Alcohol, Tobacco, Firearms and Explosives, the National Park Service, and other federal law enforcement and emergency management agencies with country-wide jurisdictions in the 2nd Quarter of 2013.

G. FAA incorporates key operational concepts of strategy into a revised law enforcement/first responder-specific COA template by the 4th Quarter of 2013.

H. FAA establishes a collaborative working group with DOJ NIJ and appropriate law enforcement agencies and trade associations to examine, plan, and develop a COA approval process for law enforcement and first responder mutual aid operations by the 4th Quarter of 2013.

I. FAA to establish working group with DOJ NIJ and the DHS S&T on the development of a technical bulletin on the Common Strategy for distribution to law enforcement/first responders across the nation by the 4th Quarter of 2013.

J. FAA commences collaboration and coordination with DOJ NIJ and DHS S&T to support the co-hosting of a DOJ/FAA/DHS-focused sUAS conference to be convened in the 4th Quarter of 2013.

K. FAA establishes a collaborative working group with DOJ NIJ, DHS and appropriate law enforcement associations to examine, plan, and develop guidelines for any law enforcement agency contemplating the use of unmanned aircraft by the 4th Quarter of 2013.

L. FAA establishes working group with DOJ NIJ on the development of a process for the collection of Unmanned Aircraft Aviation Operations Report data from law enforcement agencies by the 4th Quarter of 2013.

M. FAA completes the development of law enforcement and first responder sUAS competency evaluation procedures, safety risk analysis plan (SRAP), and evaluation checklist completed by the 4th Quarter of 2013.

N. FAA assists three different-sized law enforcement agencies in first implementation of the Common Strategy – target date coordinated with the agencies and confident timeline for the agencies – 4th Quarter of 2013.

- Explanation: FAA assistance is planned for one small agency (i.e., less than 100 sworn officers), one medium agency (i.e., 100 to 300 sworn officers), and one large law enforcement agency (i.e., greater than 300 sworn officers).

O. FAA establishes working group to examine sUAS aircraft recommended guidelines for law enforcement agencies contemplating the use of unmanned aircraft by the 4th Quarter of 2013.

P. FAA will complete COA online modifications to enable Common Strategy implementation by law enforcement agencies by the 4th Quarter of 2014.

Q. FAA reviews planning and approval documents (e.g., unique law enforcement agency COA template, FAA Flight Plan 2012, other FAA/ICAO documents) and modifies or adapts their use for law enforcement agency and first responder sUAS operations by 2015.

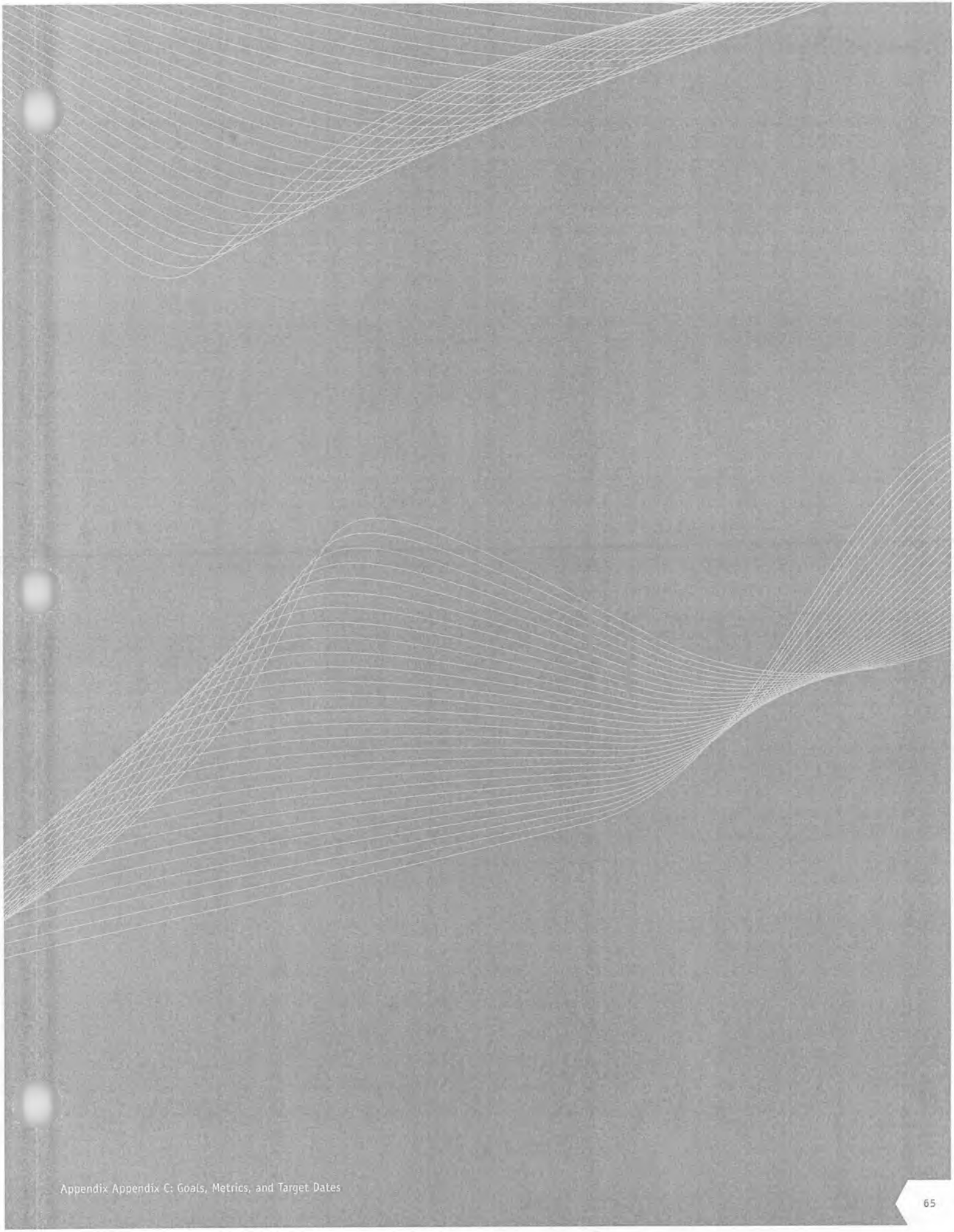
Goal 6: In accordance with the FMRA, develop policies to ensure "the Administrator of the FAA may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft."

A. Publish FAA order to establish criteria the agency will use to determine which model aircraft organizations can be considered community-based organizations.

B. Publish update to Federal Register that compares content of AC 91-57 and the FMRA, provides examples of careless and reckless operations, and makes distinction between modeling and commercial operations.

Goal 7: Requirements for the operation of "public unmanned aircraft systems" in the NAS in accordance with the FMRA.

A. Develop and implement operational and certification requirements for the operation of "public unmanned aircraft systems" in the NAS by the 4th Quarter of 2015.



Appendix D: FAA Modernization and Reform Act of 2012 Reference Text

Appendix D: FAA Modernization and Reform Act of 2012 Reference Text

Subtitle B—Unmanned Aircraft Systems

SEC. 331. DEFINITIONS.

In this subtitle, the following definitions apply:

(1) ARCTIC.—The term "Arctic" means the United States zone of the Chukchi Sea, Beaufort Sea, and Bering Sea north of the Aleutian chain.

(2) CERTIFICATE OF WAIVER; CERTIFICATE OF AUTHORIZATION.—The terms "certificate of waiver" and "certificate of authorization" mean a Federal Aviation Administration grant of approval for a specific flight operation.

(3) PERMANENT AREAS.—The term "permanent areas" means areas on land or water that provide for launch, recovery, and operation of small unmanned aircraft.

(4) PUBLIC UNMANNED AIRCRAFT SYSTEM.—The term "public unmanned aircraft system" means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft (as defined in section 40102 of title 49, United States Code).

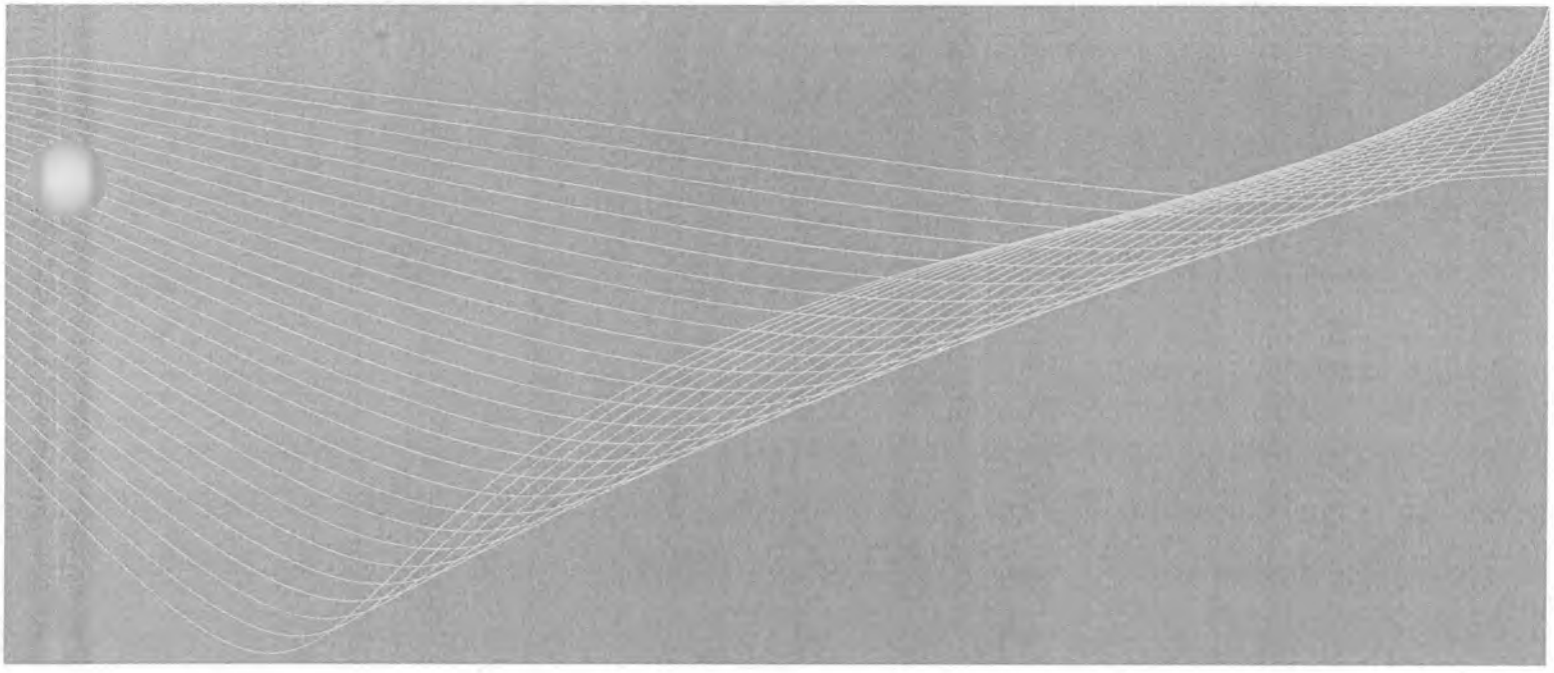
(5) SENSE AND AVOID CAPABILITY.—The term "sense and avoid capability" means the capability of an unmanned aircraft to remain a safe distance from and to avoid collisions with other airborne aircraft.

(6) SMALL UNMANNED AIRCRAFT.—The term "small unmanned aircraft" means an unmanned aircraft weighing less than 55 pounds.

(7) TEST RANGE.—The term "test range" means a defined geographic area where research and development are conducted.

(8) UNMANNED AIRCRAFT.—The term "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

(9) UNMANNED AIRCRAFT SYSTEM.—The term "unmanned aircraft system" means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.



SEC. 332. INTEGRATION OF CIVIL UNMANNED AIRCRAFT SYSTEMS INTO NATIONAL AIRSPACE SYSTEM.

(a) REQUIRED PLANNING FOR INTEGRATION.—

(1) COMPREHENSIVE PLAN.—Not later than 270 days after the date of enactment of this Act, the Secretary of Transportation, in consultation with representatives of the aviation industry, Federal agencies that employ unmanned aircraft systems technology in the national airspace system, and the unmanned aircraft systems industry, shall develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system.

(2) CONTENTS OF PLAN.—The plan required under paragraph (1) shall contain, at a minimum, recommendations or projections on—

(A) the rulemaking to be conducted under subsection (b), with specific recommendations on how the rulemaking will—

(i) define the acceptable standards for operation and certification of civil unmanned aircraft systems;

(ii) ensure that any civil unmanned aircraft system includes a sense and avoid capability; and

(iii) establish standards and requirements for the operator and pilot of a civil unmanned aircraft system, including standards and requirements for registration and licensing;

(B) the best methods to enhance the technologies and subsystems necessary to achieve the safe and routine operation of civil unmanned aircraft systems in the national airspace system;

(C) a phased-in approach to the integration of civil unmanned aircraft systems into the national airspace system;

(D) a timeline for the phased-in approach described under subparagraph (C);

(E) creation of a safe

(F) airspace designation for cooperative manned and unmanned flight operations in the national airspace system;

(G) establishment of a process to develop certification, flight standards, and air traffic requirements for civil unmanned aircraft systems at test ranges where such systems are subject to testing;

(H) the best methods to ensure the safe operation of civil unmanned aircraft systems and public unmanned aircraft systems simultaneously in the national airspace system; and

(I) incorporation of the plan into the annual NextGen Implementation Plan document (or any successor document) of the Federal Aviation Administration.

(3) DEADLINE.—The plan required under paragraph (1) shall provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015.
(4) REPORT TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to Congress a copy of the plan required under paragraph (1).
(5) ROADMAP.—Not later than 1 year after the date of enactment of this Act, the Secretary shall approve and make available in print and on the Administration's Internet Web site a 5-year roadmap for the introduction of civil unmanned aircraft systems into the national airspace system, as coordinated by the Unmanned Aircraft Program Office of the Administration. The Secretary shall update the roadmap annually.

(b) RULEMAKING.—Not later than 18 months after the date on which the plan required under subsection (a)(1) is submitted to Congress under subsection (a)(4), the Secretary shall publish in the Federal Register—

(1) a final rule on small unmanned aircraft systems that will allow for civil operation of such systems in the national airspace system, to the extent the systems do not meet the requirements for expedited operational authorization under section 333 of this Act;

(2) a notice of proposed rulemaking to implement the recommendations of the plan required under subsection (a)(1), with the final rule to be published not later than 16 months after the date of publication of the notice; and

(3) an update to the Administration's most recent policy statement on unmanned aircraft systems, contained in Docket No. FAA-2006-25714.

(c) PILOT PROJECTS.—
(1) ESTABLISHMENT.—Not later than 180 days after the date of enactment of this Act, the Administrator shall establish a program to integrate unmanned aircraft systems into the national airspace system at 6 test ranges. The program shall terminate 5 years after the date of enactment of this Act.

(2) PROGRAM REQUIREMENTS.—In establishing the program under paragraph (1), the Administrator shall—
(A) safely designate airspace for integrated manned and unmanned flight operations in the national airspace system;
(B) develop certification standards and air traffic requirements for unmanned flight operations at test ranges;
(C) coordinate with and leverage the resources of the National Aeronautics and Space Administration and the Department of Defense;
(D) address both civil and public unmanned aircraft systems;
(E) ensure that the program is coordinated with the Next Generation Air Transportation System; and (F) provide for verification of the safety of unmanned aircraft systems and related navigation procedures before integration into the national airspace system.

(3) TEST RANGE LOCATIONS.—In determining the location of the 6 test ranges of the program under paragraph (1), the Administrator shall—
(A) take into consideration geographic and climatic diversity;
(B) take into consideration the location of ground infrastructure and research needs; and
(C) consult with the National Aeronautics and Space Administration and the Department of Defense.

(4) TEST RANGE OPERATION.—A project at a test range shall be operational not later than 180 days after the date on which the project is established.

(5) REPORT TO CONGRESS.—

(A) IN GENERAL.—Not later than 90 days after the date of the termination of the program under paragraph (1), the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure and the Committee on Science, Space, and Technology of the House of Representatives a report setting forth the Administrator's findings and conclusions concerning the projects.

(B) ADDITIONAL CONTENTS.—The report under sub-paragraph (A) shall include a description and assessment of the progress being made in establishing special use air-space to fill the immediate need of the Department of Defense—

(i) to develop detection techniques for small unmanned aircraft systems; and

(ii) to validate the sense and avoid capability and operation of unmanned aircraft systems.

(d) EXPANDING USE OF UNMANNED AIRCRAFT SYSTEMS IN ARCTIC.—

(1) IN GENERAL.—Not later than 180 days after the date of enactment of this Act, the Secretary shall develop a plan and initiate a process to work with relevant Federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes. The plan for operations in these permanent areas shall include the development of processes to facilitate the safe operation of unmanned aircraft beyond line of sight. Such areas shall enable over-water flights from the surface to at least 2,000 feet in altitude, with ingress and egress routes from selected coastal launch sites.

(2) AGREEMENTS.—To implement the plan under paragraph (1), the Secretary may enter into an agreement with relevant national and international communities.

(3) AIRCRAFT APPROVAL.—Not later than 1 year after the entry into force of an agreement necessary to effectuate the purposes of this subsection, the Secretary shall work with relevant national and international communities to establish and implement a process, or may apply an applicable process already established, for approving the use of unmanned aircraft in the designated permanent areas in the Arctic without regard to whether an unmanned aircraft is used as a public aircraft, a civil aircraft, or a model aircraft.

SEC. 333. SPECIAL RULES FOR CERTAIN UNMANNED AIRCRAFT SYSTEMS.

(a) IN GENERAL.—Notwithstanding any other requirement of this subtitle, and not later than 180 days after the date of enactment of this Act, the Secretary of Transportation shall determine if certain unmanned aircraft systems may operate safely in the national airspace system before completion of the plan and rulemaking required by section 332 of this Act or the guidance required by section 334 of this Act.

(b) ASSESSMENT OF UNMANNED AIRCRAFT SYSTEMS.—In making the determination under subsection (a), the Secretary shall determine, at a minimum—

(1) which types of unmanned aircraft systems, if any, as a result of their size, weight, speed, operational capability, proximity to airports and populated areas, and operation within visual line of sight do not create a hazard to users of the national airspace system or the public or pose a threat to national security; and

(2) whether a certificate of waiver, certificate of authorization, or airworthiness certification under section 44704 of title 49, United States Code, is required for the operation of unmanned aircraft systems identified under paragraph (1).

(c) REQUIREMENTS FOR SAFE OPERATION.—If the Secretary determines under this section that certain unmanned aircraft systems may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft systems in the national airspace system.

SEC. 334. PUBLIC UNMANNED AIRCRAFT SYSTEMS.

(a) GUIDANCE.—Not later than 270 days after the date of enactment of this Act, the Secretary of Transportation shall issue guidance regarding the operation of public unmanned aircraft systems to—

(1) expedite the issuance of a certificate of authorization process;

(2) provide for a collaborative process with public agencies to allow for an incremental expansion of access to the national airspace system as technology matures and the necessary safety analysis and data become available, and until standards are completed and technology issues are resolved;

(3) facilitate the capability of public agencies to develop and use test ranges, subject to operating restrictions required by the Federal Aviation Administration, to test and operate unmanned aircraft systems; and

(4) provide guidance on a public entity's responsibility when operating an unmanned aircraft without a civil air-worthiness certificate issued by the Administration.

(b) STANDARDS FOR OPERATION AND CERTIFICATION.—Not later than December 31, 2015, the Administrator shall develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system.

(c) AGREEMENTS WITH GOVERNMENT AGENCIES.—

(1) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Secretary shall enter into agreements with appropriate government agencies to simplify the process for issuing certificates of waiver or authorization with respect to applications seeking authorization to operate public unmanned aircraft systems in the national airspace system.

(2) CONTENTS.—The agreements shall—

(A) with respect to an application described in paragraph (1)—

(i) provide for an expedited review of the application;

(ii) require a decision by the Administrator on approval or disapproval within 60 business days of the date of submission of the application; and

(iii) allow for an expedited appeal if the application is disapproved;

(B) allow for a one-time approval of similar operations carried out during a fixed period of time; and

(C) allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less, if operated—

(i) within the line of sight of the operator;

(ii) less than 400 feet above the ground;

(iii) during daylight conditions;

(iv) within Class G airspace; and

(v) outside of 5 statute miles from any airport, heliport, seaplane base, spaceport, or other location with aviation activities.

SEC. 335. SAFETY STUDIES.

The Administrator of the Federal Aviation Administration shall carry out all safety studies necessary to support the integration of unmanned aircraft systems into the national airspace system.

SEC. 336. SPECIAL RULE FOR MODEL AIRCRAFT.

(a) IN GENERAL.—Notwithstanding any other provision of law relating to the incorporation of unmanned aircraft systems into Federal Aviation Administration plans and policies, including this subtitle, the Administrator of the Federal Aviation Administration may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft, if—

(1) the aircraft is flown strictly for hobby or recreational use;

(2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;

(3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;

(4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and

(5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation (model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport)).

(b) STATUTORY CONSTRUCTION.—Nothing in this section shall be construed to limit the authority of the Administrator to pursue enforcement action against persons operating model aircraft who endanger the safety of the national airspace system.

(c) MODEL AIRCRAFT DEFINED.—In this section, the term "model aircraft" means an unmanned aircraft that is—

(1) capable of sustained flight in the atmosphere;

(2) flown within visual line of sight of the person operating the aircraft; and

(3) flown for hobby or recreational purposes.

U.S. Department of Transportation
Federal Aviation Administration

800 Independence Avenue, SW
Washington, DC 20591

2012-AJG-502 Produced by FAA Communications

3

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

November 6, 2013

The Honorable John Thune
Ranking Member
Committee on Commerce, Science
and Transportation
United States Senate
Washington, DC 20510

Dear Senator Thune:

As required by Section 332(a) of the FAA Modernization and Reform Act of 2012, I am pleased to provide you with the U.S. Department of Transportation's Unmanned Aircraft Systems (UAS) Comprehensive Plan. The Federal Aviation Administration's Joint Planning and Development Office developed this comprehensive plan under the guidance of the Next Generation Air Transportation System (NextGen) Senior Policy Committee, and in coordination with NextGen partner representatives. The Plan outlines the safe acceleration of the integration of civil UAS into the National Airspace System (NAS).

The UAS Comprehensive Plan includes UAS National Goals and Objectives that reflect the NextGen partner agencies' UAS mission needs. The work accomplished by the multi-agency teams in Fiscal Year 2012 provides the foundation for embarking on the path towards safe integration of UAS in the NAS. The completed work provides a common framework for evolving interagency coordination and planning and is a testament to the collaboration among representatives from the partner agencies and the UAS community.

A similar letter has been sent to the Chairmen of the Senate Committee on Commerce, Science and Transportation and the House Committee on Transportation and Infrastructure and the Ranking Member of the House Committee on Transportation and Infrastructure.

Sincerely,

Anthony R. Foxx

Enclosure

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

November 6, 2013

The Honorable John D. Rockefeller IV
Chairman
Committee on Commerce, Science
and Transportation
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

As required by Section 332(a) of the FAA Modernization and Reform Act of 2012, I am pleased to provide you with the U.S. Department of Transportation's Unmanned Aircraft Systems (UAS) Comprehensive Plan. The Federal Aviation Administration's Joint Planning and Development Office developed this comprehensive plan under the guidance of the Next Generation Air Transportation System (NextGen) Senior Policy Committee, and in coordination with NextGen partner representatives. The Plan outlines the safe acceleration of the integration of civil UAS into the National Airspace System (NAS).

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A similar letter has been sent to the Chairman of the House Committee on Transportation and Infrastructure and the Ranking Members of the Senate Committee on Commerce, Science and Transportation and the House Committee on Transportation and Infrastructure.

Sincerely,

Anthony R. Foxx

Enclosure

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

November 6, 2013

The Honorable Bill Shuster
Chairman
Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

As required by Section 332(a) of the FAA Modernization and Reform Act of 2012, I am pleased to provide you with the U.S. Department of Transportation's Unmanned Aircraft Systems (UAS) Comprehensive Plan. The Federal Aviation Administration's Joint Planning and Development Office developed this comprehensive plan under the guidance of the Next Generation Air Transportation System (NextGen) Senior Policy Committee, and in coordination with NextGen partner representatives. The Plan outlines the safe acceleration of the integration of civil UAS into the National Airspace System (NAS).

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A similar letter has been sent to the Chairman of the Senate Committee on Commerce, Science and Transportation and the Ranking Members of the Senate Committee on Commerce, Science and Transportation and the House Committee on Transportation and Infrastructure.

Sincerely,

Anthony R. Foxx

Enclosure

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

November 6, 2013

The Honorable Nick J. Rahall, II
Ranking Member
Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Dear Congressman Rahall:

As required by Section 332(a) of the FAA Modernization and Reform Act of 2012, I am pleased to provide you with the U.S. Department of Transportation's Unmanned Aircraft Systems (UAS) Comprehensive Plan. The Federal Aviation Administration's Joint Planning and Development Office developed this comprehensive plan under the guidance of the Next Generation Air Transportation System (NextGen) Senior Policy Committee, and in coordination with NextGen partner representatives. The Plan outlines the safe acceleration of the integration of civil UAS into the National Airspace System (NAS).

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A similar letter has been sent to the Chairmen of the Senate Committee on Commerce, Science and Transportation and the House Committee on Transportation and Infrastructure and the Ranking Member of the Senate Committee on Commerce, Science and Transportation.

Sincerely,

Anthony R. Foxx

Enclosure

Unmanned Aircraft Systems (UAS) Comprehensive Plan

A Report on the Nation's UAS Path Forward

September 2013

PREPARED BY THE JOINT PLANNING AND DEVELOPMENT OFFICE (JPDO)

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EXECUTIVE SUMMARY

The *Unmanned Aircraft Systems (UAS) Comprehensive Plan* details work that has been accomplished, along with future efforts needed to achieve safe integration of UAS into the National Airspace System (NAS). Throughout Fiscal Year 2012 (FY12), work was conducted to develop elements required to create a more complete picture of achieving safe UAS integration. The perspectives and information available from these individual activities create a framework and reveal an evolving capability for the integration of UAS into the NAS.

Representatives from the Next Generation Air Transportation System (NextGen) partner agencies – the Departments of Transportation (DOT), Defense (DoD), Commerce (DOC), and Homeland Security (DHS), the National Aeronautics and Space Administration (NASA), and the Federal Aviation Administration (FAA) – as well as industry representatives, provided through the FAA's UAS Aviation Rulemaking Committee (ARC), have actively participated in constructing this Plan. The completed work is a testament to the collaboration among representatives from the partner agencies and the UAS community.

The continued safe integration of UAS in the NAS and increased NAS access for UAS will be driven by incremental advances in: research and development (R&D) (including test ranges); rulemaking (including operational approval and airworthiness standards); and development of UAS-related technologies. Safe integration will lead us from today's need for accommodation of UAS through individual approvals to a time when standardized/routine integration into the NextGen environment is well defined.

Six high-level strategic goals that are specific, measureable, attainable, realistic, and timely were developed to reflect the principal objective of safe UAS integration into the NAS. These high-level goals – summarized below – were derived from existing goals provided by the partner agencies and should therefore resonate with the wide range of UAS stakeholders.

The overarching approach for the Goals is to allow public integration to lay the framework for civil integration. The first two Goals apply to small UAS (under 55 pounds) within visual line-of-sight (VLOS), assuming the public realm would be accomplished first and civil would follow; the third and fourth Goals apply to the other UAS, with the same process: public would occur first and civil would follow. Goal 5 was established to plan and manage growing automation capabilities through research, and Goal 6 provides the opportunity for the U.S. to remain leaders in the international forum. The sum of these Goals shows a phased-in approach for UAS integration in the NAS.

The *UAS Comprehensive Plan* sets the overarching, interagency goals, objectives, and approach to integrating UAS into the NAS. Each partner agency will work to achieve these national goals, and may develop agency-specific plans that are aligned to the national goals and objectives. The FAA's *Integration of Civil UAS in the NAS Roadmap* is an example of one such plan. It outlines, for planning purposes and within a broad timeline, the tasks, assumptions, dependencies, and considerations needed to enable UAS integration in the NAS within the wider UAS community. It will remain consistent with the *UAS Comprehensive Plan.* The FAA's UAS Concept of Operations (ConOps) reflects their desired end-state, and lays out the pathway for achieving this end-state, anticipating the technological and procedural enhancements required to make

integration happen. In addition, it begins the engineering process of incorporating UAS-specific changes into the *NextGen Implementation Plan.*

Understanding and prioritizing the R&D needs associated with each of the UAS National Goals is key to achieving robust integration of UAS in the NAS. The need for new capabilities, mitigations, and verification and validation methods to enable safe and secure operations will require the development, integration, and implementation of emerging and new technologies. Each agency presents varying needs and possesses a significant body of expertise resulting from historical investments in UAS operations. R&D-related activities undertaken in FY12 have initiated a process by which the partner agencies can share information and coordinate their research to support the UAS National Goals, maximize the return on investment dollars, and ensure that research products address the FAA's needs beyond 2015.

Two additional activities that are critical to the integration of UAS include the small UAS Rule and the test range program. First, the FAA is drafting a Notice of Proposed Rulemaking (NPRM), targeted for release in calendar year 2014 that is intended to lead to requirements and parameters for how small UAS will be integrated into the NAS. Second, a Screening Information Request (SIR) for the test site selection process was published by the FAA on February 14, 2013. The selection of the six test ranges is anticipated to be completed by the end of calendar year 2013.

The work accomplished in FY12 provides the foundation for safe integration of UAS in the NAS. Valuable relationships have been established and a commitment among the NextGen partners is reflected in the UAS National Goals. Details required for UAS integration implementation are laid out in the FAA's *Integration of Civil UAS in the NAS Roadmap* which will be updated annually. These annual updates will track and report progress. The FAA's UAS ConOps begins the process of including UAS-related changes in the FAA's *NextGen Implementation Plan.* A process has been initiated for how research that enables emerging technology can be identified, prioritized, and integrated into the *NextGen Implementation Plan.* Finally, a small UAS rulemaking project has been initiated, and the test range selection process is underway.

Important non-safety related issues, such as privacy and national security, need to be taken into consideration as UAS are integrated into the NAS. The privacy requirements proposed for the UAS test sites are specifically designed for the operation of the test sites and are not intended to pre-determine the long-term policy and regulatory framework under which UAS would operate. However, the FAA anticipates that the privacy policies developed by the test site operators will help inform the dialogue among policymakers, privacy advocates, and the industry regarding broader questions concerning the use of UAS technologies in the NAS.

Collectively, the efforts described in this document represent the framework of the *UAS Comprehensive Plan.* They will continue to be refined as needed, in FY13 and beyond, until safe integration of UAS in the NAS is accomplished for both public and civil UAS users.

1. INTRODUCTION

Over the last 50 years, rapid advances in aviation technology have transformed the nation's skies. Our National Airspace System (NAS) has evolved to include a wide variety of fixed wing and rotary aircraft of various sizes, weights, and speeds, operating across the country from populated complex metropolitan areas to remote airfields supporting small communities. They operate in a range of airspace, from low-altitude to the stratosphere. Some are dependent on thermals and wind, such as gliders and balloons, and others fly faster than the speed of sound, such as supersonic planes and spacecraft. As aircraft technology expands, so do the challenges associated with maintaining a safe and integrated NAS. And, with the recent advent of and growing interest in remotely piloted aircraft – commonly known as Unmanned Aircraft Systems (UAS) – addressing these challenges in a complex, multi-layered system has never been more critical. UAS are to be integrated in an already shaped and automated NAS and Air Traffic Control (ATC) environment that was originally developed for manned aircraft.

The use of UAS has increased significantly in the United States. From agricultural monitoring and border surveillance to local crime scene investigations, search and rescue missions, disaster response (e.g., wildfires and floods), and military training, UAS provide a wide variety of operational, societal, and economic benefits to its diverse group of users. For example, according to the Teal Group, the market for government and commercial use of UAS is expected to grow, with small UAS having the greatest growth potential.[1] Teal forecasts that the worldwide expenditures on UAS and related research could be potentially as much as $89.1 billion in aggregate over the next decade, with the United States playing a leading role. However, as the demand for UAS increases, concerns regarding how UAS will impact existing aviation grow stronger, especially in terms of safety, privacy, frequency crowding, and airspace congestion.

In 2008, the Government Accountability Office (GAO) reported[2] that the U.S. must develop a clear and common understanding of what is required to safely and routinely operate UAS in the NAS. Additionally, Congress underscored the significance of UAS integration when it enacted the FAA Modernization and Reform Act of 2012. Through this legislation, Congress set forth a number of specific requirements[3] for achieving UAS integration – namely, a Comprehensive Plan and a five-year Roadmap.

This *UAS Comprehensive Plan* is expected to address the following elements:

- FAA rulemaking projects being conducted under Section 332, sub-section (b).
- Methods to enhance technologies and subsystems necessary for safe and routine operation of civil UAS.
- Phased-in approach to civil UAS integration into the NAS.
- Timeline for phased-in integration.

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[1] Teal Group Corporation, *World Unmanned Aerial Vehicle Systems* (Fairfax, VA: 2012).

[2] U.S. Government Accountability Office. (2008, May) *Unmanned Aircraft Systems: Federal Actions Needed to Ensure Safety and Expand Their Potential Uses within the National Airspace System*, GAO-08-511. http://www.gao.gov/assets/280/275328.pdf

[3] See Appendix A: FAA Modernization and Reform Act of 2012 - UAS Requirements.

- Airspace designation of manned and UAS operations in a cooperative NAS environment.
- Establishment of a process to inform FAA rulemaking projects related to certification, flight standards, and air traffic requirements for civil UAS, and the process for gathering informational data from designated test ranges.
- Methods to ensure simultaneous safe operations of civil and public UAS within the NAS.
- Incorporation of the Plan into the annual *Next Generation Air Transportation System (NextGen) Implementation Plan.*

Ultimately, cost-effective and safe implementation will require multi-agency coordination to develop a national-level plan that guides routine UAS operations in the NAS.

In April 2012, under the guidance of the NextGen Senior Policy Committee (SPC), the Joint Planning and Development Office (JPDO) answered this challenge, assembling executive- and working-level teams comprised of individuals from the NextGen partner agencies – the Departments of Transportation (DOT), Defense (DoD), Commerce (DOC), and Homeland Security (DHS) as well as the National Aeronautics and Space Administration (NASA), and the Federal Aviation Administration (FAA). These individuals began the work required to develop a UAS plan. The initial objective of the collective team was to create and coordinate approval of UAS National Goals and Objectives that are reflective of the NextGen partner agencies' UAS mission needs, and predicated on data and information from existing documentation aggregated by the JPDO.[4] Ultimately, the UAS National Goals and Objectives represent the framework and foundation of the *UAS Comprehensive Plan* – an endeavor the JPDO is leading in collaboration with the NextGen partners, which is further described in detail within this document.

The *UAS Comprehensive Plan* sets the overarching, interagency goals, objectives and approach to integrating UAS into the NAS. Each partner agency will work to achieve these national goals, and may develop agency-specific plans that are aligned to the national goals and objectives. The FAA's *Integration of Civil UAS in the NAS Roadmap* is an example of one such plan. It outlines, for planning purposes and within a broad timeline, the tasks, assumptions, dependencies, and considerations needed to enable UAS integration in the NAS within the wider UAS community. It will remain consistent with the *UAS Comprehensive Plan*. The FAA's UAS Concept of Operations (ConOps) reflects their desired end-state, and lays out the pathway for achieving this end-state, anticipating the technological and procedural enhancements required to make integration happen. In addition, it begins the engineering process of incorporating UAS-specific changes into the NextGen Implementation Plan.

Additionally, this Comprehensive Plan supports the coordination and integration of research and development (R&D) necessary to achieve the UAS National Goals and the FAA's Integration Roadmap goals. Development of a *NextGen UAS Research, Development and Demonstration (RD&D) Roadmap*, prioritization methodology, and prioritization database in Fiscal Year 2012 (FY12) established initial information and a process for the JPDO and partner agencies to

[4] See Appendix B: UAS National Goals and Objectives Source Documents.

collaborate in their efforts to identify and address R&D needs for UAS capabilities beyond 2015. Assessment of R&D needs and prioritizing the activities is an essential element of the Comprehensive Plan.

The FAA's chief mission is to ensure the safety and efficiency of the NAS. This includes manned and unmanned aircraft operations. While the expanded use of UAS presents great opportunities, it also presents significant challenges as unmanned aircraft systems are inherently different from manned aircraft.

Safety, Privacy, Civil Rights, Civil Liberties & Security

Members of the NextGen SPC agree on the need to address privacy concerns of the public at large while safely integrating UAS in the NAS. As use of UAS by civil agencies and private industry grows, preserving the privacy, civil rights, and civil liberties of individuals becomes increasingly important. In October 2012, the SPC committed to working together on this issue and suggested that answers to privacy policy questions could be accomplished in stages.

The FAA also recognizes the importance of non-safety related issues, such as privacy and civil liberties, physical security, and potential economic opportunities, which all Federal agencies and stakeholders participating in the development of UAS policy will need to take into consideration as UAS are integrated into the NAS. Specific to privacy concerns, the FAA has proposed and is requesting public input on a privacy approach for the UAS test site program that attempts to prudently address privacy concerns by emphasizing transparency, public engagement, and compliance with existing law.

The UAS test sites authorized by Congress can provide an opportunity for development and demonstration by the test site operators and users of policies and operating approaches that would address both UAS operator mission needs and related individual privacy concerns. The lessons learned and best practices established at the test sites may be applied more generally to protect privacy in UAS operations throughout the NAS. This incremental approach will provide an example to both private and public sectors on a safe and secure way to employ UAS that is consistent with the need for privacy.

Federal agencies are mindful that national defense and homeland security measures are to be designed and performed without diminishing the privacy, civil rights, and civil liberties of individuals. There are specific laws applicable to public agencies that ensure that those agencies follow privacy principles. In addition, many agencies have their own internal privacy policies providing guidance to their employees about the importance of privacy, civil rights, and civil liberties. Robust privacy policies, privacy impact assessments, and privacy compliance reviews or audits are just some of the tools that Federal agencies may use as mechanisms to protect individual rights and liberties.

Although there is no Federal law that specifically addresses privacy concerns with respect to civil UAS operations, many states have laws that protect individuals from invasions of privacy which could be applied to intrusions committed by using a UAS.

Integrating public and civil UAS into the NAS carries certain national security implications, including cyber and communications security, domestic framework for US government operations, national airspace and defense, airman vetting/general aviation, and privacy concerns. In coordination with the National Security Staff at the White House, the FAA is working in conjunction with relevant agency partners on an Interagency Policy Committee to address these issues.

The sections that follow highlight the results of the FY12 activities and explain how these pieces are a part of or may influence the Comprehensive Plan for UAS integration in the NAS.

2. APPROACH

Several initiatives have advanced in parallel to plan for the integration of UAS in the NAS. They address the need for a common set of goals, a common understanding of how UAS will operate in the NAS, a timeline for accomplishing the activities required to allow for safe integration of UAS, and a way to evaluate research needs that enable prompt technology improvements to support the successful execution of that timeline. The highlights of these activities are included here.

2.1 UAS NATIONAL GOALS, OBJECTIVES, AND TARGETS

The JPDO developed the UAS National Goals, Objectives, and Targets in coordination with executive- and working-level representatives provided by the NextGen partner agencies. The interagency team emphasized that the UAS National Goals must represent the achievable UAS capabilities, considering user and stakeholder mission needs, type of operations, and operational boundaries.

The initial framing of the UAS National Goals and Objectives leveraged 12 key source documents,[5] including UAS roadmaps, plans, and integration efforts from various agencies. Key goals, objectives, requirements, supporting activities, and dates from applicable reference documents provided insight into agency-specific UAS initiatives. The common goals and themes reflected in the extracted data served as the basis for the development of six UAS National Goals and eight Objectives. These UAS National Goals and Objectives are not directly linked on a one-for-one basis, but rather, a specific objective could support a range of Goals.

The following assumptions frame the formulation of the UAS National Goals, Objectives, and Targets:

- Routine operations for UAS should not require exceptions or unique authorizations.
- Targets reflect the earliest start dates mandated by the FAA Modernization and Reform Act of 2012[6] for achieving initial capability in support of the UAS National Goals.
- The UAS National Goals and Objectives must align with – and not supersede – government United States Code (U.S.C.) title authorities and responsibilities (see below for further elaboration).
- Partner agency documents constitute a baseline reflecting current plans and efforts toward safe UAS integration in the NAS.[7]

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[5] Ibid.

[6] The FAA Modernization and Reform Act of 2012 specifies the following UAS target dates for safe UAS integration into the NAS:

- August 14, 2014 – Publish a final rule on small UAS. Required by Section 332 (b)(1).
- September 30, 2015 – "No later than date" for safe integration of civil UAS into the NAS. Required by Section 332(a)(3).

The final set of UAS National Goals and Objectives represents the result of several iterations of refinement and review by partner agencies and approval by the UAS National Plan Partner Agency Senior-Level Executives designated by the JPDO Board.

The Comprehensive Plan does not supersede government U.S.C. title authorities and responsibilities. The UAS National Goals and Objectives provide a framework for interagency coordination and planning. Government agencies will comply with their own processes, policies, and standards regarding airworthiness, pilot, aircrew and maintenance personnel certification and recurrent training. The authority to safely conduct public aircraft operations in the NAS is derived from Title 49, United States Code (49 U.S.C. §§ 40102(a) (41) and 40125). If no government UAS processes, policies, or standards exist, it is recommended that the agency apply specific provisions of 14 Code of Federal Regulations (CFR) applicable to civil UAS operations when they are published. The appropriate public or civil authority will be responsible for establishing the requirements called out in the UAS National Objectives.

2.1.1 UAS NATIONAL GOALS

1. Routine Public Small UAS Visual Line-of-Sight (VLOS) Operations Conducted in the NAS (without special authorization; i.e., Certificate of Authorization) (2015)[8]

- Initial Capability[9]: Operations outside of Class B/C airspace and not over populated areas.
- Full Capability[10]: Operations in all applicable domestic airspace classes subject to airspace requirements.

2. Routine Civil Small UAS VLOS Operations Conducted in the NAS (without special authorization; i.e., Special Airworthiness Certificate) (2015)

- Initial Capability: Operations outside of Class B/C airspace and not over populated areas.
- Full Capability: Operations in all applicable domestic airspace classes subject to airspace requirements.

3. Routine Public UAS Operations in the NAS (2015)

- Initial Capability: Using mitigation for UAS limitations to comply with 14 CFR Part 91 requirements.
- Full Capability: UAS compliance with revised operating requirements addressing unique UAS attributes.

4. Routine Civil UAS Operations in the NAS (2020)

- Initial Capability: Using mitigation for UAS limitations to comply with 14 CFR Part 91 requirements.

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[7] See Appendix B: UAS National Goals and Objectives Source Documents.

[8] Dates assigned to the UAS National Goals indicate when the Initial Capability will be available.

[9] Initial Capability: An initial implementation available for operations that supports the planned UAS National Goal.

[10] Full Capability: A final implementation available for operations that completes the planned UAS National Goal.

- Full Capability: UAS compliance with revised operating requirements addressing unique UAS attributes.

5. Define, Determine, and Establish Acceptable Levels of Automation for UAS in the NAS (TBD)[11]

6. Foster U.S. International Leadership in UAS Capabilities and in Standards Development (Ongoing)

- Initial Capability: UAS operations in airspace where the U.S. has the responsibility for the provision of Air Traffic Services (ATS).
- Full Capability: Harmonized UAS operations in accordance with International UAS Standards and Recommended Practices (SARPs).

2.1.2 UAS NATIONAL OBJECTIVES

1. Establish Applicable Certification and Training Requirements for Pilots/Crew Members, Other UAS Operational Personnel, and Appropriate Air Navigation Service Provider (ANSP) Personnel

1.1. Determine the roles and responsibilities of applicable pilots/crew members, other UAS operational personnel, and appropriate ANSP personnel for safe UAS integration.
1.2. Develop and propose regulatory changes, as required, to define licensing (certification) and training requirements for pilots/crew members, other UAS operational personnel, and appropriate ANSP personnel (address in 14 CFR Part 61, 63, 65, and 141-147).
1.3. Publish, if required, final rule requirements for applicable pilots/crew members, other UAS operational personnel, and appropriate ANSP personnel.
1.4. Begin training and certification initiatives for pilots/crew members, other UAS operational personnel, and appropriate ANSP personnel.

2. Approve Applicable Medical Requirements and Standards (e.g., address 14 CFR Part 67)

2.1. Develop and propose regulatory changes, as required, to define draft medical requirements and standards.
2.2. Publish, if required, a final rule establishing medical requirements and standards.

3. Establish Applicable Airworthiness Certification Requirements

3.1. Facilitate the initiation of applicable classification and basis of airworthiness certification.
3.2. Facilitate the development of draft airworthiness design standards.
3.3. Develop applicable draft airworthiness certification advisory circulars.
3.4. Approve and publish final system airworthiness certification advisory circulars.
3.5. Ensure that a robust and integrated test environment is available to develop, test, and evaluate UAS.
3.6. Administer certification, including Advisory Circular (AC) guidance and oversight.

[11] A roadmap will be developed in 2015 which will help determine when this goal will be accomplished.

4. Implement Small UAS Rules

4.1. Develop and publish small UAS Rules for operations within VLOS of the pilot or observer.

4.2. Issue permits to operate as applicable to small UAS (FAA).

5. Approve the Use of Ground Based Sense and Avoid (GBSAA) for UAS Operations

5.1. Define GBSAA performance requirements for access to all applicable domestic airspace classes subject to airspace requirements and classes of aircraft.

5.2. Define GBSAA equipment and operating requirements for access to all applicable domestic airspace classes subject to airspace requirements and classes of aircraft.

5.3. Test GBSAA equipment and procedures.

5.4. Approve GBSAA operations for routine use.

6. Approve the Use of Airborne Sense and Avoid (ABSAA) for UAS Operations

6.1. Define ABSAA performance requirements for access to all applicable domestic airspace classes subject to airspace requirements and classes of aircraft.

6.2. Define ABSAA equipment and operating requirements for access to all applicable domestic airspace classes subject to airspace requirements and classes of aircraft.

6.3. Test ABSAA equipment and procedures.

6.4. Amend 14 CFR 91.113 (Right-of-way-rules) to allow ABSAA

6.5. Approve ABSAA operations for routine use.

7. Develop and Integrate UAS Enabling Technologies within the NAS Infrastructure to Support Appropriate Levels of Automation

7.1. Coordinate, develop, and refine existing and/or emerging ontologies for automation. Baseline the ontology(ies) in order to provide standard terminology, roles, responsibilities, modes, and levels for usage in: requirements analysis, standards development, modeling and simulations assessments, systems development, procedures development, testing, certification processes, training documentation, and research specifications. Maintain consistency and interoperability with other automation systems to enable future systems of systems integration.

7.2. Develop a UAS Automation Roadmap (UAR) that evaluates the use of increasing levels of automation within the context of FAA NextGen infrastructure and stakeholder R&D capabilities. Continue to coordinate and update the UAR along with the NextGen UAS RD&D Roadmap.

7.3. Determine the requirements and develop, certify, and field UAS enabling technologies to support enhanced automation capabilities.

8. Approve Integrated Operations for Manned Aircraft and UAS in the NAS

8.1. Develop UAS agency-specific Integration Transition Plans.

8.2. Develop Airspace Integration Safety Case/Assessment.

8.3. Develop and publish operational standards, procedures, and guidance for UAS airspace operations (Regulations, Policy Documents, Advisory Circulars, Orders, Notices, Handbooks, and Manuals).

8.4. Develop and publish operational standards, procedures, and guidance relative to airport facilities and UAS surface operations (Regulations, Policy Documents, Advisory Circulars, Orders, Notices, Handbooks and Manuals).

2.2 INTEGRATION OF CIVIL UAS IN THE NAS ROADMAP (FAA'S INTEGRATION ROADMAP)

The FAA's Integration Roadmap contains FAA-developed goals, metrics (activities), and target dates (or date ranges), and incorporates many related UAS Aviation Rulemaking Committee (ARC) recommendations. The FAA's Integration Roadmap is a five-year plan, and target dates are generally limited to this horizon. The FAA will reflect necessary changes to the existing set of goals, metrics, and target dates in yearly updates to the FAA's Integration Roadmap. These annual updates enable tracking and progress reporting as recommended by the GAO.

The goals are, for the most part, intended to be addressed concurrently. The metrics help establish and maintain common government and industry expectations, and enable objective assessments of the progress made toward accomplishing each goal. The goals and metrics collectively reflect the incremental approach to UAS certification and integration, and establish a set of strategic objectives that can guide the definition of lower-level activities, schedules, and resource requirements.

Goals and metrics were developed for each of the following UAS focus areas:

(1) Certification Requirements (Airworthiness)
(2) Certification Requirements (Pilot/Crew)
(3) Ground Based Sense and Avoid (GBSAA)
(4) Airborne Sense and Avoid (ABSAA)
(5) Control and Communications (C2)
(6) Small UAS and Other Rules
(7) Test Ranges
(8) Air Traffic Interoperability
(9) Miscellaneous

These focus areas represent the elements that should be addressed to enable UAS integration in the NAS. Figure 1 is an example of the information contained in the FAA's Integration Roadmap.

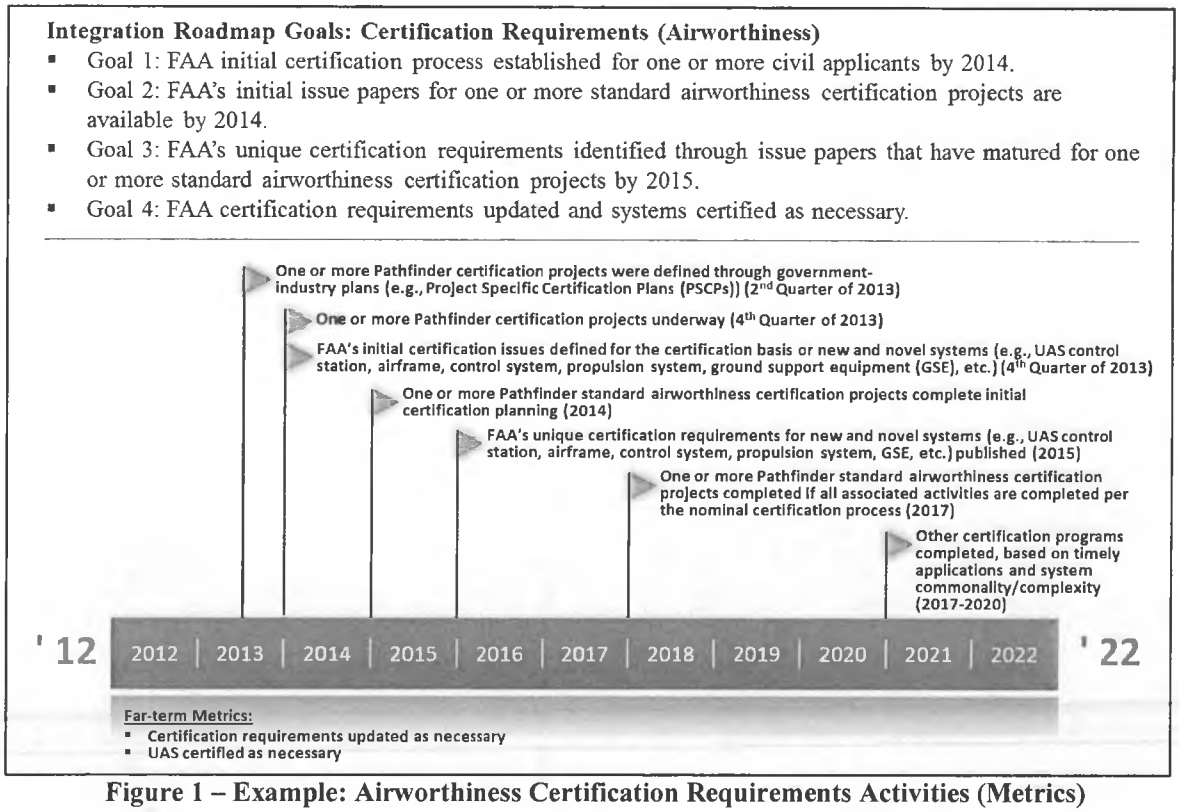


Figure 1 – Example: Airworthiness Certification Requirements Activities (Metrics)

2.3 UAS RESEARCH AND DEVELOPMENT (R&D) PRIORITIZATION

The FAA has established R&D priorities to successfully achieve UAS capabilities envisioned in 2015. However, the UAS National Goals to be achieved after initial integration in 2015 require technology solutions that are not fully available today. Understanding and prioritizing R&D needs associated with each of the UAS National Goals is critical to achieving robust integration of UAS in the NAS. Each partner agency brings unique needs and possesses a significant body of expertise resulting from historical investments in UAS operations. As a result, R&D-related activities undertaken in FY12 have established a process by which the partner agencies can share information and coordinate their research to support the UAS National Goals, maximize the return on investment dollars, and ensure that research products address the FAA's needs beyond 2015.

The FY12 UAS R&D efforts, focused on establishing a basis for identifying and prioritizing R&D needs, include the following:

- Developing and issuing a *NextGen UAS RD&D Roadmap*, which provided a catalog of R&D efforts.
- Establishing JPDO and multi-agency teams to facilitate coordination of R&D-related efforts.
- Developing an approach for prioritizing R&D topics based on the UAS National Goals.

The prioritization of R&D topics began with the *NextGen UAS RD&D Roadmap.*[12] Developed in 2011 and signed in 2012, the Roadmap is a catalog of ongoing and planned R&D efforts being conducted by the NextGen partners to support the integration of UAS operations in the NAS. Additionally, the process established a means for partner agencies to exchange information and coordinate with the FAA. Subject matter experts from the partner agencies – FAA, NASA, DoD, DHS, and DOC – contributed to the *NextGen UAS RD&D Roadmap*, identifying planned and ongoing work and critical R&D challenges in their areas of expertise. The *NextGen UAS RD&D Roadmap* defined 23 challenges within the four technical tracks of Communications, Airspace Operations, Unmanned Aircraft, and Human Systems Integration.

The FY12 R&D effort used the *NextGen UAS RD&D Roadmap* and other studies to establish a prioritization approach linked to the UAS National Goals. This activity established prospective R&D topics, prioritization categories, a UAS R&D database, and an initial list of proposed high-priority R&D needs to achieve the UAS National Goals. Representatives from partner agencies participated in developing and reviewing the methodology and the preliminary results.

The methodology incorporates four steps:

- Use the UAS National Goals to represent the requirements driving R&D needs.
- Develop a detailed list of prospective R&D topics (the FY12 effort identified 244 topics addressing 52 aspects of UAS integration in the NAS).
- Assign a priority category (Safety Critical, Necessary, Enhances, Not Applicable) to each of the R&D topics with respect to each of the UAS National Goals beyond initial integration in 2015.
- Summarize the prioritized topics associated with each of the 23 R&D challenges identified in the *NextGen UAS RD&D Roadmap*.

One of the major outcomes of the FY12 effort includes development of an initial UAS R&D prioritization database created by a team of subject matter experts working with partner agency representatives. The database documents the relationships among identified R&D needs, R&D challenges, UAS National Goals, and relative priorities. It will be used as a basis for more extensive FY13 UAS R&D prioritization work.

2.3.1 INTERAGENCY RESEARCH COLLABORATION

In addition to the JPDO-led research collaboration, the FAA has been increasing its research collaboration with the NextGen partner agencies. Details of those efforts are listed in the paragraphs below.

The FAA is providing subject matter experts to support NASA's "UAS Integration in the NAS" project to review research objectives and assumptions. The FAA and NASA have shared UAS research project plans and analysis results, and have identified the need to minimize duplicative

[12] Joint Planning and Development Office, (2012, March)
http://www.jpdo.gov/library/20120315_UAS%20RDandD%20Roadmap.pdf

efforts and determine how UAS research, expertise, and assets can be leveraged between them. There is an umbrella interagency agreement for UAS research between the FAA and NASA, which will allow the FAA to centralize and focus its collaboration with NASA while capitalizing on expertise across all NASA research centers. Specific focus with NASA is in the areas of Human Systems Integration, Communications, Certification, Separation Assurance/Sense and Avoid Interoperability, and Integrated Test and Evaluation.

The FAA and DoD have collaborated on the Defense Department's UAS – Airspace Integration (UAS-AI) Quick Reaction Test. The FAA is also collaborating with DoD/USNORTHCOM on the follow-on Joint Test, which commenced at the end of calendar year 2012. In addition, the FAA conducted an evaluation of the DoD Joint ConOps for UAS-AI, which focuses on near-term advanced accommodation of UAS in the NAS. The suite of proposed flight profile tests will potentially serve as an incremental step to inform the FAA's Integration Roadmap.

The FAA and DHS collaborated on the FAA's Demo 4. Demo 4's high-level research objectives were to assess the ability for an independent Ground-Based Voice Communication System to restore communication between the UAS pilot and ATC in the event of a lost link/lost communication scenario. The objectives also tested the viability of providing an independent Cockpit Display of Traffic Information system to aid a UAS pilot in tracking own-ship information in the event of a lost link/lost communication scenario. The UAS Demonstration Team successfully completed Demo 4 by observing a Customs and Border Protection operational flight in October 2012.

2.4 TEST RANGES

During FY12, the FAA initiated a program for test ranges in accordance with the FAA Modernization and Reform Act of 2012. This effort successfully generated a Screening Information Request (SIR) after a public comment period and public webinars, with almost 800 registrants, to address questions on the test ranges. All comments were adjudicated and the final SIR soliciting applications was published on February 14, 2013. The deadline for submitting applications was May 6, 2013. The FAA is currently evaluating the applications and anticipates that the test sites will be selected by the end of calendar year 2013. As part of the test range agreements, the FAA will be collecting information that will help inform future rulemaking activities and other policy decisions related to safety, privacy, and economic growth. In addition, NextGen partner agencies will leverage their individual and networked laboratory facilities and test infrastructure, as appropriate, to advance the goals and objectives of this plan.

2.5 SMALL UAS RULE

A Notice of Proposed Rulemaking (NPRM) on small UAS is under development with the intent to provide safe small UAS access to the NAS. The NPRM for small UAS is being drafted and is targeted for release in 2014.

3. INTEGRATED APPROACH AND THE PATH FORWARD

As described in the previous section, many parallel activities have been conducted to support the generation of this Comprehensive Plan. Each of these pieces plays a critical role in ultimately achieving the safe integration of UAS in the NAS.

Achieving approval of the UAS National Goals and Objectives by the NextGen partners was a key accomplishment, since this allowed the stakeholders to work in unison.[13] With six approved National Goals and eight Objectives, there is a common framework and timeline to begin the UAS integration work. The overarching approach for the Goals is to allow public integration to lay the framework for civil integration. The first two Goals apply to small UAS (under 55 pounds) within VLOS, assuming the public realm would be accomplished first and civil would follow; the third and fourth Goals apply to the other UAS, with the same process: public would occur first and civil would follow. Goal 5 was established to plan and manage growing automation capabilities through research, and Goal 6 provides the opportunity for the U.S. to remain leaders in the international forum. The sum of these Goals shows a phased-in approach for UAS integration in the NAS.

The FAA's UAS ConOps provides the mechanism to enable integration of UAS needs into the FAA's *NextGen Implementation Plan.* Assessment of R&D needs to support the UAS ConOps and prioritizing the activities is an essential element of the Comprehensive Plan. Since the FAA has already defined critical research to support what is required for 2015, the FY13 R&D prioritization effort addresses R&D efforts in support of UAS integration beyond 2015. The FY13 R&D prioritization activity will develop these needs and identify ongoing research efforts in close coordination with the partner agencies.

The need for new capabilities, mitigations, and verification and validation methods to enable safe operations will require the development, integration, and implementation of emerging and new technologies. Advanced planning is essential, since lead times for developing technology for full implementation of UAS National Goals beyond 2020 can span many years. The scope of issues involved in UAS integration in the NAS dictates that R&D activities must be well understood within an integrated framework in terms of relevance, timeliness, and relationships among related research activities. Using the draft methodology generated in FY12 as guidance, the JPDO will lead a more extensive UAS research prioritization activity in FY13. The NextGen *UAS RD&D Roadmap* and prioritization of R&D needs to represent significant steps toward planning and coordinating the R&D required to achieve the UAS National Goals. The JPDO and its partners plan to continue this activity with the following next steps:

- Refine the prioritization methodology.
- Update and refine the UAS R&D prioritization database, including incorporation of R&D needs associated with policy decisions and mitigation of identified risks.
- Update the UAS R&D inventory established in the *NextGen UAS RD&D Roadmap.*
- Conduct a gap analysis comparing the inventory in an updated *NextGen UAS RD&D Roadmap* to validated R&D needs identified by the R&D prioritization activity.
- Work with the partner agencies to establish R&D Community of Interest that addresses integration of UAS in the NAS.

[13] Partner agency approval is in final coordination.

- Identify further steps to fill the gaps and plan, coordinate, and assess progress of R&D associated with the UAS National Goals.

The FAA's Integration Roadmap lays out a rolling five-year plan for implementing UAS integration in the NAS. It supports the UAS National Goals and Objectives and anticipates the technology and procedural enhancements required to make integration happen. In general, it provides a timeline for phased-in integration of UAS in the NAS. The FAA's Integration Roadmap was shaped by industry recommendations received through the FAA's UAS ARC and implementation details will be added through FY13.

In addition to the activities listed above, two other activities are underway that are critical to the successful integration of UAS in the NAS. The small UAS Rule is under development, and is expected to begin to address the first two UAS National Goals. Also, the test range program has been defined and initiated. The FAA anticipates the selection will be announced by the end of calendar year 2013. The small UAS Rule and the test range program activities are included in the FAA's Integration Roadmap.

4. CONCLUSION

UAS play a unique role in the safety and security of many U.S. military and civil missions. Due to the diverse utility that UAS offer, their use is expected to increase exponentially once safe and efficient integration in the NAS is accomplished. As a result, developing a safe and efficient way for UAS to operate in the NAS with manned aircraft has become a critical issue – particularly in the planning and implementation of NextGen.

In 2008, the GAO reported that the U.S. must develop a clear and common understanding of what is required to safely and routinely operate UAS in the NAS. Congress then enacted the FAA *Modernization and Reform Act of 2012*, which laid out a number of requirements for achieving UAS integration, namely, a Comprehensive Plan and a five-year Roadmap. In early 2012, the JPDO addressed this challenge by assembling executive- and working-level teams comprised of individuals from the NextGen partner agencies. Ultimately, the work accomplished by these multi-agency teams in FY12 provided the foundation for embarking on the path towards safe integration of UAS in the NAS. The JPDO will continue to convene partner agency teams to address such issues as security, privacy, civil rights, and civil liberties as the opportunity is presented, enabling integration across several key policy areas of interest.

Specifically, valuable relationships have been established and the commitment shared by the NextGen partners is reflected in the UAS National Goals. Details required for UAS integration implementation are described in the FAA's Integration Roadmap, which will be updated annually. Also, the overarching process has been defined for how research priorities to enable emerging technology will be identified and integrated into the FAA's *NextGen Implementation Plan.* The test ranges will be positioned to provide data to assist with engineering activities that will support integration.

Collectively, the efforts described in this document represent the framework of the *UAS Comprehensive Plan.* They will continue in FY13 and beyond, as needed, until safe integration of UAS in the NAS is accomplished for both public and civil UAS users.

APPENDIX A – FAA MODERNIZATION AND REFORM ACT OF 2012: UAS REQUIREMENTS

To amend title 49, United States Code, to authorize appropriations for the Federal Aviation Administration for fiscal years 2011 through 2014, to streamline programs, create efficiencies, reduce waste, and improve aviation safety and capacity, to provide stable funding for the national aviation system, and for other purposes.

TITLE III—SAFETY
Subtitle B—Unmanned Aircraft Systems

SEC. 332. INTEGRATION OF CIVIL UNMANNED AIRCRAFT SYSTEMS INTO NATIONAL AIRSPACE SYSTEM

(a) REQUIRED PLANNING FOR INTEGRATION.—

(1) COMPREHENSIVE PLAN.—Not later than 270 days after the date of enactment of this Act, the Secretary of Transportation, in consultation with representatives of the aviation industry, Federal agencies that employ unmanned aircraft systems technology in the national airspace system, and the unmanned aircraft systems industry, shall develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system.

(2) CONTENTS OF PLAN.—The plan required under paragraph (1) shall contain, at a minimum, recommendations or projections on—

(A) the rulemaking to be conducted under subsection (b), with specific recommendations on how the rulemaking will—

(i) define the acceptable standards for operation and certification of civil unmanned aircraft systems;

(ii) ensure that any civil unmanned aircraft system includes a sense and avoid capability; and

(iii) establish standards and requirements for the operator and pilot of a civil unmanned aircraft system, including standards and requirements for registration and licensing;

(B) the best methods to enhance the technologies and subsystems necessary to achieve the safe and routine operation of civil unmanned aircraft systems in the national airspace system;

(C) a phased-in approach to the integration of civil unmanned aircraft systems into the national airspace system;

(D) a timeline for the phased-in approach described under subparagraph (C);

(E) creation of a safe[14]

(F) airspace designation for cooperative manned and unmanned flight operations in the national airspace system;

(G) establishment of a process to develop certification, flight standards, and air traffic requirements for civil unmanned aircraft systems at test ranges where such systems are subject to testing;

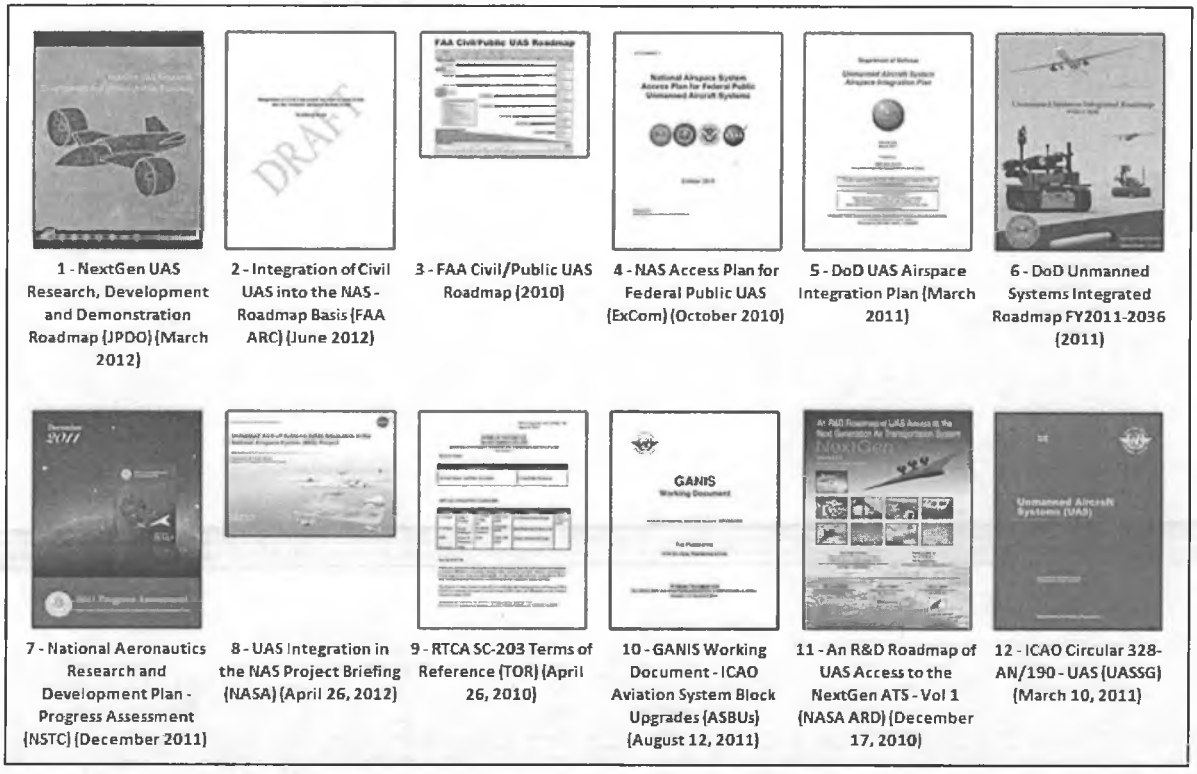
[14] Additional wording for this requirement may have been inadvertently omitted from this Bill (H.R.658).

(H) the best methods to ensure the safe operation of civil unmanned aircraft systems and public unmanned aircraft systems simultaneously in the national airspace system;
(I) incorporation of the plan into the annual NextGen Implementation Plan document (or any successor document) of the Federal Aviation Administration.

(3) DEADLINE.—The plan required under paragraph (1) shall provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015.
(4) REPORT TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to Congress a copy of the plan required under paragraph (1).
(5) ROADMAP.—Not later than 1 year after the date of enactment of this Act, the Secretary shall approve and make available in print and on the Administration's Internet Web site a five-year roadmap for the introduction of civil unmanned aircraft systems into the national airspace system, as coordinated by the Unmanned Aircraft Program Office of the Administration. The Secretary shall update the roadmap annually.

APPENDIX B – UAS NATIONAL GOALS AND OBJECTIVES SOURCE DOCUMENTS

The documents that were used to extract UAS National Goals and Objectives pertaining to safe UAS integration in the NAS are depicted below.



1 - NextGen UAS Research, Development and Demonstration Roadmap (JPDO) (March 2012)

2 - Integration of Civil UAS into the NAS - Roadmap Basis (FAA ARC) (June 2012)

3 - FAA Civil/Public UAS Roadmap (2010)

4 - NAS Access Plan for Federal Public UAS (ExCom) (October 2010)

5 - DoD UAS Airspace Integration Plan (March 2011)

6 - DoD Unmanned Systems Integrated Roadmap FY2011-2036 (2011)

7 - National Aeronautics Research and Development Plan - Progress Assessment (NSTC) (December 2011)

8 - UAS Integration in the NAS Project Briefing (NASA) (April 26, 2012)

9 - RTCA SC-203 Terms of Reference (TOR) (April 26, 2010)

10 - GANIS Working Document - ICAO Aviation System Block Upgrades (ASBUs) (August 12, 2011)

11 - An R&D Roadmap of UAS Access to the NextGen ATS - Vol 1 (NASA ARD) (December 17, 2010)

12 - ICAO Circular 328-AN/190 - UAS (UASSG) (March 10, 2011)

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APPENDIX C – UAS COMPREHENSIVE PLAN DEFINITIONS

Term	Definition
Civil Aviation	Civil aviation includes two major categories:[15] (1) Air transport, including all passenger and cargo flights operating on regularly scheduled routes, as well as on demand flights. (2) General aviation (GA), including all other civil flights, private or commercial. All air transport is commercial, but general aviation can be either commercial or private. Normally, the pilot, aircraft, and operator must all be authorized to perform commercial operations through separate commercial licensing, registration, and operation certificates.
Class A Airspace	Generally, that airspace from 18,000 feet MSL up to and including FL 600, including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Unless otherwise authorized, all persons must operate their aircraft under IFR.
Class B Airspace	Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspaces areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is "clear of clouds."
Class C Airspace	Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a five nautical mile (NM) radius, a circle with a 10NM radius that extends no lower than 1,200 feet up to 4,000 feet above the airport elevation, and an outer area that is not charted. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. VFR aircraft are only separated from IFR aircraft within the airspace.
Class D Airspace	Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival

[15] Federal Aviation Regulations FAR Part 91, 110, 121, 125, 135.

	extensions for instrument approach procedures may be Class D or Class E airspace. Unless otherwise authorized, each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. No separation services are provided to VFR aircraft.
Class E Airspace	Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also in this class are Federal airways, airspace beginning at either 700 or 1,200 feet AGL used to transition to/from the terminal or en route environment, en route domestic, and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska, up to, but not including 18,000 feet MSL, and the airspace above FL 600.
Class G Airspace	That airspace not designated as Class A, B, C, D or E.
Full Capability	A final implementation available for operations that completes the planned UAS National Goal.
Goal	Statement of an end result or outcome desired by stakeholders.
Initial Capability	An initial implementation available for operations that supports the planned UAS National Goal.
Milestone	A significant point in time or event for achieving a specific result.
National Airspace System (NAS)	The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.[16]
National Goal	A statement of an end result or outcome desired by stakeholders that enables the accomplishment of the overarching mission. It is a top-level, strategic outcome that one wishes to achieve.
Objective	Statement of necessary achievement to meet the goal.
Public Aviation	Public Aircraft Operation (PAO) is limited by the statute to certain government operations within U.S. airspace. Although these operations must comply with certain general operating rules (including those applicable to all aircraft in the NAS), other civil certification and safety oversight regulations do not apply. Whether an operation may be considered public is determined on a flight-by-flight basis, under the terms of the statute (49 U.S.C. 40102 and 49 U.S.C. 40125) and depends on

[16] FAA Order 7110.65, Air Traffic Control, Pilot/Controller Glossary, Change 2.

	factors such as aircraft ownership, operator, the purpose of the flight and the persons on board the aircraft.[17]
Stakeholders	Individuals or organizations that stand to gain from the success or failure of a system/initiative.
Strategic	A perspective that is mission-oriented rather than tactical or operational.
Strategy	Overall plan of action to achieve an objective. Ties together objectives, approaches, and actions.
Unmanned Aircraft System (UAS)	An unmanned aircraft and its associated elements related to safe operations, which may include control stations (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems, and launch/recovery equipment.

[17] FAA Order 8900.1, Flight Standards Information Management System.

APPENDIX D – UAS COMPREHENSIVE PLAN ACRONYMS

Term	Definition
4D	Four-Dimensional
ABSAA	Airborne Sense and Avoid
AC	Advisory Circular
ADS-B	Automatic Dependent Surveillance-Broadcast
AIM	Aeronautical Information Manual
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATS	Air Traffic Services
BLOS	Beyond Line-of-Sight
C2	Control and Communications
CDTI	Cockpit Display of Traffic Information
COA	Certificate of Waiver or Authorization
CFR	Code of Federal Regulations
ConOps	Concept of Operations
DHS	Department of Homeland Security
DOC	Department of Commerce
DoD	Department of Defense
DOJ	Department of Justice
DOT	Department of Transportation
ExCom	UAS Executive Committee
FAA	Federal Aviation Administration
FAA ARC	FAA Aviation Rulemaking Committee
FAR	Federal Aviation Regulations
FPV	First Person View
FY	Fiscal Year
GA	General Aviation
GAO	Government Accountability Office
GBSAA	Ground Based Sense and Avoid
ICAO	International Civil Aviation Organization
ICAO ASBUs	ICAO Aviation System Block Upgrades
ICAO UASSG	ICAO Unmanned Aircraft Systems Study Group
IFR	Instrument Flight Rules
JPDO	Joint Planning and Development Office
LOS	Line-of-Sight
MASPS	Minimum Aviation System Performance Standards

Term	Definition
MOPS	Minimum Operational Performance Standards
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NASA ARD	NASA Aeronautics Research Mission Directorate
NextGen	Next Generation Air Transportation System
NOAA	National Oceanic and Atmospheric Administration
NSTC	National Science and Technology Council
NPRM	Notice of Proposed Rulemaking
PIC	Pilot-in-Command
QRT	Quick Reaction Test
R&D	Research and Development
RD&D	Research, Development and Demonstration
RF	Radio Frequency
SAA	Sense and Avoid
SARPs	Standards and Recommended Practices
SFAR	Special Federal Aviation Regulation
SPC	Senior Policy Committee
TOR	Terms of Reference
U.S.C.	United States Code
UA	Unmanned Aircraft
UAR	UAS Automation Roadmap
UAS	Unmanned Aircraft System
UAS-AI	Unmanned Aircraft Systems – Airspace Integration
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VLOS	Visual Line-of-Sight

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[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No.: FAA-2013-0061]

Unmanned Aircraft System Test Site Program

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of availability of final privacy requirements for the unmanned aircraft system ("UAS") test site program; response to comments

SUMMARY: On February 22, 2013 the FAA published and requested public comment on the proposed privacy requirements (the "Draft Privacy Requirements") for UAS test sites (the "Test Sites") that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012 ("FMRA"). This notice responds to the public comments received and publishes the FAA's final privacy requirements for the Test Sites (the "Final Privacy Requirements").

ADDRESSES: You may review the public docket for this rulemaking (Docket No. FAA-2013-0061) on the Internet at http://www.regulations.gov. You may also review the public docket at the Docket Management Facility in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, 20590-0001 between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning the test site program, contact Elizabeth Soltys, Unmanned Aircraft Systems Integration Office, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; email: 9-ACT-UASTSS@faa.gov.

For legal questions concerning the FAA's privacy requirements for the Test Sites contact Carlos Siso, Office of the Chief Counsel, Federal Aviation Administration, 800 Independence Ave. SW., Washington, DC 20591; email: 9-AGC-UASPrivacy@faa.gov.

SUPPLEMENTARY INFORMATION

This notice summarizes and responds to the public comments received in response to the following Federal Register notices seeking public comment on the Draft Privacy Requirements for the Test Sites:

(i) Notice of availability and request for comments published in the Federal Register on February 22, 2013 (78 FR 12259), Docket No. FAA-2013-0061-0001; and

(ii) Notice of public engagement session published in the Federal Register on March 28, 2013 (78 FR 18932), Docket No. FAA-2013-0061-0050.

In addition, this notice publishes the FAA's Final Privacy Requirements for the Test Sites which are set forth under the "Conclusion" section below.

Discussion of Comments

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session. A transcript of the public engagement session is available at: http://www.faa.gov/about/initiatives/uas/media/UAStranscription.pdf. Public comments ranged from recommending that the FAA not impose any privacy requirements on the Test Sites to recommending that the FAA impose extensive privacy requirements on the Test Sites. The FAA also received comments that were not responsive to the notice or that were unclear.

The FAA analyzed the responsive comments and grouped them into ten categories. The following sections address the comments by category.

1) The FAA should focus on its safety mission; it should not engage in regulating privacy.

The FAA received a number of comments advocating that the FAA should focus on its safety mission and should not engage in regulating privacy. The following comments were received:

- The FAA should focus on safety;
- Regulating privacy is outside the FAA's mission;
- The FAA does not have statutory authority to regulate privacy;
- The FAA does not have the authority to impose privacy requirements on the Test Sites;
- The FAA should allow privacy to be addressed by other more appropriate government bodies including: Federal agencies that have expertise and authority to deal with privacy concerns; Congress; state or local legislative bodies; and the judicial system;
- The Federal Government should not regulate privacy impacts of UAS; these issues should be left to states, cities, and counties to address;
- The FAA should only require compliance with privacy laws that are already in place and focus on developing safe operation of UAS;
- The FAA should not deny access to the national airspace for reasons other than safety;
- Existing privacy laws are sufficient to cover the responsible use of UAS. There already exist Federal, state and other laws that protect privacy. In addition, tort law may also provide avenues of recourse for plaintiffs to protect their privacy rights;
- The FAA should not implement privacy regulations that make entry into the market prohibitive for small businesses;
- The FAA should not allow privacy issues to hinder commercialization of UAS;
- There is no evidence that the operations at the Test Sites will harm privacy interests. Restricting activities at the test sites at this early stage will likely overprotect privacy at the expense of innovation;

- The FAA should afford adequate time for non-governmental solutions such as industry norms and practices to develop before intervening administratively to protect privacy. These less restrictive solutions will reduce the need for administrative intervention and will allow for increased innovation in the national airspace;
- Requiring Test Site operators to develop privacy policies that are informed by Fair Information Practice Principles is onerous for commercial operators of UAS and its cost will likely outweigh any hypothetical benefits;
- Requiring Test Site operators to issue privacy policies informed by Fair Information Practice Principles will limit the diversity of data that will inform integration of UAS into the national airspace. The FAA's approach would exclude an important possible alternative from the discussion: some operators might choose not to issue a privacy policy or adopt a non-FIPPs-compliant policy; and
- The FAA should treat data gathered by UAS no differently than data gathered by a manned aircraft or by other electronic means. There is no significant difference in terms of surveillance between a UAS and a manned aircraft, and manned aircraft are permitted to operate in the national airspace with cameras.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world and does not include regulating privacy. At the same time, the FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the Test Sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

The FAA will require the Test Site operators to comply with the Final Privacy Requirements. Congress mandated that the FAA establish the Test Sites to further UAS integration into the national airspace system. The Final Privacy Requirements advance this purpose by helping inform the dialogue

among policymakers, privacy advocates, and industry regarding the impact of UAS technologies on privacy.

The FAA's authority for including the Final Privacy Requirements in the Test Site OTAs is set forth in 49 U.S.C. 106(l)(6). That statute authorizes the FAA Administrator to enter into an OTA "on such terms and conditions as the Administrator may consider appropriate." The FAA believes that it is appropriate to require Test Site operators to comply with the Final Privacy Requirements.

2) The FAA should require warrants before law enforcement can use UAS in the Test Sites to conduct surveillance or gather evidence.

The FAA received a variety of comments advocating that:

- The FAA should include provisions in the OTA that require warrants to be obtained when UAS are used to conduct surveillance or gather evidence within the Test Site; and
- The OTA include appropriate safeguards to protect Fourth Amendment rights at and around our national borders.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. The FAA is establishing the UAS Test Sites consistent with its mission and the direction in the FMRA. The FAA appreciates the commenters' concerns. Accordingly, the final privacy requirements provide that the Site Operator and its team members must comply with all applicable privacy laws.

3) The FAA should mandate specific privacy requirements for the Test Sites.

The FAA received a variety of comments advocating that the FAA mandate specific privacy requirements for the Test Sites. The recommendations included the following:

- The FAA should specify minimum privacy requirements and require each Test Site to comply with them;
- The FAA should mandate compliance with Fair Information Practice Principles for all Test Site operators;

- The FAA should establish prohibitions on where UAS can operate within a Test Site and the kinds of surveillance activities that UAS conduct at the Test Sites;
- The FAA should require all UAS flown at the Test Sites to have unencrypted down links so that all their data collection can be viewed by the public, including records contained onboard and recovered after landing;
- The FAA should require each Test Site operator to conduct a full Privacy Impact Assessment;
- The FAA should require each Test Site operator to establish a Chief Privacy Officer and centralize privacy responsibilities in that person;
- The FAA should require each Test Site operator to establish a privacy advisory committee to review proposed UAS research at the Test Sites for privacy concerns;
- The FAA should require each Test Site operator to provide a detailed response to public input it receives regarding the Test Site's privacy policy;
- The FAA should prohibit the sharing of recorded surveillance footage beyond the scope of its original purpose;
- The FAA should prohibit UAS in the Test Sites from flying below a minimum altitude;
- The FAA should prohibit UAS in the Test Sites from carrying any equipment that could be used to conduct surveillance;
- The FAA should limit the use of the data collected at the Test Sites;
- The FAA should prohibit (i) the use of Test Sites for government surveillance, and (ii) sharing data collected with law enforcement for the purpose of investigating or prosecuting a crime;

- The FAA should limit the type of data that can be collected by UAS at the Test Sites including limiting the resolution of visual imagery that UAS can collect, prohibiting recording of audio data, and restricting the ability to collect WiFi and cellular signals;
- The FAA should require Test Site operators to provide data on the payload of each UAS flown at the Test Site including specific information on the data the payload is capable of collecting;
- The FAA should mandate privacy policies that require deletion of collected data within a certain time period;
- The FAA should prohibit the Test Site operator and UAS operators at the Test Sites from retaining any data collected longer than is necessary to fulfill the purpose of the Test Site;
- The FAA should require UAS operators to file data collection statements with the FAA for UAS operations that involve remote sensing and signals surveillance from the UAS platform; and
- The FAA should require UAS operating at altitudes over 400 feet to carry an automatic dependent surveillance-broadcast transponder (ADS-B Out) so that UAS operations can be tracked.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. Although there is a long history of placing cameras and other sensors on aircraft for a variety of purposes—news helicopters, aerial surveys, film/television production, law enforcement, etc.—the FAA is not, through awarding and supervising these Test Sites, taking specific views on whether or how the Federal Government should regulate privacy or the scope of data that can be collected by manned or unmanned aircraft.

There was substantial difference of opinion among commenters as to whether UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy

restrictions on UAS operations at the Test Sites. In addition, there was substantial difference of opinion among commenters regarding what elements would be appropriate for a Test Site privacy policy. Based on the comments received, the FAA will require Test Sites to comply with the following requirements in addition to those described in the Draft Privacy Requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

The above are reflected in the Final Privacy Requirements.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons. *First*, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the Test Sites.

Second, the FAA believes that Test Sites operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each Test Site. The selection criteria for the Test Sites specify that only a "public entity" can serve as a Test Site operator. The term "public entity" is defined in the selection criteria to mean "(A) any State or local government; (B) any department, agency, special purpose district, or other instrumentality of a State or States or local government; and (C) the National Railroad Passenger Corporation, and any commuter authority." The FAA expects that public entities will be responsive to stakeholder concerns.

Third, if UAS operations at a Test Site raise privacy concerns that are not adequately addressed by the Test Site's privacy policies, elected officials can weigh the benefits and costs of additional

privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS. *See* Drone Legislation All the Rage: Varies Widely Across 43 States, According to WestlawNext, June 17, 2013, *available at*: http://thomsonreuters.com/ press-releases/062013/drone_legislation_varies_across_ states_according_to_Westlaw.

4) The FAA should conduct audits of the Test Sites to ensure compliance with privacy policies.

Various commenters recommended that the FAA should audit each Test Site to ensure compliance with the privacy policies in the OTA.

Response: Each Test Site will be operated by a public entity (see response to Category 3 above). The FAA expects that the public entity operating each test site will already be subject to oversight and audit requirements. The FAA does not believe that it is appropriate for the FAA to impose additional audit requirements on the Test Site operators.

5) The FAA should require Test Site operators to keep records that will allow for effective citizen participation and reporting of privacy violations.

One commenter recommended that the FAA require Test Site operators to keep accurate, detailed, frequent, and accessible records to allow for effective citizen participation and reporting of privacy violations.

Response: Each Test Site operator will be a public entity (see response to Category 3 above). Public entities are generally subject to laws that establish record keeping requirements and provide the public access to records. The FAA does not believe that it is appropriate for the FAA to impose additional record keeping requirements on the Test Site operators other than those specified in the Final Privacy Requirements.

6) The FAA should establish a searchable database or registry of UAS operators and operations at the Test Sites.

The FAA received a variety of comments advocating that:

- The FAA should create a public, searchable database or registry of all UAS operators. Some commenters recommended that the database include information about surveillance equipment used and the operator's data collection practices;
- The FAA should require UAS operators at the Test Sites to provide public statements describing the surveillance equipment that will be carried by a UAS, the geographical area where the UAS will be operated, and the purposes for which the UAS will be deployed; and
- The FAA should establish a means for the public to access the data on UAS flights collected by the FAA.

Response: The FAA believes that it is not appropriate for the FAA to create a public registry or database of UAS operations at the Test Sites. However, the FAA has included a contractual provision in the Final Privacy Requirements that will require each Test Site operator to maintain a record of all UAS operating at the Test Site.

7) **The FAA should modify its Test Site selection criteria to take into account privacy concerns.**

Various commenters recommended that the FAA revise its selection criteria. Suggestions included the following:

- The FAA should choose an applicant that has an established UAS research program with active engagement with UAS privacy issues;
- The FAA should choose at least one Test Site in a state with strong privacy protective UAS laws and regulations;
- The FAA should select one or more Test Sites in or near a densely populated urban area in order to avoid a bias towards privacy issues relevant for rural UAS operations; and

- The FAA should consider the privacy track record of applicants as part of the selection process.

Response: The FAA believes that it is not appropriate to modify the Test Site selection criteria to include the recommended privacy considerations. Applicants have already submitted complete applications based on the announced selection criteria and the application period has closed.

The FAA published the Test Site selection criteria and application instructions on February 14, 2013 on https://faaco.faa.gov under Solicitation number DTFACT-13-R-00002. The selection criteria incorporate the factors that Congress directed the FAA to consider in the FMRA, including, geographic and climatic diversity; location of ground infrastructure; and research needs. The FAA required applicants to submit seven volumes of extensive and detailed information that address a broad set of considerations including safety, airspace use, experience, research objectives, and risk considerations. This information will allow the FAA to make a selection based on the direction provided by Congress in the FMRA and on the FAA's mission.

The FAA developed the Test Site selection criteria after seeking public input and consulting with other agencies regarding what selection criteria would be appropriate. In March 2012, the FAA published a request for comment in the Federal Register and in April 2012, the FAA hosted two public webinars to obtain public input on the FAA's proposed selection criteria. Although there was significant public participation, the FAA did not receive comments advocating that privacy issues be used as a factor in choosing the Test Sites.

8) The FAA should require Test Site operators to conduct specific tests related to privacy and surveillance.

Commenters recommended that the FAA should:

- Require UAS operators at Test Sites to conduct specific tests related to surveillance and privacy;

- Require Test Site operators to design the sites— including the creation of "fake" houses or businesses—to allow UAS operators to test how accurate their surveillance systems are and test how much data those systems collect; and
- Develop and require Test Sites to implement a standard battery of privacy tests that each UAS operating within a Test Site should have to perform in order to collect data that the FAA can use to make decisions about privacy issues.

Response: The FAA is not planning to have the Test Site operators conduct specific research.

9) The FAA should not take punitive actions against a Test Site operator for privacy violations without due process.

One commenter noted that if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws, the OTA allows the FAA to suspend or modify the relevant operational authority for a Test Site (e.g. Certificate of Operation, or OTA). That commenter recommended that a Test Site operator be entitled to due process before the operational authority be suspended or modified.

Response: A Test Site operator's rights to operate a Test Site are set forth in the OTA and are subject to the terms and conditions in the OTA. The FAA believes that it is appropriate to include contractual provisions in the Final Privacy Requirements that allow the FAA to protect the public interest by suspending or modifying the relevant operational authority for a Test Site if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws.

10) The FAA should establish sanctions for violations of privacy policies or rights.

One commenter recommended that the FAA rescind the OTA for a Test Site where serious privacy violations have occurred and levy fines against operators that fail to comply with privacy policies.

Response: The Final Privacy Requirements provide that violations of privacy laws can result in suspension or termination of the OTA.

The FAA will not monitor a Test Site's compliance with its own privacy policies. The FAA expects the public entities operating the Tests Sites and their respective state/local oversight bodies to monitor and enforce a Test Site's compliance with its own policies.

Conclusion

Based on the comments submitted, the FAA intends to require each test site operator to comply with all of the privacy requirements included in the Draft Privacy Requirements as well as the following additional privacy requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

Accordingly, the FAA intends to include the following terms and conditions into Article 3 of the OTA:

"ARTICLE 3 PRIVACY; APPLICABLE LAW

a. Privacy Policies

The Site Operator must:

(i) Have privacy policies governing all activities conducted under the OTA, including the operation and relevant activities of the UAS authorized by the Site Operator.

(ii) Make its privacy policies publicly available;

(iii) Have a mechanism to receive and consider comments from the public on its privacy policies;

(iv) Conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback;

(v) Update its privacy policies as necessary to remain operationally current and effective; and

(vi) Ensure the requirements of its privacy policies are applied to all operations conducted under the OTA.

The Site Operator's privacy policies should be informed by Fair Information Practice Principles.

b. Compliance With Applicable Privacy Laws

For purposes of this agreement, the term "Applicable Law" shall mean (i) a law, order, regulation, or rule of an administrative or legislative government body with jurisdiction over the matter in question, or (ii) a ruling, order, decision or judgment of a court with jurisdiction over the matter in question.

The Site Operator and its team members must operate in accordance with all Applicable Law regarding the protection of an individual's right to privacy (hereinafter referred to as "Privacy Laws").

If the U.S. Department of Justice or a state's law enforcement authority files criminal or civil charges over a potential violation of a Privacy Law, the FAA may take appropriate action including suspending or modifying the relevant operational authority (e.g., Certificate of Operation, or OTA) until the proceedings are completed. If the proceedings demonstrate the operation was in violation of the Privacy Law, the FAA may terminate the relevant operational authority.

c. Change in Law

If during the term of this Agreement an Applicable Law comes into effect which may have an impact on UAS, including impacts on the privacy interests of individuals or entities affected by any operation of any UAS operating at the Test Site, such Applicable Law will be applicable to the OTA and the FAA may update or amend the OTA to reflect these changes.

d. Transmission of Data to the FAA

The Site Operator should not provide or transmit to the FAA or its designees any data other than the data the data requested by the FAA pursuant to Article 5 of this OTA.

e. <u>Other Requirements</u>

The Site Operator must:

(i) Maintain a record of all UAS operating at the test sites; and

(ii) Require each UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS."

Issued in Washington, DC on November 7, 2013.

Marc L. Warren

Acting Chief Counsel, Federal Aviation Administration.

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REPORT OF THE
DEPARTMENT OF CRIMINAL JUSTICE SERVICES

Protocols for the Use of Unmanned Aircraft Systems (UAS) by Law-Enforcement Agencies

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 12

COMMONWEALTH OF VIRGINIA
RICHMOND
2013

COMMONWEALTH of VIRGINIA

Department of Criminal Justice Services

Garth L. Wheeler
Director

1100 Bank Street
Richmond, Virginia 23219
(804) 786-4000
TDD (804) 786-8732

November 1, 2013

To: The Honorable Robert F. McDonnell
Members of the General Assembly

From: Garth Wheeler, Director

Subject: Protocols for the Use of Unmanned Aircraft Systems by Law-Enforcement Agencies

It is my pleasure to provide you with the Protocols for the Use of Unmanned Aircraft Systems by Law-Enforcement Agencies developed pursuant to House Bill 2012 (2013). During the 2013 General Assembly Session, House Bill 2012 created a moratorium on the use of unmanned aircraft systems by law-enforcement agencies until July 1, 2015, with certain exceptions. The legislation also required the Department of Criminal Justice Services, in consultation with the Office of the Attorney General and other agencies, to develop model protocols for the use of unmanned aircraft systems by law-enforcement agencies. The results of the Department's work are included in the attached report.

If you have any questions about the protocols, please contact Teresa Gooch, Division Director, Division of Law Enforcement and Security Services (804-786-8730).

Unmanned Aircraft Systems (UAS) Protocols for use by Law Enforcement Agencies

October 7, 2013

Virginia Department of Criminal Justice Services
www.dcjs.virginia.gov

In the 2013 session of the General Assembly, House Bill 2012 placed a moratorium on the use of unmanned aircraft systems by state and local law enforcement and regulatory entities until July 1, 2015, except in defined emergency situations or in training exercises related to such situations.

The moratorium does not apply to certain Virginia National Guard functions or to research and development conducted by institutions of higher education or other research organizations.

The bill requires the Department of Criminal Justice Services, in consultation with the Office of the Attorney General and other agencies, to develop protocols for the use of drones by law enforcement agencies and report its findings to the Governor and the General Assembly by November 1, 2013.

In April 2013, a workgroup of public safety and legal professionals was assembled to accomplish the Department of Criminal Justice Services requirement of this bill.

The Department of Criminal Justice Services would like to thank the following individuals for their professional contributions to this policy:

Colonel Steven Sellers, Albemarle County Police Department
Sheriff Brian Roberts, Brunswick County Sheriff's Office
Chief Doug Middleton, Henrico County Department of Police
Ms. Shannon Dion, Office of the Attorney General
Sheriff Steve Dye, Russell County Sheriff's Office
SSA Marc Haalman, Virginia Department of Alcoholic Beverage Control
Officer Greg Hall, Virginia Department of Game and Inland Fisheries
Mr. David Summers, Virginia Department of Conservation and Recreation
Lt. Colonel James Caruso, Virginia Department of Military Affairs
Capt. Kirk Marlowe, Virginia Department of State Police
1st Sgt. Angelo Woodhouse, Virginia State Police

Virginia Department of Criminal Justice Services staff:

Teresa Gooch, Director, Division of Law Enforcement
Sam Hoffman, Standards, Policy and Homeland Security Manager
Gary M. Dillon, Manager, Virginia Accreditation Center

Definitions

Model Aircraft – Remote controlled aircrafts used by hobbyists, which are built, produced, manufactured and operated for the purposes of sport, recreation and/or competition. Model aircraft use is not regulated at the federal level and many UAS hobbyist belong to the Academy of Model Aeronautics, a professional association representing the interests of the hobby.

Unmanned Aircraft System (UAS) – The preferred industry definition of aircraft designed to navigate in the air without an on-board pilot. The authorization to use UAS is regulated by the Federal Aviation Administration (FAA). For the purposes of this policy guideline, UASs are non-weaponized.

UAS Flight Crew Member – A pilot, observer, payload operator or other person(s) assigned duties for a UAS flight mission or training exercise.

UAS Pilot – A person exercising control over a UAS during flight.

VTOL – Vertical take-off and landing

Potential Law Enforcement Applications

Accident Investigation
Missing Persons
Search and Rescue
Drug Investigations
Disaster Management
Crowd Control
Explosive Ordnance Disposal
Hostage and Barricade Situations
CBRNE Incident *(chemical, biological, radiological, nuclear, and explosives)*
Forensic Scenes
Support for Arrest Warrants
VIP Security Support
Perimeter Security
Low Cost Aerial Imagery
Enhance Situational Awareness

Protocols Based upon Legislation

Under current Virginia legislation, UASs cannot be used by law enforcement agencies for anything other than specified types of search and rescue or training. This legislation places a moratorium on their use, with exceptions, until July 1, 2015.

Protocols for the use of UASs currently must mirror those situations specified in that legislation, as listed below:

Amber Alert

Senior Alert

Blue Alert

Search or Rescue (To alleviate an immediate danger to a person)

Training exercises related to these uses

Benefits to Officer and Community Safety

Unmanned Aerial Systems (UAS) do not require a qualified pilot on board to operate the UAS or the attached equipment such as cameras, FLIR (forward looking infrared), etc. UAS operators and system operators remain safely on the ground reducing their exposure to threats.

UASs are able to enter environments, which may be hazardous to pilots of manned aircraft. These threats may be natural or manmade. They include hazardous waste, fire, smoke, threatening weather, and ground fire from perpetrators.

UASs provide superior situational awareness while minimizing the danger to which operators are exposed.

UASs and trained operators minimize response time to most emergency situations. UASs can be launched from a safe location within close proximity to the scene.

UASs designed for law enforcement come in two categories, vertical takeoff and landing (VTOL), and fixed wing. This allows for their use in different environments that may restrict the size of the launch area. VTOL may be launched and landed in a very limited space.

UAS operators should be in direct contact with incident command, enhancing communication between command and air assets.

Community safety is enhanced by the rapid response of air assets to an emergency. Many UASs designed for law enforcement use can be launched within five minutes. In most cases manned aircrafts must take off and land at an airports under the direction of air traffic controllers, which can adversely delay response time.

UASs designed for law enforcement use are small enough to be stored in containers, which are the approximate size of a small backpack, or in small cases that can be carried in patrol vehicles, thereby minimizing response time.

Agencies wishing to utilize UASs must obtain a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA) to ensure compliance with federal requirements thus ensuring UASs are operated in accordance strict federal guidelines.

Cost Benefit

The cost benefit of utilizing a UAS designed for public safety as compared to manned aircraft is substantial. It should be noted that UASs are not designed to take the place of manned aircraft. The use of UASs would supplement the aerial capabilities of a law enforcement agency to provide enhanced service to the public.

The Metro Aviation Unit, a joint effort by the City of Richmond, Chesterfield County, and Henrico County, operates four fixed wing aircraft (two Cessna 172s and two Cessna 182s). The average hourly cost to operate each of these aircraft is $150. The cost of purchasing a manned aircraft similar to those being utilized by the Metro Aviation Unit is in excess of $800,000. These figures do not include personnel costs.

According to the Association for Unmanned Vehicle Systems International (AUVSI), the average hourly cost of operating a UAS designed for public safety use ranges from $30 to $50. The costs of UASs designed for law enforcement ranges from a few hundred dollars to over $40,000. These figures do not include personnel costs.

Training

The FAA has developed the rules for the public's operation of UASs. They can be found in FAA Memorandum "Interim Operational Approval Guidance 08-01 Unmanned Aircraft Systems Operations in the U. S. National Airspace".

Agency model policy and operational procedures

Community Engagement

Law enforcement agencies interested in integrating UAS technology in their operations should actively engage their communities in an effort to educate the public. Due to extensive media coverage of military drone use, there is widespread fear of similar deployment tactics on Virginia soil. Additionally, civil liberties organizations have concerns about violations of 4th Amendment rights.

1. Law enforcement agencies desiring to use UAS technology should first determine how they will utilize this technology, including the costs, benefits and risks.
2. Law enforcement agencies should then engage the community early in the planning process, including their governing body and civil liberties advocates.
3. It's imperative that the use of UAS technology be as transparent as possible to ensure the community that the law enforcement agency is in full compliance with the US Constitution, federal, state and local law governing search and seizure.
4. Law enforcement agencies should provide an opportunity for the community to review and comment on agency procedures for the use of UAS.
5. Transparency is the key to successful community support. For that reason, it is recommended that agencies work with the local media to help facilitate community education and dialogue.

System Requirements

1. Agencies deploying UAS technology shall maintain a flight log, which captures flight time, duration, date, supervisory authorization and reason for flight. UAS vehicles equipped with digital logs/counters are an acceptable alternative.
2. It is strongly encouraged that UAS vehicles should be painted in a high visibility paint or display high visibility markings, if the construction of the UAS permits. This will facilitate line-of-sight control by the pilot and allow for easier ground monitoring. In situations where covert operations are authorized (high risk search/arrest warrant), high visibility markings may not be optimal.
3. Equipping law enforcement UAS with weapons of any kind is strictly prohibited.
4. Law enforcement UAS technology shall be equipped with "auto return" technology, which automatically returns the vehicle to the launch location if radio connectivity is lost. For this reason, the use of "home built" aircraft or RC model aircraft is strongly discouraged.

Operational Procedures

1. All law enforcement UAS vehicles require a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA). 0A law enforcement agency interested in deploying UAS technology should contact the FAA early in the planning process to determine the requirements of a COA.
2. UAS vehicles will only be operated by personnel, both pilots and crewmembers, who have been trained and certified in the operation of the system. All law enforcement agency personnel with UAS responsibilities, including supervisors and commanders, must complete training in the policies and procedures governing their use.

3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training or for demonstration purposes. Supervisory authorization shall be documented in the flight log.
4. A Virginia standardized flight log shall be used.
5. An authorized supervisor/commander will conduct a quarterly audit of flight logs. Unless as restricted by the Virginia FOIA, all flight logs and quarterly audits will be made available to the public upon request. Public agencies are encouraged to publish flight log information on their webpages.
6. Agencies must develop a disciplinary policy, which addresses unauthorized use of UAS technology.
7. Unless community or officer safety is compromised, agencies are encouraged to publically notify neighborhoods prior to using an UAS vehicle. The use of Reverse 911 telephone calls is a good example of a notification procedure.
8. When the primary mission is to collect evidence of a criminal incident AND the UAS vehicle will intrude upon the reasonable expectation of privacy, the law enforcement agency should consult with their Commonwealth's Attorney about obtaining a search warrant in advance of deployment.

Legal Considerations

Federal Legislation Governing the Use of UASs

The FAA Modernization and Reform Act of 2012 (49 U.S.C. § 40101, et seq.) is the only legislation passed by the United States Congress on the topic of unmanned aircraft systems. The act sets out requirements for new laws and regulations concerning unmanned aircrafts. The requirements are to ensure public safety and uniformity throughout national airspace and that civil unmanned aircraft systems include a sense and avoid capability. The act defines different types of unmanned aircraft and aircraft systems including:

1. **Unmanned aircraft** – an aircraft operated without the possibility of direct human intervention from within or on the aircraft.

2. **Small unmanned aircraft** – an unmanned aircraft weighing less than 55 pounds.

3. **Unmanned aircraft system** – an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) required for the pilot in command to operate safely and efficiently in the national airspace system.

4. **Public unmanned aircraft system** – an unmanned aircraft system meeting the qualifications and conditions required for operation of a public aircraft.

Law enforcement agencies should be aware that laws and regulations related to the use of UAS are evolving and what may be true today is not necessarily true tomorrow. For example, the FAA is expected to release proposed rules later this year establishing policies, procedures and standards for small UAS which law enforcement may use. Additionally, there are several bills under consideration by the U.S. Congress, including: Preserving American Privacy Act of 2013, Preserving Freedom from Unwarranted Surveillance Act of 2013, Drone Aircraft Privacy and Transparency Act of 2013, and Safeguarding Privacy and the Fostering Aerospace Innovation Act of 2013. Enactment of these bills will impact law enforcement agencies' use of UASs and agencies should diligently monitor the law for future changes.

Federal Communications Commission Considerations

The Federal Communications Commission (FCC) regulates the use of radio frequencies, which UASs depend upon for operation. Frequencies allow the ground operator to control the device and collect surveillance data but are subject to interference. Some UAS systems available at retail stores include FCC approved frequencies that are shared by many users, which means reliability and security of the system may be at risk. For example, a UAS operating on a shared frequency may not maintain adequate connectivity between the device and the ground operator, thereby increasing the risk of losing control of the device. If control is lost, the device may crash into the ground or other property. Shared frequencies are also not secure, meaning a sophisticated user could intercept the frequency and access data sent from the UAS to the ground operator. Both scenarios involve liability issues for agencies which should be thoroughly considered before utilization of a UAS.

On the other hand, some UAS manufacturers have safeguards in place to decrease the risk of frequency interference. Some systems use encrypted communications and technology to prevent detection and unauthorized access. "Pairing" a UAS and ground control station creates a unique line of communication, which prevents outside linkage to the system. Other safeguards include key recognition, monitoring for interference and lost link modes.

If an agency wants a more secure frequency with which to control their UAS, it should petition the FCC for a designated spectrum for law enforcement. Doing so does not guarantee protection from interference, as the device itself must have built in safeguards to protect against interference and consequence mitigation in the event there is a communication breech. In summary, law enforcement agencies should thoroughly research various types of UAS systems to determine which model offers the best security measures for its intended use. Agencies are encouraged to contact the Virginia State Police Communications Division for additional guidance.

Freedom of Information Act

The Virginia Freedom of Information Act (FOIA) "ensures the people of the Commonwealth ready access to public records in the custody of a public body or its officers and employees, and free entry to meetings of public bodies wherein the business of the people is being conducted." All public records are presumed open unless a public body properly invokes an exemption and does not disclose the records. Va. Code §§ 2.2-3700-3714. Law enforcement agencies should consider the applicability of statutory exemptions for their public records regarding UASs. For example, an agency may elect to withhold records contained in criminal investigative files which include photographs taken by an UAS or specific tactical plans utilizing UAS technology. See Va. Code 2.2-3705.2 and 2.2-3706. Other exemptions may apply depending on the situation and agencies are advised to consult with their legal counsel in drafting responses to FOIA requests.

Agencies with specific FOIA questions are encouraged to contact the Virginia Freedom of Information Advisory Council at http://foiacouncil.dls.virginia.gov/ or (804) 225-3056.

Image Retention

The Government Data Collection and Dissemination Practices Act (Va. Code §§ 2.2-3800 – 3809), or the "Data Act," addresses how agencies handle personal information obtained through various methods. The Data Act defines personal information as information providing a basis for inferring personal characteristics, such as "photographs or things done by or to such individual." The Data Act specifies that personal information shall not be collected unless need for the information has been clearly established, shall be relevant for the purpose it is collected, shall not be misused, and must be collected within the confines of the law. However, the Data Act does not apply to personal information systems maintained by the Department of the State Police or other police departments that deal with investigations and intelligence gathering relating to criminal activity. (Va. Code § 2.2-3802(7)).

A recent Attorney General opinion addresses the use of license plate readers and whether information obtained by these devices can be kept by law enforcement. (2013 Op. Va. Att'y Gen. No. 12-073, *available at* www.ag.virginia.gov.) The answer depends on whether the information collected is for a specific criminal matter, which is exempt from the Data Act, or whether the information is collected for potential future use, which is subject to the Data Act. As applied to law enforcement's use of UAS to collect images, if the images are obtained for no particular reason, the Data Act prohibits law enforcement from storing the information for future use. However, if the UAS is deployed for a particular purpose directly related to "investigations and intelligence gathering related to criminal activity" the Data Act does not apply.

Federal Aviation Administration

Law enforcement agencies utilizing UAS technology must comply with federal laws and regulations which currently require public entities, such local police departments, to obtain a Certificate of

Authorization or Waiver (COA) before using an UAS in civil airspace. The primary purpose of the COA is to avoid in-air collisions with other objects in the air. Applicants apply online and the FAA evaluates the proposed operation for safety feasibility. For a complete listing of regulations, visit: www.faa.gov/regulations_policies/faa_regulations

The COA allows an operator to use a defined area of airspace and includes special provisions unique to the proposed operation. COAs usually are issued for a specific period and most require the applicant to coordinate with an air traffic control facility. Because UAS technology cannot currently comply with "see and avoid" rules that apply to all aircraft, a visual observer must maintain visual contact with the UAS and serve as its "eyes" when operating outside airspace restricted from other users.

Applying for a COA: https://ioeaaa.faa.gov/oeaaa/

Who may apply for a COA? Only public agencies operating an unmanned aircraft. A public agency is any agency that operates a public aircraft (14 CFR Part 1.1). If you receive funding from the federal government at some level, you are probably a public agency. A public agency can never operate under the guidelines of Advisory Circular 91-57 (Model Aircraft Operating Standards).

Additional Resources: "*Unmanned Aircraft Systems Operations in the U.S. National Airspace System – Interim Operational Approval Guidance"* provides FAA guidance for public use of unmanned aircraft by defining the COA evaluation process.
www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/faq/media/uas_guidance08-01.pdf

4th Amendment Considerations

The 4th Amendment protects individuals and their homes from unreasonable, warrantless searches and seizures by government actors. People have certain expectations of privacy in their property, particularly in their homes. Several doctrines have emerged by courts in balancing individual privacy and the need for government to keep people safe. The plain view doctrine authorizes warrantless searches when an officer, in a lawful place, can plainly see an item of incriminating character. The open fields doctrine recognizes that a person has less expectation of privacy outside of his home.

Applying the 4th Amendment to UAS surveillance is new territory for both law enforcement and the courts. The constitutionality of this technology as used by law enforcement will depend on many factors, including how and where the surveillance takes place. Whether a target is at home or in a public place will affect a court's analysis of how strong his expectation of privacy is. Other factors include the type and length of surveillance. The following cases primarily focus on manned airplane and helicopter flights but may be helpful to law enforcement agencies navigating the unchartered waters, or airspace in this instance, of using UAS technology in a manner that respects the 4th Amendment.[1]

Privacy in the Home

Kyllo v. U.S., 533 U.S. 27 (2001). Receiving tips from an informant, a federal agent acting without a warrant used a thermal imaging device to view Kyllo's home to help determine whether he was growing marijuana inside. Based on information yielded by the device, a warrant was obtained to search the home.

[1] See "*Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses,*" by Congressional Research Service, April 3, 2013, at www.fas.org/sgp/crs/natsec/R42701.pdf for additional information.

The Supreme Court ruled that use of the thermal imaging device to gather information about the inside of the home constituted a search under the 4th Amendment.

Property Rights

Florida v. Jardines, 569 U.S. __ (2013). Officers brought a narcotics dog to defendant's front porch, which alerted for the presence of drugs. A search warrant was obtained for the home and marijuana plants were subsequently found. Using a property-rights analysis, the court concluded that using a trained dog on the front porch of a home was a physical intrusion on defendant's 4th Amendment rights. Unlike simply knocking on the door, which is a customary and routine act, bringing a police trained dog is neither customary nor routine. Because the officers only learned about the drugs by physically intruding on the defendant's property in order to gather evidence, an unlawful search occurred. (This case may be applicable if UASs are used in close proximity to homes in order to peer into windows.)

Open Fields and Manned Aerial Surveillance

Wellford v. Virginia, 227 Va. 297 (1984). After receiving a tip that Wellford was growing marijuana plants, law enforcement used a helicopter to fly 1000 feet above his fields and observed marijuana plants. Defendant was arrested after being observed caring for the plants. The court ruled that the open field was not part of the home's curtilage and therefore defendant had no expectation of privacy.

California v. Ciraolo, 476 U.S. 207 (1987). After receiving a tip that Ciraolo was growing marijuana plants in his backyard, which was shielded from view at ground level with a fence, law enforcement conducted warrantless aerial surveillance at 1000 feet. Officers, using nothing more than their "naked eyes," observed marijuana plants in the yard, which led to a search warrant of the property. The naked-eye aerial surveillance did not violate a reasonable expectation of privacy because it "took place within public navigable airspace in a physically nonintrusive manner."

Giancola v. West Va. Dep't of Pub. Safety, 830 F.2d 547 (4th Cir. 1987). Aerial surveillance from a helicopter flying at 100 feet did not violate the 4th Amendment. The aerial surveillance tactics were not unreasonably intrusive after considering the total number of surveillances conducted (two), the frequency of the surveillance, the length of each surveillance, altitude, number of aircraft (one), the degree of disruption of legitimate activities on the ground, and compliance with flight regulations.

Florida v. Riley, 488 U.S. 445 (1989). After receiving an anonymous tip that marijuana was growing in a greenhouse located ten to twenty feet behind a mobile home, law enforcement flew a helicopter over the property at an altitude of 400 feet. Marijuana was observed growing inside the greenhouse, which led to the issuance of a search warrant. In denying the motion to suppress the Court reasoned the helicopter was flying at a legal altitude, met all flight regulations, and that any member of the public could have legally taken the same flight and made the same observations. Therefore, Riley had no reasonable expectation of privacy in the greenhouse.

U.S. v. Breza, 308 F. 3d. 430 (5th Cir. 2002). During a drug interdiction helicopter flight, law enforcement officers observed what they thought were marijuana plants in an area surrounding Breza's dwelling. After descending to approximately 200 feet, this suspicion was confirmed and officers on the ground, without a warrant, searched the garden and seized hundreds of marijuana plants. The 4th Circuit held that the surveillance did not violate the 4th Amendment because the flight fully complied with all laws and regulations and were a regular occurrence. The court also upheld the warrantless entry because the defendant was observed burning the marijuana plants.

Agency/Operator Certifications

Pilot & Observer Certifications/Qualifications

It should be noted that all certifications/qualifications herein are applicable to operations of UAS at and below 400 feet. All pilot and observer training records will be maintained by the agency employing those persons and are subject to state and federal inspection.

Pilots:

Each UAS pilot must be an FAA-certificated airman or successfully pass either the FAA's pilot knowledge exam or complete an FJ\1\-approved UAS pilot training curriculum. However, if operating in controlled airspace, additional certifications are required. *Note*: Certification does not require the practical fight requirements of a manned aircraft.

Pilots will receive training specific to the UAS to be operated. This training must be conducted and documented by a qualified instructor designated by the proponent as being the individual(s) trained and certified by the manufacturer to provide training on the specified UAS.

Pilots must not perform duties for more than one UAS at a time and are not allowed to perform concurrent duties both as pilot and observer.

Pilots are prohibited from flying any law enforcement mission without having completed three UAS flight events within the preceding 90 days.

Law enforcement standard operating procedures (SOP) must include Crew Resource Management (CRM) techniques to ensure the highest possible situational awareness and effective communication by pilots during each flight operation. Pilots must be trained in these procedures and techniques. ***Note*:** CRM training involves a wide range of knowledge, skills and attitudes to include communications, situational awareness, problem solving, decision making, and teamwork. CRM is defined as a management system which makes optimum use of all available resources – equipment, procedures and people – to promote safety and enhance the efficiency of operations.

All pilot training must be conducted and documented by a qualified instructor designated by the proponent as being an individual trained and certified.

Pilots must be medically qualified and have in their possession a second class (or higher) airman medical certificate that has been issued under 14 CFR Part 67, Medical Standards and Certification.

Pilots are subject to the provisions of 14 CFR § 91.17, Alcohol and Drugs.

Observers:

Observers must successfully complete a UAS observer training curriculum that includes, at a minimum, instruction on rules and responsibilities described in 14 CFR § 91.111, Operating Near Other Aircraft, 14 CFR § 91.113, Right of Way Rules, Cloud Clearances, and that emphasizes "See and Avoid" concepts and fundamental radio communications, including standard ATC phraseology. Observer training must include thorough instruction regarding manned aircraft traffic conflicts and pilot communications for any maneuvers/actions required to avoid traffic conflicts.

Observers must not perform duties for more than one UAS at a time and are not allowed to perform concurrent duties both as pilot and observer.

Law enforcement standard operating procedures (SOP) must include Crew Resource Management (CRM) techniques to ensure the highest possible situational awareness and effective communication by observers during each flight operation. Observers must be trained in these procedures and techniques.

All observers training must be conducted and documented by a qualified instructor designated by the proponent as being an individual trained and certified by the manufacturer to provide training on the specified UAS.

Observers must be medically qualified and have in their possession a second class (or higher) airman medical certificate that has been issued under 14 CFR Part 67, Medical Standards and Certification.

Observers are subject to the provisions of 14 CFR § 91.17, Alcohol and Drugs.

It should be noted that the FAA is working to change the requirement for a second-class airman medical certification to self-certification as to being healthy to fly and a letter from a competent medical authority certifying the operator's eyesight to the second-class medical certification requirements of correctable to 20/20.

Memorandum of Understanding Between Federal Aviation Administration and the U.S. Department of Justice, Office of Justice Programs, National Institute of Justice Concerning Operation of Unmanned Aircraft Systems by Law Enforcement (www.alea.org/assets/pressReleases/assets/1805/DOJ%20FAA%20MOU.pdf)

Regulatory Considerations

24VAC5-20-100. Operation of aircraft.

All aircraft operations shall be conducted in conformity with Federal Aviation Regulations as amended from time to time and violation of such federal regulations shall also constitute a violation of this chapter.

Statutory Authority

§§ 5.1-2.2 and 5.1-2.15 of the *Code of Virginia.*

Historical Notes

Derived from VR165-01-02:1 § 2.9, eff. September 9, 1992.

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Unmanned aerial vehicle industry taking off in Alaska

ELWOOD BREHMER, ALASKA JOURNAL OF COMMERCE

PHOTOS/MICHAEL DINNEEN/AJOC

The venerable Piper Super Cub isn't being squeezed out, but the face of aviation in Alaska is changing.

Once strictly a military tool, unmanned aerial vehicles, or UAVs, are now being used in civilian government work and the private sector.

Fairweather LLC announced the formation of research subsidiary Tulugaq LLC Sept. 30. A joint venture between the resource industry support company and regional Native corporations Olgoonik Corp. and Kaktovik Inupiat Corp., Tulugaq's work centers on its 21st Century aircraft, the Diamond Aircraft DA42. The word Tulugaq is Inupiaq for raven. Fairweather was founded in 1976 by Sherron Perry with an initial focus on providing aviation weather observation services to remote regions, and has since expanded into a wide array of industry support activities.

"We make science happen," Tulugaq Operations Manager Steve Wackowski said. "My boss, Sherron Perry, saw a niche for airborne remote sensing so we're approaching it in two ways: manned and unmanned remote sensing. Part of our DA42 is the manned portion of that, but the kicker on the DA42 is it's optionally unmanned."

By replacing the pilot seat in the DA42 with a remote control conversion kit, the $1.2 million aircraft becomes a UAV with a 44-foot wingspan.

The dual-flight option is the reason Tulugaq bought the DA42, Wackowski said. And when the time comes, it will be taken advantage of, he said.

Manned or not, the Tulugaq has about $400,000 worth of sensing equipment and cameras that can be swapped in and out of receivers on the nose and belly of the DA42.

All of the equipment is operated with a Microsoft Xbox video game controller. Wackowski said it was developed with the Xbox controller so the controls would be as recognizable to operators as possible.

Because the sensors are designed to fit into receivers built into the plane, Tulugaq does not need to get a certificate of airworthiness every time it changes them, he added.

"The analogy I use, is, the plane's kind of like an iPhone; you can build an app for that," Wackowski said.

Until recently the Federal Aviation Administration had banned commercial operation of UAVs in the United States. On Sept. 24, ConocoPhillips announced it had completed the country's first commercial UAV (also known as an unmanned aircraft system, or UAS) flight off of Northwest Alaska in the Chuckchi Sea. The roughly 40-pound ScanEagle UAV was launched from Fairweather's Westward Wind research vessel during a week of flights, according to a ConocoPhillips release.

"Airborne surveillance is often a component of offshore projects. The UAS could be useful in monitoring and data collection efforts, with the benefit of improved safety and lower noise levels as compared to using manned aircraft," ConocoPhillips President Trond-Erik Johansen said in a formal statement.

To operate a UAV, a certificate of authorization, known in the industry as a COA, must be approved by the Federal Aviation Administration. It is essentially a flight plan for unmanned aircraft. It designates where, when and at what altitude a UAV can be flown.

ConocoPhillips can claim the first commercial UAV flight, but Alaska has also already seen unmanned craft used for noncommercial purposes.

The National Oceanic and Atmospheric Administration Alaska Fisheries Science Center staff flew UAVs on Steller sea lion surveys in the Aleutian Islands in the spring of 2012 in conjunction with University of Alaska Fairbanks researchers at the UAF's Geophysical Institute, which has become a leading research center for unmanned aircraft development.

By hovering a small, quad-copter UAV above the sea lions' brooding grounds the researchers took infrared photos of the animals — listed as an endangered population — and were able to count them from an offshore vessel without disturbing the sea lions or putting pilots and biologists in risky low-level flying situations.

Unmanned craft will allow for monitoring shifting sea ice, marine mammals and birds as more companies from transportation to resource development enter the Arctic.

While it will likely be another couple years before widespread commercial use of UAVs is approved, particularly for large aircraft like the DA42, it's "dull, dirty and dangerous" missions similar to the sea lion counts that they are made for, Wackowski said.

"Most clients won't let you put a manned crew (in the Arctic) when you're talking about going more than 20 to 30 miles offshore," he said.

Prior to his work with Fairweather and its subsidiary, Wackowski had experience as an unmanned aircraft pilot in the Alaska Air Force Reserve. He holds the record for the northernmost UAV flight at 88.5 degrees North for flying a hand-launched AeroVironment Raven RQ-11 off of a Canadian icebreaker in the summer of 2011.

He was flying so close to the North Pole that the Raven's compass was disrupted, Wackowski said.

"Things operate differently up in the high Arctic," he said.

While setting the record, Wackowski was able to find leads, or cracks, in the sea ice ahead of the ship with an infrared camera on the Raven, which ship pilots prefer to follow when traveling through an icepack, he said. He also searched for polar bears while a team off the ship installed a buoy under the ice.

While he didn't find any bears, he said the mission is an example of a simple task a UAV can perform to make Arctic work easier.

The FAA is in the midst of developing operational guidelines for UAVs and was directed by Congress to have them complete by 2015. As part of the 2012 FAA Modernization and Reform Act, the agency was tasked with choosing six UAV test sites across the country.

UAF Geophysical Institute Director Greg Walker is pushing for Alaska to be one of the test sites and has said that given the state's areas of open airspace and potential for future UAV use, it is more a matter of whether Alaska is chosen first, rather than at all. The FAA is expected to choose the test sites by the end of the year.

A test site would consist of airspace and a landing strip designated for UAV research.

"We fully support the University of Alaska's efforts to get the UAV test bed up here," Wackowski said. "It would be huge — a boom for industry and Alaska."

Aviation industry experts have forecast UAVs will quickly become a $30 billion-plus business in the U.S. once the FAA clarifies its airspace and communication regulations for the aircraft subset.

Anchorage-based Peak 3 Inc. is in the business of prepping other companies for the FAA standards rollout. Peak 3 President and CEO Jen Haney said her company has worked in Alaska and the Lower 48 consulting with businesses and government agencies on how UAVs can benefit their operations and how to be ready to fly when the FAA says, "cleared for takeoff."

Part of the UAF team pushing for an Alaska test site, Haney said the culture of UAV operators needs to be similar to that of traditional aviation for safety reasons.

"I don't think it's unreasonable for (UAV) pilots to be required to have their pilot's license," she said.

The FAA is the "biggest roadblock" to expanding the unmanned industry, Haney said, but the slow careful nature of the agency is necessary to safely integrate a whole new realm of aircraft into the skies.

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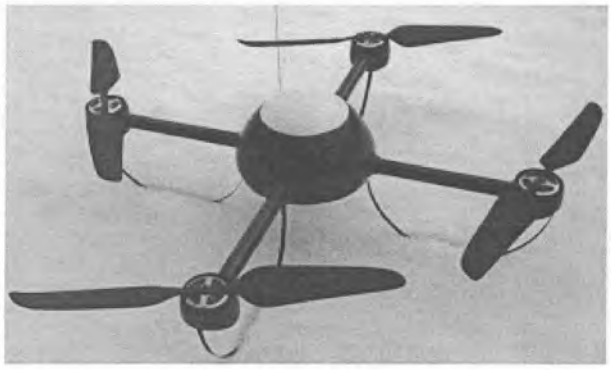
FAA prepares for invasion of 7,500 drones

By Washington Times (DC) November 9, 2013 6:50 am

Print Email Letter to Editor

Text Size: A A A



(File Photo)

The chief of the Federal Aviation Administration predicted Thursday that U.S. airspace could be crowded with as many as 7,500 commercial drones within the next five years, as he unveiled a long- awaited regulatory blueprint that seeks to protect Americans' privacy while requiring testing for law enforcement and private companies seeking to operate unmanned aerial vehicles.

FAA Administrator Michael Huerta said his agency would set up six sites across the country to test drone operators, but cautioned that there could be delays for those looking to obtain certificates to operate unmanned aircraft once the regulatory guidelines are in place. He said ensuring safety in increasingly congested skies was his agency's top priority.

"We must fulfill those obligations in a thoughtful, careful manner that ensures safety and promotes economic growth," Mr. Huerta said in a speech to aerospace industry executives.

The FAA's announcement is the latest step in the march toward transitioning drones from the military use in the war on terrorism that made them famous to civilian applications that can range from collecting survey and weather data to assisting rescues and law enforcement operations.

The Association for Unmanned Vehicle Systems, the leading trade group for the nation's private-sector drone operators, estimated this year that the commercial drone industry will create more than 100,000 jobs and generate more than $82 billion in economic impact over the next 10 years - if the government moves quickly to establish workable operating regulations and safeguards.

The impending boom has raised concerns among privacy advocates about how and where drones might be used to collect data. The FAA is requiring future test sites to develop privacy plans and

make them available to the public. The policy also requires test site operators to disclose how data will be obtained and used.

"Make no mistake about it, privacy is an extremely important issue and it is something that the public has a significant interest and concern over and we need to recognize as an industry that if we are going to take full advantage of the benefits that we are talking about for these technologies we need to be responsive to the public's concerns about privacy," Mr. Huerta said.

Christopher Calabrese, American Civil Liberties Union legislative counsel, told The Washington Times that while the FAA's requirement for public disclosure of data and retention policies are needed and welcome, the safeguards do not go far enough.

"It's crucial that as we move forward with drone use, those procedural protections are followed by concrete restrictions on how data from drones can be used and how long it can be stored. Congress must also weigh in on areas outside of the FAA's authority, such as use by law enforcement and the Department of Homeland Security, which have the ability to use drones for invasive surveillance that must be kept in check," Mr. Calabrese said.

Legislation has been introduced by Sen. Edward J. Markey, Massachusetts Democrat, and Rep. Ted Poe, Texas Republican, and Rep. Zoe Lofgren, California Democrat. If passed, this legislation would require law enforcement agencies to obtain warrants before using drones to collect surveillance data on U.S. soil. "People are really worried about drone use. You see it in a huge number of state bills and laws, and I think the FAA needs to understand that if they don't address privacy issues then drones are not going to be a useful technology," he said. "Privacy can't be swept under the rug."

Mr. Huerta told reporters after his address that there was not a fast-track application process for particular agencies - such as law enforcement - looking to apply for certification to operate unmanned aircraft.

"Our current policy provides for any public user that would like to apply for a certificate of operation to operate unmanned aircraft within national airspace, they are free to apply...," he said. "But I wouldn't say we have a particular priority one way or the other."

Mr. Huerta did allude to possible exceptions for law enforcement agencies to use small unmanned aircraft systems but stressed that the FAA was looking into how to streamline the application process in a way that ensures safe integration into the system and said approximately 80 law enforcement agencies already operate unmanned aircraft under special certificates of authorization.

The FAA released an integration road map and comprehensive plan on its website Thursday.

Both documents lay out steps for unmanned aircraft integration by 2015. Setting up test sites for unmanned aircraft is the next step on the path to integration, and bidding from states to host the sites has been spirited.

"By the end of the year, we plan to choose six test sites for civil unmanned aircraft. Congress required us to do so, and we need to make sure we use these sites to obtain the best data that we can," Mr. Huerta said.

The FAA has received 25 applications for test sights representing 26 states.

The drone industry, which has pushed the Obama administration to speed regulations to clear the way for more commercial uses, called the FAA's moves "an important step."

"From advancing scientific research and responding to natural disasters to locating missing persons and helping to fight wildfires, [drones] can save time, save money, and, most importantly, save lives," said a statement by Mr. Michael Toscano, president and CEO of the Association for Unmanned Vehicle Systems.

Mr. Toscano noted that the FAA's announcements were better late than never as the FAA has missed every deadline laid out for drone integration in the reauthorization act. However, they have had to cope with significant funding cuts from sequestration and government shutdowns. "Every day that we don't fly in national airspace, we lose between $27 to $30 million of economic revenue," he said.

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Commercial Litigation
ALERT

November 11, 2013

THE FAA'S ROADMAP FOR UNMANNED AIRCRAFT SYSTEMS (UAS) INTEGRATION: FORESHADOWING FUTURE REGULATIONS FOR SMALL COMMERCIAL DRONES

On November 7, the Federal Aviation Administration released its first annual Integration of *Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap* (the "Roadmap") and accompanying *Notice of Final Privacy Requirements for UAS Test Sites* (Docket No. FAA-2013-0061) ("the "Privacy Requirements"). At the same time, the FAA's Joint Planning and Development Office delivered to Congress the *UAS Comprehensive Plan* (the "Plan") mandated by the 2012 FAA Modernization and Reform Act. These three documents represent the first comprehensive look at how and when the FAA plans to integrate commercial drones into the national airspace system.[1]

A Faster Track for Small Commercial Drones

The FAA's new documents make clear that larger commercial drones will be integrated into the national airspace system very slowly, over an extended period involving technical testing and rulemaking that may span a decade.[2] However, the timeframe for the express approval of so-called "small" commercial drones ("sUAS"), weighing less than 55 pounds, is of arguably greater interest to the nation's nascent commercial drone industry. Many of the most beneficial uses of civilian drone technology can easily be implemented using technology available today, at low altitudes, by platforms weighing far less than 55 pounds. These include aerial photography and cinematography, agricultural crop analysis, wildlife and environmental monitoring, search-and-rescue, geographical mapping, power line and infrastructure inspection, and countless others.

A notice of proposed rulemaking ("NPRM") specifically addressing sUAS has been promised by the FAA since 2010, but its release has been repeatedly delayed. This most recent update moves the goal again, but sounds promising. The Comprehensive Plan indicates that "The NPRM for small UAS is being drafted and is targeted for release in 2014." Plan at 15. The Roadmap is a little more specific: "The sUAS NPRM is expected to be released in *early* 2014." Roadmap at 58 (emphasis added).

[1] These documents are available at http://www.faa.gov/news/press_releases/news_story.cfm?newsId=15334 .

[2] Currently there is no federal aviation regulation specifically addressing the commercial operation of unmanned aircraft systems. The FAA has asserted as its "policy" that commercial uses are prohibited.

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A Foreshadowing of Burdensome Regulations

Although the contents of the anticipated sUAS NPRM have remained a closely-guarded secret for years, a significant portion of the future proposed regulatory framework may now be gleaned by a close reading of the FAA's new Roadmap, Comprehensive Plan and Privacy Requirements documents. These suggest that the proposed regulatory framework may be much more burdensome than anticipated by developers of the smallest UAS platforms intended to be flown at low altitudes.

Operator Qualifications

Pilot Certification, including Medical Requirements: The FAA's introductory section of the Roadmap indicates that "At the core of these policies is the concept that each aircraft is flown by a pilot in accordance with required procedures and practices. This same policy applies to UAS." Roadmap at 9. The Roadmap further indicates that the FAA plans to amend its regulations so as to address "certification of sUAS pilots." Roadmap at 34. Additionally, the Roadmap's "Goals, Metrics and Target Dates" section includes the following as "Goal 1": "FAA certification requirements for pilots and crew members for sUAS classes (including medical requirements, training standards, etc.) published as part of a sUAS rule by 2014." Roadmap at 52. These statements strongly suggest that future operation of sUAS may be limited to persons who have undertaken a training course, who pass an examination of some kind, and who are medically qualified. This framework, reminiscent of the current pilot certification regime for manned aircraft, threatens the practicality of commercial uses of very small drones where pilot certification is arguably unnecessary (for example, a photographer using a hobby-grade radio-controlled multirotor to take photographs of real estate at very low altitudes).

Operational Restrictions

Constrained Airspace and Performance: The Roadmap indicates that "[o]perations of sUAS under new regulations may have operational, airspace, and performance constraints." Roadmap at 34. "As integration begins, there will be approved airspace and procedures for sUAS." *Id.* at 35. The Comprehensive Plan gives a more specific sense of the anticipated initial airspace restrictions for sUAS: The "Initial Capability" will involve "Operations outside of Class B/C airspace and not over populated areas." Plan at 9. The indication of an airspace restriction (in particular, an altitude ceiling) for early commercial drone use is not a surprise. However, the reference to "not over populated areas" may pose a serious impediment to numerous commercial applications, such as cinematography on controlled film sets, crop inspection in semi-rural areas, or the survey of disaster-stricken urban areas. Moreover, the reference to "performance constraints" and "approved procedures" suggests potential restrictions on the capabilities and applications of sUAS platforms even within the designated airspace.

Line-of-Sight Requirement: The Roadmap hints that sUAS may need to be operated within the "visual line-of-sight (LOS) of the flight crew" in order to avoid regulations similar to those applicable to manned aircraft. Roadmap at 33. Otherwise, a lengthy list of "general requirements and assumptions" for UAS operations may be applied to non-LOS sUAS, including compliance with existing operating rules, the need for an airworthiness certificate, the requirement to "file and fly an IFR flight plan," the use of an on-board ADS-B (Out) transponder, air traffic separation capabilities, and pilot communication with ATC using standard phraseology, among others. *Id.* at 33-34. The Plan similarly suggests that the early FAA goals "apply to small UAS (under 55 pounds) within visual line-of-sight (VLOS)." Plan at 3. Many small sUAS will operate at the limit of visual perception, or be momentarily out of sight such as when flying low between buildings on a disaster relief mission or under tree-top level during infrastructure inspection. Therefore, the definition of "visual line of sight" will seemingly play an important role in the exemption from the long list of technical and procedural requirements. In the Glossary at the back of the Roadmap, the term "Visual Line-of-Sight" is defined as "Unaided (corrective lenses and/or sunglasses exempted) visual contact between a pilot-in-command or a visual observer and a UAS

sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground." The term is not defined in the Comprehensive Plan. Arguably, direct visual observation of an sUAS is far less useful as an indication of its precise location than video and digital telemetry sent back to the ground, and there is some sentiment among industry participants that the more important point is visual confirmation that the surrounding airspace is free of other air traffic even if the sUAS is not directly visible for its entire operation.

Autonomous Flight Prohibited: The FAA appears to have drawn a line in the sand with respect to autonomous flight for any UAS. "Autonomous operations are not permitted. The [pilot] has full control, or override authority to assume control at all times during normal UAS operations." Roadmap at 33. Some of the more innovative small multirotor designs contemplate the use of autonomous technologies to navigate the environment, for example in a search and rescue operation surrounding a collapsed building. One key technology already implemented in many existing sUAS platforms is the ability to "return to home" via GPS guidance in the event of a control signal loss or other malfunction. Although that situation may not qualify as "normal UAS operations," the FAA's Roadmap suggests that developers generally must include the ability of a ground-based pilot to monitor and override all of a drone's autonomous flight functions.

Daytime Flight Only: The FAA's timeline indicates that "sUAS follow-on night operations experiments and study accepted by the FAA for review by the 3rd Quarter of 2014" with a goal of "increased night operations for public entities . . . by the 3rd Quarter of 2015." Roadmap at 58. This suggests a delay for certain commercial applications, such as search-and-rescue, agriculture, or wildlife monitoring, where night operations are advantageous or critical.

Privacy Considerations

Privacy Framework: The FAA's Roadmap declares that "the FAA's mission does not include developing or enforcing policies pertaining to privacy or civil liberties." Roadmap at 11. Its response to privacy concerns that have been raised with respect to the six planned UAS test sites is to permit the test site operators (who are "public entities" -- generally state or local government agencies) to develop their own privacy policies, with the FTC's Fair Information Practice Principles as an informative guideline. *Id.* at 11-12. The FAA expects those policies to be in writing, to provide for public comment, and to involve an annual compliance review. *See* Privacy Requirements at 8, 13. "[T]he privacy policies developed by the test site operators will help inform the dialogue among policymakers, privacy advocates, and the industry regarding broader questions concerning the use of UAS technologies." Roadmap at 12. Noticeably absent from any of the FAA's documents is an indication of how the FAA plans to address privacy issues with respect to *sUAS platforms*, as to which it has promised an NPRM by "early 2014," and which are anticipated to be in "routine" operation by 2015. Obviously, the experiences to be gained from the six test sites cannot guide the sUAS NPRM because the test sites have not even been chosen and will not be operational for some time. In light of the statement concerning its "mission, "perhaps the FAA plans to defer to state and local standards. Indeed, many of the privacy concerns that are often expressed about commercial drone technology are already addressed by technology-neutral state common law principles, or anti-stalking and invasion-of-privacy statutes.

Mandatory Procedures

Registration and Approval: The FAA has also indicated that future regulations will address "registration of sUAS [and] approval of sUAS operations." It is not clear from these documents whether the registration and approval mechanism will be minimally burdensome (such as simple identification and operational notice provided on an FAA website) or something more complex resembling the registration

of manned aircraft and the visible display of an N-Number on the drone. The latter approach could be difficult for smaller platforms.

Safety Data Reporting and Recordkeeping: The Roadmap indicates that "[d]ata collection will expand when . . . new rules and associated safety data reporting requirements are implemented for sUAS." Roadmap at 28. This safety data will be used by FAA to "support the basis for and define appropriate UAS operating requirements." One of the FAA's early goals is to accomplish "Necessary changes to record keeping systems established as part of a sUAS rule." *Id.* at 53. These statements all suggest that commercial sUAS operators will be expected to collect safety-related data, potentially using required sensors on board the drone, and to maintain formal operating records.

Interface with Air Traffic Control: The Roadmap contemplates that the FAA will "[t]rain air traffic control workforce within six months after sUAS rule enactment" and "sUAS operations are aligned with ATC Handbook ... when the sUAS rule is published and effective." This suggests that sUAS operation may, in some way, be subject to interaction with air traffic control.

The Path Forward

Government Users First: The Comprehensive Plan states that with respect to routine sUAS operations, the FAA is "assuming the public realm would be accomplished first and civil would follow." Plan at 16. In other words, public operators (typically government agencies or organizations funded by government, such as law enforcement or state universities) can be expected to be permitted use of sUAS platforms before civil (private, commercial) operators. 2015 is indicated as the goal for both of those "national goals," however, so the purpose of the two-step approach is unclear. *Id.* at 9.

Risk Assessment Hurdle: The Roadmap indicates that "The sUAS proposed rule has undergone a risk assessment by the FAA through its Safety Management System (SMS) process." Roadmap at 58. This may account for the FAA's already lengthy delay. However, it also suggests that public input during the notice-and-comment period might require the SMS risk assessment to be redone, triggering a new delay before the final sUAS rules are actually implemented.

***

If you have any questions or need additional information about this Alert, or any unmanned aircraft systems topic, please contact:

Brendan M. Schulman
Special Counsel
bschulman@kramerlevin.com

***

This memorandum provides general information on legal issues and developments of interest to our clients and friends. It is not intended to provide legal advice. Readers should seek specific legal advice before taking any action with respect to the matters we discuss here. Should you have any questions or wish to discuss any of the issues raised in this memorandum, please call your Kramer Levin contact.

7

LISA MURKOWSKI
ALASKA

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November 12, 2013

Representative Shelley Hughes
Alaska State Legislature
600 E. Railroad Ave
Wasilla AK, 99654

Senator Donny Olson
Alaska State Legislature
716 W. 4th Ave. Suite 560
Anchorage AK, 99501-2133

Dear Representative Hughes and Senator Olson:

I am pleased to provide supporting comments to the Unmanned Aerial Systems (UASs) Legislative Task Force for consideration as you move forward with recommendations on the use of UASs in the public, private and commercial arena. I commend the Task Force for taking a robust look at the public interest issues associated with UASs.

I recognize the valuable role these systems can play in public safety, law enforcement, land management, and agriculture, among other sectors. The potential economic benefits of a carefully managed effort to integrate UASs in the airspace are demonstrably large. Already, ConocoPhillips contractors have sent a ScanEagle aircraft offshore from Wainwright for exploratory purposes. One of the University of Fairbanks' (UAF) unmanned aircraft helped a Russian tanker in 2011-2012 to find a path to deliver fuel. The FAA is approving unmanned flights nationwide and I support the state's interest in safely and responsibly considering the use of UASs across industries.

As we look at evaluating UAS implementation, the following issues must be addressed: safety, privacy, controlling information, certification and balancing data collection with privacy. If we can use unmanned aircraft efficaciously to conduct mapping, for search and rescue operations, crash investigations, pipeline inspections or monitoring oil spills and wildfires then we must look at the potential for implementation in Alaska.

In 2012, FAA was tasked with determining how to integrate UAS into the National Airspace System. In this effort, an economic analysis was completed by the Association for Unmanned Vehicle Systems International providing useful data. This study indicates that the industry impact totals more than $13.6 billion and more than 70,000 new jobs from 2015 to 2017. In Alaska, this amounts to a $19 million economic effect with 95 additional jobs. What is needed is a regulatory structure for commercial and civil development to take advantage of this opportunity in a responsible manner.

The FAA is working to integrate UASs into the national airspace by 2015. As the FAA works to establish six test sites for evaluating how to accomplish the integration, the Legislative Task Force is well poised to address concerns of privacy, overreach, uses and regulations. I support FAA's consideration of UAF as an arctic test site to further vet the use of UASs in diverse terrain and airspace.

Thank you for the opportunity to comment on the Unmanned Aerial Systems Legislative Task Force process. I support your efforts to evaluate all issues associated with the use of unmanned aircraft in Alaska and to consider the application of these systems for public, private and commercial purposes.

Sincerely,

Lisa Murkowski

United States Senator

Written Testimony

Of

Stephen J. Ingley
Executive Director
Airborne Law Enforcement Association

Before the
Legislative Task Force on Unmanned Aircraft Systems Public Meeting
State of Alaska

Good morning Representative Hughes and members of the Legislative Task Force on Unmanned Aircraft Systems. My name is Stephen Ingley and I am the executive director of the Airborne Law Enforcement Association (ALEA). ALEA is a 501(c)(3) non-profit educational membership organization, founded in 1968 to support, promote and advance the safe and effective utilization of aircraft by governmental agencies in support of public safety missions through training, networking, advocacy and educational programs. Our vision is the safe and successful completion of each airborne public safety operation. And our values are Safety, Education & Training, Networking, Public Service, Professionalism, and Ethics and Integrity. Our members operate traditional aircraft (airplanes and helicopters), alternative aircraft (light sport aircraft, gyro-copters and powered parachutes) and unmanned aircraft systems (UAS).

UAS technology has been successfully fielded by the US military in combating terrorism. As the war has drawn down, UAS manufacturers have developed more devices that are small, portable and reliable. More importantly, the manufacturers started to develop devices that were relatively inexpensive, making it conceivable that those agencies that could not afford traditional aviation assets, could afford small UAS (sUAS) technology.

Realizing the potential of this technology, in 2005, the ALEA became active in researching the feasibility of incorporating sUAS into the "toolbox" of public safety agencies. This included participating in the Federal Aviation Administration's (FAA) Proposed Rulemaking Committee for UAS, participating in the Department of Justice's, National Institute of Justice research projects for UAS, conducting UAS training for ALEA members, and working with various organizations and federal and state legislatures on UAS issues. In addition to this, the ALEA has taken the lead in public safety aviation by embracing this new technology, as we see the capabilities of UAS in enhancing the safety of our citizens and public safety employees.

It is a very common occurrence to see military operated UAS on national and local news programs. These devices are large, armed with weapons and operated in theater. Many times, articles have been written regarding the use of UAS technology by American public safety agencies, along with a photos of military grade Predators and Global Hawks. The depiction of military UAS devices within an article concerning public safety's use only heightens the fear of the public and fosters distrust. More importantly, it paints a picture that your local police or sheriff's department is going to operate Predator type UAS devices, capable of long-term, sustainable surveillance and rocket-launched weapons. This stylized hype couldn't be further from the truth.

While the military has been successful in its use of UAS technology to combat terrorism, American public safety is in its infancy in using these devices to combat crime, save lives and enhance the efficiency of agencies. Today, there are four local agencies that have FAA approval to operate UAS devices in their respective

jurisdictions. They are the Grand Forks County (North Dakota) Sheriff's Office, Mesa County (Colorado) Sheriff's Office, Arlington (Texas) Police Department and the Miami-Dade Police Department. Mesa County was the first agency to initiate utilizing UAS technology within their day-to-day operations. Being a very rural county in Colorado, this was a relatively easy process for them, as they had little impact on the national airspace and interfering with the safe operation of other aircraft. Although rural, Mesa County has pioneered the use of these devices for all agencies. What Mesa County has discovered is that these devices are not just a law enforcement tool, but also a tool for public safety generally, as well as government operations. For example, the Mesa County UAS program routinely assists its various fire agencies in responding to building fires. Their UAS devices are launched to provide fire incident commanders timely information regarding the fire that they are combating. In addition, the devices are routinely used for Search and Rescue (SAR) missions. sUAS are able to clear large areas of land (wooded and cleared) much faster than utilizing ground personnel. This permits the Mesa County rescuers to manage a SAR operation much more efficiently and enhances the chance of finding any victims much sooner by deploying search personnel smarter. Mesa County also utilized its sUAS to survey its county owned landfill for an annual land use survey. In the past, the county hired a company to conduct this survey using traditional aircraft and it cost taxpayers thousands of dollars. By using the county owned sUAS, the work was conducted for only hundreds of dollars, saving the county precious funds to allocate elsewhere.

In the province of Saskatchewan, the Royal Canadian Mounted Police, utilizing a sUAS, was recently credited with the first public safety SAR mission that directly resulted in saving someone's life.

I would like to highlight an event that occurred in Baltimore County (Maryland) recently. On May 28, 2013, a large container vehicle and a CSX freight train collided at a vehicle crossing. This incident occurred in an area that is near the city of Baltimore and in an area of mixed commercial and residential use. In addition, the incident occurred less than one half mile from Interstate 95, a major north and south thoroughfare. The incident included the explosion of a railroad car carrying hazardous materials and serious damage to commercial, government and personal property miles away. Immediately after the incident occurred, the Baltimore County Police Department launched one of their turbine engine helicopters to provide command and control support for the Baltimore County Fire Department incident commander (clearly not a law enforcement mission). The aircraft provided an "eye-in-the-sky" for the incident commander and continuously downlinked the images to the incident command post, Emergency Operations Center and within the county's intranet for police and fire commanders. Although the county used its traditional aviation resources to complete this mission, the mission could have been conducted by a sUAS at a fraction of the cost. The turbine engine aircraft costs approximately $400.00 per hour to operate, and they were on-scene for several hours with multiple aircraft. A sUAS would have only cost the agency approximately $25.00 per

hour to operate and would have provided the same aerial images to the fire and police commanders.

Of course, Mesa County and the other agencies use their sUAS for law enforcement missions as well. These missions include, but are not limited to:

- Traffic crash scene photography
- Crime scene photography (with and without the need for a search warrant)
- Command and control of major incidents
- Tactical Operations (Barricaded subjects, armed subjects, school incidents)

As much as the ALEA embraces the inclusion of new technology into the airborne public safety industry, we also embrace the rights of our citizens. The ALEA supports the professional operation of aircraft in public safety missions and expects its members to do so within the framework of the laws of this country. In fact, we routinely say that we are a "Profession within a Profession." We are both professional public safety officers and professional aviators. As such, we work tirelessly to educate our members on search and seizure laws pertaining to privacy and the use of aircraft, UAS included.

To reiterate our opening remarks submitted to the Privacy Project 2013, we "support and promote the IACP Aviation Committee's Recommended Guidelines for the use of Unmanned Aircraft and the Association for Unmanned Vehicle Systems International's (AUVSI) Unmanned Aircraft System Operations Industry 'Code of Conduct.' We do not concur with privacy advocates who claim that public safety agencies' utilization of unmanned aerial systems (UAS) poses a greater threat to 'privacy rights' than manned aviation. Similarly, we do not concur that said uses pose a greater threat to privacy 'rights' than other technologies currently utilized by public safety agencies, both in manned aircraft and on the ground. Furthermore, we do not accept that any legislation is necessary as there are long-standing court rulings upholding our Fourth Amendment protections; but we are particularly opposed to legislation that focus their attention on one technology based on fears of what could occur tomorrow, however unlikely. Aside from recent laws enacted that place outright bans on UAS use, such as that in Charlottesville, VA, many current 'anti-drone' bills appear to be more of an attempt to increase protections under the Fourth Amendment without actually altering the U.S. Constitution. The presumption in most of these pieces of legislation is that a reasonable expectation of privacy now exists in places where there has been no such expectation. As such, a warrant must be obtained before UAS can be utilized by public safety."

The ALEA believes that the Fourth Amendment of the Constitution of the United States of America is alive and well; and the protections contained therein against unreasonable searches and seizures have been supported through years of judicial opinions. We also believe in the Constitutional process of lawfully obtaining a search warrant when there are specific, articulable grounds to believe that the use

of an aircraft, UAS included, will intrude upon a reasonable expectation of privacy. However, in situations where time is of the essence and **NO** reasonable expectation of privacy exists, we would be opposed to restrictions that would limit the effectiveness of UAS.

We would encourage you to focus attention on the more basic issue at hand -- the storage, use, retention, and destruction of sensitive data; not the technology that gathers the data. Similar to law enforcement's use of Automated License Plate Readers (LPRs) and government and non-government surveillance camera's, the data captured and the use of this data is of concern to civil liberty advocates and others. As such, ALEA believes that law enforcement agencies must have solid policies that address, at a minimum, the following:

- How captured data is stored.
- Who has access to the data.
- How long the data is stored.
- How the data is purged.
- Audit controls to hold law enforcement employees accountable for the proper use of captured and stored data.
- Transparency in the inspection of stored data that is not evidence of a crime.

As stated above, these are the same privacy issues that we face concerning LPRs and surveillance cameras. However, unlike these two public safety tools, UAS is being treated differently, resulting in the creation of a separate and higher set of operating standards. If there is to be legislation, it needs to focus on public safety agencies utilization of sound policies that address the bullet points above, as opposed to developing different sets of legislated standards for each device that may be used to gather data.

In closing, ALEA, along with other organizations, have worked diligently with the FAA to develop procedures to operate UAS technology within the National Airspace. This includes the newly released FAA and Department of Justice Memorandum of Understanding that clearly explains the procedures to obtain a Certificate of Authorization to operate a UAS by a public safety agency. The ALEA continues to be committed to embracing this technology, working with others to see its safe integration into the National Airspace, and to developing training for public safety professionals who operate UAS. Our subsidiary, the Public Safety Aviation Accreditation Commission, is also committed to developing standards for the operation of UAS by public safety agencies.

On behalf of the Airborne Law Enforcement Association and its membership, thank you for the opportunity to participate in these deliberations.

United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
Alaska OCS Region
3801 Centerpoint Drive, Suite 500
Anchorage, Alaska 99503-5823

OCT 2 3 2013

The Honorable Shelley Hughes
Representative
Alaska State Legislature
House District 8 Greater Palmer
600 East Railroad Avenue
Wasilla, Alaska 99654

Dear Representative Hughes:

The Bureau of Ocean Energy Management (BOEM) is responsible for managing exploration and development of mineral and energy resources in the Outer Continental Shelf, seaward of State boundaries. BOEM's Environmental Studies Program (ESP) supports research to collect information needed for assessment and management of potential impacts from oil and gas development and to enable BOEM to develop mitigation protocols to protect the Arctic environment and the Alaska Native subsistence way of life. The ESP has supported aerial surveys generally flying at altitudes between 1000-2000 feet to monitor distribution and movement of multiple species of marine mammals. Manned aircraft flights can be dangerous and expensive because of long transit times, hazardous weather conditions, fuel-capacity limitations and operation costs. The ESP remains interested in working with our partners to evaluate the use of UAS to help fill information gaps often unattainable from manned aircraft in remote, hazardous or sensitive areas where use of conventional aircraft may present logistical difficulties.

Since 1974, the ESP has supported large scale aerial surveys during the summer and fall to document distribution, relative abundance, and migration of marine mammals in the Beaufort Sea. This decades-long coverage provides one of the longest monitoring efforts of biological phenomenon, which is increasingly valuable during this time of changing Arctic environmental conditions. The geographic area of these aerial surveys was extended to also cover the Chukchi Sea in 2008. **As the use of Unmanned Aircraft Systems increases, it is important to ensure that protocols are developed to avoid conflicts between aerial and UAS surveys which may be proposed for the same geographic area during the same time period. We encourage this Legislative Task Force on Unmanned Aircraft Systems to address coordination with ongoing efforts as legislation is developed.**

When we submit our statement, as per the flyer for this, we have been asked to include the following, with proposed answers given in **bold**:

Your name – **Dee Williams, PhD**
Business name – **BOEM Environmental Studies Program**
Contact information – **907-334-5283; dee.williams@boem.gov**
Business category: **Government**
Business client: **Public**

Sincerely,

Sharon E. Warren
Acting Regional Director

Scenarios Network
FOR ALASKA & ARCTIC PLANNING

October 22, 2013

Representative Shelley Hughes
Alaska State Legislature
600 East Railroad Avenue
Wasilla, Alaska 99654

Dear Representative Hughes

Please consider my concerns regarding the potential for "over" legistlation of unmanned aircraft systems (UAS) technology because of unwarranted fears.

UAS will provide many new capabilities for commercial, research, government, and even recreational users. In order to realize this potential, especially for commercial uses, it is important to acknowledge the tension that will occur among all parties, especially in the area of privacy. We need a better understanding of the technology's benefits before laws are created restricting their use.

A good example is the issue of public versus private airspace. For example, a manned aircraft flying at 500 feet altitude, in the National Airspace, over a person's private property is legally permitted to collect air photographs of the property. Is the same true for UAS? What if the altitude is less than 500 feet, i.e. 450 or even 50 feet? Does a property owner have rights to the airspace above their property and to what height? Can they shoot at the manned aircraft at 500 feet or the UAS at 100 feet?

On the otherhand, a significant cause of concern with UAS technology is privacy. Do voyeurism and peeping tom laws apply to UAS? What if the UAS is on your property but you are using the camera on the UAS to peer through a neighbor's window, perhaps above a privacy fence?

We can all acknowledge this tension created by privacy does exist. And will likely a source of future litigation. But the early uses of the technology, especially for search & rescue, research, and commercial innovation likely deserves some protection.

I can be reached at 907-474-6958 or kwcunningham@alaska.edu should you have any questions.

Cheers

Keith W. Cunningham

Keith W. Cunningham, PhD
Research Assistant Professor – Remote Sensing

David R. Neel **6 March 2013**

(U) SUBJECT: Potential for Nefarious Use of Unmanned Aerial Vehicles (UAVs)

(U) UAVs can provide first responders, private industry, or government agencies with multiple advantages; from providing aerial imagery, use as a communications relay platform in remote areas, infrared (IR) detection during search and rescue operations, or monitoring the movement of a wildfire; UAV applications have only the limitations of the imagination. Within the year, the FAA must allow any "government public safety agency" to operate a UAV weighing 25 pounds or less, as long as certain conditions are met. The FAA predicts that after they allow commercial use of drones in U.S. airspace, 15,000 of the flying robots will be in the skies by 2015, and double that by 2030.

(U) Often, what benefits legal use of a tool has an equalizing balance of adding a burden to society when that same technology is used with nefarious intent. Unlawful use of UAV technology will be as diverse as the proposed legitimate applications. Criminal individuals and organizations will quickly identify the legal and operational gaps in law enforcement response to such an asymmetric vector. Additionally, criminals will recognize the initial legal and privacy constraints for law enforcement use of UAVs, and seek to exploit those boundaries. Terrorists will also understand the implications of a potentially low-cost, low-risk delivery of a kinetic attack on buildings, persons, or other manned aircraft. Individuals will also have the readily available, non-attributable means to stalk, spy, eavesdrop, or facilitate retribution violence or destruction of public or private property.

(U) Criminal use of UAVs will include, but not limited to:

- Circumventing checkpoints to move contraband
- Surveillance of law enforcement operations
- Jamming of law enforcement communications
- Act as an airborne communications repeater for "secure" communications
- Electronic eavesdropping platform for government/military/economic espionage
- Fish and Game guiding violations
- Kinetic attacks

(U) Potential for miss-use of this platform is great. Additionally, wrong-doers or those who believe that UAV use is violating their Privacy or Civil Rights-Civil Liberties, will seek ways to defeat, destroy, disable, or misappropriate (steal) UAV's that are conducting legal or commercial missions. New technologies, tactics, techniques and procedures will emerge to support this, and must be anticipated. There are already documents available on the open internet identifying "How to Kill UAVs." This also plays into current negative media coverage of the use of "drones" in the United States.

(U) Legislative bodies and policy makers, law enforcement leadership, and regulatory authorities need to begin now to anticipate how this UAV/UAS technology will be used for criminal activity and pass the appropriate legislation, develop effective operational countermeasures, and identify investigative strategies.

David Neel is the DHS Intelligence Officer assigned to the State of Alaska. This paper represents his personal viewpoint and should not be construed to reflect an official position by the U.S. Department of Homeland Security or the State of Alaska.

8

Economic Impact of a

Pan-Pacific Unmanned Aircraft Systems Test Site

May 2013

PREPARED FOR

Alaska Center for Unmanned
Aircraft Systems Integration
University of Alaska Fairbanks

PREPARED BY

McDowell
GROUP

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Executive Summary

Purpose and Scope

In March 2013, the University of Alaska Fairbanks Center for Unmanned Aircraft Systems contracted with McDowell Group to analyze the economic conditions for unmanned aircraft systems (UASs) in Alaska and measure the projected economic impact of developing a Federal Aviation Administration (FAA) test site for UAS in Alaska. The economic impact assessment (EIA) in this report provides annual projections of the direct, indirect, and induced impacts to employment and wages as well as projections of output and value added related to the test site, called the Pan-Pacific UAS Test Range Complex (PPUTRC) – with test ranges located in Alaska, Hawaii, and Oregon. The EIA focuses on the additional economic activity that is expected in response to the PPUTRC test site selection. Additional information is provided in this report on the economic impact of the commercialization of UAS specifically in Alaska once UAS flights are allowed in the National Airspace System (NAS).

Summary

- UAS represent a new industry that is set to quickly grow once new government regulations increase access to designated test sites and then to the National Airspace System (NAS), the system of air traffic control that enables safe and efficient flight activity in the U.S.
- UAS applications are far reaching for civilian and military purposes; ranging from environmental monitoring to search and rescue to pipeline or powerline inspections.
- The FAA has limited the authorized use of UASs in the U.S. to efforts focused on the public interest. There are currently two ways to operate a UAS with the approval of the FAA (both of these options require that the flight takes place outside of densely-populated areas):
    - Certificate of Waiver or Authorization (COA) for public UAS
    - Special airworthiness certificate for private sector (civil) UAS
- However, the FAA is scheduled to designate six UAS test sites in the U.S., as required under the FAA Modernization and Reform Act of 2012. The sites will operate from January of 2014 to February 13, 2017 to provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UASs in the NAS.
- According to the Association of Unmanned Vehicle Systems International (AUVSI), integration of UASs into the NAS will generate some $82 billion in activity in the U.S. between 2015 and 2025; employment impacts are estimated at just over 100,000 jobs by 2025.

- In an effort to bring additional UAS activity and related economic benefits to Alaska, UAF is leading the PPUTRC Test Site application process for 13 ranges in Alaska, Hawaii, and Oregon.
- Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide-open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts).
- In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from $57 million in 2014 to about $76 million in 2017.
- Output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017.
- Value added would climb from $109 million to $134 million over the same period.
- Designation of the PPUTRC will provide a four-year total of $20 million of income tax revenue to Hawaii and Oregon.

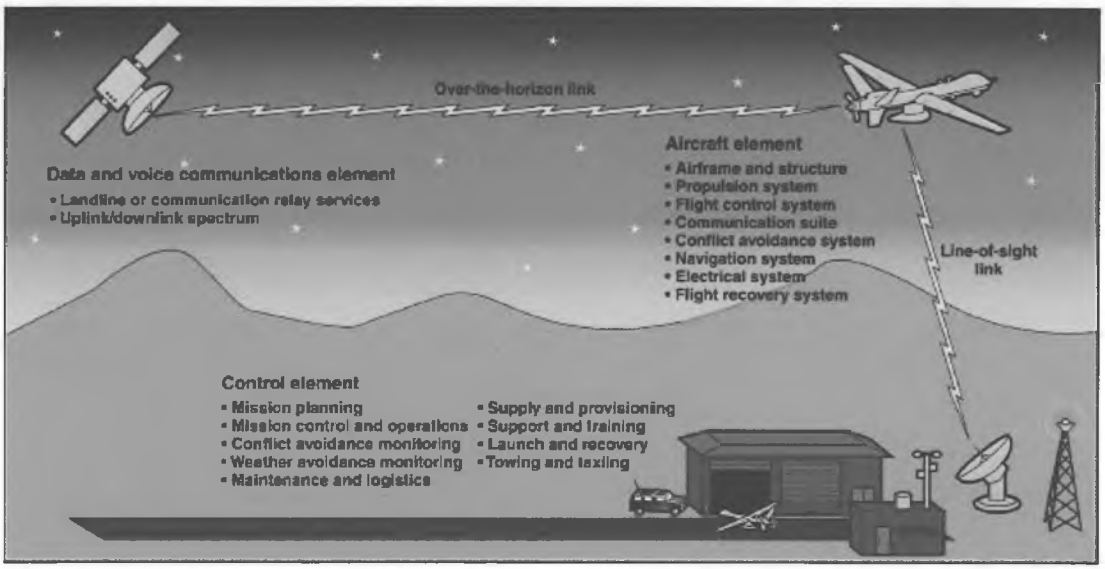
Chapter 1. Unmanned Aircraft Systems in the United States and the NAS

Background

Unmanned aerial vehicles (UAVs) were first described in the late-19th century. Early attempts to develop these UAVs, mostly for combat purposes, soon followed. These remotely piloted vehicles first entered U.S. combat in the mid-20th century to support missions focused on reconnaissance and surveillance, and sometimes they were also used as decoys. Throughout most of the 20th century UAVs lacked real-time data capability and instead focused on collecting images and video for surveillances purposes. Widespread adoption of the technology for U.S. military purposes did not begin until the 1990s and, to a much greater extent, the 2000s during the Afghanistan and Iraq conflicts. It was at this point that technological innovations related to onboard sensors, communication links, and data collection began drastically increasing the potential domestic uses of unmanned aircraft systems.

The increase in complexity for the UAVs required a systems approach to appropriately understand the interactions - and design each component from the start as an integratedsystem - among the on-the-ground control elements, the aircraft, and the communication links. This broader operational perspective is termed "unmanned aircraft system" (UAS). The image below provides a conceptual rendering of the interactions among key elements of a UAS flight.

Figure 1: Conceptual Rendering of an Unmanned Aircraft System



Source: GAO, 2013

UAS Applications

Unmanned aircraft often provide advantages in comparison to manned aircraft. For instance, flights that are dangerous or covert represent potential opportunities where an unmanned vehicle might be preferred over a manned vehicle. Similarly, dull tasks such as extended surveillance missions may be better suited for ground-based operators that can be relieved at the end of their shift. UAVs are often more fuel efficient, quieter, and less disruptive to their surroundings (in comparison to manned aircrafts) and, thus, can allow for fewer environmental disturbances as well as more accurate research results. Finally, initial costs, operating costs (e.g. maintenance costs, fuel costs, storage costs, etc.), and labor costs (e.g. wages, insurances, etc.) are all generally lower for UAVs (Source: Austin, 2010). UASs have already been shown to lead to arrests as well as saving lives during search and rescue missions (Source: The Verge, 2013).

The existing and potential applications for UASs are wide ranging for both civilian uses as well as for military purposes. The lists below provide an abbreviated look at how important this relatively new field may become to sectors throughout Alaska's economy (Source: Austin, 2010):

Civilian

- Aerial Photography - Film, video, stills, etc.
- Agriculture - Crop monitoring and spraying; herd monitoring and driving
- Coastguard – Search and rescue, coastline, and sea-lane monitoring
- Conservation – Pollution and land monitoring
- Customs and Excise – Surveillance for illegal imports
- Electricity Companies – Powerline inspection
- Fire Services and Forestry – Fire detection, incident control
- Fisheries – Fisheries protection
- Gas and Oil Supply Companies – Land survey and pipeline security
- Information Services – News information and pictures, feature pictures (e.g. wildlife)
- Lifeboat Institutions – Incident investigation, guidance, and control
- Local Authorities – Survey, disaster control
- Meteorological Services – Sampling and analysis of atmosphere for forecasting, etc.
- Oil Companies – Pipeline security
- Ordinance Survey – Aerial photography for mapping
- Police Authorities – Search for missing persons, security and incident surveillance
- Rivers Authorities –Water course and level monitoring, flood and pollution control
- Survey Organizations – Geographical, geological, and archaeological survey
- Traffic Agencies – Monitoring and control of road traffic
- Water Boards – Reservoir and pipeline monitoring

Military

- Navy
    - Shadowing enemy fleets

    - Decoying missiles by the emission of artificial signatures
    - Electron intelligence
    - Relaying radio signals
    - Protection of ports from offshore attack
    - Placement and monitoring of sonar buoys and possibly other forms of anti-submarine warfare
- Army
    - Reconnaissance
    - Surveillance of enemy activity
    - Monitoring of nuclear, biological, or chemical (NBC) contamination
    - Electronic intelligence
    - Target designation and monitoring
    - Location and destruction of land mines
- Air Force
    - Long-range, high-altitude surveillance
    - Radar system jamming and destruction
    - Electronic intelligence
    - Airfield base security
    - Airfield damage assessment
    - Elimination of unexploded bombs

UAS Categories

UASs are typically categorized based on the size or capability of the UAV. The five categories below provide a common categorization of UAS that helps simplify requirement assessments and costing estimates (Source: Teal Group, 2008):

- Micro or Mini – A small UAV that ranges in size from something that can be held in the palm of the hand to a UAV that can be carried on your back and launched by hand.
- Naval – A tactical UAV is generally operated with simpler systems over a radius between 100 and 300 km.
- Tactical – A reconnaissance UAV used by the Army for endurance missions ranging several hours over an operating radius up to 200 km.
- MALE – Medium Altitude Long Endurance reconnaissance UAVs fly between 5,000 and 15,000 meters in altitude for approximately 24 hours.
- HALE – High Altitude Long Endurance reconnaissance and surveillance UAVs are usually operated by Air Forces at altitudes over 15,000 meters for periods longer than 24 hours.

National Airspace System

The NAS was developed to allow for safe and efficient commercial aviation. However, commercial UAS flights are currently not allowed in the NAS due to concerns over (1) "the inability to detect, sense, and avoid other aircraft and airborne objects in a manner similar to 'see and avoid' by a pilot in a manned aircraft, (2) vulnerabilities in the command and control of UAS operations, (3) the lack of technological and operational standards needed to guide the safe and consistent performance of UAS, and (4) the lack of final regulations to accelerate the safe integration of UAS into the national airspace" (Source: U.S. GAO, 2012 and Waggoner, 2013).

The first authorized use of UASs in the NAS in the U.S. was permitted by FAA in 1990. Over the past 23 years, the FAA has limited the authorized use of UAS in the U.S. to efforts focused on the public interest. These missions have included border patrol, military training, disaster relief, firefighting, search and rescue, law enforcement, and testing and evaluation. According to the FAA, the Department of Homeland Security currently utilize UASs for border and port surveillance; NASA and NOAA utilize UAS to help with scientific research and environmental monitoring; law enforcement agencies utilize UASs to support public safety; and state universities use UASs to conduct research (Source: FAA Fact Sheet 2013). These efforts are limited to areas outside of major urban areas at elevations less than 50,000 feet. The aircraft range in size from a hummingbird to a wingspan as large as a Boeing 737; although many are the size of a remote-control plane or helicopter. Recreational use of airspace is allowed away from airports and air traffic and below 400 feet above ground level – informal flights for business purposes are specifically excluded (Source: FAA Advisory Circular 91-57).

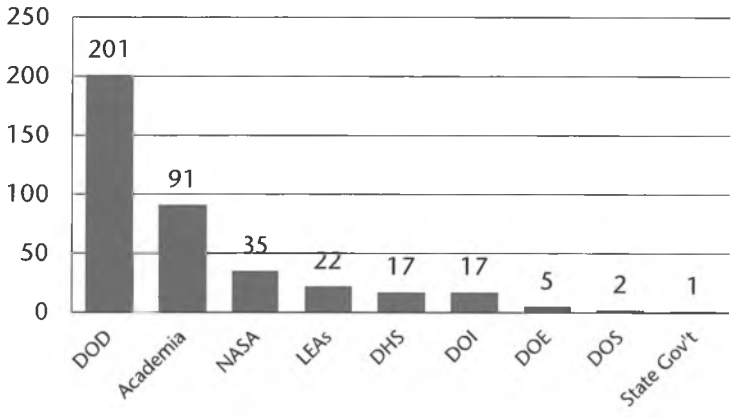
As of 2013, there are currently two ways to operate a UAS with the approval of the FAA: (1) Certificate of Waiver or Authorization (COA) for public UAS's and (2) special airworthiness certificate for private sector (civil) UAS's – both of these options require that the flight takes place outside of densely-populated areas.

Certificate of Waiver or Authorization (COA)

COAs allow public entities to fly UASs in a defined block of civil airspace. The FAA issued the first COAs in January 2007. With COAs, the UAV must remain in view, either of the ground crew or via a chase plane, since UAS technology cannot currently comply with 'See and Avoid' rules. COAs usually require between six and 24 months for approval and cost $40,000 to $60,000 (Source: Economic Development of Central Oregon, 2011). Most of the cost is for specialists in the testing protocols, documentation, and in managing the process through the FAA. Common applications by COA holders include firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions (Source: FAA 2013b). The number of COAs issued has increased since 2009, with 146 in 2009, 298 in 2010, and 313 in 2011 (Source: FAA 2013b). In 2012, the FAA issued 391 COAs to 121 federal, state, and local government entities in the U.S. A total of 1,428 COAs have been issued since January of 2007 (Source: GAO 2013). As of February 15, 2013, there were 327 active COAs (Source: FAA 2013b).

The graph below aggregates the 391 COAs issued in 2012 to nine types of entities: U.S. Department of Defense, academia, NASA, local law enforcement agencies, U.S. Department of Homeland Security, U.S. Department of the Interior, U.S. Department of Energy, U.S. Department of State, and state government.

Figure 2: Number of Approved COAs, 2012



Source: GAO, 2013

Special Airworthiness Certificate

Special airworthiness certificates are the only way for civil operators to fly UASs in the NAS at present. However, these certificates cannot be utilized to carry people or property for compensation or hire – they can only be issued for research and development, crew training, or market surveys (Source: FAA 2011).

Allowing UAS in the NAS

In recent years the FAA has made a concerted effort to integrate UAS regulations into the NAS. In 2009, the FAA, NASA, DoD, and the Department of Homeland Security began addressing pathways to integrating UAS regulations into the NAS through their UAS Executive Committee. Additionally, the FAA chartered a UAS Aviation Rulemaking Committee in 2011 to create operational procedures, regulatory standards, and policies related to UAS flights in the NAS. In 2012, the FAA Modernization and Reform Act of 2012 (FMRA of 2012) was passed by Congress to approve six test sites where UAS integration could be tested prior to a 2015 integration of UAS regulations in the NAS (Source: FAA 2012). Delays within the FAA due to technical, logistical, and public outreach concerns may contribute to a UAS integration date later than 2015. However, six test sites are still scheduled to run from January 1, 2014 to February 13, 2017.

Six UAS Test Sites

There is considerable competition over where test sites will be designated, since designation will provide immediate employment in the selected region and support a strong foundation for UAS activity prior to integration of UAS regulation in the NAS. As of March 5, 2013, 50 applicants from 37 states were granted access to the FAA test site application web portal (Source: FAA 2013b). The FAA will consider

five key items when deciding the location of the six test sites: (1) geographic and climatic diversity, (2) location of ground infrastructure and research needs, (3) consultation with NASA and DOD, (4) population density and air traffic density of the surrounding area of any proposed location as well as the potential impact areas in the event of incidents, such as "Fly away" given potential safety mitigations; and (5) identification of specific goals and objectives to be accomplished. Additionally, the test sites are expected to provide an environment and opportunity to test conventional takeoff and landing capability, high speed flight (greater than 250 knots indicated air speed), maritime (launch/maneuver/recovery) capability, operations at extremely high altitudes (Class A airspace and above), and evaluation of dissimilar aircraft (including a mix of manned and unmanned aircraft) in multiple altitude structures (Source: FAA 2013a).

The six test sites that are selected will support the following operations and programs:

- Safe designation of airspace for integrated manned and unmanned flight operations in the national airspace system;
- Development of certification standards and air traffic requirements for unmanned flight operations;
- Coordinating with and leveraging the resources of NASA and the Department of Defense;
- Addressing both civil and public unmanned aircraft systems;
- Ensuring that the program is coordinated with the Next Generation Air Transportation System; and
- Ensuring the safety of unmanned aircraft systems and related navigation procedures before they are integrated into the national airspace system (Source: FAA, 2013b).

The test site operators will provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UAS regulations in the NAS. Additionally, data collection will support development and operations research and professional development opportunities will be available for inspectors, airspace managers, air traffic controllers, and others. The specific goals described by the PPUTRC applicants include (Source: PPUTRC, 2013):

- Develop a set of standards for select unmanned aircraft categories, for aircraft state monitoring, and navigation. PPUTRC goals and objectives work will augment ongoing standards work with research on categories of UAS not yet addressed, and evaluations needed to refine emerging standards under consideration;
- Validate FAA acceptable risk thresholds or safety management system standards for UAS operations;

- Identify safety factors in UAS design; validate certification standards, including protocols for air traffic control interaction. Define and qualify underlying assumptions and a minimum set of air vehicle characteristics critical to safety, reliability, etc.;
- Develop effective, compliant 'sense and avoid' systems to satisfy regulatory guidance;
- Identify gaps in federal and state statutory and case law protections for privacy and recommend policies or legislation to remedy;
- Directly support the federal mandate for "Expanding Use of UAS in the Arctic" (in Sec 332(d) of Public Law 112-95);
- Design experiments and provide data to support American Society for Testing and Materials (ASTM) F38 and Radio Technical Commission for Aeronautics Special Committee (RTCA SC) 203 to evaluate minimum training and operator qualification standards for crew licensing.

Economic Impact of UAS in the U.S.

The economic implications of integrating UAS regulations into the NAS are substantial. According to a study conducted for the Association for Unmanned Vehicle Systems International (AUVSI), integration will generate $82 billion in activity between 2015 and 2025. Employment impacts are estimated at just over 100,000 jobs by 2025.

The direct economic impact of UAS development in the U.S. is expected to climb from $1.1 billion in 2015 to over $5 billion annually by 2025, measured in terms of output. Including indirect and induced effects, the annual economic impact is expected to rise from $2.3 billion in 2015 to $10 billion in 2025 (Source: AUVSI, 2013).

Areas selected as UAS test sites will have an advantage in capturing these economic benefits; thus the fierce competition among the 50 applicants.

Chapter 2. Pan-Pacific Test Range Complex

In 2012, the Alaska Center for UAS Integration (ACUASI) at the University of Alaska Fairbanks Geophysical Institute began collaborating with Oregon State University and the University of Hawaii to propose a Pan-Pacific Test Range Complex (PPUTRC) as one of the six FAA test sites. This proposed PPUTRC contains 13 test ranges located in Alaska, Hawaii, and Oregon. Of the 13 ranges, six ranges are in Alaska (Denali, Kodiak, North Slope, Oliktok, Poker Flat, and Wainwright), three ranges are in Hawaii (Humuula-R-3103, Makua-R-3109, and Maku-R-3110), and four ranges are in Oregon (Juniper MOA, Pendleton, Tillamook Coastal, and Warm Spring).

Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts). The diverse testing environments for the PPUTRC are included in the Table 1 below:

Table 1: Diversity of Potential Testing Environments for the PPUTRC

360 degree oceanic airspace access	Arctic landscape	Extreme low temperatures
Oceanic and sea-ice access	High arctic winds	High sea-salt corrosion effect
Able to fully matrix UAS into NextGen and air traffic operating both VFR and IFR; high and low altitude	Operations in all classes and categories of military SUA	Operations in Classes A through F international airspace in the oceanic environment
Class C, D, & E airspace within 5-nautical miles of airports	High and low-land vegetation tundra	Numerous inland waterways and lakes
High density airports integration studies and testing	Class C, D, & E airspace airport approaches/departures	High-humidity high and low-altitude
Hot and cold high-desert testing	Littoral coastal region mountainous area	Class E (high) airspace
Jungle conditions	Class A airspace	Mountainous terrain
Volcanic	Glacier	Ship traffic including open ocean and ports

UAS Activity in Alaska, Hawaii, and Oregon

There are currently 15 active COAs in the PPUTRC area as well as eight in-process COAs and 20 expired COAs.

Alaska

ACUASI at the University of Alaska Fairbanks (UAF) is the lead organization for the proposed PPUTRC. The formal PPUTRC team includes over 80 businesses, universities, tribes, and economic development organizations in Alaska. UAF has actively managed UAS operations since 2004.

ACUASI was formed in 2012 to enhance UAS research in Alaska. ACUASI and the UAF Geophysical Institute have developed and flown a variety of in-situ and remote sensing instruments on various UASs in Alaska and throughout the world. Scientific and research campaigns undertaken in Alaska over the past decade include using UASs to support observation and monitoring of sea lions in the Aleutian Islands, weather forecasting, volcanic plume monitoring, atmospheric sampling during wildfires, monitoring of sea ice build ups, and oil spill mapping. Commercial applications trialed in Alaska include whale monitoring, cadastral mapping, maritime navigation support, industrial plant monitoring, and environmental clean-up. This experience, coupled with the FAA's UAS test site status, would leverage a variety of new economic activities in Alaska.

The following table, which summarizes ACUASI activity in 2012, illustrates the variety of UAS activity supported by the organization. The table also provides revenue and staffing data for each UAS campaign.

Table 2: UAS Campaigns Supported by the University of Alaska Fairbanks in 2012

Client	Flight Locations	Type of UAS	Purpose of Flights	Revenue for Site Operator	Site Operator Staff	Flight Operator Staff
Aleutians	Aleutian Islands, AK	Aeryon Scout and Puma	Seal observation	$314,200	2 pilots	1 observer
Idaho	Lewiston, ID	Aeryon Scout	Salmon nest observation	$115,000	1 pilot	1 observer
Eglin Air Force Base	Fort Walton Beach, FL	ScanEagle and Aeryon Scout	Controlled burn experiment	$413,000	4 pilots	3 observers
Prudhoe Bay	Prudhoe Bay, AK	Aeryon Scout	British Petroleum flare stack monitoring	$190,000	1 pilot	1 observer
Nome	Nome, AK	Aeryon Scout	Harbor Ice monitoring for USCG	$30,000	1 pilot	1 observer
Ugak Island	Ugak Island, AK	Aeryon Scout	Seal population monitor	$6,500	1 Pilot	1 observer
Fort Greely	Fort Greely, AK	ScanEagle and Aeryon Scout	Flight test	$25,000	2 pilots	2 observers
Chile	Santiago, Chile	Aeryon Scout	Glacier Ice monitor	$9,000	1 pilot	1 observer
Belgium	Belgium	Gatewing	Flight training	$16,000	2 pilots	1 observer
Anchorage	Fort Richardson, AK	Aeryon Scout	Flight test and demonstration	$1,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	ScanEagle	Payload test	$347,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Aeryon Scout	Payload test and demonstration	$30,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Raven	Flight test for avionics	$5,000	2 pilots	2 observers
Hawaii	Offshore Hawaiian Islands	Puma	Tsunami debris tracking	$95,000	1 pilot	1 observer

Sources: ACUASI, 2013

Figure 3: Types of UAS Flown in Alaska in 2012

Aeryon Scout

Boeing Insitu ScanEagle

AeroVironment Raven

Gatewing

AeroVironment Puma

Hawaii

Hawaii offers many unique qualities that make UAS operations appealing. These include: (1) expansive over-water areas unencumbered by other aviation uses, (2) proximity to U.S. Pacific Command – a significant user of future UAS systems, (3) opportunities for joint operations with the Pacific Missile Range Facility – a major test range on Kauai, and (4) opportunities for long-range point-to-point tests with partner ranges in Alaska and Oregon. The Hawaii ranges have proven an important focus for the development of scientific applications of UAS, with significant milestones including test flights of the Aerovironment Pathfinder; Pathfinder Plus; and Helios solar-hybrid propulsion high altitude, long endurance UAS, between 1997 and 2001. Scientific applications led by U.S. federal agencies have recently seen Hawaii emerge as a focal point for NOAA's exploration of UAS as a tool for marine park surveillance. NOAA has utilized UAS to monitor Papahanaumokuakea Marine National Monument since 2007 and performed initial trials using small hand launched systems in mid-2012.

Oregon

The Oregon-based PPUTRC team members include 16 businesses, universities, tribes, and economic development organizations. Additionally, six committed team partners will convert to formal team members upon FAA test site designation award to PPUTRC. Engagements are also planned with a wide ranging network in Oregon – including the 111 AUVSI members and numerous startup companies, primarily in sensor, robotics, and other supporting technologies. In comparison to Alaska and Hawaii, Oregon has historically been more engaged in design, development, and manufacture of UAV systems and subsystems.

The two largest Oregon UAS firms are Insitu (design, development, and manufacture of UAS systems) and FLIR Systems (remote sensors). The main Oregon firm involved in UAS applications has been Near Space Corporation (NSC). NSC uses very high altitude unmanned balloons and gliders to perform scientific and commercial test activities, ranging from data gathering on behalf of government agencies to near-space testing of hardware and sensors for commercial firms. NSC is opening a new $6 million flight test and operations facility at the Tillamook Airport on the Oregon coast. Existing UAS activity also includes the Oregon Army National Guard operations in Pendleton. Oregon's UAS efforts are synergistic with a separately funded ground vehicle innovation initiative, Drive Oregon, which requires systems that can be spun out of UAS: quiet, efficient motors, lightweight composite designs, and navigation systems. The potential economic benefits of the test sites, as well as NAS integration, are particularly strong for Oregon's already significant aircraft manufacturing sector.

Recent UAS Funding in Alaska, Hawaii, and Oregon

Since 2004, nine Alaska contractors have received direct U.S. federal agency contracts for UAS goods and services. The largest federal contract in Alaska is a 5-year standing services award, worth $47 million, from the U.S. Navy to the University of Alaska in 2010 for UAS payload integration and flight test services. The second major award made since 2004 to an Alaska firm consists of a series of pacts totaling $17 million from the U.S. State Department to Anchorage-headquartered Kuk Construction (subsidiary of Olgoonik Development, an Alaskan Native Corporation) for the provision of UAS-based security surveillance services in Iraq in partnership with KBR, Inc. UAF has collaborated with commercial entities, such as Idaho Power Company, and manufacturers including AeroVironment to conduct surveys and observe environmental impacts. Additionally, UAF has collaborated with BP for oil spill response and flare stack monitoring, as well as projects focused on detecting and locating gas and oil pipeline leaks and developing new sensors and processes to identify leaks.

Hawaii's large military presence has resulted in defense spending as the primary source of federal funding to UAS vendors in the state. Direct defense contracts accounted for 94 percent of all awards in terms of obligated amounts from 2004-2012, rising to 97 percent when including awards placed by the General Services Administration on behalf of the U.S. Air Force. The remaining awards were placed with Honolulu-based Referentia Systems by NOAA as part of the Papahanaumokuakea Marine National Monument monitoring project. Hawaii supports a dedicated UAS development and manufacturing company, Williams Aerospace, a small firm currently developing new platforms in the fixed-wing, hand launched micro and medium altitude endurance classes. The state is also working to create two commercial UAS services arms, addressing the defense, homeland security, and precision agriculture markets.

In Oregon, a consortium of industry, academia, and public entities has created a 7-year strategic plan to double the size of the UAS industry in the state, with the help of a $2.5 million State of Oregon grant scheduled for the 2013-14 biennium and additional investments of at least $1.15 million from other sources for a total of $3.65 million. The plan specifically creates UAS solutions for commercial applications, and safely integrating those UAS solutions into the NAS. Projects include emergency response; weather; firefighting; search and rescue; wildlife and habitat management; law enforcement; physical and resource surveys (land and water); management of agriculture, livestock, and public lands; and management of public and private infrastructure. Oregon State University (OSU) has already begun UAS flights based on these research objectives.

Leveraging Current Research Institutes, Community Colleges, and Training Centers

ACUASI is collaborating with the UAF College of Engineering and Mines (CEM) and the Community and Technical College (CTC) to integrate UAS engineering, science, and technology into UAF's teaching, research, and service activities. Additionally, ACUASI is working with the CEM to fill a full-time tenure track engineering faculty position with a professor focused on UAS engineering, science, and technology. ACUASI and CTC also intend to include UAS technology courses in CTC's aviation curricula to train UAS developers, technicians, and pilots as well as to improve outreach to remote Alaskan villages that could benefit from UAS technologies. Cooperation with the CTC at UAA will add air traffic controller participation, offer training for UAS operators, and ultimately build a maintenance program similar to the Aircraft and Powerplant program currently offered.

The University of Hawaii is testing UASs in several of its research programs, evaluating the utility and impact of UAS through analysis of coastal resource management, terrestrial and aquatic environmental monitoring, natural source management and inventory, and human impact studies. University of Hawaii is also developing programs to train students and research professionals on UASs, and plans to integrate this capacity into accredited degree programs.

The new OSU industry-university UAS consortium will depend on test site facilities for collaborative research and development in all phases of operations and applications. Through the Colleges of Engineering, Science, Agriculture, Forestry and Earth, Ocean and Atmospheric Sciences, OSU has expertise and supports ongoing research on control theory and robotics, flexible airframes and flight, sensors, and signal processing, and numerous applications in natural and environmental sciences and environmental monitoring, measuring, and management. OSU-Cascades, located in Central Oregon near the Warm Springs and Juniper test ranges, offers programs in energy engineering, computer science, natural resources, and business, and plans to add programs designed in conjunction with the UAS industry. OSU-Cascades can also provide on-site facilities for OSU-Corvallis researchers leading projects in the region. Central Oregon Community College (COCC) has one of the largest aviation flight training programs on the West Coast – both fixed wing and rotary. COCC offers certifications for UAS flight training and plans to develop a program for data analysis of sensors, building on the school's strong geographic information systems program. Additionally, Blue Mountain Community College (BMCC) in Pendleton, Oregon is developing a UAS curriculum for instructional delivery and course certification. Oregon Institute of Technology (OIT) offers a variety of degrees in engineering and engineering technology, composite engineering, computer and software systems engineering, and electrical engineering, including a master's degree in manufacturing engineering. It offers degrees in professional land surveying and geographic information systems. OIT is collaborating with Rockwell Collins, the aviation electronics company, on real-world projects at a joint campus outside Portland and offers similar hands-on collaborations with other aerospace firms in the northwestern U.S.

Expansion of Existing Businesses and Attracting New Business Investment

The University of Alaska has spun off at least two companies who intend to test their products on the Pan-Pacific test range. These companies were created by University graduate students who were expanding their research in sensors for testing in UASs. UA recently received $5 million from the State of Alaska to support the development of a sustainable high-tech industry in Alaska. Already two companies have established satellite offices in Alaska to improve collaboration with the ACUASI.

Placement of a UAS test site in Hawaii will promote growth within Hawaii and reduce development cycles for manufacturers and researchers. Additionally, it would reduce or eliminate costs to ship sensors, and send knowledgeable staff, to mainland test sites to operate and demonstrate systems. Close proximity to a test site in Hawaii will greatly benefit firms such as BAE Systems, Williams Aerospace, and others – including many military and government contractors working with the Honolulu Fire Department, Honolulu Police Department, U.S. Civil Air Patrol, U.S. Coast Guard, U.S. Department of Defense, U.S. Department of Homeland Security, U.S. National Guard, and others.

In Oregon, more than a dozen companies have said that they will begin testing their sensor packages, propulsion systems, and airframes in Oregon if the Pan-Pacific UAS Test Area is designated as a national test site. Additionally, two companies have informally pledged to open satellite offices at a state test range. The PPUTRC will benefit UAS businesses in the Columbia River Gorge. Over the past seven years, the Gorge's UAS industry grew from a small core of 30 people to an employment base of more than 1,400 employees. Many of these new jobs were created by the UAS companies' suppliers. The two largest Oregon UAS manufacturers are Insitu, manufacturer of UAS platforms and subsystems, and FLIR Surveillance Systems, a manufacturer of electro-optic and infrared imaging systems. Insitu is a major global supplier of high endurance, runway-independent UAS. FLIR Surveillance provides more ER and IR imaging systems for unmanned aircraft, unmanned ground, and unmanned maritime platforms than any other company. Activity in the Gorge from firms such as Insitu, FLIR Surveillance Systems, Cloud Cap Technology, and UTC Aerospace has spun off more than 20 local companies. Central Oregon's general aviation aircraft manufacturing industry had a similar growth pattern over a 15-year period, expanding from a core company of about 30 employees (Lancair) to a cluster of 25 companies that now employs nearly 1,200 people. It is anticipated the PPUTRC will help expand these existing businesses in the Gorge and Central Oregon.

Infrastructure

Alaska expects to invest $1.5 million to construct a test site center at its Poker Flat Research Range, as well as develop and acquire mobile test infrastructure such as fixtures, data collection devices, and monitoring systems similar to its internet-Portable Aerial Surveillance System (iPASS), a web-based application that merges track information from radar, GPS, and a transponder interrogator/receiver. Additionally, large data collection requirements are expected to drive development of a data center for processing and storage.

Hawaii's test ranges link to military/restricted areas used for current UAS operations. These sites include the Pohakuloa training area on the Island of Hawaii, Bradshaw and Wheeler Army Airfields on Oahu, and the Pacific Missile Range Facility on Kauai. Other areas under consideration include Upolu and Dillingham Airfields (on the Big Island and Oahu, respectively). Test points within the ranges would be utilized to support both shore and ship-based development, testing and certification of new UASs, training and crew certification of operational UASs, and development of expanded and joint capabilities involving existing communications systems and operations tactics using UAS.

The budget for the $2.5 million Oregon innovation grant envisions spending at least $1.2 million at test ranges for new equipment and/or infrastructure, with the grant providing $300,000, private enterprise providing $750,000, and public entities providing $150,000. Possible infrastructure development proposed with this funding includes: portable ground radar units; an automatic dependent surveillance-broadcast ground station or a similar 'sense and avoid' technology system; one or more operations management buildings housing computers, calibration components, baseline sensors with a range of capabilities, data analysis equipment, supporting software, maintenance facilities and machine shops; and ground control stations, an observation tower, and ITAR facilities as needed. Additionally, as noted earlier, Near Space Corporation is preparing to open a new $6 million flight test and operations facility at the Tillamook airport.

Chapter 3. Potential Economic Impacts of the PPUTRC

Designation as one of the nation's six UAS test sites promises to have significant economic impacts in the areas where flight activity occurs and support services are provided. Private and public sector UAS activity that has been constrained by restricted access and a restrictive federal authorizing process will have much greater opportunity to conduct UAV flight operations. In this chapter the potential economic impacts in Alaska, Hawaii, and Oregon related to serving as a test site are quantified.

The following economic impact projections were developed by McDowell Group, Inc. utilizing flight activity, flight cost, and flight-related staffing data provided by PPUTRC team members. Direct economic activity was measured by approximating preflight administrative costs, site fees per day, operating costs per day, and total flight days from historical data provided by the applicant. Sector-level information was obtained from the applicant concerning the number of UAS-related firms and jobs per firm. Direct employment estimates were then coupled with multipliers obtained from the IMPLAN economic impact model to estimate total direct, indirect, and induced economic effects. Annual projections from 2014 to 2017 were calculated for each of the 13 ranges utilizing growth rates based on funding forecasts from the Teal Group UAS market profile and forecast report, historical flight activity, and projected growth in flight activity, research, and UAS-related manufacturing as provided by the applicant.

In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect, and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from$57 million in 2014 to about $76 million in 2017.

Table 3: Summary Impacts of PPUTRC Test Site Designation, 2012-2017
Combined Impacts in Alaska, Hawaii and Oregon

Impact of Test Site Designation				
	2014	2015	2016	2017
Total Employment	**1,065**	**1,260**	**1,335**	**1,429**
Direct Employment	490	571	602	642
Indirect Employment	198	243	259	279
Induced Employment	377	447	474	508
Total Labor Income ($ million)	**$56.9**	**$66.9**	**$70.8**	**$75.6**
Direct Labor Income ($ million)	$26.4	$30.5	$32.2	$34.2
Indirect Labor Income ($ million)	$10.4	$12.5	$13.3	$14.4
Induced Labor Income ($ million)	$20.1	$23.8	$25.3	$27.1
Output ($ million)	**$265.0**	**$301.8**	**$315.9**	**$333.5**
Total Value Added ($ million)	**$109.3**	**$121.9**	**$127.1**	**$133.5**
State Income Taxes ($ million)	$4.3	$5.0	$5.3	$5.6

Employment Resulting from UAS and Test Site Operations

In 2014, with designation of PPURTC as a test site, UAS activity in Alaska, Hawaii, and Oregon is expected to account for 581 direct jobs and a total of 1,254 jobs - including direct, indirect, and induced jobs. Approximately 85 percent of that total employment (1,065 jobs) is attributable to test site designation. The remaining 15 percent (189 jobs) is expected to occur in the absence of PPUTRC test site designation. By 2017, employment will rise to an estimated 904 direct jobs and 1,991 total jobs - with 72 percent of that total employment (1,429) attributable to test site designation. A significant number of these direct jobs are expected in smaller communities that tend to have higher unemployment – thus test site designation for the PPUTRC will help improve opportunities where they will provide the most benefits.

Table 4: Direct Employment, 2012-2017

Direct Employment						
	2012	2013	2014	2015	2016	2017
Total Direct Employment						
PPUTRC	**74**	**82**	**581**	**712**	**801**	**904**
Alaska Ranges	43	47	129	142	157	173
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	31	35	452	498	549	605
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**490**	**571**	**602**	**642**
Alaska Ranges	-	-	77	82	86	91
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	-	-	414	417	421	424

Oregon's relatively high direct employment numbers are due to the existing, well-developed aircraft manufacturing sector in Oregon. Oregon is well placed to supply the growing demand for UAS aircraft that will be triggered by UAS integration. Most of the new jobs created in Oregon due to PPUTRC designation include manufacturing jobs (many of which may be created due to designation of test sites anywhere in the U.S.). These numbers for Oregon are based on an analysis provided to McDowell Group by Economic Development for Central Oregon (EDCO).

In addition to direct jobs created from UAS firms, significant indirect and induced jobs will also be created. Indirect jobs represent jobs created throughout the supply chain to support the UAS industry and induced jobs represent jobs created due to changes in household consumption as a result of the UAS industry.

Table 5: Indirect Employment, 2012-2017

Indirect Employment	2012	2013	2014	2015	2016	2017
Total Indirect Employment						
PPUTRC	**21**	**24**	**224**	**290**	**328**	**374**
Alaska Ranges	7	8	22	24	27	30
Hawaii Ranges	-	-	-	42	56	74
Oregon Ranges	14	16	202	223	246	271
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**198**	**243**	**259**	**279**
Alaska Ranges	-	-	-	42	56	74
Hawaii Ranges	-	-	185	187	188	190
Oregon Ranges	-	-	13	14	15	16

Table 6: Induced Employment, 2012-2017

Induced Employment	2012	2013	2014	2015	2016	2017
Total Induced Employment						
PPUTRC	**59**	**65**	**448**	**558**	**629**	**712**
Alaska Ranges	35	39	106	117	129	142
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	24	26	342	377	416	459
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**377**	**447**	**474**	**508**
Alaska Ranges	-	-	63	67	71	75
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	-	-	313	316	319	321

Note: Summation of columns may not match the total due to rounding

Labor Income Resulting from UAS and Test Site Operations

In 2014, UAS activity in Alaska, Hawaii, and Oregon is expected to account for $31 million in direct labor income and $67 million in total labor income - including direct, indirect, and induced - assuming the PPUTRC is awarded test site designation. Approximately 84 percent of that total labor income ($57 million) is attributable to test site designation, while the remaining 16 percent ($10 million) is expected to occur even if the proposed PPUTRC does not become a test site. By 2017, labor income is expected to include $106 million in total direct, indirect, and induced labor income - with 71 percent of that total labor income ($76 million) attributable to test site designation.

Table 7: Direct Income, 2012-2017 ($ million)

	Direct Income					
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$4.0**	**$4.4**	**$31.3**	**$38.2**	**$42.9**	**$48.3**
Alaska Ranges	$2.3	$2.6	$7.0	$7.7	$8.5	$9.4
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	$1.7	$1.9	$24.2	$26.7	$29.5	$32.5
Impact of Test Site Designation						
PPUTRC	-	-	**$26.4**	**$30.5**	**$32.2**	**$34.2**
Alaska Ranges	-	-	$4.2	$4.4	$4.7	$5.0
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	-	-	$22.2	$22.4	$22.6	$22.8

Table 8: Indirect Income, 2012-2017 ($ million)

	Indirect Income					
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$1.1**	**$1.3**	**$11.7**	**$15.0**	**$17.0**	**$19.3**
Alaska Ranges	$0.4	$0.4	$1.2	$1.3	$1.5	$1.6
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	$0.7	$0.8	$10.5	$11.6	$12.8	$14.1
Impact of Test Site Designation						
PPUTRC			**$10.4**	**$12.5**	**$13.3**	**$14.4**
Alaska Ranges	-	-	$0.7	$0.8	$0.8	$0.9
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	-	-	$9.6	$9.7	$9.8	$9.9

Table 9: Induced Income, 2012-2017 ($ million)

	Induced Income					
	2012	2013	2014	2015	2016	2017
Total Induced Income						
PPUTRC	**$3.5**	**$3.8**	**$24.4**	**$30.1**	**$34.0**	**$38.4**
Alaska Ranges	$2.2	$2.5	$6.7	$7.4	$8.2	$9.0
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	$1.2	$1.4	$17.6	$19.4	$21.4	$23.6
Impact of Test Site Designation						
PPUTRC	-	-	**$20.1**	**$23.8**	**$25.3**	**$27.1**
Alaska Ranges	-	-	$4.0	$4.3	$4.5	$4.8
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	-	-	$16.1	$16.3	$16.4	$16.6

Output, Value Added, & State Income Taxes Resulting from UAS and Test Site Operations

'Output' represents the value of industry production, and 'total value added' is the difference between an industry's total output and the cost of their intermediate inputs. Economic modeling conducted for the purposes of this study indicates output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017. Value added would climb from $109 million to $134 million over the same period.

Table 10: Output, 2012-2017 ($ million)

	Output					
	2012	2013	2014	2015	2016	2017
Total Output						
PPUTRC	**$18.3**	**$20.2**	**$302.4**	**$366.8**	**$411.7**	**$463.6**
Alaska Ranges	$8.6	$9.5	$34.3	$37.8	$41.7	$46.0
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	$9.7	$10.7	$268.1	$295.6	$325.9	$359.3
Impact of Test Site Designation						
PPUTRC	-	-	**$280.1**	**$315.5**	**$328.4**	**$344.7**
Alaska Ranges	-	-	$23.8	$24.8	$25.8	$26.8
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	-	-	$256.3	$257.4	$258.5	$259.6

Table 11: Total Value Added, 2012-2017 ($ million)

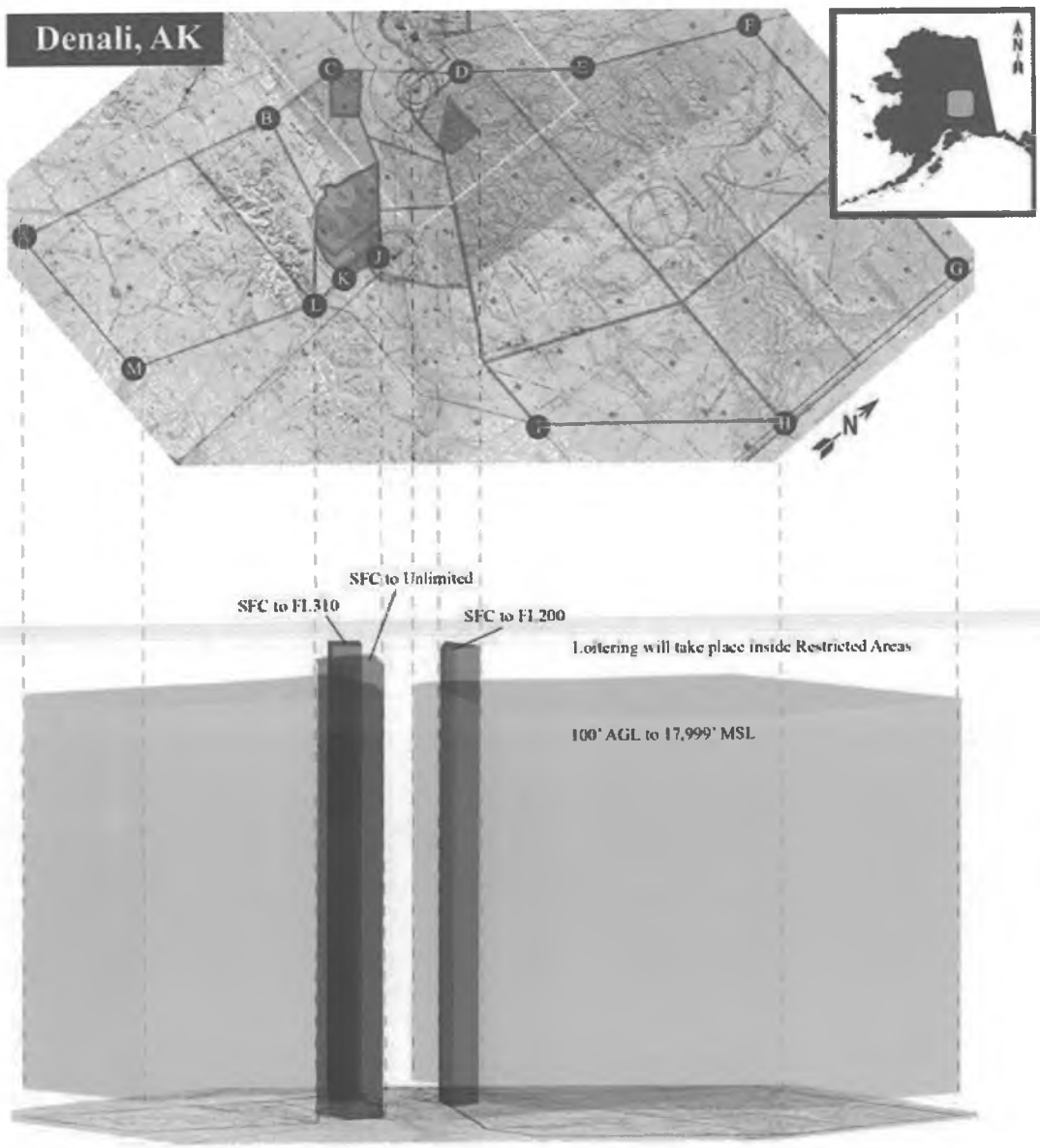
	Value Added					
	2012	2013	2014	2015	2016	2017
Total Value Added						
PPUTRC	**$9.5**	**$10.5**	**$127.7**	**$151.8**	**$169.7**	**$190.3**
Alaska Ranges	$5.7	$6.3	$22.7	$25.0	$27.6	$30.4
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	$3.8	$4.2	$105.1	$115.8	$127.7	$140.8
Impact of Test Site Designation						
PPUTRC	-	-	**$116.2**	**$128.2**	**$132.8**	**$138.5**
Alaska Ranges	-	-	$15.8	$16.4	$17.1	$17.7
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	-	-	$100.4	$100.9	$101.3	$101.7

Designation of the PPUTRC will provide a combined four-year total of $20 million in income tax revenue to Hawaii and Oregon. The effective income tax rate for these calculations was approximated as 7.5 percent for Hawaii, and 9 percent for Oregon (Alaska has no income tax).

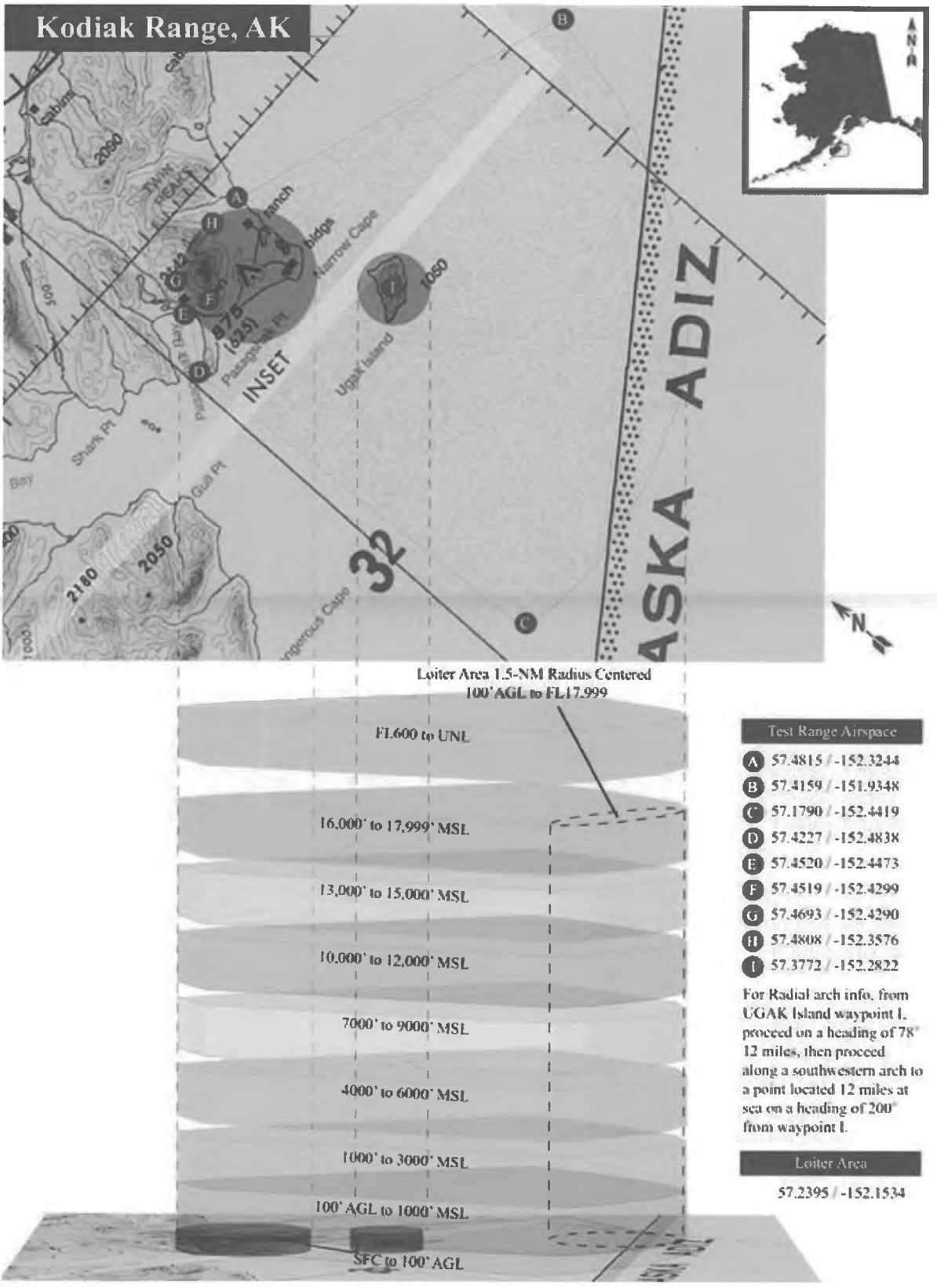
Table 12: State Income Taxes, 2012-2017 ($ million)

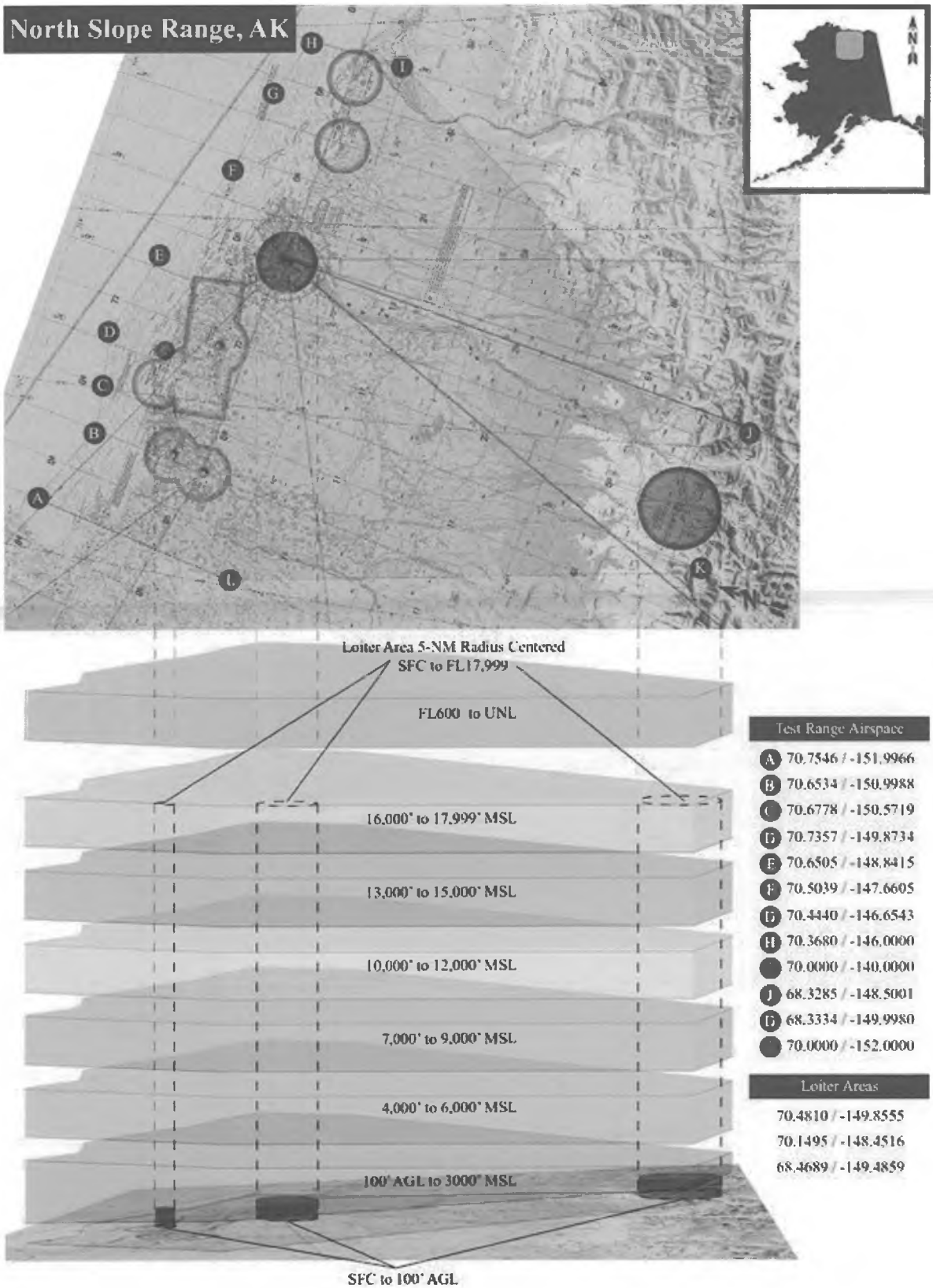
	State Income Taxes					
	2012	2013	2014	2015	2016	2017
Total State Income Taxes						
PPUTRC	**$0.2**	**$0.2**	**$4.7**	**$5.9**	**$6.6**	**$7.5**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	$0.2	$0.2	$4.7	$5.2	$5.7	$6.3
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**$4.5**	**$5.2**	**$5.5**	**$5.8**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	-	-	$4.5	$4.5	$4.6	$4.6

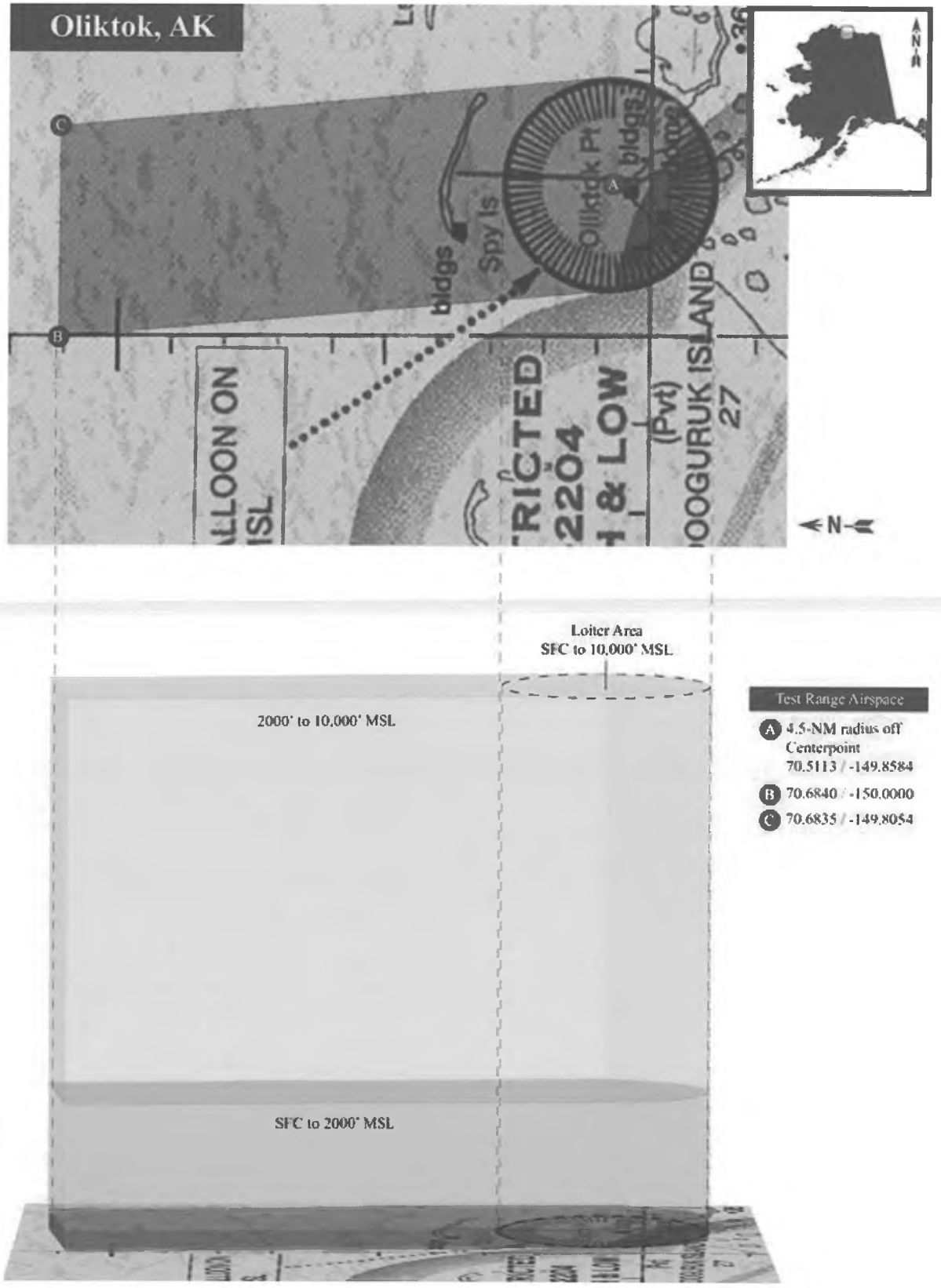
Appendix. Proposed Pan-Pacific Test Ranges

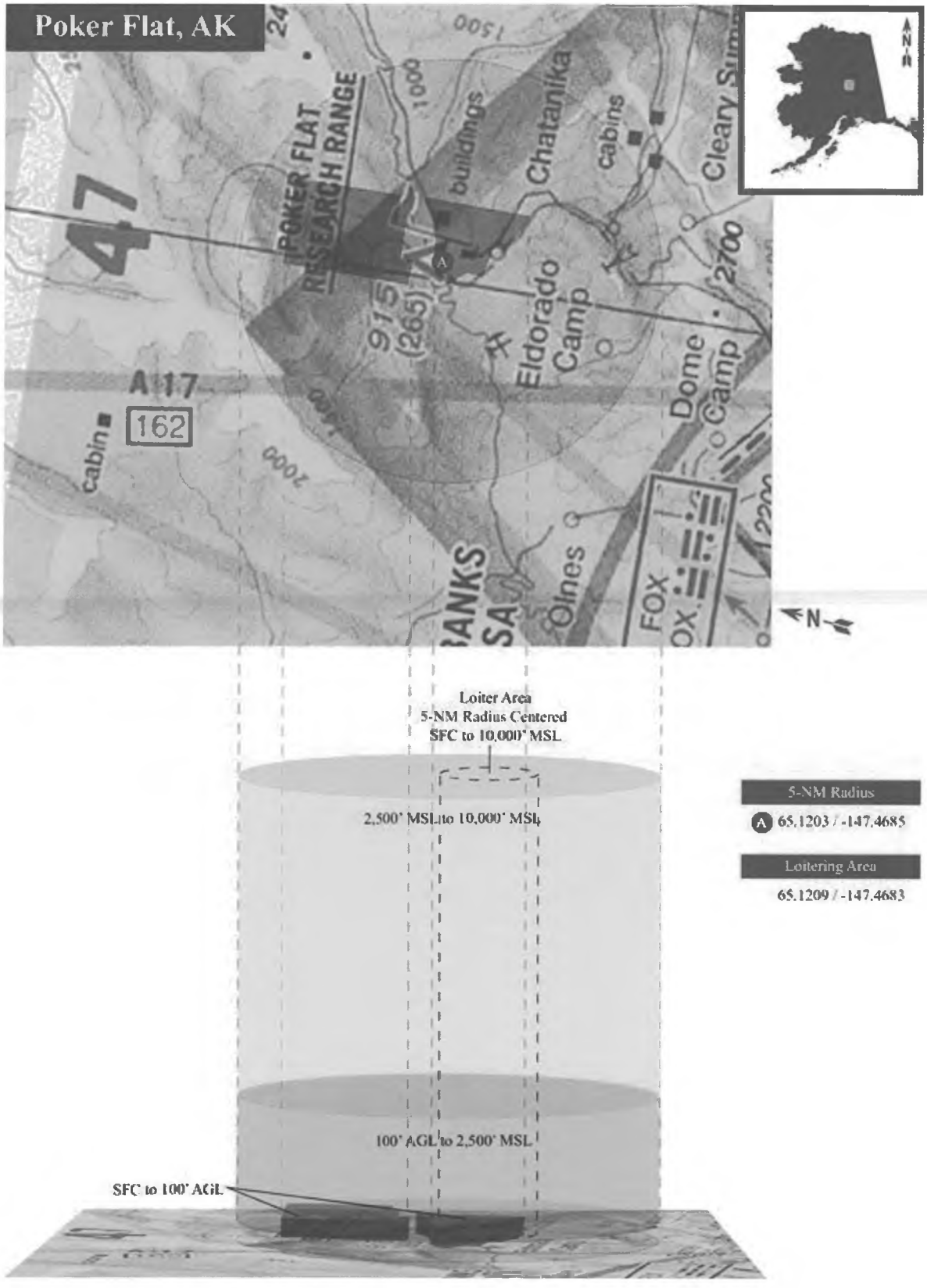


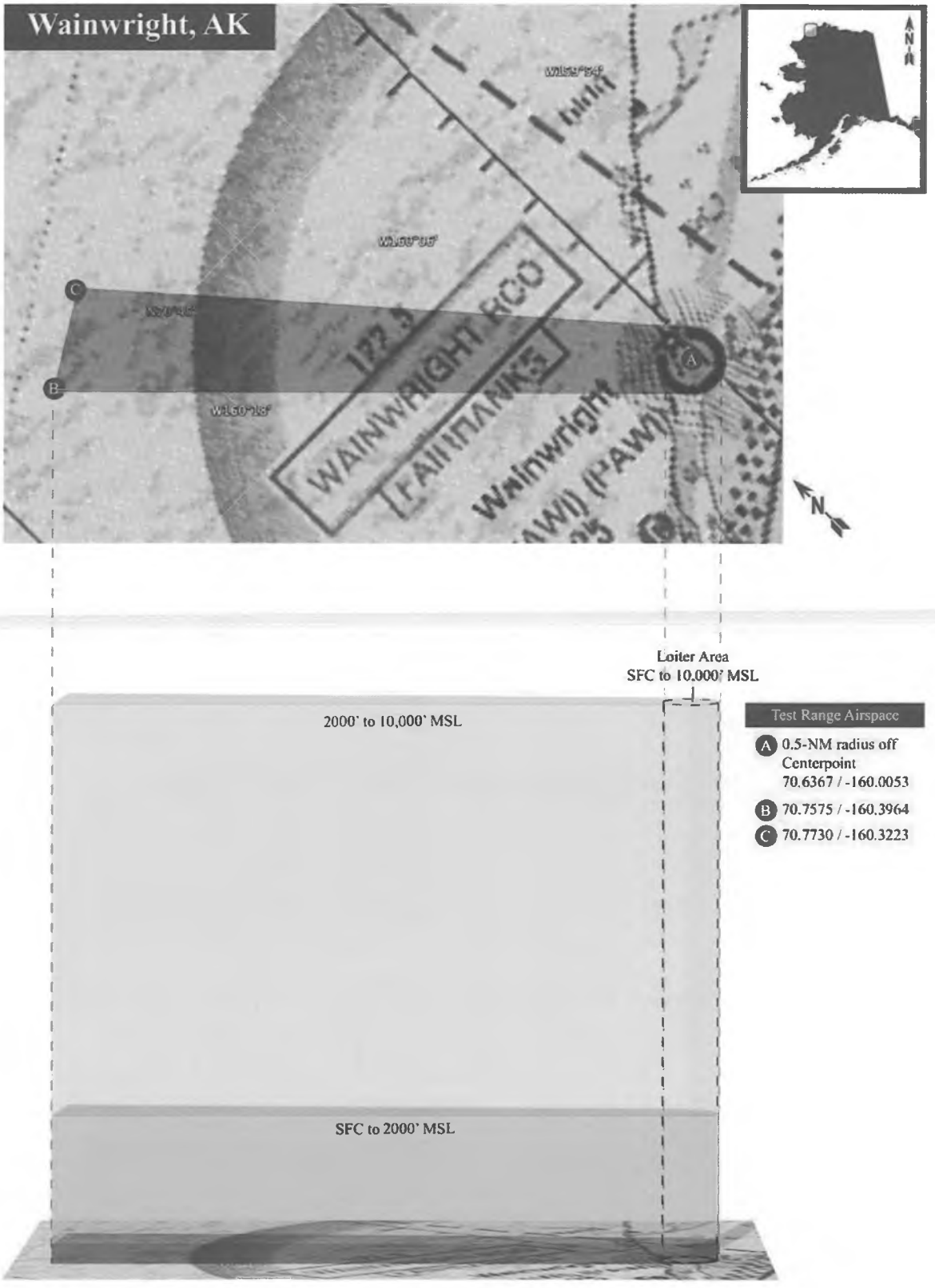
Test Range Airspace		
A 62.5000 / -148.8500	F 66.1668 / -145.0934	J 63.9364 / -145.8266
B 63.9653 / -148.0089	G 66.1692 / -141.0817	K 63.7156 / -145.9051
C 64.3756 / -147.9803	H 65.0000 / -141.0821	L 63.4974 / -145.9046
D 64.9000 / -146.9134	I 64.0000 / -143.0159	M 62.5000 / -146.7279
E 65.3505 / -146.0719		

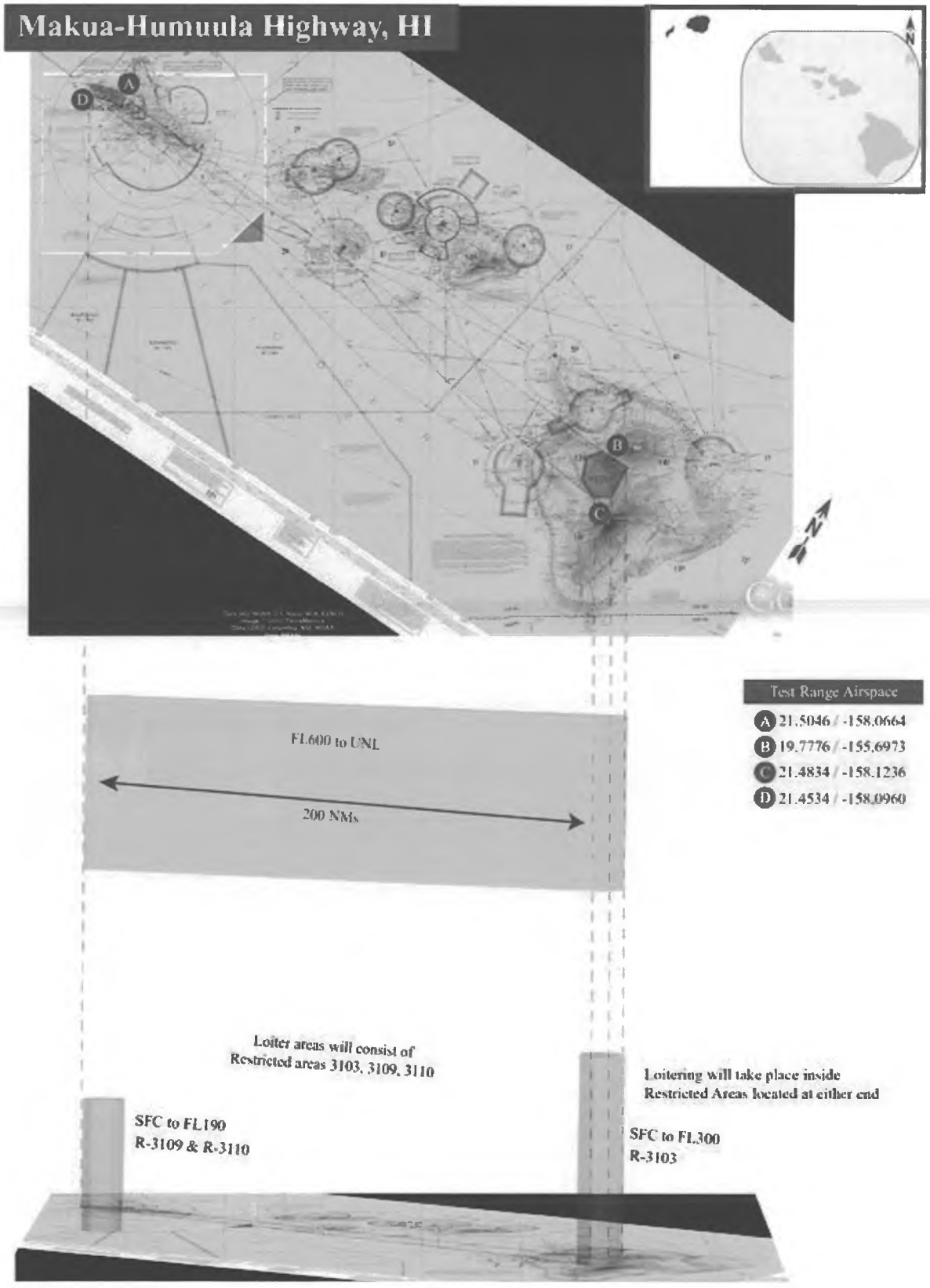

Kodiak Range, AK
INSET
ASKA ADIZ
Narrow Cape
Ugak Island
Shark Pt.
Gull Pt.
Bay
Loiter Area 1.5-NM Radius Centered
100' AGL to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7000' to 9000' MSL
4000' to 6000' MSL
1000' to 3000' MSL
100' AGL to 1000' MSL
SFC to 100' AGL
Test Range Airspace
A 57.4815 / -152.3244
B 57.4159 / -151.9348
C 57.1790 / -152.4419
D 57.4227 / -152.4838
E 57.4520 / -152.4473
F 57.4519 / -152.4299
G 57.4693 / -152.4290
H 57.4808 / -152.3576
I 57.3772 / -152.2822
For Radial arch info. from UGAK Island waypoint I, proceed on a heading of 78° 12 miles, then proceed along a southwestern arch to a point located 12 miles at sea on a heading of 200° from waypoint I.
Loiter Area
57.2395 / -152.1534
N

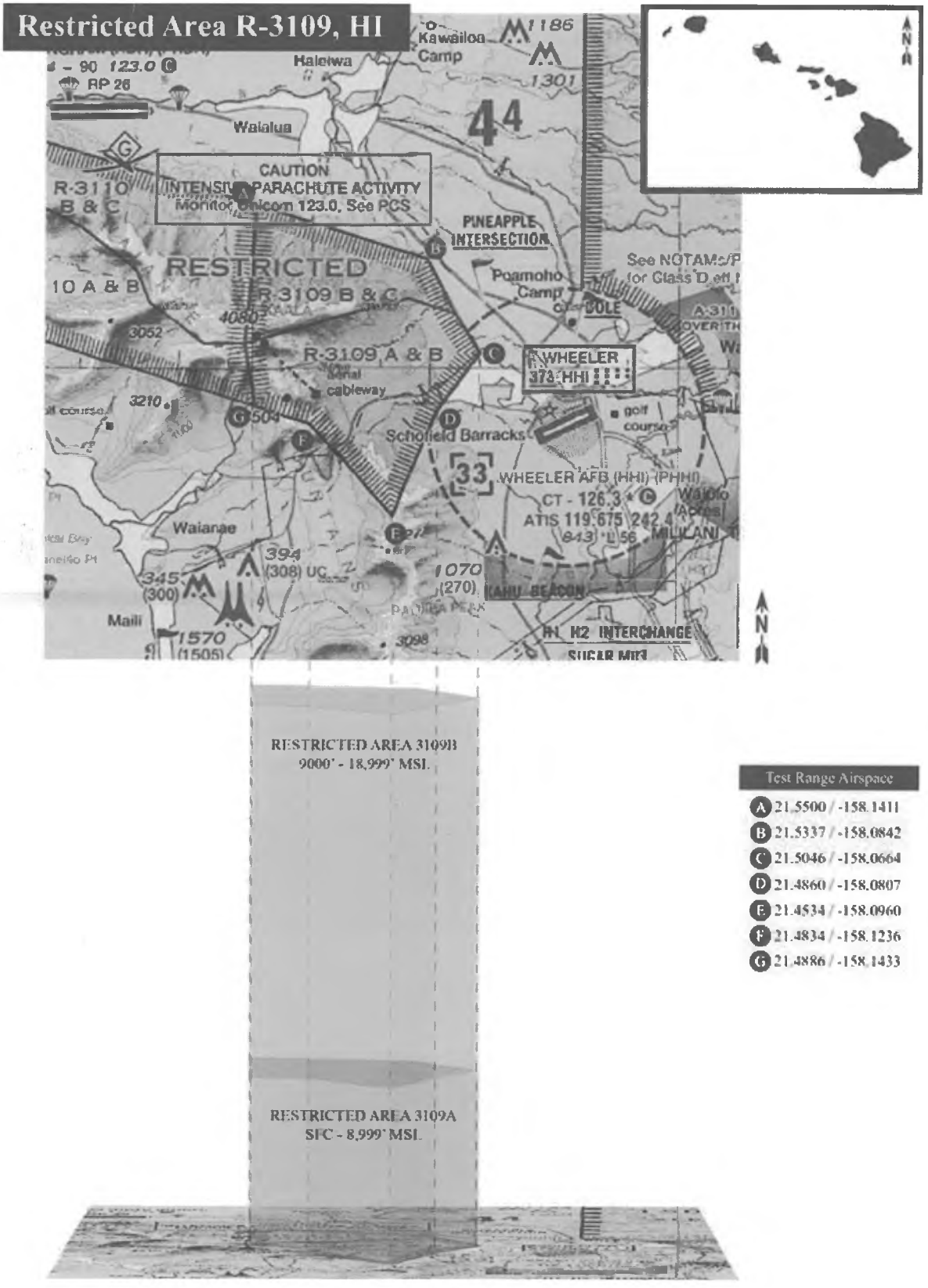

North Slope Range, AK
A
B
C
D
E
F
G
H
I
J
K
L
AK
Loiter Area 5-NM Radius Centered
SFC to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7,000' to 9,000' MSL
4,000' to 6,000' MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 70.7546 / -151.9966
B 70.6534 / -150.9988
C 70.6778 / -150.5719
D 70.7357 / -149.8734
E 70.6505 / -148.8415
F 70.5039 / -147.6605
G 70.4440 / -146.6543
H 70.3680 / -146.0000
70.0000 / -140.0000
J 68.3285 / -148.5001
D 68.3334 / -149.9980
70.0000 / -152.0000
Loiter Areas
70.4810 / -149.8555
70.1495 / -148.4516
68.4689 / -149.4859

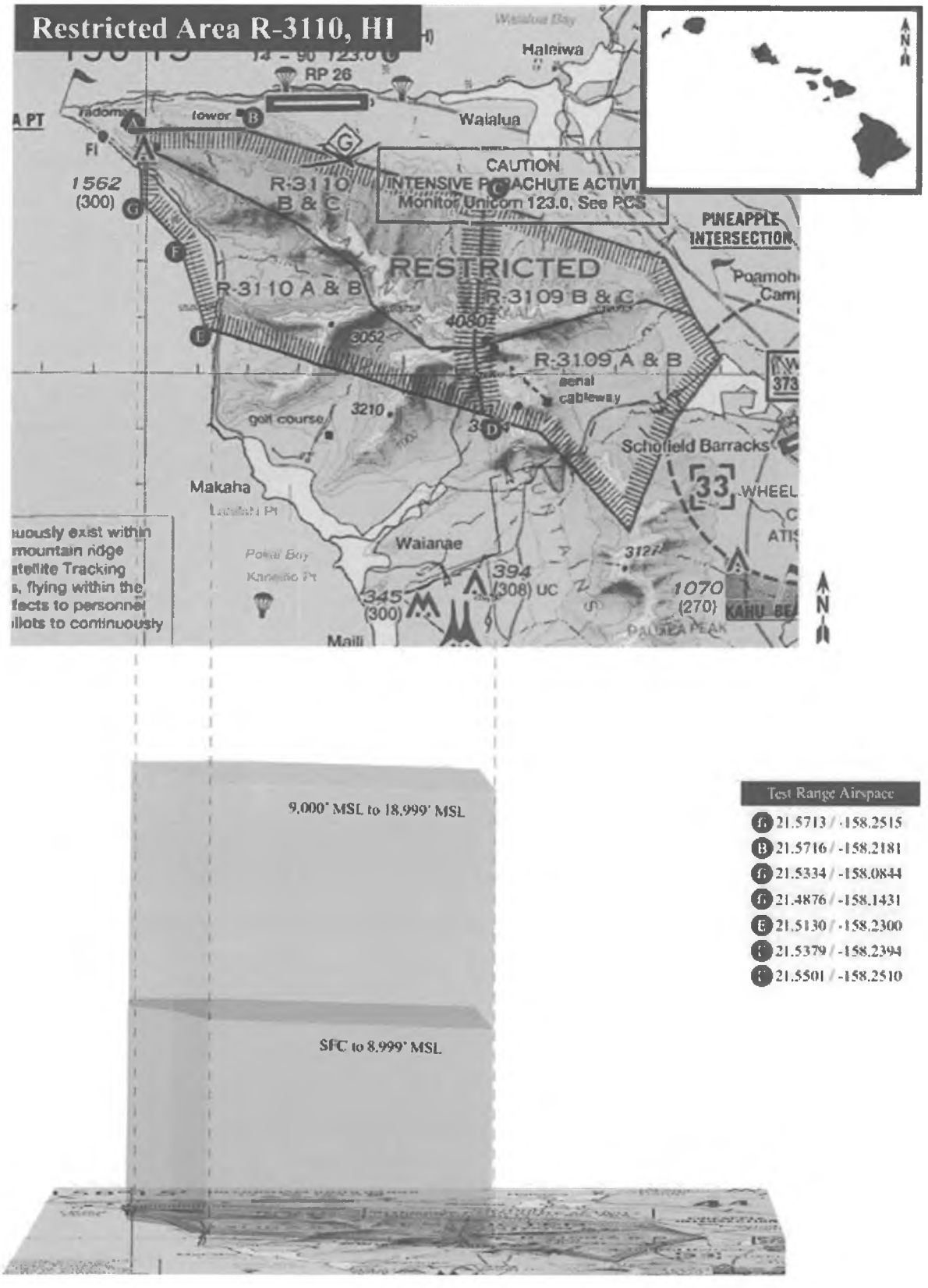

Oliktok, AK
Oliktok Pt
bldgs
Spy Is
bldgs
A
B
C
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 4.5-NM radius off Centerpoint 70.5113 / -149.8584
B 70.6840 / -150.0000
C 70.6835 / -149.8054


Poker Flat, AK
POKER FLAT RESEARCH RANGE
47
A17
162
Chatanika
Eldorado Camp
Dome Camp
Cleary Summit
buildings
cabins
cabin
FOX
Olnes
N
Loiter Area
5-NM Radius Centered
SFC to 10,000' MSL
2,500' MSL to 10,000' MSL
100' AGL to 2,500' MSL
SFC to 100' AGL
5-NM Radius
A 65.1203 / -147.4685
Loitering Area
65.1209 / -147.4683

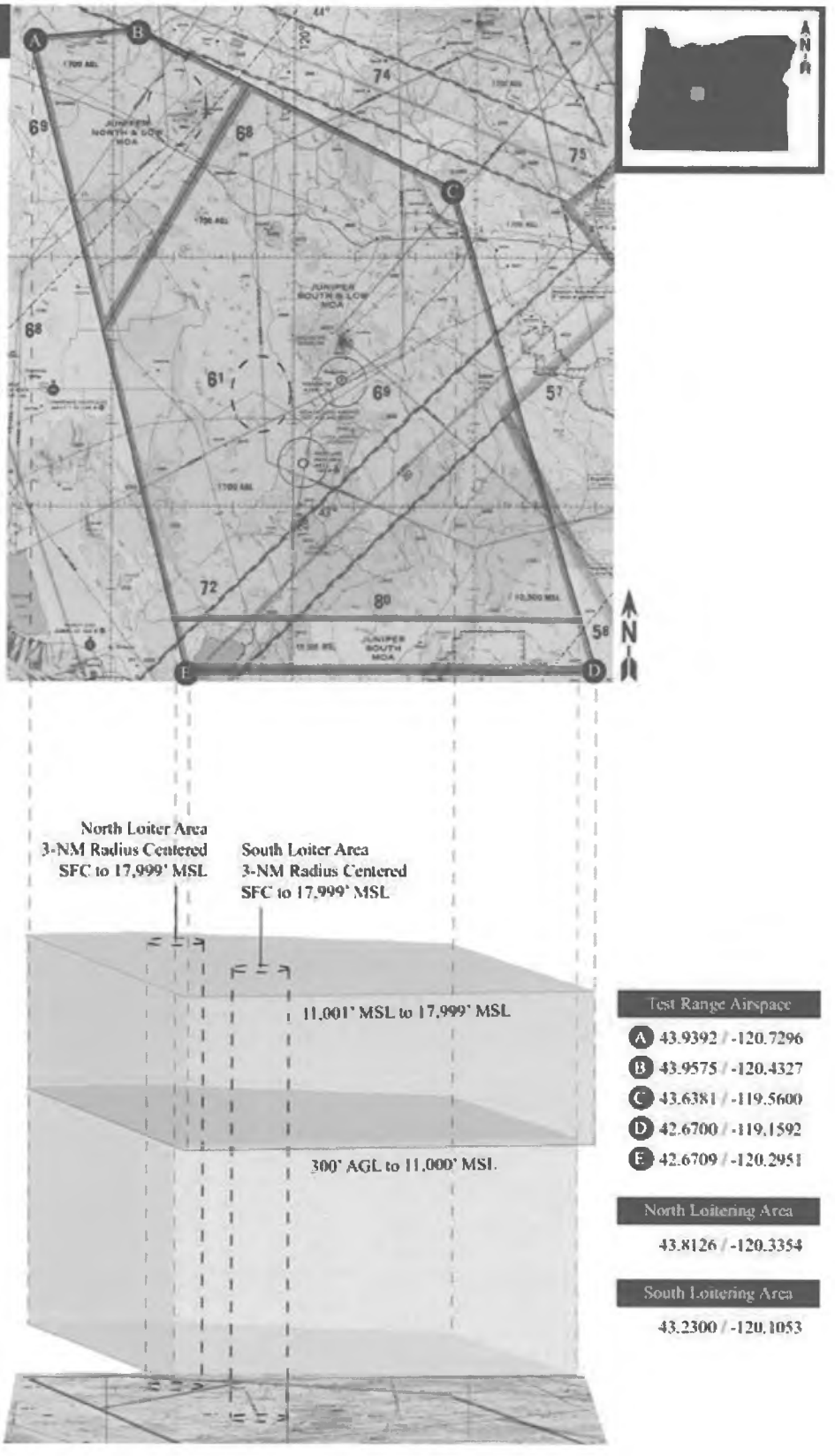

Wainwright, AK
WAINWRIGHT RCO
FAIRBANKS
Wainwright
(PAWI) (PAWI)
A
B
C
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 0.5-NM radius off Centerpoint 70.6367 / -160.0053
B 70.7575 / -160.3964
C 70.7730 / -160.3223


Makua-Humuula Highway, HI
A
D
B
C
N
Test Range Airspace
A 21.5046 / -158.0664
B 19.7776 / -155.6973
C 21.4834 / -158.1236
D 21.4534 / -158.0960
FL600 to UNL
200 NMs
Loiter areas will consist of
Restricted areas 3103, 3109, 3110
Loitering will take place inside
Restricted Areas located at either end
SFC to FL190
R-3109 & R-3110
SFC to FL300
R-3103


Restricted Area R-3109, HI
Kawailoa Camp
1186
1301
Haleiwa
RP 26
Waialua
44
CAUTION
INTENSIVE PARACHUTE ACTIVITY
Monitor Unicom 123.0, See PCS
R-3110 B & C
PINEAPPLE INTERSECTION
RESTRICTED
10 A & B
R-3109 B & C
Poamoho Camp
DOLE
See NOTAMs/P
for Class D eff
4080
3052
R-3109 A & B
WHEELER
373 HHI
cableway
3210
golf course
Schofield Barracks
33
WHEELER AFB (HHI) (PHHI)
CT - 126.3
ATIS 119.675 242.4
Waiawa
MILILANI
Waianae
394
(308) UC
345
(300)
1070
(270)
KAHU BEACON
Maili
1570
(1505)
3098
H1 H2 INTERCHANGE
SUGAR MILL
N
RESTRICTED AREA 3109B
9000' - 18,999' MSL
RESTRICTED AREA 3109A
SFC - 8,999' MSL
Test Range Airspace
A 21.5500 / -158.1411
B 21.5337 / -158.0842
C 21.5046 / -158.0664
D 21.4860 / -158.0807
E 21.4534 / -158.0960
F 21.4834 / -158.1236
G 21.4886 / -158.1433


Restricted Area R-3110, HI
Haleiwa
RP 26
Wahiawa
Waialua
tower
CAUTION
INTENSIVE PARACHUTE ACTIVITY
Monitor Unicom 123.0, See PCS
1562
(300)
R-3110
B & C
PINEAPPLE
INTERSECTION
RESTRICTED
R-3110 A & B
R-3109 B & C
4080
3052
R-3109 A & B
aerial
cableway
3210
golf course
Schofield Barracks
33
WHEEL
Makaha
Waianae
394
(308) UC
345
(300)
1070
(270)
KAHU
Maili
9,000' MSL to 18,999' MSL
SFC to 8,999' MSL
Test Range Airspace
G 21.5713 / -158.2515
B 21.5716 / -158.2181
G 21.5334 / -158.0844
G 21.4876 / -158.1431
E 21.5130 / -158.2300
C 21.5379 / -158.2394
C 21.5501 / -158.2510

Juniper, OR



Test Range Airspace

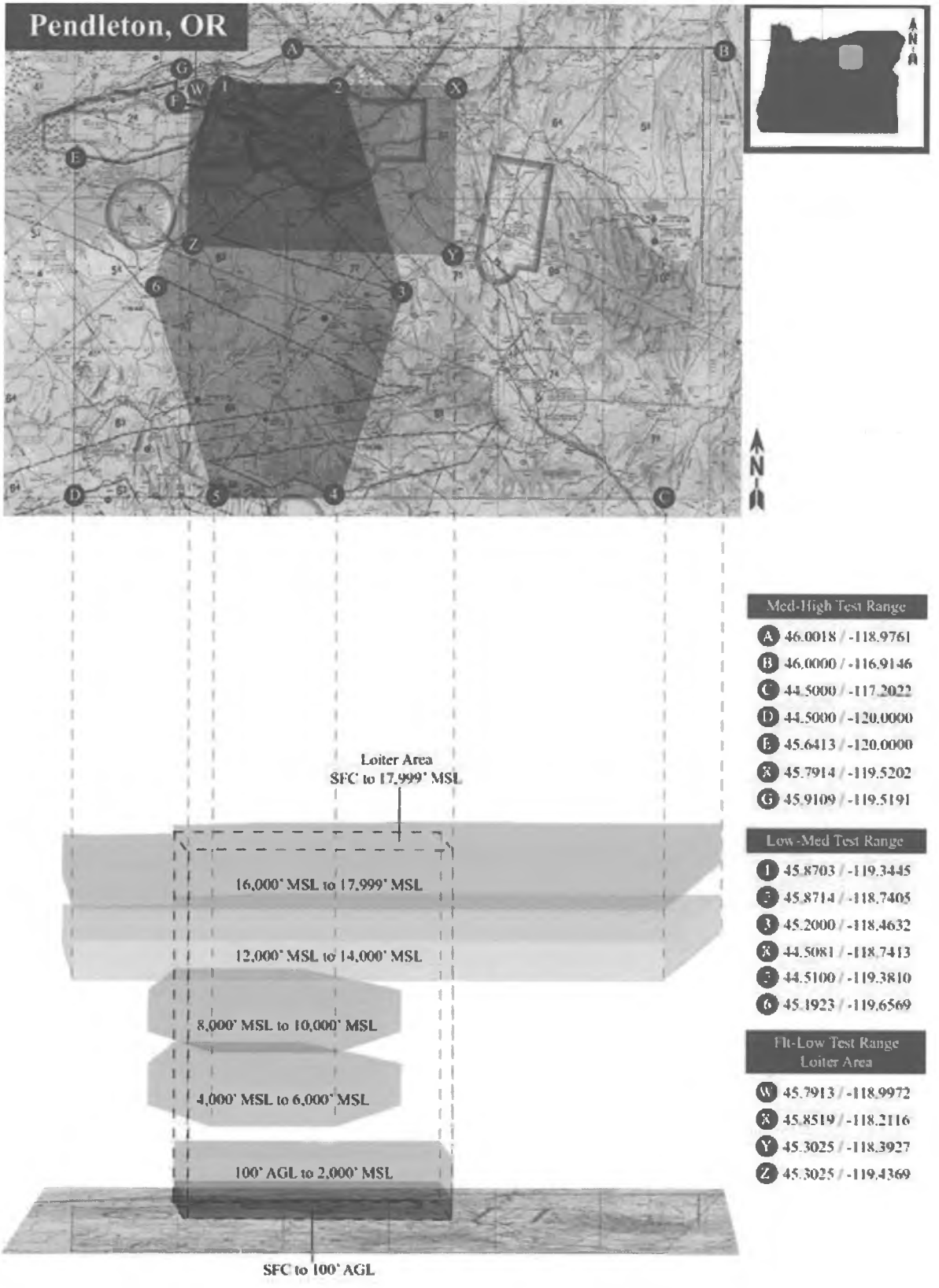
- A 43.9392 / -120.7296
- B 43.9575 / -120.4327
- C 43.6381 / -119.5600
- D 42.6700 / -119.1592
- E 42.6709 / -120.2951

North Loitering Area

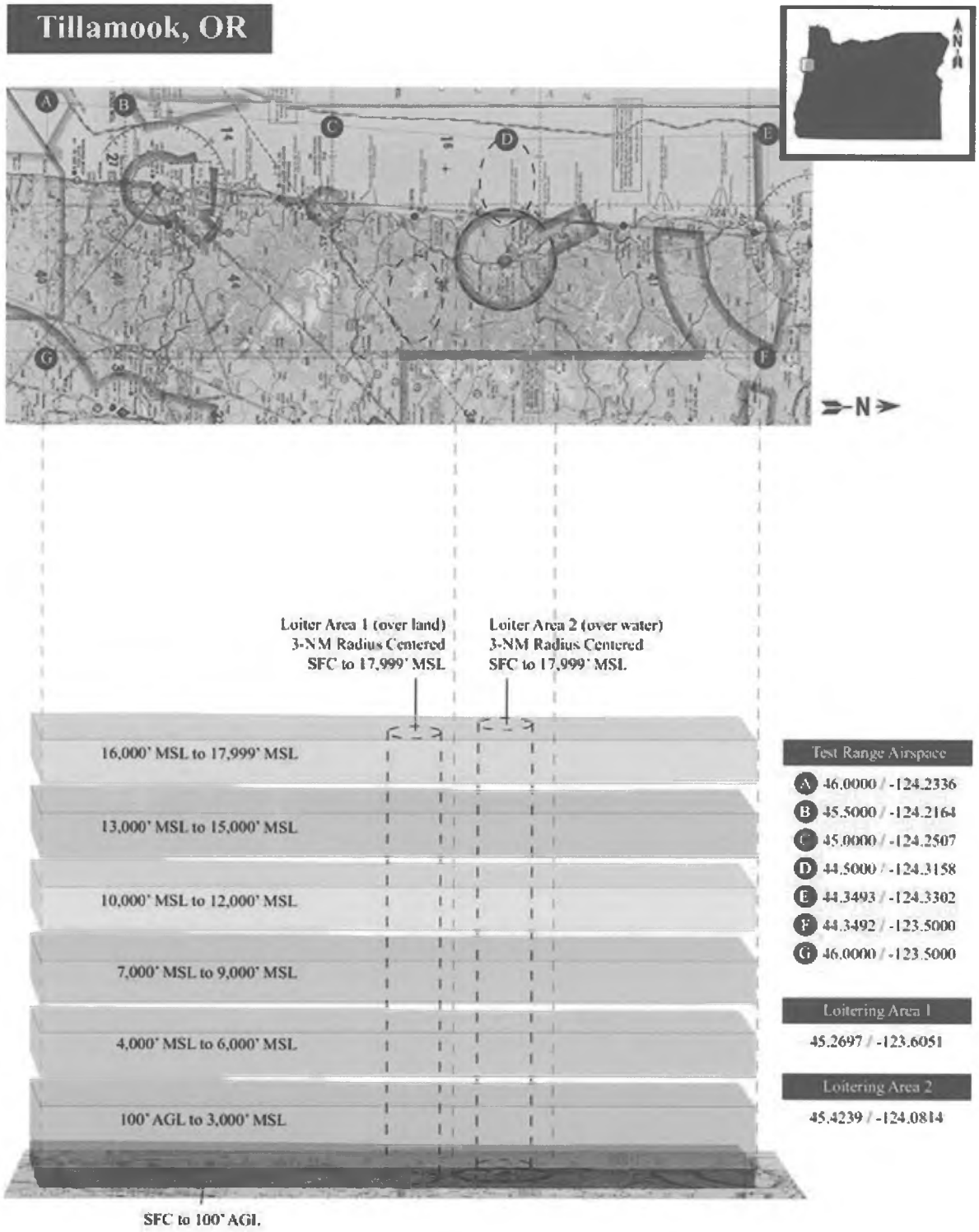
43.8126 / -120.3354

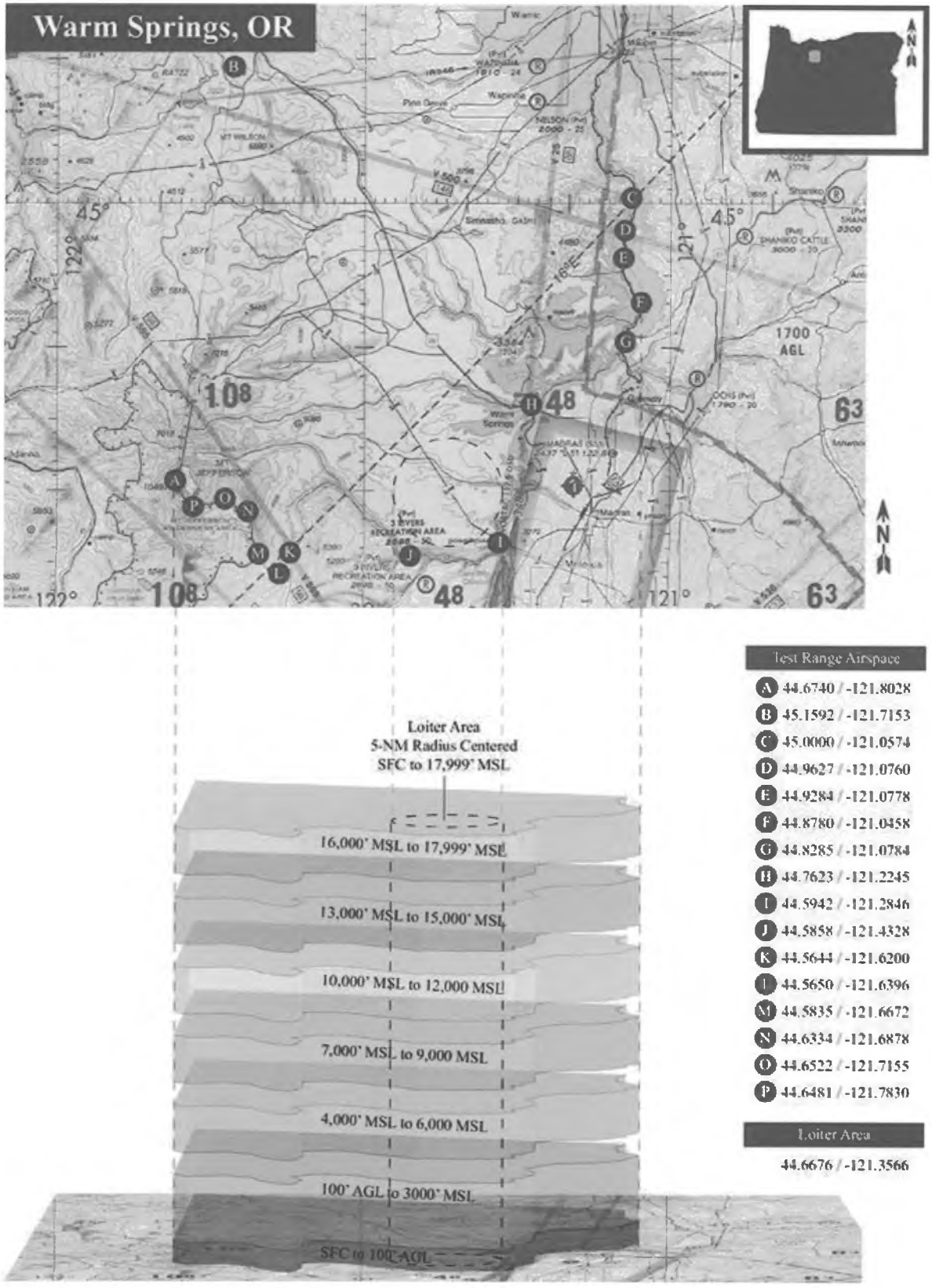
South Loitering Area

43.2300 / -120.1053


Pendleton, OR
A
B
C
D
E
F
G
W
1
2
X
Z
Y
6
3
5
4
N
Loiter Area
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
12,000' MSL to 14,000' MSL
8,000' MSL to 10,000' MSL
4,000' MSL to 6,000' MSL
100' AGL to 2,000' MSL
SFC to 100' AGL
Med-High Test Range
A 46.0018 / -118.9761
B 46.0000 / -116.9146
C 44.5000 / -117.2022
D 44.5000 / -120.0000
E 45.6413 / -120.0000
X 45.7914 / -119.5202
G 45.9109 / -119.5191
Low-Med Test Range
1 45.8703 / -119.3445
2 45.8714 / -118.7405
3 45.2000 / -118.4632
X 44.5081 / -118.7413
5 44.5100 / -119.3810
6 45.1923 / -119.6569
Flt-Low Test Range
Loiter Area
W 45.7913 / -118.9972
X 45.8519 / -118.2116
Y 45.3025 / -118.3927
Z 45.3025 / -119.4369

Tillamook, OR




Warm Springs, OR
Loiter Area
5-NM Radius Centered
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
13,000' MSL to 15,000' MSL
10,000' MSL to 12,000 MSL
7,000' MSL to 9,000 MSL
4,000' MSL to 6,000 MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 44.6740 / -121.8028
B 45.1592 / -121.7153
C 45.0000 / -121.0574
D 44.9627 / -121.0760
E 44.9284 / -121.0778
F 44.8780 / -121.0458
G 44.8285 / -121.0784
H 44.7623 / -121.2245
I 44.5942 / -121.2846
J 44.5858 / -121.4328
K 44.5644 / -121.6200
L 44.5650 / -121.6396
M 44.5835 / -121.6672
N 44.6334 / -121.6878
O 44.6522 / -121.7155
P 44.6481 / -121.7830
Loiter Area
44.6676 / -121.3566

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01/15/14 Interim Report to the Legislature

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Photos courtesy of Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks and Academy of Model Aeronautics.

Legislative Task Force on Unmanned Aircraft Systems

Interim Report to the Legislature

As required by Legislative Resolve 17 SLA-13

January 15, 2014

Legislative Task Force on Unmanned Aircraft Systems

Interim Report to the Legislature

As required by Legislative Resolve 17 SLA-13

January 15, 2014

Task Force Members:

Representative Shelley Hughes, Co-Chair

Senator Donny Olson, Co-Chair

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D LEGISLATIVE LEGAL SERVICES MEMO – ALASKA LAWS PROTECTING PRIVACY

E ECONOMIC IMPACT OF A PAN-PACIFIC UNMANNED AIRCRAFT SYSTEMS TEST SITE

ACRONYMS AND ABBREVIATIONS

AMA	Academy of Model Aeronautics
ASTM	American Society for Testing and Materials
AUVSI	Association for Unmanned Vehicle Systems International
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
COA	Certificate of Authorization
DHS	Department of Homeland Security
DOC	Department of Commerce
DoD	Department of Defense
DOT/PF	Alaska Department of Transportation/Public Facilities
FAA	Federal Aviation Administration
FMRA	FAA Modernization and Reform Act of 2012
GAO	Government Accountability Office
IACP	International Association of Chiefs of Police
ICAO	International Civil Aviation Organization
IPC	Interagency Policy Committee
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NextGen	Next Generation Air Transportation System
PPUTRC	Pan-Pacific UAS Test Range Complex
RT&D	Research, testing, and development
RTCA SC	Radio Technical Commission for Aeronautics Special Committee
SPC	Senior Policy Committee
STEM	Science, Technology, Engineering, and Math
UAS	Unmanned Aircraft Systems

EXECUTIVE SUMMARY

The Legislative Task Force on Unmanned Aircraft Systems (UAS) was formed under House Concurrent Resolution No. 6 to review regulations and guidance regarding UAS and provide recommendations for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of UAS for public and private applications.

In response to public concern, the Legislative Task Force on UAS (LTFUAS) reviewed multiple potential UAS scenarios focusing on privacy issues, economic development, public safety, anticipated mission types, and safety. LTFUAS evaluated existing privacy laws for Alaska to avoid recommending duplicative law for UAS, considered ways to encourage the economic development and safe uses of UAS in Alaska, and supported public education to address public reservations regarding UAS use in Alaska as well as provide information on the use of UAS for life-saving and other cost-saving and beneficial applications for dull, dirty and dangerous tasks.

LTFUAS concluded that the Federal Aviation Administration (FAA) is adequately addressing the safety concerns of integrating UAS into the National Airspace System (NAS). FAA Guideline N 8900.227 clearly states the requirements for the aircraft, pilot training and responsibilities, and the expectations of the test sites for safe operations of UAS. The FAA guidelines provided LTFUAS assurance that unmanned aircraft can be operated safely in Alaska.

After understanding the role of the FAA and safety goals for integration of UAS into the NAS, the LTFUAS makes the following recommendations.

1. All state and local law enforcement entities should adopt the International Association of Chiefs of Police (IACP) guidelines to help ensure privacy protection for Alaskans.

2. All law enforcement entities must first obtain a court order to use UAS over private property for criminal investigation against any person.

3. Encourage all law enforcement entities to use high-visibility marking or navigational lighting on law enforcement UAS as appropriate.

4. Convey a clear message to industry that Alaska is open for business to harness the beneficial uses of UAS, to encourage the growth of this economic sector, and to allow Alaska to continue to lead the nation in aviation innovation.

5. Encourage private and public UAS training programs.

6. Report all UAS incidents/accidents of aircraft larger than 55 pounds to the University of Alaska and/or Alaska Aviation Coordination Council.

7. Extend LTFUAS until June 30, 2017, and expand the duties of the Task Force with the addition of one member representing the Alaska Department of Transportation/Public Facilities (DOT/PF) and one public member, for the following reasons:

- During this transitional phase of growing use of UAS in Alaska, the LTFUAS should be extended to continue to monitor the integration and any privacy matters that may arise that are not already covered by existing law. Because Alaska currently has a strong set of privacy laws, rather than recommend prohibitions be incorporated into statute that might inhibit industry, the LTFUAS recommends it continue to review UAS operations in light of current statutes and only recommend changes in statute as necessary.

- Because FAA will be updating and issuing new guidelines based on the work of the new FAA UAS test sites announced on December 30, 2013, it is necessary for the LTFUAS to continue to review FAA policies to determine their impact and whether any additional policy changes at the state level may be necessary in response.

- With Alaska's recent selection as one of the nation's six UAS test sites through the University of Alaska's application (in conjunction with Oregon and Hawaii), the LTFUAS will meet part of the test site's requirement as a public forum where concerns regarding privacy and data matters can be collected and evaluated.

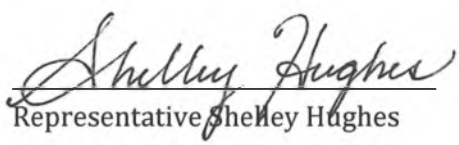
As we move forward, and particularly in light of the fact that Alaska has been selected as an FAA test site for UAS integration, and with the extension and expansion of duties of the Task Force, we continue emphasis on:

1) management of the test ranges,
2) economic development opportunities,
3) public education and public relations regarding UAS, and
4) difference between model aircraft and UAS.

In addition to the above seven recommendations, the Task Force also recommends the following:

1) each department of the State of Alaska identify a point of contact for UAS to coordinate with the LTFUAS and provide information regarding department policy and procedures to ensure accountability and privacy in regard to UAS use, and

2) the Alaska Department of Administration review and update its data retention policies particularly in the area of inadvertent captured data that is not relevant to a state agency.



Representative Shelley Hughes

Senator Donny Olson

1. INTRODUCTION

House Concurrent Resolution No. 6 formed the Legislative Task Force on Unmanned Aircraft Systems (UAS) to:

- review regulations and guidance from the Federal Aviation Administration (FAA) regarding UAS;
- provide written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of UAS for public and private applications; and
- submit a final report to the Legislature.

The Legislative Task Force on UAS (LTFUAS) met in 2013 on July 24 and October 2 via teleconference and twice in person October 23-24 and November 26 to respond to the concerns Alaskans have raised regarding unmanned aircraft use in Alaska. The LTFUAS:

- reviewed regulations and guidance from the FAA, International Association of Chiefs of Police (IACP), and multiple related recommendations for UAS operations;
- received hours of public testimony and written public testimony; and
- compiled recommendations and suggested legislation for the use of UAS for public and private applications in Alaska that are protective of privacy.

The LTFUAS considered two approaches to regulating the use of UAS in Alaska:

1. restrict the industry and adopt exemptions for specific kinds of approved uses, or
2. generally allow UAS operations in Alaska and adopt the necessary privacy, operations, and other guidelines that seem necessary to protect Alaskans.

The LTFUAS adopted the second approach and emphasized that educating the public will be an important part of integrating this technology safely and for the benefit of Alaskans.

The LTFUAS concluded that the FAA is adequately addressing the safety concerns of integrating UAS in the National Airspace System (NAS). FAA Guideline N 8900.227 spells out the details of operating UAS by clearly stating the requirements of the aircraft, pilot training and responsibilities, and the expectations of the FAA UAS Test Sites.[1] The rules outlined in the guidelines provided the LTFUAS assurance that unmanned aircraft can be operated safely in Alaska.

The FAA also recently released its Final Privacy Requirements in November 2013. The privacy document from the FAA clearly identified that while it governs the NAS, local governments will assume the responsibility of addressing privacy concerns.

[1] Notice N 8900.227, Subj: Unmanned Aircraft Systems (UAS) Operation Approval. Effective Date 7/30/13, Cancellation Date 7/30/14. Available at http://www.faa.gov/documentLibrary/media/Notice/N_8900.227.pdf

Alaskans are fortunate to have a state constitution and state law that provide some of the greatest privacy protections compared to other states. As the LTFUAS reviewed multiple scenarios for misuse of the UAS, it determined that existing laws would apply, are sufficiently protective of privacy, and penalties are already in place to address inappropriate behavior.

When studying the many possible scenarios for misuse, the LTFUAS returned repeatedly to the premise that an unmanned aircraft is a tool; the operator needs to be considered for breaches of privacy or harming another.

This report presents the findings of the LTFUAS resulting from LTFUAS meetings, public testimony, research, and information from industry experts in pursuit of the assigned duties listed above.

1.1 Background and Planning

The earliest UAS was A.M. Low's "Aerial Target" of 1916 during World War I. The flight lasted 12 seconds. Over the last 50 years, rapid advances in aviation technology have transformed the world's skies. In the United States, the NAS has evolved to include a variety of fixed-wing and rotary aircraft operating across the country in metropolitan areas to remote airfields. As aircraft technology expands, so do the challenges associated with managing safe skies. UAS have created a critical integration challenge for the FAA as they are flown in an environment that was originally developed for manned aircraft.

1.1.1 Federal

In 2008, the Government Accountability Office (GAO) reported that the United States must develop a clear and common understanding of what is required to safely and routinely operate UAS in the NAS. Congress enacted the FAA Modernization and Reform Act of 2012 (FMRA). Through this act, Congress set forth a number of specific requirements for achieving UAS integration—namely a UAS Comprehensive Plan[2] and a five-year Roadmap.[3]

In April 2012 under the guidance of the Next Generation Air Transportation System (NextGen) Implementation Plan Senior Policy Committee (SPC), the Joint Planning and Development Office assembled the Departments of Transportation (DOT), Defense (DoD), Commerce (DOC), and Homeland Security (DHS) as well as the National Aeronautics and Space Administration (NASA) and the FAA to develop the UAS Comprehensive Plan. The UAS Comprehensive Plan sets the overarching integration of UAS into the NAS. The plan also supports the coordination and integration of research and development necessary to achieve UAS integration goals by 2015 (Title 14 of the Code of Federal Regulations, Part 91 [14 CFR 91]; Appendix A).

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[2] Unmanned Aircraft Systems (UAS) Comprehensive Plan. September 2013. Prepared by the Joint Planning and Development Office. Available at http://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.pdf

[3] Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration. Available at http://www.faa.gov/about/initiatives/uas/media/uas_roadmap_2013.pdf

1.1.2 Federal and State Collaboration

One part of the UAS Comprehensive Plan included a priority for UAS research and development. NextGen developed the *NextGen UAS Research, Development and Demonstration Roadmap*,[4] and the FAA initiated a program for test ranges in accordance with the FMRA. In response to the FAA's solicitation for applications, the University of Alaska Fairbanks teamed with the States of Oregon and Hawaii and submitted the Pan-Pacific UAS Test Range Complex application.

On December 30, the FAA announced that Alaska was one of six states selected as a test site for safe operations and integration studies. The University of Alaska Fairbanks plans to work on state monitoring, navigation and safety standards.

1.1.3 State

Anticipating the integration of UAS in Alaska's NAS and the probable selection of Alaska as an FAA test site, HCR6 was passed to establish a task force to consider the implications of bringing this new technology to Alaska as early as spring 2014.

The FAA also recently released its Final Privacy Requirements in November 2013. The privacy document from the FAA clearly identified that while it governs the NAS, local governments will assume the responsibility of addressing privacy concerns.

Flight safety will continue to be monitored by the FAA. The State of Alaska will develop additional safety rules that pertain to specific kinds of UAS operations and will address the concern of personal privacy.

The LTFUAS approach is to responsibly embrace the positive uses of UAS without overregulating the industry and thus hindering economic opportunity. In addition to accepting the use of UAS in Alaska, the LTFUAS recognizes that public perception is greatly influenced through media reports, such as military flights in war zones. The public appears hesitant to allow UAS in Alaska due to fear of invasion of personal privacy and overreaching law enforcement.

1.2 Future of UAS in Our Skies

The FAA is expediting the planning and integration of UAS in the NAS because of the rapid advancements in this technology and the global response to the wide variety of uses by UAS. Unmanned aircraft will become part of our economy, transportation system, public safety, and much more.

Protecting the privacy of our citizens is the most important concern of the LTFUAS, and it remains at the forefront of each application of UAS missions. Alaska must respond quickly to this new technology in three ways: (1) support the integration of UAS in our airspace, (2) develop a forum to

[4] Next Generation Air Transportation System, NextGen UAS Research, Development and Demonstration Roadmap. Version 1.0, March 15, 2012. Available at http://www.jpdo.gov/library/20120315_UAS%20RDandD%20Roadmap.pdf

review concerns and recommend legislation, and (3) educate the public. All of these approaches must work in unison to be successful and maintain personal privacy.

The UAS industry is changing as quickly as your imagination can conjure a new application for use. During the first week of December 2013, some headlines included:

- HexaCopter Used to Smuggle Contraband into Prison (Georgia, USA) ... similar report of misuse in Quebec, Canada, prisons.
- New Wave Energy wants to put power plants in the sky (London)... plans to build the first high altitude aerial power plant, using networks of unmanned aircraft that can harvest energy from multiple sources and transmit it wirelessly to receiving stations on the ground.
- ARA Nighthawk UAS Demonstrates Search and Rescue and Accident Reconstruction Value (Vermont State Police)... could provide benefits far outweighing (privacy) concerns.
- U.S. Navy Launches UAS from Submerged Submarine (Office of Naval Research)... rose to the ocean surface and then completed a vertical launch as part of its 12-hour mission.
- Louisville Hosts Quadcopter Battle (Louisville, KY)... you must be willing to remain in the same room as the quadcopter if the controls are given to a psychopathic 12 year old.
- United Nations UAS Deployment Debuts in Congo (Africa)... for the purposes of monitoring the volatile border with Rwanda and Uganda.

- Domino's UK tests pizza-delivering drones... the DomiCopter is undergoing further testing in the United Kingdom. (Other names previously considered included the "Pepperdroney" and the "Flyin' Hawaiian."
- Parrot Drones "Vulnerable to Flying Hack Attack" (Cambridge University, UK)... security researcher has created a flying contraption that can hijack control of other UAS ... this comes with new vocabulary "hackerspace."
- World's Smallest Quadcopter for Under $40 ... and it weighs only four-tenths of an ounce.

- UAS to Save and Change Lives (Philippines)... disaster relief.
- Robots of the Serengeti (Tanzania)... poaching surveillance.
- Amazon.com Delivery... spoof article, for now.
- Precision Farming Forum in Oregon to Examine UAS Technology in Agriculture ... presumed one of the most significant cost savings and deployment for UAS uses.

- Arinc Incorporated announced that it has partnered with the Anne Arundel County Public School System (AACPS) to develop a class on UAS for students participating in the Science, Technology, Engineering, and Math (STEM) magnet program. The course is believed to be the first of its kind in the nation for high school students.

Nearly every country on the planet is preparing for UAS in efforts that range from military actions and border patrol to research and development of UAS technology.

2. FEDERAL AVIATION ADMINISTRATION—SAFETY AND PRIVACY

From *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap*:

"Since the early 1990s, unmanned aircraft systems (UAS) have operated on a limited basis in the National Airspace System (NAS). Until recently, UAS mainly supported public operations, such as military and border security operations. The list of potential uses is now rapidly expanding to encompass a broad range of other activities, including aerial photography, surveying land and crops, communications and broadcast, monitoring forest fires and environmental conditions, and protecting critical infrastructures.

The FAA created the Unmanned Aircraft Systems Integration Office to facilitate integration of UAS safely and efficiently into the NAS. Toward that goal, the FAA is collaborating with a broad spectrum of stakeholders, which includes manufacturers, commercial vendors, industry trade associations, technical standards organizations, academic institutions, research and development centers, governmental agencies, and other regulators."[5]

FAA 'Roadmap'

"Ultimately, UAS must be integrated into the NAS without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies."

2.1 Safety Guidelines

The LTFUAS studied the FAA Guidelines for the Operations of Unmanned Aircraft Systems, participated in a presentation of the guidelines from Ro Bailey, Deputy Director of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks, and sought comments from representatives of the FAA. FAA Guideline N 8900.227 provides the most current guidelines for federal approval of operating unmanned aircraft.[6]

The LTFUAS recognizes that the FAA manages the safety of the national airspace and has adopted extensive guidelines regarding aircraft certification, pilot training and certification, and approval process for flights (or missions). The FAA Guideline N 8900.227 also provides detailed requirements for the operations of pending test sites and the current approval of flights in designated areas for specific purposes. The FAA pre-approves UAS missions and awards a Certificate of Authorization (COA) that identifies the details of the mission. This process is tightly scrutinized, and the entity flying the UAS is accountable to the FAA under the details of the COA.

[5] Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration. Available at http://www.faa.gov/about/initiatives/uas/media/uas_roadmap_2013.pdf

[6] Notice N 8900.227, Subj: Unmanned Aircraft Systems (UAS) Operation Approval. Effective Date 7/30/13, Cancellation Date 7/30/14. Available at http://www.faa.gov/documentLibrary/media/Notice/N_8900.227.pdf

The COA approval process gives the LTFUAS confidence that safety of the national airspace is adequately considered and that UAS missions will not invade personal privacy or operate inappropriately.

It is the opinion of the LTFUAS that no additional statutory or regulatory requirements are needed for FAA-approved missions.

2.2 Privacy Concerns

2.2.1 FAA Final Privacy Requirements

The FAA recently published its Final Privacy Requirements, November 7, 2013 (Appendix A) regarding unmanned aircraft. The FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the test sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

FAA Final Privacy Requirements

On February 22, 2013, the FAA requested public comment on the proposed privacy requirements for UAS test sites that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012.

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session.

The public comments were grouped into 10 categories, and the FAA provided a response to each category. You can view all categories, comments and responses in the document provided in Appendix A.

From the FAA Final Privacy Requirements:

There was substantial difference of opinion among commenters as to whether the UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy restrictions on UAS operations at the test sites. In addition, there was substantial difference of opinion regarding what elements would be appropriate for a test site privacy policy.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons.

First, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the test sites.

Test Site Requirements

1. *Test site operators must maintain a record of all UAS operating in the test sites;*
2. *Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and*
3. *Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.*

Second, the FAA believes that the test site operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each test site.

Third, if UAS operations at a test site raise privacy concerns that are not adequately addressed by the test site's privacy policies, elected officials can weigh the benefits and costs of additional privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS.

Conclusion: Based on the comments submitted, the FAA intends to require each test site operator to comply with all of the privacy requirements included in the Draft Privacy Requirements as well as the following additional privacy requirements:

1. Test site operators must maintain a record of all UAS operating in the test sites;
2. Test site operators must require every UAS operator in the test site to have a written plan for the operator's use and retention of data collected by the UAS; and
3. Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices, and share those outcomes annually in a public forum with an opportunity for public feedback.

It is the opinion of the LTFUAS that privacy policy is adequate through the FAA requirements for the use of UAS in the test sites.

2.2.2 Privacy and Civil Liberties Consideration

The FAA is implementing a UAS Test Site Program to help the FAA gain better understanding of operational issues relating to UAS. Although the FAA's mission does not include developing or enforcing policies pertaining to privacy or civil liberties, experience with the UAS test sites will present an opportunity to enhance the dialogue in the Interagency Policy Committee (IPC) and other interagency forums concerning the use of UAS technologies and the areas of privacy and civil liberties.

> *The Fourth Amendment is central to the privacy issues with respect to government UAS operation. Although the Supreme Court has never explicitly considered the question of UAS privacy, there is a long list of relevant precedents. Among them are several cases from the 1980s that specifically considered aerial observations and the Fourth Amendment.*

Homeland Security

95,000 miles of maritime border security includes joint operations with the U.S. Coast Guard. Some of those miles include Alaska coastline.

2.2.3 Homeland Security Privacy Impact Assessment

U.S. Customs and Border Protection (CBP) is responsible for guarding nearly 7,000 miles of land border, 2,000 miles of coastal waters, and 95,000 miles of maritime border. CBP employs several types of aircraft to achieve its mission objectives including UAS. COAs have been

authorized in Arizona, Texas, Florida, and North Dakota. When deploying resources for operations, the Office of Air and Marine must determine the availability of aircraft type and the integration of the requested activity into its flight operations.

Homeland Security addressed privacy in the Privacy Impact Assessment published September 9, 2013. A summary of privacy concerns addressed in their document includes:

- The collection and use of data from aerial surveillance remains within the scope of its authorities to protect the border and provide support for law enforcement activities while continuing to preserve a person's right to privacy.
- UAS present a perceived risk because they are able to fly for longer periods of time and conduct surveillance relatively undetected. While UAS can fly for longer periods of time, they are equipped with the same technology to conduct surveillance that is presently deployed on manned aircraft.
- Concern for the security of the UAS itself and the potential for hijacking of the unmanned aircraft are managed by the close monitoring of ground control and satellite communication by encrypted data. If one ground station were to lose contact, a second ground station is equipped to pick up the UAS and continue operations.

3. ALASKA STATE LAW—SAFETY AND PRIVACY

The LTFUAS is confident that the FAA will regulate safety of UAS flights in Alaska. While safety is critically important, the LTFUAS also recognizes that certain codes of conduct must be followed to ensure harmonious UAS operations in Alaska.

3.1.1 Self-Regulation by Three National Organizations

The LTFUAS considered the recommendations of the following three national organizations that have adopted rules and codes of conduct regarding UAS operations. The LTFUAS adopted the IACP rules in the legislation to be introduced this session.

- **IACP:** International Association of Chiefs of Police Recommended Guidelines (Appendix B) for the use of Unmanned Aircraft was adopted in August 2012. The Alaska Department of Public Safety has also adopted these guidelines as their doctrine with the exception of increasing the flight approval responsibility from a "supervisor" to the director's office.

- **AUVSI:** Association for Unmanned Vehicle Systems International states: "As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct."[7]

- **AMA**: Academy of Model Aeronautics' *AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View. Failsafe. Stabilization and Autopilot Systems* guides model aircraft operators.[8]

In the same manner that the FAA does not regulate model aeronautics, the LTFUAS does not intend to adopt requirements of hobbyist activities using UAS.

3.1.2 Model Aircraft Rules and Definitions

The technology differences between unmanned aircraft systems and model aircraft used for sport or recreation use is narrowing each day. Technology is advancing by leaps and bounds, while at the same time becoming more affordable and integrated into off-the-shelf-systems for consumers and hobbyists. While there are many technical documents and references through the FAA Modernization and Reform Act, the general difference between UAS and model aeronautics is the operation and intent of the operator not the aircraft.

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[7] Unmanned Aircraft System Operations Industry "Code of Conduct." Accessed January 13, 2014. Available at http://www.auvsi.org/conduct

[8] AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems. Revision 07/20/2013. AMA Advanced Flight Systems Committee Report 101. Available at http://www.modelaircraft.org/files/AFSCREPORT101.pdf

If the activity or intent of the activity is used for commercial operations or contributing to the creation of a product or service, it is considered commercial activity and it is subject to the FAA regulations and rule as stated in the FAA Modernization and Reform Act of 2012 and FAA UAS Road Map 2013.

If the activity is for sport and recreation use as defined by FAA SEC 336 SPECIAL RULE FOR MODEL AIRCRAFT of the Modernization Act, it is controlled by a cooperative agreement between the FAA and a Community Based Organization (CBO), such as the Academy of Model Aeronautics (AMA).

The AMA has been successful in self-regulating operations for hobbyists and aviation safety for over 77 years. During those 77 years, the AMA faced many challenges of new technologies such as analog to digital radio, coordinating operations within the airspace and the ever changing aircraft designs and capabilities not unlike the latest multi rotor and First Person View (FPV) capabilities. To address the current safety requirements and interest of model aircraft operators, the AMA has developed and updated its general safety code AMA Publication 105-Safety Code and it Advanced Aircraft rules publication 550-First Person View and 560-Autopilot effective Jan 1, 2014 to keep up with the FAA rule making and technology advances. Refer to Appendix C.

It was discussed that a notice should be provided at the time of purchase of each model aircraft to review the AMA flight operation guidelines for appropriate use of model aeronautics. The LTFUAS did not adopt a requirement for notice regarding hobbyists since so many aircraft are purchased outside of Alaska and would not be required to provide the notice.

Legal Services

Constitutional Protection of Privacy: *The Constitution of the State of Alaska explicitly protects the right of privacy against government intrusion. Art. I, sec. 22 provides: "The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section."*

Alaska Statutory Protections:

AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means

AS 11.61.116 Sending an explicit image of a minor

AS 11.61.120(a)(6) Harassment: publishing or distributing certain images

AS 11.61.123 Indecent viewing or photography

AS 11.76.113 Misconduct involving confidential information in the first degree

AS 11.76.115 Misconduct involving confidential information in the second degree

3.1.3 Alaska State Law and Personal Privacy

The State of Alaska and its local governments cannot dictate the use of the national airspace but can consider rules that better define the FAA guidelines, can consider legal repercussion for entities found in violation of adopted laws, and can provide for specific privacy laws regarding the use of UAS in Alaska.

The State of Alaska Constitution provides privacy protection, "although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. Both the Alaska Constitution and the Fourth Amendment to the United States Constitution require a warrant by a

governmental agency for the search of a place where a person has a reasonable expectation of privacy."[9]

Although much attention regarding UAS privacy focuses on government use and the Fourth Amendment, it is non-governmental use that is likely to raise some of the most significant privacy challenges in coming years. For private entities, the key constitutional question is the extent of their First Amendment privilege to gather information.

Civil use of unmanned aircraft will fall under the federal and state laws including such provisions as trespassing, invasion of privacy, intrusion upon seclusion, publication of private facts, stalking and harassment, and business privacy.

The LTFUAS, with guidance from Legislative Legal Services, considered many scenarios of possible violations of state and federal law that might occur with the use of unmanned aircraft. Legislative Legal Services provided the document, *Observations from Above: Unmanned Aircraft Systems and Privacy*,[10] that presented a variety of scenarios that have been tried in court and some that should be discussed as they pertain to UAS and personal privacy. The Legal Services memo outlining the areas of statute that protect personal privacy can be found in Appendix D.

Privacy protection considerations reviewed by the LTFUAS include but are not limited to the following.

1. **If data is gathered by a government agency, it is a public record. However, AS 40.20.120 provides certain protections for private information. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information and whether the person whose actions have been captured has a reasonable expectation of privacy.**

It was discussed that data captured by a government-operated UAS would be treated similarly to data captured by other technology such as cell phones, manned aircraft, satellite images, voice recorders, etc. Case law is substantial in determining if the person would be considered to have a reasonable expectation of privacy and when a warrant would be required to obtain and use any data collected.

CH 48 (HB65) SLA08 Personal Information Protection Act also addresses the collection, storage, and breach of privacy. This act would include any data captured by a UAS.

2. **As technology continues to advance beyond "normal" application of current laws, a balanced approach that recognizes the inherent difficulty in predicting the future must be adopted when drafting new laws.**

[9] Memorandum: Alaska Laws Protecting Privacy (Work Order No. 28-LS0990). September 30, 2013. Division of Legal and Research Services, Legislative Affairs Agency, State of Alaska, Juneau.

[10] John Villasenor. 2013. Observations from Above: Unmanned Aircraft Systems and Privacy. Harvard Journal of Law & Public Policy. Available at http://www.harvard-jlpp.com/wp-content/uploads/2013/04/36_2_457_Villasenor.pdf

The LTFUAS determined that we cannot foresee the future applications of technology (of UAS or other technologies); therefore, creating restrictions in law based on assumptions is not recommended.

Observations From Above: UAS and Privacy

This document was published in the Harvard Journal of Law and Public Privacy by John Villasenor, a senior fellow in Governance Studies and the Center for Technology Innovation, the Brookings Institution.

The Task Force discussed many of the scenarios posed by the author when considering the need for Alaska law.

3. How should Alaska manage unintentionally captured images or data?

Discussion concluded that there are adequate statutes, case law, and data retention guidelines that resolved the concerns of the LTFUAS in the area of unintentionally captured images or data.

Recommendation: The LTFUAS also would request that the Department of Administration review its data retention schedules with particular emphasis on law enforcement data captured inadvertently and allowing that data to be destroyed.

4. The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of the FAA Modernization and Reform Act of 2012 (FMRA) have a "line of sight" requirement.

The LTFUAS assumes that FAA regulations adopted in the next several years will continue to require visual line-of-sight operation. "Sense and avoid" technology will become more mature and some non-line-of-sight missions may be permitted by the FAA. Non-line-of-sight operations and other unknown technological advances may bring new challenges that will require the Legislature to review industry guidelines and state laws in the future.

5. Unmanned aircraft may bring efficient advances to law enforcement; however, the public seems to be highly sensitive to law enforcement using unmanned aircraft.

After reviewing many possible uses of UAS, the LTFUAS determined that existing law already affords the public with adequate protections.

- **Routine Technology**: The use of UAS is treated much the same as any other technological tool used to protect the public. The Department of Public Safety has adopted the IACP Guidelines for UAS, and the LTFUAS found those guidelines to be superior for rules of law enforcement use.

The rules of the IACP will be offered as a provision of the legislation.

- **Public Navigable Airspace:** The question of what constitutes "public navigable airspace" for UAS operated by the government is central to privacy policy. The LTFUAS found that almost every law enforcement scenario discussed was already protected by existing law.
- **Role of Imaging Technology:** Rules and case law exist that protect citizens from inappropriate use of capturing data that is "more than the human eye could ever see."
- **Extended Surveillance:** Law enforcement does not intend to use UAS for standard patrol activities at this time. Limiting flight hours was not seen as an acceptable control because long flights may be necessary in the event of search and rescue or natural disaster remediation operations.
- **Obtaining a Warrant:** After much discussion, it was decided that using UAS to gather data would require a warrant in similar situations as using any other data gathering device (such as voice recording, photography, and thermal imaging with manual technology). No additional laws are required to obtain a warrant for UAS data gathering.

Voluntary Approaches

The International Association of Chiefs of Police (IACP) adopted model guidelines for the use of UAS for law enforcement purposes.

The Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct calls for a commitment to "respect the privacy of individuals."

Academy of Model Aeronautics has also adopted operational policies and guidelines for advanced flight systems used in radio controlled model aircraft.

It is the understanding of the LTFUAS that all law enforcement entities must first obtain a court order to use UAS over private property for criminal investigation against any person. This will be offered as a provision of the recommended legislation.

- **Weaponized Aircraft:** FAA guidelines do not allow anything to be dropped from an unmanned aircraft.
- **Visibility**: Law enforcement is planning to use high-visibility marking on any UAS they will use. Application of navigational lighting and/or high-visibility paint is being considered.
- **Public Education**: It is apparent that public education is necessary for all agencies using UAS but sensitivity is heightened for law enforcement uses.

Law Enforcement

Public protection will benefit greatly from unmanned aircraft for the purposes of search and rescue, crash scene documentation time, natural disaster monitoring, wildfire management, amber and silver alerts, hostage situations, and other life safety extremes. Some efforts will require warrants to proceed and some will be allowed under a Certificate of Authorization (COA).

It is the opinion of the LTFUAS that existing privacy laws are adequate to govern the use of unmanned aircraft.

It is the opinion of the LTFUAS that since Alaska has been chosen as one of the FAA UAS Test Sites, we have the opportunity to participate in the use of UAS in a variety of ways that would put Alaska in the position to establish policy guiding the use of UAS for the rest of the United States to consider.

3.2 Technical Operations Guidelines

International Civil Aviation Organization (ICAO), a special agency of the United Nations, promotes "the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency, and regularity, as well as aviation environmental protection."[11]

The goal of the ICAO in addressing unmanned aviation is to provide the fundamental international regulatory framework to support routine operation of UAS throughout the world in a safe, harmonized, and seamless manner comparable to that of manned operations.

> "A number of Civil Aviation Authorities have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft... In general, UAS should be operated in accordance with the rule governing the flight of manned aircraft and meet equipment requirements applicable to the class of airspace within which they intend to operate... To safely integrate UAS in non-segregated airspace, the UAS must act and respond as manned aircraft do. Air Traffic, Airspace and Airport standards should not be significantly changed. The UAS must be able to comply with existing provisions to the greatest extent possible."[12]

UAS Operations Guidelines

Technical rules for operating unmanned aircraft systems are clearly identified at a global and federal level. "A number of Civil Aviation Authorities have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft..."

FAA Guideline N 8900.227 specifically sets the rules for the technical operations of flying unmanned aircraft.

The FAA has established guidelines for the certification and airworthiness of the aircraft, certification of the pilot including additional instruction in operating specific UAS, flight operations with the test sites, management of the test site, and certificates of authorization (COAs) for particular missions.

The LTFUAS is confident in the FAA guidelines in protecting the safety of the national airspace.

3.3 Benefits to Alaska

The University of Alaska Fairbanks Center for Unmanned Aircraft Systems Integration, Research, Testing, and Development (RT&D) is a nationally recognized program that has shown responsible use of UAS for more than 10 years. The University has been selected by the FAA to be one of the six federal test sites. The University proposal contained a diverse set of test site range locations in

[11] ICAO web page: http://www.icao.int/about-icao/Pages/default.aspx

[12] *From* Circular 328 - Unmanned Aircraft Systems (UAS) (Cir 328 AN/190) as cited in Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration. Available at http://www.faa.gov/about/initiatives/uas/media/uas_roadmap_2013.pdf

seven climatic zones as well as geographic diversity with test site range locations in Hawaii and Oregon. The research plan includes the development of a set of standards for unmanned aircraft categories, state monitoring and navigation, as well as safety standards for UAS operations.

Numerous benefits that can be realized as Alaska takes the lead on this new technology are:

- Economic
- Policy Development
- Expedited Timeline for Test Range Use and Approved Missions
- Encourage University Pilot Training Program for UAS
- Education—Public Awareness
- Market Alaska as "Open for Business" for UAS
- Public Safety Statewide

3.3.1 Economic Benefit

Test Site Selection: As part of the University of Alaska's application to the FAA for selection as a test site, the McDowell Group was contracted to complete an economic evaluation of unmanned aircraft benefits for Alaska. *Economic Impact of a Pan-Pacific Unmanned Aircraft Systems Test Site* was completed May 2013 (Appendix E). The highlights of this report include:

> "In total, designation of PPUTRC [Pan-Pacific UAS Test Range Complex] as a UAS test site would be expected to generate 1,065 direct, indirect, and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from $57 million in 2014 to about $76 million in 2017.
>
> In addition to direct jobs created from UAS firms, significant indirect and induced jobs will also be created. Indirect jobs represent jobs created throughout the supply chain to support the UAS industry and induced jobs represent jobs created due to changes in household consumption as a result of the UAS industry."[13]

In addition to Test Site Selection: The cost savings to government agencies in both man hours and safety risk is immeasurable at this time, but the LTFUAS realizes there will be many efficiencies gained with the use of this technology. Examples include but are not limited to:

- **More Accurate Biological Studies.** One specific marine mammal population count had been conducted by a single manned airplane flyover to film and later count the animals. The noise from the aircraft distressed the animals and many were on the move during the filming. With the UAS launched nearby, the animals were undisturbed and a more accurate count was completed. The more-accurate count gave biologists better data to determine such things as the health of the population and whether or not to include them on the endangered species list.

[13] Economic Impact of a Pan-Pacific Unmanned Aircraft Systems Test Site. May 2013. Prepared for Alaska Center for Unmanned Aircraft Systems Integration, University of Alaska Fairbanks. Prepared by McDowell Group.

- **Rapid Response of Air Assets for Traffic Resolution.** Several incidents along the major highways in Alaska have resulted in extended road closures up to 6 hours. For example, manual photography and mapping documentation conducted from the ground can keep a road closed for approximately 3 hours. Using a UAS to map an accident from the air can result in the road being opened in approximately 1 hour.
- **Accurate Data Collection Leading to Cost Savings.** UAS were used to determine the functioning ability of oil field smoke stacks that resulted in accurate data provided in 20 minutes, and information that showed the needed replacement of only one of three catalytic converters, saving the oil company approximately $1 million.
- **Facilitate Search & Rescue and Other Life-Saving Missions.** Many examples were discussed where human life safety was at significant risk and that UAS could be used to complete the mission.
- **Significant Cost Savings in Public Safety.** Alaska's law enforcement aircraft costs an average hourly rate of $700 and one aircraft (Super Cub) costs approximately $800,000, and the A-Star helicopter is $3.6 million. The average hourly cost of operating a UAS ranges from $30 to $50 per hour, and the aircraft costs range from a few hundred dollars to over $40,000.

3.3.2 Policy Development

Now that Alaska has been selected as one of the FAA test sites, the opportunity to develop regulations and guidelines for UAS missions nationwide can be realized.

The test site operators will provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UAS regulations in the NAS. Additionally, data collection will support development and operations research, and professional development opportunities will be available for inspectors, airspace managers, air traffic controllers, and others. The specific goals described by the PPUTRC applicants are listed below.

- Develop a set of standards for select unmanned aircraft categories, for aircraft state monitoring, and navigation. [PPUTRC goals and objectives work will augment ongoing standards work with research on categories of UAS not yet addressed, and evaluations needed to refine emerging standards under consideration.]
- Validate FAA acceptable risk thresholds or safety management system standards for UAS operations.
- Identify safety factors in UAS design.
- Validate certification standards, including protocols for air traffic control interaction.
- Define and qualify underlying assumptions and a minimum set of air vehicle characteristics critical to safety, reliability, etc.
- Develop effective, compliant "sense and avoid" systems to satisfy regulatory guidance.

- Identify gaps in federal and state statutory and case law protections for privacy and recommend policies or legislation to remedy.
- Directly support the federal mandate for "Expanding Use of UAS in the Arctic" (in Sec 332(d) of Public Law 112-95).
- Design experiments and provide data to support American Society for Testing and Materials (ASTM) F38 and Radio Technical Commission for Aeronautics Special Committee (RTCA SC) 203 to evaluate minimum training and operator qualification standards for crew licensing.[14]

UAF Center for Unmanned Aircraft Systems Integration, RT&D

UAF has been involved in UAS missions for more than 10 years. It has participated in research and data gathering operations from Prudhoe Bay to South Africa.

The Alaska Legislature indicated its support in the University's efforts by passage of HCR6 in the 2013 session. The resolution identified many of the good uses of UAS in Alaska and established this task force to recommend statutory changes.

3.3.3 Expedited Timeline for Test Range Use and Approved Missions

Currently, approved UAS missions (flights) require approval by the FAA through the COA process. This process requires the entity interested in operating UAS to complete a detailed flight plan and aircraft approval. This process takes approximately 6 months from application to flight.

Now that Alaska has been selected as a test site, specific areas of the state are expected to be pre-approved for flight testing, thus eliminating the extensive application process through the FAA. The University Center for Unmanned Aircraft Systems Integration RT&D will authorize and schedule UAS flights in the test ranges and other areas with expedited approval.

3.3.4 Encourage Pilot Training Program for UAS

One hurdle that aircraft manufacturers and pilots are experiencing is that while specific training is a requirement to fly a UAS, there is no UAS flight training program approved by the FAA. Alaska would like to lead the nation and become a training center for interested UAS pilots and crew.

The LTFUAS recognizes this as an opportunity for our state University in pilot training and as an economic benefit in the state. In addition, it will keep the University in league with other U.S. universities that are developing pilot training programs.

3.3.5 Education—Public Awareness

The LTFUAS discussed that each entity that would be using a UAS would also be responsible to educate the public on the purpose of the mission as well as provide contact information of a person who would be able to respond to inquiries.

[14] Ibid.

The LTFUAS also felt that some of the public awareness would be provided through the extended duties of the LTFUAS as they deliberate the issues surrounding UAS flights in Alaska.

3.3.6 Market Alaska "Open for Business" for UAS

The Department of Commerce, Community, and Economic Development is partnering with the Fairbanks Economic Development Council to prepare an education booth for Alaska at the next AUVSI convention in Florida in May 2014.

Now that Alaska has been selected as a test site, many manufacturers and associated businesses will seek out the University to begin using test ranges and conduct business in and around the state. If fact, at least one UAS services business has already indicated an intent to open an office here in Alaska.

3.3.7 Benefits to the Public Safety Statewide

- UAS do not require a pilot on board to operate the aircraft or attached equipment. UAS operators and system operators remain safely on the ground, reducing their exposure to threats.
- UAS are able to enter environments that may be hazardous to pilots of manned aircraft.
- UAS provide superior situational awareness while minimizing the danger to which operators are exposed.
- UAS and trained operators minimize response time to most emergency situations.
- Community safety is enhanced by the rapid response of air assets to an emergency. In most cases, manned aircraft must take off and land at airports where UAS can launch from nearly anywhere within minutes.

3.4 Audits of Missions

FAA Privacy Policy requires the test site to report a variety of data on the flights occurring in the test ranges.

At this time, the LTFUAS does not believe there should be an additional requirement for reporting other than what is required by the FAA.

3.5 Test Site Operations Manager Position

The FAA Privacy Policy requirement also requires a Chief Privacy Officer at the test site. The University is refining the duties of the Director of the Test Site to encompass all the responsibilities of managing the test ranges. This officer will be developing privacy policies to govern all activities conducted by the test site, make privacy policies publicly available, and establish a mechanism to receive and consider comments from the public. Annually, the privacy officer will review test site

operations to verify compliance with the policies and practices and share those outcomes in a public forum.

3.6 Incentive Grants

Many businesses have asked the LTFUAS if Alaska will offer any incentives to conduct business in the state. Given the reduced General Fund income to Alaska, the LTFUAS did not consider any financial incentives for potential business startups in Alaska.

The LTFUAS did discuss the advantages of being selected as a test site and the expedited administrative support for conducting UAS business in Alaska. It was agreed that the opportunity will offer many benefits to our state (see Section 3.3).

3.7 Research Appropriation to University of Alaska Fairbanks

While the LTFUAS would like to support the University financially, it was determined that funding may not be available at this time. The FAA states that no additional funding will be provided in conjunction with test site selection, but we are confident that federal funding may follow as integration into the NAS will require additional management.

4. FINAL RECOMMENDATIONS

The LTFUAS supports its recommendations to the Legislature by considering and adopting general guidelines from the following reports from the FAA:

- Guidelines for Operations of UAS (N 8900.227)
- Comprehensive Plan to Integrate UAS in National Airspace
- Final Privacy Requirements

The LTFUAS also adopted the IACP UAS Guidelines as appropriate for law enforcement in Alaska (Appendix B).

In addition to the FAA documents, the LTFUAS considered a report from Legislative Legal Services that identified Alaska's privacy laws and Constitutional protections of privacy to determine if there might be a scenario created through the use of UAS that would not be protected by existing privacy laws. The LTFUAS also recognized that because Alaska has been chosen as an FAA UAS Test Site for UAS Integration, an emphasis on management of the test ranges, economic development, and public education need immediate attention.

The LTFUAS made the following conclusions:

- It is the opinion of the LTFUAS that no additional statutory or regulatory requirements are needed for FAA-approved missions.
- It is the opinion of the LTFUAS that privacy policy is adequate through the FAA requirements for the use of UAS in the test sites.
- The LTFUAS does not intend to adopt requirements of hobbyist activities using UAS in the same manner that the FAA does not regulate model aeronautics.
- It is the opinion of the LTFUAS that the Department of Administration should review its data retention schedules with particular emphasis on law enforcement data captured inadvertently and allowing that data to be destroyed.
- It is the opinion of the LTFUAS that existing privacy laws are adequate to govern the use of unmanned aircraft
- The LTFUAS is confident in the FAA guidelines in protecting the safety of the national airspace.

Based on these findings, the final recommendations of the LTFUAS are the following:

1. Require all state and local law enforcement entities to adopt the IACP guidelines to help ensure privacy protection for Alaskans.

2. Require all law enforcement entities to first obtain a court order to use UAS over private property for criminal investigation against any person.

3. Encourage use of high-visibility marking or navigational lighting on law enforcement UAS as appropriate.

4. Convey a clear message to industry that Alaska is open for business to harness the beneficial uses of UAS, to encourage the growth of this economic sector, and to allow Alaska to continue to lead the nation in aviation innovation.

5. Encourage private and public UAS training programs.

6. Report all UAS incidents/accidents of aircraft larger than 55 pounds to the University of Alaska and/or Alaska Aviation Coordination Council.

7. Extend LTFUAS until June 30, 2017, and expand the duties of the Task Force with the addition of one member representing the Alaska Department of Transportation/Public Facilities (DOT/PF) and one public member, for the following reasons:

    - During this transitional phase of growing use of UAS in Alaska, the LTFUAS should be extended to continue to monitor it and any privacy matters that may arise that are not already covered by existing law. Because Alaska currently has a strong set of privacy laws, rather than recommend prohibitions be incorporated into statute that might inhibit industry, the LTFUAS recommends it continue to review UAS operations in light of current statutes and only recommend changes in statute as necessary.

    - Because FAA will be updating and issuing new guidelines based on the work of the new FAA UAS Test Sites announced on December 30, 2013, it is necessary for the LTFUAS to continue to review FAA policies to determine their impact and whether any additional policy changes at the state level may be necessary in response.

    - With Alaska's recent selection as one of the nation's six FAA UAS Test Sites through the University of Alaska's application (in conjunction with Oregon and Hawaii), the LTFUAS will meet part of the test site's requirement as a public forum where concerns regarding privacy and data matters can be collected and evaluated.

As we move forward, and particularly in light of the fact that Alaska has been selected as an FAA test site for UAS integration, and with the extension and expansion of duties of the Task Force, the LTFUAS further recommends immediate emphasis on the following:

1. management of the test ranges,

2. economic development opportunities,

3. public education and public relations regarding UAS, and

4. difference of model aircraft from UAS.

In addition to the above seven recommendations, the Task Force also recommends the following:

1. each department of the State of Alaska identify a point of contact for UAS to coordinate with the LTFUAS and provide information regarding department policy and procedures to ensure accountability and privacy in regard to UAS use, and

1) the Alaska Department of Administration review and update its data retention policies particularly in the area of inadvertent captured data that is not relevant to a state agency.

5. DEFINITIONS

TERMINOLOGY	DEFINITION	SOURCE
Autonomous Operations	It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the NAS outside of Restricted, Prohibited, or Warning areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorized in the national airspace system. Although the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.	1
Certificate of Waiver or Authorization (COA)	An FAA grant of approval for a specific flight operation. The authorization to operate a UAS in the National Airspace System as a public aircraft outside of Restricted, Warning, or Prohibited areas approved for aviation activities.	2
Civil Aircraft	Aircraft other than public aircraft.	2
Crewmember [UAS]	In addition to the crewmembers identified in 14 CFR Part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and visual observers, but may include other persons as appropriate or required to ensure safe operation of the aircraft.	2
Detect and Avoid	Term used instead of Sense and Avoid in the Terms of Reference for RTCA Special Committee 228. This new term has not been defined by RTCA and may be considered to have the same definition as Sense and Avoid when used in this document.	2
International Civil Aviation Organization (ICAO)	A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport.	2
Manned Aircraft	Aircraft piloted by a human onboard.	2
Model Aircraft	An unmanned aircraft that is capable of sustained flight in the atmosphere; flown within visual line-of-sight of the person operating the aircraft and flown for hobby or recreational purposes.	2
National Airspace System	The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.	2
Personal Information Privacy Act (PIPA)	An Act relating to breaches of security involving personal information, credit report and credit score security freezes, protection of social security numbers, care of records, disposal of records, identity theft, credit cards, and debit cards, disclosure of the names and addresses of permanent fund dividend applicants, and to the jurisdiction of the office of administrative hearings; amending Rules 60 and 82, Alaska Rules of Civil Procedure; and providing for an effective date.	3

TERMINOLOGY	DEFINITION	SOURCE
Pilot-in-Command	Pilot-in-command means the person who: 1) has final authority and responsibility for the operation and safety of the flight; 2) has been designated as pilot-in-command before or during the flight; and 3) holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight.	2
Public Aircraft	An aircraft operated by a governmental entity (including federal, state, or local governments, and the U.S. Department of Defense and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. See 14 CFR Part 1, § 1.1 for a complete definition of a public aircraft.	2
Sense and Avoid	The capability of a UAS to remain well clear from and avoid collisions with other airborne traffic. Sense and Avoid provides the functions of self-separation and collision avoidance to establish an analogous capability to "see and avoid" required by manned aircraft.	2
Test Range	A defined geographic area where research and development are conducted in accordance with Sections 332 and 334 of the FMRA. Test ranges are also known as test sites in related documents such as the FAA's Screening Information Request.	2
Unmanned Aircraft	1) A device used or intended to be used for flight in the air that has no onboard pilot. This devise excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR Part 101), rockets, tethered aircraft and unpowered gliders. 2) An aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.	2
Unmanned Aircraft System	An unmanned aircraft and its associated elements related to safe operations, which may include control stations (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems, and launch/recovery equipment. An unmanned aircraft and associated elements (including communications links and the components that control the unmanned aircraft) that are required for the pilot-in-command to operate safely and efficiently in the national airspace system.	2
Visual Line-of-Sight	Unaided (corrective lenses and/or sunglasses exempted) visual contact between a pilot-in-command or a visual observer and a UAS sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.	2

Sources:

1. Interim Operational Approval Guidance 08-01. Aviation Safety Unmanned Aircraft Program Office Air-160. Unmanned Aircraft Systems Operations in the U. S. National Airspace System, March 13, 2008. Federal Aviation Administration.
2. Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration.
3. Chapter 92 SLA 08 (HB65) .

APPENDIX A

FAA FINAL PRIVACY REQUIREMENTS NOVEMBER 7, 2013

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No.: FAA-2013-0061]

Unmanned Aircraft System Test Site Program

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of availability of final privacy requirements for the unmanned aircraft system ("UAS") test site program; response to comments

SUMMARY: On February 22, 2013 the FAA published and requested public comment on the proposed privacy requirements (the "Draft Privacy Requirements") for UAS test sites (the "Test Sites") that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012 ("FMRA"). This notice responds to the public comments received and publishes the FAA's final privacy requirements for the Test Sites (the "Final Privacy Requirements").

ADDRESSES: You may review the public docket for this rulemaking (Docket No. FAA-2013-0061) on the Internet at http://www.regulations.gov. You may also review the public docket at the Docket Management Facility in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, 20590-0001 between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning the test site program, contact Elizabeth Soltys, Unmanned Aircraft Systems Integration Office, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; email: 9-ACT-UASTSS@faa.gov.

For legal questions concerning the FAA's privacy requirements for the Test Sites contact Carlos Siso, Office of the Chief Counsel, Federal Aviation Administration, 800 Independence Ave. SW., Washington, DC 20591; email: 9-AGC-UASPrivacy@faa.gov.

SUPPLEMENTARY INFORMATION

This notice summarizes and responds to the public comments received in response to the following Federal Register notices seeking public comment on the Draft Privacy Requirements for the Test Sites:

(i) Notice of availability and request for comments published in the Federal Register on February 22, 2013 (78 FR 12259), Docket No. FAA-2013-0061-0001; and

(ii) Notice of public engagement session published in the Federal Register on March 28, 2013 (78 FR 18932), Docket No. FAA-2013-0061-0050.

In addition, this notice publishes the FAA's Final Privacy Requirements for the Test Sites which are set forth under the "Conclusion" section below.

Discussion of Comments

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session. A transcript of the public engagement session is available at: http://www.faa.gov/about/initiatives/uas/media/UAStranscription.pdf. Public comments ranged from recommending that the FAA not impose any privacy requirements on the Test Sites to recommending that the FAA impose extensive privacy requirements on the Test Sites. The FAA also received comments that were not responsive to the notice or that were unclear.

The FAA analyzed the responsive comments and grouped them into ten categories. The following sections address the comments by category.

1) The FAA should focus on its safety mission; it should not engage in regulating privacy.

The FAA received a number of comments advocating that the FAA should focus on its safety mission and should not engage in regulating privacy. The following comments were received:

- The FAA should focus on safety;
- Regulating privacy is outside the FAA's mission;
- The FAA does not have statutory authority to regulate privacy;
- The FAA does not have the authority to impose privacy requirements on the Test Sites;
- The FAA should allow privacy to be addressed by other more appropriate government bodies including: Federal agencies that have expertise and authority to deal with privacy concerns; Congress; state or local legislative bodies; and the judicial system;
- The Federal Government should not regulate privacy impacts of UAS; these issues should be left to states, cities, and counties to address;
- The FAA should only require compliance with privacy laws that are already in place and focus on developing safe operation of UAS;
- The FAA should not deny access to the national airspace for reasons other than safety;
- Existing privacy laws are sufficient to cover the responsible use of UAS. There already exist Federal, state and other laws that protect privacy. In addition, tort law may also provide avenues of recourse for plaintiffs to protect their privacy rights;
- The FAA should not implement privacy regulations that make entry into the market prohibitive for small businesses;
- The FAA should not allow privacy issues to hinder commercialization of UAS;
- There is no evidence that the operations at the Test Sites will harm privacy interests. Restricting activities at the test sites at this early stage will likely overprotect privacy at the expense of innovation;

- The FAA should afford adequate time for non-governmental solutions such as industry norms and practices to develop before intervening administratively to protect privacy. These less restrictive solutions will reduce the need for administrative intervention and will allow for increased innovation in the national airspace;
- Requiring Test Site operators to develop privacy policies that are informed by Fair Information Practice Principles is onerous for commercial operators of UAS and its cost will likely outweigh any hypothetical benefits;
- Requiring Test Site operators to issue privacy policies informed by Fair Information Practice Principles will limit the diversity of data that will inform integration of UAS into the national airspace. The FAA's approach would exclude an important possible alternative from the discussion: some operators might choose not to issue a privacy policy or adopt a non-FIPPs-compliant policy; and
- The FAA should treat data gathered by UAS no differently than data gathered by a manned aircraft or by other electronic means. There is no significant difference in terms of surveillance between a UAS and a manned aircraft, and manned aircraft are permitted to operate in the national airspace with cameras.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world and does not include regulating privacy. At the same time, the FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the Test Sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

The FAA will require the Test Site operators to comply with the Final Privacy Requirements. Congress mandated that the FAA establish the Test Sites to further UAS integration into the national airspace system. The Final Privacy Requirements advance this purpose by helping inform the dialogue

among policymakers, privacy advocates, and industry regarding the impact of UAS technologies on privacy.

The FAA's authority for including the Final Privacy Requirements in the Test Site OTAs is set forth in 49 U.S.C. 106(l)(6). That statute authorizes the FAA Administrator to enter into an OTA "on such terms and conditions as the Administrator may consider appropriate." The FAA believes that it is appropriate to require Test Site operators to comply with the Final Privacy Requirements.

2) The FAA should require warrants before law enforcement can use UAS in the Test Sites to conduct surveillance or gather evidence.

The FAA received a variety of comments advocating that:

- The FAA should include provisions in the OTA that require warrants to be obtained when UAS are used to conduct surveillance or gather evidence within the Test Site; and
- The OTA include appropriate safeguards to protect Fourth Amendment rights at and around our national borders.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. The FAA is establishing the UAS Test Sites consistent with its mission and the direction in the FMRA. The FAA appreciates the commenters' concerns. Accordingly, the final privacy requirements provide that the Site Operator and its team members must comply with all applicable privacy laws.

3) The FAA should mandate specific privacy requirements for the Test Sites.

The FAA received a variety of comments advocating that the FAA mandate specific privacy requirements for the Test Sites. The recommendations included the following:

- The FAA should specify minimum privacy requirements and require each Test Site to comply with them;
- The FAA should mandate compliance with Fair Information Practice Principles for all Test Site operators;

- The FAA should establish prohibitions on where UAS can operate within a Test Site and the kinds of surveillance activities that UAS conduct at the Test Sites;
- The FAA should require all UAS flown at the Test Sites to have unencrypted down links so that all their data collection can be viewed by the public, including records contained onboard and recovered after landing;
- The FAA should require each Test Site operator to conduct a full Privacy Impact Assessment;
- The FAA should require each Test Site operator to establish a Chief Privacy Officer and centralize privacy responsibilities in that person;
- The FAA should require each Test Site operator to establish a privacy advisory committee to review proposed UAS research at the Test Sites for privacy concerns;
- The FAA should require each Test Site operator to provide a detailed response to public input it receives regarding the Test Site's privacy policy;
- The FAA should prohibit the sharing of recorded surveillance footage beyond the scope of its original purpose;
- The FAA should prohibit UAS in the Test Sites from flying below a minimum altitude;
- The FAA should prohibit UAS in the Test Sites from carrying any equipment that could be used to conduct surveillance;
- The FAA should limit the use of the data collected at the Test Sites;
- The FAA should prohibit (i) the use of Test Sites for government surveillance, and (ii) sharing data collected with law enforcement for the purpose of investigating or prosecuting a crime;

- The FAA should limit the type of data that can be collected by UAS at the Test Sites including limiting the resolution of visual imagery that UAS can collect, prohibiting recording of audio data, and restricting the ability to collect WiFi and cellular signals;
- The FAA should require Test Site operators to provide data on the payload of each UAS flown at the Test Site including specific information on the data the payload is capable of collecting;
- The FAA should mandate privacy policies that require deletion of collected data within a certain time period;
- The FAA should prohibit the Test Site operator and UAS operators at the Test Sites from retaining any data collected longer than is necessary to fulfill the purpose of the Test Site;
- The FAA should require UAS operators to file data collection statements with the FAA for UAS operations that involve remote sensing and signals surveillance from the UAS platform; and
- The FAA should require UAS operating at altitudes over 400 feet to carry an automatic dependent surveillance-broadcast transponder (ADS-B Out) so that UAS operations can be tracked.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. Although there is a long history of placing cameras and other sensors on aircraft for a variety of purposes—news helicopters, aerial surveys, film/television production, law enforcement, etc.—the FAA is not, through awarding and supervising these Test Sites, taking specific views on whether or how the Federal Government should regulate privacy or the scope of data that can be collected by manned or unmanned aircraft.

There was substantial difference of opinion among commenters as to whether UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy

restrictions on UAS operations at the Test Sites. In addition, there was substantial difference of opinion among commenters regarding what elements would be appropriate for a Test Site privacy policy. Based on the comments received, the FAA will require Test Sites to comply with the following requirements in addition to those described in the Draft Privacy Requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

The above are reflected in the Final Privacy Requirements.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons. *First*, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the Test Sites.

Second, the FAA believes that Test Sites operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each Test Site. The selection criteria for the Test Sites specify that only a "public entity" can serve as a Test Site operator. The term "public entity" is defined in the selection criteria to mean "(A) any State or local government; (B) any department, agency, special purpose district, or other instrumentality of a State or States or local government; and (C) the National Railroad Passenger Corporation, and any commuter authority." The FAA expects that public entities will be responsive to stakeholder concerns.

Third, if UAS operations at a Test Site raise privacy concerns that are not adequately addressed by the Test Site's privacy policies, elected officials can weigh the benefits and costs of additional

privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS. *See* Drone Legislation All the Rage: Varies Widely Across 43 States, According to WestlawNext, June 17, 2013, *available at*: http://thomsonreuters.com/ press-releases/062013/drone_legislation_varies_across_ states_according_to_Westlaw.

4) The FAA should conduct audits of the Test Sites to ensure compliance with privacy policies.

Various commenters recommended that the FAA should audit each Test Site to ensure compliance with the privacy policies in the OTA.

Response: Each Test Site will be operated by a public entity (see response to Category 3 above). The FAA expects that the public entity operating each test site will already be subject to oversight and audit requirements. The FAA does not believe that it is appropriate for the FAA to impose additional audit requirements on the Test Site operators.

5) The FAA should require Test Site operators to keep records that will allow for effective citizen participation and reporting of privacy violations.

One commenter recommended that the FAA require Test Site operators to keep accurate, detailed, frequent, and accessible records to allow for effective citizen participation and reporting of privacy violations.

Response: Each Test Site operator will be a public entity (see response to Category 3 above). Public entities are generally subject to laws that establish record keeping requirements and provide the public access to records. The FAA does not believe that it is appropriate for the FAA to impose additional record keeping requirements on the Test Site operators other than those specified in the Final Privacy Requirements.

6) The FAA should establish a searchable database or registry of UAS operators and operations at the Test Sites.

The FAA received a variety of comments advocating that:

- The FAA should create a public, searchable database or registry of all UAS operators. Some commenters recommended that the database include information about surveillance equipment used and the operator's data collection practices;
- The FAA should require UAS operators at the Test Sites to provide public statements describing the surveillance equipment that will be carried by a UAS, the geographical area where the UAS will be operated, and the purposes for which the UAS will be deployed; and
- The FAA should establish a means for the public to access the data on UAS flights collected by the FAA.

Response: The FAA believes that it is not appropriate for the FAA to create a public registry or database of UAS operations at the Test Sites. However, the FAA has included a contractual provision in the Final Privacy Requirements that will require each Test Site operator to maintain a record of all UAS operating at the Test Site.

7) The FAA should modify its Test Site selection criteria to take into account privacy concerns.

Various commenters recommended that the FAA revise its selection criteria. Suggestions included the following:

- The FAA should choose an applicant that has an established UAS research program with active engagement with UAS privacy issues;
- The FAA should choose at least one Test Site in a state with strong privacy protective UAS laws and regulations;
- The FAA should select one or more Test Sites in or near a densely populated urban area in order to avoid a bias towards privacy issues relevant for rural UAS operations; and

- The FAA should consider the privacy track record of applicants as part of the selection process.

Response: The FAA believes that it is not appropriate to modify the Test Site selection criteria to include the recommended privacy considerations. Applicants have already submitted complete applications based on the announced selection criteria and the application period has closed.

The FAA published the Test Site selection criteria and application instructions on February 14, 2013 on https://faaco.faa.gov under Solicitation number DTFACT-13-R-00002. The selection criteria incorporate the factors that Congress directed the FAA to consider in the FMRA, including, geographic and climatic diversity; location of ground infrastructure; and research needs. The FAA required applicants to submit seven volumes of extensive and detailed information that address a broad set of considerations including safety, airspace use, experience, research objectives, and risk considerations. This information will allow the FAA to make a selection based on the direction provided by Congress in the FMRA and on the FAA's mission.

The FAA developed the Test Site selection criteria after seeking public input and consulting with other agencies regarding what selection criteria would be appropriate. In March 2012, the FAA published a request for comment in the Federal Register and in April 2012, the FAA hosted two public webinars to obtain public input on the FAA's proposed selection criteria. Although there was significant public participation, the FAA did not receive comments advocating that privacy issues be used as a factor in choosing the Test Sites.

8) The FAA should require Test Site operators to conduct specific tests related to privacy and surveillance.

Commenters recommended that the FAA should:

- Require UAS operators at Test Sites to conduct specific tests related to surveillance and privacy;

- Require Test Site operators to design the sites— including the creation of "fake" houses or businesses—to allow UAS operators to test how accurate their surveillance systems are and test how much data those systems collect; and
- Develop and require Test Sites to implement a standard battery of privacy tests that each UAS operating within a Test Site should have to perform in order to collect data that the FAA can use to make decisions about privacy issues.

Response: The FAA is not planning to have the Test Site operators conduct specific research.

9) The FAA should not take punitive actions against a Test Site operator for privacy violations without due process.

One commenter noted that if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws, the OTA allows the FAA to suspend or modify the relevant operational authority for a Test Site (e.g. Certificate of Operation, or OTA). That commenter recommended that a Test Site operator be entitled to due process before the operational authority be suspended or modified.

Response: A Test Site operator's rights to operate a Test Site are set forth in the OTA and are subject to the terms and conditions in the OTA. The FAA believes that it is appropriate to include contractual provisions in the Final Privacy Requirements that allow the FAA to protect the public interest by suspending or modifying the relevant operational authority for a Test Site if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws.

10) The FAA should establish sanctions for violations of privacy policies or rights.

One commenter recommended that the FAA rescind the OTA for a Test Site where serious privacy violations have occurred and levy fines against operators that fail to comply with privacy policies.

Response: The Final Privacy Requirements provide that violations of privacy laws can result in suspension or termination of the OTA.

The FAA will not monitor a Test Site's compliance with its own privacy policies. The FAA expects the public entities operating the Tests Sites and their respective state/local oversight bodies to monitor and enforce a Test Site's compliance with its own policies.

Conclusion

Based on the comments submitted, the FAA intends to require each test site operator to comply with all of the privacy requirements included in the Draft Privacy Requirements as well as the following additional privacy requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

Accordingly, the FAA intends to include the following terms and conditions into Article 3 of the OTA:

"ARTICLE 3 PRIVACY; APPLICABLE LAW

a. Privacy Policies

The Site Operator must:

(i) Have privacy policies governing all activities conducted under the OTA, including the operation and relevant activities of the UAS authorized by the Site Operator.

(ii) Make its privacy policies publicly available;

(iii) Have a mechanism to receive and consider comments from the public on its privacy policies;

(iv) Conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback;

(v) Update its privacy policies as necessary to remain operationally current and effective; and

(vi) Ensure the requirements of its privacy policies are applied to all operations conducted under the OTA.

The Site Operator's privacy policies should be informed by Fair Information Practice Principles.

b. Compliance With Applicable Privacy Laws

For purposes of this agreement, the term "Applicable Law" shall mean (i) a law, order, regulation, or rule of an administrative or legislative government body with jurisdiction over the matter in question, or (ii) a ruling, order, decision or judgment of a court with jurisdiction over the matter in question.

The Site Operator and its team members must operate in accordance with all Applicable Law regarding the protection of an individual's right to privacy (hereinafter referred to as "Privacy Laws").

If the U.S. Department of Justice or a state's law enforcement authority files criminal or civil charges over a potential violation of a Privacy Law, the FAA may take appropriate action including suspending or modifying the relevant operational authority (e.g., Certificate of Operation, or OTA) until the proceedings are completed. If the proceedings demonstrate the operation was in violation of the Privacy Law, the FAA may terminate the relevant operational authority.

c. Change in Law

If during the term of this Agreement an Applicable Law comes into effect which may have an impact on UAS, including impacts on the privacy interests of individuals or entities affected by any operation of any UAS operating at the Test Site, such Applicable Law will be applicable to the OTA and the FAA may update or amend the OTA to reflect these changes.

d. Transmission of Data to the FAA

The Site Operator should not provide or transmit to the FAA or its designees any data other than the data the data requested by the FAA pursuant to Article 5 of this OTA.

e. Other Requirements

The Site Operator must:

(i) Maintain a record of all UAS operating at the test sites; and

(ii) Require each UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS."

Issued in Washington, DC on November 7, 2013.

Marc L. Warren

Acting Chief Counsel, Federal Aviation Administration.

APPENDIX B

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE RECOMMENDED GUIDELINES

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE
AVIATION COMMITTEE

Recommended Guidelines for the use of Unmanned Aircraft

August 2012

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of our lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. **Model Aircraft** - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. **Unmanned Aircraft (UA)** – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. **UA Flight Crewmember** - A pilot, visual observer, payload operator or other person assigned duties for a UA for the purpose of flight.
4. **Unmanned Aircraft Pilot** - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, the agency will operate the aircraft in full compliance with the mandates of the Constitution, federal, state and local law governing search and seizure.
4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UA should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.
4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UA will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training, or demonstration purposes.
4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.

APPENDIX C

ACADEMY OF MODEL AERONAUTICS SAFETY CODES

Academy of Model Aeronautics National Model Aircraft Safety Code

Effective January 1, 2014

A. **GENERAL**: A model aircraft is a non-human-carrying aircraft capable of sustained flight in the atmosphere. It may not exceed limitations of this code and is intended exclusively for sport, recreation, education and/or competition. All model flights must be conducted in accordance with this safety code and any additional rules specific to the flying site.

1. Model aircraft will not be flown:
   (a) In a careless or reckless manner.
   (b) At a location where model aircraft activities are prohibited.
2. Model aircraft pilots will:
   (a) Yield the right of way to all human-carrying aircraft.
   (b) See and avoid all aircraft and a spotter must be used when appropriate. (AMA Document #540-D.)
   (c) Not fly higher than approximately 400 feet above ground level within three (3) miles of an airport without notifying the airport operator.
   (d) Not interfere with operations and traffic patterns at any airport, heliport or seaplane base except where there is a mixed use agreement.
   (e) Not exceed a takeoff weight, including fuel, of 55 pounds unless in compliance with the AMA Large Model Airplane program. (AMA Document 520-A.)
   (f) Ensure the aircraft is identified with the name and address or AMA number of the owner on the inside or affixed to the outside of the model aircraft. (This does not apply to model aircraft flown indoors.)
   (g) Not operate aircraft with metal-blade propellers or with gaseous boosts except for helicopters operated under the provisions of AMA Document #555.
   (h) Not operate model aircraft while under the influence of alcohol or while using any drug that could adversely affect the pilot's ability to safely control the model.
   (i) Not operate model aircraft carrying pyrotechnic devices that explode or burn, or any device which propels a projectile or drops any object that creates a hazard to persons or property.
   Exceptions:
   - Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight.
   - Rocket motors (using solid propellant) up to a G-series size may be used provided they remain attached to the model during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code but may not be launched from model aircraft.
   - Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program Document. (AMA Document #718.)

   (j) Not operate a turbine-powered aircraft, unless in compliance with the AMA turbine regulations. (AMA Document #510-A.)
3. Model aircraft will not be flown in AMA sanctioned events, air shows or model demonstrations unless:
   (a) The aircraft, control system and pilot skills have successfully demonstrated all maneuvers intended or anticipated prior to the specific event.
   (b) An inexperienced pilot is assisted by an experienced pilot.
4. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

B. **RADIO CONTROL (RC)**

1. All pilots shall avoid flying directly over unprotected people, vessels, vehicles or structures and shall avoid endangerment of life and property of others.
2. A successful radio equipment ground-range check in accordance with manufacturer's recommendations will be completed before the first flight of a new or repaired model aircraft.
3. At all flying sites a safety line(s) must be established in front of which all flying takes place. (AMA Document #706.)
   (a) Only personnel associated with flying the model aircraft are allowed at or in front of the safety line.
   (b) At air shows or demonstrations, a straight safety line must be established.
   (c) An area away from the safety line must be maintained for spectators.
   (d) Intentional flying behind the safety line is prohibited.
4. RC model aircraft must use the radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. RC model aircraft will not knowingly operate within three (3) miles of any pre-existing flying site without a frequency-management agreement. (AMA Documents #922 and #923.)
6. With the exception of events flown under official AMA Competition Regulations, excluding takeoff and landing, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flightline.
7. Under no circumstances may a pilot or other person touch an outdoor model aircraft in flight while it is still under power, except to divert it from striking an individual.
8. RC night flying requires a lighting system providing the pilot with a clear view of the model's attitude and orientation at all times. Hand-held illumination systems are inadequate for night flying operations.
9. The pilot of an RC model aircraft shall:
   (a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.
   (b) Fly using the assistance of a camera or First-Person View (FPV) only in accordance with the procedures outlined in AMA Document #550.
   (c) Fly using the assistance of autopilot or stabilization system only in accordance with the procedures outlined in AMA Document #560.

C. **FREE FLIGHT**

1. Must be at least 100 feet downwind of spectators and automobile parking when the model aircraft is launched.
2. Launch area must be clear of all individuals except mechanics, officials, and other fliers.
3. An effective device will be used to extinguish any fuse on the model aircraft after the fuse has completed its function.

D. **CONTROL LINE**

1. The complete control system (including the safety thong where applicable) must have an inspection and pull test prior to flying.
2. The pull test will be in accordance with the current Competition Regulations for the applicable model aircraft category.
3. Model aircraft not fitting a specific category shall use those pull-test requirements as indicated for Control Line Precision Aerobatics.
4. The flying area must be clear of all utility wires or poles and a model aircraft will not be flown closer than 50 feet to any above-ground electric utility lines.
5. The flying area must be clear of all nonessential participants and spectators before the engine is started.

Academy of Model Aeronautics **AMA Document #550**
"AMA Advanced Flight Systems Committee"
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operation
Utilizing "First Person View" Systems

1. DEFINITION OF TERMS:

Please refer to Page 3, section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

FPV flying of radio control model aircraft by AMA members is allowed only for noncommercial purposes as a hobby/recreational and/or competition activity and must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA *FPV novice pilots* must use a buddy-box system with an *FPV spotter* while learning to fly *FPV*.

b) All *FPV* flights require an AMA *FPV pilot* to have an AMA *FPV spotter* next to him/her maintaining *VLOS* with the *FPV aircraft* throughout its flight.

c) The *FPV pilot* must brief the *FPV spotter* on the *FPV spotter's* duties, communications and hand-over control procedures before *FPV flight*.

d) The AMA *FPV spotter* must communicate with the *FPV pilot* to ensure the *FPV aircraft* remains within *VLOS*, warning the *FPV pilot* of approaching aircraft, and when avoidance techniques are necessary.

e) During an FPV flight, the FPV spotter must be prepared to acquire the transmitter/control from the FPV pilot and assume VLOS control of the model aircraft any time safe operation of the flight is in question.

f) If the *FPV pilot* experiences a problem due to a loss of video link, orientation, or is unable to safely fly, he/she must abandon *FPV* mode and fly *VLOS* or pass the RC transmitter to the *FPV spotter* to assume *VLOS* control of the model aircraft.

g) Before the initial *FPV* flight of an *FPV model aircraft* and/or after any changes or repairs *to essential flight systems*, the *FPV model aircraft* must have an *R/C test flight* by conventional *VLOS*.

h) *FPV model aircraft* must use frequencies approved by the FCC for both the RC system and the wireless video system. Pilots must meet applicable FCC licensing requirements if they choose to operate the RC flight control system or the wireless video system on Amateur Band frequencies.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft must be flown within *VLOS* of the operator.

b) Model aircraft flown using *FPV* must remain at or below 400 feet AGL when within 3 miles of an airport as specified in the AMA Safety Code.

c) Model aircraft flown *FPV* are limited to a weight (including fuel, batteries, and onboard *FPV* equipment) of 15lbs. and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) AMA *FPV novice pilots* should consider using a cockpit view flight simulator to become accustomed to *FPV* flight.

b) AMA *FPV pilots* should consider using a programmable *autopilot* (AMA Document #560) with a failsafe "return to launch" (RTL) feature that will maintain control of the aircraft in the event of signal loss.

c) An onboard camera equipped with a pan and tilt mount that is positioned by head tracking goggles, will improve the *FPV pilot's* situational awareness of airspace surrounding the *FPV aircraft* during flight, but does not replace the requirement for an AMA *FPV spotter*.

d) When purchasing *FPV* operational systems, always try to select quality equipment, verify its compatibility, install components for interference rejection, and determine that signal range is adequate for maximum VLOS range.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA FPV Pilot is an AMA member who is capable of maintaining stable flight of a model aircraft within its intended flight envelope when flown FPV without losing control or having a collision.

Buddy-Box System is a system that has one transmitter operating as the master controller, while a second transmitter is linked/slaved to it allowing dual control of an aircraft. The operator of the master transmitter allows one or the other transmitter to control the aircraft through the use of a spring-loaded switch. The switch provides instantaneous transfer of control from one transmitter to the other. The buddy-box system is an efficient and effective means of achieving a position transfer of control from one pilot to another. Although this system is commonly used for training novice fliers, it is also useful in situations where an experienced pilot may have an increased likelihood of needing a second pilot's assistance in maintaining control of the aircraft. The use of the buddy-box may be helpful in assisting pilots with physical limitations, flying in congested environments, during times of reduced visibility, or anytime during FPV when a timely transfer of control may be beneficial.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's flight envelope. (This includes primary radio control systems and any stabilization or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft.

Flight Envelope is defined as the range of airspeeds, attitudes, and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

FPV Aircraft is an RC model aircraft equipped with a video transmitter to send real-time video images from an onboard camera to a ground based receiver for display on a pilot's video monitor/goggles. (*FPV model aircraft* types include: Fixed Wing, Rotary Wing, and Multi-Rotor Platforms).

FPV Novice Pilot is an AMA member learning to fly *FPV* utilizing a buddy-box system with an experienced AMA *RC pilot* operating the master transmitter and serving as the *FPV spotter*.

FPV Spotter is an experienced AMA *RC pilot* who has been briefed by the *FPV pilot* on the tasks, responsibilities and procedures involved in being a spotter; is capable and mature enough to perform the duties and is able to assume conventional *VLOS* control of the aircraft.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's *flight envelope*. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting stable flight).

R/C Test Flight requires an *AMA Pilot* to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its *flight envelope*.

Visual Line Of Sight (VLOS) is the distance at which the pilot is able to maintain visual

contact with the aircraft and determine its orientation without enhancements other than corrective lenses.

Academy of Model Aeronautics
AMA Advanced Flight Systems Committee
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operation Utilizing Failsafe, Stabilization and Autopilot Systems

1. DEFINITION OF TERMS:

Please refer to Page 3, section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

All model aircraft flights utilizing *stabilization* and *autopilot* control systems must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA members flying radio controlled model aircraft equipped with flight *stabilization* and *autopilot* systems must maintain *VLOS* with the aircraft at all times including programmed autopilot waypoint flight.

b) *AMA Pilots* must be able to instantaneously deactivate programmed flight of *autopilot systems* at any time during flight and resume manual control of the model aircraft.

c) *AMA Pilots* must perform an *R/C Test Flight* of a model aircraft before activating a newly installed *autopilot* or *stabilization system* and/or after any repairs or replacement of model aircraft *essential flight systems*.

d) Model aircraft exceeding 15lbs and/or 70mph may only use an *autopilot* for a programmed "return to launch" (RTL) flight and not for programmed waypoint flying of a predetermined course.

e) STABILIZATION & AUTOPILOT SYSTEMS MAY BE USED FOR/TO:

- Stabilization/automatically stabilize aircraft to level flight when control sticks are centered.
- Recovery/activate TRX switch to recover an out of control aircraft to level flight.
- Heading/activate TRX switch to hold a model aircraft's heading for precision flight path.
- Altitude/activate TRX switch to maintain fixed aircraft altitude while allowing directional control.
- Return GPS/activate TRX switch to return aircraft via GPS to launch point.
- Return FSS/failsafe activated from radio signal loss to return aircraft via GPS to launch point.
- Fixed circle/activate TRX switch to circle aircraft at point of activation at fixed altitude.
- Waypoint/activate TRX switch to initiate an autopilot programmed flight path via waypoints.
- Fencing/autopilot programed to display site unique boundaries on video monitor/goggles.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft be flown within *VLOS* of the operator.

b) Model aircraft must be flown at or below 400 feet AGL when within 3 miles of an airport as stated in the AMA Safety Code.

c) Model aircraft utilizing an *autopilot* for waypoint flying are limited to a maximum weight (including fuel, batteries, and onboard *autopilot systems*) of 15lbs and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) If your radio system lacks *failsafe* capability, consider using programmable digital servos or auxiliary *failsafe* modules. In the event of a radio signal failure these components will activate desired safe servo settings or an *autopilot* for return to base/launch (RTL).

b) When using an *autopilot system* the "return to launch" (RTL) feature should be programmed to return the aircraft to a safe location and safely terminate the flight should manual control of the aircraft be lost. When using RTL, pay particular attention to the manufacturer's throttle recommendations to prevent stalling.

c) The use of *stabilization systems* is recommended when flying FPV to improve flight stability and video quality.

d) Pilots usually choose to incorporate *stabilization* and *autopilot systems* for model aircraft flying to enhance flight performance, correct bad tendencies of the model aircraft, maintain stability in windy weather, establish precision heading holds for takeoffs/landings, flight training for novice pilots, create a steady flight platform for cameras, and generally just to make an airplane easier and safer to fly.

e) When purchasing *stabilization* and *autopilot systems*, always try to select quality equipment from reputable dealers, ensure for compatibility with other onboard systems, and install components according to manufacturers' instructions.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data or information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA Pilot is an AMA member who is capable of manually operating an R/C transmitter to control a model aircraft's flight path within its safe intended *flight envelope* without losing control or having a collision.

Autopilot Systems incorporate programmable flight *stabilization* with an altitude sensor and a GPS receiver for accurate positioning and to navigate/control a radio controlled model aircraft's flight path. Advanced systems offer software for entering navigable waypoints. The flight data waypoints may be saved to autopilot's/GPS memory for programmed flight.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's *flight envelope*. (This includes primary R/C systems and any *stabilization* or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

Failsafe Systems are designed to minimize or prevent damage and safely terminate a flight when a radio controlled model aircraft loses radio signal. Modern radio systems can be programmed to position servos to a desired control setting in the event of radio signal failure.

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft. (AMA Document #550).

Flight Envelope is defined as the range of airspeeds, attitudes and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's intended flight envelope. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting manually controlled stable flight).

R/C Test Flight requires an AMA Pilot to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its safe intended *flight envelope*.

Stabilization Systems are designed to maintain intended model aircraft flight attitudes. The pilot can install, program and/or activate a system to stabilize yaw, pitch, or roll or any one attitude or combination of attitudes. Systems are often based on rate/heading hold gyros or inertial motion sensors utilizing multi-axis gyros and accelerometers for attitude stabilization.

Visual Line of Sight (VLOS) is the distance at which the pilot is able to maintain visual contact with the aircraft and determine its orientation and attitude without enhancements other than corrective lenses.

APPENDIX D

LEGISLATIVE LEGAL SERVICES MEMO
ALASKA LAWS PROTECTING PRIVACY

LEGAL SERVICES

DIVISION OF LEGAL AND RESEARCH SERVICES
LEGISLATIVE AFFAIRS AGENCY
STATE OF ALASKA

(907) 465-3867 or 465-2450
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State Capitol
Juneau, Alaska 99801-1182
Deliveries to: 129 6th St., Rm. 329

MEMORANDUM September 30, 2013

SUBJECT: Alaska Laws Protecting Privacy
(Work Order No. 28-LS0990)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Kathleen Strasbaugh
Legislative Counsel

You have asked for a review of Alaska's laws protecting individual privacy in preparation for a meeting of the Task Force on Unmanned Aircraft Systems. Among the Task Force's duties is providing written recommendations concerning, among other things, a state policy that protects privacy. 2013 Legislative Resolve No. 17 at 3. To that end, as I understand from Ms. Blaisdell, you would like to know what protections might already exist, with a view toward avoiding duplication of existing law. The Task Force has apparently expressed concern about how information gathered by unmanned aircraft could be used by private or public parties, and what use might be made of such information captured inadvertently.

This memo will outline constitutionally based protections of privacy and identify state statutes that might apply to conduct considered invasion of privacy. As you requested, this memo focuses on the protections afforded under Alaska law. A brief discussion of emerging federal law is included, but I haven't explored other states' case law, nor lower federal court cases that consider these issues. However, I have attached an excerpt of an *Alaska Law Review* which summarizes Alaska's privacy law as it has developed independently of federal constitutional law. I have also attached a recent *Harvard Law Review* article that specifically addresses this topic in great detail. The memo also briefly addresses scenarios set out in your request. Please note that it is very difficult to predict the outcome of litigation in this very new intersection of technology and privacy law.

1. Constitutional Protection of Privacy

The Constitution of the State of Alaska explicitly protects the right of privacy against government (but not private) intrusion. Art. I, sec. 22, provides:

> The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section.

This protection, although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. *Woods & Rohde, Inc. v. State, Department of Labor*, 565 P.2d 138, 149 (Alaska 1977).[1] Both the Alaska Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy. *Beltz v. State*, 221 P.3d 328, 333, 337 (Alaska 2009) (search of garbage placed out on the street for collection did not require warrant; expectation of privacy found not reasonable.)

Neither the Alaska Supreme Court nor the United States Supreme Court has ruled on whether surveillance by a government operated unmanned aerial vehicle is a search under the Fourth Amendment. Based on available precedent, it is possible that the courts will decide that the use of an unmanned aerial vehicle constitutes a search requiring either a warrant, or the application of a recognized exception to the warrant requirement.

The United States Supreme Court has considered law enforcement or other government agency use of aerial surveillance and the use of technological devices for surveillance purposes. The Court found that surveillance by manned aircraft is not an intrusion into a private area that renders an overflight a search under the Fourth Amendment to the United States Constitution; however the placement of a global positioning device on a person's vehicle is an intrusion that constitutes a search. Here is a brief summary of some of these cases: *United States v. Jones*, 565 U.S. ___, 132 S.Ct. 945 (2012): Attachment of global positioning device to automobile parked in public place is a search under the Fourth Amendment.

Dow Chemical Co. v. United States, 476 U.S. 227 (1986) EPA aerial surveillance and photography of chemical plant is not a search where the aircraft was manned and operating at a lawful altitude.

California v. Ciraolo, 476 U.S. 207 (1986) Manned aerial surveillance of a backyard marijuana grow at lawful altitude did not violate the Fourth Amendment.

The Court might find the use of a technology that exceeds human observational capacity the sort of intrusion that constitutes a search requiring a warrant or an accepted exception:

> Where, as here, the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a "search" and is presumptively unreasonable without a warrant.

Kyllo v. United States, 533 U.S. 27, 40 (2001) (internal citations omitted) (thermal

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[1] In Alaska, the right to privacy extends to protection of such activities as possession and use of marijuana in the home by an adult, which, while not a fundamental right, is protected because such possession and use does not implicate the public welfare in the manner that more harmful substances, or public ingestion, or use by minors might. *Ravin v. State*, 537 P.2d 494, 508-09 (Alaska 1975).

imaging of home from outside a search under the Fourth Amendment).

2. Alaska Statutory protections

There are a handful of criminal statutes that may apply to improper use of images obtained from unmanned aerial vehicle surveillance. These statutes would seem to apply for the most part to private actors. These are offenses that punish conduct that invades the privacy of a victim, and would require proof that images gathered by the unmanned aerial vehicle were disseminated. These offenses would probably not punish capturing the images inadvertently, although collecting and storing them might be a concern.

Alaska Statute	Charge	Penalty
11.41.270	Stalking in the second degree: nonconsensual conduct prohibited by statute prohibits monitoring by technical means.	Class A misdemeanor[2]
11.61.116	Sending an explicit image of a minor.	(1) class B misdemeanor if the person distributes the image to another person;[3] (2) a class A misdemeanor if the person distributes the image to an Internet website that is accessible to the public.
11.61.120(a)(6)	Harassment in the second degree: publishing or distributing images that show certain body parts or a sexual act.	Class B misdemeanor

[2] A class A misdemeanor is punishable by a fine of up to $10,000, and a sentence of imprisonment up to one year.

[3] A class B misdemeanor is punishable by a fine of up to $2,000, and a sentence of imprisonment up to 90 days.

11.61.123	Indecent viewing or photography (with certain law enforcement and security surveillance exceptions).	(1) class C felony if the person viewed or shown in a picture was, at the time of the viewing or production of the picture, a minor;[4] (2) class A misdemeanor if the person viewed or shown in the picture was, at the time of viewing or production of the picture, an adult.
11.76.113	Misconduct involving confidential information in the first degree: use of confidential information to commit a crime or obtain a benefit to which the person is not entitled to injure another, or deprive another of a benefit.	Class A misdemeanor
11.76.115	Misconduct involving confidential information in the second degree: knowingly and without legal authority obtaining confidential information about another.	Class B misdemeanor

In addition to the above criminal offenses, there are other provisions of law that might bear on the information obtained from data gathered by an unmanned aerial vehicles.

If the data is gathered by a government agency, it is a public record. However, AS 40.25.120 provides certain protections for private information. AS 40.25.120(a)(4) excepts records required by law to be kept confidential. *See Falcon v. APOC*, 570 P.2d 469 (Alaska 1977) (physician not required to disclose identity of certain patients to Alaska Public Offices Commission where the disclosure of the patients' identities might disclose the fact that they were being treated for conditions that patients would normally keep private); *Alaska Wildlife Alliance v. Rue*, 948 P.2d 976 (Alaska 1997) (payroll information may be kept private where disclosure might endanger employees or contractors, where those employees and contractors were threatened with harm). AS 40.25.120(a)(6)(C) protects information gathered by law enforcement the disclosure of which "could reasonably be expected to constitute an unwarranted invasion of the personal privacy of a suspect, defendant, victim, or witness."

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[4] A Class C felony is punishable by a fine of up to $50,000, and a sentence of imprisonment up to five years. Presumptive sentences based on whether the offense is a first or subsequent offense are set out at AS 12.55.155(e).

There may be civil liability for obtaining (and subsequently misappropriating) information on trade secrets or patented processes. *See, generally.* AS 45.50.

In addition, a person who is subject to surveillance that is unreasonable or unlawful could sue for the tort of invasion of privacy. *Compare Wal-Mart v. Stewart*, 990 P.2d 626, 634 (Alaska 1999) (daily search of employee's bags held an unreasonable invasion of privacy where not part of a random, nondiscriminatory policy, and where the employee feared that refusing the search might result in others suspecting him of theft, or result in a police call or firing).

3. Particular scenarios

Inadvertent capture of evidence of illegal activity. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information, and whether the person whose actions have been captured has a reasonable expectation of privacy. One of the scenarios mentioned in your request is the capture of evidence of poaching. Assuming that the poacher is a person taking game on property that is not the poacher's own, the poacher cannot reasonably expect privacy when present on another's land without authority.

If a law enforcement agency sends out an unmanned aerial vehicle for patrolling or surveillance, perhaps to look for illegal cultivation of marijuana or manufacture of methamphetamine on public land, and in the course of doing so, captures evidence of an industrial sized marijuana grow operation on private land, it might provide grounds to obtain a warrant to explore further.[5] Under Alaska law, if the observation of the event is lawful or in "plain view," the discovery inadvertent, and the incriminating nature of the evidence immediately apparent, a warrant might not be required. *Ahvakana v. State*, 283 P.3d 1284, 1288 (Alaska Ct. App. 2012) (entry into property where evidence found was authorized under the emergency aid exception to the warrant requirement). However, since the vehicle is not manned, the federal authorities discussed above suggest that the information might not be considered to be lawfully obtained unless some other exception to the requirement of a warrant is present. It is not clear to me whether and under what circumstances a court might grant a search warrant to follow up on information inadvertently obtained, but not in "plain view."

It is possible that the inadvertent capture of information that might otherwise be inadmissible under the exclusionary rule that bars admission of evidence obtained in violation of the United States Constitution will be treated as a good faith exception under *United States v. Leon*, 468 U.S. 897(1984). In *Leon*, the United States Supreme Court held that the Fourth Amendment exclusionary rule should not be applied so as to bar the use of evidence obtained by officers acting in reasonable reliance on a search warrant

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[5] *But see State v. Crocker*, 97 P.3d 93 (Alaska Ct. App. 2004) holding that because the application for the warrant did not affirmatively disclose information that the marijuana cultivation was beyond what was permitted under *Ravin*, there was no probable cause for a warrant.

issued by a detached and neutral magistrate but ultimately found to be invalid. A court could determine that information inadvertently captured in otherwise lawful surveillance is likewise a good faith exception. However, Alaska's appellate courts have not decided whether to adopt this exception. *Deemer v. State*, 244 P.3d 69, 72 (Alaska Ct. App. 2010). Thus it is impossible to predict the outcome of litigation on this subject under Alaska law, and it is not at all clear, given the federal case law developments discussed elsewhere in this memorandum, that the United States Supreme Court would apply the exception in a situation where there was no warrant.

Person intentionally gathers private information for personal use or distribution. A number of the criminal charges listed above might be available. In addition, if the images obtained are used in child pornography, a number of federal and state criminal statutes might apply.

Please advise if you require further assistance in this matter.

KJS:ray
13-008.ray

Enclosures

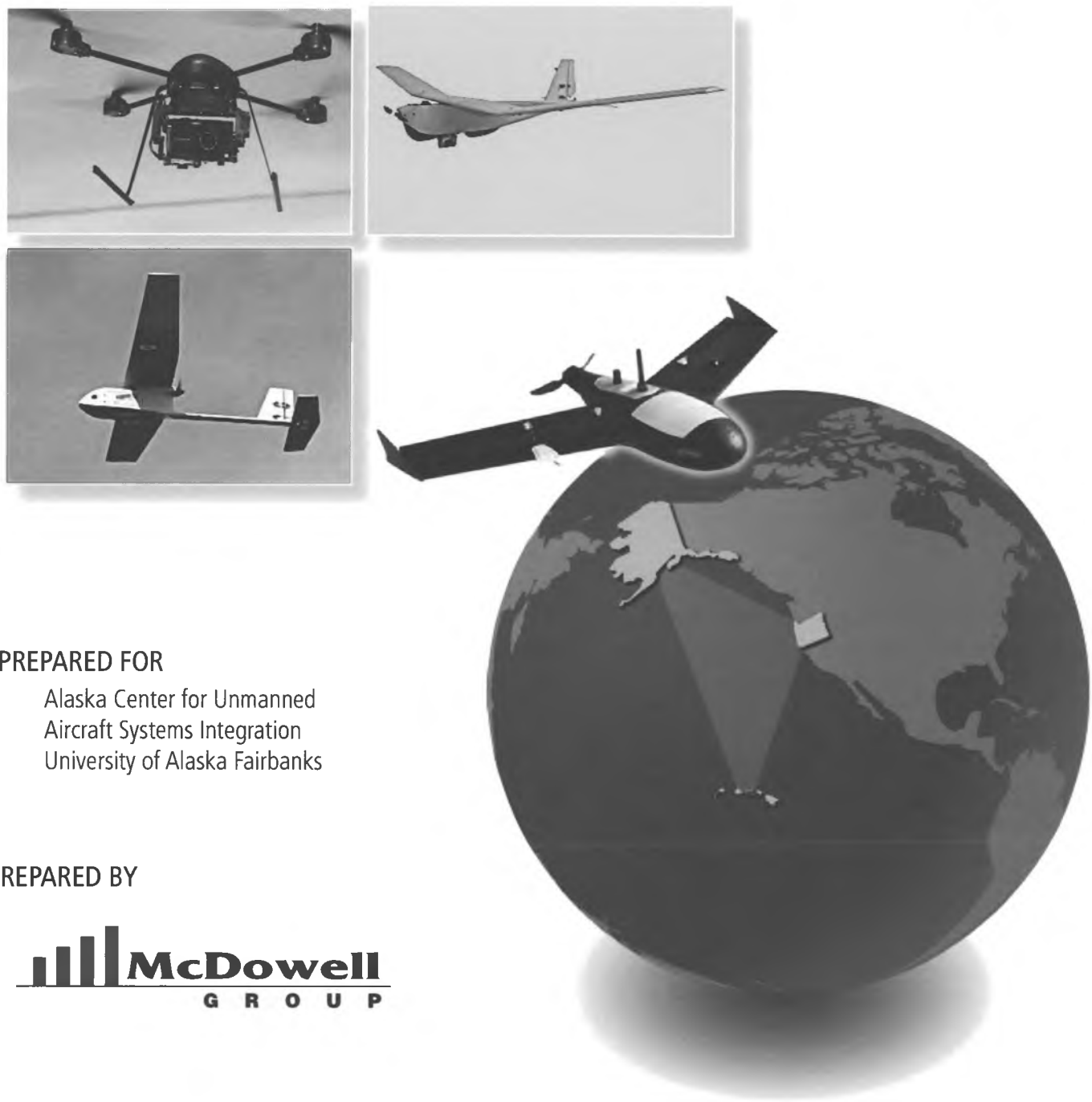
APPENDIX E

ECONOMIC IMPACT OF A PAN-PACIFIC UNMANNED AIRCRAFT SYSTEMS TEST SITE

Economic Impact of a

Pan-Pacific Unmanned Aircraft Systems Test Site

May 2013



PREPARED FOR

Alaska Center for Unmanned
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University of Alaska Fairbanks

PREPARED BY

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Executive Summary

Purpose and Scope

In March 2013, the University of Alaska Fairbanks Center for Unmanned Aircraft Systems contracted with McDowell Group to analyze the economic conditions for unmanned aircraft systems (UASs) in Alaska and measure the projected economic impact of developing a Federal Aviation Administration (FAA) test site for UAS in Alaska. The economic impact assessment (EIA) in this report provides annual projections of the direct, indirect, and induced impacts to employment and wages as well as projections of output and value added related to the test site, called the Pan-Pacific UAS Test Range Complex (PPUTRC) – with test ranges located in Alaska, Hawaii, and Oregon. The EIA focuses on the additional economic activity that is expected in response to the PPUTRC test site selection. Additional information is provided in this report on the economic impact of the commercialization of UAS specifically in Alaska once UAS flights are allowed in the National Airspace System (NAS).

Summary

- UAS represent a new industry that is set to quickly grow once new government regulations increase access to designated test sites and then to the National Airspace System (NAS), the system of air traffic control that enables safe and efficient flight activity in the U.S.
- UAS applications are far reaching for civilian and military purposes; ranging from environmental monitoring to search and rescue to pipeline or powerline inspections.
- The FAA has limited the authorized use of UASs in the U.S. to efforts focused on the public interest. There are currently two ways to operate a UAS with the approval of the FAA (both of these options require that the flight takes place outside of densely-populated areas):
    - Certificate of Waiver or Authorization (COA) for public UAS
    - Special airworthiness certificate for private sector (civil) UAS
- However, the FAA is scheduled to designate six UAS test sites in the U.S., as required under the FAA Modernization and Reform Act of 2012. The sites will operate from January of 2014 to February 13, 2017 to provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UASs in the NAS.
- According to the Association of Unmanned Vehicle Systems International (AUVSI), integration of UASs into the NAS will generate some $82 billion in activity in the U.S. between 2015 and 2025; employment impacts are estimated at just over 100,000 jobs by 2025.

- In an effort to bring additional UAS activity and related economic benefits to Alaska, UAF is leading the PPUTRC Test Site application process for 13 ranges in Alaska, Hawaii, and Oregon.
- Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide-open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts).
- In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from $57 million in 2014 to about $76 million in 2017.
- Output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017.
- Value added would climb from $109 million to $134 million over the same period.
- Designation of the PPUTRC will provide a four-year total of $20 million of income tax revenue to Hawaii and Oregon.

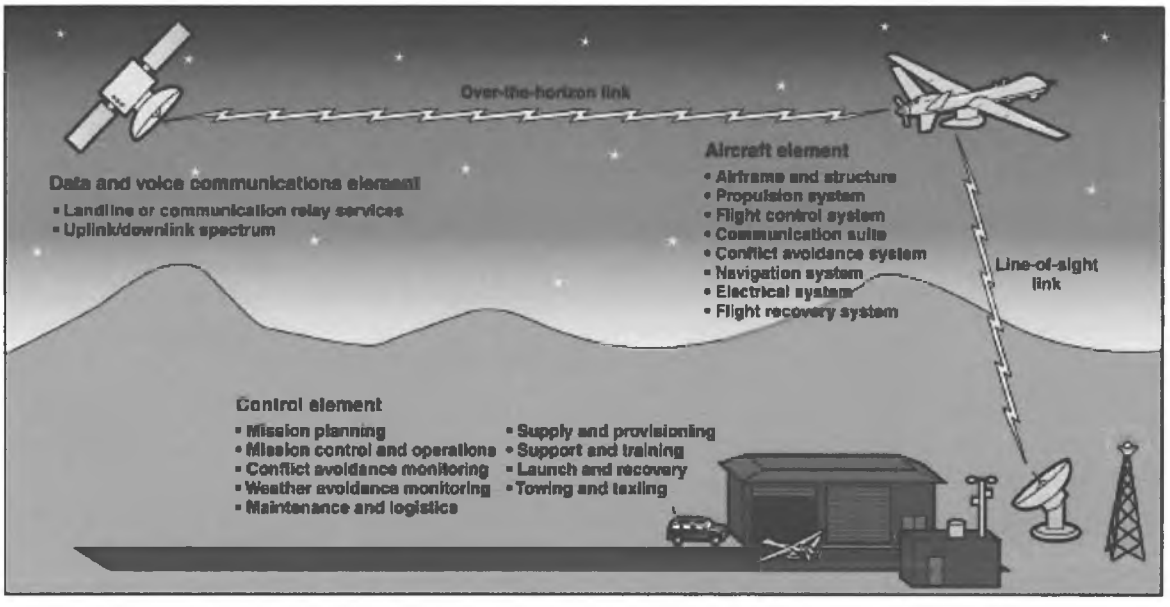
Chapter 1. Unmanned Aircraft Systems in the United States and the NAS

Background

Unmanned aerial vehicles (UAVs) were first described in the late-19th century. Early attempts to develop these UAVs, mostly for combat purposes, soon followed. These remotely piloted vehicles first entered U.S. combat in the mid-20th century to support missions focused on reconnaissance and surveillance, and sometimes they were also used as decoys. Throughout most of the 20th century UAVs lacked real-time data capability and instead focused on collecting images and video for surveillances purposes. Widespread adoption of the technology for U.S. military purposes did not begin until the 1990s and, to a much greater extent, the 2000s during the Afghanistan and Iraq conflicts. It was at this point that technological innovations related to onboard sensors, communication links, and data collection began drastically increasing the potential domestic uses of unmanned aircraft systems.

The increase in complexity for the UAVs required a systems approach to appropriately understand the interactions - and design each component from the start as an integratedsystem - among the on-the-ground control elements, the aircraft, and the communication links. This broader operational perspective is termed "unmanned aircraft system" (UAS). The image below provides a conceptual rendering of the interactions among key elements of a UAS flight.

Figure 1: Conceptual Rendering of an Unmanned Aircraft System



Source: GAO, 2013

UAS Applications

Unmanned aircraft often provide advantages in comparison to manned aircraft. For instance, flights that are dangerous or covert represent potential opportunities where an unmanned vehicle might be preferred over a manned vehicle. Similarly, dull tasks such as extended surveillance missions may be better suited for ground-based operators that can be relieved at the end of their shift. UAVs are often more fuel efficient, quieter, and less disruptive to their surroundings (in comparison to manned aircrafts) and, thus, can allow for fewer environmental disturbances as well as more accurate research results. Finally, initial costs, operating costs (e.g. maintenance costs, fuel costs, storage costs, etc.), and labor costs (e.g. wages, insurances, etc.) are all generally lower for UAVs (Source: Austin, 2010). UASs have already been shown to lead to arrests as well as saving lives during search and rescue missions (Source: The Verge, 2013).

The existing and potential applications for UASs are wide ranging for both civilian uses as well as for military purposes. The lists below provide an abbreviated look at how important this relatively new field may become to sectors throughout Alaska's economy (Source: Austin, 2010):

Civilian

- Aerial Photography - Film, video, stills, etc.
- Agriculture - Crop monitoring and spraying; herd monitoring and driving
- Coastguard – Search and rescue, coastline, and sea-lane monitoring
- Conservation – Pollution and land monitoring
- Customs and Excise – Surveillance for illegal imports
- Electricity Companies – Powerline inspection
- Fire Services and Forestry – Fire detection, incident control
- Fisheries – Fisheries protection
- Gas and Oil Supply Companies – Land survey and pipeline security
- Information Services – News information and pictures, feature pictures (e.g. wildlife)
- Lifeboat Institutions – Incident investigation, guidance, and control
- Local Authorities – Survey, disaster control
- Meteorological Services – Sampling and analysis of atmosphere for forecasting, etc.
- Oil Companies – Pipeline security
- Ordinance Survey – Aerial photography for mapping
- Police Authorities – Search for missing persons, security and incident surveillance
- Rivers Authorities –Water course and level monitoring, flood and pollution control
- Survey Organizations – Geographical, geological, and archaeological survey
- Traffic Agencies – Monitoring and control of road traffic
- Water Boards – Reservoir and pipeline monitoring

Military

- Navy
    - Shadowing enemy fleets

    - Decoying missiles by the emission of artificial signatures
    - Electron intelligence
    - Relaying radio signals
    - Protection of ports from offshore attack
    - Placement and monitoring of sonar buoys and possibly other forms of anti-submarine warfare
- Army
    - Reconnaissance
    - Surveillance of enemy activity
    - Monitoring of nuclear, biological, or chemical (NBC) contamination
    - Electronic intelligence
    - Target designation and monitoring
    - Location and destruction of land mines
- Air Force
    - Long-range, high-altitude surveillance
    - Radar system jamming and destruction
    - Electronic intelligence
    - Airfield base security
    - Airfield damage assessment
    - Elimination of unexploded bombs

UAS Categories

UASs are typically categorized based on the size or capability of the UAV. The five categories below provide a common categorization of UAS that helps simplify requirement assessments and costing estimates (Source: Teal Group, 2008):

- Micro or Mini – A small UAV that ranges in size from something that can be held in the palm of the hand to a UAV that can be carried on your back and launched by hand.
- Naval – A tactical UAV is generally operated with simpler systems over a radius between 100 and 300 km.
- Tactical – A reconnaissance UAV used by the Army for endurance missions ranging several hours over an operating radius up to 200 km.
- MALE – Medium Altitude Long Endurance reconnaissance UAVs fly between 5,000 and 15,000 meters in altitude for approximately 24 hours.
- HALE – High Altitude Long Endurance reconnaissance and surveillance UAVs are usually operated by Air Forces at altitudes over 15,000 meters for periods longer than 24 hours.

National Airspace System

The NAS was developed to allow for safe and efficient commercial aviation. However, commercial UAS flights are currently not allowed in the NAS due to concerns over (1) "the inability to detect, sense, and avoid other aircraft and airborne objects in a manner similar to 'see and avoid' by a pilot in a manned aircraft, (2) vulnerabilities in the command and control of UAS operations, (3) the lack of technological and operational standards needed to guide the safe and consistent performance of UAS, and (4) the lack of final regulations to accelerate the safe integration of UAS into the national airspace" (Source: U.S. GAO, 2012 and Waggoner, 2013).

The first authorized use of UASs in the NAS in the U.S. was permitted by FAA in 1990. Over the past 23 years, the FAA has limited the authorized use of UAS in the U.S. to efforts focused on the public interest. These missions have included border patrol, military training, disaster relief, firefighting, search and rescue, law enforcement, and testing and evaluation. According to the FAA, the Department of Homeland Security currently utilize UASs for border and port surveillance; NASA and NOAA utilize UAS to help with scientific research and environmental monitoring; law enforcement agencies utilize UASs to support public safety; and state universities use UASs to conduct research (Source: FAA Fact Sheet 2013). These efforts are limited to areas outside of major urban areas at elevations less than 50,000 feet. The aircraft range in size from a hummingbird to a wingspan as large as a Boeing 737; although many are the size of a remote-control plane or helicopter. Recreational use of airspace is allowed away from airports and air traffic and below 400 feet above ground level – informal flights for business purposes are specifically excluded (Source: FAA Advisory Circular 91-57).

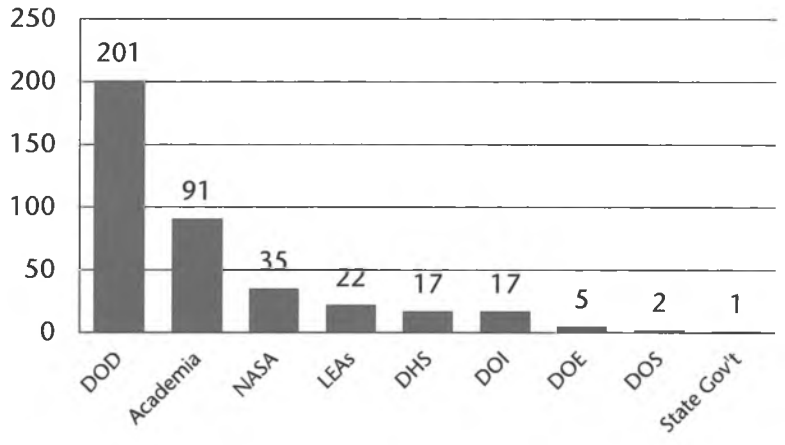
As of 2013, there are currently two ways to operate a UAS with the approval of the FAA: (1) Certificate of Waiver or Authorization (COA) for public UAS's and (2) special airworthiness certificate for private sector (civil) UAS's – both of these options require that the flight takes place outside of densely-populated areas.

Certificate of Waiver or Authorization (COA)

COAs allow public entities to fly UASs in a defined block of civil airspace. The FAA issued the first COAs in January 2007. With COAs, the UAV must remain in view, either of the ground crew or via a chase plane, since UAS technology cannot currently comply with 'See and Avoid' rules. COAs usually require between six and 24 months for approval and cost $40,000 to $60,000 (Source: Economic Development of Central Oregon, 2011). Most of the cost is for specialists in the testing protocols, documentation, and in managing the process through the FAA. Common applications by COA holders include firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions (Source: FAA 2013b). The number of COAs issued has increased since 2009, with 146 in 2009, 298 in 2010, and 313 in 2011 (Source: FAA 2013b). In 2012, the FAA issued 391 COAs to 121 federal, state, and local government entities in the U.S. A total of 1,428 COAs have been issued since January of 2007 (Source: GAO 2013). As of February 15, 2013, there were 327 active COAs (Source: FAA 2013b).

The graph below aggregates the 391 COAs issued in 2012 to nine types of entities: U.S. Department of Defense, academia, NASA, local law enforcement agencies, U.S. Department of Homeland Security, U.S. Department of the Interior, U.S. Department of Energy, U.S. Department of State, and state government.

Figure 2: Number of Approved COAs, 2012



Source: GAO, 2013

Special Airworthiness Certificate

Special airworthiness certificates are the only way for civil operators to fly UASs in the NAS at present. However, these certificates cannot be utilized to carry people or property for compensation or hire – they can only be issued for research and development, crew training, or market surveys (Source: FAA 2011).

Allowing UAS in the NAS

In recent years the FAA has made a concerted effort to integrate UAS regulations into the NAS. In 2009, the FAA, NASA, DoD, and the Department of Homeland Security began addressing pathways to integrating UAS regulations into the NAS through their UAS Executive Committee. Additionally, the FAA chartered a UAS Aviation Rulemaking Committee in 2011 to create operational procedures, regulatory standards, and policies related to UAS flights in the NAS. In 2012, the FAA Modernization and Reform Act of 2012 (FMRA of 2012) was passed by Congress to approve six test sites where UAS integration could be tested prior to a 2015 integration of UAS regulations in the NAS (Source: FAA 2012). Delays within the FAA due to technical, logistical, and public outreach concerns may contribute to a UAS integration date later than 2015. However, six test sites are still scheduled to run from January 1, 2014 to February 13, 2017.

Six UAS Test Sites

There is considerable competition over where test sites will be designated, since designation will provide immediate employment in the selected region and support a strong foundation for UAS activity prior to integration of UAS regulation in the NAS. As of March 5, 2013, 50 applicants from 37 states were granted access to the FAA test site application web portal (Source: FAA 2013b). The FAA will consider

five key items when deciding the location of the six test sites: (1) geographic and climatic diversity, (2) location of ground infrastructure and research needs, (3) consultation with NASA and DOD, (4) population density and air traffic density of the surrounding area of any proposed location as well as the potential impact areas in the event of incidents, such as "Fly away" given potential safety mitigations; and (5) identification of specific goals and objectives to be accomplished. Additionally, the test sites are expected to provide an environment and opportunity to test conventional takeoff and landing capability, high speed flight (greater than 250 knots indicated air speed), maritime (launch/maneuver/recovery) capability, operations at extremely high altitudes (Class A airspace and above), and evaluation of dissimilar aircraft (including a mix of manned and unmanned aircraft) in multiple altitude structures (Source: FAA 2013a).

The six test sites that are selected will support the following operations and programs:

- Safe designation of airspace for integrated manned and unmanned flight operations in the national airspace system;
- Development of certification standards and air traffic requirements for unmanned flight operations;
- Coordinating with and leveraging the resources of NASA and the Department of Defense;
- Addressing both civil and public unmanned aircraft systems;
- Ensuring that the program is coordinated with the Next Generation Air Transportation System; and
- Ensuring the safety of unmanned aircraft systems and related navigation procedures before they are integrated into the national airspace system (Source: FAA, 2013b).

The test site operators will provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UAS regulations in the NAS. Additionally, data collection will support development and operations research and professional development opportunities will be available for inspectors, airspace managers, air traffic controllers, and others. The specific goals described by the PPUTRC applicants include (Source: PPUTRC, 2013):

- Develop a set of standards for select unmanned aircraft categories, for aircraft state monitoring, and navigation. PPUTRC goals and objectives work will augment ongoing standards work with research on categories of UAS not yet addressed, and evaluations needed to refine emerging standards under consideration;
- Validate FAA acceptable risk thresholds or safety management system standards for UAS operations;

- Identify safety factors in UAS design; validate certification standards, including protocols for air traffic control interaction. Define and qualify underlying assumptions and a minimum set of air vehicle characteristics critical to safety, reliability, etc.;
- Develop effective, compliant 'sense and avoid' systems to satisfy regulatory guidance;
- Identify gaps in federal and state statutory and case law protections for privacy and recommend policies or legislation to remedy;
- Directly support the federal mandate for "Expanding Use of UAS in the Arctic" (in Sec 332(d) of Public Law 112-95);
- Design experiments and provide data to support American Society for Testing and Materials (ASTM) F38 and Radio Technical Commission for Aeronautics Special Committee (RTCA SC) 203 to evaluate minimum training and operator qualification standards for crew licensing.

Economic Impact of UAS in the U.S.

The economic implications of integrating UAS regulations into the NAS are substantial. According to a study conducted for the Association for Unmanned Vehicle Systems International (AUVSI), integration will generate $82 billion in activity between 2015 and 2025. Employment impacts are estimated at just over 100,000 jobs by 2025.

The direct economic impact of UAS development in the U.S. is expected to climb from $1.1 billion in 2015 to over $5 billion annually by 2025, measured in terms of output. Including indirect and induced effects, the annual economic impact is expected to rise from $2.3 billion in 2015 to $10 billion in 2025 (Source: AUVSI, 2013).

Areas selected as UAS test sites will have an advantage in capturing these economic benefits; thus the fierce competition among the 50 applicants.

Chapter 2. Pan-Pacific Test Range Complex

In 2012, the Alaska Center for UAS Integration (ACUASI) at the University of Alaska Fairbanks Geophysical Institute began collaborating with Oregon State University and the University of Hawaii to propose a Pan-Pacific Test Range Complex (PPUTRC) as one of the six FAA test sites. This proposed PPUTRC contains 13 test ranges located in Alaska, Hawaii, and Oregon. Of the 13 ranges, six ranges are in Alaska (Denali, Kodiak, North Slope, Oliktok, Poker Flat, and Wainwright), three ranges are in Hawaii (Humuula-R-3103, Makua-R-3109, and Maku-R-3110), and four ranges are in Oregon (Juniper MOA, Pendleton, Tillamook Coastal, and Warm Spring).

Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts). The diverse testing environments for the PPUTRC are included in the Table 1 below:

Table 1: Diversity of Potential Testing Environments for the PPUTRC

360 degree oceanic airspace access	Arctic landscape	Extreme low temperatures
Oceanic and sea-ice access	High arctic winds	High sea-salt corrosion effect
Able to fully matrix UAS into NextGen and air traffic operating both VFR and IFR; high and low altitude	Operations in all classes and categories of military SUA	Operations in Classes A through F international airspace in the oceanic environment
Class C, D, & E airspace within 5-nautical miles of airports	High and low-land vegetation tundra	Numerous inland waterways and lakes
High density airports integration studies and testing	Class C, D, & E airspace airport approaches/departures	High-humidity high and low-altitude
Hot and cold high-desert testing	Littoral coastal region mountainous area	Class E (high) airspace
Jungle conditions	Class A airspace	Mountainous terrain
Volcanic	Glacier	Ship traffic including open ocean and ports

UAS Activity in Alaska, Hawaii, and Oregon

There are currently 15 active COAs in the PPUTRC area as well as eight in-process COAs and 20 expired COAs.

Alaska

ACUASI at the University of Alaska Fairbanks (UAF) is the lead organization for the proposed PPUTRC. The formal PPUTRC team includes over 80 businesses, universities, tribes, and economic development organizations in Alaska. UAF has actively managed UAS operations since 2004.

ACUASI was formed in 2012 to enhance UAS research in Alaska. ACUASI and the UAF Geophysical Institute have developed and flown a variety of in-situ and remote sensing instruments on various UASs in Alaska and throughout the world. Scientific and research campaigns undertaken in Alaska over the past decade include using UASs to support observation and monitoring of sea lions in the Aleutian Islands, weather forecasting, volcanic plume monitoring, atmospheric sampling during wildfires, monitoring of sea ice build ups, and oil spill mapping. Commercial applications trialed in Alaska include whale monitoring, cadastral mapping, maritime navigation support, industrial plant monitoring, and environmental clean-up. This experience, coupled with the FAA's UAS test site status, would leverage a variety of new economic activities in Alaska.

The following table, which summarizes ACUASI activity in 2012, illustrates the variety of UAS activity supported by the organization. The table also provides revenue and staffing data for each UAS campaign.

Table 2: UAS Campaigns Supported by the University of Alaska Fairbanks in 2012

Client	Flight Locations	Type of UAS	Purpose of Flights	Revenue for Site Operator	Site Operator Staff	Flight Operator Staff
Aleutians	Aleutian Islands, AK	Aeryon Scout and Puma	Seal observation	$314,200	2 pilots	1 observer
Idaho	Lewiston, ID	Aeryon Scout	Salmon nest observation	$115,000	1 pilot	1 observer
Eglin Air Force Base	Fort Walton Beach, FL	ScanEagle and Aeryon Scout	Controlled burn experiment	$413,000	4 pilots	3 observers
Prudhoe Bay	Prudhoe Bay, AK	Aeryon Scout	British Petroleum flare stack monitoring	$190,000	1 pilot	1 observer
Nome	Nome, AK	Aeryon Scout	Harbor Ice monitoring for USCG	$30,000	1 pilot	1 observer
Ugak Island	Ugak Island, AK	Aeryon Scout	Seal population monitor	$6,500	1 Pilot	1 observer
Fort Greely	Fort Greely, AK	ScanEagle and Aeryon Scout	Flight test	$25,000	2 pilots	2 observers
Chile	Santiago, Chile	Aeryon Scout	Glacier Ice monitor	$9,000	1 pilot	1 observer
Belgium	Belgium	Gatewing	Flight training	$16,000	2 pilots	1 observer
Anchorage	Fort Richardson, AK	Aeryon Scout	Flight test and demonstration	$1,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	ScanEagle	Payload test	$347,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Aeryon Scout	Payload test and demonstration	$30,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Raven	Flight test for avionics	$5,000	2 pilots	2 observers
Hawaii	Offshore Hawaiian Islands	Puma	Tsunami debris tracking	$95,000	1 pilot	1 observer

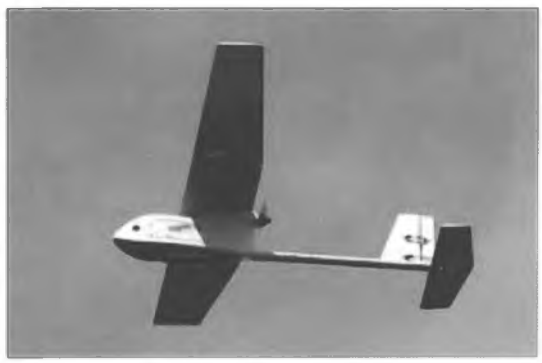
Sources: ACUASI, 2013

Figure 3: Types of UAS Flown in Alaska in 2012

Aeryon Scout

Boeing Insitu ScanEagle

AeroVironment Raven



Gatewing

AeroVironment Puma

Hawaii

Hawaii offers many unique qualities that make UAS operations appealing. These include: (1) expansive over-water areas unencumbered by other aviation uses, (2) proximity to U.S. Pacific Command – a significant user of future UAS systems, (3) opportunities for joint operations with the Pacific Missile Range Facility – a major test range on Kauai, and (4) opportunities for long-range point-to-point tests with partner ranges in Alaska and Oregon. The Hawaii ranges have proven an important focus for the development of scientific applications of UAS, with significant milestones including test flights of the Aerovironment Pathfinder; Pathfinder Plus; and Helios solar-hybrid propulsion high altitude, long endurance UAS, between 1997 and 2001. Scientific applications led by U.S. federal agencies have recently seen Hawaii emerge as a focal point for NOAA's exploration of UAS as a tool for marine park surveillance. NOAA has utilized UAS to monitor Papahanaumokuakea Marine National Monument since 2007 and performed initial trials using small hand launched systems in mid-2012.

Oregon

The Oregon-based PPUTRC team members include 16 businesses, universities, tribes, and economic development organizations. Additionally, six committed team partners will convert to formal team members upon FAA test site designation award to PPUTRC. Engagements are also planned with a wide ranging network in Oregon – including the 111 AUVSI members and numerous startup companies, primarily in sensor, robotics, and other supporting technologies. In comparison to Alaska and Hawaii, Oregon has historically been more engaged in design, development, and manufacture of UAV systems and subsystems.

The two largest Oregon UAS firms are Insitu (design, development, and manufacture of UAS systems) and FLIR Systems (remote sensors). The main Oregon firm involved in UAS applications has been Near Space Corporation (NSC). NSC uses very high altitude unmanned balloons and gliders to perform scientific and commercial test activities, ranging from data gathering on behalf of government agencies to near-space testing of hardware and sensors for commercial firms. NSC is opening a new $6 million flight test and operations facility at the Tillamook Airport on the Oregon coast. Existing UAS activity also includes the Oregon Army National Guard operations in Pendleton. Oregon's UAS efforts are synergistic with a separately funded ground vehicle innovation initiative, Drive Oregon, which requires systems that can be spun out of UAS: quiet, efficient motors, lightweight composite designs, and navigation systems. The potential economic benefits of the test sites, as well as NAS integration, are particularly strong for Oregon's already significant aircraft manufacturing sector.

Recent UAS Funding in Alaska, Hawaii, and Oregon

Since 2004, nine Alaska contractors have received direct U.S. federal agency contracts for UAS goods and services. The largest federal contract in Alaska is a 5-year standing services award, worth $47 million, from the U.S. Navy to the University of Alaska in 2010 for UAS payload integration and flight test services. The second major award made since 2004 to an Alaska firm consists of a series of pacts totaling $17 million from the U.S. State Department to Anchorage-headquartered Kuk Construction (subsidiary of Olgoonik Development, an Alaskan Native Corporation) for the provision of UAS-based security surveillance services in Iraq in partnership with KBR, Inc. UAF has collaborated with commercial entities, such as Idaho Power Company, and manufacturers including AeroVironment to conduct surveys and observe environmental impacts. Additionally, UAF has collaborated with BP for oil spill response and flare stack monitoring, as well as projects focused on detecting and locating gas and oil pipeline leaks and developing new sensors and processes to identify leaks.

Hawaii's large military presence has resulted in defense spending as the primary source of federal funding to UAS vendors in the state. Direct defense contracts accounted for 94 percent of all awards in terms of obligated amounts from 2004-2012, rising to 97 percent when including awards placed by the General Services Administration on behalf of the U.S. Air Force. The remaining awards were placed with Honolulu-based Referentia Systems by NOAA as part of the Papahanaumokuakea Marine National Monument monitoring project. Hawaii supports a dedicated UAS development and manufacturing company, Williams Aerospace, a small firm currently developing new platforms in the fixed-wing, hand launched micro and medium altitude endurance classes. The state is also working to create two commercial UAS services arms, addressing the defense, homeland security, and precision agriculture markets.

In Oregon, a consortium of industry, academia, and public entities has created a 7-year strategic plan to double the size of the UAS industry in the state, with the help of a $2.5 million State of Oregon grant scheduled for the 2013-14 biennium and additional investments of at least $1.15 million from other sources for a total of $3.65 million. The plan specifically creates UAS solutions for commercial applications, and safely integrating those UAS solutions into the NAS. Projects include emergency response; weather; firefighting; search and rescue; wildlife and habitat management; law enforcement; physical and resource surveys (land and water); management of agriculture, livestock, and public lands; and management of public and private infrastructure. Oregon State University (OSU) has already begun UAS flights based on these research objectives.

Leveraging Current Research Institutes, Community Colleges, and Training Centers

ACUASI is collaborating with the UAF College of Engineering and Mines (CEM) and the Community and Technical College (CTC) to integrate UAS engineering, science, and technology into UAF's teaching, research, and service activities. Additionally, ACUASI is working with the CEM to fill a full-time tenure track engineering faculty position with a professor focused on UAS engineering, science, and technology. ACUASI and CTC also intend to include UAS technology courses in CTC's aviation curricula to train UAS developers, technicians, and pilots as well as to improve outreach to remote Alaskan villages that could benefit from UAS technologies. Cooperation with the CTC at UAA will add air traffic controller participation, offer training for UAS operators, and ultimately build a maintenance program similar to the Aircraft and Powerplant program currently offered.

The University of Hawaii is testing UASs in several of its research programs, evaluating the utility and impact of UAS through analysis of coastal resource management, terrestrial and aquatic environmental monitoring, natural source management and inventory, and human impact studies. University of Hawaii is also developing programs to train students and research professionals on UASs, and plans to integrate this capacity into accredited degree programs.

The new OSU industry-university UAS consortium will depend on test site facilities for collaborative research and development in all phases of operations and applications. Through the Colleges of Engineering, Science, Agriculture, Forestry and Earth, Ocean and Atmospheric Sciences, OSU has expertise and supports ongoing research on control theory and robotics, flexible airframes and flight, sensors, and signal processing, and numerous applications in natural and environmental sciences and environmental monitoring, measuring, and management. OSU-Cascades, located in Central Oregon near the Warm Springs and Juniper test ranges, offers programs in energy engineering, computer science, natural resources, and business, and plans to add programs designed in conjunction with the UAS industry. OSU-Cascades can also provide on-site facilities for OSU-Corvallis researchers leading projects in the region. Central Oregon Community College (COCC) has one of the largest aviation flight training programs on the West Coast – both fixed wing and rotary. COCC offers certifications for UAS flight training and plans to develop a program for data analysis of sensors, building on the school's strong geographic information systems program. Additionally, Blue Mountain Community College (BMCC) in Pendleton, Oregon is developing a UAS curriculum for instructional delivery and course certification. Oregon Institute of Technology (OIT) offers a variety of degrees in engineering and engineering technology, composite engineering, computer and software systems engineering, and electrical engineering, including a master's degree in manufacturing engineering. It offers degrees in professional land surveying and geographic information systems. OIT is collaborating with Rockwell Collins, the aviation electronics company, on real-world projects at a joint campus outside Portland and offers similar hands-on collaborations with other aerospace firms in the northwestern U.S.

Expansion of Existing Businesses and Attracting New Business Investment

The University of Alaska has spun off at least two companies who intend to test their products on the Pan-Pacific test range. These companies were created by University graduate students who were expanding their research in sensors for testing in UASs. UA recently received $5 million from the State of Alaska to support the development of a sustainable high-tech industry in Alaska. Already two companies have established satellite offices in Alaska to improve collaboration with the ACUASI.

Placement of a UAS test site in Hawaii will promote growth within Hawaii and reduce development cycles for manufacturers and researchers. Additionally, it would reduce or eliminate costs to ship sensors, and send knowledgeable staff, to mainland test sites to operate and demonstrate systems. Close proximity to a test site in Hawaii will greatly benefit firms such as BAE Systems, Williams Aerospace, and others – including many military and government contractors working with the Honolulu Fire Department, Honolulu Police Department, U.S. Civil Air Patrol, U.S. Coast Guard, U.S. Department of Defense, U.S. Department of Homeland Security, U.S. National Guard, and others.

In Oregon, more than a dozen companies have said that they will begin testing their sensor packages, propulsion systems, and airframes in Oregon if the Pan-Pacific UAS Test Area is designated as a national test site. Additionally, two companies have informally pledged to open satellite offices at a state test range. The PPUTRC will benefit UAS businesses in the Columbia River Gorge. Over the past seven years, the Gorge's UAS industry grew from a small core of 30 people to an employment base of more than 1,400 employees. Many of these new jobs were created by the UAS companies' suppliers. The two largest Oregon UAS manufacturers are Insitu, manufacturer of UAS platforms and subsystems, and FLIR Surveillance Systems, a manufacturer of electro-optic and infrared imaging systems. Insitu is a major global supplier of high endurance, runway-independent UAS. FLIR Surveillance provides more ER and IR imaging systems for unmanned aircraft, unmanned ground, and unmanned maritime platforms than any other company. Activity in the Gorge from firms such as Insitu, FLIR Surveillance Systems, Cloud Cap Technology, and UTC Aerospace has spun off more than 20 local companies. Central Oregon's general aviation aircraft manufacturing industry had a similar growth pattern over a 15-year period, expanding from a core company of about 30 employees (Lancair) to a cluster of 25 companies that now employs nearly 1,200 people. It is anticipated the PPUTRC will help expand these existing businesses in the Gorge and Central Oregon.

Infrastructure

Alaska expects to invest $1.5 million to construct a test site center at its Poker Flat Research Range, as well as develop and acquire mobile test infrastructure such as fixtures, data collection devices, and monitoring systems similar to its internet-Portable Aerial Surveillance System (iPASS), a web-based application that merges track information from radar, GPS, and a transponder interrogator/receiver. Additionally, large data collection requirements are expected to drive development of a data center for processing and storage.

Hawaii's test ranges link to military/restricted areas used for current UAS operations. These sites include the Pohakuloa training area on the Island of Hawaii, Bradshaw and Wheeler Army Airfields on Oahu, and the Pacific Missile Range Facility on Kauai. Other areas under consideration include Upolu and Dillingham Airfields (on the Big Island and Oahu, respectively). Test points within the ranges would be utilized to support both shore and ship-based development, testing and certification of new UASs, training and crew certification of operational UASs, and development of expanded and joint capabilities involving existing communications systems and operations tactics using UAS.

The budget for the $2.5 million Oregon innovation grant envisions spending at least $1.2 million at test ranges for new equipment and/or infrastructure, with the grant providing $300,000, private enterprise providing $750,000, and public entities providing $150,000. Possible infrastructure development proposed with this funding includes: portable ground radar units; an automatic dependent surveillance-broadcast ground station or a similar 'sense and avoid' technology system; one or more operations management buildings housing computers, calibration components, baseline sensors with a range of capabilities, data analysis equipment, supporting software, maintenance facilities and machine shops; and ground control stations, an observation tower, and ITAR facilities as needed. Additionally, as noted earlier, Near Space Corporation is preparing to open a new $6 million flight test and operations facility at the Tillamook airport.

Chapter 3. Potential Economic Impacts of the PPUTRC

Designation as one of the nation's six UAS test sites promises to have significant economic impacts in the areas where flight activity occurs and support services are provided. Private and public sector UAS activity that has been constrained by restricted access and a restrictive federal authorizing process will have much greater opportunity to conduct UAV flight operations. In this chapter the potential economic impacts in Alaska, Hawaii, and Oregon related to serving as a test site are quantified.

The following economic impact projections were developed by McDowell Group, Inc. utilizing flight activity, flight cost, and flight-related staffing data provided by PPUTRC team members. Direct economic activity was measured by approximating preflight administrative costs, site fees per day, operating costs per day, and total flight days from historical data provided by the applicant. Sector-level information was obtained from the applicant concerning the number of UAS-related firms and jobs per firm. Direct employment estimates were then coupled with multipliers obtained from the IMPLAN economic impact model to estimate total direct, indirect, and induced economic effects. Annual projections from 2014 to 2017 were calculated for each of the 13 ranges utilizing growth rates based on funding forecasts from the Teal Group UAS market profile and forecast report, historical flight activity, and projected growth in flight activity, research, and UAS-related manufacturing as provided by the applicant.

In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect, and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from$57 million in 2014 to about $76 million in 2017.

Table 3: Summary Impacts of PPUTRC Test Site Designation, 2012-2017
Combined Impacts in Alaska, Hawaii and Oregon

Impact of Test Site Designation				
	2014	2015	2016	2017
Total Employment	**1,065**	**1,260**	**1,335**	**1,429**
Direct Employment	490	571	602	642
Indirect Employment	198	243	259	279
Induced Employment	377	447	474	508
Total Labor Income ($ million)	**$56.9**	**$66.9**	**$70.8**	**$75.6**
Direct Labor Income ($ million)	$26.4	$30.5	$32.2	$34.2
Indirect Labor Income ($ million)	$10.4	$12.5	$13.3	$14.4
Induced Labor Income ($ million)	$20.1	$23.8	$25.3	$27.1
Output ($ million)	**$265.0**	**$301.8**	**$315.9**	**$333.5**
Total Value Added ($ million)	**$109.3**	**$121.9**	**$127.1**	**$133.5**
State Income Taxes ($ million)	$4.3	$5.0	$5.3	$5.6

Employment Resulting from UAS and Test Site Operations

In 2014, with designation of PPURTC as a test site, UAS activity in Alaska, Hawaii, and Oregon is expected to account for 581 direct jobs and a total of 1,254 jobs - including direct, indirect, and induced jobs. Approximately 85 percent of that total employment (1,065 jobs) is attributable to test site designation. The remaining 15 percent (189 jobs) is expected to occur in the absence of PPUTRC test site designation. By 2017, employment will rise to an estimated 904 direct jobs and 1,991 total jobs - with 72 percent of that total employment (1,429) attributable to test site designation. A significant number of these direct jobs are expected in smaller communities that tend to have higher unemployment – thus test site designation for the PPUTRC will help improve opportunities where they will provide the most benefits.

Table 4: Direct Employment, 2012-2017

Direct Employment	2012	2013	2014	2015	2016	2017
Total Direct Employment						
PPUTRC	**74**	**82**	**581**	**712**	**801**	**904**
Alaska Ranges	43	47	129	142	157	173
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	31	35	452	498	549	605
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**490**	**571**	**602**	**642**
Alaska Ranges	-	-	77	82	86	91
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	-	-	414	417	421	424

Oregon's relatively high direct employment numbers are due to the existing, well-developed aircraft manufacturing sector in Oregon. Oregon is well placed to supply the growing demand for UAS aircraft that will be triggered by UAS integration. Most of the new jobs created in Oregon due to PPUTRC designation include manufacturing jobs (many of which may be created due to designation of test sites anywhere in the U.S.). These numbers for Oregon are based on an analysis provided to McDowell Group by Economic Development for Central Oregon (EDCO).

In addition to direct jobs created from UAS firms, significant indirect and induced jobs will also be created. Indirect jobs represent jobs created throughout the supply chain to support the UAS industry and induced jobs represent jobs created due to changes in household consumption as a result of the UAS industry.

Table 5: Indirect Employment, 2012-2017

Indirect Employment						
	2012	2013	2014	2015	2016	2017
Total Indirect Employment						
PPUTRC	**21**	**24**	**224**	**290**	**328**	**374**
Alaska Ranges	7	8	22	24	27	30
Hawaii Ranges	-	-	-	42	56	74
Oregon Ranges	14	16	202	223	246	271
Impact of Test Site Designation						
PPUTRC	-	-	**198**	**243**	**259**	**279**
Alaska Ranges	-	-	-	42	56	74
Hawaii Ranges	-	-	185	187	188	190
Oregon Ranges	-	-	13	14	15	16

Table 6: Induced Employment, 2012-2017

Induced Employment						
	2012	2013	2014	2015	2016	2017
Total Induced Employment						
PPUTRC	**59**	**65**	**448**	**558**	**629**	**712**
Alaska Ranges	35	39	106	117	129	142
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	24	26	342	377	416	459
Impact of Test Site Designation						
PPUTRC	-	-	**377**	**447**	**474**	**508**
Alaska Ranges	-	-	63	67	71	75
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	-	-	313	316	319	321

Note: Summation of columns may not match the total due to rounding

Labor Income Resulting from UAS and Test Site Operations

In 2014, UAS activity in Alaska, Hawaii, and Oregon is expected to account for $31 million in direct labor income and $67 million in total labor income - including direct, indirect, and induced - assuming the PPUTRC is awarded test site designation. Approximately 84 percent of that total labor income ($57 million) is attributable to test site designation, while the remaining 16 percent ($10 million) is expected to occur even if the proposed PPUTRC does not become a test site. By 2017, labor income is expected to include $106 million in total direct, indirect, and induced labor income - with 71 percent of that total labor income ($76 million) attributable to test site designation.

Table 7: Direct Income, 2012-2017 ($ million)

	Direct Income					
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$4.0**	**$4.4**	**$31.3**	**$38.2**	**$42.9**	**$48.3**
Alaska Ranges	$2.3	$2.6	$7.0	$7.7	$8.5	$9.4
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	$1.7	$1.9	$24.2	$26.7	$29.5	$32.5
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**$26.4**	**$30.5**	**$32.2**	**$34.2**
Alaska Ranges	-	-	$4.2	$4.4	$4.7	$5.0
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	-	-	$22.2	$22.4	$22.6	$22.8

Table 8: Indirect Income, 2012-2017 ($ million)

Indirect Income						
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$1.1**	**$1.3**	**$11.7**	**$15.0**	**$17.0**	**$19.3**
Alaska Ranges	$0.4	$0.4	$1.2	$1.3	$1.5	$1.6
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	$0.7	$0.8	$10.5	$11.6	$12.8	$14.1
Impact of Test Site Designation						
PPUTRC			**$10.4**	**$12.5**	**$13.3**	**$14.4**
Alaska Ranges	-	-	$0.7	$0.8	$0.8	$0.9
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	-	-	$9.6	$9.7	$9.8	$9.9

Table 9: Induced Income, 2012-2017 ($ million)

Induced Income						
	2012	2013	2014	2015	2016	2017
Total Induced Income						
PPUTRC	**$3.5**	**$3.8**	**$24.4**	**$30.1**	**$34.0**	**$38.4**
Alaska Ranges	$2.2	$2.5	$6.7	$7.4	$8.2	$9.0
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	$1.2	$1.4	$17.6	$19.4	$21.4	$23.6
Impact of Test Site Designation						
PPUTRC	-	-	**$20.1**	**$23.8**	**$25.3**	**$27.1**
Alaska Ranges	-	-	$4.0	$4.3	$4.5	$4.8
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	-	-	$16.1	$16.3	$16.4	$16.6

Output, Value Added, & State Income Taxes Resulting from UAS and Test Site Operations

'Output' represents the value of industry production, and 'total value added' is the difference between an industry's total output and the cost of their intermediate inputs. Economic modeling conducted for the purposes of this study indicates output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017. Value added would climb from $109 million to $134 million over the same period.

Table 10: Output, 2012-2017 ($ million)

	Output					
	2012	2013	2014	2015	2016	2017
Total Output						
PPUTRC	**$18.3**	**$20.2**	**$302.4**	**$366.8**	**$411.7**	**$463.6**
Alaska Ranges	$8.6	$9.5	$34.3	$37.8	$41.7	$46.0
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	$9.7	$10.7	$268.1	$295.6	$325.9	$359.3
Impact of Test Site Designation						
PPUTRC	-	-	**$280.1**	**$315.5**	**$328.4**	**$344.7**
Alaska Ranges	-	-	$23.8	$24.8	$25.8	$26.8
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	-	-	$256.3	$257.4	$258.5	$259.6

Table 11: Total Value Added, 2012-2017 ($ million)

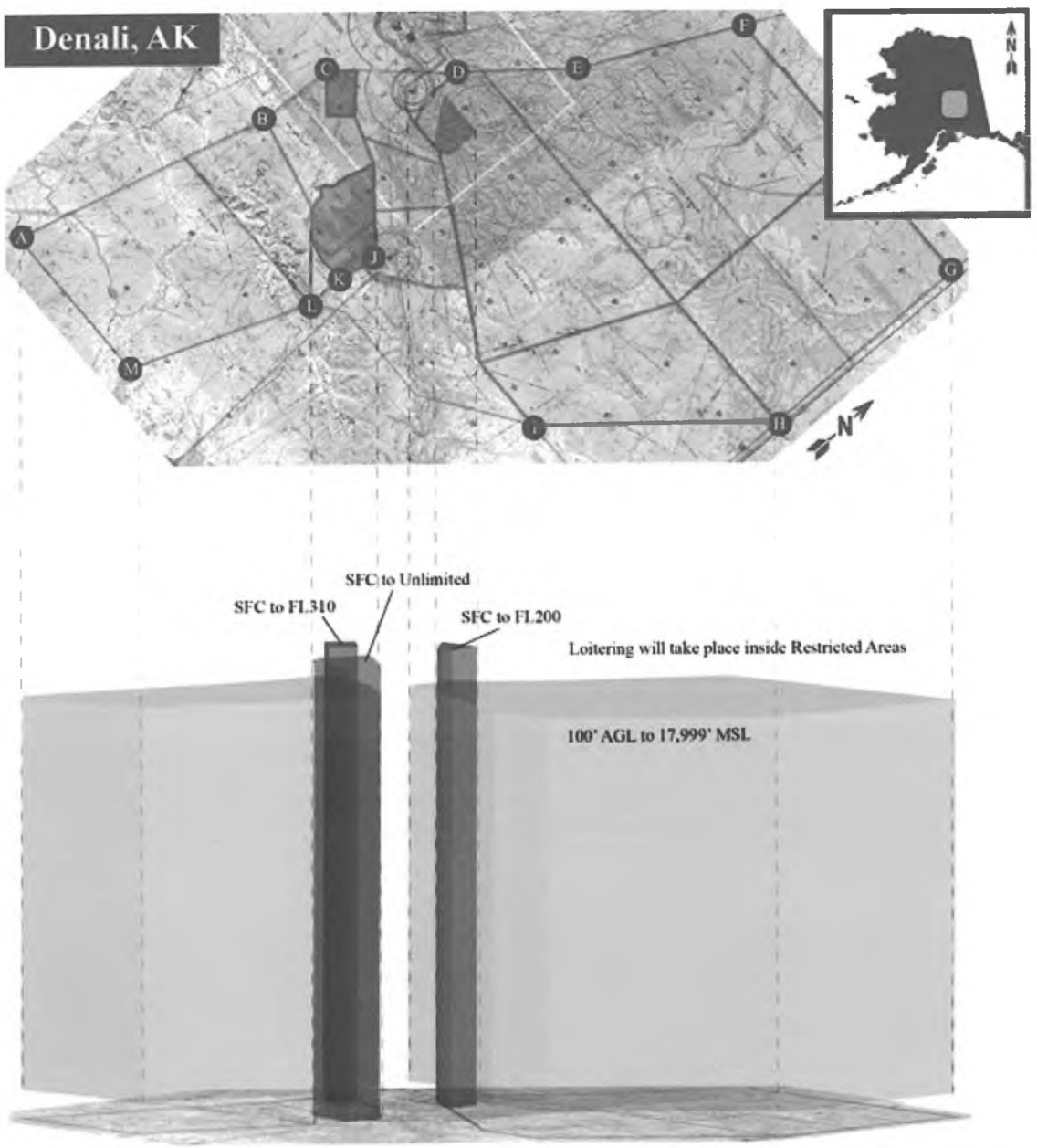
	Value Added					
	2012	2013	2014	2015	2016	2017
Total Value Added						
PPUTRC	**$9.5**	**$10.5**	**$127.7**	**$151.8**	**$169.7**	**$190.3**
Alaska Ranges	$5.7	$6.3	$22.7	$25.0	$27.6	$30.4
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	$3.8	$4.2	$105.1	$115.8	$127.7	$140.8
Impact of Test Site Designation						
PPUTRC	-	-	**$116.2**	**$128.2**	**$132.8**	**$138.5**
Alaska Ranges	-	-	$15.8	$16.4	$17.1	$17.7
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	-	-	$100.4	$100.9	$101.3	$101.7

Designation of the PPUTRC will provide a combined four-year total of $20 million in income tax revenue to Hawaii and Oregon. The effective income tax rate for these calculations was approximated as 7.5 percent for Hawaii, and 9 percent for Oregon (Alaska has no income tax).

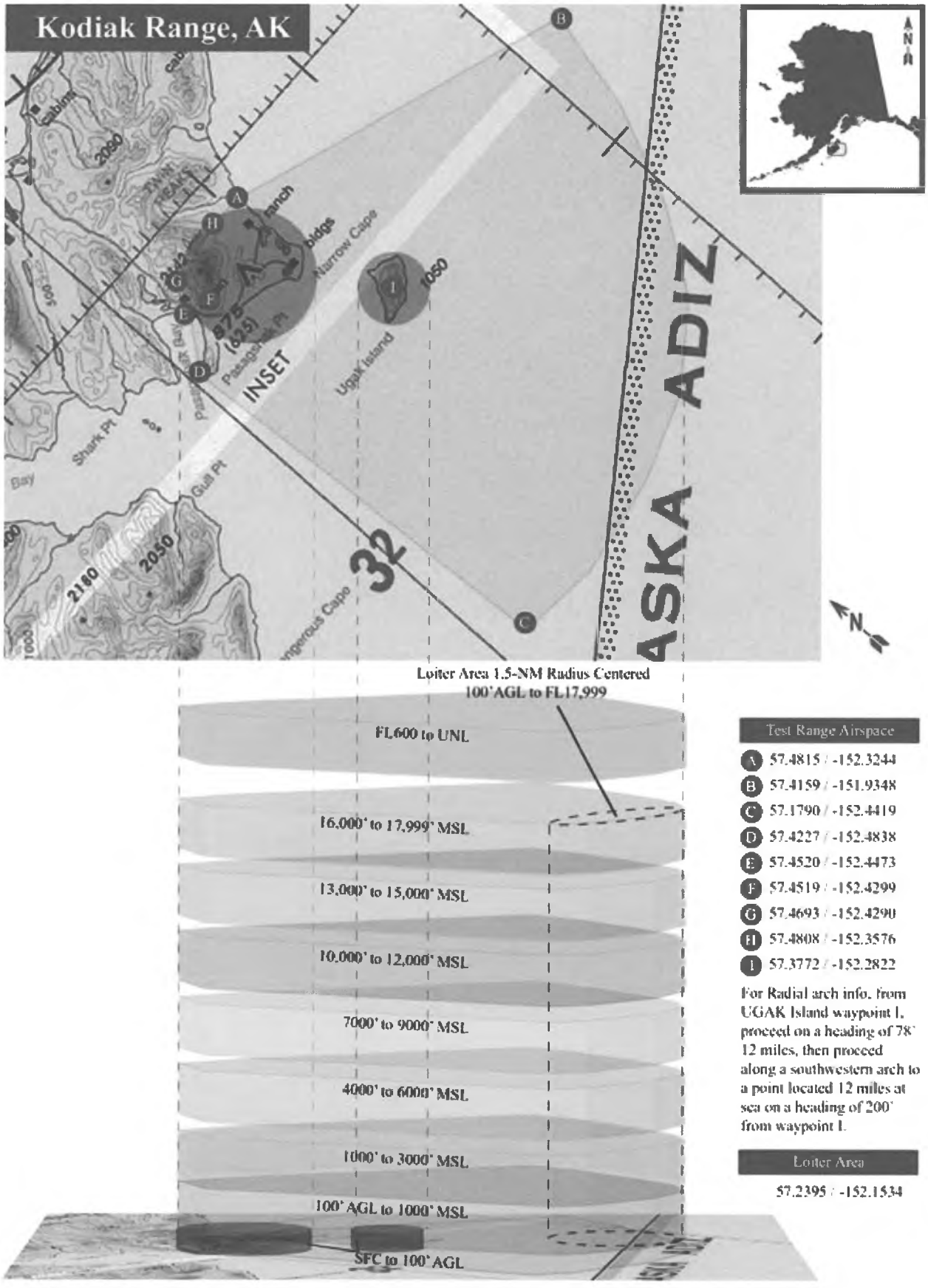
Table 12: State Income Taxes, 2012-2017 ($ million)

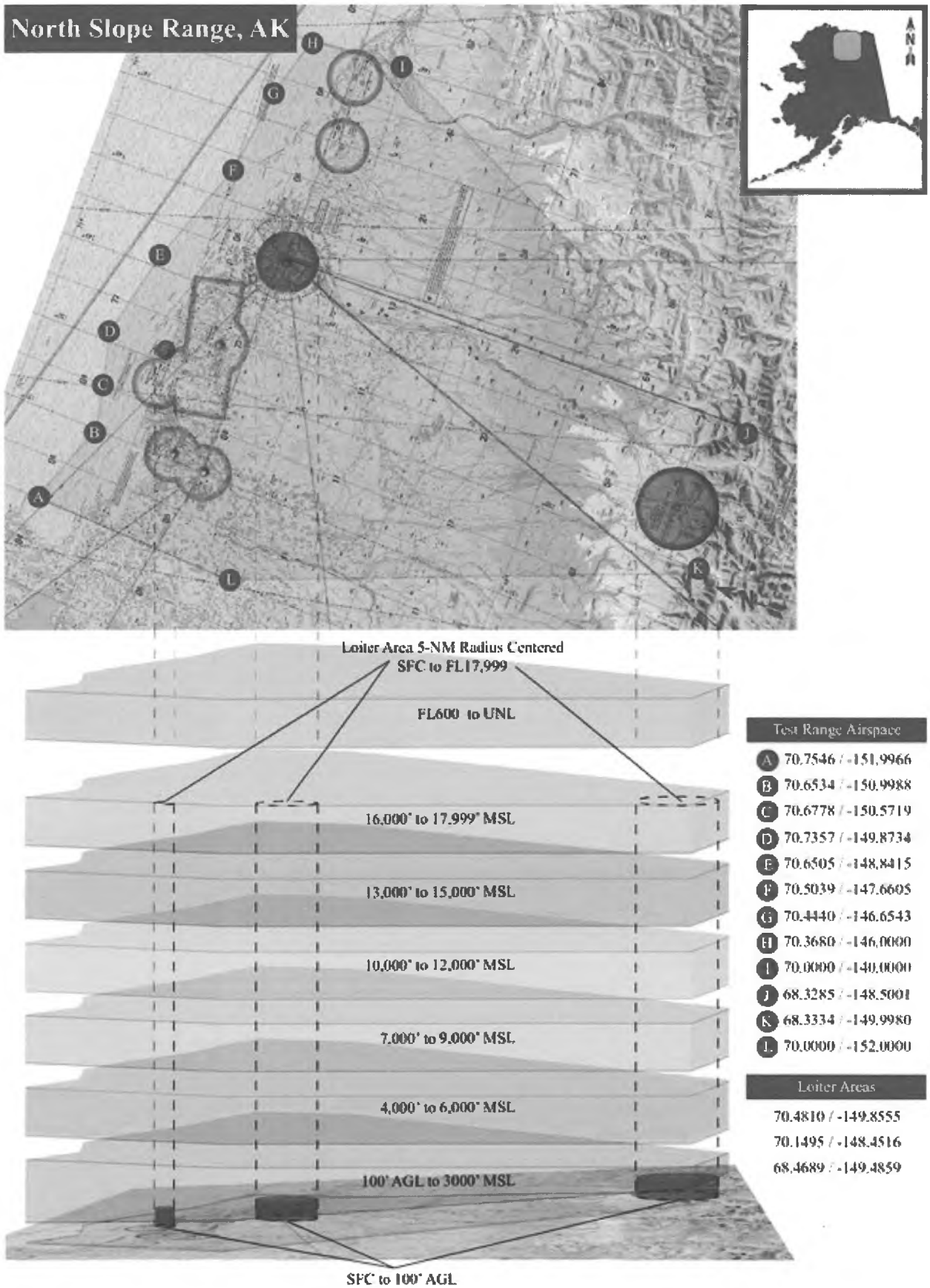
State Income Taxes						
	2012	2013	2014	2015	2016	2017
Total State Income Taxes						
PPUTRC	**$0.2**	**$0.2**	**$4.7**	**$5.9**	**$6.6**	**$7.5**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	$0.2	$0.2	$4.7	$5.2	$5.7	$6.3
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**$4.5**	**$5.2**	**$5.5**	**$5.8**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	-	-	$4.5	$4.5	$4.6	$4.6

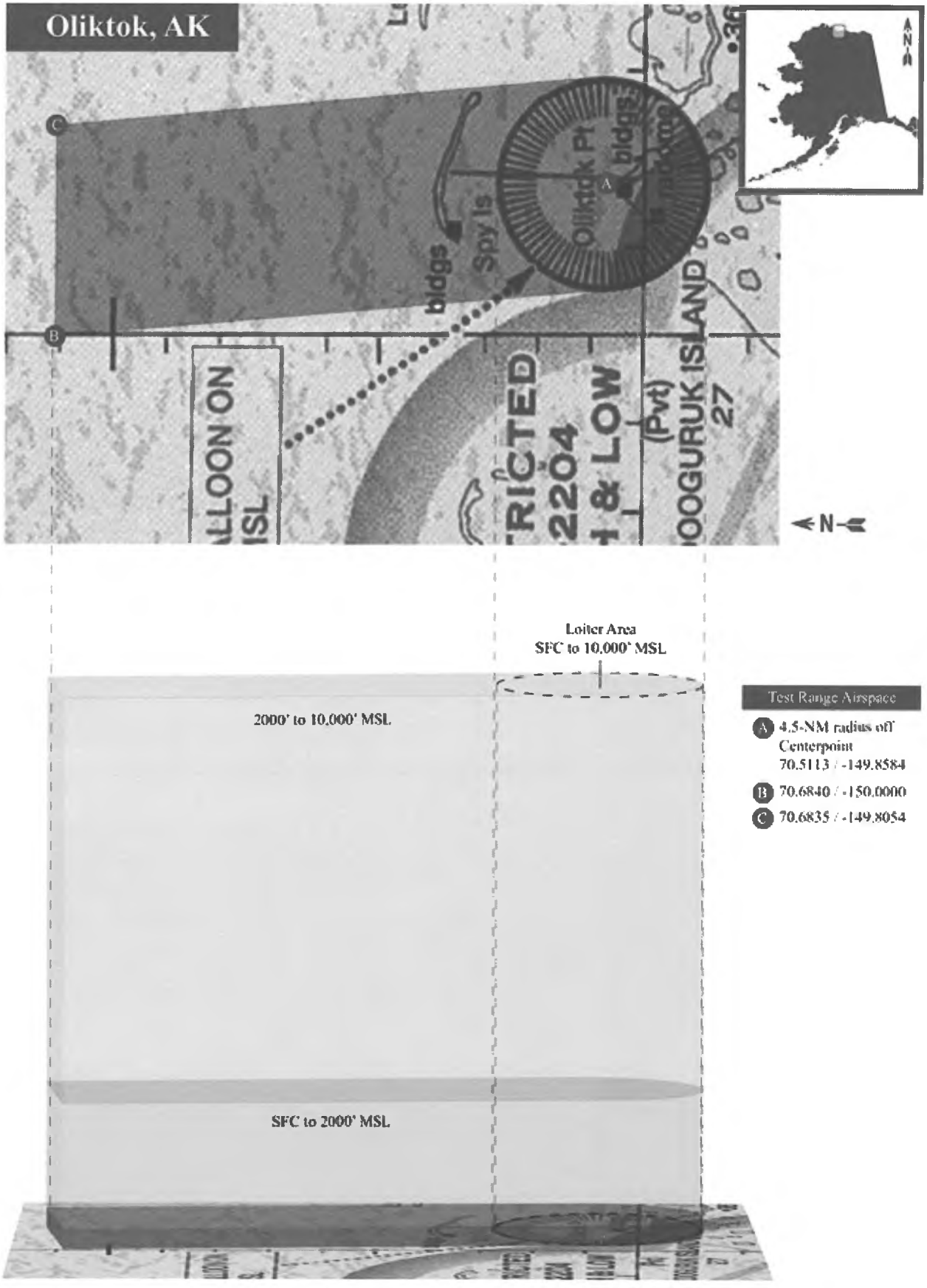
Appendix. Proposed Pan-Pacific Test Ranges

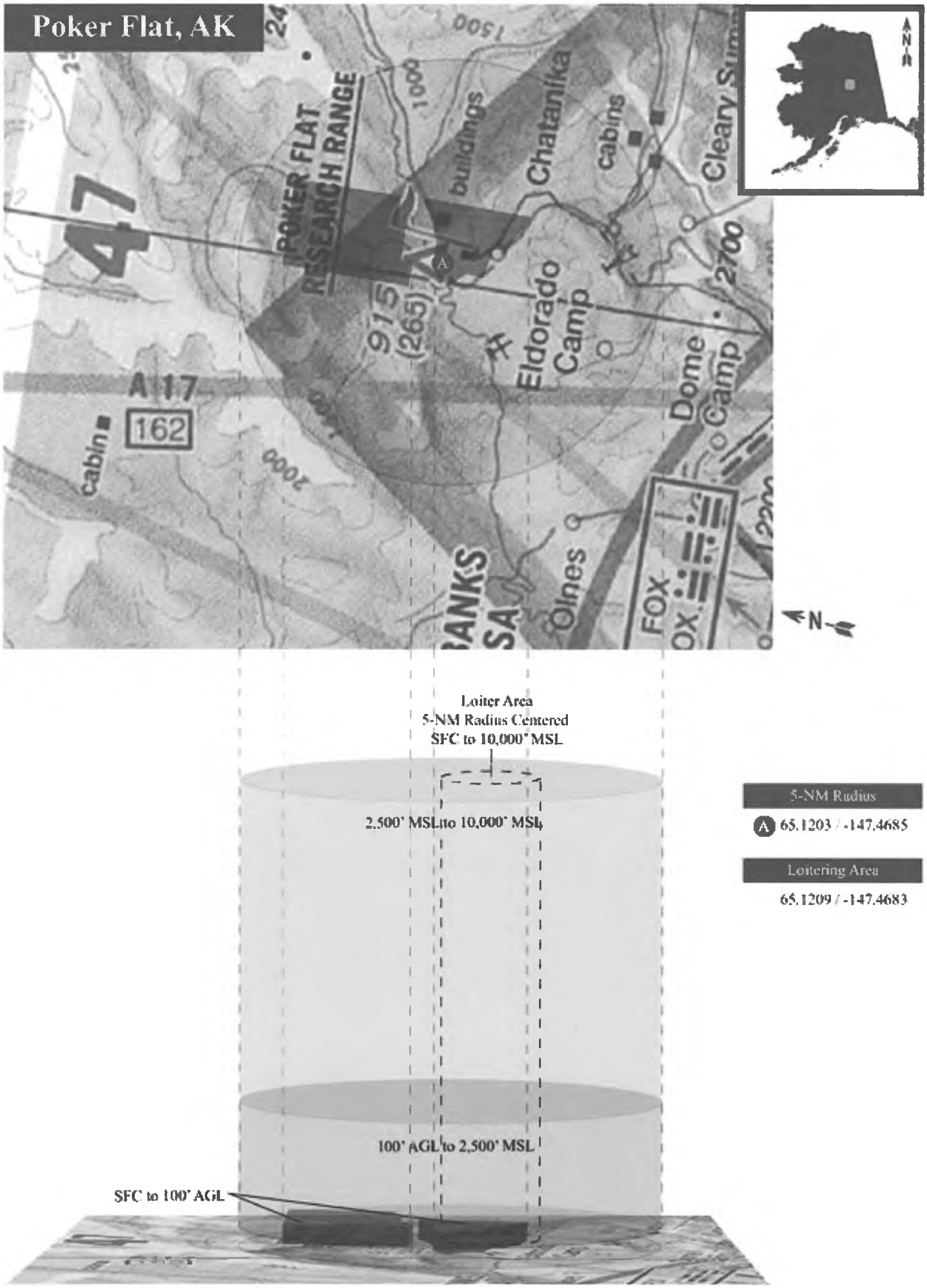


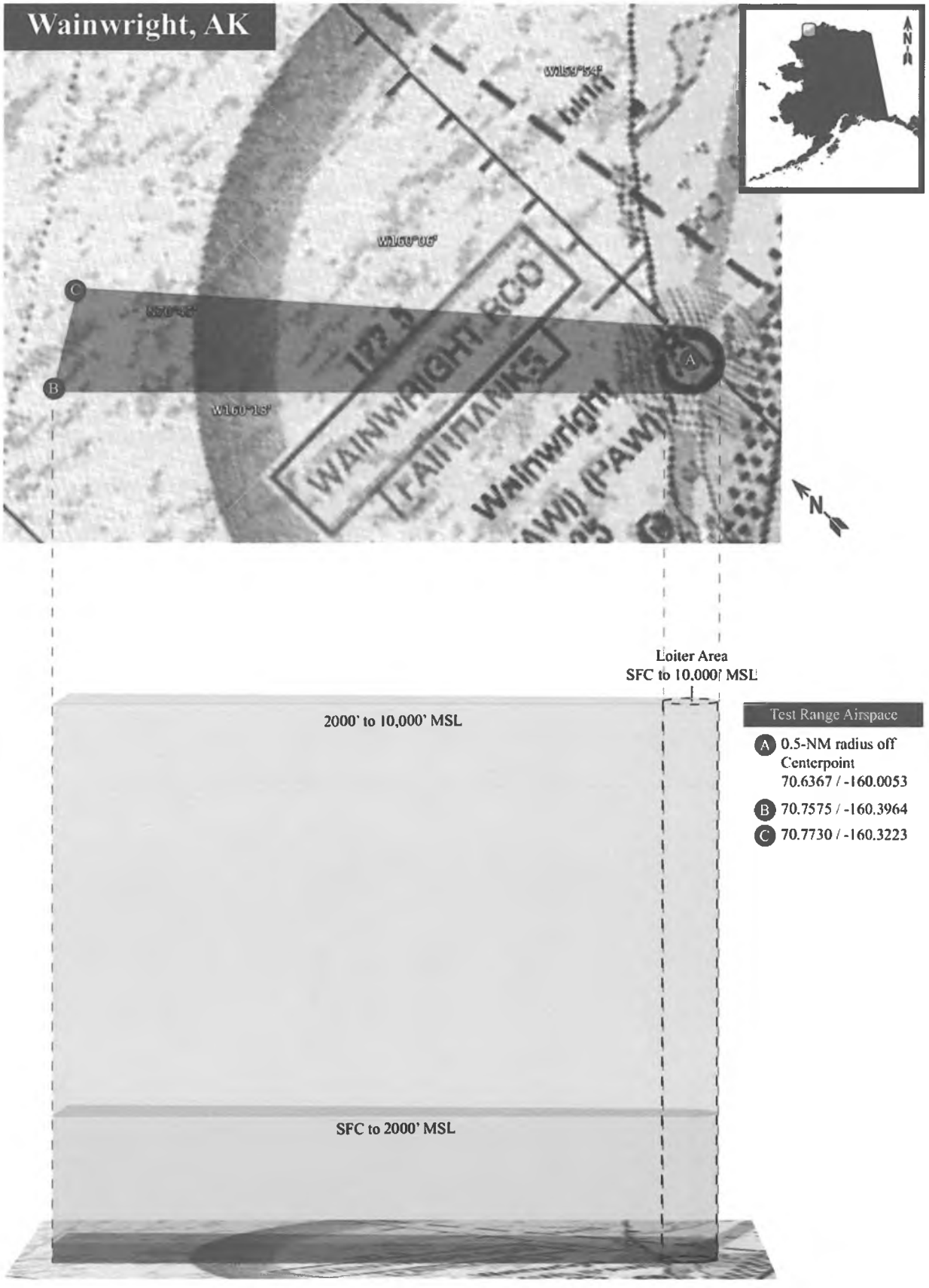
Test Range Airspace		
A 62.5000 / -148.8500	F 66.1668 / -145.0934	J 63.9364 / -145.8266
B 63.9653 / -148.0089	G 66.1692 / -141.0817	K 63.7156 / -145.9051
C 64.3756 / -147.9803	H 65.0000 / -141.0821	L 63.4974 / -145.9046
D 64.9000 / -146.9134	I 64.0000 / -143.0159	M 62.5000 / -146.7279
E 65.3505 / -146.0719		

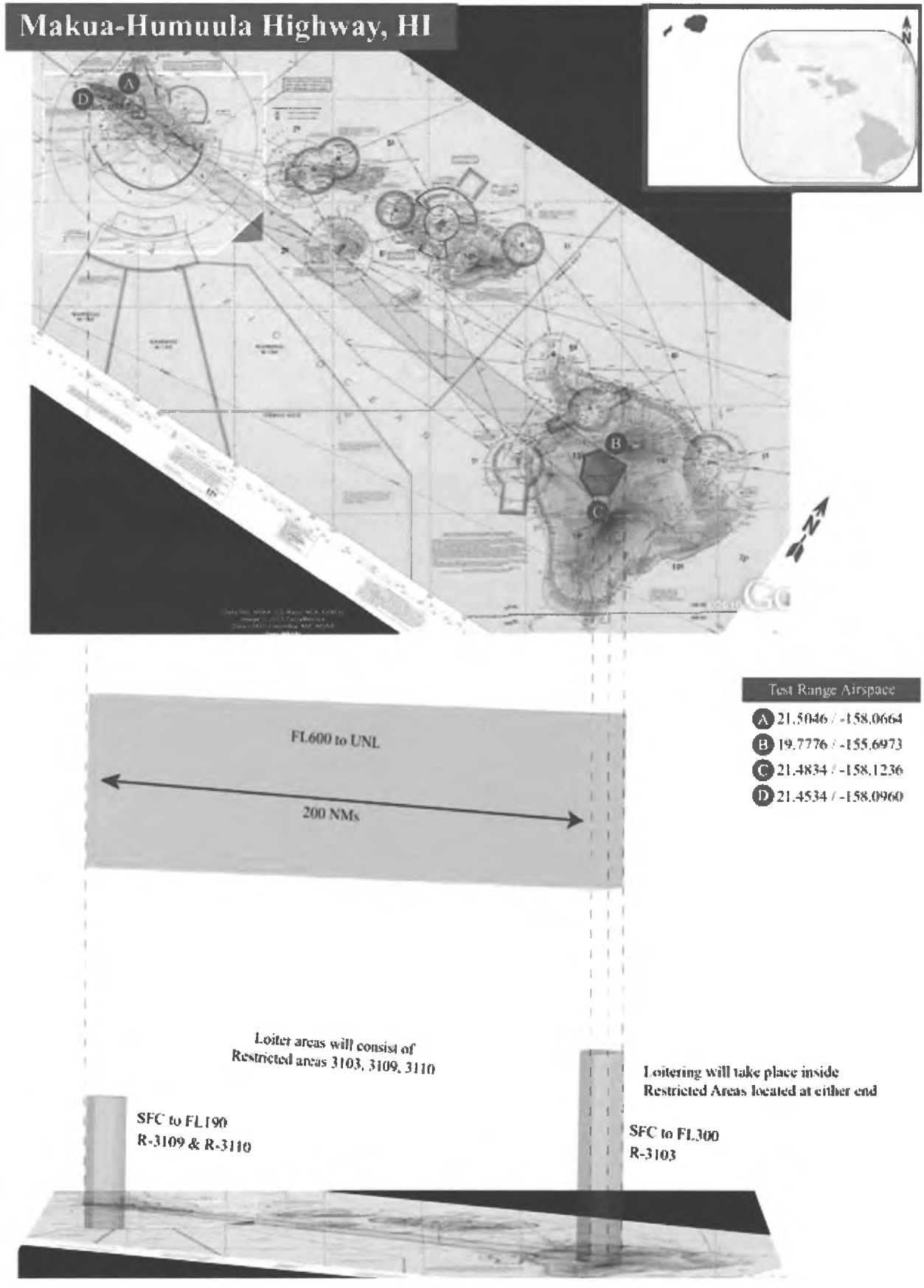

Kodiak Range, AK
INSET
Ugak Island
Narrow Cape
Shark Pt
Gull Pt
Bay
2080
2050
2180
1050
875
(625)
32
ASKA ADIZ
N
Loiter Area 1.5-NM Radius Centered
100' AGL to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7000' to 9000' MSL
4000' to 6000' MSL
1000' to 3000' MSL
100' AGL to 1000' MSL
SFC to 100' AGL
Test Range Airspace
A 57.4815 / -152.3244
B 57.4159 / -151.9348
C 57.1790 / -152.4419
D 57.4227 / -152.4838
E 57.4520 / -152.4473
F 57.4519 / -152.4299
G 57.4693 / -152.4290
H 57.4808 / -152.3576
I 57.3772 / -152.2822
For Radial arch info. from UGAK Island waypoint I, proceed on a heading of 78° 12 miles, then proceed along a southwestern arch to a point located 12 miles at sea on a heading of 200° from waypoint I.
Loiter Area
57.2395 / -152.1534

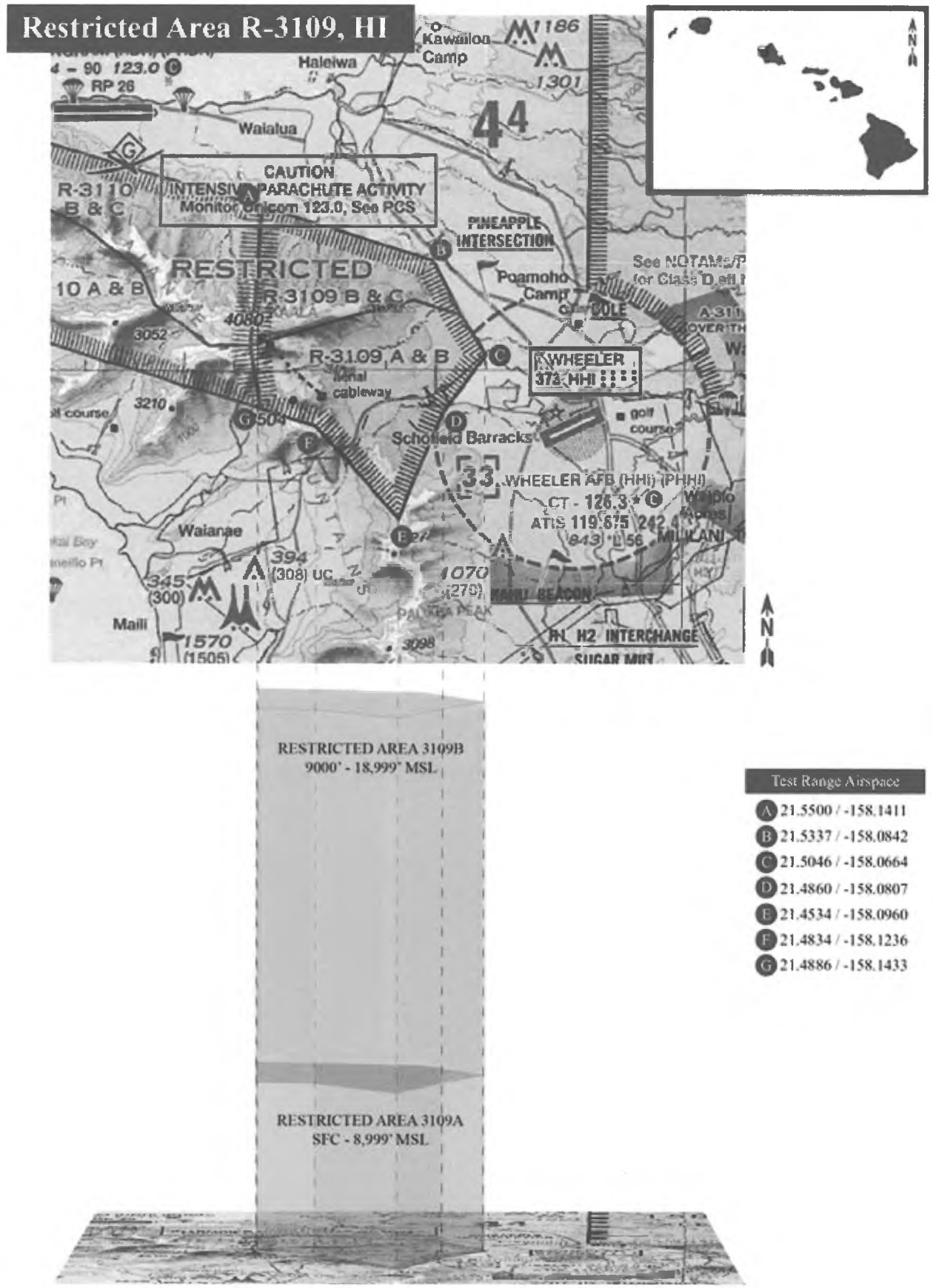

North Slope Range, AK
AK
Loiter Area 5-NM Radius Centered
SFC to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7,000' to 9,000' MSL
4,000' to 6,000' MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 70.7546 / -151.9966
B 70.6534 / -150.9988
C 70.6778 / -150.5719
D 70.7357 / -149.8734
E 70.6505 / -148.8415
F 70.5039 / -147.6605
G 70.4440 / -146.6543
H 70.3680 / -146.0000
I 70.0000 / -140.0000
J 68.3285 / -148.5001
K 68.3334 / -149.9980
L 70.0000 / -152.0000
Loiter Areas
70.4810 / -149.8555
70.1495 / -148.4516
68.4689 / -149.4859

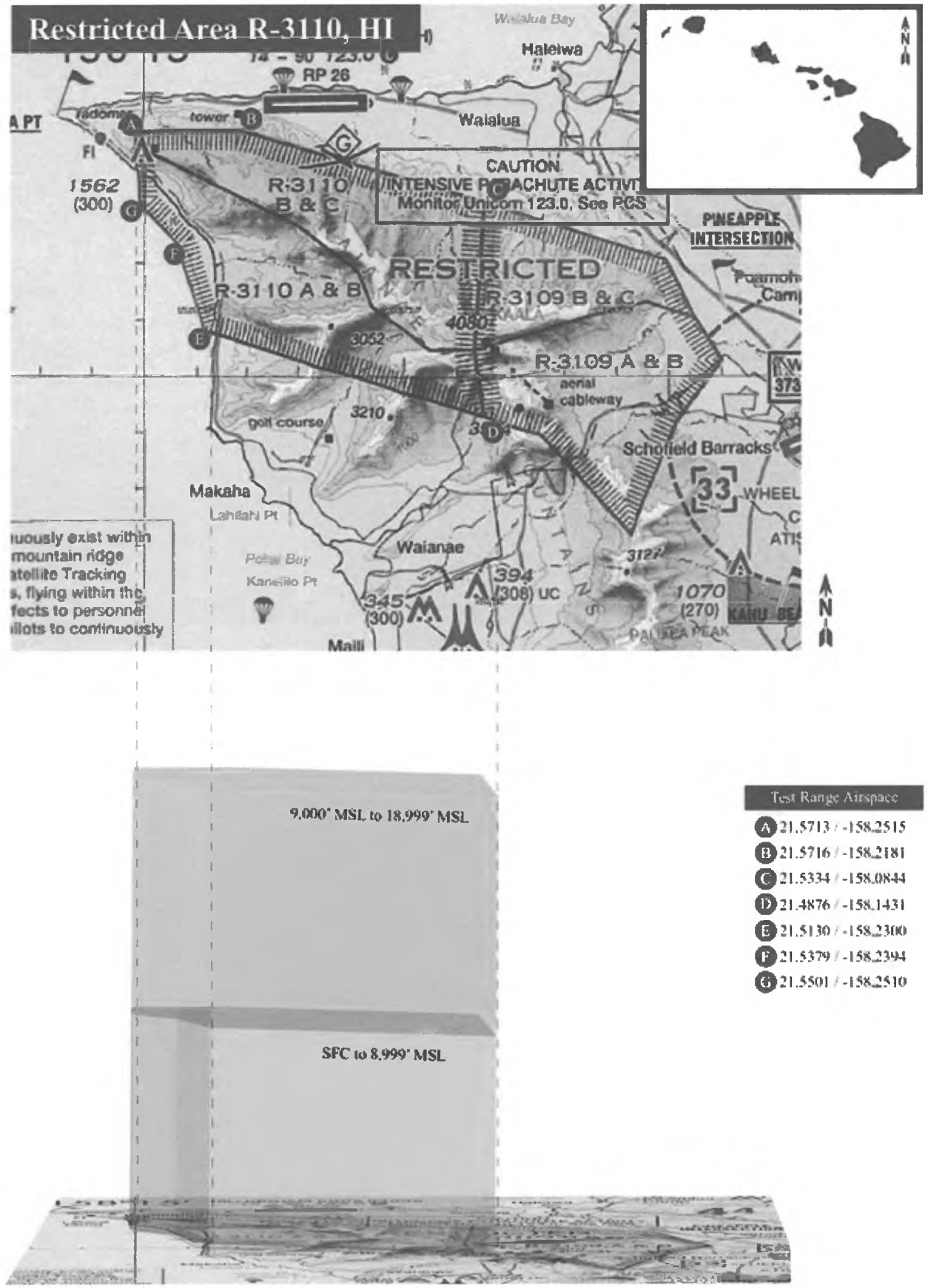

Oliktok, AK
Oliktok Pt
bldgs
Spy Is
bldgs
A
B
C
(Pvt)
27
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 4.5-NM radius off Centerpoint 70.5113 / -149.8584
B 70.6840 / -150.0000
C 70.6835 / -149.8054


Poker Flat, AK
POKER FLAT RESEARCH RANGE
Chatanika
buildings
cabins
Cleary Summit
Eldorado Camp
Dome Camp
A17
162
Cabin
Olnes
FOX
915
(265)
2700
1000
1500
47
N
Loiter Area
5-NM Radius Centered
SFC to 10,000' MSL
2,500' MSL to 10,000' MSL
100' AGL to 2,500' MSL
SFC to 100' AGL
5-NM Radius
A 65.1203 / -147.4685
Loitering Area
65.1209 / -147.4683

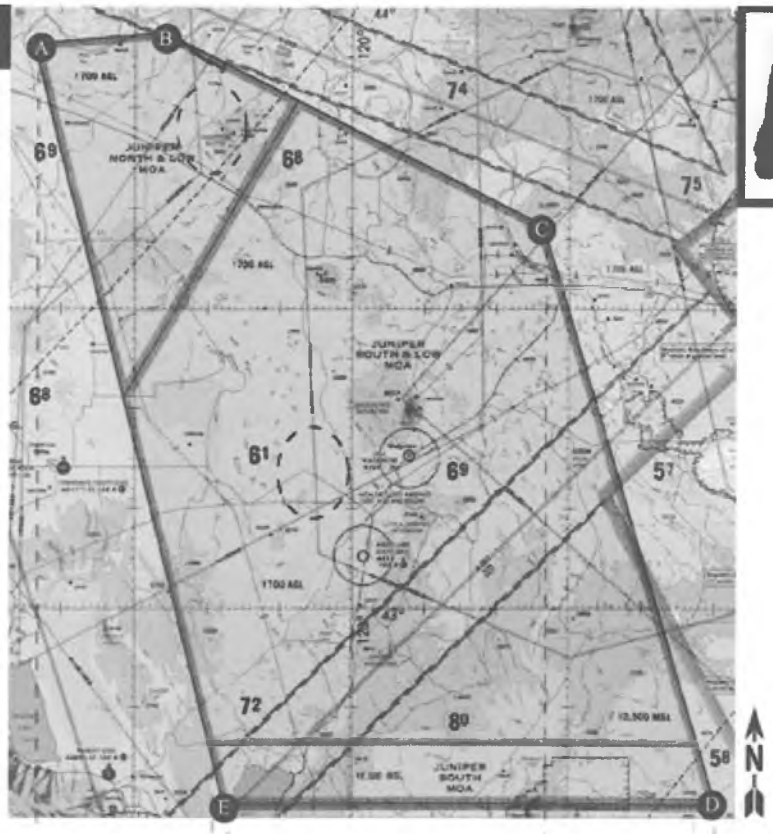

Wainwright, AK
W150°54'
W150°06'
W150°18'
WAINWRIGHT RCO
FAIRBANKS
Wainwright
AWI) (PAWI)
A
B
C
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 0.5-NM radius off Centerpoint 70.6367 / -160.0053
B 70.7575 / -160.3964
C 70.7730 / -160.3223

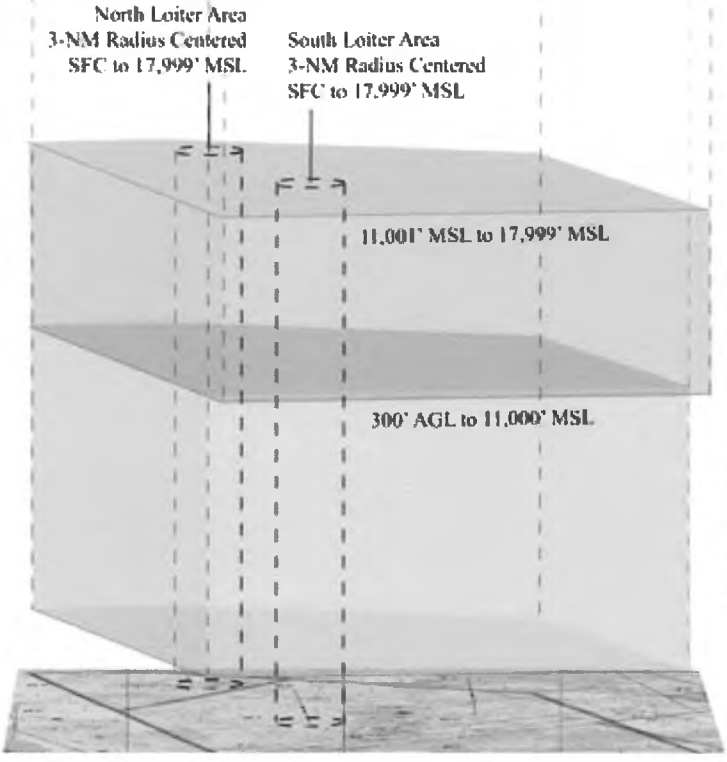

Makua-Humuula Highway, HI
A
D
B
C
N
FL600 to UNL
200 NMs
Test Range Airspace
A 21.5046 / -158.0664
B 19.7776 / -155.6973
C 21.4834 / -158.1236
D 21.4534 / -158.0960
Loiter areas will consist of
Restricted areas 3103, 3109, 3110
SFC to FL190
R-3109 & R-3110
Loitering will take place inside
Restricted Areas located at either end
SFC to FL300
R-3103


Restricted Area R-3109, HI
Haleiwa
Kawailoa Camp
Waialua
CAUTION
INTENSIVE PARACHUTE ACTIVITY
Monitor Unicom 123.0, See PCS
R-3110 B & C
RESTRICTED
R-3109 B & C
10 A & B
PINEAPPLE INTERSECTION
Poamoho Camp
COLE
WHEELER
373 HHI
R-3109 A & B
cableway
golf course
Schofield Barracks
WHEELER AFB (HHI) (PHHI)
CT - 126.3
ATIS 119.675
Waianae
Waipio
MILILANI
Maili
H1 H2 INTERCHANGE
RESTRICTED AREA 3109B
9000' - 18,999' MSL
RESTRICTED AREA 3109A
SFC - 8,999' MSL
Test Range Airspace
A 21.5500 / -158.1411
B 21.5337 / -158.0842
C 21.5046 / -158.0664
D 21.4860 / -158.0807
E 21.4534 / -158.0960
F 21.4834 / -158.1236
G 21.4886 / -158.1433


Restricted Area R-3110, HI
Haleiwa
Waialua
RP 26
tower
CAUTION
Monitor Unicom 123.0, See PCS
1562
(300)
R-3110
B & C
RESTRICTED
R-3110 A & B
R-3109 B & C
R-3109 A & B
4080'
3052
aerial
cableway
3210
golf course
PINEAPPLE
INTERSECTION
Schofield Barracks
33
WHEEL
Makaha
Lahilahi Pt
Waianae
Kaneilio Pt
394
(308) UC
345
(300)
1070
(270)
Mauli
PALIKEA PEAK
N
9,000' MSL to 18,999' MSL
SFC to 8,999' MSL
Test Range Airspace
A 21.5713 / -158.2515
B 21.5716 / -158.2181
C 21.5334 / -158.0844
D 21.4876 / -158.1431
E 21.5130 / -158.2300
F 21.5379 / -158.2394
G 21.5501 / -158.2510

Juniper, OR

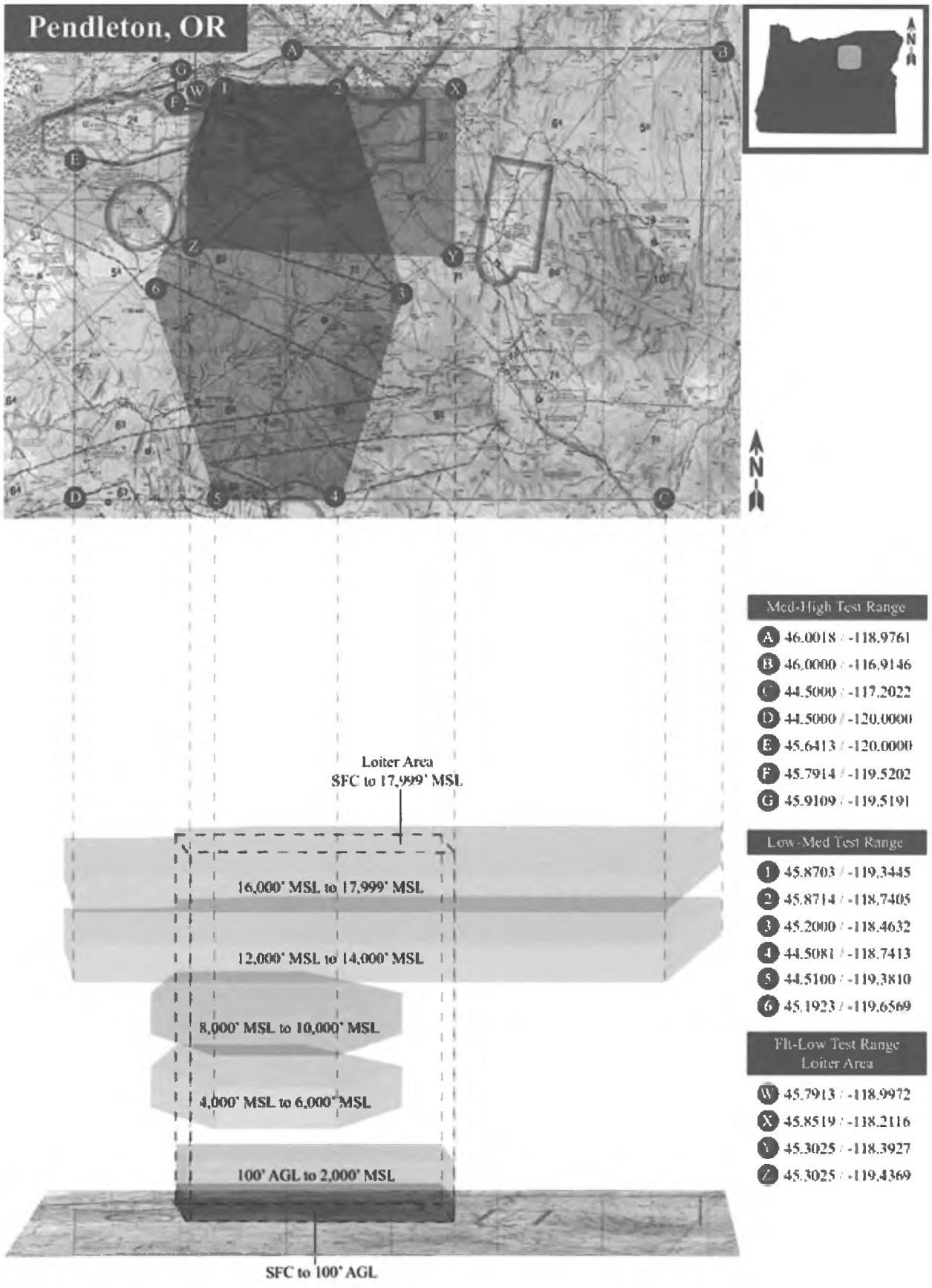




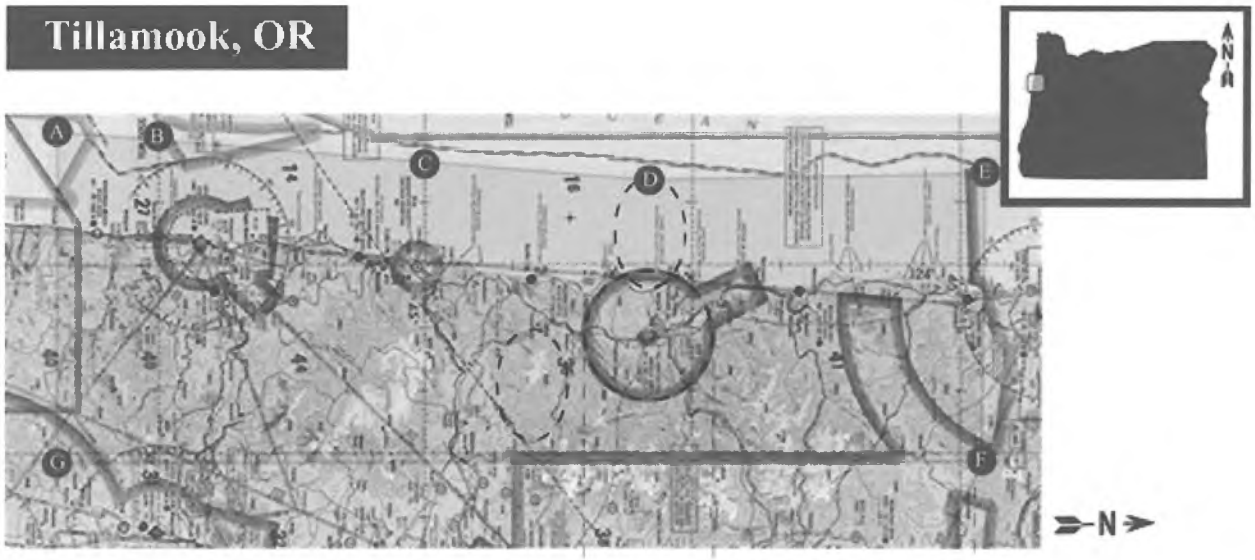
Test Range Airspace	
A	43.9392 / -120.7296
B	43.9575 / -120.4327
C	43.6381 / -119.5600
D	42.6700 / -119.1592
E	42.6709 / -120.2951

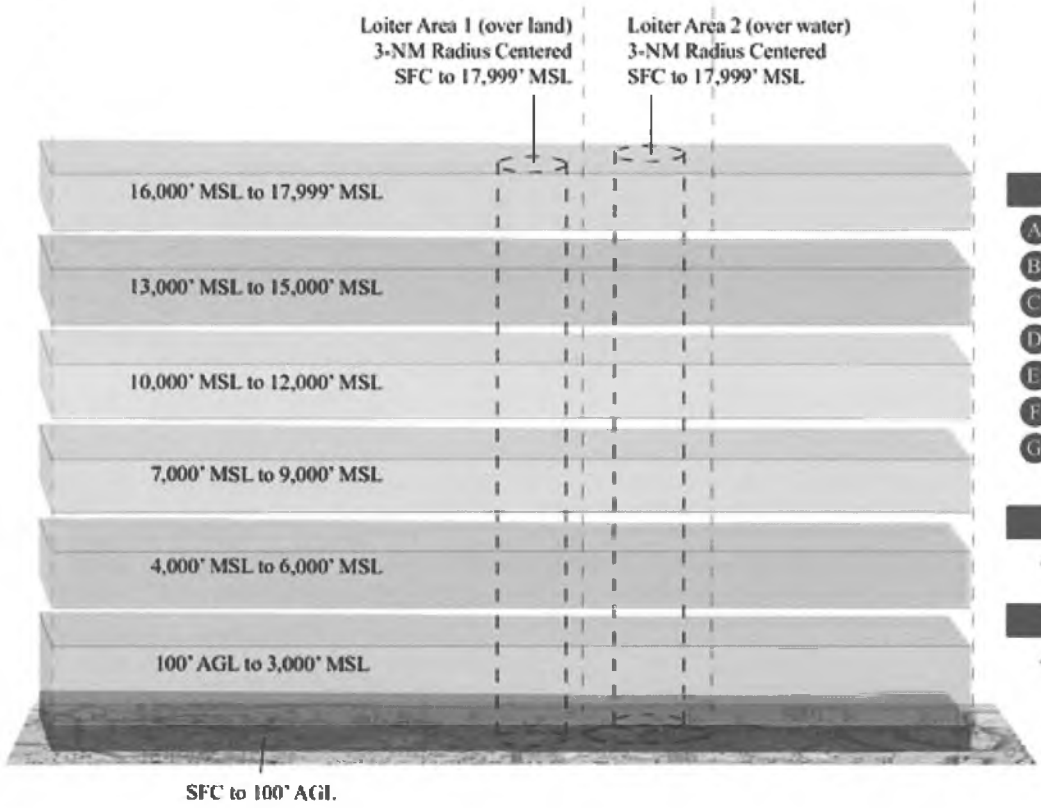
North Loitering Area
43.8126 / -120.3354

South Loitering Area
43.2300 / -120.1053


Pendleton, OR
N
Loiter Area
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
12,000' MSL to 14,000' MSL
8,000' MSL to 10,000' MSL
4,000' MSL to 6,000' MSL
100' AGL to 2,000' MSL
SFC to 100' AGL
Med-High Test Range
A 46.0018 / -118.9761
B 46.0000 / -116.9146
C 44.5000 / -117.2022
D 44.5000 / -120.0000
E 45.6413 / -120.0000
F 45.7914 / -119.5202
G 45.9109 / -119.5191
Low-Med Test Range
1 45.8703 / -119.3445
2 45.8714 / -118.7405
3 45.2000 / -118.4632
4 44.5081 / -118.7413
5 44.5100 / -119.3810
6 45.1923 / -119.6569
Flt-Low Test Range
Loiter Area
W 45.7913 / -118.9972
X 45.8519 / -118.2116
Y 45.3025 / -118.3927
Z 45.3025 / -119.4369

Tillamook, OR





Test Range Airspace

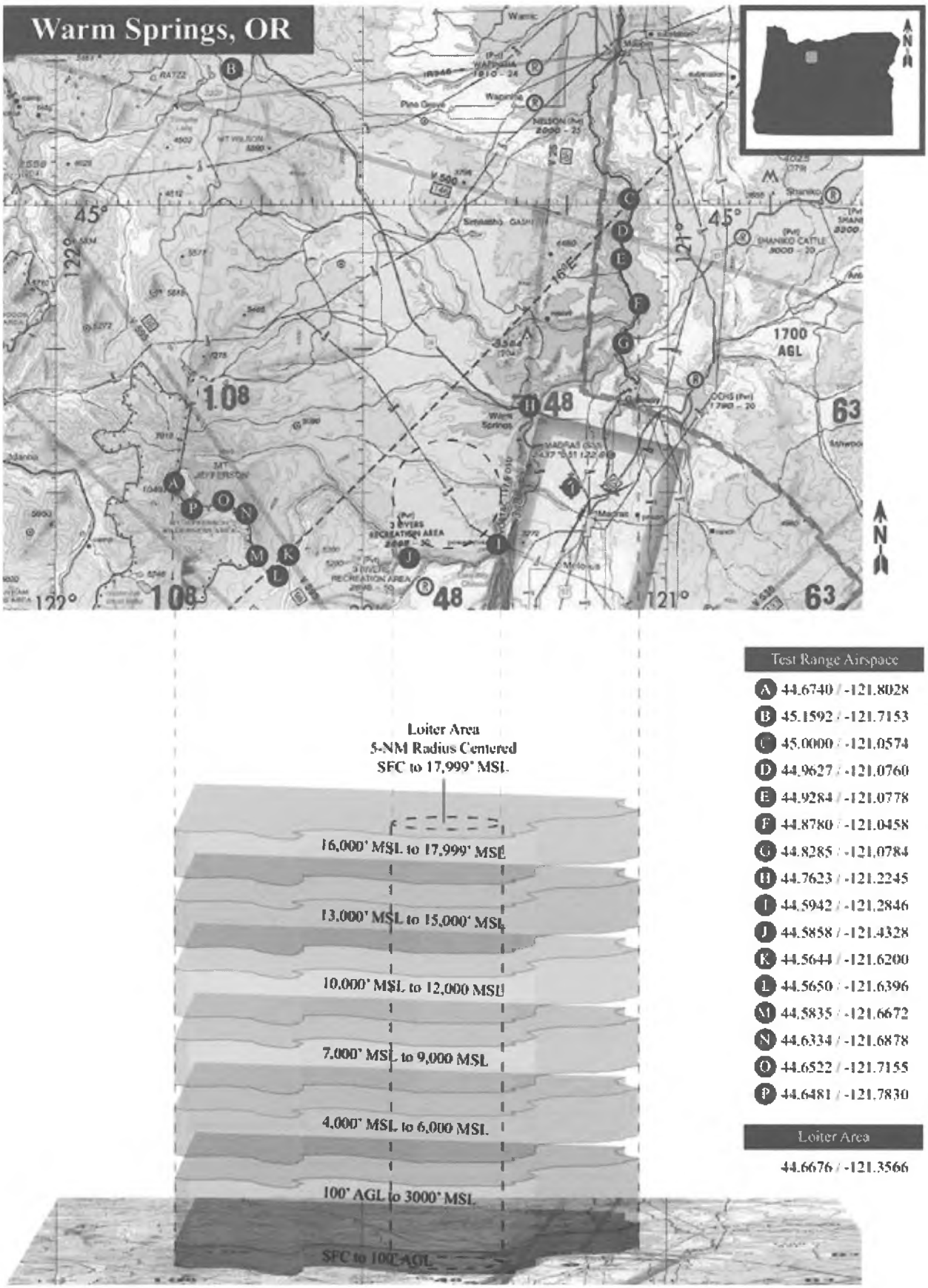
- A 46.0000 / -124.2336
- B 45.5000 / -124.2164
- C 45.0000 / -124.2507
- D 44.5000 / -124.3158
- E 44.3493 / -124.3302
- F 44.3492 / -123.5000
- G 46.0000 / -123.5000

Loitering Area 1

45.2697 / -123.6051

Loitering Area 2

45.4239 / -124.0814


Warm Springs, OR
Loiter Area
5-NM Radius Centered
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
13,000' MSL to 15,000' MSL
10,000' MSL to 12,000 MSL
7,000' MSL to 9,000 MSL
4,000' MSL to 6,000 MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 44.6740 / -121.8028
B 45.1592 / -121.7153
C 45.0000 / -121.0574
D 44.9627 / -121.0760
E 44.9284 / -121.0778
F 44.8780 / -121.0458
G 44.8285 / -121.0784
H 44.7623 / -121.2245
I 44.5942 / -121.2846
J 44.5858 / -121.4328
K 44.5644 / -121.6200
L 44.5650 / -121.6396
M 44.5835 / -121.6672
N 44.6334 / -121.6878
O 44.6522 / -121.7155
P 44.6481 / -121.7830
Loiter Area
44.6676 / -121.3566

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04/25/14 Corres-pondence

<TARGET><BILL></BILL><SUBJECT>04-25-14
Correspondence</SUBJECT><COMM><TARGET></COMM></TARGET>

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Friday, April 25, 2014 1:23 PM
To: 'althea_stmartin@murkowski.senate.gov'
Subject: unmanned aircraft
Attachments: HCR6 2013 SIGNED.pdf; CSHB255(JUD) ver Y Unmanned Aircraft Systems.pdf; CSHCR15(FIN) ver O.pdf; FINAL Legislative Task Force UAS Interim Report - Jan 15-2014.pdf

Hello Althea,

I'm just working on the final report of the 2013 task force (due in June). It will repeat much of the Interim report and include the two pieces of legislation that passed this session.

Industry folks who may be good to invite to your round table:

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If you would like to subscribe to Representative Hughes' newsletter, please click here.

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Friday, April 25, 2014 1:40 PM
To: althea_stmartin@murkowski.senate.gov
Subject: unmanned aircraft task force

I hit send rather than save – sorry

The task force members are:
Senator Donny Olson – sen.donny.olson@akleg.gov
Representative Shelley Hughes – rep.shelley.hughes@akleg.gov
Lt Steve Adams, DPS State Troopers – steven.adams@alaska.gov
Mike O'Hare, DMVA – mike.ohare@alaska.gov
Ro Bailey, Univ of Alaska Fairbanks – rbailey11@alaska.edu
Steve Colligan, Academy of Model Aeronautics – scolligan@e-terra.com
Steve Strait, Aviation Advisory Board – steve@straitmedia.us

New members are:
John Binder, DOT/PF – john.binder@alaska.gov
Joe Jacobson, Dept of Commerce - Joe.jacobson@alaska.gov

2 industry seats
1 public member

Let me know if there is anything else I can do to help
Ginger Blaisdell

Chief of Staff
Office of Representative Shelley Hughes
Capital Building Room 409
Juneau, Alaska 99801

907-465-5265
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If you would like to subscribe to Representative Hughes' newsletter, please click here.

Ginger Blaisdell

From: Diana Campbell <dlcampbell@alaska.edu>
Sent: Thursday, May 01, 2014 9:44 AM
To: Ginger Blaisdell; Courtney Sanborn
Subject: FAA Director coming to Alaska (Confidential)

Categories: Red Category

Hello, Ginger,
We just got word the FAA director,

Michael Huerta, Administrator

is coming to Alaska this weekend. On Monday, in Anchorage, he will sign a Certificate of Authorization for UAF/GI's Pan-Pacific UAS Test Range Complex. Immediately following that, we will fly our first mission.

We are making plans for a two concurrent press conferences, one in Anchorage and one in Fairbanks. The FAA director will not be able to come to Fairbanks, but the mission will be held at UAF's Large Animal Research facility. The time is set at 11 a.m. so far.

Ginger, the reason I'm writing is because we want to make sure the task force members and industry people are aware and have the opportunity to witness the events, in Anchorage or Fairbanks.

Could you send Courtney Sanborn and me the names and contact information of the UAS task force members and industry people your office is aware of, please?

Of course, Rep. Hughes is top on our list.

As you can imagine, we at UAF are all pulling together for this historical event.

I'm arranging the logistics for Anchorage, so if you need to, give me a shout by email or phone.

Also, my cell is 322-7686.

Thank you.

d

Diana Campbell
Public Relations Assistant/Event Coordinator
Public & Media Relations
Geophysical Institute, UAF
PO Box 757320, 608 Elvey
Fairbanks, AK 99775-7320

907-474-5229

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Mark Meyer - advance for public use
RD Bailey
Admin Huerta
Auth granted to UAF
1. ecology

- all aircraft
- all people
- all property

2. Policies and procedures to integrate UAS into NAS.

RD:
Moving over hope as UAS test site into reality

Chancellor Rogers:
Marti Rogers:

real-time sense and avoid
"latency"
"loss of link"

FAA is not taking a role in privacy - does he have recommendations for tk as we develop policy?

How does the FAA clearly define the difference between model aircraft and the work of the test site.

Hobby v. Commercial

What should UAS carry as it relates to avionics (radar, pings)

FAA 100th anniversary of commercial flight

06/30/14 Final Report to the Legislature

<TARGET><BILL></BILL><SUBJECT>06-30-14 Final Report to the Legislature</SUBJECT><COMM>JUNM28</COMM></TARGET>

Top: UAF photo by Todd Paris, remainder courtesy of Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks and Academy of Model Aeronautics

Legislative Task Force on Unmanned Aircraft Systems

Final Report to the Legislature

As required by
Legislative Resolve 17 SLA-13

June 30, 2014

Legislative Task Force on Unmanned Aircraft Systems

Final Report to the Legislature

As required by Legislative Resolve 17 SLA-13

June 30, 2014

Task Force Members:

Representative Shelley Hughes, Co-Chair
Senator Donny Olson, Co-Chair
Lt. Steve Adams, Department of Public Safety
Mike O'Hare, Department of Military and Veterans' Affairs
McHugh Pierre, Department of Military and Veterans' Affairs
Ro Bailey, Alaska Center for Unmanned Aircraft Systems Integration, UAF
Greg Walker, Alaska Center for Unmanned Aircraft Systems Integration, UAF
Steve Colligan, Academy of Model Aeronautics—Alaska Chapter
Steve Strait, Aviation Advisory Board

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C ACADEMY OF MODEL AERONAUTICS SAFETY CODES

D LEGISLATIVE LEGAL SERVICES MEMO – ALASKA LAWS PROTECTING PRIVACY

E ECONOMIC IMPACT OF A PAN-PACIFIC UNMANNED AIRCRAFT SYSTEMS TEST SITE

ACRONYMS AND ABBREVIATIONS

AMA	Academy of Model Aeronautics
ASTM	American Society for Testing and Materials
AUVSI	Association for Unmanned Vehicle Systems International
CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
COA	Certificate of Authorization
DCCED	Department of Commerce, Community, and Economic Development
DHS	Department of Homeland Security
DOC	Department of Commerce
DoD	Department of Defense
DOT/PF	Alaska Department of Transportation/Public Facilities
FAA	Federal Aviation Administration
FMRA	FAA Modernization and Reform Act of 2012
GAO	Government Accountability Office
IACP	International Association of Chiefs of Police
ICAO	International Civil Aviation Organization
IPC	Interagency Policy Committee
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NextGen	Next Generation Air Transportation System
PPUTRC	Pan-Pacific UAS Test Range Complex
RPA	Remotely piloted aircraft
RT&D	Research, testing, and development
RTCA SC	Radio Technical Commission for Aeronautics Special Committee
SPC	Senior Policy Committee
STEM	Science, Technology, Engineering, and Math
UAF	University of Alaska Fairbanks
UAS	Unmanned Aircraft Systems

EXECUTIVE SUMMARY

The Legislative Task Force on Unmanned Aircraft Systems (LTFUAS) was formed under House Concurrent Resolution No. 6 to review regulations and guidance regarding unmanned aircraft systems (UAS). The LTFUAS was tasked to provide recommendations for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of UAS for public and private commercial applications.

In response to public concern between May and December 2013, the LTFUAS reviewed multiple potential UAS scenarios focusing on privacy issues, economic development, public safety, anticipated mission types, and flight safety. LTFUAS evaluated existing privacy laws for Alaska to avoid recommending duplicative law for UAS; considered ways to encourage the economic development and safe uses of UAS in Alaska; and supported public education to address public reservations regarding UAS use in Alaska as well as provide information on the use of UAS for life-saving and other cost-saving and beneficial applications for dull, dirty, and dangerous tasks.

LTFUAS concluded that the Federal Aviation Administration (FAA) is adequately addressing the safety concerns of integrating UAS into the National Airspace System (NAS). FAA Guideline N 8900.227 clearly states the requirements for the aircraft, pilot training and responsibilities, and the expectations of the test sites for safe operations of UAS.[1] The FAA guidelines provided LTFUAS assurance that unmanned aircraft can be operated safely in Alaska.

After understanding the role of the FAA and safety goals for integration of UAS into the NAS, the LTFUAS made the following recommendations in its preliminary report submitted to the Alaska State Legislature on January 15, 2014.

1. All state and local law enforcement entities should adopt the International Association of Chiefs of Police (IACP) guidelines to help ensure privacy protection for Alaskans.

2. All law enforcement entities must first obtain a court order to use UAS over private property for criminal investigation against any person.

3. Encourage all law enforcement entities to use high-visibility marking or navigational lighting on law enforcement UAS as appropriate.

4. Convey a clear message to industry that Alaska is open for business to harness the beneficial uses of UAS, to encourage the growth of this economic sector, and to allow Alaska to continue to lead the nation in aviation innovation.

5. Encourage private and public UAS training programs.

6. Report all UAS incidents/accidents of aircraft larger than 55 pounds to the University of Alaska and/or Alaska Aviation Coordination Council.

[1] Notice N 8900.227, Subj: Unmanned Aircraft Systems (UAS) Operation Approval. Effective Date 7/30/13, Cancellation Date 7/30/14. Available at http://www.faa.gov/documentLibrary/media/Notice/N_8900.227.pdf

7. Extend LTFUAS until June 30, 2017, and expand the duties of the Task Force with the addition of one member representing the Alaska Department of Transportation/Public Facilities (DOT/PF) and one public member, for the following reasons:

    - During this transitional phase of growing use of UAS in Alaska, the LTFUAS should be extended to continue to monitor the integration of UAS into the NAS and any privacy matters that may arise that are not already covered by existing law. Because Alaska currently has a strong set of privacy laws, rather than recommend prohibitions be incorporated into statute that might inhibit industry, the LTFUAS recommends it continue to review UAS operations in light of current statutes and only recommend changes in statute as necessary.

    - Because FAA will be updating and issuing new guidelines based on the work of the new FAA UAS test sites announced on December 30, 2013, it is necessary for the LTFUAS to continue to review FAA policies to determine their impact and whether any additional policy changes at the state level may be necessary in response.

    - With Alaska's December 30, 2013, selection as one of the nation's six UAS test sites through the University of Alaska's application (in conjunction with Oregon and Hawaii), the LTFUAS will meet part of the test site's requirement as a public forum where concerns regarding privacy and data matters can be collected and evaluated.

The LTFUAS recommendations were addressed in either House Bill 255 (HB255) or House Concurrent Resolution 15 (HCR15) and in the University of Alaska Pan Pacific UAS Test Range Complex operating requirements as follows:

- Recommendations 2, 3, and 4 were addressed in HB255 passed by the Legislature.
- Recommendation 1 was adjusted. Instead of requiring law enforcement entities to adopt a specific publication, HB255 incorporated particular guidelines as requirements for law enforcement entities.
- Recommendations 4 and 7 were addressed in HCR15. In addition, two industry seats were added to the LTFUAS.
- Recommendation 6 was partially addressed by HB255 for reporting requirements of law enforcement. Other industries will need to be addressed as a continuing task for the LTFUAS.

As we move forward, and particularly in light of the fact that Alaska has been selected as an FAA test site for UAS integration, and with the extension and expansion of duties of the LTFUAS, we continue emphasis on:

1) management of the test ranges,
2) economic development opportunities,
3) public education and public relations regarding UAS,

4) rules for hobby and recreational use of model aircraft as outlined by the FAA, and

5) privacy issues including those related to data collection.

The LTFUAS recommended the following for further review:

1) each department of the State of Alaska identify a point of contact for UAS to coordinate with the LTFUAS and provide information regarding department policy and procedures to ensure accountability and privacy in regard to UAS use, and

2) the Alaska Department of Administration review and update its data retention policies particularly in the area of inadvertent captured data that are not relevant to a state agency.

Lastly, in May and June of 2014, notice of the three open seats (two industry, one public) on the LTFUAS have circulated by email, radio, meeting announcements, and newsletters. Co-Chair Shelley Hughes collected letters of interest and resumes from 13 applicants and submitted them to House Speaker Chenault and Senate President Huggins on June 24, 2014, for appointments to the LTFUAS to be expanded as of July 1, 2014.

Shelley Hughes

/s/

1. INTRODUCTION

House Concurrent Resolution No. 6 (HCR6) formed the Legislative Task Force on Unmanned Aircraft Systems (LTFUAS) to conduct the following tasks:

- review regulations and guidance from the Federal Aviation Administration (FAA) regarding unmanned aircraft systems (UAS);
- provide written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of UAS for public and private applications; and
- submit a preliminary and final report to the Legislature.

The LTFUAS met in 2013 on July 24 and October 2 via teleconference and twice in person October 23-24 and November 26 to respond to the concerns Alaskans have raised regarding unmanned aircraft use in Alaska. The LTFUAS completed the following tasks:

- reviewed regulations and guidance from the FAA, International Association of Chiefs of Police (IACP), and multiple related recommendations for UAS operations;
- received hours of public testimony and written public testimony;
- compiled recommendations and suggested legislation for the use of UAS for public and private applications in Alaska that are protective of privacy; and
- submitted a preliminary report to the Alaska State Legislature on January 15, 2014, and a final report on June 30, 2014.

The LTFUAS considered two approaches to regulating the use of UAS in Alaska:

1. restrict the industry and adopt exemptions for specific kinds of approved uses, or
2. generally allow UAS operations in Alaska and adopt the necessary privacy, operations, and other guidelines that seem necessary to protect Alaskans.

The LTFUAS adopted the second approach and emphasized that educating the public will be an important part of integrating this technology safely and for the benefit of Alaskans.

The LTFUAS concluded that the FAA is adequately addressing the safety concerns of integrating UAS in the National Airspace System (NAS). FAA Guideline N 8900.227 spells out the details of operating UAS by clearly stating the requirements of the aircraft, pilot training and responsibilities, and the expectations of the FAA UAS Test Sites.[2] The rules outlined in the guidelines provided the LTFUAS assurance that unmanned aircraft can be operated safely in Alaska.

[2] Notice N 8900.227, Subj: Unmanned Aircraft Systems (UAS) Operation Approval. Effective Date 7/30/13, Cancellation Date 7/30/14. Available at http://www.faa.gov/documentLibrary/media/Notice/N_8900.227.pdf

The FAA also recently released its Final Privacy Requirements in November 2013. The privacy document from the FAA clearly identified that while it governs the NAS, local governments will assume the responsibility of addressing privacy concerns.

Alaskans are fortunate to have a state constitution and state law that provide some of the greatest privacy protections compared to other states. As the LTFUAS reviewed multiple scenarios for misuse of UAS, it determined that existing laws would apply, are sufficiently protective of privacy, and penalties are already in place to address inappropriate behavior.

When studying the many possible scenarios for misuse, the LTFUAS returned repeatedly to the premise that an unmanned aircraft is a tool; the operator needs to be considered for breaches of privacy or harming another.

This report presents the findings of the LTFUAS resulting from LTFUAS meetings, public testimony, research, and information from industry experts in pursuit of the assigned duties listed above.

1.1 Background and Planning

The earliest UAS was A.M. Low's "Aerial Target" of 1916 during World War I. The flight lasted 12 seconds. Over the last 50 years, rapid advances in aviation technology have transformed the world's skies. In the United States, the NAS has evolved to include a variety of fixed-wing and rotary aircraft operating across the country from metropolitan areas to remote airfields. As aircraft technology expands, so do the challenges associated with managing safe skies. UAS have created a critical integration challenge for the FAA as they are flown in an environment that was originally developed for manned aircraft.

1.1.1 Federal

In 2008, the Government Accountability Office (GAO) reported that the United States must develop a clear and common understanding of what is required to safely and routinely operate UAS in the NAS. Congress enacted the FAA Modernization and Reform Act of 2012 (FMRA). Through this act, Congress set forth a number of specific requirements for achieving UAS integration—namely a UAS Comprehensive Plan[3] and a 5-year Roadmap.[4]

In April 2012 under the guidance of the Next Generation Air Transportation System (NextGen) Implementation Plan Senior Policy Committee (SPC), the Joint Planning and Development Office assembled the Departments of Transportation (DOT), Defense (DoD), Commerce (DOC), and Homeland Security (DHS) as well as the National Aeronautics and Space Administration (NASA) and the FAA to develop the UAS Comprehensive Plan. The UAS Comprehensive Plan sets the

[3] Unmanned Aircraft Systems (UAS) Comprehensive Plan. September 2013. Prepared by the Joint Planning and Development Office. Available at http://www.faa.gov/about/office_org/headquarters_offices/agi/reports/media/UAS_Comprehensive_Plan.pdf

[4] Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration. Available at http://www.faa.gov/about/initiatives/uas/media/uas_roadmap_2013.pdf

overarching integration of UAS into the NAS. The plan also supports the coordination and integration of research and development necessary to achieve UAS integration goals by 2015 (Title 14 of the Code of Federal Regulations, Part 91 [14 CFR 91]; FAA Guideline N 8900.227).

1.1.2 Federal and State Collaboration

One part of the UAS Comprehensive Plan included a priority for UAS research and development. NextGen developed the *NextGen UAS Research, Development and Demonstration Roadmap,*[5] and the FAA initiated a program for test ranges in accordance with the FMRA. In response to the FAA's solicitation for applications, the University of Alaska Fairbanks (UAF) teamed with the States of Oregon and Hawaii and submitted the Pan-Pacific UAS Test Range Complex application.

On December 30, 2013, the FAA announced that Alaska was one of six states selected as a test site for safe operations and integration studies. UAF plans to work on state monitoring, navigation and safety standards.

1.1.3 State

Anticipating the integration of UAS in Alaska's NAS and the probable selection of Alaska as an FAA UAS test site, HCR6 was passed to establish a Task Force to consider the implications of bringing this new technology to Alaska as early as spring 2014.

The FAA also recently released its Final Privacy Requirements in November 2013. The privacy document from the FAA clearly identified that while it governs the NAS, local governments will assume the responsibility of addressing privacy concerns.

Flight safety will continue to be monitored by the FAA. The State of Alaska will develop additional safety rules that pertain to specific kinds of UAS operations and will address the concern of personal privacy.

The LTFUAS approach is to responsibly embrace the positive uses of UAS without overregulating the industry and thus hindering economic opportunity. In addition to accepting the use of UAS in Alaska, the LTFUAS recognizes that public perception is greatly influenced through media reports, such as military flights in war zones. The public has been hesitant to allow UAS in Alaska due to fear of invasion of personal privacy and overreaching law enforcement. Recent media reports have decreased public anxiety and increased public awareness of potential benefits of UAS, such as the publicity surrounding Amazon's consideration of "drone deliveries" in the future, YouTube videos showing beer delivered by a UAS to ice fishermen, and news reports of drones being used to identify hot spots in forest fires.

[5] Next Generation Air Transportation System, NextGen UAS Research, Development and Demonstration Roadmap. Version 1.0, March 15, 2012. Available at http://www.jpdo.gov/library/20120315_UAS%20RDandD%20Roadmap.pdf

1.2 Future of UAS in Our Skies

The FAA is expediting the planning and integration of UAS in the NAS because of the rapid advancements in this technology and the global response to the wide variety of uses by UAS. Unmanned aircraft will become part of our economy, transportation system, public safety, and much more.

Protecting the privacy of our citizens is the most important concern of the LTFUAS, and it remains at the forefront of each application of UAS missions. Alaska must respond quickly to this new technology in three ways: (1) support the integration of UAS in our airspace, (2) develop a forum to review concerns and recommend legislation, and (3) educate the public. All of these approaches must work in unison to be successful and maintain personal privacy.

1.2.1 LTFUAS Reauthorization

House Concurrent Resolution 15 (HCR15) reauthorized the LTFUAS for 3 more years, terminating June 30, 2017, and coinciding with the timing of the FAA UAS test site at the University of Alaska Fairbanks. The LTFUAS has added responsibilities as it continues its work; the duties of the Task Force shall include:

1. reviewing regulations and guidance from the FAA regarding UAS;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of UAS for public and private applications;
3. evaluating complaints and concerns expressed to the LTFUAS;
4. identifying potential privacy and public safety concerns associated with UAS and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to UAS;
6. studying the FAA's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of UAS in Alaska;
7. conducting a public hearing concerning privacy and the capture of data by UAS at the University of Alaska's test site;
8. further studying the nonpublic use of UAS to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

1.2.2 Law Enforcement Rules

House Bill 255 (HB255) established the rules by which law enforcement agencies throughout the state can use UAS to improve safety and reduce costs for the public benefit of Alaskans.

Under HB255, A law enforcement agency may use an unmanned aircraft system:

(1) to gather evidence in a criminal investigation (A) under the express terms of a search warrant issued by a court; or (B) in accordance with a judicially recognized exception to the warrant requirement; or

(2) in situations and for uses not involving a criminal investigation and not intended to lead to the production of evidence for use in a criminal investigation, if the use does not constitute an unwarranted invasion of personal privacy and is consistent with the procedures in AS 18.65.901.

The bill also requires law enforcement to:

- Maintain a record of each flight, including the time, date, and purpose of the flight, and the identity of the authorized official;
- Establish an auditable flight record system, including the documentation of a change in a flight time record;
- Establish a method of notifying the public of the operation of an unmanned aircraft system, unless notifying the public would endanger the safety of a person;
- Provide for community involvement in the development of the policies;
- Ensure that the flight of a UAS be for a public purpose;
- Obtain any authorization, permit, or certificate required by the FAA to operate the UAS;
- Allow operation only by trained and certified pilots and crews; and
- Dispose of images that are not required as part of an investigation, for prosecution or training.

The UAS industry is changing as quickly as your imagination can conjure a new application for use. Nearly every country on the planet is preparing for UAS in efforts that range from military actions and border patrol to research and development of UAS technology.

Alaska recognizes that the integration of this industry is already occurring, and we must respond proactively. We invite the appropriate use of UAS, and the LTFUAS will recommend rules, education, and reporting requirements for their approved use in the State of Alaska and continue to monitor any privacy issues that may arise, including those related to data collection.

2. FEDERAL AVIATION ADMINISTRATION—SAFETY AND PRIVACY

From *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap*:

"Since the early 1990s, unmanned aircraft systems (UAS) have operated on a limited basis in the National Airspace System (NAS). Until recently, UAS mainly supported public operations, such as military and border security operations. The list of potential uses is now rapidly expanding to encompass a broad range of other activities, including aerial photography, surveying land and crops, communications and broadcast, monitoring forest fires and environmental conditions, and protecting critical infrastructures.

The FAA created the Unmanned Aircraft Systems Integration Office to facilitate integration of UAS safely and efficiently into the NAS. Toward that goal, the FAA is collaborating with a broad spectrum of stakeholders, which includes manufacturers, commercial vendors, industry trade associations, technical standards organizations, academic institutions, research and development centers, governmental agencies, and other regulators."[6]

FAA 'Roadmap'

"Ultimately, UAS must be integrated into the NAS without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies."

2.1 Safety Guidelines

The LTFUAS studied the FAA Guidelines for the Operations of Unmanned Aircraft Systems, participated in a presentation of the guidelines from Ro Bailey, Deputy Director of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks, and sought comments from representatives of the FAA. FAA Guideline N 8900.227 provides the most current guidelines for federal approval of operating unmanned aircraft.[7]

The LTFUAS recognizes that the FAA manages the safety of the NAS and has adopted extensive guidelines regarding aircraft certification, pilot training and certification, and approval processes for flights (or missions). The FAA Guideline N 8900.227also provides detailed requirements for the operations of pending test sites and the current approval of flights in designated areas for specific purposes. The FAA pre-approves UAS missions and awards a Certificate of Authorization (COA) that identifies the details of the mission. This process is tightly scrutinized, and the entity flying the UAS is accountable to the FAA under the details of the COA.

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[6] Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration. Available at http://www.faa.gov/about/initiatives/uas/media/uas_roadmap_2013.pdf

[7] Notice N 8900.227, Subj: Unmanned Aircraft Systems (UAS) Operation Approval. Effective Date 7/30/13, Cancellation Date 7/30/14. Available at http://www.faa.gov/documentLibrary/media/Notice/N_8900.227.pdf

The COA approval process gives the LTFUAS confidence that safety of the NAS is adequately considered and that UAS missions will not invade personal privacy or operate inappropriately.

It is the opinion of the LTFUAS that no additional statutory or regulatory requirements are needed for FAA-approved missions.

2.2 Privacy Concerns

2.2.1 FAA Final Privacy Requirements

The FAA recently published its Final Privacy Requirements, November 7, 2013 (Appendix A) regarding unmanned aircraft. The FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the test sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

FAA Final Privacy Requirements

On February 22, 2013, the FAA requested public comment on the proposed privacy requirements for UAS test sites that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012.

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session.

The public comments were grouped into 10 categories, and the FAA provided a response to each category. You can view all categories, comments and responses in the document provided in Appendix A.

From the FAA Final Privacy Requirements:

There was substantial difference of opinion among commenters as to whether the UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy restrictions on UAS operations at the test sites. In addition, there was substantial difference of opinion regarding what elements would be appropriate for a test site privacy policy.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons.

First, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the test sites.

Second, the FAA believes that the test site operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each test site.

Test Site Requirements

1. *Test site operators must maintain a record of all UAS operating in the test sites;*
2. *Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and*
3. *Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.*

Third, if UAS operations at a test site raise privacy concerns that are not adequately addressed by the test site's privacy policies, elected officials can weigh the benefits and costs of additional privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS.

Conclusion: Based on the comments submitted, the FAA intends to require each test site operator to comply with all of the privacy requirements included in the Final Privacy Requirements as well as the following additional privacy requirements:

1. Test site operators must maintain a record of all UAS operating in the test sites;
2. Test site operators must require every UAS operator in the test site to have a written plan for the operator's use and retention of data collected by the UAS; and
3. Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices, and share those outcomes annually in a public forum with an opportunity for public feedback.

It is the opinion of the LTFUAS that privacy policy is adequate through the FAA requirements for the use of UAS in the test sites.

2.2.2 Privacy and Civil Liberties Consideration

The FAA is implementing a UAS Test Site Program to help the FAA gain better understanding of operational issues relating to UAS. Although the FAA's mission does not include developing or enforcing policies pertaining to privacy or civil liberties, experience with the FAA UAS test sites will present an opportunity to enhance the dialogue in the Interagency Policy Committee (IPC) and other interagency forums concerning the use of UAS technologies and the areas of privacy and civil liberties.

"The Fourth Amendment is central to the privacy issues with respect to government UAS operation. Although the Supreme Court has never explicitly considered the question of UAS privacy, there is a long list of relevant precedents. Among them are several cases from the 1980s that specifically considered aerial observations and the Fourth Amendment."[8]

2.2.3 Homeland Security Privacy Impact Assessment

U.S. Customs and Border Protection (CBP) is responsible for guarding nearly 7,000 miles of land border, 2,000 miles of coastal waters, and 95,000 miles of maritime border. CBP employs several types of aircraft to achieve its mission objectives including UAS. COAs have been authorized in Arizona, Texas, Florida, and North Dakota. When deploying resources for operations, the Office of Air and Marine must determine the availability of aircraft type and the integration of the requested activity into its flight operations.

[8] John Villasenor. 2013. Observations from Above: Unmanned Aircraft Systems and Privacy. Harvard Journal of Law & Public Policy. Available at http://www.harvard-jlpp.com/wp-content/uploads/2013/04/36_2_457_Villasenor.pdf

Homeland Security addressed privacy in the Privacy Impact Assessment published September 9, 2013.[9] A summary of privacy concerns addressed in their document includes:

Homeland Security

95,000 miles of maritime border security includes joint operations with the U.S. Coast Guard. Some of those miles include Alaska coastline.

- The collection and use of data from aerial surveillance remains within the scope of its authorities to protect the border and provide support for law enforcement activities while continuing to preserve a person's right to privacy.
- UAS present a perceived risk because they are able to fly for longer periods of time and conduct surveillance relatively undetected. While UAS can fly for longer periods of time, they are equipped with the same technology to conduct surveillance that is presently deployed on manned aircraft.
- Concern for the security of the UAS itself and the potential for hijacking of the unmanned aircraft are managed by the close monitoring of ground control and satellite communication by encrypted data. If one ground station were to lose contact, a second ground station is equipped to pick up the UAS and continue operations.

[9] Department of Homeland Security. 2013. Privacy Impact Assessment for the Aircraft Systems. DHS/CBP/PIA-018. September 9. Available at http://www.dhs.gov/sites/default/files/publications/privacy-pia-cbp-aircraft-systems-20130926.pdf

3. ALASKA STATE LAW—SAFETY AND PRIVACY

The LTFUAS is confident that the FAA will regulate safety of UAS flights in Alaska. While safety is critically important, the LTFUAS also recognizes that certain codes of conduct must be followed to ensure harmonious UAS operations in Alaska.

3.1.1 Self-Regulation by Three National Organizations

The LTFUAS considered the recommendations of the following three national organizations that have adopted rules and codes of conduct regarding UAS operations. The LTFUAS adopted the IACP rules in the legislation introduced during the legislative session. During the committee process, the decision was made that it would be ill advised to adopt a dated publication. Instead the bill incorporated applicable guidelines from the publication.

- **IACP:** International Association of Chiefs of Police Recommended Guidelines (Appendix B) for the use of Unmanned Aircraft was adopted in August 2012. The Alaska Department of Public Safety has also adopted these guidelines as their doctrine with the exception of increasing the flight approval responsibility from a "supervisor" to the director's office.

- **AUVSI:** Association for Unmanned Vehicle Systems International states: "As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct."[10]

- **AMA**: Academy of Model Aeronautics' *AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View. Failsafe. Stabilization and Autopilot Systems* guides model aircraft operators.[11]

In the same manner that the FAA does not regulate model aeronautics, the LTFUAS does not intend to adopt requirements of hobbyist activities using UAS.

3.1.2 Model Aircraft Rules and Definitions

The technology differences between UAS and model aircraft used for sport or recreation use is narrowing each day. Technology is advancing by leaps and bounds, while at the same time becoming more affordable and integrated into off-the-shelf-systems for consumers and hobbyists. While there are many technical documents and references through the FAA Modernization and

[10] Unmanned Aircraft System Operations Industry "Code of Conduct." Accessed January 13, 2014. Available at http://www.auvsi.org/conduct

[11] AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems. Revision 07/20/2013. AMA Advanced Flight Systems Committee Report 101. Available at http://www.modelaircraft.org/files/AFSCREPORT101.pdf

Reform Act, the general difference between UAS and model aeronautics is the operation and intent of the operator not the aircraft.

If the activity or intent of the activity is used for commercial operations or contributing to the creation of a product or service, it is considered commercial activity, and it is subject to the FAA regulations and rule as stated in the FAA Modernization and Reform Act of 2012 and FAA UAS Road Map 2013.

If the activity is for sport and recreation use as defined by FAA SEC 336 SPECIAL RULE FOR MODEL AIRCRAFT of the Modernization Act, it is controlled by a cooperative agreement between the FAA and a Community Based Organization (CBO), such as the Academy of Model Aeronautics (AMA).

The AMA has been successful in self-regulating operations for hobbyists and aviation safety for over 77 years. During those 77 years, the AMA faced many challenges of new technologies such as analog to digital radio, coordinating operations within the airspace and the ever changing aircraft designs and capabilities not unlike the latest multi-rotor and First Person View (FPV) capabilities. To address the current safety requirements and interest of model aircraft operators, the AMA has developed and updated its general safety code AMA Publication 105-Safety Code and advanced aircraft rules publication 550-First Person View and 560-Autopilot effective January 1, 2014, to keep up with the FAA rule making and technology advances. Refer to Appendix C.

Legal Services

Constitutional Protection of Privacy: *The Constitution of the State of Alaska explicitly protects the right of privacy against government intrusion. Art. I, sec. 22 provides: "The right of the people to privacy is recognized and shall not be infringed. The Legislature shall implement this section."*

Alaska Statutory Protections:

AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means

AS 11.61.116 Sending an explicit image of a minor

AS 11.61.120(a)(6) Harassment: publishing or distributing certain images

AS 11.61.123 Indecent viewing or photography

AS 11.76.113 Misconduct involving confidential information in the first degree

AS 11.76.115 Misconduct involving confidential information in the second degree

It was discussed that a notice should be provided at the time of purchase of each model aircraft to review the AMA flight operation guidelines for appropriate use of model aeronautics. The LTFUAS did not adopt a requirement for notice regarding hobbyists since so many aircraft are purchased outside of Alaska and would not be required to provide the notice.

3.1.3 Alaska State Law and Personal Privacy

The State of Alaska and its local governments cannot dictate the use of the NAS but can consider rules that better define the FAA guidelines, can consider legal repercussion for entities found in violation of adopted laws, and can provide for specific privacy laws regarding the use of UAS in Alaska.

The State of Alaska Constitution provides privacy protection, "although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. Both the Alaska

Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy."[12]

Although much attention regarding UAS privacy focuses on government use and the Fourth Amendment, it is non-governmental use that is likely to raise some of the most significant privacy challenges in coming years. For private entities, the key constitutional question is the extent of their First Amendment privilege to gather information.

Civil use of unmanned aircraft will fall under the federal and state laws including such provisions as trespassing, invasion of privacy, intrusion upon seclusion, publication of private facts, stalking and harassment, and business privacy.

The LTFUAS, with guidance from Legislative Legal Services, considered many scenarios of possible violations of state and federal law that might occur with the use of unmanned aircraft. Legislative Legal Services provided the document, *Observations from Above: Unmanned Aircraft Systems and Privacy*,[13] that presented a variety of scenarios that have been tried in court and some that should be discussed as they pertain to UAS and personal privacy. The Legal Services memo outlining the areas of statute that protect personal privacy can be found in Appendix D.

Privacy protection considerations reviewed by the LTFUAS include but are not limited to the following.

1. **If data is gathered by a government agency, it is a public record. However, AS 40.20.120 provides certain protections for private information. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information and whether the person whose actions have been captured has a reasonable expectation of privacy.**

It was discussed that data captured by a government-operated UAS would be treated similarly to data captured by other technology such as cell phones, manned aircraft, satellite images, voice recorders, etc. Case law is substantial in determining if the person would be considered to have a reasonable expectation of privacy and when a warrant would be required to obtain and use any data collected.

CH 48 (HB65) SLA08 Personal Information Protection Act also addresses the collection, storage, and breach of privacy. This act would include any data captured by a UAS.

2. **As technology continues to advance beyond "normal" application of current laws, a balanced approach that recognizes the inherent difficulty in predicting the future must be adopted when drafting new laws.**

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[12] Memorandum: Alaska Laws Protecting Privacy (Work Order No. 28-LS0990). September 30, 2013. Division of Legal and Research Services, Legislative Affairs Agency, State of Alaska, Juneau.

[13] John Villasenor. 2013. Observations from Above: Unmanned Aircraft Systems and Privacy. Harvard Journal of Law & Public Policy. Available at http://www.harvard-jlpp.com/wp-content/uploads/2013/04/36_2_457_Villasenor.pdf

The LTFUAS determined that we cannot foresee the future applications of technology (of UAS or other technologies); therefore, creating restrictions in law based on assumptions is not recommended.

Observations From Above: UAS and Privacy

This document was published in the Harvard Journal of Law and Public Privacy by John Villasenor, a senior fellow in Governance Studies and the Center for Technology Innovation, the Brookings Institution.

The Task Force discussed many of the scenarios posed by the author when considering the need for Alaska law.

3. How should Alaska manage unintentionally captured images or data?

Discussion as of December 2013 concluded that there are adequate statutes, case law, and data retention guidelines that resolved the concerns of the LTFUAS in the area of unintentionally captured images or data. Discussion during the legislative session of 2014 indicated that data collection will be an area the LTFUAS will need to continue to monitor.

Recommendation: The LTFUAS also requests that the Department of Administration review its data retention schedules with particular emphasis on law enforcement data captured inadvertently and allowing that data to be destroyed.

4. The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of the FAA Modernization and Reform Act of 2012 (FMRA) have a "line of sight" requirement.

The LTFUAS assumes that FAA regulations adopted in the next several years will continue to require visual line-of-sight operation. "Sense and avoid" technology will become more mature and some non-line-of-sight missions may be permitted by the FAA. Non-line-of-sight operations and other unknown technological advances may bring new challenges that will require the Legislature to review industry guidelines and state laws in the future.

5. Unmanned aircraft may bring efficient advances to law enforcement; however, the public seems to be highly sensitive to law enforcement using unmanned aircraft.

After reviewing many possible uses of UAS, the LTFUAS determined that existing law already affords the public with adequate protections.

- **Routine Technology**: The use of UAS is treated much the same as any other technological tool used to protect the public. The Department of Public Safety has adopted the IACP Guidelines for UAS, and the LTFUAS found those guidelines to be superior for rules of law enforcement use.

Specific guidelines from the IACP were offered as a provision of the legislation.

- **Public Navigable Airspace:** The question of what constitutes "public navigable airspace" for UAS operated by the government is central to privacy policy. The LTFUAS found that almost every law enforcement scenario discussed was already protected by existing law.
- **Role of Imaging Technology:** Rules and case law exist that protect citizens from inappropriate use of capturing data that is "more than the human eye could ever see."
- **Extended Surveillance:** Law enforcement does not intend to use UAS for standard patrol activities at this time. Limiting flight hours was not seen as an acceptable control because long flights may be necessary in the event of search and rescue or natural disaster remediation operations.
- **Obtaining a Warrant:** After much discussion, it was decided that using UAS to gather data would require a warrant in similar situations as using any other data gathering device (such as voice recording, photography, and thermal imaging with manual technology). No additional laws are required to obtain a warrant for UAS data gathering.

Voluntary Approaches

The International Association of Chiefs of Police (IACP) adopted model guidelines for the use of UAS for law enforcement purposes.

The Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct calls for a commitment to "respect the privacy of individuals."

Academy of Model Aeronautics (AMA) has also adopted operational policies and guidelines for advanced flight systems used in radio-controlled model aircraft.

It is the understanding of the LTFUAS that all law enforcement entities must first obtain a court order to use UAS over private property for criminal investigation against any person. This will be offered as a provision of the recommended legislation.

- **Weaponized Aircraft:** FAA guidelines do not allow anything to be dropped from an unmanned aircraft.
- **Visibility**: Law enforcement is planning to use high-visibility marking on any UAS they will use. Application of navigational lighting and/or high-visibility paint is being considered.
- **Public Education**: It is apparent that public education is necessary for all agencies using UAS but sensitivity is heightened for law enforcement uses.

Law Enforcement

Public protection will benefit greatly from unmanned aircraft for the purposes of search and rescue, crash scene documentation time, natural disaster monitoring, wildfire management, amber and silver alerts, hostage situations, and other life safety extremes. Some efforts will require warrants to proceed and some will be allowed under a Certificate of Authorization (COA).

It is the opinion of the LTFUAS that existing privacy laws are adequate to govern the use of unmanned aircraft.

It is the opinion of the LTFUAS that since Alaska has been chosen as one of the FAA UAS Test Sites, we have the opportunity to participate in the use of UAS in a variety of ways that would put Alaska in the position to establish policy guiding the use of UAS for the rest of the United States to consider.

3.2 Technical Operations Guidelines

International Civil Aviation Organization (ICAO), a special agency of the United Nations, promotes "the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency, and regularity, as well as aviation environmental protection."[14]

The goal of the ICAO in addressing unmanned aviation is to provide the fundamental international regulatory framework to support routine operation of UAS throughout the world in a safe, harmonized, and seamless manner comparable to that of manned operations.

> "A number of Civil Aviation Authorities have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft... In general, UAS should be operated in accordance with the rule governing the flight of manned aircraft and meet equipment requirements applicable to the class of airspace within which they intend to operate... To safely integrate UAS in non-segregated airspace, the UAS must act and respond as manned aircraft do. Air Traffic, Airspace and Airport standards should not be significantly changed. The UAS must be able to comply with existing provisions to the greatest extent possible."[15]

UAS Operations Guidelines

Technical rules for operating unmanned aircraft systems are clearly identified at a global and federal level. "A number of Civil Aviation Authorities have adopted the policy that UAS must meet the equivalent levels of safety as manned aircraft..."

FAA Guideline N 8900.227 specifically sets the rules for the technical operations of flying unmanned aircraft.

The FAA has established guidelines for the certification and airworthiness of the aircraft, certification of the pilot including additional instruction in operating specific UAS, flight operations with the test sites, management of the test site, and COAs for particular missions.

The LTFUAS is confident in the FAA guidelines in protecting the safety of the NAS.

[14] ICAO web page: http://www.icao.int/about-icao/Pages/default.aspx

[15] *From* Circular 328 - Unmanned Aircraft Systems (UAS) (Cir 328 AN/190) as cited in Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration. Available at http://www.faa.gov/about/initiatives/uas/media/uas_roadmap_2013.pdf

4. BENEFITS TO ALASKA

The UAF Center for Unmanned Aircraft Systems Integration, Research, Testing, and Development (RT&D) is a nationally recognized program that has shown responsible use of UAS for more than 10 years. The University has been selected by the FAA to be one of the six federal test sites. The University proposal contained a diverse set of test site range locations in seven climatic zones as well as geographic diversity with test site range locations in Hawaii and Oregon. The research plan includes the development of a set of standards for unmanned aircraft categories, state monitoring and navigation, as well as safety standards for UAS operations.

Numerous benefits that can be realized as Alaska takes the lead on this new technology are:

- Economic
- Policy Development
- Expedited Timeline for Test Range Use and Approved Missions
- Encourage University Pilot Training Program for UAS
- Education—Public Awareness
- Market Alaska as "Open for Business" for UAS
- Public Safety Statewide

4.1 Economic Benefit

Test Site Selection: As part of the University of Alaska's application to the FAA for selection as a test site, the McDowell Group was contracted to complete an economic evaluation of unmanned aircraft benefits for Alaska. *Economic Impact of a Pan-Pacific Unmanned Aircraft Systems Test Site* was completed May 2013 (Appendix E). The highlights of this report include:

> "In total, designation of PPUTRC [Pan-Pacific UAS Test Range Complex] as a UAS test site would be expected to generate 1,065 direct, indirect, and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from $57 million in 2014 to about $76 million in 2017.
>
> In addition to direct jobs created from UAS firms, significant indirect and induced jobs will also be created. Indirect jobs represent jobs created throughout the supply chain to support the UAS industry and induced jobs represent jobs created due to changes in household consumption as a result of the UAS industry."[16]

In addition to Test Site Selection: The cost savings to government agencies in both man hours and safety risk is immeasurable at this time, but the LTFUAS realizes there will be many efficiencies gained with the use of this technology. Examples include but are not limited to:

[16] Economic Impact of a Pan-Pacific Unmanned Aircraft Systems Test Site. May 2013. Prepared for Alaska Center for Unmanned Aircraft Systems Integration, University of Alaska Fairbanks. Prepared by McDowell Group.

- **More Accurate Biological Studies.** One specific marine mammal population count had been conducted by a single manned airplane flyover to film and later count the animals. The noise from the aircraft distressed the animals and many were on the move during the filming. With the UAS launched nearby, the animals were undisturbed and a more accurate count was completed. The more-accurate count gave biologists better data to determine such things as the health of the population and whether or not to include them on the endangered species list.
- **Rapid Response of Air Assets for Traffic Resolution.** Several incidents along the major highways in Alaska have resulted in extended road closures up to 6 hours. For example, manual photography and mapping documentation conducted from the ground can keep a road closed for approximately 3 hours. Using a UAS to map an accident from the air can result in the road being opened in approximately 1 hour.
- **Accurate Data Collection Leading to Cost Savings.** UAS were used to determine the functioning ability of oil field smoke stacks that resulted in accurate data provided in 20 minutes, and information that showed the needed replacement of only one of three catalytic converters, saving the oil company approximately $1 million.
- **Facilitate Search & Rescue and Other Life-Saving Missions.** Many examples were discussed where human life safety was at significant risk and that UAS could be used to complete the mission.
- **Significant Cost Savings in Public Safety.** Alaska's law enforcement aircraft costs an average hourly rate of $700 and one aircraft (Super Cub) costs approximately $800,000, and the A-Star helicopter is $3.6 million. The average hourly cost of operating a UAS ranges from $30 to $50 per hour, and the aircraft costs range from a few hundred dollars to over $40,000.

4.2 Policy Development

With Alaska being selected as one of the FAA UAS test sites, the opportunity to develop regulations and guidelines for UAS missions nationwide can be realized.

The test site operators will provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UAS regulations in the NAS. Additionally, data collection will support development and operations research, and professional development opportunities will be available for inspectors, airspace managers, air traffic controllers, and others. The specific goals described by the PPUTRC applicants are listed below.

- Develop a set of standards for select unmanned aircraft categories, for aircraft state monitoring, and navigation. [PPUTRC goals and objectives work will augment ongoing standards work with research on categories of UAS not yet addressed, and evaluations needed to refine emerging standards under consideration.]

- Validate FAA acceptable risk thresholds or safety management system standards for UAS operations.
- Identify safety factors in UAS design.
- Validate certification standards, including protocols for air traffic control interaction.
- Define and qualify underlying assumptions and a minimum set of air vehicle characteristics critical to safety, reliability, etc.
- Develop effective, compliant "sense and avoid" systems to satisfy regulatory guidance.
- Identify gaps in federal and state statutory and case law protections for privacy and recommend policies or legislation to remedy.

UAF Center for Unmanned Aircraft Systems Integration, RT&D

UAF has been involved in UAS missions for more than 10 years. It has participated in research and data gathering operations from Prudhoe Bay to South Africa.

The Alaska Legislature indicated its support in the University's efforts by passage of HCR6 in the 2013 session. The resolution identified many of the good uses of UAS in Alaska and established this task force to recommend statutory changes.

- Directly support the federal mandate for "Expanding Use of UAS in the Arctic" (in Sec 332(d) of Public Law 112-95).
- Design experiments and provide data to support American Society for Testing and Materials (ASTM) F38 and Radio Technical Commission for Aeronautics Special Committee (RTCA SC) 203 to evaluate minimum training and operator qualification standards for crew licensing.[17]

4.3 Expedited Timeline for Test Range Use and Approved Missions

Currently, approved UAS missions (flights) require approval by the FAA through the COA process. This process requires the entity interested in operating UAS to complete a detailed flight plan and aircraft approval. This process takes approximately 6 months from application to flight.

Now that Alaska has been selected as a test site, specific areas of the state are expected to be pre-approved for flight testing, thus eliminating the extensive application process through the FAA. The University Center for Unmanned Aircraft Systems Integration RT&D will authorize and schedule UAS flights in the test ranges and other areas with expedited approval.

4.4 Encourage Pilot Training Program for UAS

One hurdle that aircraft manufacturers and pilots are experiencing is that while specific training is a requirement to fly a UAS, there is no UAS flight training program approved by the FAA. Alaska would like to lead the nation and become a training center for interested UAS pilots and crews.

The LTFUAS recognizes this as an opportunity for our state university in pilot training and as an economic benefit in the state. In addition, it will keep the University of Alaska in league with other U.S. universities that are developing pilot training programs.

[17] Ibid.

4.5 Education—Public Awareness

The LTFUAS discussed that each entity that would be using a UAS would also be responsible to educate the public on the purpose of the mission as well as provide contact information of a person who would be able to respond to inquiries.

Some of the public awareness also would be provided through the extended duties of the LTFUAS as they deliberate the issues surrounding UAS flights in Alaska.

4.6 Market Alaska "Open for Business" for UAS

The Department of Commerce, Community, and Economic Development (CDDED) partnered with the Fairbanks Economic Development Council and provided an education booth representing Alaska at the AUVSI convention in Florida in May 2014. A summary of responses from the DCCED representatives is that, based on meetings held during the AUVSI show, it is very likely there will be industry visits later this summer that will look closely at Alaska as a place for investment.

Since Alaska has been selected as a test site, many manufacturers and associated businesses will seek out the University to begin using test ranges and conduct business in and around the state. If fact, at least one UAS services business has already indicated an intent to open an office in Alaska. Alaska is a state with great UAS industry potential.

4.7 Benefits to the Public Safety Statewide

- UAS do not require a pilot on board to operate the aircraft or attached equipment. UAS operators and system operators remain safely on the ground, reducing their exposure to threats.
- UAS are able to enter environments that may be hazardous to pilots of manned aircraft.
- UAS provide superior situational awareness while minimizing the danger to which operators are exposed.
- UAS and trained operators minimize response time to most emergency situations.
- Community safety is enhanced by the rapid response of air assets to an emergency. In most cases, manned aircraft must take off and land at airports where UAS can launch from nearly anywhere within minutes.

4.8 Audits of Missions

FAA Privacy Policy requires the test site to report a variety of data on the flights occurring in the test ranges.

At this time, the LTFUAS does not believe there should be an additional requirement for reporting other than what is required by the FAA.

4.9 Test Site Operations Manager Position

The FAA Privacy Policy requirement also requires a Chief Privacy Officer at the UAS test site. The University is refining the duties of the Director of the Test Site to encompass all the responsibilities of managing the test ranges. This officer will be developing privacy policies to govern all activities conducted by the test site, make privacy policies publicly available, and establish a mechanism to receive and consider comments from the public. Annually, the privacy officer will review test site operations to verify compliance with the policies and practices and share those outcomes in a public forum.

4.10 Incentive Grants

Many businesses have asked the LTFUAS if Alaska will offer any incentives to conduct business in the state. Given the reduced General Fund income to Alaska, the LTFUAS did not consider any financial incentives for potential business startups in Alaska.

The LTFUAS did discuss the advantages of being selected as a test site and the expedited administrative support for conducting UAS business in Alaska. It was agreed that the opportunity will offer many benefits to our state (see Section 3.3).

4.11 Research Appropriation to University of Alaska Fairbanks

While the LTFUAS would like to support the University financially, it was determined that funding may not be available at this time. The FAA states that no additional funding will be provided in conjunction with test site selection, but we are confident that federal funding may follow as integration into the NAS will require additional management.

5. FINAL RECOMMENDATIONS

The LTFUAS supports its recommendations to the Legislature by considering and adopting general guidelines from the following reports from the FAA:

- Guidelines for Operations of UAS (FAA Guideline N 8900.227)
- Comprehensive Plan to Integrate UAS in the NAS
- Final Privacy Requirements (Appendix A)

The LTFUAS also adopted the IACP UAS Guidelines as appropriate for law enforcement in Alaska (Appendix B).

In addition to the FAA documents, the LTFUAS considered a report from Legislative Legal Services that identified Alaska's privacy laws and Constitutional protections of privacy to determine if there might be a scenario created through the use of UAS that would not be protected by existing privacy laws. The LTFUAS also recognized that because Alaska has been chosen as an FAA UAS Test Site for UAS Integration, an emphasis on management of the test ranges, economic development, and public education need immediate attention.

The LTFUAS made the following conclusions:

- It is the opinion of the LTFUAS that no additional statutory or regulatory requirements are needed for FAA-approved missions.
- It is the opinion of the LTFUAS that privacy policy is adequate through the FAA requirements for the use of UAS in the test sites.
- The LTFUAS does not intend to adopt requirements for hobbyist activities using UAS in the same manner that the FAA does not regulate model aeronautics.
- It is the opinion of the LTFUAS that the Department of Administration should review its data retention schedules with particular emphasis on law enforcement data captured inadvertently and allowing that data to be destroyed.
- It is the opinion of the LTFUAS that existing privacy laws are adequate to govern the use of unmanned aircraft.
- The LTFUAS is confident in the FAA guidelines in protecting the safety of the NAS.

Based on these findings, the final recommendations of the LTFUAS are the following:

1. Require all state and local law enforcement entities to adopt the IACP guidelines to help ensure privacy protection for Alaskans.

2. Require all law enforcement entities to first obtain a court order to use UAS over private property for criminal investigation against any person.

3. Encourage use of high-visibility marking or navigational lighting on law enforcement UAS as appropriate.

4. Convey a clear message to industry that Alaska is open for business to harness the beneficial uses of UAS, to encourage the growth of this economic sector, and to allow Alaska to continue to lead the nation in aviation innovation.

5. Encourage private and public UAS training programs.

6. Report all UAS incidents/accidents of aircraft larger than 55 pounds to the University of Alaska and/or Alaska Aviation Coordination Council.

7. Extend LTFUAS until June 30, 2017, and expand the duties of the Task Force, adding two industry seats and one public member seat, for the following reasons:

    - During this transitional phase of growing use of UAS in Alaska, the LTFUAS should be extended to continue to monitor the integration of UAS into the NAS and any privacy matters that may arise that are not already covered by existing law. Because Alaska currently has a strong set of privacy laws, rather than recommend prohibitions be incorporated into statute that might inhibit industry, the LTFUAS recommends it continue to review UAS operations in light of current statutes and only recommend changes in statute as necessary.

    - Because FAA will be updating and issuing new guidelines based on the work of the new FAA UAS Test Sites announced on December 30, 2013, it is necessary for the LTFUAS to continue to review FAA policies to determine their impact and whether any additional policy changes at the state level may be necessary in response.

    - With Alaska's December 30, 2013, selection as one of the nation's six FAA UAS Test Sites through the University of Alaska's application (in conjunction with Oregon and Hawaii), the LTFUAS will meet part of the test site's requirement as a public forum where concerns regarding privacy and data matters can be collected and evaluated.

As we move forward, and particularly in light of the fact that Alaska has been selected as an FAA test site for UAS integration, and with the extension and expansion of duties of the Task Force, the LTFUAS further recommends immediate emphasis on the following:

1. management of the test ranges,
2. economic development opportunities,
3. public education and public relations regarding UAS,
4. rules for hobby and recreational use of model aircraft as outlined by the FAA, and
5. privacy issues including those related to data collection.

In addition to the above recommendations, the LTFUAS also recommends the following:

- each department of the State of Alaska identify a point of contact for UAS to coordinate with the LTFUAS and provide information regarding department policy and procedures to ensure accountability and privacy in regard to UAS use, and
- the Alaska Department of Administration review and update its data retention policies particularly in the area of inadvertent captured data that are not relevant to a state agency.

6. DEFINITIONS

TERMINOLOGY	DEFINITION	SOURCE
Autonomous Operations	It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the NAS outside of Restricted, Prohibited, or Warning areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorized in the National Airspace System. Although the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.	1
Certificate of Waiver or Authorization (COA)	An FAA grant of approval for a specific flight operation. The authorization to operate a UAS in the National Airspace System as a public aircraft outside of Restricted, Warning, or Prohibited areas approved for aviation activities.	2
Civil Aircraft	Aircraft other than public aircraft.	2
Crewmember [UAS]	In addition to the crewmembers identified in 14 CFR Part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and visual observers, but may include other persons as appropriate or required to ensure safe operation of the aircraft.	2
Detect and Avoid	Term used instead of Sense and Avoid in the Terms of Reference for RTCA Special Committee 228. This new term has not been defined by RTCA and may be considered to have the same definition as Sense and Avoid when used in this document.	2
International Civil Aviation Organization (ICAO)	A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport.	2
Manned Aircraft	Aircraft piloted by a human onboard.	2
Model Aircraft	An unmanned aircraft that is capable of sustained flight in the atmosphere; flown within visual line-of-sight of the person operating the aircraft and flown for hobby or recreational purposes.	2
National Airspace System	The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military.	2
Personal Information Privacy Act (PIPA)	An Act relating to breaches of security involving personal information, credit report and credit score security freezes, protection of social security numbers, care of records, disposal of records, identity theft, credit cards, and debit cards, disclosure of the names and addresses of permanent fund dividend applicants, and to the jurisdiction of the office of administrative hearings; amending Rules 60 and 82, Alaska Rules of Civil Procedure; and providing for an effective date.	3

TERMINOLOGY	DEFINITION	SOURCE
Pilot-in-Command	Pilot-in-command means the person who: 1) has final authority and responsibility for the operation and safety of the flight; 2) has been designated as pilot-in-command before or during the flight; and 3) holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight.	2
Public Aircraft	An aircraft operated by a governmental entity (including federal, state, or local governments, and the U.S. Department of Defense and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. See 14 CFR Part 1, § 1.1 for a complete definition of a public aircraft.	2
Sense and Avoid	The capability of a UAS to remain well clear from and avoid collisions with other airborne traffic. Sense and Avoid provides the functions of self-separation and collision avoidance to establish an analogous capability to "see and avoid" required by manned aircraft.	2
Test Range	A defined geographic area where research and development are conducted in accordance with Sections 332 and 334 of the FMRA. Test ranges are also known as test sites in related documents such as the FAA's Screening Information Request.	2
Unmanned Aircraft	1) A device used or intended to be used for flight in the air that has no onboard pilot. This devise excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR Part 101), rockets, tethered aircraft and unpowered gliders. 2) An aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.	2
Unmanned Aircraft System	An unmanned aircraft and its associated elements related to safe operations, which may include control stations (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems, and launch/recovery equipment. An unmanned aircraft and associated elements (including communications links and the components that control the unmanned aircraft) that are required for the pilot-in-command to operate safely and efficiently in the National Airspace System.	2
Visual Line-of-Sight	Unaided (corrective lenses and/or sunglasses exempted) visual contact between a pilot-in-command or a visual observer and a UAS sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.	2

Sources:

1. Interim Operational Approval Guidance 08-01. Aviation Safety Unmanned Aircraft Program Office Air-160. Unmanned Aircraft Systems Operations in the U. S. National Airspace System, March 13, 2008. Federal Aviation Administration.
2. Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. First Edition–2013. U.S. Department of Transportation Federal Aviation Administration.
3. Chapter 92 SLA 08 (HB65) .

APPENDIX A

FAA FINAL PRIVACY REQUIREMENTS NOVEMBER 7, 2013

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No.: FAA-2013-0061]

Unmanned Aircraft System Test Site Program

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of availability of final privacy requirements for the unmanned aircraft system ("UAS") test site program; response to comments

SUMMARY: On February 22, 2013 the FAA published and requested public comment on the proposed privacy requirements (the "Draft Privacy Requirements") for UAS test sites (the "Test Sites") that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012 ("FMRA"). This notice responds to the public comments received and publishes the FAA's final privacy requirements for the Test Sites (the "Final Privacy Requirements").

ADDRESSES: You may review the public docket for this rulemaking (Docket No. FAA-2013-0061) on the Internet at http://www.regulations.gov. You may also review the public docket at the Docket Management Facility in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, 20590-0001 between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning the test site program, contact Elizabeth Soltys, Unmanned Aircraft Systems Integration Office, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; email: 9-ACT-UASTSS@faa.gov.

For legal questions concerning the FAA's privacy requirements for the Test Sites contact Carlos Siso, Office of the Chief Counsel, Federal Aviation Administration, 800 Independence Ave. SW., Washington, DC 20591; email: 9-AGC-UASPrivacy@faa.gov.

SUPPLEMENTARY INFORMATION

This notice summarizes and responds to the public comments received in response to the following Federal Register notices seeking public comment on the Draft Privacy Requirements for the Test Sites:

(i) Notice of availability and request for comments published in the Federal Register on February 22, 2013 (78 FR 12259), Docket No. FAA-2013-0061-0001; and

(ii) Notice of public engagement session published in the Federal Register on March 28, 2013 (78 FR 18932), Docket No. FAA-2013-0061-0050.

In addition, this notice publishes the FAA's Final Privacy Requirements for the Test Sites which are set forth under the "Conclusion" section below.

Discussion of Comments

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session. A transcript of the public engagement session is available at: http://www.faa.gov/about/initiatives/uas/media/UAStranscription.pdf. Public comments ranged from recommending that the FAA not impose any privacy requirements on the Test Sites to recommending that the FAA impose extensive privacy requirements on the Test Sites. The FAA also received comments that were not responsive to the notice or that were unclear.

The FAA analyzed the responsive comments and grouped them into ten categories. The following sections address the comments by category.

1) The FAA should focus on its safety mission; it should not engage in regulating privacy.

The FAA received a number of comments advocating that the FAA should focus on its safety mission and should not engage in regulating privacy. The following comments were received:

- The FAA should focus on safety;
- Regulating privacy is outside the FAA's mission;
- The FAA does not have statutory authority to regulate privacy;
- The FAA does not have the authority to impose privacy requirements on the Test Sites;
- The FAA should allow privacy to be addressed by other more appropriate government bodies including: Federal agencies that have expertise and authority to deal with privacy concerns; Congress; state or local legislative bodies; and the judicial system;
- The Federal Government should not regulate privacy impacts of UAS; these issues should be left to states, cities, and counties to address;
- The FAA should only require compliance with privacy laws that are already in place and focus on developing safe operation of UAS;
- The FAA should not deny access to the national airspace for reasons other than safety;
- Existing privacy laws are sufficient to cover the responsible use of UAS. There already exist Federal, state and other laws that protect privacy. In addition, tort law may also provide avenues of recourse for plaintiffs to protect their privacy rights;
- The FAA should not implement privacy regulations that make entry into the market prohibitive for small businesses;
- The FAA should not allow privacy issues to hinder commercialization of UAS;
- There is no evidence that the operations at the Test Sites will harm privacy interests. Restricting activities at the test sites at this early stage will likely overprotect privacy at the expense of innovation;

- The FAA should afford adequate time for non-governmental solutions such as industry norms and practices to develop before intervening administratively to protect privacy. These less restrictive solutions will reduce the need for administrative intervention and will allow for increased innovation in the national airspace;
- Requiring Test Site operators to develop privacy policies that are informed by Fair Information Practice Principles is onerous for commercial operators of UAS and its cost will likely outweigh any hypothetical benefits;
- Requiring Test Site operators to issue privacy policies informed by Fair Information Practice Principles will limit the diversity of data that will inform integration of UAS into the national airspace. The FAA's approach would exclude an important possible alternative from the discussion: some operators might choose not to issue a privacy policy or adopt a non-FIPPs-compliant policy; and
- The FAA should treat data gathered by UAS no differently than data gathered by a manned aircraft or by other electronic means. There is no significant difference in terms of surveillance between a UAS and a manned aircraft, and manned aircraft are permitted to operate in the national airspace with cameras.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world and does not include regulating privacy. At the same time, the FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the Test Sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

The FAA will require the Test Site operators to comply with the Final Privacy Requirements. Congress mandated that the FAA establish the Test Sites to further UAS integration into the national airspace system. The Final Privacy Requirements advance this purpose by helping inform the dialogue

among policymakers, privacy advocates, and industry regarding the impact of UAS technologies on privacy.

The FAA's authority for including the Final Privacy Requirements in the Test Site OTAs is set forth in 49 U.S.C. 106(l)(6). That statute authorizes the FAA Administrator to enter into an OTA "on such terms and conditions as the Administrator may consider appropriate." The FAA believes that it is appropriate to require Test Site operators to comply with the Final Privacy Requirements.

2) The FAA should require warrants before law enforcement can use UAS in the Test Sites to conduct surveillance or gather evidence.

The FAA received a variety of comments advocating that:

- The FAA should include provisions in the OTA that require warrants to be obtained when UAS are used to conduct surveillance or gather evidence within the Test Site; and
- The OTA include appropriate safeguards to protect Fourth Amendment rights at and around our national borders.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. The FAA is establishing the UAS Test Sites consistent with its mission and the direction in the FMRA. The FAA appreciates the commenters' concerns. Accordingly, the final privacy requirements provide that the Site Operator and its team members must comply with all applicable privacy laws.

3) The FAA should mandate specific privacy requirements for the Test Sites.

The FAA received a variety of comments advocating that the FAA mandate specific privacy requirements for the Test Sites. The recommendations included the following:

- The FAA should specify minimum privacy requirements and require each Test Site to comply with them;
- The FAA should mandate compliance with Fair Information Practice Principles for all Test Site operators;

- The FAA should establish prohibitions on where UAS can operate within a Test Site and the kinds of surveillance activities that UAS conduct at the Test Sites;
- The FAA should require all UAS flown at the Test Sites to have unencrypted down links so that all their data collection can be viewed by the public, including records contained onboard and recovered after landing;
- The FAA should require each Test Site operator to conduct a full Privacy Impact Assessment;
- The FAA should require each Test Site operator to establish a Chief Privacy Officer and centralize privacy responsibilities in that person;
- The FAA should require each Test Site operator to establish a privacy advisory committee to review proposed UAS research at the Test Sites for privacy concerns;
- The FAA should require each Test Site operator to provide a detailed response to public input it receives regarding the Test Site's privacy policy;
- The FAA should prohibit the sharing of recorded surveillance footage beyond the scope of its original purpose;
- The FAA should prohibit UAS in the Test Sites from flying below a minimum altitude;
- The FAA should prohibit UAS in the Test Sites from carrying any equipment that could be used to conduct surveillance;
- The FAA should limit the use of the data collected at the Test Sites;
- The FAA should prohibit (i) the use of Test Sites for government surveillance, and (ii) sharing data collected with law enforcement for the purpose of investigating or prosecuting a crime;

- The FAA should limit the type of data that can be collected by UAS at the Test Sites including limiting the resolution of visual imagery that UAS can collect, prohibiting recording of audio data, and restricting the ability to collect WiFi and cellular signals;
- The FAA should require Test Site operators to provide data on the payload of each UAS flown at the Test Site including specific information on the data the payload is capable of collecting;
- The FAA should mandate privacy policies that require deletion of collected data within a certain time period;
- The FAA should prohibit the Test Site operator and UAS operators at the Test Sites from retaining any data collected longer than is necessary to fulfill the purpose of the Test Site;
- The FAA should require UAS operators to file data collection statements with the FAA for UAS operations that involve remote sensing and signals surveillance from the UAS platform; and
- The FAA should require UAS operating at altitudes over 400 feet to carry an automatic dependent surveillance-broadcast transponder (ADS-B Out) so that UAS operations can be tracked.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. Although there is a long history of placing cameras and other sensors on aircraft for a variety of purposes—news helicopters, aerial surveys, film/television production, law enforcement, etc.—the FAA is not, through awarding and supervising these Test Sites, taking specific views on whether or how the Federal Government should regulate privacy or the scope of data that can be collected by manned or unmanned aircraft.

There was substantial difference of opinion among commenters as to whether UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy

restrictions on UAS operations at the Test Sites. In addition, there was substantial difference of opinion among commenters regarding what elements would be appropriate for a Test Site privacy policy. Based on the comments received, the FAA will require Test Sites to comply with the following requirements in addition to those described in the Draft Privacy Requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

The above are reflected in the Final Privacy Requirements.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons. *First*, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the Test Sites.

Second, the FAA believes that Test Sites operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each Test Site. The selection criteria for the Test Sites specify that only a "public entity" can serve as a Test Site operator. The term "public entity" is defined in the selection criteria to mean "(A) any State or local government; (B) any department, agency, special purpose district, or other instrumentality of a State or States or local government; and (C) the National Railroad Passenger Corporation, and any commuter authority." The FAA expects that public entities will be responsive to stakeholder concerns.

Third, if UAS operations at a Test Site raise privacy concerns that are not adequately addressed by the Test Site's privacy policies, elected officials can weigh the benefits and costs of additional

privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS. *See* Drone Legislation All the Rage; Varies Widely Across 43 States, According to WestlawNext, June 17, 2013, *available at*: http://thomsonreuters.com/ press-releases/062013/drone_legislation_varies_across_ states_according_to_Westlaw.

4) The FAA should conduct audits of the Test Sites to ensure compliance with privacy policies.

Various commenters recommended that the FAA should audit each Test Site to ensure compliance with the privacy policies in the OTA.

Response: Each Test Site will be operated by a public entity (see response to Category 3 above). The FAA expects that the public entity operating each test site will already be subject to oversight and audit requirements. The FAA does not believe that it is appropriate for the FAA to impose additional audit requirements on the Test Site operators.

5) The FAA should require Test Site operators to keep records that will allow for effective citizen participation and reporting of privacy violations.

One commenter recommended that the FAA require Test Site operators to keep accurate, detailed, frequent, and accessible records to allow for effective citizen participation and reporting of privacy violations.

Response: Each Test Site operator will be a public entity (see response to Category 3 above). Public entities are generally subject to laws that establish record keeping requirements and provide the public access to records. The FAA does not believe that it is appropriate for the FAA to impose additional record keeping requirements on the Test Site operators other than those specified in the Final Privacy Requirements.

6) The FAA should establish a searchable database or registry of UAS operators and operations at the Test Sites.

The FAA received a variety of comments advocating that:

- The FAA should create a public, searchable database or registry of all UAS operators. Some commenters recommended that the database include information about surveillance equipment used and the operator's data collection practices;
- The FAA should require UAS operators at the Test Sites to provide public statements describing the surveillance equipment that will be carried by a UAS, the geographical area where the UAS will be operated, and the purposes for which the UAS will be deployed; and
- The FAA should establish a means for the public to access the data on UAS flights collected by the FAA.

Response: The FAA believes that it is not appropriate for the FAA to create a public registry or database of UAS operations at the Test Sites. However, the FAA has included a contractual provision in the Final Privacy Requirements that will require each Test Site operator to maintain a record of all UAS operating at the Test Site.

7) **The FAA should modify its Test Site selection criteria to take into account privacy concerns.**

Various commenters recommended that the FAA revise its selection criteria. Suggestions included the following:

- The FAA should choose an applicant that has an established UAS research program with active engagement with UAS privacy issues;
- The FAA should choose at least one Test Site in a state with strong privacy protective UAS laws and regulations;
- The FAA should select one or more Test Sites in or near a densely populated urban area in order to avoid a bias towards privacy issues relevant for rural UAS operations; and

- The FAA should consider the privacy track record of applicants as part of the selection process.

Response: The FAA believes that it is not appropriate to modify the Test Site selection criteria to include the recommended privacy considerations. Applicants have already submitted complete applications based on the announced selection criteria and the application period has closed.

The FAA published the Test Site selection criteria and application instructions on February 14, 2013 on https://faaco.faa.gov under Solicitation number DTFACT-13-R-00002. The selection criteria incorporate the factors that Congress directed the FAA to consider in the FMRA, including, geographic and climatic diversity; location of ground infrastructure; and research needs. The FAA required applicants to submit seven volumes of extensive and detailed information that address a broad set of considerations including safety, airspace use, experience, research objectives, and risk considerations. This information will allow the FAA to make a selection based on the direction provided by Congress in the FMRA and on the FAA's mission.

The FAA developed the Test Site selection criteria after seeking public input and consulting with other agencies regarding what selection criteria would be appropriate. In March 2012, the FAA published a request for comment in the Federal Register and in April 2012, the FAA hosted two public webinars to obtain public input on the FAA's proposed selection criteria. Although there was significant public participation, the FAA did not receive comments advocating that privacy issues be used as a factor in choosing the Test Sites.

8) The FAA should require Test Site operators to conduct specific tests related to privacy and surveillance.

Commenters recommended that the FAA should:

- Require UAS operators at Test Sites to conduct specific tests related to surveillance and privacy;

- Require Test Site operators to design the sites— including the creation of "fake" houses or businesses—to allow UAS operators to test how accurate their surveillance systems are and test how much data those systems collect; and
- Develop and require Test Sites to implement a standard battery of privacy tests that each UAS operating within a Test Site should have to perform in order to collect data that the FAA can use to make decisions about privacy issues.

Response: The FAA is not planning to have the Test Site operators conduct specific research.

9) The FAA should not take punitive actions against a Test Site operator for privacy violations without due process.

One commenter noted that if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws, the OTA allows the FAA to suspend or modify the relevant operational authority for a Test Site (e.g. Certificate of Operation, or OTA). That commenter recommended that a Test Site operator be entitled to due process before the operational authority be suspended or modified.

Response: A Test Site operator's rights to operate a Test Site are set forth in the OTA and are subject to the terms and conditions in the OTA. The FAA believes that it is appropriate to include contractual provisions in the Final Privacy Requirements that allow the FAA to protect the public interest by suspending or modifying the relevant operational authority for a Test Site if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws.

10) The FAA should establish sanctions for violations of privacy policies or rights.

One commenter recommended that the FAA rescind the OTA for a Test Site where serious privacy violations have occurred and levy fines against operators that fail to comply with privacy policies.

Response: The Final Privacy Requirements provide that violations of privacy laws can result in suspension or termination of the OTA.

The FAA will not monitor a Test Site's compliance with its own privacy policies. The FAA expects the public entities operating the Tests Sites and their respective state/local oversight bodies to monitor and enforce a Test Site's compliance with its own policies.

Conclusion

Based on the comments submitted, the FAA intends to require each test site operator to comply with all of the privacy requirements included in the Draft Privacy Requirements as well as the following additional privacy requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

Accordingly, the FAA intends to include the following terms and conditions into Article 3 of the OTA:

"ARTICLE 3 PRIVACY; APPLICABLE LAW

a. Privacy Policies

The Site Operator must:

(i) Have privacy policies governing all activities conducted under the OTA, including the operation and relevant activities of the UAS authorized by the Site Operator.

(ii) Make its privacy policies publicly available;

(iii) Have a mechanism to receive and consider comments from the public on its privacy policies;

(iv) Conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback;

(v) Update its privacy policies as necessary to remain operationally current and effective; and

(vi) Ensure the requirements of its privacy policies are applied to all operations conducted under the OTA.

The Site Operator's privacy policies should be informed by Fair Information Practice Principles.

b. Compliance With Applicable Privacy Laws

For purposes of this agreement, the term "Applicable Law" shall mean (i) a law, order, regulation, or rule of an administrative or legislative government body with jurisdiction over the matter in question, or (ii) a ruling, order, decision or judgment of a court with jurisdiction over the matter in question. The Site Operator and its team members must operate in accordance with all Applicable Law regarding the protection of an individual's right to privacy (hereinafter referred to as "Privacy Laws").

If the U.S. Department of Justice or a state's law enforcement authority files criminal or civil charges over a potential violation of a Privacy Law, the FAA may take appropriate action including suspending or modifying the relevant operational authority (e.g., Certificate of Operation, or OTA) until the proceedings are completed. If the proceedings demonstrate the operation was in violation of the Privacy Law, the FAA may terminate the relevant operational authority.

c. Change in Law

If during the term of this Agreement an Applicable Law comes into effect which may have an impact on UAS, including impacts on the privacy interests of individuals or entities affected by any operation of any UAS operating at the Test Site, such Applicable Law will be applicable to the OTA and the FAA may update or amend the OTA to reflect these changes.

d. Transmission of Data to the FAA

The Site Operator should not provide or transmit to the FAA or its designees any data other than the data the data requested by the FAA pursuant to Article 5 of this OTA.

e. <u>Other Requirements</u>

The Site Operator must:

(i) Maintain a record of all UAS operating at the test sites; and

(ii) Require each UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS."

Issued in Washington, DC on November 7, 2013.

Marc L. Warren

Acting Chief Counsel, Federal Aviation Administration.

APPENDIX A

FAA FINAL PRIVACY REQUIREMENTS NOVEMBER 7, 2013

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No.: FAA-2013-0061]

Unmanned Aircraft System Test Site Program

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of availability of final privacy requirements for the unmanned aircraft system ("UAS") test site program; response to comments

SUMMARY: On February 22, 2013 the FAA published and requested public comment on the proposed privacy requirements (the "Draft Privacy Requirements") for UAS test sites (the "Test Sites") that the FAA will establish pursuant to the FAA Modernization and Reform Act of 2012 ("FMRA"). This notice responds to the public comments received and publishes the FAA's final privacy requirements for the Test Sites (the "Final Privacy Requirements").

ADDRESSES: You may review the public docket for this rulemaking (Docket No. FAA-2013-0061) on the Internet at http://www.regulations.gov. You may also review the public docket at the Docket Management Facility in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, 20590-0001 between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning the test site program, contact Elizabeth Soltys, Unmanned Aircraft Systems Integration Office, Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; email: 9-ACT-UASTSS@faa.gov.

For legal questions concerning the FAA's privacy requirements for the Test Sites contact Carlos Siso, Office of the Chief Counsel, Federal Aviation Administration, 800 Independence Ave. SW., Washington, DC 20591; email: 9-AGC-UASPrivacy@faa.gov.

SUPPLEMENTARY INFORMATION

This notice summarizes and responds to the public comments received in response to the following Federal Register notices seeking public comment on the Draft Privacy Requirements for the Test Sites:

(i) Notice of availability and request for comments published in the Federal Register on February 22, 2013 (78 FR 12259), Docket No. FAA-2013-0061-0001; and

(ii) Notice of public engagement session published in the Federal Register on March 28, 2013 (78 FR 18932), Docket No. FAA-2013-0061-0050.

In addition, this notice publishes the FAA's Final Privacy Requirements for the Test Sites which are set forth under the "Conclusion" section below.

Discussion of Comments

The FAA received 99 comments through Regulations.gov and 53 comments through the public engagement session. A transcript of the public engagement session is available at: http://www.faa.gov/about/initiatives/uas/media/UAStranscription.pdf. Public comments ranged from recommending that the FAA not impose any privacy requirements on the Test Sites to recommending that the FAA impose extensive privacy requirements on the Test Sites. The FAA also received comments that were not responsive to the notice or that were unclear.

The FAA analyzed the responsive comments and grouped them into ten categories. The following sections address the comments by category.

1) The FAA should focus on its safety mission; it should not engage in regulating privacy.

The FAA received a number of comments advocating that the FAA should focus on its safety mission and should not engage in regulating privacy. The following comments were received:

- The FAA should focus on safety;
- Regulating privacy is outside the FAA's mission;
- The FAA does not have statutory authority to regulate privacy;
- The FAA does not have the authority to impose privacy requirements on the Test Sites;
- The FAA should allow privacy to be addressed by other more appropriate government bodies including: Federal agencies that have expertise and authority to deal with privacy concerns; Congress; state or local legislative bodies; and the judicial system;
- The Federal Government should not regulate privacy impacts of UAS; these issues should be left to states, cities, and counties to address;
- The FAA should only require compliance with privacy laws that are already in place and focus on developing safe operation of UAS;
- The FAA should not deny access to the national airspace for reasons other than safety;
- Existing privacy laws are sufficient to cover the responsible use of UAS. There already exist Federal, state and other laws that protect privacy. In addition, tort law may also provide avenues of recourse for plaintiffs to protect their privacy rights;
- The FAA should not implement privacy regulations that make entry into the market prohibitive for small businesses;
- The FAA should not allow privacy issues to hinder commercialization of UAS;
- There is no evidence that the operations at the Test Sites will harm privacy interests. Restricting activities at the test sites at this early stage will likely overprotect privacy at the expense of innovation;

- The FAA should afford adequate time for non-governmental solutions such as industry norms and practices to develop before intervening administratively to protect privacy. These less restrictive solutions will reduce the need for administrative intervention and will allow for increased innovation in the national airspace;
- Requiring Test Site operators to develop privacy policies that are informed by Fair Information Practice Principles is onerous for commercial operators of UAS and its cost will likely outweigh any hypothetical benefits;
- Requiring Test Site operators to issue privacy policies informed by Fair Information Practice Principles will limit the diversity of data that will inform integration of UAS into the national airspace. The FAA's approach would exclude an important possible alternative from the discussion: some operators might choose not to issue a privacy policy or adopt a non-FIPPs-compliant policy; and
- The FAA should treat data gathered by UAS no differently than data gathered by a manned aircraft or by other electronic means. There is no significant difference in terms of surveillance between a UAS and a manned aircraft, and manned aircraft are permitted to operate in the national airspace with cameras.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world and does not include regulating privacy. At the same time, the FAA recognizes that there is substantial debate and difference of opinion among policy makers, industry, advocacy groups, and members of the public as to whether UAS operations at the Test Sites will raise novel privacy issues that are not adequately addressed by existing legal frameworks.

The FAA will require the Test Site operators to comply with the Final Privacy Requirements. Congress mandated that the FAA establish the Test Sites to further UAS integration into the national airspace system. The Final Privacy Requirements advance this purpose by helping inform the dialogue

among policymakers, privacy advocates, and industry regarding the impact of UAS technologies on privacy.

The FAA's authority for including the Final Privacy Requirements in the Test Site OTAs is set forth in 49 U.S.C. 106(l)(6). That statute authorizes the FAA Administrator to enter into an OTA "on such terms and conditions as the Administrator may consider appropriate." The FAA believes that it is appropriate to require Test Site operators to comply with the Final Privacy Requirements.

2) The FAA should require warrants before law enforcement can use UAS in the Test Sites to conduct surveillance or gather evidence.

The FAA received a variety of comments advocating that:

- The FAA should include provisions in the OTA that require warrants to be obtained when UAS are used to conduct surveillance or gather evidence within the Test Site; and
- The OTA include appropriate safeguards to protect Fourth Amendment rights at and around our national borders.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. The FAA is establishing the UAS Test Sites consistent with its mission and the direction in the FMRA. The FAA appreciates the commenters' concerns. Accordingly, the final privacy requirements provide that the Site Operator and its team members must comply with all applicable privacy laws.

3) The FAA should mandate specific privacy requirements for the Test Sites.

The FAA received a variety of comments advocating that the FAA mandate specific privacy requirements for the Test Sites. The recommendations included the following:

- The FAA should specify minimum privacy requirements and require each Test Site to comply with them;
- The FAA should mandate compliance with Fair Information Practice Principles for all Test Site operators;

- The FAA should establish prohibitions on where UAS can operate within a Test Site and the kinds of surveillance activities that UAS conduct at the Test Sites;
- The FAA should require all UAS flown at the Test Sites to have unencrypted down links so that all their data collection can be viewed by the public, including records contained onboard and recovered after landing;
- The FAA should require each Test Site operator to conduct a full Privacy Impact Assessment;
- The FAA should require each Test Site operator to establish a Chief Privacy Officer and centralize privacy responsibilities in that person;
- The FAA should require each Test Site operator to establish a privacy advisory committee to review proposed UAS research at the Test Sites for privacy concerns;
- The FAA should require each Test Site operator to provide a detailed response to public input it receives regarding the Test Site's privacy policy;
- The FAA should prohibit the sharing of recorded surveillance footage beyond the scope of its original purpose;
- The FAA should prohibit UAS in the Test Sites from flying below a minimum altitude;
- The FAA should prohibit UAS in the Test Sites from carrying any equipment that could be used to conduct surveillance;
- The FAA should limit the use of the data collected at the Test Sites;
- The FAA should prohibit (i) the use of Test Sites for government surveillance, and (ii) sharing data collected with law enforcement for the purpose of investigating or prosecuting a crime;

- The FAA should limit the type of data that can be collected by UAS at the Test Sites including limiting the resolution of visual imagery that UAS can collect, prohibiting recording of audio data, and restricting the ability to collect WiFi and cellular signals;
- The FAA should require Test Site operators to provide data on the payload of each UAS flown at the Test Site including specific information on the data the payload is capable of collecting;
- The FAA should mandate privacy policies that require deletion of collected data within a certain time period;
- The FAA should prohibit the Test Site operator and UAS operators at the Test Sites from retaining any data collected longer than is necessary to fulfill the purpose of the Test Site;
- The FAA should require UAS operators to file data collection statements with the FAA for UAS operations that involve remote sensing and signals surveillance from the UAS platform; and
- The FAA should require UAS operating at altitudes over 400 feet to carry an automatic dependent surveillance-broadcast transponder (ADS-B Out) so that UAS operations can be tracked.

Response: The FAA's mission is to provide the safest, most efficient aerospace system in the world. Although there is a long history of placing cameras and other sensors on aircraft for a variety of purposes—news helicopters, aerial surveys, film/television production, law enforcement, etc.—the FAA is not, through awarding and supervising these Test Sites, taking specific views on whether or how the Federal Government should regulate privacy or the scope of data that can be collected by manned or unmanned aircraft.

There was substantial difference of opinion among commenters as to whether UAS operations and manned aircraft operations present different privacy issues that justify imposing special privacy

restrictions on UAS operations at the Test Sites. In addition, there was substantial difference of opinion among commenters regarding what elements would be appropriate for a Test Site privacy policy. Based on the comments received, the FAA will require Test Sites to comply with the following requirements in addition to those described in the Draft Privacy Requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

The above are reflected in the Final Privacy Requirements.

The FAA has determined that it should not impose privacy requirements beyond those in the Final Privacy Requirements for the following reasons. *First*, there are many privacy laws and applications of tort law that may address some of the privacy issues that arise from UAS operations at the Test Sites.

Second, the FAA believes that Test Sites operators will be responsive to local stakeholders' privacy concerns and will develop privacy policies appropriately tailored to each Test Site. The selection criteria for the Test Sites specify that only a "public entity" can serve as a Test Site operator. The term "public entity" is defined in the selection criteria to mean "(A) any State or local government; (B) any department, agency, special purpose district, or other instrumentality of a State or States or local government; and (C) the National Railroad Passenger Corporation, and any commuter authority." The FAA expects that public entities will be responsive to stakeholder concerns.

Third, if UAS operations at a Test Site raise privacy concerns that are not adequately addressed by the Test Site's privacy policies, elected officials can weigh the benefits and costs of additional

privacy laws or regulations. Forty-three states have already enacted or are considering legislation regulating use of UAS. *See* Drone Legislation All the Rage; Varies Widely Across 43 States, According to WestlawNext, June 17, 2013, *available at*: http://thomsonreuters.com/ press-releases/062013/drone_legislation_varies_across_ states_according_to_Westlaw.

4) The FAA should conduct audits of the Test Sites to ensure compliance with privacy policies.

Various commenters recommended that the FAA should audit each Test Site to ensure compliance with the privacy policies in the OTA.

Response: Each Test Site will be operated by a public entity (see response to Category 3 above). The FAA expects that the public entity operating each test site will already be subject to oversight and audit requirements. The FAA does not believe that it is appropriate for the FAA to impose additional audit requirements on the Test Site operators.

5) The FAA should require Test Site operators to keep records that will allow for effective citizen participation and reporting of privacy violations.

One commenter recommended that the FAA require Test Site operators to keep accurate, detailed, frequent, and accessible records to allow for effective citizen participation and reporting of privacy violations.

Response: Each Test Site operator will be a public entity (see response to Category 3 above). Public entities are generally subject to laws that establish record keeping requirements and provide the public access to records. The FAA does not believe that it is appropriate for the FAA to impose additional record keeping requirements on the Test Site operators other than those specified in the Final Privacy Requirements.

6) The FAA should establish a searchable database or registry of UAS operators and operations at the Test Sites.

The FAA received a variety of comments advocating that:

- The FAA should create a public, searchable database or registry of all UAS operators. Some commenters recommended that the database include information about surveillance equipment used and the operator's data collection practices;
- The FAA should require UAS operators at the Test Sites to provide public statements describing the surveillance equipment that will be carried by a UAS, the geographical area where the UAS will be operated, and the purposes for which the UAS will be deployed; and
- The FAA should establish a means for the public to access the data on UAS flights collected by the FAA.

Response: The FAA believes that it is not appropriate for the FAA to create a public registry or database of UAS operations at the Test Sites. However, the FAA has included a contractual provision in the Final Privacy Requirements that will require each Test Site operator to maintain a record of all UAS operating at the Test Site.

7) **The FAA should modify its Test Site selection criteria to take into account privacy concerns.**

Various commenters recommended that the FAA revise its selection criteria. Suggestions included the following:

- The FAA should choose an applicant that has an established UAS research program with active engagement with UAS privacy issues;
- The FAA should choose at least one Test Site in a state with strong privacy protective UAS laws and regulations;
- The FAA should select one or more Test Sites in or near a densely populated urban area in order to avoid a bias towards privacy issues relevant for rural UAS operations; and

- The FAA should consider the privacy track record of applicants as part of the selection process.

Response: The FAA believes that it is not appropriate to modify the Test Site selection criteria to include the recommended privacy considerations. Applicants have already submitted complete applications based on the announced selection criteria and the application period has closed.

The FAA published the Test Site selection criteria and application instructions on February 14, 2013 on https://faaco.faa.gov under Solicitation number DTFACT-13-R-00002. The selection criteria incorporate the factors that Congress directed the FAA to consider in the FMRA, including, geographic and climatic diversity; location of ground infrastructure; and research needs. The FAA required applicants to submit seven volumes of extensive and detailed information that address a broad set of considerations including safety, airspace use, experience, research objectives, and risk considerations. This information will allow the FAA to make a selection based on the direction provided by Congress in the FMRA and on the FAA's mission.

The FAA developed the Test Site selection criteria after seeking public input and consulting with other agencies regarding what selection criteria would be appropriate. In March 2012, the FAA published a request for comment in the Federal Register and in April 2012, the FAA hosted two public webinars to obtain public input on the FAA's proposed selection criteria. Although there was significant public participation, the FAA did not receive comments advocating that privacy issues be used as a factor in choosing the Test Sites.

8) The FAA should require Test Site operators to conduct specific tests related to privacy and surveillance.

Commenters recommended that the FAA should:

- Require UAS operators at Test Sites to conduct specific tests related to surveillance and privacy;

- Require Test Site operators to design the sites— including the creation of "fake" houses or businesses—to allow UAS operators to test how accurate their surveillance systems are and test how much data those systems collect; and
- Develop and require Test Sites to implement a standard battery of privacy tests that each UAS operating within a Test Site should have to perform in order to collect data that the FAA can use to make decisions about privacy issues.

Response: The FAA is not planning to have the Test Site operators conduct specific research.

9) The FAA should not take punitive actions against a Test Site operator for privacy violations without due process.

One commenter noted that if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws, the OTA allows the FAA to suspend or modify the relevant operational authority for a Test Site (e.g. Certificate of Operation, or OTA). That commenter recommended that a Test Site operator be entitled to due process before the operational authority be suspended or modified.

Response: A Test Site operator's rights to operate a Test Site are set forth in the OTA and are subject to the terms and conditions in the OTA. The FAA believes that it is appropriate to include contractual provisions in the Final Privacy Requirements that allow the FAA to protect the public interest by suspending or modifying the relevant operational authority for a Test Site if charges are filed by law enforcement against a Test Site operator due to potential violations of privacy laws.

10) The FAA should establish sanctions for violations of privacy policies or rights.

One commenter recommended that the FAA rescind the OTA for a Test Site where serious privacy violations have occurred and levy fines against operators that fail to comply with privacy policies.

Response: The Final Privacy Requirements provide that violations of privacy laws can result in suspension or termination of the OTA.

The FAA will not monitor a Test Site's compliance with its own privacy policies. The FAA expects the public entities operating the Tests Sites and their respective state/local oversight bodies to monitor and enforce a Test Site's compliance with its own policies.

Conclusion

Based on the comments submitted, the FAA intends to require each test site operator to comply with all of the privacy requirements included in the Draft Privacy Requirements as well as the following additional privacy requirements:

(1) Test site operators must maintain a record of all UAS operating in the test sites;

(2) Test site operators must require every UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS; and

(3) Test site operators must conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback.

Accordingly, the FAA intends to include the following terms and conditions into Article 3 of the OTA:

"ARTICLE 3 PRIVACY; APPLICABLE LAW

a. Privacy Policies

The Site Operator must:

(i) Have privacy policies governing all activities conducted under the OTA, including the operation and relevant activities of the UAS authorized by the Site Operator.

(ii) Make its privacy policies publicly available;

(iii) Have a mechanism to receive and consider comments from the public on its privacy policies;

(iv) Conduct an annual review of test site operations to verify compliance with stated privacy policy and practices and share those outcomes annually in a public forum with an opportunity for public feedback;

(v) Update its privacy policies as necessary to remain operationally current and effective; and

(vi) Ensure the requirements of its privacy policies are applied to all operations conducted under the OTA.

The Site Operator's privacy policies should be informed by Fair Information Practice Principles.

b. Compliance With Applicable Privacy Laws

For purposes of this agreement, the term "Applicable Law" shall mean (i) a law, order, regulation, or rule of an administrative or legislative government body with jurisdiction over the matter in question, or (ii) a ruling, order, decision or judgment of a court with jurisdiction over the matter in question.

The Site Operator and its team members must operate in accordance with all Applicable Law regarding the protection of an individual's right to privacy (hereinafter referred to as "Privacy Laws").

If the U.S. Department of Justice or a state's law enforcement authority files criminal or civil charges over a potential violation of a Privacy Law, the FAA may take appropriate action including suspending or modifying the relevant operational authority (e.g., Certificate of Operation, or OTA) until the proceedings are completed. If the proceedings demonstrate the operation was in violation of the Privacy Law, the FAA may terminate the relevant operational authority.

c. Change in Law

If during the term of this Agreement an Applicable Law comes into effect which may have an impact on UAS, including impacts on the privacy interests of individuals or entities affected by any operation of any UAS operating at the Test Site, such Applicable Law will be applicable to the OTA and the FAA may update or amend the OTA to reflect these changes.

d. Transmission of Data to the FAA

The Site Operator should not provide or transmit to the FAA or its designees any data other than the data the data requested by the FAA pursuant to Article 5 of this OTA.

e. Other Requirements

The Site Operator must:

(i) Maintain a record of all UAS operating at the test sites; and

(ii) Require each UAS operator in the Test Site to have a written plan for the operator's use and retention of data collected by the UAS."

Issued in Washington, DC on November 7, 2013.

Marc L. Warren

Acting Chief Counsel, Federal Aviation Administration.

APPENDIX B

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE RECOMMENDED GUIDELINES

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE
AVIATION COMMITTEE

Recommended Guidelines for the use of Unmanned Aircraft

August 2012

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of our lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. **Model Aircraft** - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. **Unmanned Aircraft (UA)** – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. **UA Flight Crewmember** - A pilot, visual observer, payload operator or other person assigned duties for a UA for the purpose of flight.
4. **Unmanned Aircraft Pilot** - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, the agency will operate the aircraft in full compliance with the mandates of the Constitution, federal, state and local law governing search and seizure.
4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UA should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.
4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UA will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training, or demonstration purposes.
4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.

INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE

AVIATION COMMITTEE

Recommended Guidelines for the use of Unmanned Aircraft

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of our lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. **Model Aircraft** - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. **Unmanned Aircraft (UA)** – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. **UA Flight Crewmember** - A pilot, visual observer, payload operator or other person assigned duties for a UA for the purpose of flight.
4. **Unmanned Aircraft Pilot** - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, that the agency will operate the aircraft in full compliance with the mandates of the Constitution, federal, state and local law governing search and seizure.
4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UA should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.
4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UA will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training, or demonstration purposes.
4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.

APPENDIX C

ACADEMY OF MODEL AERONAUTICS SAFETY CODES

Academy of Model Aeronautics National Model Aircraft Safety Code

Effective January 1, 2014

A. **GENERAL**: A model aircraft is a non-human-carrying aircraft capable of sustained flight in the atmosphere. It may not exceed limitations of this code and is intended exclusively for sport, recreation, education and/or competition. All model flights must be conducted in accordance with this safety code and any additional rules specific to the flying site.

1. Model aircraft will not be flown:
   (a) In a careless or reckless manner.
   (b) At a location where model aircraft activities are prohibited.
2. Model aircraft pilots will:
   (a) Yield the right of way to all human-carrying aircraft.
   (b) See and avoid all aircraft and a spotter must be used when appropriate. (AMA Document #540-D.)
   (c) Not fly higher than approximately 400 feet above ground level within three (3) miles of an airport without notifying the airport operator.
   (d) Not interfere with operations and traffic patterns at any airport, heliport or seaplane base except where there is a mixed use agreement.
   (e) Not exceed a takeoff weight, including fuel, of 55 pounds unless in compliance with the AMA Large Model Airplane program. (AMA Document 520-A.)
   (f) Ensure the aircraft is identified with the name and address or AMA number of the owner on the inside or affixed to the outside of the model aircraft. (This does not apply to model aircraft flown indoors.)
   (g) Not operate aircraft with metal-blade propellers or with gaseous boosts except for helicopters operated under the provisions of AMA Document #555.
   (h) Not operate model aircraft while under the influence of alcohol or while using any drug that could adversely affect the pilot's ability to safely control the model.
   (i) Not operate model aircraft carrying pyrotechnic devices that explode or burn, or any device which propels a projectile or drops any object that creates a hazard to persons or property.
   Exceptions:
   - Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight.
   - Rocket motors (using solid propellant) up to a G-series size may be used provided they remain attached to the model during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code but may not be launched from model aircraft.
   - Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program Document. (AMA Document #718.)

   (j) Not operate a turbine-powered aircraft, unless in compliance with the AMA turbine regulations. (AMA Document #510-A.)
3. Model aircraft will not be flown in AMA sanctioned events, air shows or model demonstrations unless:
   (a) The aircraft, control system and pilot skills have successfully demonstrated all maneuvers intended or anticipated prior to the specific event.
   (b) An inexperienced pilot is assisted by an experienced pilot.
4. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

B. **RADIO CONTROL (RC)**

1. All pilots shall avoid flying directly over unprotected people, vessels, vehicles or structures and shall avoid endangerment of life and property of others.
2. A successful radio equipment ground-range check in accordance with manufacturer's recommendations will be completed before the first flight of a new or repaired model aircraft.
3. At all flying sites a safety line(s) must be established in front of which all flying takes place. (AMA Document #706.)
   (a) Only personnel associated with flying the model aircraft are allowed at or in front of the safety line.
   (b) At air shows or demonstrations, a straight safety line must be established.
   (c) An area away from the safety line must be maintained for spectators.
   (d) Intentional flying behind the safety line is prohibited.
4. RC model aircraft must use the radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. RC model aircraft will not knowingly operate within three (3) miles of any pre-existing flying site without a frequency-management agreement. (AMA Documents #922 and #923.)
6. With the exception of events flown under official AMA Competition Regulations, excluding takeoff and landing, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flightline.
7. Under no circumstances may a pilot or other person touch an outdoor model aircraft in flight while it is still under power, except to divert it from striking an individual.
8. RC night flying requires a lighting system providing the pilot with a clear view of the model's attitude and orientation at all times. Hand-held illumination systems are inadequate for night flying operations.
9. The pilot of an RC model aircraft shall:
   (a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.
   (b) Fly using the assistance of a camera or First-Person View (FPV) only in accordance with the procedures outlined in AMA Document #550.
   (c) Fly using the assistance of autopilot or stabilization system only in accordance with the procedures outlined in AMA Document #560.

C. **FREE FLIGHT**

1. Must be at least 100 feet downwind of spectators and automobile parking when the model aircraft is launched.
2. Launch area must be clear of all individuals except mechanics, officials, and other fliers.
3. An effective device will be used to extinguish any fuse on the model aircraft after the fuse has completed its function.

D. **CONTROL LINE**

1. The complete control system (including the safety thong where applicable) must have an inspection and pull test prior to flying.
2. The pull test will be in accordance with the current Competition Regulations for the applicable model aircraft category.
3. Model aircraft not fitting a specific category shall use those pull-test requirements as indicated for Control Line Precision Aerobatics.
4. The flying area must be clear of all utility wires or poles and a model aircraft will not be flown closer than 50 feet to any above-ground electric utility lines.
5. The flying area must be clear of all nonessential participants and spectators before the engine is started.

Academy of Model Aeronautics **AMA Document #550**
"AMA Advanced Flight Systems Committee"
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operation Utilizing "First Person View" Systems

1. DEFINITION OF TERMS:

Please refer to Page 3, section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

FPV flying of radio control model aircraft by AMA members is allowed only for noncommercial purposes as a hobby/recreational and/or competition activity and must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA *FPV novice pilots* must use a buddy-box system with an *FPV spotter* while learning to fly *FPV*.

b) All *FPV* flights require an AMA *FPV pilot* to have an AMA *FPV spotter* next to him/her maintaining *VLOS* with the *FPV aircraft* throughout its flight.

c) The *FPV pilot* must brief the *FPV spotter* on the *FPV spotter's* duties, communications and hand-over control procedures before *FPV flight*.

d) The AMA *FPV spotter* must communicate with the *FPV pilot* to ensure the *FPV aircraft* remains within *VLOS*, warning the *FPV pilot* of approaching aircraft, and when avoidance techniques are necessary.

e) During an FPV flight, the FPV spotter must be prepared to acquire the transmitter/control from the FPV pilot and assume VLOS control of the model aircraft any time safe operation of the flight is in question.

f) If the *FPV pilot* experiences a problem due to a loss of video link, orientation, or is unable to safely fly, he/she must abandon *FPV* mode and fly *VLOS* or pass the RC transmitter to the *FPV spotter* to assume *VLOS* control of the model aircraft.

g) Before the initial *FPV* flight of an *FPV model aircraft* and/or after any changes or repairs *to essential flight systems*, the *FPV model aircraft* must have an *R/C test flight* by conventional *VLOS*.

h) *FPV model aircraft* must use frequencies approved by the FCC for both the RC system and the wireless video system. Pilots must meet applicable FCC licensing requirements if they choose to operate the RC flight control system or the wireless video system on Amateur Band frequencies.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft must be flown within *VLOS* of the operator.

b) Model aircraft flown using *FPV* must remain at or below 400 feet AGL when within 3 miles of an airport as specified in the AMA Safety Code.

c) Model aircraft flown *FPV* are limited to a weight (including fuel, batteries, and onboard *FPV* equipment) of 15lbs. and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) AMA *FPV novice pilots* should consider using a cockpit view flight simulator to become accustomed to *FPV* flight.

b) AMA *FPV pilots* should consider using a programmable *autopilot* (AMA Document #560) with a failsafe "return to launch" (RTL) feature that will maintain control of the aircraft in the event of signal loss.

c) An onboard camera equipped with a pan and tilt mount that is positioned by head tracking goggles, will improve the *FPV pilot's* situational awareness of airspace surrounding the *FPV aircraft* during flight, but does not replace the requirement for an AMA *FPV spotter*.

d) When purchasing *FPV* operational systems, always try to select quality equipment, verify its compatibility, install components for interference rejection, and determine that signal range is adequate for maximum VLOS range.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA FPV Pilot is an AMA member who is capable of maintaining stable flight of a model aircraft within its intended flight envelope when flown FPV without losing control or having a collision.

Buddy-Box System is a system that has one transmitter operating as the master controller, while a second transmitter is linked/slaved to it allowing dual control of an aircraft. The operator of the master transmitter allows one or the other transmitter to control the aircraft through the use of a spring-loaded switch. The switch provides instantaneous transfer of control from one transmitter to the other. The buddy-box system is an efficient and effective means of achieving a position transfer of control from one pilot to another. Although this system is commonly used for training novice fliers, it is also useful in situations where an experienced pilot may have an increased likelihood of needing a second pilot's assistance in maintaining control of the aircraft. The use of the buddy-box may be helpful in assisting pilots with physical limitations, flying in congested environments, during times of reduced visibility, or anytime during FPV when a timely transfer of control may be beneficial.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's flight envelope. (This includes primary radio control systems and any stabilization or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft.

Flight Envelope is defined as the range of airspeeds, attitudes, and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

FPV Aircraft is an RC model aircraft equipped with a video transmitter to send real-time video images from an onboard camera to a ground based receiver for display on a pilot's video monitor/goggles. (*FPV model aircraft* types include: Fixed Wing, Rotary Wing, and Multi-Rotor Platforms).

FPV Novice Pilot is an AMA member learning to fly *FPV* utilizing a buddy-box system with an experienced AMA *RC pilot* operating the master transmitter and serving as the *FPV spotter*.

FPV Spotter is an experienced AMA *RC pilot* who has been briefed by the *FPV pilot* on the tasks, responsibilities and procedures involved in being a spotter; is capable and mature enough to perform the duties and is able to assume conventional *VLOS* control of the aircraft.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's *flight envelope*. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting stable flight).

R/C Test Flight requires an *AMA Pilot* to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its *flight envelope*.

Visual Line Of Sight (VLOS) is the distance at which the pilot is able to maintain visual

contact with the aircraft and determine its orientation without enhancements other than corrective lenses.

Academy of Model Aeronautics
AMA Advanced Flight Systems Committee
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operation Utilizing Failsafe, Stabilization and Autopilot Systems

1. DEFINITION OF TERMS:

Please refer to Page 3, section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

All model aircraft flights utilizing *stabilization* and *autopilot* control systems must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA members flying radio controlled model aircraft equipped with flight *stabilization* and *autopilot* systems must maintain *VLOS* with the aircraft at all times including programmed autopilot waypoint flight.

b) *AMA Pilots* must be able to instantaneously deactivate programmed flight of *autopilot systems* at any time during flight and resume manual control of the model aircraft.

c) *AMA Pilots* must perform an *R/C Test Flight* of a model aircraft before activating a newly installed *autopilot* or *stabilization system* and/or after any repairs or replacement of model aircraft *essential flight systems*.

d) Model aircraft exceeding 15lbs and/or 70mph may only use an *autopilot* for a programmed "return to launch" (RTL) flight and not for programmed waypoint flying of a predetermined course.

e) STABILIZATION & AUTOPILOT SYSTEMS MAY BE USED FOR/TO:

- Stabilization/automatically stabilize aircraft to level flight when control sticks are centered.
- Recovery/activate TRX switch to recover an out of control aircraft to level flight.
- Heading/activate TRX switch to hold a model aircraft's heading for precision flight path.
- Altitude/activate TRX switch to maintain fixed aircraft altitude while allowing directional control.
- Return GPS/activate TRX switch to return aircraft via GPS to launch point.
- Return FSS/failsafe activated from radio signal loss to return aircraft via GPS to launch point.
- Fixed circle/activate TRX switch to circle aircraft at point of activation at fixed altitude.
- Waypoint/activate TRX switch to initiate an autopilot programmed flight path via waypoints.
- Fencing/autopilot programed to display site unique boundaries on video monitor/goggles.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft be flown within *VLOS* of the operator.

b) Model aircraft must be flown at or below 400 feet AGL when within 3 miles of an airport as stated in the AMA Safety Code.

c) Model aircraft utilizing an *autopilot* for waypoint flying are limited to a maximum weight (including fuel, batteries, and onboard *autopilot systems*) of 15lbs and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) If your radio system lacks *failsafe* capability, consider using programmable digital servos or auxiliary *failsafe* modules. In the event of a radio signal failure these components will activate desired safe servo settings or an *autopilot* for return to base/launch (RTL).

b) When using an *autopilot system* the "return to launch" (RTL) feature should be programmed to return the aircraft to a safe location and safely terminate the flight should manual control of the aircraft be lost. When using RTL, pay particular attention to the manufacturer's throttle recommendations to prevent stalling.

c) The use of *stabilization systems* is recommended when flying FPV to improve flight stability and video quality.

d) Pilots usually choose to incorporate *stabilization* and *autopilot systems* for model aircraft flying to enhance flight performance, correct bad tendencies of the model aircraft, maintain stability in windy weather, establish precision heading holds for takeoffs/landings, flight training for novice pilots, create a steady flight platform for cameras, and generally just to make an airplane easier and safer to fly.

e) When purchasing *stabilization* and *autopilot systems*, always try to select quality equipment from reputable dealers, ensure for compatibility with other onboard systems, and install components according to manufacturers' instructions.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data or information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA Pilot is an AMA member who is capable of manually operating an R/C transmitter to control a model aircraft's flight path within its safe intended *flight envelope* without losing control or having a collision.

Autopilot Systems incorporate programmable flight *stabilization* with an altitude sensor and a GPS receiver for accurate positioning and to navigate/control a radio controlled model aircraft's flight path. Advanced systems offer software for entering navigable waypoints. The flight data waypoints may be saved to autopilot's/GPS memory for programmed flight.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's *flight envelope*. (This includes primary R/C systems and any *stabilization* or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

Failsafe Systems are designed to minimize or prevent damage and safely terminate a flight when a radio controlled model aircraft loses radio signal. Modern radio systems can be programmed to position servos to a desired control setting in the event of radio signal failure.

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft. (AMA Document #550).

Flight Envelope is defined as the range of airspeeds, attitudes and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's intended flight envelope. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting manually controlled stable flight).

R/C Test Flight requires an AMA Pilot to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its safe intended *flight envelope*.

Stabilization Systems are designed to maintain intended model aircraft flight attitudes. The pilot can install, program and/or activate a system to stabilize yaw, pitch, or roll or any one attitude or combination of attitudes. Systems are often based on rate/heading hold gyros or inertial motion sensors utilizing multi-axis gyros and accelerometers for attitude stabilization.

Visual Line of Sight (VLOS) is the distance at which the pilot is able to maintain visual contact with the aircraft and determine its orientation and attitude without enhancements other than corrective lenses.

APPENDIX D

LEGISLATIVE LEGAL SERVICES MEMO
ALASKA LAWS PROTECTING PRIVACY

LEGAL SERVICES

DIVISION OF LEGAL AND RESEARCH SERVICES
LEGISLATIVE AFFAIRS AGENCY
STATE OF ALASKA

(907) 465-3867 or 465-2450
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Mail Stop 3101

State Capitol
Juneau, Alaska 99801-1182
Deliveries to: 129 6th St., Rm. 329

MEMORANDUM September 30, 2013

SUBJECT: Alaska Laws Protecting Privacy
(Work Order No. 28-LS0990)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Kathleen Strasbaugh
Legislative Counsel

You have asked for a review of Alaska's laws protecting individual privacy in preparation for a meeting of the Task Force on Unmanned Aircraft Systems. Among the Task Force's duties is providing written recommendations concerning, among other things, a state policy that protects privacy. 2013 Legislative Resolve No. 17 at 3. To that end, as I understand from Ms. Blaisdell, you would like to know what protections might already exist, with a view toward avoiding duplication of existing law. The Task Force has apparently expressed concern about how information gathered by unmanned aircraft could be used by private or public parties, and what use might be made of such information captured inadvertently.

This memo will outline constitutionally based protections of privacy and identify state statutes that might apply to conduct considered invasion of privacy. As you requested, this memo focuses on the protections afforded under Alaska law. A brief discussion of emerging federal law is included, but I haven't explored other states' case law, nor lower federal court cases that consider these issues. However, I have attached an excerpt of an *Alaska Law Review* which summarizes Alaska's privacy law as it has developed independently of federal constitutional law. I have also attached a recent *Harvard Law Review* article that specifically addresses this topic in great detail. The memo also briefly addresses scenarios set out in your request. Please note that it is very difficult to predict the outcome of litigation in this very new intersection of technology and privacy law.

1. Constitutional Protection of Privacy

The Constitution of the State of Alaska explicitly protects the right of privacy against government (but not private) intrusion. Art. I, sec. 22, provides:

> The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section.

This protection, although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. *Woods & Rohde, Inc. v. State, Department of Labor*, 565 P.2d 138, 149 (Alaska 1977).[1] Both the Alaska Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy. *Beltz v. State*, 221 P.3d 328, 333, 337 (Alaska 2009) (search of garbage placed out on the street for collection did not require warrant; expectation of privacy found not reasonable.)

Neither the Alaska Supreme Court nor the United States Supreme Court has ruled on whether surveillance by a government operated unmanned aerial vehicle is a search under the Fourth Amendment. Based on available precedent, it is possible that the courts will decide that the use of an unmanned aerial vehicle constitutes a search requiring either a warrant, or the application of a recognized exception to the warrant requirement.

The United States Supreme Court has considered law enforcement or other government agency use of aerial surveillance and the use of technological devices for surveillance purposes. The Court found that surveillance by manned aircraft is not an intrusion into a private area that renders an overflight a search under the Fourth Amendment to the United States Constitution; however the placement of a global positioning device on a person's vehicle is an intrusion that constitutes a search. Here is a brief summary of some of these cases: *United States v. Jones*, 565 U.S. ___, 132 S.Ct. 945 (2012): Attachment of global positioning device to automobile parked in public place is a search under the Fourth Amendment.

Dow Chemical Co. v. United States, 476 U.S. 227 (1986) EPA aerial surveillance and photography of chemical plant is not a search where the aircraft was manned and operating at a lawful altitude.

California v. Ciraolo, 476 U.S. 207 (1986) Manned aerial surveillance of a backyard marijuana grow at lawful altitude did not violate the Fourth Amendment.

The Court might find the use of a technology that exceeds human observational capacity the sort of intrusion that constitutes a search requiring a warrant or an accepted exception:

> Where, as here, the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a "search" and is presumptively unreasonable without a warrant.

Kyllo v. United States, 533 U.S. 27, 40 (2001) (internal citations omitted) (thermal

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[1] In Alaska, the right to privacy extends to protection of such activities as possession and use of marijuana in the home by an adult, which, while not a fundamental right, is protected because such possession and use does not implicate the public welfare in the manner that more harmful substances, or public ingestion, or use by minors might. *Ravin v. State*, 537 P.2d 494, 508-09 (Alaska 1975).

imaging of home from outside a search under the Fourth Amendment).

2. Alaska Statutory protections

There are a handful of criminal statutes that may apply to improper use of images obtained from unmanned aerial vehicle surveillance. These statutes would seem to apply for the most part to private actors. These are offenses that punish conduct that invades the privacy of a victim, and would require proof that images gathered by the unmanned aerial vehicle were disseminated. These offenses would probably not punish capturing the images inadvertently, although collecting and storing them might be a concern.

Alaska Statute	Charge	Penalty
11.41.270	Stalking in the second degree: nonconsensual conduct prohibited by statute prohibits monitoring by technical means.	Class A misdemeanor[2]
11.61.116	Sending an explicit image of a minor.	(1) class B misdemeanor if the person distributes the image to another person;[3] (2) a class A misdemeanor if the person distributes the image to an Internet website that is accessible to the public.
11.61.120(a)(6)	Harassment in the second degree: publishing or distributing images that show certain body parts or a sexual act.	Class B misdemeanor

[2] A class A misdemeanor is punishable by a fine of up to $10,000, and a sentence of imprisonment up to one year.

[3] A class B misdemeanor is punishable by a fine of up to $2,000, and a sentence of imprisonment up to 90 days.

11.61.123	Indecent viewing or photography (with certain law enforcement and security surveillance exceptions).	(1) class C felony if the person viewed or shown in a picture was, at the time of the viewing or production of the picture, a minor;[4] (2) class A misdemeanor if the person viewed or shown in the picture was, at the time of viewing or production of the picture, an adult.
11.76.113	Misconduct involving confidential information in the first degree: use of confidential information to commit a crime or obtain a benefit to which the person is not entitled to injure another, or deprive another of a benefit.	Class A misdemeanor
11.76.115	Misconduct involving confidential information in the second degree: knowingly and without legal authority obtaining confidential information about another.	Class B misdemeanor

In addition to the above criminal offenses, there are other provisions of law that might bear on the information obtained from data gathered by an unmanned aerial vehicles.

If the data is gathered by a government agency, it is a public record. However, AS 40.25.120 provides certain protections for private information. AS 40.25.120(a)(4) excepts records required by law to be kept confidential. *See Falcon v. APOC*, 570 P.2d 469 (Alaska 1977) (physician not required to disclose identity of certain patients to Alaska Public Offices Commission where the disclosure of the patients' identities might disclose the fact that they were being treated for conditions that patients would normally keep private); *Alaska Wildlife Alliance v. Rue*, 948 P.2d 976 (Alaska 1997) (payroll information may be kept private where disclosure might endanger employees or contractors, where those employees and contractors were threatened with harm). AS 40.25.120(a)(6)(C) protects information gathered by law enforcement the disclosure of which "could reasonably be expected to constitute an unwarranted invasion of the personal privacy of a suspect, defendant, victim, or witness."

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[4] A Class C felony is punishable by a fine of up to $50,000, and a sentence of imprisonment up to five years. Presumptive sentences based on whether the offense is a first or subsequent offense are set out at AS 12.55.155(e).

There may be civil liability for obtaining (and subsequently misappropriating) information on trade secrets or patented processes. *See, generally.* AS 45.50.

In addition, a person who is subject to surveillance that is unreasonable or unlawful could sue for the tort of invasion of privacy. *Compare Wal-Mart v. Stewart*, 990 P.2d 626, 634 (Alaska 1999) (daily search of employee's bags held an unreasonable invasion of privacy where not part of a random, nondiscriminatory policy, and where the employee feared that refusing the search might result in others suspecting him of theft, or result in a police call or firing).

3. Particular scenarios

Inadvertent capture of evidence of illegal activity. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information, and whether the person whose actions have been captured has a reasonable expectation of privacy. One of the scenarios mentioned in your request is the capture of evidence of poaching. Assuming that the poacher is a person taking game on property that is not the poacher's own, the poacher cannot reasonably expect privacy when present on another's land without authority.

If a law enforcement agency sends out an unmanned aerial vehicle for patrolling or surveillance, perhaps to look for illegal cultivation of marijuana or manufacture of methamphetamine on public land, and in the course of doing so, captures evidence of an industrial sized marijuana grow operation on private land, it might provide grounds to obtain a warrant to explore further.[5] Under Alaska law, if the observation of the event is lawful or in "plain view," the discovery inadvertent, and the incriminating nature of the evidence immediately apparent, a warrant might not be required. *Ahvakana v. State*, 283 P.3d 1284, 1288 (Alaska Ct. App. 2012) (entry into property where evidence found was authorized under the emergency aid exception to the warrant requirement). However, since the vehicle is not manned, the federal authorities discussed above suggest that the information might not be considered to be lawfully obtained unless some other exception to the requirement of a warrant is present. It is not clear to me whether and under what circumstances a court might grant a search warrant to follow up on information inadvertently obtained, but not in "plain view."

It is possible that the inadvertent capture of information that might otherwise be inadmissible under the exclusionary rule that bars admission of evidence obtained in violation of the United States Constitution will be treated as a good faith exception under *United States v. Leon*, 468 U.S. 897(1984). In *Leon*, the United States Supreme Court held that the Fourth Amendment exclusionary rule should not be applied so as to bar the use of evidence obtained by officers acting in reasonable reliance on a search warrant

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[5] *But see State v. Crocker*, 97 P.3d 93 (Alaska Ct. App. 2004) holding that because the application for the warrant did not affirmatively disclose information that the marijuana cultivation was beyond what was permitted under *Ravin*, there was no probable cause for a warrant.

issued by a detached and neutral magistrate but ultimately found to be invalid. A court could determine that information inadvertently captured in otherwise lawful surveillance is likewise a good faith exception. However, Alaska's appellate courts have not decided whether to adopt this exception. *Deemer v. State*, 244 P.3d 69, 72 (Alaska Ct. App. 2010). Thus it is impossible to predict the outcome of litigation on this subject under Alaska law, and it is not at all clear, given the federal case law developments discussed elsewhere in this memorandum, that the United States Supreme Court would apply the exception in a situation where there was no warrant.

Person intentionally gathers private information for personal use or distribution. A number of the criminal charges listed above might be available. In addition, if the images obtained are used in child pornography, a number of federal and state criminal statutes might apply.

Please advise if you require further assistance in this matter.

KJS:ray
13-008.ray

Enclosures

APPENDIX E

ECONOMIC IMPACT OF A PAN-PACIFIC UNMANNED AIRCRAFT SYSTEMS TEST SITE

Economic Impact of a

Pan-Pacific Unmanned Aircraft Systems Test Site

May 2013

PREPARED FOR

Alaska Center for Unmanned
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Executive Summary

Purpose and Scope

In March 2013, the University of Alaska Fairbanks Center for Unmanned Aircraft Systems contracted with McDowell Group to analyze the economic conditions for unmanned aircraft systems (UASs) in Alaska and measure the projected economic impact of developing a Federal Aviation Administration (FAA) test site for UAS in Alaska. The economic impact assessment (EIA) in this report provides annual projections of the direct, indirect, and induced impacts to employment and wages as well as projections of output and value added related to the test site, called the Pan-Pacific UAS Test Range Complex (PPUTRC) – with test ranges located in Alaska, Hawaii, and Oregon. The EIA focuses on the additional economic activity that is expected in response to the PPUTRC test site selection. Additional information is provided in this report on the economic impact of the commercialization of UAS specifically in Alaska once UAS flights are allowed in the National Airspace System (NAS).

Summary

- UAS represent a new industry that is set to quickly grow once new government regulations increase access to designated test sites and then to the National Airspace System (NAS), the system of air traffic control that enables safe and efficient flight activity in the U.S.
- UAS applications are far reaching for civilian and military purposes; ranging from environmental monitoring to search and rescue to pipeline or powerline inspections.
- The FAA has limited the authorized use of UASs in the U.S. to efforts focused on the public interest. There are currently two ways to operate a UAS with the approval of the FAA (both of these options require that the flight takes place outside of densely-populated areas):
    - Certificate of Waiver or Authorization (COA) for public UAS
    - Special airworthiness certificate for private sector (civil) UAS
- However, the FAA is scheduled to designate six UAS test sites in the U.S., as required under the FAA Modernization and Reform Act of 2012. The sites will operate from January of 2014 to February 13, 2017 to provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UASs in the NAS.
- According to the Association of Unmanned Vehicle Systems International (AUVSI), integration of UASs into the NAS will generate some $82 billion in activity in the U.S. between 2015 and 2025; employment impacts are estimated at just over 100,000 jobs by 2025.

- In an effort to bring additional UAS activity and related economic benefits to Alaska, UAF is leading the PPUTRC Test Site application process for 13 ranges in Alaska, Hawaii, and Oregon.
- Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide-open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts).
- In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from $57 million in 2014 to about $76 million in 2017.
- Output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017.
- Value added would climb from $109 million to $134 million over the same period.
- Designation of the PPUTRC will provide a four-year total of $20 million of income tax revenue to Hawaii and Oregon.

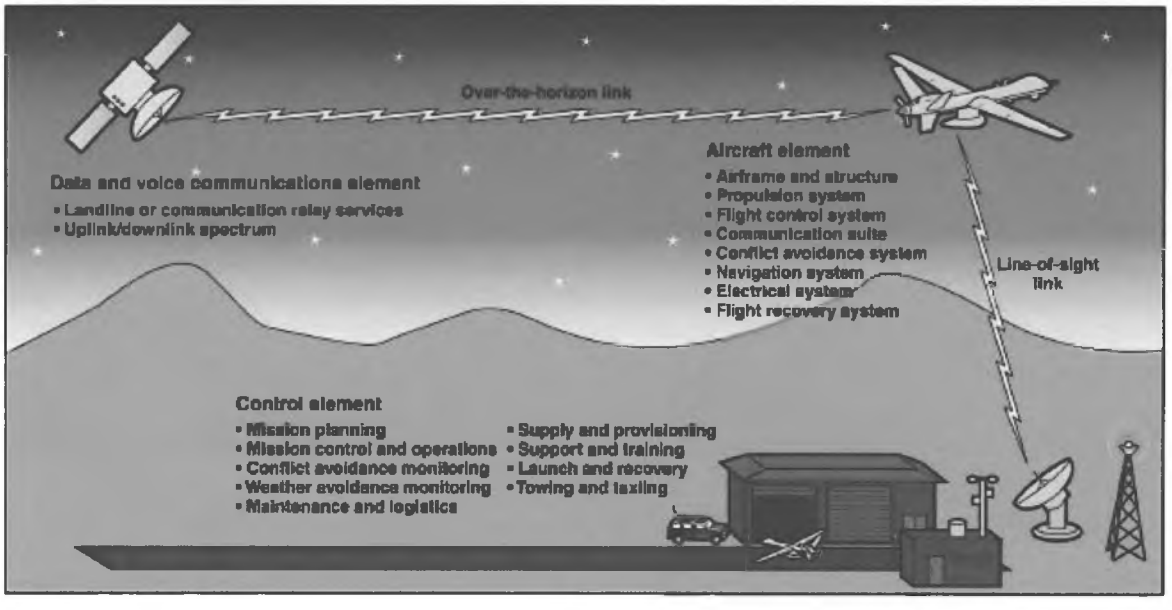
Chapter 1. Unmanned Aircraft Systems in the United States and the NAS

Background

Unmanned aerial vehicles (UAVs) were first described in the late-19th century. Early attempts to develop these UAVs, mostly for combat purposes, soon followed. These remotely piloted vehicles first entered U.S. combat in the mid-20th century to support missions focused on reconnaissance and surveillance, and sometimes they were also used as decoys. Throughout most of the 20th century UAVs lacked real-time data capability and instead focused on collecting images and video for surveillances purposes. Widespread adoption of the technology for U.S. military purposes did not begin until the 1990s and, to a much greater extent, the 2000s during the Afghanistan and Iraq conflicts. It was at this point that technological innovations related to onboard sensors, communication links, and data collection began drastically increasing the potential domestic uses of unmanned aircraft systems.

The increase in complexity for the UAVs required a systems approach to appropriately understand the interactions - and design each component from the start as an integratedsystem - among the on-the-ground control elements, the aircraft, and the communication links. This broader operational perspective is termed "unmanned aircraft system" (UAS). The image below provides a conceptual rendering of the interactions among key elements of a UAS flight.

Figure 1: Conceptual Rendering of an Unmanned Aircraft System



Source: GAO, 2013

UAS Applications

Unmanned aircraft often provide advantages in comparison to manned aircraft. For instance, flights that are dangerous or covert represent potential opportunities where an unmanned vehicle might be preferred over a manned vehicle. Similarly, dull tasks such as extended surveillance missions may be better suited for ground-based operators that can be relieved at the end of their shift. UAVs are often more fuel efficient, quieter, and less disruptive to their surroundings (in comparison to manned aircrafts) and, thus, can allow for fewer environmental disturbances as well as more accurate research results. Finally, initial costs, operating costs (e.g. maintenance costs, fuel costs, storage costs, etc.), and labor costs (e.g. wages, insurances, etc.) are all generally lower for UAVs (Source: Austin, 2010). UASs have already been shown to lead to arrests as well as saving lives during search and rescue missions (Source: The Verge, 2013).

The existing and potential applications for UASs are wide ranging for both civilian uses as well as for military purposes. The lists below provide an abbreviated look at how important this relatively new field may become to sectors throughout Alaska's economy (Source: Austin, 2010):

Civilian

- Aerial Photography - Film, video, stills, etc.
- Agriculture - Crop monitoring and spraying; herd monitoring and driving
- Coastguard – Search and rescue, coastline, and sea-lane monitoring
- Conservation – Pollution and land monitoring
- Customs and Excise – Surveillance for illegal imports
- Electricity Companies – Powerline inspection
- Fire Services and Forestry – Fire detection, incident control
- Fisheries – Fisheries protection
- Gas and Oil Supply Companies – Land survey and pipeline security
- Information Services – News information and pictures, feature pictures (e.g. wildlife)
- Lifeboat Institutions – Incident investigation, guidance, and control
- Local Authorities – Survey, disaster control
- Meteorological Services – Sampling and analysis of atmosphere for forecasting, etc.
- Oil Companies – Pipeline security
- Ordinance Survey – Aerial photography for mapping
- Police Authorities – Search for missing persons, security and incident surveillance
- Rivers Authorities –Water course and level monitoring, flood and pollution control
- Survey Organizations – Geographical, geological, and archaeological survey
- Traffic Agencies – Monitoring and control of road traffic
- Water Boards – Reservoir and pipeline monitoring

Military

- Navy
    - Shadowing enemy fleets

    - Decoying missiles by the emission of artificial signatures
    - Electron intelligence
    - Relaying radio signals
    - Protection of ports from offshore attack
    - Placement and monitoring of sonar buoys and possibly other forms of anti-submarine warfare
- Army
    - Reconnaissance
    - Surveillance of enemy activity
    - Monitoring of nuclear, biological, or chemical (NBC) contamination
    - Electronic intelligence
    - Target designation and monitoring
    - Location and destruction of land mines
- Air Force
    - Long-range, high-altitude surveillance
    - Radar system jamming and destruction
    - Electronic intelligence
    - Airfield base security
    - Airfield damage assessment
    - Elimination of unexploded bombs

UAS Categories

UASs are typically categorized based on the size or capability of the UAV. The five categories below provide a common categorization of UAS that helps simplify requirement assessments and costing estimates (Source: Teal Group, 2008):

- Micro or Mini – A small UAV that ranges in size from something that can be held in the palm of the hand to a UAV that can be carried on your back and launched by hand.
- Naval – A tactical UAV is generally operated with simpler systems over a radius between 100 and 300 km.
- Tactical – A reconnaissance UAV used by the Army for endurance missions ranging several hours over an operating radius up to 200 km.
- MALE – Medium Altitude Long Endurance reconnaissance UAVs fly between 5,000 and 15,000 meters in altitude for approximately 24 hours.
- HALE – High Altitude Long Endurance reconnaissance and surveillance UAVs are usually operated by Air Forces at altitudes over 15,000 meters for periods longer than 24 hours.

National Airspace System

The NAS was developed to allow for safe and efficient commercial aviation. However, commercial UAS flights are currently not allowed in the NAS due to concerns over (1) "the inability to detect, sense, and avoid other aircraft and airborne objects in a manner similar to 'see and avoid' by a pilot in a manned aircraft, (2) vulnerabilities in the command and control of UAS operations, (3) the lack of technological and operational standards needed to guide the safe and consistent performance of UAS, and (4) the lack of final regulations to accelerate the safe integration of UAS into the national airspace" (Source: U.S. GAO, 2012 and Waggoner, 2013).

The first authorized use of UASs in the NAS in the U.S. was permitted by FAA in 1990. Over the past 23 years, the FAA has limited the authorized use of UAS in the U.S. to efforts focused on the public interest. These missions have included border patrol, military training, disaster relief, firefighting, search and rescue, law enforcement, and testing and evaluation. According to the FAA, the Department of Homeland Security currently utilize UASs for border and port surveillance; NASA and NOAA utilize UAS to help with scientific research and environmental monitoring; law enforcement agencies utilize UASs to support public safety; and state universities use UASs to conduct research (Source: FAA Fact Sheet 2013). These efforts are limited to areas outside of major urban areas at elevations less than 50,000 feet. The aircraft range in size from a hummingbird to a wingspan as large as a Boeing 737; although many are the size of a remote-control plane or helicopter. Recreational use of airspace is allowed away from airports and air traffic and below 400 feet above ground level – informal flights for business purposes are specifically excluded (Source: FAA Advisory Circular 91-57).

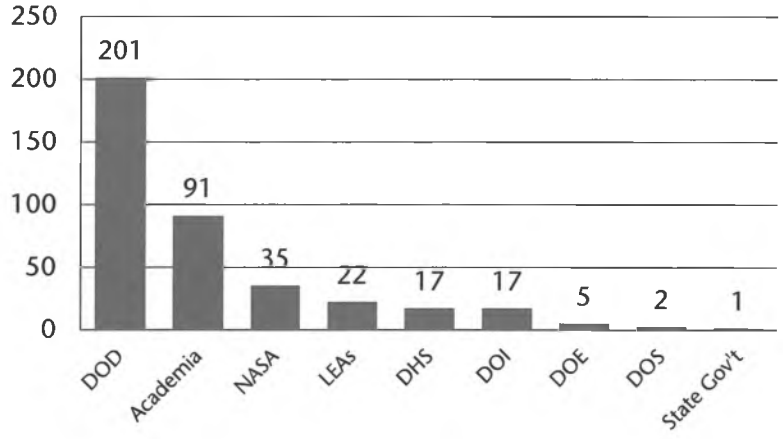
As of 2013, there are currently two ways to operate a UAS with the approval of the FAA: (1) Certificate of Waiver or Authorization (COA) for public UAS's and (2) special airworthiness certificate for private sector (civil) UAS's – both of these options require that the flight takes place outside of densely-populated areas.

Certificate of Waiver or Authorization (COA)

COAs allow public entities to fly UASs in a defined block of civil airspace. The FAA issued the first COAs in January 2007. With COAs, the UAV must remain in view, either of the ground crew or via a chase plane, since UAS technology cannot currently comply with 'See and Avoid' rules. COAs usually require between six and 24 months for approval and cost $40,000 to $60,000 (Source: Economic Development of Central Oregon, 2011). Most of the cost is for specialists in the testing protocols, documentation, and in managing the process through the FAA. Common applications by COA holders include firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions (Source: FAA 2013b). The number of COAs issued has increased since 2009, with 146 in 2009, 298 in 2010, and 313 in 2011 (Source: FAA 2013b). In 2012, the FAA issued 391 COAs to 121 federal, state, and local government entities in the U.S. A total of 1,428 COAs have been issued since January of 2007 (Source: GAO 2013). As of February 15, 2013, there were 327 active COAs (Source: FAA 2013b).

The graph below aggregates the 391 COAs issued in 2012 to nine types of entities: U.S. Department of Defense, academia, NASA, local law enforcement agencies, U.S. Department of Homeland Security, U.S. Department of the Interior, U.S. Department of Energy, U.S. Department of State, and state government.

Figure 2: Number of Approved COAs, 2012



Source: GAO, 2013

Special Airworthiness Certificate

Special airworthiness certificates are the only way for civil operators to fly UASs in the NAS at present. However, these certificates cannot be utilized to carry people or property for compensation or hire – they can only be issued for research and development, crew training, or market surveys (Source: FAA 2011).

Allowing UAS in the NAS

In recent years the FAA has made a concerted effort to integrate UAS regulations into the NAS. In 2009, the FAA, NASA, DoD, and the Department of Homeland Security began addressing pathways to integrating UAS regulations into the NAS through their UAS Executive Committee. Additionally, the FAA chartered a UAS Aviation Rulemaking Committee in 2011 to create operational procedures, regulatory standards, and policies related to UAS flights in the NAS. In 2012, the FAA Modernization and Reform Act of 2012 (FMRA of 2012) was passed by Congress to approve six test sites where UAS integration could be tested prior to a 2015 integration of UAS regulations in the NAS (Source: FAA 2012). Delays within the FAA due to technical, logistical, and public outreach concerns may contribute to a UAS integration date later than 2015. However, six test sites are still scheduled to run from January 1, 2014 to February 13, 2017.

Six UAS Test Sites

There is considerable competition over where test sites will be designated, since designation will provide immediate employment in the selected region and support a strong foundation for UAS activity prior to integration of UAS regulation in the NAS. As of March 5, 2013, 50 applicants from 37 states were granted access to the FAA test site application web portal (Source: FAA 2013b). The FAA will consider

five key items when deciding the location of the six test sites: (1) geographic and climatic diversity, (2) location of ground infrastructure and research needs, (3) consultation with NASA and DOD, (4) population density and air traffic density of the surrounding area of any proposed location as well as the potential impact areas in the event of incidents, such as "Fly away" given potential safety mitigations; and (5) identification of specific goals and objectives to be accomplished. Additionally, the test sites are expected to provide an environment and opportunity to test conventional takeoff and landing capability, high speed flight (greater than 250 knots indicated air speed), maritime (launch/maneuver/recovery) capability, operations at extremely high altitudes (Class A airspace and above), and evaluation of dissimilar aircraft (including a mix of manned and unmanned aircraft) in multiple altitude structures (Source: FAA 2013a).

The six test sites that are selected will support the following operations and programs:

- Safe designation of airspace for integrated manned and unmanned flight operations in the national airspace system;
- Development of certification standards and air traffic requirements for unmanned flight operations;
- Coordinating with and leveraging the resources of NASA and the Department of Defense;
- Addressing both civil and public unmanned aircraft systems;
- Ensuring that the program is coordinated with the Next Generation Air Transportation System; and
- Ensuring the safety of unmanned aircraft systems and related navigation procedures before they are integrated into the national airspace system (Source: FAA, 2013b).

The test site operators will provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UAS regulations in the NAS. Additionally, data collection will support development and operations research and professional development opportunities will be available for inspectors, airspace managers, air traffic controllers, and others. The specific goals described by the PPUTRC applicants include (Source: PPUTRC, 2013):

- Develop a set of standards for select unmanned aircraft categories, for aircraft state monitoring, and navigation. PPUTRC goals and objectives work will augment ongoing standards work with research on categories of UAS not yet addressed, and evaluations needed to refine emerging standards under consideration;
- Validate FAA acceptable risk thresholds or safety management system standards for UAS operations;

- Identify safety factors in UAS design; validate certification standards, including protocols for air traffic control interaction. Define and qualify underlying assumptions and a minimum set of air vehicle characteristics critical to safety, reliability, etc.;
- Develop effective, compliant 'sense and avoid' systems to satisfy regulatory guidance;
- Identify gaps in federal and state statutory and case law protections for privacy and recommend policies or legislation to remedy;
- Directly support the federal mandate for "Expanding Use of UAS in the Arctic" (in Sec 332(d) of Public Law 112-95);
- Design experiments and provide data to support American Society for Testing and Materials (ASTM) F38 and Radio Technical Commission for Aeronautics Special Committee (RTCA SC) 203 to evaluate minimum training and operator qualification standards for crew licensing.

Economic Impact of UAS in the U.S.

The economic implications of integrating UAS regulations into the NAS are substantial. According to a study conducted for the Association for Unmanned Vehicle Systems International (AUVSI), integration will generate $82 billion in activity between 2015 and 2025. Employment impacts are estimated at just over 100,000 jobs by 2025.

The direct economic impact of UAS development in the U.S. is expected to climb from $1.1 billion in 2015 to over $5 billion annually by 2025, measured in terms of output. Including indirect and induced effects, the annual economic impact is expected to rise from $2.3 billion in 2015 to $10 billion in 2025 (Source: AUVSI, 2013).

Areas selected as UAS test sites will have an advantage in capturing these economic benefits; thus the fierce competition among the 50 applicants.

Chapter 2. Pan-Pacific Test Range Complex

In 2012, the Alaska Center for UAS Integration (ACUASI) at the University of Alaska Fairbanks Geophysical Institute began collaborating with Oregon State University and the University of Hawaii to propose a Pan-Pacific Test Range Complex (PPUTRC) as one of the six FAA test sites. This proposed PPUTRC contains 13 test ranges located in Alaska, Hawaii, and Oregon. Of the 13 ranges, six ranges are in Alaska (Denali, Kodiak, North Slope, Oliktok, Poker Flat, and Wainwright), three ranges are in Hawaii (Humuula-R-3103, Makua-R-3109, and Maku-R-3110), and four ranges are in Oregon (Juniper MOA, Pendleton, Tillamook Coastal, and Warm Spring).

Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts). The diverse testing environments for the PPUTRC are included in the Table 1 below:

Table 1: Diversity of Potential Testing Environments for the PPUTRC

360 degree oceanic airspace access	Arctic landscape	Extreme low temperatures
Oceanic and sea-ice access	High arctic winds	High sea-salt corrosion effect
Able to fully matrix UAS into NextGen and air traffic operating both VFR and IFR; high and low altitude	Operations in all classes and categories of military SUA	Operations in Classes A through F international airspace in the oceanic environment
Class C, D, & E airspace within 5-nautical miles of airports	High and low-land vegetation tundra	Numerous inland waterways and lakes
High density airports integration studies and testing	Class C, D, & E airspace airport approaches/departures	High-humidity high and low-altitude
Hot and cold high-desert testing	Littoral coastal region mountainous area	Class E (high) airspace
Jungle conditions	Class A airspace	Mountainous terrain
Volcanic	Glacier	Ship traffic including open ocean and ports

UAS Activity in Alaska, Hawaii, and Oregon

There are currently 15 active COAs in the PPUTRC area as well as eight in-process COAs and 20 expired COAs.

Alaska

ACUASI at the University of Alaska Fairbanks (UAF) is the lead organization for the proposed PPUTRC. The formal PPUTRC team includes over 80 businesses, universities, tribes, and economic development organizations in Alaska. UAF has actively managed UAS operations since 2004.

ACUASI was formed in 2012 to enhance UAS research in Alaska. ACUASI and the UAF Geophysical Institute have developed and flown a variety of in-situ and remote sensing instruments on various UASs in Alaska and throughout the world. Scientific and research campaigns undertaken in Alaska over the past decade include using UASs to support observation and monitoring of sea lions in the Aleutian Islands, weather forecasting, volcanic plume monitoring, atmospheric sampling during wildfires, monitoring of sea ice build ups, and oil spill mapping. Commercial applications trialed in Alaska include whale monitoring, cadastral mapping, maritime navigation support, industrial plant monitoring, and environmental clean-up. This experience, coupled with the FAA's UAS test site status, would leverage a variety of new economic activities in Alaska.

The following table, which summarizes ACUASI activity in 2012, illustrates the variety of UAS activity supported by the organization. The table also provides revenue and staffing data for each UAS campaign.

Table 2: UAS Campaigns Supported by the University of Alaska Fairbanks in 2012

Client	Flight Locations	Type of UAS	Purpose of Flights	Revenue for Site Operator	Site Operator Staff	Flight Operator Staff
Aleutians	Aleutian Islands, AK	Aeryon Scout and Puma	Seal observation	$314,200	2 pilots	1 observer
Idaho	Lewiston, ID	Aeryon Scout	Salmon nest observation	$115,000	1 pilot	1 observer
Eglin Air Force Base	Fort Walton Beach, FL	ScanEagle and Aeryon Scout	Controlled burn experiment	$413,000	4 pilots	3 observers
Prudhoe Bay	Prudhoe Bay, AK	Aeryon Scout	British Petroleum flare stack monitoring	$190,000	1 pilot	1 observer
Nome	Nome, AK	Aeryon Scout	Harbor Ice monitoring for USCG	$30,000	1 pilot	1 observer
Ugak Island	Ugak Island, AK	Aeryon Scout	Seal population monitor	$6,500	1 Pilot	1 observer
Fort Greely	Fort Greely, AK	ScanEagle and Aeryon Scout	Flight test	$25,000	2 pilots	2 observers
Chile	Santiago, Chile	Aeryon Scout	Glacier Ice monitor	$9,000	1 pilot	1 observer
Belgium	Belgium	Gatewing	Flight training	$16,000	2 pilots	1 observer
Anchorage	Fort Richardson, AK	Aeryon Scout	Flight test and demonstration	$1,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	ScanEagle	Payload test	$347,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Aeryon Scout	Payload test and demonstration	$30,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Raven	Flight test for avionics	$5,000	2 pilots	2 observers
Hawaii	Offshore Hawaiian Islands	Puma	Tsunami debris tracking	$95,000	1 pilot	1 observer

Sources: ACUASI, 2013

Figure 3: Types of UAS Flown in Alaska in 2012

Aeryon Scout

Boeing Insitu ScanEagle

AeroVironment Raven

Gatewing

AeroVironment Puma

Hawaii

Hawaii offers many unique qualities that make UAS operations appealing. These include: (1) expansive over-water areas unencumbered by other aviation uses, (2) proximity to U.S. Pacific Command – a significant user of future UAS systems, (3) opportunities for joint operations with the Pacific Missile Range Facility – a major test range on Kauai, and (4) opportunities for long-range point-to-point tests with partner ranges in Alaska and Oregon. The Hawaii ranges have proven an important focus for the development of scientific applications of UAS, with significant milestones including test flights of the Aerovironment Pathfinder; Pathfinder Plus; and Helios solar-hybrid propulsion high altitude, long endurance UAS, between 1997 and 2001. Scientific applications led by U.S. federal agencies have recently seen Hawaii emerge as a focal point for NOAA's exploration of UAS as a tool for marine park surveillance. NOAA has utilized UAS to monitor Papahanaumokuakea Marine National Monument since 2007 and performed initial trials using small hand launched systems in mid-2012.

Oregon

The Oregon-based PPUTRC team members include 16 businesses, universities, tribes, and economic development organizations. Additionally, six committed team partners will convert to formal team members upon FAA test site designation award to PPUTRC. Engagements are also planned with a wide ranging network in Oregon – including the 111 AUVSI members and numerous startup companies, primarily in sensor, robotics, and other supporting technologies. In comparison to Alaska and Hawaii, Oregon has historically been more engaged in design, development, and manufacture of UAV systems and subsystems.

The two largest Oregon UAS firms are Insitu (design, development, and manufacture of UAS systems) and FLIR Systems (remote sensors). The main Oregon firm involved in UAS applications has been Near Space Corporation (NSC). NSC uses very high altitude unmanned balloons and gliders to perform scientific and commercial test activities, ranging from data gathering on behalf of government agencies to near-space testing of hardware and sensors for commercial firms. NSC is opening a new $6 million flight test and operations facility at the Tillamook Airport on the Oregon coast. Existing UAS activity also includes the Oregon Army National Guard operations in Pendleton. Oregon's UAS efforts are synergistic with a separately funded ground vehicle innovation initiative, Drive Oregon, which requires systems that can be spun out of UAS: quiet, efficient motors, lightweight composite designs, and navigation systems. The potential economic benefits of the test sites, as well as NAS integration, are particularly strong for Oregon's already significant aircraft manufacturing sector.

Recent UAS Funding in Alaska, Hawaii, and Oregon

Since 2004, nine Alaska contractors have received direct U.S. federal agency contracts for UAS goods and services. The largest federal contract in Alaska is a 5-year standing services award, worth $47 million, from the U.S. Navy to the University of Alaska in 2010 for UAS payload integration and flight test services. The second major award made since 2004 to an Alaska firm consists of a series of pacts totaling $17 million from the U.S. State Department to Anchorage-headquartered Kuk Construction (subsidiary of Olgoonik Development, an Alaskan Native Corporation) for the provision of UAS-based security surveillance services in Iraq in partnership with KBR, Inc. UAF has collaborated with commercial entities, such as Idaho Power Company, and manufacturers including AeroVironment to conduct surveys and observe environmental impacts. Additionally, UAF has collaborated with BP for oil spill response and flare stack monitoring, as well as projects focused on detecting and locating gas and oil pipeline leaks and developing new sensors and processes to identify leaks.

Hawaii's large military presence has resulted in defense spending as the primary source of federal funding to UAS vendors in the state. Direct defense contracts accounted for 94 percent of all awards in terms of obligated amounts from 2004-2012, rising to 97 percent when including awards placed by the General Services Administration on behalf of the U.S. Air Force. The remaining awards were placed with Honolulu-based Referentia Systems by NOAA as part of the Papahanaumokuakea Marine National Monument monitoring project. Hawaii supports a dedicated UAS development and manufacturing company, Williams Aerospace, a small firm currently developing new platforms in the fixed-wing, hand launched micro and medium altitude endurance classes. The state is also working to create two commercial UAS services arms, addressing the defense, homeland security, and precision agriculture markets.

In Oregon, a consortium of industry, academia, and public entities has created a 7-year strategic plan to double the size of the UAS industry in the state, with the help of a $2.5 million State of Oregon grant scheduled for the 2013-14 biennium and additional investments of at least $1.15 million from other sources for a total of $3.65 million. The plan specifically creates UAS solutions for commercial applications, and safely integrating those UAS solutions into the NAS. Projects include emergency response; weather; firefighting; search and rescue; wildlife and habitat management; law enforcement; physical and resource surveys (land and water); management of agriculture, livestock, and public lands; and management of public and private infrastructure. Oregon State University (OSU) has already begun UAS flights based on these research objectives.

Leveraging Current Research Institutes, Community Colleges, and Training Centers

ACUASI is collaborating with the UAF College of Engineering and Mines (CEM) and the Community and Technical College (CTC) to integrate UAS engineering, science, and technology into UAF's teaching, research, and service activities. Additionally, ACUASI is working with the CEM to fill a full-time tenure track engineering faculty position with a professor focused on UAS engineering, science, and technology. ACUASI and CTC also intend to include UAS technology courses in CTC's aviation curricula to train UAS developers, technicians, and pilots as well as to improve outreach to remote Alaskan villages that could benefit from UAS technologies. Cooperation with the CTC at UAA will add air traffic controller participation, offer training for UAS operators, and ultimately build a maintenance program similar to the Aircraft and Powerplant program currently offered.

The University of Hawaii is testing UASs in several of its research programs, evaluating the utility and impact of UAS through analysis of coastal resource management, terrestrial and aquatic environmental monitoring, natural source management and inventory, and human impact studies. University of Hawaii is also developing programs to train students and research professionals on UASs, and plans to integrate this capacity into accredited degree programs.

The new OSU industry-university UAS consortium will depend on test site facilities for collaborative research and development in all phases of operations and applications. Through the Colleges of Engineering, Science, Agriculture, Forestry and Earth, Ocean and Atmospheric Sciences, OSU has expertise and supports ongoing research on control theory and robotics, flexible airframes and flight, sensors, and signal processing, and numerous applications in natural and environmental sciences and environmental monitoring, measuring, and management. OSU-Cascades, located in Central Oregon near the Warm Springs and Juniper test ranges, offers programs in energy engineering, computer science, natural resources, and business, and plans to add programs designed in conjunction with the UAS industry. OSU-Cascades can also provide on-site facilities for OSU-Corvallis researchers leading projects in the region. Central Oregon Community College (COCC) has one of the largest aviation flight training programs on the West Coast – both fixed wing and rotary. COCC offers certifications for UAS flight training and plans to develop a program for data analysis of sensors, building on the school's strong geographic information systems program. Additionally, Blue Mountain Community College (BMCC) in Pendleton, Oregon is developing a UAS curriculum for instructional delivery and course certification. Oregon Institute of Technology (OIT) offers a variety of degrees in engineering and engineering technology, composite engineering, computer and software systems engineering, and electrical engineering, including a master's degree in manufacturing engineering. It offers degrees in professional land surveying and geographic information systems. OIT is collaborating with Rockwell Collins, the aviation electronics company, on real-world projects at a joint campus outside Portland and offers similar hands-on collaborations with other aerospace firms in the northwestern U.S.

Expansion of Existing Businesses and Attracting New Business Investment

The University of Alaska has spun off at least two companies who intend to test their products on the Pan-Pacific test range. These companies were created by University graduate students who were expanding their research in sensors for testing in UASs. UA recently received $5 million from the State of Alaska to support the development of a sustainable high-tech industry in Alaska. Already two companies have established satellite offices in Alaska to improve collaboration with the ACUASI.

Placement of a UAS test site in Hawaii will promote growth within Hawaii and reduce development cycles for manufacturers and researchers. Additionally, it would reduce or eliminate costs to ship sensors, and send knowledgeable staff, to mainland test sites to operate and demonstrate systems. Close proximity to a test site in Hawaii will greatly benefit firms such as BAE Systems, Williams Aerospace, and others – including many military and government contractors working with the Honolulu Fire Department, Honolulu Police Department, U.S. Civil Air Patrol, U.S. Coast Guard, U.S. Department of Defense, U.S. Department of Homeland Security, U.S. National Guard, and others.

In Oregon, more than a dozen companies have said that they will begin testing their sensor packages, propulsion systems, and airframes in Oregon if the Pan-Pacific UAS Test Area is designated as a national test site. Additionally, two companies have informally pledged to open satellite offices at a state test range. The PPUTRC will benefit UAS businesses in the Columbia River Gorge. Over the past seven years, the Gorge's UAS industry grew from a small core of 30 people to an employment base of more than 1,400 employees. Many of these new jobs were created by the UAS companies' suppliers. The two largest Oregon UAS manufacturers are Insitu, manufacturer of UAS platforms and subsystems, and FLIR Surveillance Systems, a manufacturer of electro-optic and infrared imaging systems. Insitu is a major global supplier of high endurance, runway-independent UAS. FLIR Surveillance provides more ER and IR imaging systems for unmanned aircraft, unmanned ground, and unmanned maritime platforms than any other company. Activity in the Gorge from firms such as Insitu, FLIR Surveillance Systems, Cloud Cap Technology, and UTC Aerospace has spun off more than 20 local companies. Central Oregon's general aviation aircraft manufacturing industry had a similar growth pattern over a 15-year period, expanding from a core company of about 30 employees (Lancair) to a cluster of 25 companies that now employs nearly 1,200 people. It is anticipated the PPUTRC will help expand these existing businesses in the Gorge and Central Oregon.

Infrastructure

Alaska expects to invest $1.5 million to construct a test site center at its Poker Flat Research Range, as well as develop and acquire mobile test infrastructure such as fixtures, data collection devices, and monitoring systems similar to its internet-Portable Aerial Surveillance System (iPASS), a web-based application that merges track information from radar, GPS, and a transponder interrogator/receiver. Additionally, large data collection requirements are expected to drive development of a data center for processing and storage.

Hawaii's test ranges link to military/restricted areas used for current UAS operations. These sites include the Pohakuloa training area on the Island of Hawaii, Bradshaw and Wheeler Army Airfields on Oahu, and the Pacific Missile Range Facility on Kauai. Other areas under consideration include Upolu and Dillingham Airfields (on the Big Island and Oahu, respectively). Test points within the ranges would be utilized to support both shore and ship-based development, testing and certification of new UASs, training and crew certification of operational UASs, and development of expanded and joint capabilities involving existing communications systems and operations tactics using UAS.

The budget for the $2.5 million Oregon innovation grant envisions spending at least $1.2 million at test ranges for new equipment and/or infrastructure, with the grant providing $300,000, private enterprise providing $750,000, and public entities providing $150,000. Possible infrastructure development proposed with this funding includes: portable ground radar units; an automatic dependent surveillance-broadcast ground station or a similar 'sense and avoid' technology system; one or more operations management buildings housing computers, calibration components, baseline sensors with a range of capabilities, data analysis equipment, supporting software, maintenance facilities and machine shops; and ground control stations, an observation tower, and ITAR facilities as needed. Additionally, as noted earlier, Near Space Corporation is preparing to open a new $6 million flight test and operations facility at the Tillamook airport.

Chapter 3. Potential Economic Impacts of the PPUTRC

Designation as one of the nation's six UAS test sites promises to have significant economic impacts in the areas where flight activity occurs and support services are provided. Private and public sector UAS activity that has been constrained by restricted access and a restrictive federal authorizing process will have much greater opportunity to conduct UAV flight operations. In this chapter the potential economic impacts in Alaska, Hawaii, and Oregon related to serving as a test site are quantified.

The following economic impact projections were developed by McDowell Group, Inc. utilizing flight activity, flight cost, and flight-related staffing data provided by PPUTRC team members. Direct economic activity was measured by approximating preflight administrative costs, site fees per day, operating costs per day, and total flight days from historical data provided by the applicant. Sector-level information was obtained from the applicant concerning the number of UAS-related firms and jobs per firm. Direct employment estimates were then coupled with multipliers obtained from the IMPLAN economic impact model to estimate total direct, indirect, and induced economic effects. Annual projections from 2014 to 2017 were calculated for each of the 13 ranges utilizing growth rates based on funding forecasts from the Teal Group UAS market profile and forecast report, historical flight activity, and projected growth in flight activity, research, and UAS-related manufacturing as provided by the applicant.

In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect, and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from$57 million in 2014 to about $76 million in 2017.

Table 3: Summary Impacts of PPUTRC Test Site Designation, 2012-2017
Combined Impacts in Alaska, Hawaii and Oregon

Impact of Test Site Designation	2014	2015	2016	2017
Total Employment	**1,065**	**1,260**	**1,335**	**1,429**
Direct Employment	490	571	602	642
Indirect Employment	198	243	259	279
Induced Employment	377	447	474	508
Total Labor Income ($ million)	**$56.9**	**$66.9**	**$70.8**	**$75.6**
Direct Labor Income ($ million)	$26.4	$30.5	$32.2	$34.2
Indirect Labor Income ($ million)	$10.4	$12.5	$13.3	$14.4
Induced Labor Income ($ million)	$20.1	$23.8	$25.3	$27.1
Output ($ million)	**$265.0**	**$301.8**	**$315.9**	**$333.5**
Total Value Added ($ million)	**$109.3**	**$121.9**	**$127.1**	**$133.5**
State Income Taxes ($ million)	$4.3	$5.0	$5.3	$5.6

Employment Resulting from UAS and Test Site Operations

In 2014, with designation of PPURTC as a test site, UAS activity in Alaska, Hawaii, and Oregon is expected to account for 581 direct jobs and a total of 1,254 jobs - including direct, indirect, and induced jobs. Approximately 85 percent of that total employment (1,065 jobs) is attributable to test site designation. The remaining 15 percent (189 jobs) is expected to occur in the absence of PPUTRC test site designation. By 2017, employment will rise to an estimated 904 direct jobs and 1,991 total jobs - with 72 percent of that total employment (1,429) attributable to test site designation. A significant number of these direct jobs are expected in smaller communities that tend to have higher unemployment – thus test site designation for the PPUTRC will help improve opportunities where they will provide the most benefits.

Table 4: Direct Employment, 2012-2017

Direct Employment						
	2012	2013	2014	2015	2016	2017
Total Direct Employment						
PPUTRC	**74**	**82**	**581**	**712**	**801**	**904**
Alaska Ranges	43	47	129	142	157	173
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	31	35	452	498	549	605
Impact of Test Site Designation						
PPUTRC	-	-	**490**	**571**	**602**	**642**
Alaska Ranges	-	-	77	82	86	91
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	-	-	414	417	421	424

Oregon's relatively high direct employment numbers are due to the existing, well-developed aircraft manufacturing sector in Oregon. Oregon is well placed to supply the growing demand for UAS aircraft that will be triggered by UAS integration. Most of the new jobs created in Oregon due to PPUTRC designation include manufacturing jobs (many of which may be created due to designation of test sites anywhere in the U.S.). These numbers for Oregon are based on an analysis provided to McDowell Group by Economic Development for Central Oregon (EDCO).

In addition to direct jobs created from UAS firms, significant indirect and induced jobs will also be created. Indirect jobs represent jobs created throughout the supply chain to support the UAS industry and induced jobs represent jobs created due to changes in household consumption as a result of the UAS industry.

Table 5: Indirect Employment, 2012-2017

Indirect Employment	2012	2013	2014	2015	2016	2017
Total Indirect Employment						
PPUTRC	**21**	**24**	**224**	**290**	**328**	**374**
Alaska Ranges	7	8	22	24	27	30
Hawaii Ranges	-	-	-	42	56	74
Oregon Ranges	14	16	202	223	246	271
Impact of Test Site Designation						
PPUTRC	-	-	**198**	**243**	**259**	**279**
Alaska Ranges	-	-	-	42	56	74
Hawaii Ranges	-	-	185	187	188	190
Oregon Ranges	-	-	13	14	15	16

Table 6: Induced Employment, 2012-2017

Induced Employment	2012	2013	2014	2015	2016	2017
Total Induced Employment						
PPUTRC	**59**	**65**	**448**	**558**	**629**	**712**
Alaska Ranges	35	39	106	117	129	142
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	24	26	342	377	416	459
Impact of Test Site Designation						
PPUTRC	-	-	**377**	**447**	**474**	**508**
Alaska Ranges	-	-	63	67	71	75
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	-	-	313	316	319	321

Note: Summation of columns may not match the total due to rounding

Labor Income Resulting from UAS and Test Site Operations

In 2014, UAS activity in Alaska, Hawaii, and Oregon is expected to account for $31 million in direct labor income and $67 million in total labor income - including direct, indirect, and induced - assuming the PPUTRC is awarded test site designation. Approximately 84 percent of that total labor income ($57 million) is attributable to test site designation, while the remaining 16 percent ($10 million) is expected to occur even if the proposed PPUTRC does not become a test site. By 2017, labor income is expected to include $106 million in total direct, indirect, and induced labor income - with 71 percent of that total labor income ($76 million) attributable to test site designation.

Table 7: Direct Income, 2012-2017 ($ million)

	Direct Income					
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$4.0**	**$4.4**	**$31.3**	**$38.2**	**$42.9**	**$48.3**
Alaska Ranges	$2.3	$2.6	$7.0	$7.7	$8.5	$9.4
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	$1.7	$1.9	$24.2	$26.7	$29.5	$32.5
Impact of Test Site Designation						
PPUTRC	-	-	**$26.4**	**$30.5**	**$32.2**	**$34.2**
Alaska Ranges	-	-	$4.2	$4.4	$4.7	$5.0
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	-	-	$22.2	$22.4	$22.6	$22.8

Table 8: Indirect Income, 2012-2017 ($ million)

Indirect Income						
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$1.1**	**$1.3**	**$11.7**	**$15.0**	**$17.0**	**$19.3**
Alaska Ranges	$0.4	$0.4	$1.2	$1.3	$1.5	$1.6
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	$0.7	$0.8	$10.5	$11.6	$12.8	$14.1
Impact of Test Site Designation						
PPUTRC			**$10.4**	**$12.5**	**$13.3**	**$14.4**
Alaska Ranges	-	-	$0.7	$0.8	$0.8	$0.9
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	-	-	$9.6	$9.7	$9.8	$9.9

Table 9: Induced Income, 2012-2017 ($ million)

Induced Income						
	2012	2013	2014	2015	2016	2017
Total Induced Income						
PPUTRC	**$3.5**	**$3.8**	**$24.4**	**$30.1**	**$34.0**	**$38.4**
Alaska Ranges	$2.2	$2.5	$6.7	$7.4	$8.2	$9.0
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	$1.2	$1.4	$17.6	$19.4	$21.4	$23.6
Impact of Test Site Designation						
PPUTRC	-	-	**$20.1**	**$23.8**	**$25.3**	**$27.1**
Alaska Ranges	-	-	$4.0	$4.3	$4.5	$4.8
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	-	-	$16.1	$16.3	$16.4	$16.6

Output, Value Added, & State Income Taxes Resulting from UAS and Test Site Operations

'Output' represents the value of industry production, and 'total value added' is the difference between an industry's total output and the cost of their intermediate inputs. Economic modeling conducted for the purposes of this study indicates output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017. Value added would climb from $109 million to $134 million over the same period.

Table 10: Output, 2012-2017 ($ million)

	Output					
	2012	2013	2014	2015	2016	2017
Total Output						
PPUTRC	**$18.3**	**$20.2**	**$302.4**	**$366.8**	**$411.7**	**$463.6**
Alaska Ranges	$8.6	$9.5	$34.3	$37.8	$41.7	$46.0
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	$9.7	$10.7	$268.1	$295.6	$325.9	$359.3
Impact of Test Site Designation						
PPUTRC	-	-	**$280.1**	**$315.5**	**$328.4**	**$344.7**
Alaska Ranges	-	-	$23.8	$24.8	$25.8	$26.8
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	-	-	$256.3	$257.4	$258.5	$259.6

Table 11: Total Value Added, 2012-2017 ($ million)

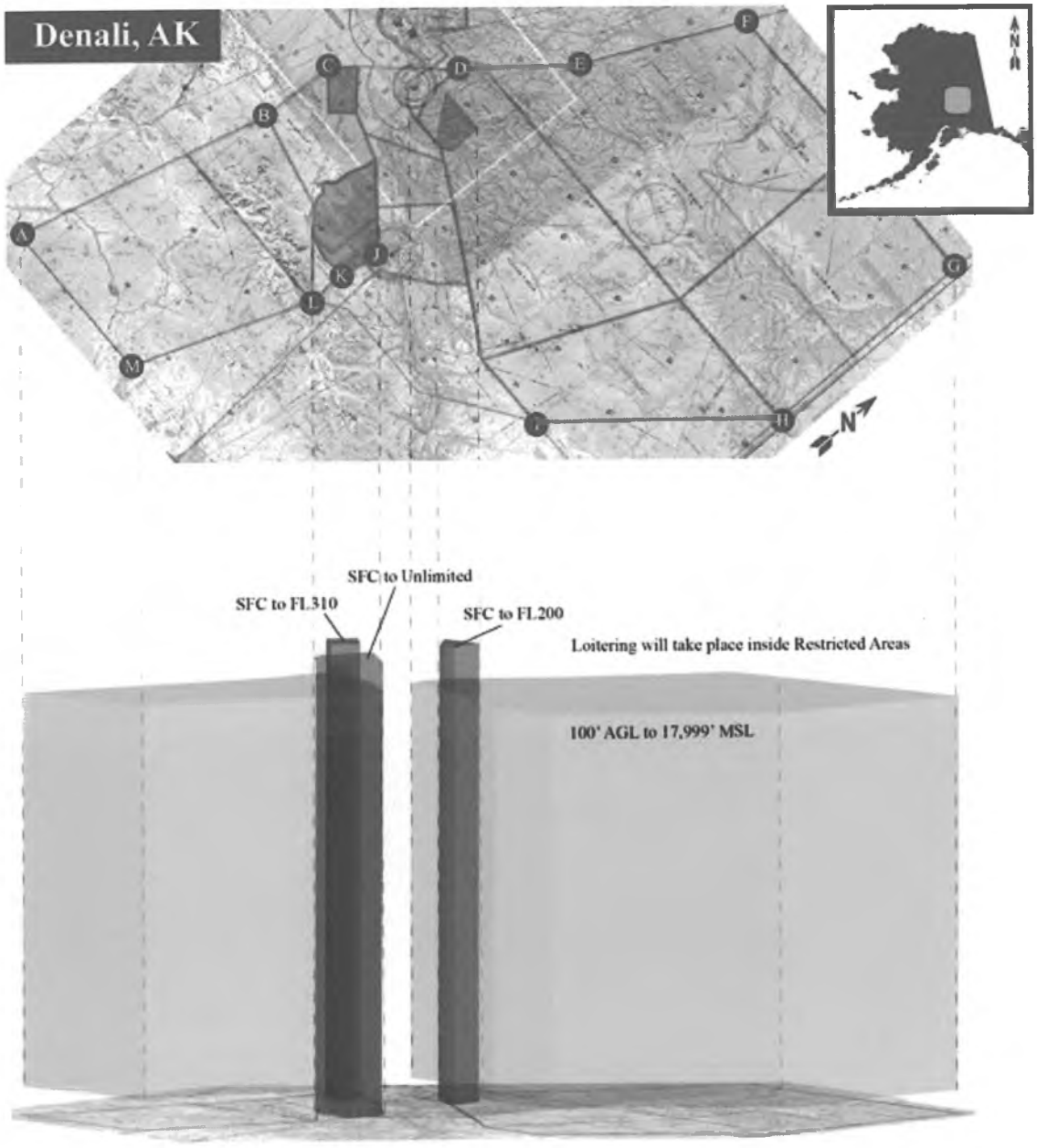
	Value Added					
	2012	2013	2014	2015	2016	2017
Total Value Added						
PPUTRC	**$9.5**	**$10.5**	**$127.7**	**$151.8**	**$169.7**	**$190.3**
Alaska Ranges	$5.7	$6.3	$22.7	$25.0	$27.6	$30.4
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	$3.8	$4.2	$105.1	$115.8	$127.7	$140.8
Impact of Test Site Designation						
PPUTRC	-	-	**$116.2**	**$128.2**	**$132.8**	**$138.5**
Alaska Ranges	-	-	$15.8	$16.4	$17.1	$17.7
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	-	-	$100.4	$100.9	$101.3	$101.7

Designation of the PPUTRC will provide a combined four-year total of $20 million in income tax revenue to Hawaii and Oregon. The effective income tax rate for these calculations was approximated as 7.5 percent for Hawaii, and 9 percent for Oregon (Alaska has no income tax).

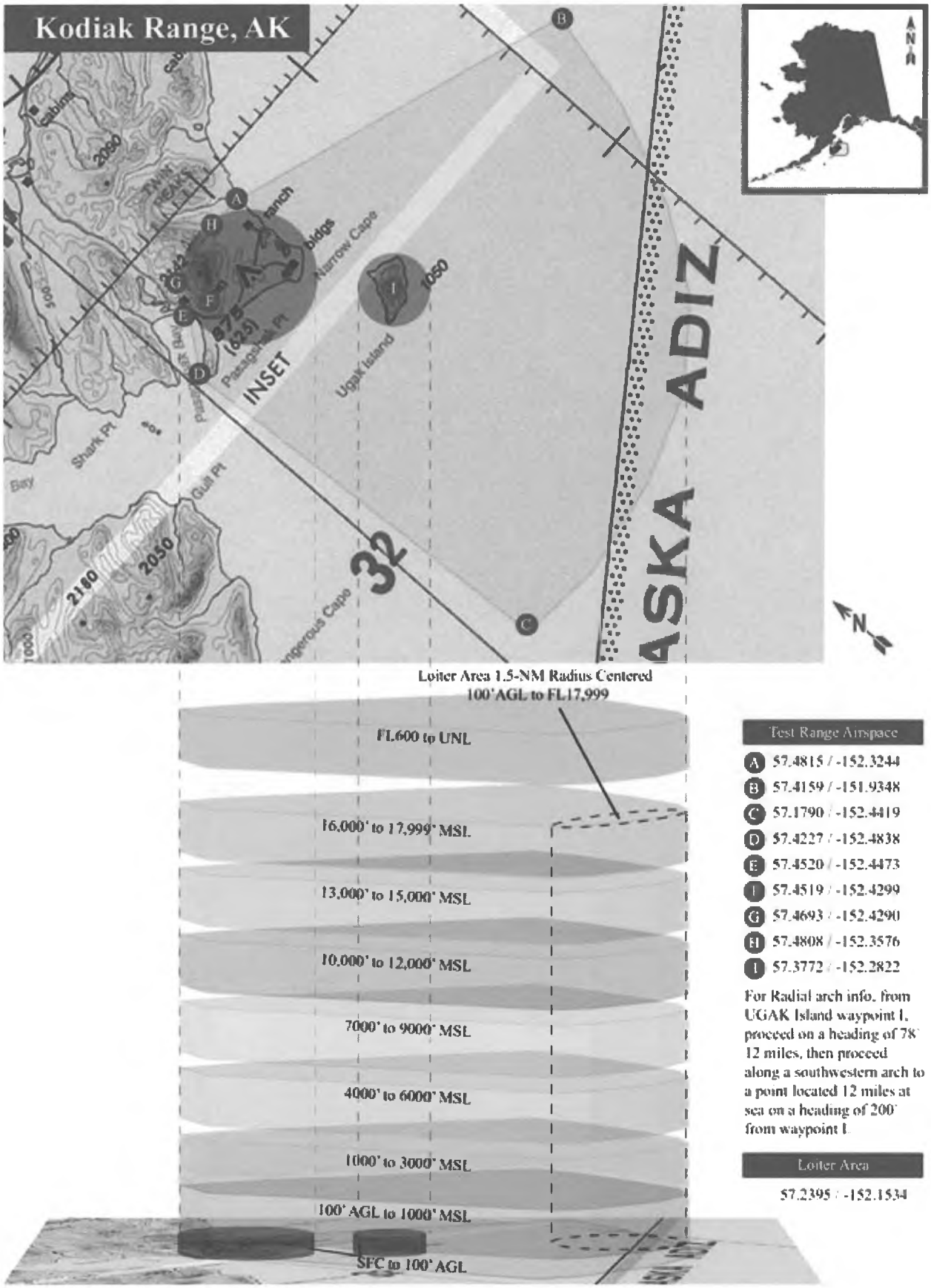
Table 12: State Income Taxes, 2012-2017 ($ million)

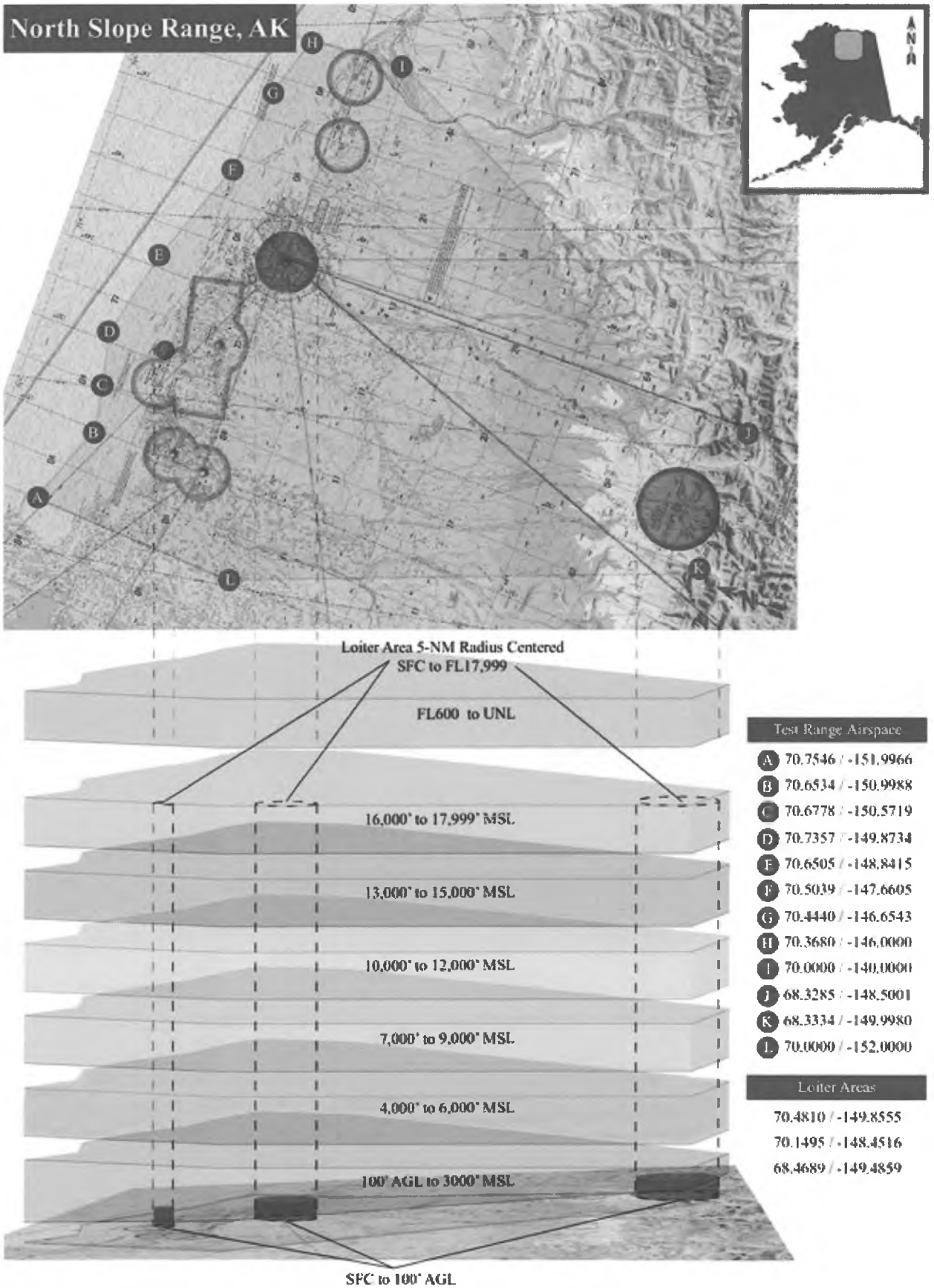
State Income Taxes						
	2012	2013	2014	2015	2016	2017
Total State Income Taxes						
PPUTRC	**$0.2**	**$0.2**	**$4.7**	**$5.9**	**$6.6**	**$7.5**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	$0.2	$0.2	$4.7	$5.2	$5.7	$6.3
Impact of Test Site Designation						
PPUTRC	-	-	**$4.5**	**$5.2**	**$5.5**	**$5.8**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	-	-	$4.5	$4.5	$4.6	$4.6

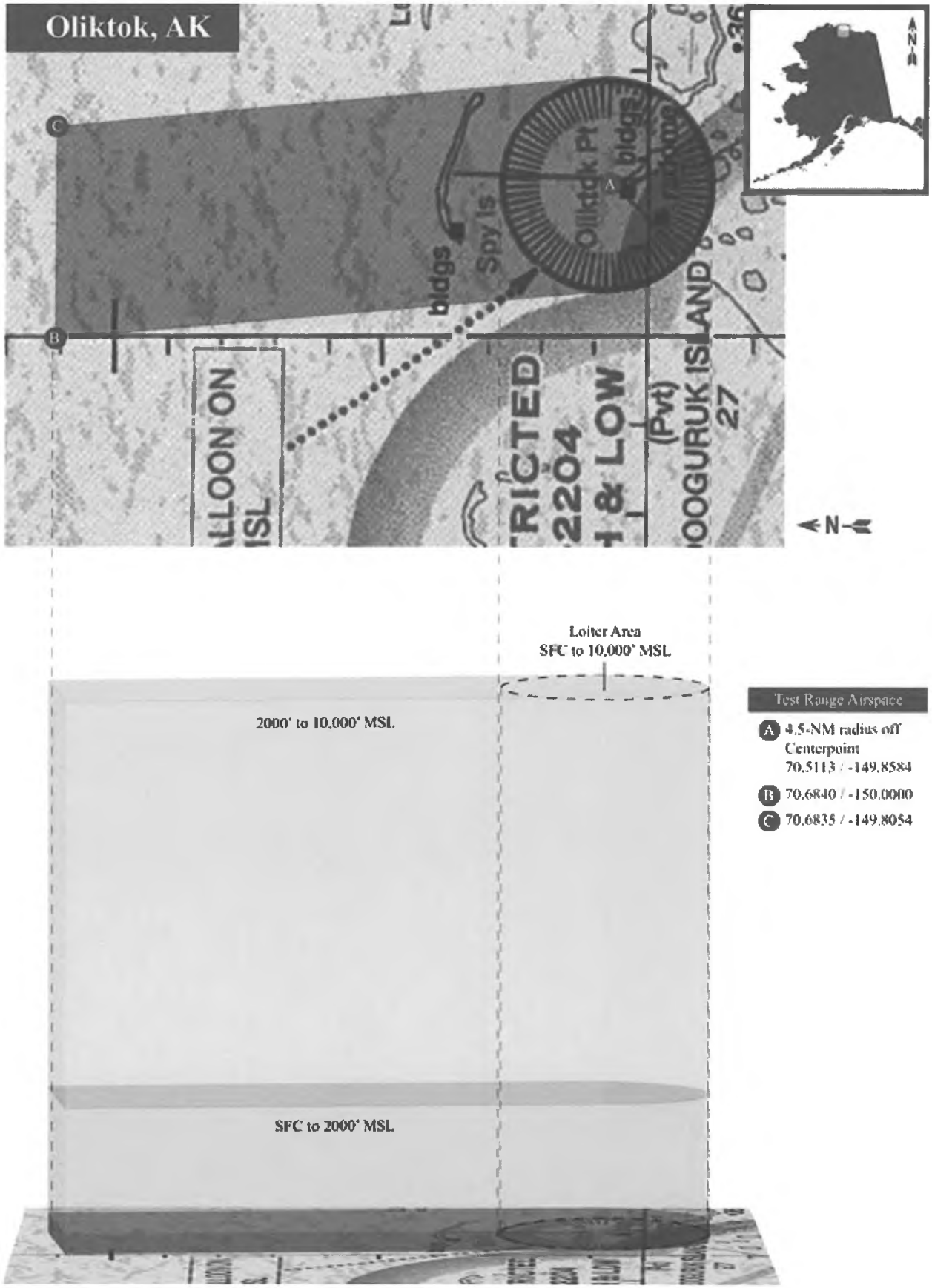
Appendix. Proposed Pan-Pacific Test Ranges

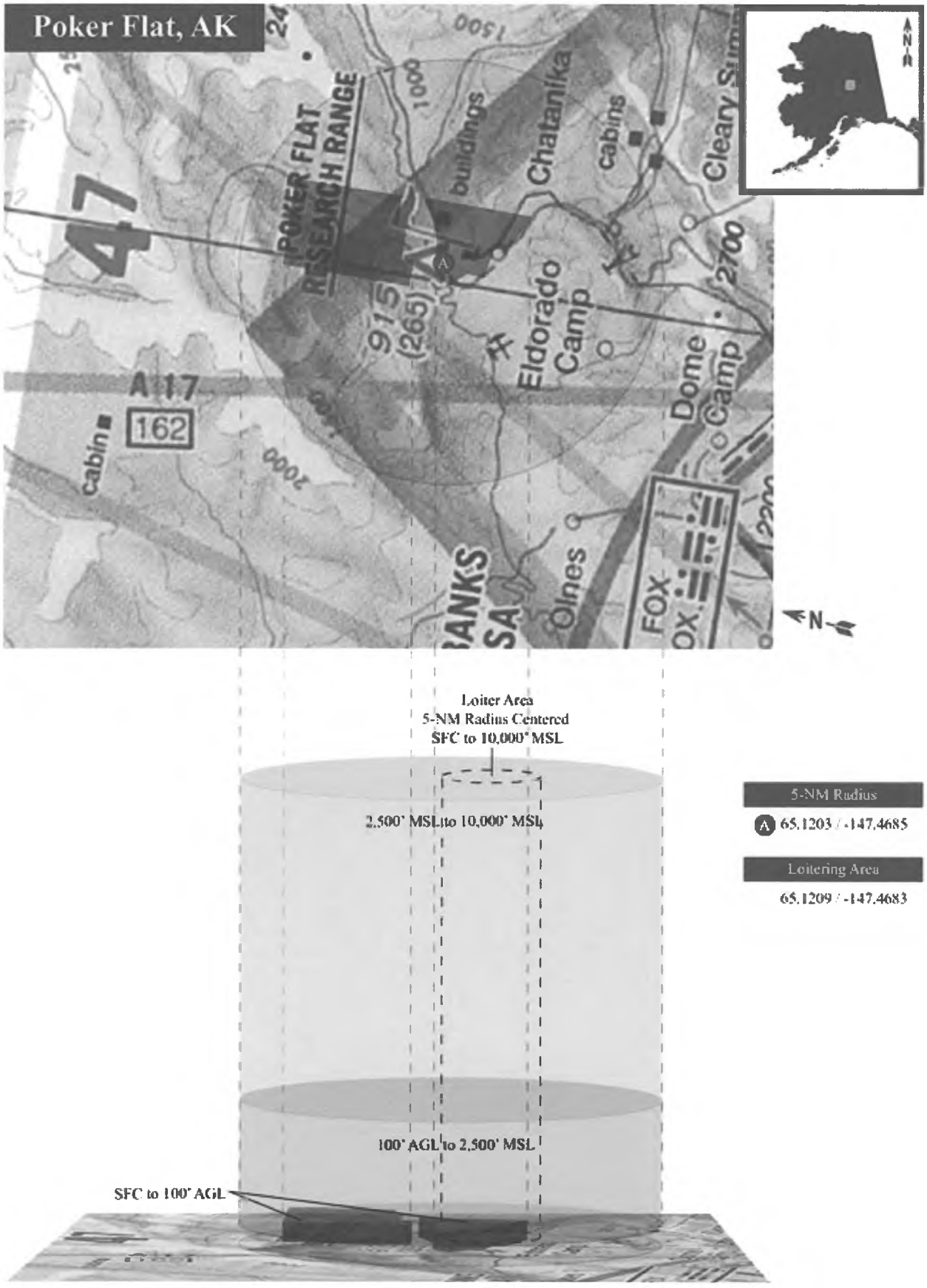


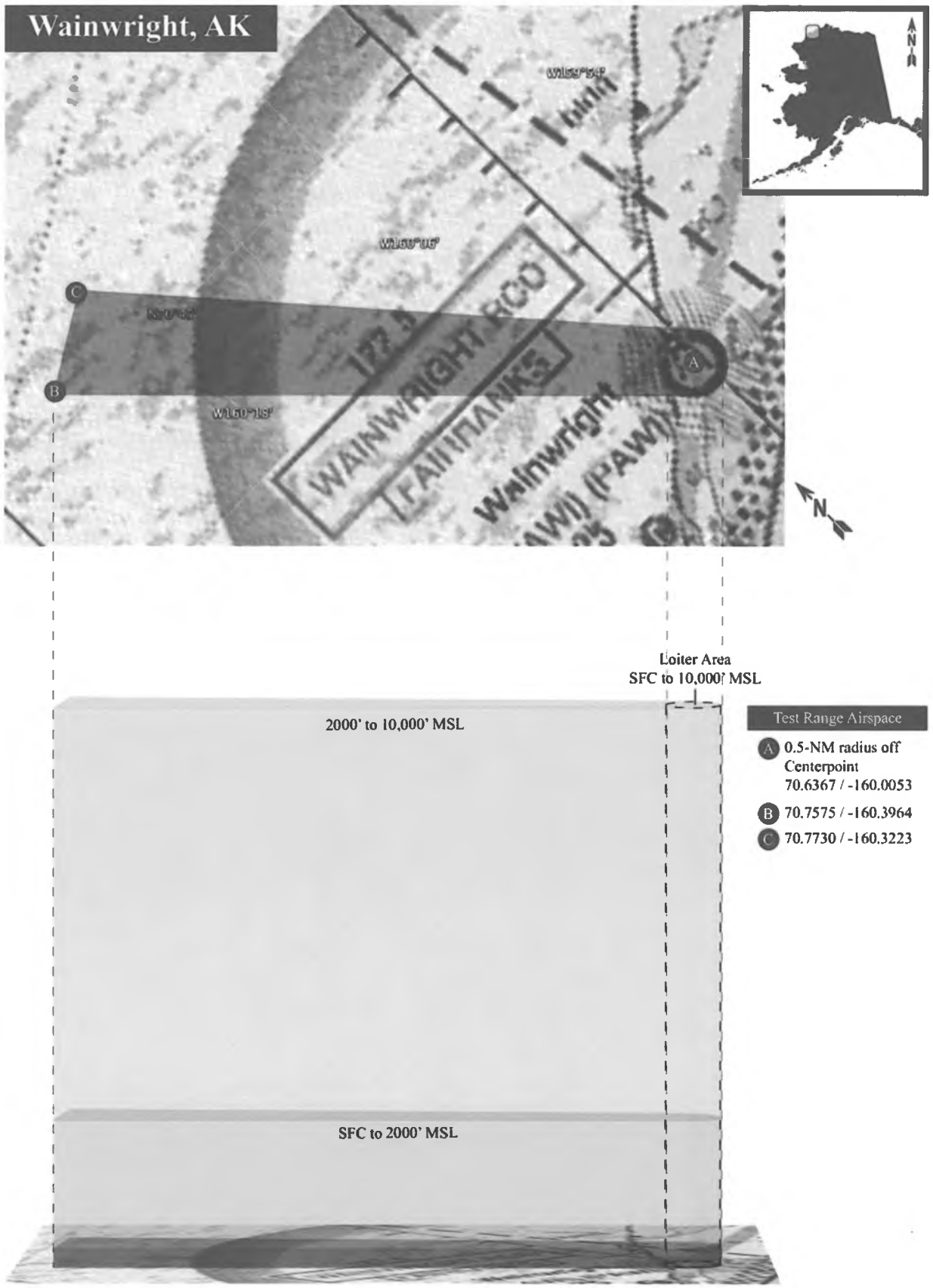
Test Range Airspace		
A 62.5000 / -148.8500	I 66.1668 / -145.0934	J 63.9364 / -145.8266
B 63.9653 / -148.0089	G 66.1692 / -141.0817	K 63.7156 / -145.9051
C 64.3756 / -147.9803	H 65.0000 / -141.0821	L 63.4974 / -145.9046
D 64.9000 / -146.9134	I 64.0000 / -143.0159	M 62.5000 / -146.7279
E 65.3505 / -146.0719		

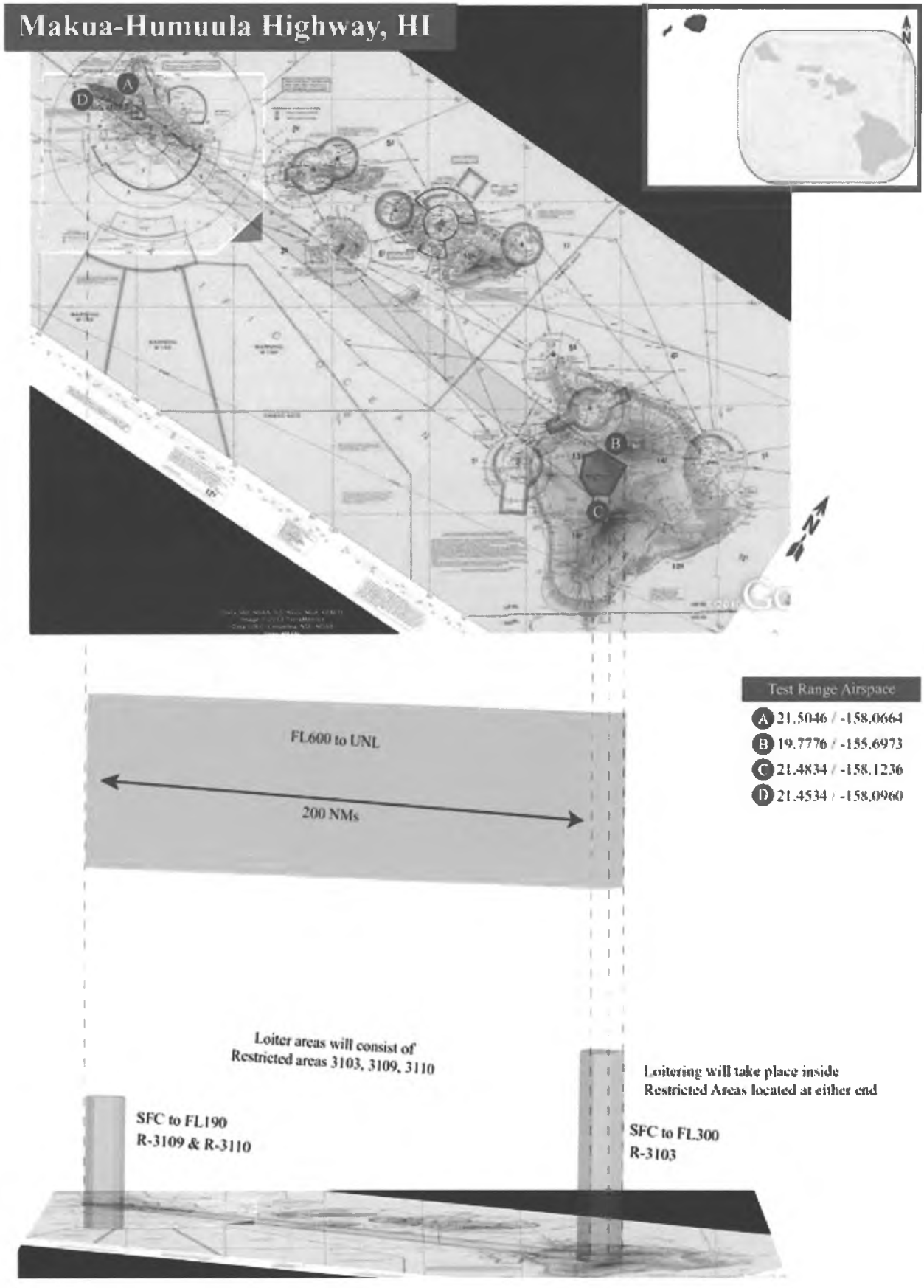

Kodiak Range, AK
ALASKA ADIZ
INSET
Ugak Island
Narrow Cape
Shark Pt.
Gull Pt.
Bay
Cabins
Ranch
bldgs
TWIN PEAKS
2060
2050
2100
1050
875
(625)
32
A
B
C
D
E
F
G
H
I
N
Loiter Area 1.5-NM Radius Centered
100' AGL to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7000' to 9000' MSL
4000' to 6000' MSL
1000' to 3000' MSL
100' AGL to 1000' MSL
SFC to 100' AGL
Test Range Airspace
A 57.4815 / -152.3244
B 57.4159 / -151.9348
C 57.1790 / -152.4419
D 57.4227 / -152.4838
E 57.4520 / -152.4473
F 57.4519 / -152.4299
G 57.4693 / -152.4290
H 57.4808 / -152.3576
I 57.3772 / -152.2822
For Radial arch info. from UGAK Island waypoint I, proceed on a heading of 78° 12 miles, then proceed along a southwestern arch to a point located 12 miles at sea on a heading of 200° from waypoint I.
Loiter Area
57.2395 / -152.1534

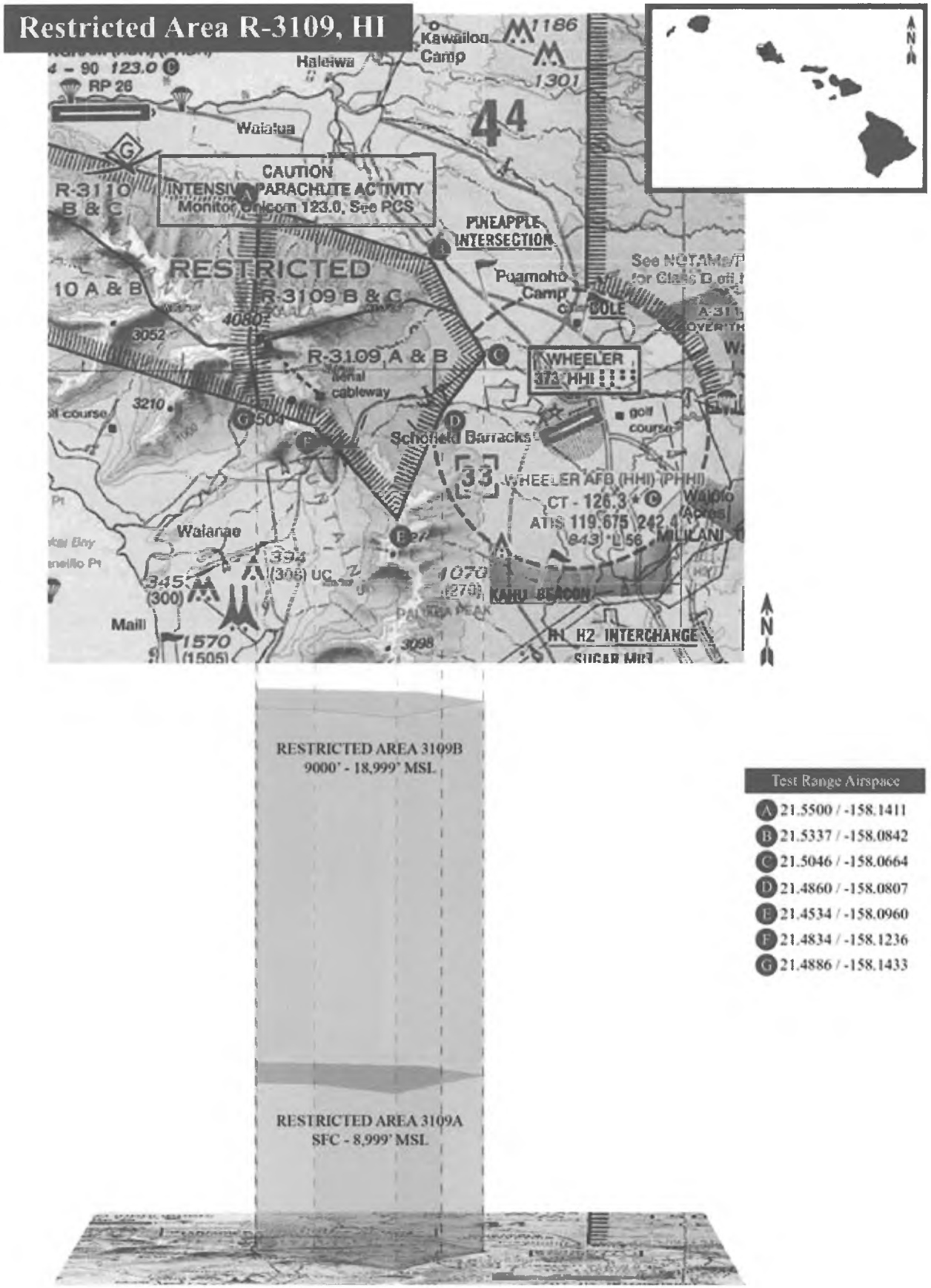

North Slope Range, AK
AK
Loiter Area 5-NM Radius Centered
SFC to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7,000' to 9,000' MSL
4,000' to 6,000' MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 70.7546 / -151.9966
B 70.6534 / -150.9988
C 70.6778 / -150.5719
D 70.7357 / -149.8734
E 70.6505 / -148.8415
F 70.5039 / -147.6605
G 70.4440 / -146.6543
H 70.3680 / -146.0000
I 70.0000 / -140.0000
J 68.3285 / -148.5001
K 68.3334 / -149.9980
L 70.0000 / -152.0000
Loiter Areas
70.4810 / -149.8555
70.1495 / -148.4516
68.4689 / -149.4859

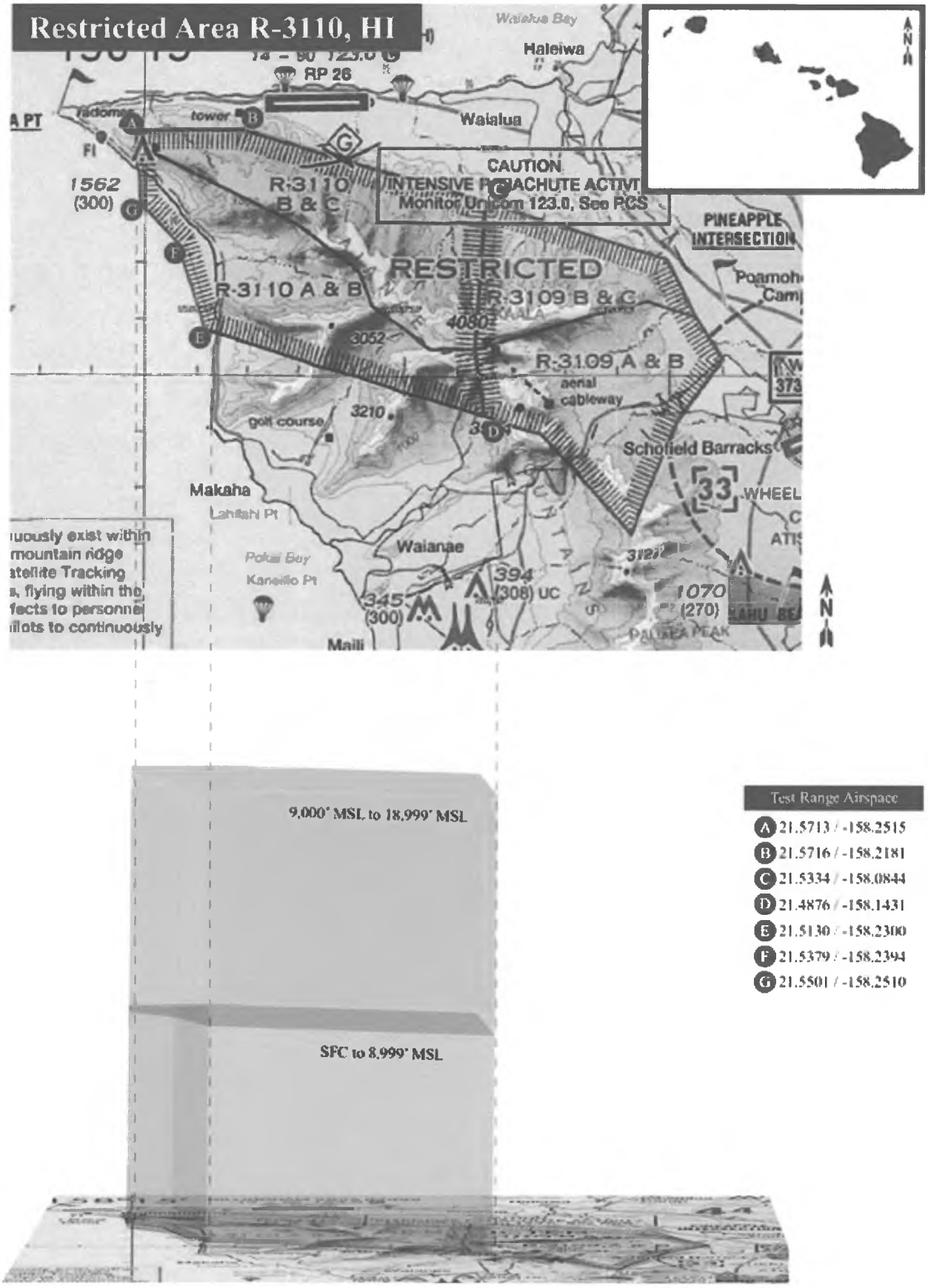

Oliktok, AK
Oliktok Pt
bldgs
Spy Is
bldgs
A
B
C
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 4.5-NM radius off Centerpoint 70.5113 / -149.8584
B 70.6840 / -150.0000
C 70.6835 / -149.8054


Poker Flat, AK
POKER FLAT RESEARCH RANGE
Chatanika
buildings
cabins
Cleary Summit
Eldorado Camp
Dome Camp
915 (265)
2700
1500
1000
A 17
162
Cabin
47
FOX
Olnes
N
Loiter Area
5-NM Radius Centered
SFC to 10,000' MSL
2,500' MSL to 10,000' MSL
100' AGL to 2,500' MSL
SFC to 100' AGL
5-NM Radius
A 65.1203 / -147.4685
Loitering Area
65.1209 / -147.4683

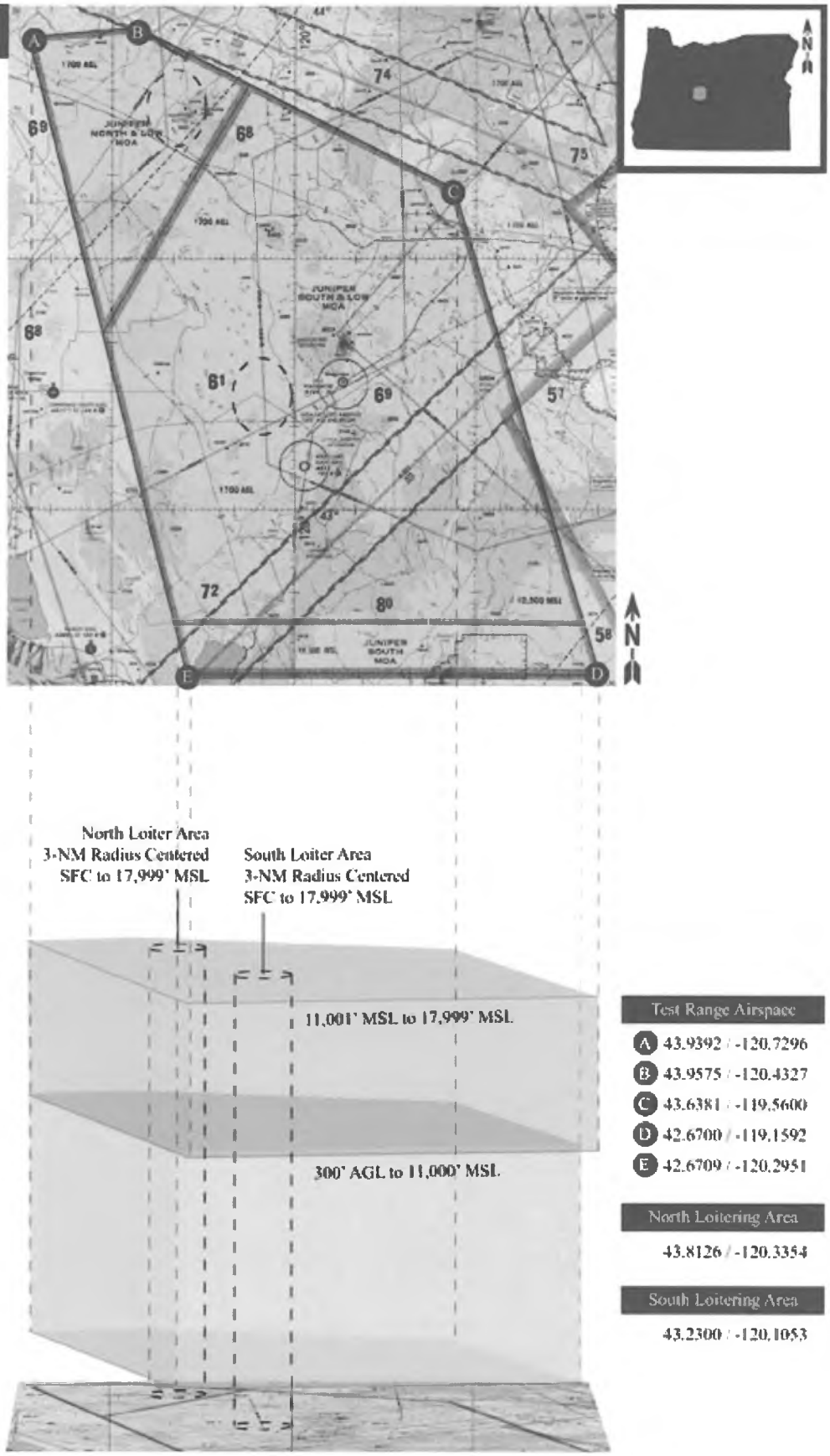

Wainwright, AK
W153°54'
W150°06'
W150°18'
C
B
A
WAINWRIGHT RCO
FAIRBANKS
Wainwright
(PAWI)
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 0.5-NM radius off Centerpoint 70.6367 / -160.0053
B 70.7575 / -160.3964
C 70.7730 / -160.3223


Makua-Humuula Highway, HI
A
B
C
D
N
Test Range Airspace
A 21.5046 / -158.0664
B 19.7776 / -155.6973
C 21.4834 / -158.1236
D 21.4534 / -158.0960
FL600 to UNL
200 NMs
Loiter areas will consist of
Restricted areas 3103, 3109, 3110
SFC to FL190
R-3109 & R-3110
Loitering will take place inside
Restricted Areas located at either end
SFC to FL300
R-3103


Restricted Area R-3109, HI
Kawailoa Camp
Haleiwa
RP 26
Waialua
CAUTION
INTENSIVE PARACHUTE ACTIVITY
Monitor Unicom 123.0, See PCS
R-3110 B & C
PINEAPPLE INTERSECTION
RESTRICTED
R-3109 B & C
10 A & B
Poamoho Camp
DOLE
WHEELER 373 HHI
R-3109 A & B
cableway
Schofield Barracks
golf course
WHEELER AFB (HHI) (PHHI)
CT - 126.3
ATIS 119.675 242.4
Waialae
MILILANI
Waianae
KAHU BEACON
Makua
H1 H2 INTERCHANGE
RESTRICTED AREA 3109B
9000' - 18,999' MSL
RESTRICTED AREA 3109A
SFC - 8,999' MSL
Test Range Airspace
A 21.5500 / -158.1411
B 21.5337 / -158.0842
C 21.5046 / -158.0664
D 21.4860 / -158.0807
E 21.4534 / -158.0960
F 21.4834 / -158.1236
G 21.4886 / -158.1433


Restricted Area R-3110, HI
Haleiwa
Waialua
RP 26
tower
CAUTION
INTENSIVE PARACHUTE ACTIVI
Monitor UHF com 123.0, See PCS
R-3110
B & C
RESTRICTED
R-3110 A & B
R-3109 B & C
R-3109 A & B
PINEAPPLE
INTERSECTION
aerial
cableway
golf course
Schofield Barracks
WHEEL
Makaha
Lahilahi Pt
Waianae
Kaneilio Pt
Maili
1562
(300)
3052
4080
3210
394
(308) UC
345
(300)
1070
(270)
9,000' MSL to 18,999' MSL
SFC to 8,999' MSL
Test Range Airspace
A 21.5713 / -158.2515
B 21.5716 / -158.2181
C 21.5334 / -158.0844
D 21.4876 / -158.1431
E 21.5130 / -158.2300
F 21.5379 / -158.2394
G 21.5501 / -158.2510

Juniper, OR



Test Range Airspace

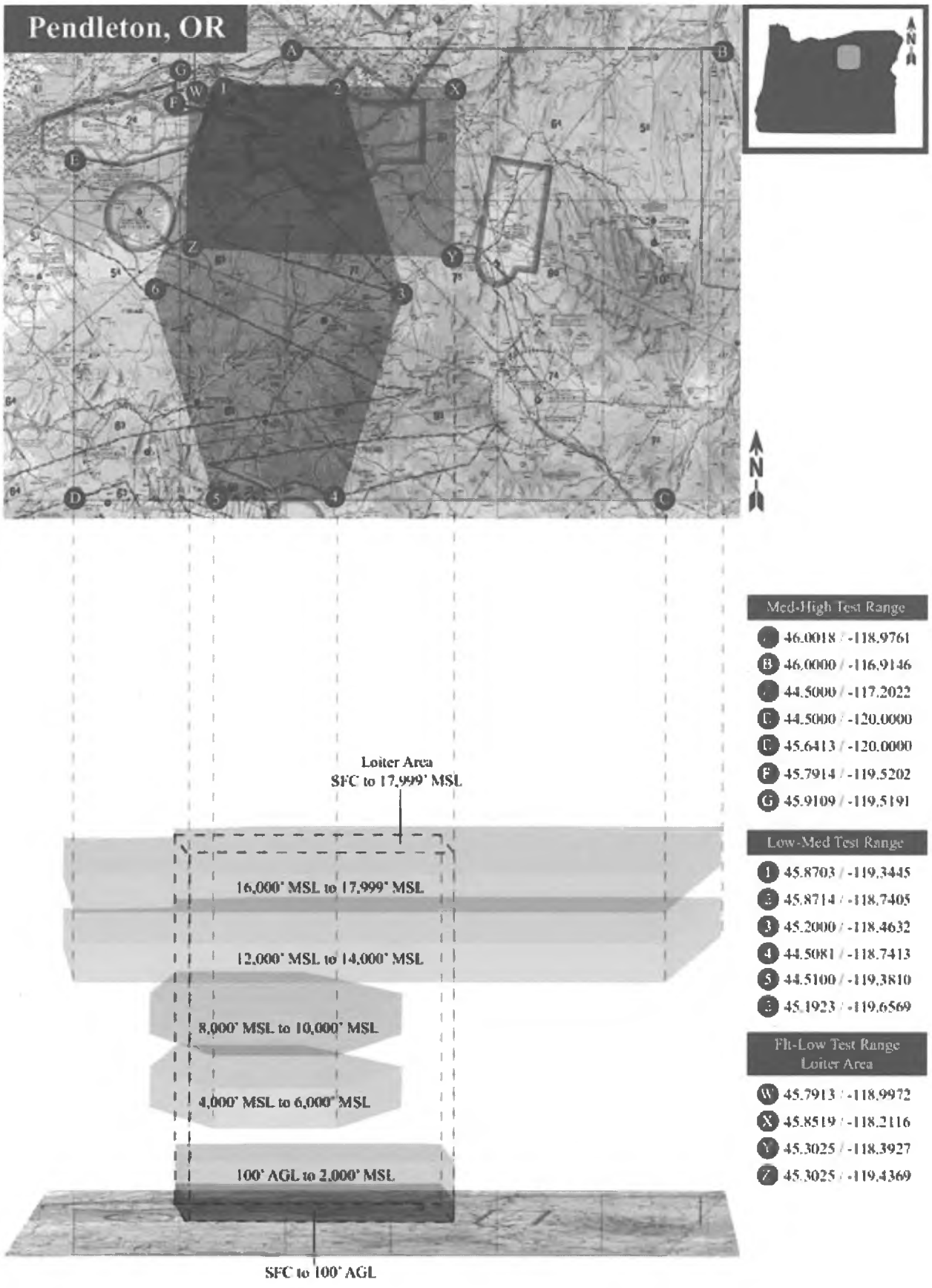
- A 43.9392 / -120.7296
- B 43.9575 / -120.4327
- C 43.6381 / -119.5600
- D 42.6700 / -119.1592
- E 42.6709 / -120.2951

North Loitering Area

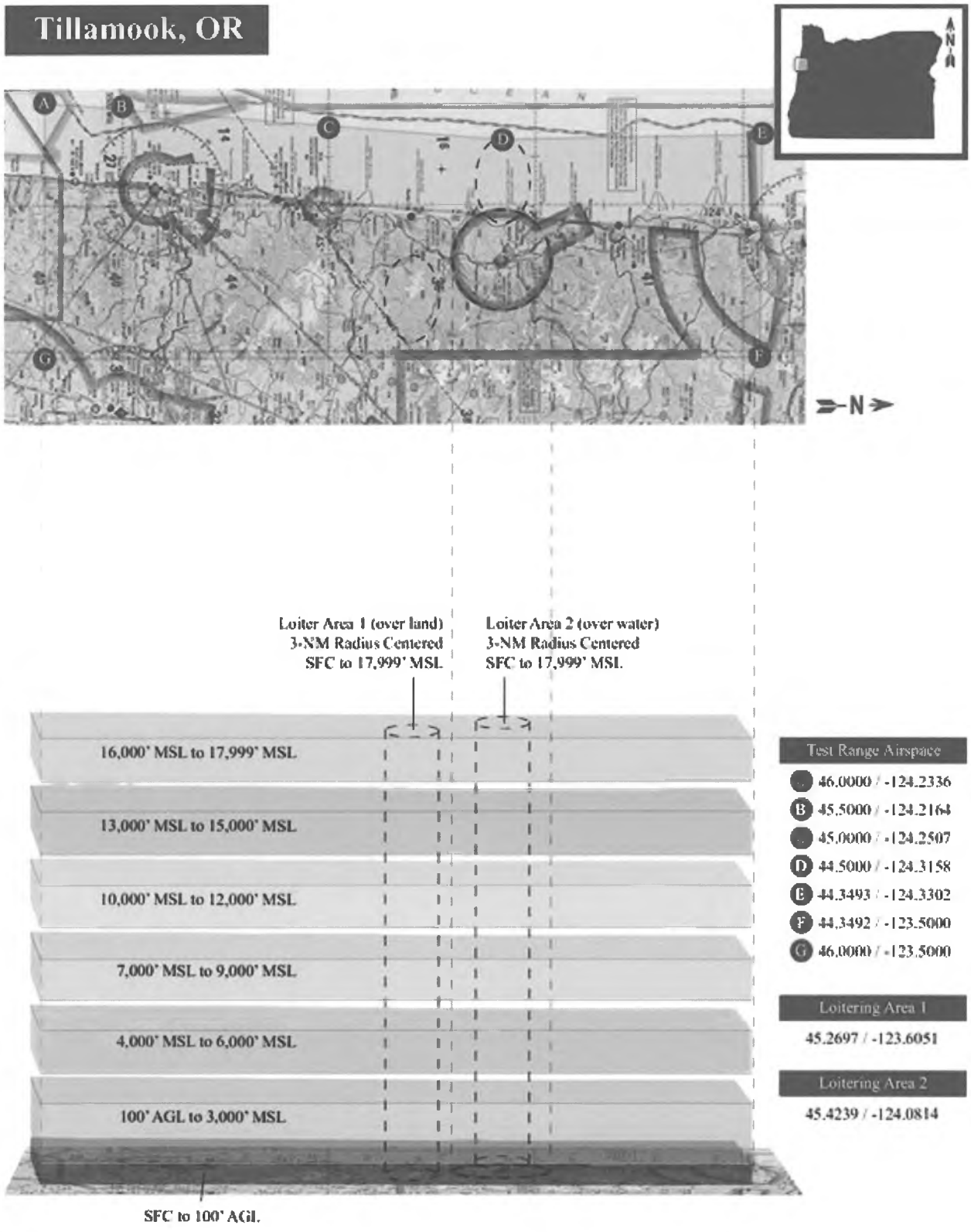
43.8126 / -120.3354

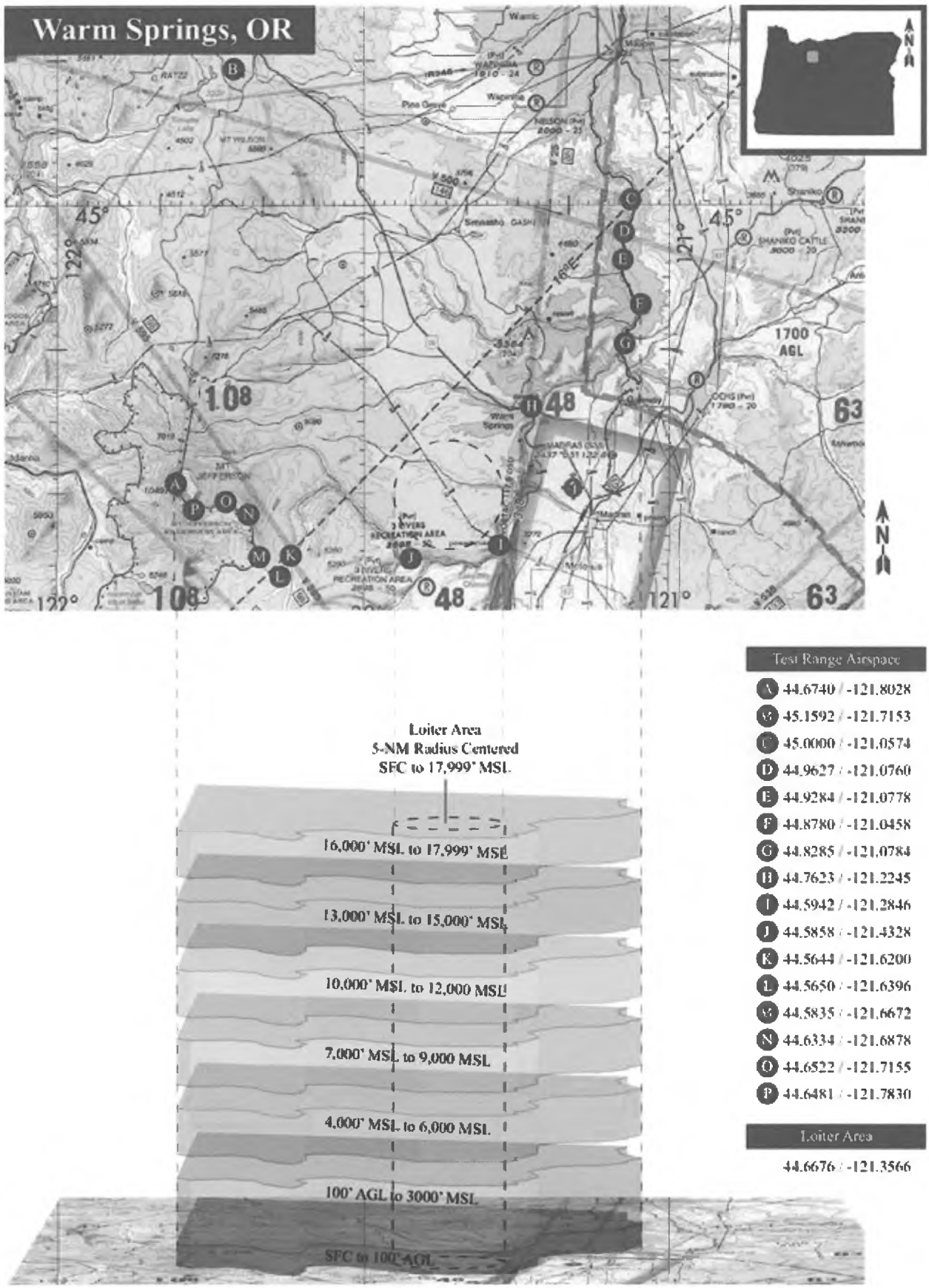
South Loitering Area

43.2300 / -120.1053


Pendleton, OR
N
Loiter Area
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
12,000' MSL to 14,000' MSL
8,000' MSL to 10,000' MSL
4,000' MSL to 6,000' MSL
100' AGL to 2,000' MSL
SFC to 100' AGL
Med-High Test Range
A 46.0018 / -118.9761
B 46.0000 / -116.9146
C 44.5000 / -117.2022
D 44.5000 / -120.0000
E 45.6413 / -120.0000
F 45.7914 / -119.5202
G 45.9109 / -119.5191
Low-Med Test Range
1 45.8703 / -119.3445
2 45.8714 / -118.7405
3 45.2000 / -118.4632
4 44.5081 / -118.7413
5 44.5100 / -119.3810
6 45.1923 / -119.6569
Flt-Low Test Range
Loiter Area
W 45.7913 / -118.9972
X 45.8519 / -118.2116
Y 45.3025 / -118.3927
Z 45.3025 / -119.4369

Tillamook, OR




Warm Springs, OR
Loiter Area
5-NM Radius Centered
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
13,000' MSL to 15,000' MSL
10,000' MSL to 12,000 MSL
7,000' MSL to 9,000 MSL
4,000' MSL to 6,000 MSL
100' AGL to 3000' MSL
SFC to 100' AGL
1700 AGL
Test Range Airspace
V 44.6740 / -121.8028
W 45.1592 / -121.7153
C 45.0000 / -121.0574
D 44.9627 / -121.0760
E 44.9284 / -121.0778
F 44.8780 / -121.0458
G 44.8285 / -121.0784
H 44.7623 / -121.2245
I 44.5942 / -121.2846
J 44.5858 / -121.4328
K 44.5644 / -121.6200
L 44.5650 / -121.6396
M 44.5835 / -121.6672
N 44.6334 / -121.6878
O 44.6522 / -121.7155
P 44.6481 / -121.7830
Loiter Area
44.6676 / -121.3566

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09/19/14 Task Force Meeting: Presentations and Public Testimony

<TARGET><BILL></BILL><SUBJECT>09-19-14 Task Force Meeting Presentations and Public Testimony</SUBJECT><COMM><TARGET></COMM></TARGET>

Jim Arnesen
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REPRESENTATIVE
SHELLEY HUGHES

Economic Development
Trade and Tourism Committee
Chairman
Energy Committee
State Affairs Committee
Military & Veterans' Affairs Committee
University Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

HOUSE OF REPRESENTATIVES

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housemajority.org

To: Legislative Task Force on Unmanned Aircraft Systems

From: Representative Shelley Hughes, Co-Chair

Shelley Hughes

Date: September 3, 2014

Re: Committee Schedule for September 18-19, 2014

The Legislative Task Force on Unmanned Aircraft Systems will meet at the Anchorage Downtown Hilton hotel (room number will be posted at the hotel) as part of the University of Alaska UAS Interest Group Meeting for purposes of accepting public testimony.

Thursday, September 18, 2014

3:00pm – 5:00pm
Accepting public testimony
(this portion of the task force meeting will NOT be teleconferenced or available for akl.tv)

The Legislative Task Force on Unmanned Aircraft Systems will meet at the temporary Anchorage Legislative Information Office, 733 West 4th Ave., 1st Floor Conference Room.

Friday, September 19, 2014

9:00am – 12:00pm
Discussion of unmanned aircraft systems matrix and education campaign
Accepting public testimony as time allows
+ Teleconferenced and akl.tv

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Wednesday, September 03, 2014 3:08 PM
To: Bob May (bob@gallerylodge.com); Com Folger; Com Kemp; Connie McKenzie; David Scott; General Katkus; Ginger Blaisdell; Howell, Kelly A (DPS); Joe Jacobson; John Binder - Dep Com DOT; John Parker; Lt. Steve Adams; Margaret Sharpe; McHugh Pierre; Micaela Fowler; Mike O'Hare; Rep. Shelley Hughes; Ro Bailey; Sen. Donny Olson; Steve Colligan - Model Aeronautics; Steve Strait (steve@straitmedia.us); Steve Wackowski; Susan Bell
Subject: task force meeting announcement
Attachments: chief clerk announcement.docx

Please let me know if you will or will not be attending any portion of the UAS Interest Group meeting on Sept 16-18 (in addition to the public testimony on the afternoon of Thursday Sept 18). I am working with the University to reserve spaces for task force members.

I will send an information packet on Monday September 8 when I finish gathering information.
Let me know if you want anything specific on the agenda:

- UAS matrix
- Education campaign
- Update from Joe Josephson and invited guest(s)

Thank you
Ginger Blaisdell

Chief of Staff
Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 409
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

If you would like to subscribe to Representative Hughes' newsletter, please click here.

Legislative Task Force on Unmanned Aircraft Systems
September 19, 2014 Meeting at 733 West 4th Ave
Temporary Anchorage Legislative Information Office

9:00am – 12:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof

- Ginger Blaisdell, Staff to Rep. Hughes
- David Scott, Staff to Senator Donny Olson

Guest Attendee(s):

Kerry Long, FAA Chief

AGENDA

9:00am Welcome and Introductions .....Representative Shelley Hughes

- Comments on UAA Interest Group Meetings
- Review of Meeting Summary from August 1, 2014
- Invited Guest(s): Kerry Long, FAA Chief
- Today's discussion topic: Education Campaign
- DRAFT Letter to Commissioners
- Public Testimony (as time allows)
- Adjournment

Task Force Responsibilities per HCR15 and Review of Resolution

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications;
3. evaluating complaints and concerns expressed to the task force;
4. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to unmanned aircraft systems;
6. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;
7. conducting a public hearing concerning privacy and the capture of data by unmanned aircraft systems at the University of Alaska's test site;
8. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

Provided Documents .....Ginger Blaisdell

- News Article UAS Vision 9-10-2014: Amazon.com Unveils 'Drone Store' and documents
- AMA matrix documents provided by Steve Colligan
- Type and Purpose matrix draft by Ginger Blaisdell
- Pilot skills matrix drafted by Jay Skaggs
- DRAFT Letter to Commissioners

Future Agenda Items .....as listed in August

- Responses to FAA rules in Oct/Nov
- PPUTRC public meeting on privacy policy at the September meeting will meet the FAA requirements of the test site for this year
- Data retention
- Invitation to AMA officials on education
- Define framework – training and education
- Dept Public Safety guidance document on enforcement of UAS
- Integration not segregation of airspace: invite DOI, FAA, Military, BP/Exxon, etc
- System for gathering citizen complaints

Follow Up – To Do ..... **as listed in August**

- Military mission in Alaska – process and plans
- Letter to Commissioners of state agencies on UAS re: point of contact for their department
- Italy data protection laws
- Who to contact? Complaint / enforcement system / responses
- FAA enforcement
- Doug Marshall UND privacy
- UTMS – unmanned traffic management system
- FAQs could be discussed at a teleconference meeting of the task force

Adjourn ..... **Representative Shelley Hughes**

Legislative Task Force on Unmanned Aircraft Systems
August 1, 2014 Meeting at 733 West 4th Ave
Temporary Anchorage Legislative Information Office

9:00am – 4:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair (not in attendance)
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II (called in)
- Bob May, Gallery Lodge, Kasilof

- Ginger Blaisdell, Staff to Rep. Hughes
- Syndey Seay, Staff to Senator Donny Olson (called in)

Invited Attendee:

- Kathleen Strasbaugh, Legislative Legal (called in for questions)

Meeting attendees:

- Gary Williams, Aero Forensics
- Jeff Yates, Dat/Em Systems International
- Brandon Anderson, Alaska Aerial Technology
- Jay Skaggs, FAA
- Pete Adams, ENI Petroleum
- Mike Pannone, Aero Forensics
- Carole Anderson, UAA Student Aviation Administration

MEETING SUMMARY

9:00am Welcome and Introductions .....Representative Shelley Hughes

- Round table discussion of expectations from each task force member; specific outcomes include:
  1. Ensure that safety is the utmost priority, and also that there be a cooperative effort between all facets of not only the industry, but the public and federal and state government to foster the growth of the industry in the right way.
  2. Consider an internship program introduced into the university system.
  3. Recognizes a wide range of uses for UAS, but must be very mindful of public safety and public trust. Must not infringe on the privacy of the public.
  4. Oct,Nov the initial draft will be out from FAA and the Task Force may want to consider weighing in during the public comment section.
- Each member discussed his/her background and personal experience with unmanned aircraft systems, and some general comments about what the task force can do for Alaska.

Task Force Responsibilities per HCR15 and Review of Resolution

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;
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5. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
6. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry;
7. considering recommendations for public education related to unmanned aircraft systems;
8. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws; and
9. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications.

Review of HB255 ..... Lt. Steve Adams

- Lt Adams read through HB255 and discussed the applicability of the law.
- Current update on Department of Public Safety using UAS
    - DPS does not currently have a program for UAS, have been working towards establishing one for the past two years. The missions when UAS would be used would likely include:
        1. FIRST: search and rescue, within defined incident perimeter
        2. SECOND: Lost children or vulnerable people
        3. THIRD: Mapping or examination of traffic incidents that may not be accessible
        4. FOURTH: Mapping of hostile crime scenes.
        5. FIFTH: Officer safety during tactical operation
        6. SIXTH: Natural disasters and hazardous materials operations, in areas
    - Will not turn these into "speed monitors" - These are public safety monitors, not law enforcement monitors.
    - DPS is hoping to acquire a UAS in the very near future. Due to short-staffing and lack of funding, DPS is probably another year out from purchasing a UAS.

Earlier this month the Fairbanks area conducted multiple mock scenarios where traditional methods and UAS were used.

TRAFFIC: for 3D mapping of a traffic accident and how the data was implemented to draw lines between points of impact etc. Current equipment took one hour for imaging the scene and 3 hours to process the data before evidence could be moved. Mapping by using the Scout UAS took about ten minutes on scene and an hour and half to process the data.

- UAS will dramatically reduce traffic blockage time during incident management. Mapping of the entirety of an incident scene is a slow process due to the spread of evidence items after collision. Expectations are that UAS will allow for more immediate clearing of a crash scene and could reduce process time by up to three hours.
- It was also added that officer safety, overall traffic monitoring of flow into an incident area can also be greatly improved by UAS implementation.

Active Shooter in a Multi-story Building: UAS flew over the building with a body-temp monitoring tech to monitor for heat signatures within the building. The UAS relayed info to commander as to the location of the gunman. SWAT team was able to assess the situation better and complete action more safely by understanding the movement of the gunman.

FIRE: UAS was able to identify the hottest spot of the fire within an insulated training building, and the UAS was able to identify the "hot spots" and communicate that to the officers.

If we have a UAS for Department of Public Safety, is the Certificate of Authorization (COA) needed for every incident? Or is it a one-time COA?

- Lt Adams: First, we need a training COA to be able to demonstrate safe operation, then a jurisdictional COA, then on a case-by-case basis we would need to evaluate whether it is feasible and safe to use UAS.
- There are states/counties currently operating UAS under jurisdictional COAs.

FAA Reg 8900.268 addresses the inappropriate use of UAS, gives some idea to the field offices as to what they can do. Currently, there are no state statutes that are specific to UAS.

Review of Status of PPUTRC ..... Ro Bailey

- Update from Ro Bailey on test site and range activity

On December 30, 2013, Alaska was announced as a Test site location by the FAA. To become operational, Alaska had to complete flight planning guide, improve privacy, and apply for COA.

The finalization process culminated in Michael Huerta, FAA Administrator, coming to Alaska in early May and signing the COA. At the same time, PPUTRC launched the Aryan Scout flight in Fairbanks conducting a mission over the large-animal science facility.

- Goals of research was to study how the drone affects the animals, does it disturb them, etc...
- Test site will be taking "baby steps" alongside FAA to make sure that everything they do is both advancing the state of knowledge, while meeting all of the required regulations.

PPUTRC Expectations:

- Anticipating COAs for multiple aircraft under one COA, takes about 90 days to get a COA approved, barring any major setbacks.
- Air-worthiness: there are no "standards" to declare airworthiness. The FAA will establish a special airworthiness program for the test sites. Will be performance standards for airworthiness, rather than design standards. Tests will be performed on UAS in the test site to determine airworthiness based on performance.
- It's about building confidence with the FAA, building a trust, as that increases the test site may gain the ability to produce its own COAs.

What is the interest level for use within the test site, now that AK is officially a site?

"Almost overwhelming interest, way more industry users are interested now", including local and state aviation entities. Many entities are recruiting commercial pilots to become UAS pilots.

Without federal funding, how are you supporting the test site?

ACUASI has the initial funding provided by the legislature ($5 million FY2012), "still living on that, but it's going – fast". The test site business model provides for directly charging for use of the test site for private users, industry testing, as well as government missions and grants.

- **Possibility of UAF becoming an FAA Center of Excellence**

  FAA Center of Excellence, Univ of Mississippi and Alaska are partnering in the application process, and if they are chosen, the state would receive funding from the center for research. Process of selection is in beginning stages.

Ro was asked to describe the process of how UAS were used in the Kenai wildfire.

Too many steps to discuss all but in summary, we got a phone call from a member of the national guard, saying they may want to use UAS on Funny River fire. The Scan Eagle was needed for the mission. After receiving the verbal go-ahead, Ro called the FAA and requested an emergency COA on Monday, Memorial Day. Team was dispatched immediately to Kenai. COA was approved in less than 24 hours.

DMVA: *"This was a great exercise in the process of HOW to get a mission like this approved, an exercise in process and futility."*

The flight took part at night, to scan thermal hotspots of the fire and map the hot spots, pass the information onto the firefighting team leads for access from mobile phones. The information allowed the crews to knock down a number of hot spots.

The real cost-saving potential is more eventual than anything, when we have the resources (models of UAS) that we need for a range of scenarios (fires, search and rescue, etc...) Once we have the proper tools for the proper scenario, that's when the real cost savings will be seen. Matching the right UAS with the right scenario is KEY.

Will there be a debriefing process after the use of UAVs in real situations?

DMVA: Yes, we do have debriefs to address needs to make improvements and better the process.

Report on AUVSI Conference in Florida May 2014 .....Joe Jacobson

- Copy of flyer that was developed for the AUVSI conference is provided
- Update from the DCCED efforts in promoting UAS industry in Alaska:

AUVSI event in Florida May 2014: Over 8000 attendees, majority being aviation vehicles, some ground and under-water. The Department had a booth to share info about why AK is leading the nation in advancing UAS industry. Industry follow up: generated about 40 industry contacts. PPUTRC is confident that the connections made at this event have possibility of future contracts.

Panel discussion at AUVSI took place with AK reps. Follow-up interviews resulted as well as the possibility of a PBS-funded tv documentary series on Alaska UAS.

The group of AK reps at the event met with a global simulation training company to discuss opportunity to establish a UAS training facility in AK. That company has been in Alaska this week to tour possible locations and learn what AK has to offer.

Report on Military and Alaska Aerospace Corporation Consideration of UAS ..... Mike O'Hare

- What are the military plans for UAS in Alaska?

  AK National Guard, AK Aerospace, Homeland Security all fall under DMVA. Department Of Deffense plans to incorporate the Gray-Eagle UAS (predecessor to the predator drone) to the into Alaska for long-range training; NOT a military mission. The FAA regulates the process and COAs are still required for all missions.

  Weaponization of UAS on the domestic front has never been discussed for the National Air Space. There is a clear line between commercial use and battle-use.

  AK National Guard is not interested in actually owning the platforms, but are interested in training pilots for UAS.

  Emergency Management, Homeland Security perspective: No ownership of platforms, but will contract out services to UAS industry for emergency response and management.

  Same COA process for Gray Eagles, but does that include flights over military airspace?

  DMVA: No, for flights over military airspace during training, no COA, but for any missions that take place outside of that space it will require COAs (for emergency response missions etc...). The military will "have to look at the capabilities, the time associated with the process, and the cost. If it's less expensive to have satellite imagery available, we'll use that but it is always good to have options."

- What are the AAC plans for UAS in Alaska?

  AK Aerospace Corp will be working with the university to implement training sites and programs. Kodiak may become a training range. AK Aerospace Corp will not be purchasing any platforms, but is interested in operating the facilities.

Report on Department of Transportation .....John Binder

- Exploring uses of UAS by DOT, opportunities available. State is very excited about the possibility of using UAS to develop the GIS system for the state for mapping and geography.

- Concern with the integration process. A lot of traffic in our skies, "big sky becomes not so big". Recovery of aircraft is another point of concern.
- Biggest factor is proper communication between users and UAS pilots, and the airports and state.

Introduction of Items in Notebook .....Ginger Blaisdell

Tab 1

- Final Report to the Legislature, June 30, 2014
- HCR15
- HB255

Tab 2 – **Up to date with industry**

- Newsworthy comments – pulse of the industry – What's happening with UAS policy worldwide

All documents were provided to stimulate dialogue and consider others' good ideas.

Documents included a summary of ten of the most notable UAS currently in the news and a blog with good info graphics for consumers. The FAA published a fact sheet January 6, 2014 that succinctly described Civil UAS, Public UAS and Model Aircraft. Australian Certified UAV Operators Inc comments on Australia's legislative recommendations – many are similar to Alaska's concerns. UK Civil Aviation Authority is establishing a case-by-case review for approving UAS. Philippines issued UAS regulations that are very restrictive. News article on South Africa using the term "RPAS" rather than UAS to bring the "pilot" back into the acronym to identify that a human is involved. Fully autonomous aircraft are not being considered at this point. And finally an announcement that the FAA is on track to meet its Sept 2015 deadline of integrating UAS into the National Air Space.

UNIV: Fully autonomous UAVs are currently banned by the FAA. Related the conversation back to the technology being implemented in automobiles (ABS braking, parallel parking, etc...) and how it takes some work for the public to become comfortable with this type of technology.

Tab 3 – **Hobby Fliers**

All documents were provided to stimulate dialogue and consider others' good ideas.

- Guidelines for Hobby Fliers – prepared by the Academy of Model Aeronautics entitled "What Can I Do With My Model Aircraft?"
- FAA Interpretation of the Special Rule for Model Aircraft
- P.L. 112-95 Sec 336. Special Rule for Model Aircraft

AMA: The Academy of Model Aeronautics has also prepared a matrix of UAS platforms, their intended uses and requirements.

Hobbyists' perspective: through this entire process, you learn the methods of procedure. AMA's mission is to promote safety, regulations and responsibility for our youth. Regardless of whether they go into the UAS field, the process will teach give them valuable experience and prepare them for professional life." STEM education, training, and igniting the interest in our youth should be a priority.

AMA is preparing to roll out a hobby self-certification system. To obtain special classification for aircraft over 55 lbs you need to prove that you have the ability to safely fly an aircraft over 55 lbs. AMA will provide training programs for certification. AMA offers special waivers and training programs for many different types of UAS.

Tab 4 – **Commercial Fliers**

All documents were provided to stimulate dialogue

- FAA expediting commercial use for film production, precision agriculture, power line and pipeline inspection, and oil and gas flare stack inspection
- Perception that FAA Does not/Cannot Enforce
- Hollywood cinematography exemption
- UAS used by private investigators
- Industry already solving issues before UAS are approved for commercial use: flight tracking software, no-fly-zone software around airports, auto-parachute for system failure, and more. **Industry**: Patent on sensory avoidance technology, a radar system that weighs about 12.6 ounces, and when it is finished and ready for production it will weigh closer to 6 ounces.

Tab 5 – **Privacy and Safety Concerns**

All documents were provided to stimulate dialogue

- Revisit Legislative Legal Services memo on existing privacy laws
- New memo from Legislative Legal Services regarding private investigators using UAS
- Obama issues executive order for National Telecommunications and Information Administration to develop guidelines for UAS privacy.
- Definition of "reasonable expectation of privacy"
- Australia's power point on Commercial RPAS and Privacy

Tab 6 – **Public Education, Evaluating Complaints, General Operations, Certification, Insurance/Liability, Consequences**

AMA: Within discussions about large operators and industry advancement is the opportunity for STEM education for our youth. UAS provide a great opportunity to get our kids engaged in engineering, science and technology. Engaging the general public is crucial for the process of integration. We need to define the broad spectrum of usage and educate the public on UAS, the rules. "It's happening, and we need to get out in front of it."

UNIV: discussed the intern program they have at UAF currently, four interns now and discussion of future private sponsorship for "co-op" program.

Public: As a commercial pilot, the fact was discussed that large aircraft are currently almost fully autonomous. Human pilot takes off, programs the route into mapping system and the plane can fly and land itself with very minimal human interaction. Emphasis that in order to gain the public trust and comfort level with UAS in commercial airspace, they need to rely on the positive stories (the search and rescue success, fire-fighting, etc.) The task force cannot move too quickly and risk a negative outcome.

Flip chart pages on walls summarized these discussion points

- Industry Needs:

    1. Require manufacturers to include safety flyer in all hobby/commercial aircraft sold
    2. Signage when flying for commercial purposes (such as real estate or agriculture) - "unmanned aircraft in flight"
    3. Idea of a "fishing license" would not be needed for commercial use because of other certifications and licensure. The license would include a sticker for the aircraft so it could be tracked back to the responsible owner – maybe for hobby

    AMA: From the hobbyist's perspective, we are required to have identification stickers on aircraft. The real question is how to define and separate the levels of the airspace to determine the regulated differences between commercial and hobbyist UAVs. Does the general hobbyist know this or just active AMA members?

    UNIV: The FAA is working on licensing requirements right now. There is a requirement to register aircraft now, just like any other manned aircraft. This allows the UAS to be traced back to the owner. In the commercial/industry sector, insurance companies require UASs to be stickered for ID.

- Future Meeting Agenda:

    1. Responses to FAA rules in Oct/Nov
    2. PPUTRC public meeting on privacy policy at the September meeting will meet the FAA requirements of the test site for this year
    3. Data retention
    4. Invitation to AMA officials on education

5. Define framework – training and education
6. Dept Public Safety guidance document on enforcement of UAS
7. Integration not segregation of airspace: invite DOI, FAA, Military, BP/Exxon, etc

- Public Education and Outreach:

1. Public Trust
2. AMA certification program
3. UAA – UAS course taught by Harry Kieling Wed nights beginning Aug 27
4. Plus or minus 55 lbs: civil ~ public ~ hobby
5. Sizes and purpose
6. Develop matrix for the common person ~ Define what a UAS is, what a model aircraft is. What their purposes are. Where, when how can they fly?
7. Competition and award for best government use

- Public Information and Education Campaign: Possibly start the process at a very young age via education and school system.

1. User polls?
2. Hobby transition to professional
3. Intent and use matrix ~ including categories and distinct lines of separation as to the types of operations and the regulations associated with each category
4. Web presence
5. Pamphlet
6. Successful uses
7. Challenges
8. Privacy
9. STEM / voc tech
10. Public relations: who's doing what? Government, industry, hobby
11. Op Ed in publications
12. Social media
13. DCCED marketing assistance

- Follow Up – To Do

1. Military mission in Alaska – process and plans
2. Letter to Commissioners of state agencies on UAS re: point of contact for their department
3. Italy data protection laws
4. Who to contact? Complaint / enforcement system / responses
5. FAA enforcement
6. Doug Marshall UND privacy
7. UTMS – unmanned traffic management system
8. FAQs could be discussed at a teleconference meeting of the task force

Tab 7 – **Written public testimony**

- No written testimony provided
- Public attendees provided comments as requested throughout the day

3:30pm **Closing Remarks and Adjourn**

FINAL THOUGHTS:

Ro: Interest Group meeting coming up in September. What we're doing, Test site info, FAA, usergroups Sep 16-18.

Steve Strait: important to focus on integration of the airspace, not segregation. Need to reach beyond just the entities that we represent here on this TF. Inclusion of the military in the discussion. Education, we should do our best to mitigate accidents via education of the public to hopefully minimize incidents.

John Parker: Public education is vital. With an informed public, we are more likely to be successful in integrating UASs.

Bob: Education of controllers, maintainers, operators and the public. Continuous evaluation of the industry and policing it.

Steve Colligan: I agree with education, but we have to define it. Public Relations, the industry and oil companies and those who are using this tech are responsible for telling the stories of the good that is being done with UASs.

John Binder: Supported Colligan's idea of a framework/matrix.

Mike O'Hare: Education. What we've done, are doing and should do with UAVs and allow for feedback to address major concerns. Mike can arrange a military contact or provide updates on how the military is using the technology.

Joe Jacobson: Prioritization of what the TF can reasonably accomplish by taking an approach that things can be taken on one at a time and accomplished. Not becoming overwhelmed by too much information. Need to be good and strategic about what our messaging is going to be. A public awareness campaign, budget action to promote the work of this TF and information to the public.

ALASKA
UAS Interest Group

2014 | Alaska UAS Interest Group Annual Meeting

Sept. 15-18, 2014 | Anchorage Hilton Hotel

A forum for civil, commercial and government technologists, engineers, users and stakeholders.

- Learn about the Pan Pacific UAS Test Range Complex
- Examine the potential impacts of UAS activity in the Arctic
- Explore UAS applications to education, research, natural resource management and emergency response
- Hear about how NOAA will use UAS to monitor rivers

Learn more about the conference: www.uasalaska.org
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New Alaska FAA chief focused on safety

ELWOOD BREHMER, ALASKA JOURNAL OF COMMERCE

LONG

As the new head of the Federal Aviation Administration in Alaska, Kerry Long is focused on one word: safety.

The fact that other topics sometimes overshadow the agency's core mission of promoting safe flying is a testament to how effective the FAA is and should not be forgotten, he said.

"I'm pleased that we can focus on issues of efficiency, on issues of getting somewhere late, where we don't have to worry about if we're going to get there," he said. "I think that gets lost in translation. Aviation is still by far the safest mode of transportation."

Long took over as the FAA Alaska Region Administrator July 28. Since then, he has immersed himself in the unique needs of the state's aviators and how the federal agency with oversight of those needs can best meet them.

First and foremost is making sure new and existing users of the skies can operate side by side, as well as advancing how they are monitored.

"My priorities here are NextGen and the UAS test site," Long said.

The UAS, or Unmanned Aerial System, test site sponsored by the University of Alaska Fairbanks Long referred to is one of six nationwide chosen by the FAA to help the agency meet its congressional mandate to develop regulations to integrate unmanned aircraft into the national airspace by the Sept. 30, 2015.

The Pan-Pacific UAS Test Range Complex, headquartered in Fairbanks, includes not only the vast tracts of airspace above Alaska, but also areas of Hawaii and Oregon that afford industry the option to test technology in the Arctic, tropics, or somewhere in between.

Long said the uniqueness of the Alaska test site, combined with the support, financially and otherwise, it has received from the state, has helped push it to the front of the group.

The Legislature appropriated $5 million to UAF's Geophysical Institute in fiscal year 2012 to advance UAS testing. With continued state support, he wants to do whatever the FAA's regional office can to help keep Alaska at the forefront of UAS testing, Long said.

"We can, I think, significantly support UAF and the test site, to be specific, in how we think they ought to be staffed to be able to effectively run this dispersed program they have in Hawaii and Oregon and here," he said.

It will be a challenge for the FAA to do much more because the federal regulation mandate did not come with money.

"Our goal at the FAA is to support these test sites the best we can, but unfortunately we have a mandate but no funding, which is a tough combination," Long noted.

FAA test site evaluators that visited Fairbanks in August were impressed with the safe and efficient operations going on there, Long said from his Anchorage office Aug 29.

While the UAS test site evaluation group was in Fairbanks, the test site staff was able to show first-hand the capability of small unmanned aircraft in a practical setting, he said.

"There was a traffic accident and we happened to have the evaluation team that has been going from test site to test site making sure that everybody is following best practices and that sort of thing," Long described. "One of the folks was the gentlemen responsible for approving any emergency requests for a (certificate of authorization) and he was able to approve the use of a UAS to demonstrate to the team how it would be used with a traffic accident and how much more efficient it is to use a UAS to do the photography work."

Prior to taking the regional administrator position, Long served as the FAA's chief counsel under President George W. Bush from 2007-09. More recently, he was a lead ethics official with the National Transportation Safety Board. Before his public service began, Long was a large aircraft transaction attorney, working primarily for Boeing and Rolls Royce, he said.

He emphasized that communication is key in his new position.

Long met with Rep. Don Young, Sen. Lisa Murkowski, state Transportation Department Deputy Commissioner of Aviation John Binder and private industry representatives to gain perspective about what the state needs from the FAA in his first weeks in Alaska.

Long said he assured the congressional delegation members that, "I will be as candid as we can be as an agency with what's going on."

His experience in other parts of the federal government will help him bridge the gap that all-too-often exists between Alaska and Washington, D.C., he said.

"Not only do you need an effective advocate for the FAA in Alaska, you need an effective advocate for Alaska at the FAA in Washington," Long remarked. "I've been to Washington; I've spent my time there and I've cut my teeth there on many of the issues we face up here.

"I've learned what fights can be won."

He plans on hosting as many Outside federal officials as will travel to Alaska so they can better understand what the state's aviation industry needs, he said.

A visit from FAA Deputy Administrator Michael Whitaker, who is leading implementation of the agency's NextGen air traffic monitoring program, was scheduled for early this month.

NextGen, the "next generation" of aircraft tracking, is a satellite-based system that is designed to update aircraft location quicker than radar, allowing for more efficient flight paths and safer operations at crowded airports.

Within five to 10 years, the FAA hopes NextGen will be installed across the country.

"The bottom line is we are all counting on NextGen into the future to be the answer to the inefficiencies of dealing with ground-based navigation," Long said.

"It's one of the most massive programs undertaken by the government, certainly ever by the FAA.

Beyond engaging with other federal officials, Long said he is happy to talk about the agency's mission in Alaska, whether that's a group of school children or state leaders. It's a vital part of the job he enjoys, and best of all, it hardly costs anything, he said.

"I'm free. I'll go anywhere and I'll talk to anyone about aviation safety and the role of the agency and there's lots of people around here that will do that with me," Long said. "As far as I'm concerned no group is to small as long as they're interested and can help us promote aviation safety."

Elwood Brehmer can be reached at elwood.brehmer@alaskajournal.com.

Amazon.com Unveils 'Drone Store'

Amazon isn't just interested in making its own drones to deliver items — now the company has opened up an online storefront for people interested in buying UAVs, too.Amazon has unveiled the "Drone Store," which features a handful of robotic vehicles and related accessories available to purchase. There's also "Buying Guide" page and a "Fly Responsibly" section that includes links to the Association for Unmanned Vehicle Systems International and the Academy of Model Aeronautics.

Amazon announced its foray into drone delivery, named Prime Air, late last year. The company has recently petitioned the U.S. Federal Aviation Administration to allow it to test its package-delivering robots at an airfield near Seattle, and said it's testing its 8th and 9th generation of aircraft.

Source: Geek Store

g+1

Posted in Business News, Non-Military & Commercial UAS on September 10, 2014 by The Editor.
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AMA ACADEMY OF MODEL AERONAUTICS Bringing Modelers Together

Read the Academy of Model Aeronautics National Model Aircraft Safety Code ›Learn more

AUVSI ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

Visit the Association for Unmanned Vehicle Systems International web page with information on responsible flying ›Learn more

To learn more about operating UAVs in the United States, visit the Federal Aviation Administration's UAS website, including frequently asked questions. Remember that rules vary by location. Amazon provides these links for informational purposes only ›Learn more

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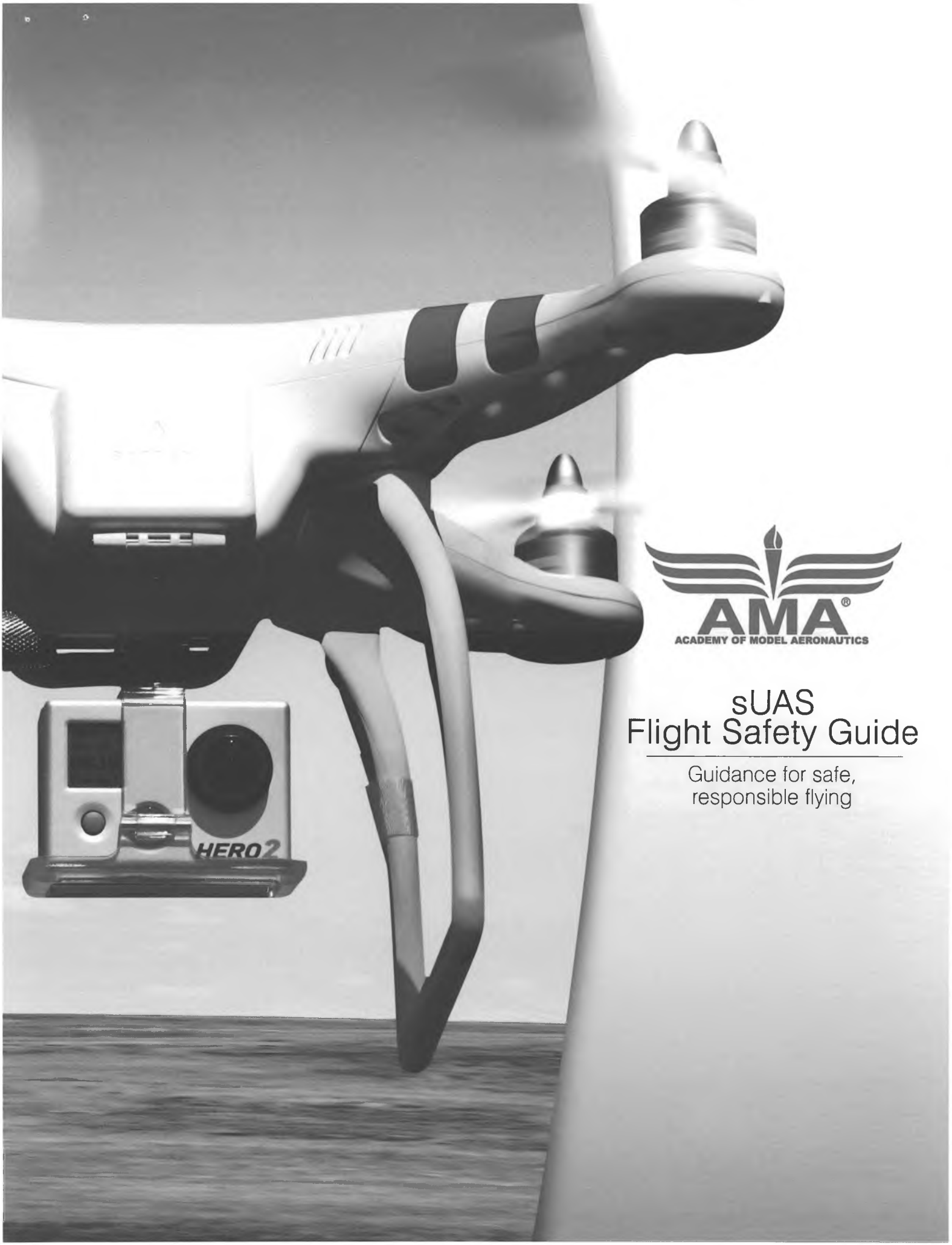

AMA®
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sUAS Flight Safety Guide

Guidance for safe, responsible flying

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Foreward

If this is your first purchase of a recreational small Unmanned Aircraft System (drone) or the first time you've ventured into the world of model aviation, welcome! Welcome to the stimulating and enjoyable world of model aviation and a community of thousands of aeromodeling enthusiasts who for more than 100 years have enjoyed the fascination and allure of virtual flight through model aircraft.

Model aircraft have operated in the National Airspace System (NAS) for decades and have done so safely and responsibly. The aeromodeling activity conducted within the safety guidelines of the Academy of Model Aeronautics has achieved an excellent safety record, a record that surpasses most other forms of aviation. The success of this community was recently recognized by Congress in the FAA Modernization and Reform Act of 2012 with the addition of the Special Rule for Model Aircraft, now Public Law 112-95, Sec. 336.

The establishment of this Special Rule reflects Congress' recognition of community-based programming as an effective and sensible means of managing the recreational small unmanned aircraft activity, and it was Congress' intent to protect this community from onerous and unnecessary federal regulation.

The key to the success of the community and the longevity of the aeromodeling activity is the individual commitment to operating their aircraft in a safe and responsible manner and in accordance with a community-based set of standards.

sUAS are defined as being less than 55 pounds; however, the majority of the platforms in use today are less than 20 pounds, and most are less than 10 pounds. This safety guide is intended to help the sUAS operator to fly his or her aircraft in a safe and responsible manner.

Flying sUAS in a safe and responsible manner certainly means doing so in way that does not endanger persons or property. But, it also means operating your device in a manner that is respectful of community standards, the concerns of others, property and privacy rights, and flying in a community friendly manner. As a general rule:

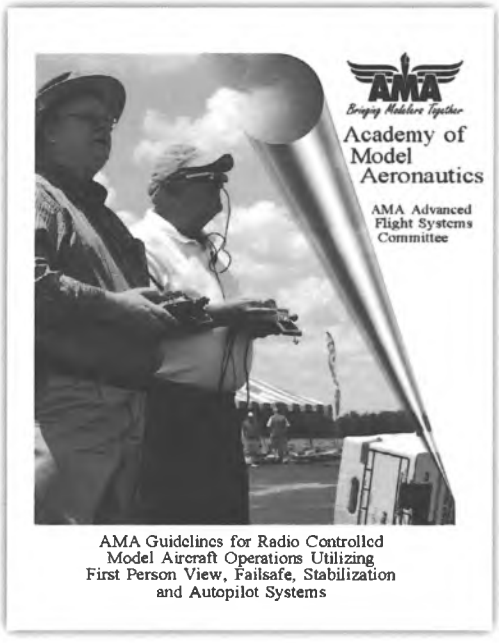
- Don't operate on or fly over private property without first obtaining permission from the property owner and/or the property tenant.
- Don't fly where the operation of radio control aircraft is prohibited.
- Don't fly near open assemblies of people without first obtaining permission or otherwise making prior arrangements to do so.
- Don't fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc. without making prior arrangements to do so.

Fly friendly, fly safely, and enjoy the hobby!

Academy of Model Aeronautics

Basic sUAS Safety Principles

- Do not interfere with manned aircraft operations.
- Yield right of way to manned aircraft. See and avoid other aircraft at all times (AMA Doc #540-D).
- Do not endanger persons or property. No intentional overflight of moving vehicles or unprotect persons. Fly no closer than 25 feet.
- Fly no higher than necessary (less than 400 feet). Remain below surrounding obstacles when possible.
- Avoid operations in close proximity to airports. When within 5 miles of an airport, contact the airport/Air Traffic Control (ATC).
- Enssure pilot competency/proficiency and the safe operation of the aircraft.
- Remain within visual line of sight (VLOS). Use a spotter when necessary/appropriate.



AMA Guidelines for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems

AMA's Privacy Policy

"The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data or information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers."

"SEE AND AVOID" GUIDANCE

A. General:

1. The primary means to avoid collisions between all aircraft flying within our National Airspace System (NAS) is "See and Avoid."

2. Vigilance must be maintained by each person operating an aircraft (whether model or manned) so as to "see and avoid" other aircraft.

3. Model aircraft must avoid manned aircraft. Our privilege to fly model aircraft in the NAS depends on our commitment to remain "well clear" of manned aircraft.

4. Simply avoiding an actual collision is not enough. A "near miss" is not acceptable.

5. Unless flying at a mixed-use site where manned and model aircraft routinely share airspace through their own site-specific rules, model aircraft must fly sufficiently far away from manned aircraft so as not to create a collision hazard.

6. Model aircraft flying must not only be safe, it must be perceived to be safe by the greater manned aviation community. Modelers must continually demonstrate their respect for the safety of manned aircraft by remaining vigilant and well clear.

7. Whenever a potential conflict arises between model aircraft and manned aircraft, the pilot of the model aircraft must always give way to the manned aircraft.

8. The pilot of a model aircraft must never assume the pilot of a manned aircraft can see the model or will perform any maneuver to avoid the model's flight path.

9. Visual Line of Sight is required by the Safety Code. It means that visual contact with the aircraft must be maintained without enhancement other than by corrective lenses prescribed for the model aircraft pilot. All RC flying must remain clear of clouds smoke or any other obstruction to the line of sight.

10. "Blue Sky" is a term used to explain the method used to increase separation between a model and a manned aircraft in the same vicinity. The modeler should maneuver the aircraft in such a way as to increase the amount of *blue sky* perceived between the model and the manned aircraft. By increasing the blue sky separation, the question about depth perception is taken out of the equation and the modeler need not worry whether the model is closer to him than the manned aircraft or further away. Increasing the blue sky between the model and the manned aircraft automatically increases separation between them.

11. A modeler should never place any consideration for the well-being of the model aircraft above the safety of manned aircraft. Maneuvering to avoid the conflict may require that the model aircraft be sacrificed.

12. Free flight models should not be launched with relatively low altitude manned aircraft in sight and downwind or headed downwind from the launch site.

B. Spotters:

1. Before a flight, the pilot must insure that the spotter understands his/her duties and expectations.

2. A spotter should be used to assist in monitoring the surrounding airspace for manned aircraft whenever a flight is expected to exceed 400 feet above the ground and that operation is expected to be in proximity to known manned aircraft traffic such as at a mixed-use facility or within three miles of an airport. The spotter must have sufficient visual acuity and be mature enough to take this responsibility very seriously.

3. A spotter should also be prepared to assist his/her pilot in the event that another model aircraft or spectators become endangered or in turn are perceived to be a danger to the pilot or the pilot's model aircraft.

4. If a model aircraft pilot experiences what he or she considers a near miss with a manned aircraft, that model aircraft pilot should notify AMA Headquarters with a written report of the incident, including action taken by the model aircraft pilot to avoid the manned aircraft. This report is intended to help the modeler, the club, and the AMA capture as much detail as possible so that it may be used to assist all parties in recalling the particulars of the incident at a later time. Call 1-800-435-9262 (1-800-IFLYAMA) extension 230 or 251 for assistance with this report.

Academy of Model Aeronautics
"AMA Advanced Flight Systems Committee"
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operation Utilizing "First Person View" Systems

1. DEFINITION OF TERMS:

Please refer to Page 5 section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

FPV flying of radio control model aircraft by AMA members is allowed only for noncommercial purposes as a hobby/recreational and/or competition activity and must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) *FPV novice pilots* undergoing training at low altitude must use a buddy-box system with an *FPV spotter,* or must go to a safer altitude if no buddy-box system is used.

b) All *FPV* flights require an AMA *FPV pilot* to have an AMA *FPV spotter* next to him/her maintaining *VLOS* with the *FPV aircraft* throughout its flight.

c) The *FPV pilot* must brief the *FPV spotter* on the *FPV spotter's* duties, communications and hand-over control procedures before *FPV flight.*

d) The AMA *FPV spotter* must communicate with the *FPV pilot* to ensure the *FPV aircraft* remains within *VLOS*, warning the *FPV pilot* of approaching aircraft, and when avoidance techniques are necessary.

e) During an FPV flight, the FPV spotter must be prepared to acquire the transmitter/control from the *FPV pilot* and assume *VLOS* control of the model aircraft at any time safe operation of the flight is in question.

f) If an *FPV pilot* experiences a safety issue that does not appear to be a brief glitch, they must abandon *FPV* mode and fly *VLOS.*

g) Before the initial *FPV* flight of an *FPV model aircraft* and/or after any changes or repairs *to essential flight systems*, the *FPV model aircraft* must have an *R/C test flight* by conventional *VLOS.*

h) *FPV model aircraft* must use frequencies approved by the FCC for both the RC system and the wireless video system. Pilots must meet applicable FCC licensing requirements if they choose to operate the RC flight control system or the wireless video system on Amateur Band frequencies.

i) AMA *FPV pilots* must first be capable of flying their FPV model aircraft manually before utilizing *FPV* flight.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft must be flown within *VLOS* of the operator.

b) Model aircraft flown using *FPV* must remain at or below 400 feet AGL when within 3 miles of an airport as specified in the AMA Safety Code.

c) Model aircraft flown *FPV* are limited to a weight (including fuel, batteries, and onboard *FPV* equipment) of 15lbs. and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) AMA *FPV novice pilots* should consider using a cockpit view flight simulator to become accustomed to *FPV* flight.

b) AMA *FPV pilots* should consider using a programmable *autopilot* (AMA Document #560) with a failsafe "return to launch" (RTL) feature that will maintain control of the aircraft in the event of signal loss.

c) When purchasing *FPV* operational systems, always try to select quality equipment, verify its compatibility, install components for interference rejection, and determine that signal range is adequate for maximum VLOS range.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA FPV Pilot is an AMA member who is capable of maintaining stable flight of a model aircraft within its intended flight envelope when flown FPV without losing control or having a collision.

Buddy-Box System is a system that has one transmitter operating as the master controller, while a second transmitter is linked/slaved to it allowing dual control of an aircraft. The operator of the master transmitter allows one or the other transmitter to control the aircraft through the use of a spring-loaded switch. The switch provides instantaneous transfer of control from one transmitter to the other. The buddy-box system is an efficient and effective means of achieving a position transfer of control from one pilot to another.

Although this system is commonly used for training novice fliers, it is also useful in situations where an experienced pilot may have an increased likelihood of needing a second pilot's assistance in maintaining control of the aircraft. The use of the buddy-box may be helpful in assisting pilots with physical limitations, flying in congested environments, during times of reduced visibility, or anytime during FPV when a timely transfer of control may be beneficial.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's flight envelope. (This includes primary radio control systems and any stabilization or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft.

Flight Envelope is defined as the range of airspeeds, attitudes, and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

FPV Aircraft is an RC model aircraft equipped with a video transmitter to send real-time video images from an onboard camera to a ground based receiver for display on a pilot's video monitor/goggles. (*FPV model aircraft* types include: Fixed Wing, Rotary Wing, and Multi-Rotor Platforms).

FPV Novice Pilot is an AMA member learning to fly *FPV* utilizing a buddy-box system with an experienced AMA *RC pilot* operating the master transmitter and serving as the *FPV spotter*.

FPV Spotter is an experienced AMA *RC pilot* who has been briefed by the *FPV pilot* on the tasks, responsibilities and procedures involved in being a spotter; is capable and mature enough to perform the duties and is able to assume conventional *VLOS* control of the aircraft.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's *flight envelope*. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting stable flight).

R/C Test Flight requires an *AMA Pilot* to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its *flight envelope*.

Visual Line Of Sight (VLOS) is the distance at which the pilot is able to maintain visual contact with the aircraft and determine its orientation without enhancements other than corrective lenses.

Academy of Model Aeronautics
AMA Advanced Flight Systems Committee
amaflightsystems@gmail.com

Radio Controlled Model Aircraft Operation Utilizing Failsafe, Stabilization and Autopilot Systems

1. DEFINITION OF TERMS:

Please refer to Page 3, section 7 which contains an alphabetical listing of the definitions of the terms in italics that are used in this document.

2. GENERAL:

All model aircraft flights utilizing *stabilization* and *autopilot* control systems must be conducted in accordance with AMA's current National Model Aircraft Safety Code and any additional rules specific to a flying site/location.

3. OPERATIONS – REQUIREMENTS – LIMITATIONS:

a) AMA members flying radio controlled model aircraft equipped with flight *stabilization* and *autopilot* systems must maintain *VLOS* with the aircraft at all times including programmed autopilot waypoint flight.

b) *AMA Pilots* must be able to instantaneously deactivate programmed flight of *autopilot systems* at any time during flight and resume manual control of the model aircraft.

c) *AMA Pilots* must perform an *R/C Test Flight* of a model aircraft before activating a newly installed *autopilot* or *stabilization system* and/or after any repairs or replacement of model aircraft *essential flight systems*.

d) Model aircraft exceeding 15lbs and/or 70mph may only use an *autopilot* for a programmed "return to launch" (RTL) flight and not for programmed waypoint flying of a predetermined course.

e) STABILIZATION & AUTOPILOT SYSTEMS MAY BE USED FOR/TO:

- Stabilization/automatically stabilize aircraft to level flight when control sticks are centered.
- Recovery/activate TRX switch to recover an out of control aircraft to level flight.
- Heading/activate TRX switch to hold a model aircraft's heading for precision flight path.
- Altitude/activate TRX switch to maintain fixed aircraft altitude while allowing directional control.
- Return GPS/activate TRX switch to return aircraft via GPS to launch point.
- Return FSS/failsafe activated from radio signal loss to return aircraft via GPS to launch point.
- Fixed circle/activate TRX switch to circle aircraft at point of activation at fixed altitude.
- Waypoint/activate TRX switch to initiate an autopilot programmed flight path via waypoints.
- Fencing/autopilot programed to display site unique boundaries on video monitor/goggles.

4. RANGE – ALTITUDE – WEIGHT – SPEED:

a) One of the requirements in Federal Law (Public Law 112-95 Sec 336 (c) (2) February 14, 2012) for model aircraft to be excluded from FAA regulations is that model aircraft be flown within *VLOS* of the operator.

b) Model aircraft must be flown at or below 400 feet AGL when within 3 miles of an airport as stated in the AMA Safety Code.

c) Model aircraft utilizing an *autopilot* for waypoint flying are limited to a maximum weight (including fuel, batteries, and onboard *autopilot systems*) of 15lbs and a speed of 70mph.

5. RECOMMENDATIONS & INFORMATION:

a) If your radio system lacks *failsafe* capability, consider using programmable digital servos or auxiliary *failsafe* modules. In the event of a radio signal failure these components will activate desired safe servo settings or an *autopilot* for return to base/launch (RTL).

b) When using an *autopilot system* the "return to launch" (RTL) feature should be programmed to return the aircraft to a safe location and safely terminate the flight should manual control of the aircraft be lost. When using RTL, pay particular attention to the manufacturer's throttle recommendations to prevent stalling.

c) The use of *stabilization systems* is recommended when flying FPV to improve flight stability and video quality.

d) Pilots usually choose to incorporate *stabilization* and *autopilot systems* for model aircraft flying to enhance flight performance, correct bad tendencies of the model aircraft, maintain stability in windy weather, establish precision heading holds for takeoffs/landings, flight training for novice pilots, create a steady flight platform for cameras, and generally just to make an airplane easier and safer to fly.

e) When purchasing *stabilization* and *autopilot systems*, always try to select quality equipment from reputable dealers, ensure for compatibility with other onboard systems, and install components according to manufacturers' instructions.

6. PRIVACY PROTECTION SAFEGUARDS:

The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data or information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers.

7. DEFINITIONS OF TERMS:

AMA Pilot is an AMA member who is capable of manually operating an R/C transmitter to control a model aircraft's flight path within its safe intended *flight envelope* without losing control or having a collision.

Autopilot Systems incorporate programmable flight *stabilization* with an altitude sensor and a GPS receiver for accurate positioning and to navigate/control a radio controlled model aircraft's flight path. Advanced systems offer software for entering navigable waypoints. The flight data waypoints may be saved to autopilot's/GPS memory for programmed flight.

Essential Flight Systems are any systems or components necessary to maintain stable flight within a model aircraft's *flight envelope*. (This includes primary R/C systems and any *stabilization* or gyros required to maintain stability and heading in certain types of model aircraft that would be uncontrollable/unstable without their use).

Failsafe Systems are designed to minimize or prevent damage and safely terminate a flight when a radio controlled model aircraft loses radio signal. Modern radio systems can be programmed to position servos to a desired control setting in the event of radio signal failure.

First Person View (FPV) refers to the operation of a radio controlled (R/C) model aircraft using an onboard camera's cockpit view to orient and control the aircraft. (AMA Document #550).

Flight Envelope is defined as the range of airspeeds, attitudes and flight maneuvers which a model aircraft can safely perform/operate for its intended use.

Non-Essential Flight Systems are any systems or components that are not necessary to maintain stable flight within the model aircraft's intended flight envelope. (This includes *autopilot* or *stabilization systems* that can be activated and deactivated in flight by the pilot without affecting manually controlled stable flight).

R/C Test Flight requires an AMA Pilot to manually operate an R/C transmitter to control a model aircraft's flight path and determine if the aircraft is capable of maintaining stable flight within its safe intended *flight envelope*.

Stabilization Systems are designed to maintain intended model aircraft flight attitudes. The pilot can install, program and/or activate a system to stabilize yaw, pitch, or roll or any one attitude or combination of attitudes. Systems are often based on rate/heading hold gyros or inertial motion sensors utilizing multi-axis gyros and accelerometers for attitude stabilization.

Visual Line of Sight (VLOS) is the distance at which the pilot is able to maintain visual contact with the aircraft and determine its orientation and attitude without enhancements other than corrective lenses.

Academy of Model Aeronautics National Model Aircraft Safety Code

Effective January 1, 2014

A. **GENERAL**: A model aircraft is a non-human-carrying aircraft capable of sustained flight in the atmosphere. It may not exceed limitations of this code and is intended exclusively for sport, recreation, education and/or competition. All model flights must be conducted in accordance with this safety code and any additional rules specific to the flying site.

1. Model aircraft will not be flown:
   (a) In a careless or reckless manner.
   (b) At a location where model aircraft activities are prohibited.
2. Model aircraft pilots will:
   (a) Yield the right of way to all human-carrying aircraft.
   (b) See and avoid all aircraft and a spotter must be used when appropriate. (AMA Document #540-D.)
   (c) Not fly higher than approximately 400 feet above ground level within three (3) miles of an airport without notifying the airport operator.
   (d) Not interfere with operations and traffic patterns at any airport, heliport or seaplane base except where there is a mixed use agreement.
   (e) Not exceed a takeoff weight, including fuel, of 55 pounds unless in compliance with the AMA Large Model Airplane program. (AMA Document 520-A.)
   (f) Ensure the aircraft is identified with the name and address or AMA number of the owner on the inside or affixed to the outside of the model aircraft. (This does not apply to model aircraft flown indoors.)
   (g) Not operate aircraft with metal-blade propellers or with gaseous boosts except for helicopters operated under the provisions of AMA Document #555.
   (h) Not operate model aircraft while under the influence of alcohol or while using any drug that could adversely affect the pilot's ability to safely control the model.
   (i) Not operate model aircraft carrying pyrotechnic devices that explode or burn, or any device which propels a projectile or drops any object that creates a hazard to persons or property.
   Exceptions:
   - Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight.
   - Rocket motors (using solid propellant) up to a G-series size may be used provided they remain attached to the model during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code but may not be launched from model aircraft.
   - Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program Document. (AMA Document #718.)

   (j) Not operate a turbine-powered aircraft, unless in compliance with the AMA turbine regulations. (AMA Document #510-A.)
3. Model aircraft will not be flown in AMA sanctioned events, air shows or model demonstrations unless:
   (a) The aircraft, control system and pilot skills have successfully demonstrated all maneuvers intended or anticipated prior to the specific event.
   (b) An inexperienced pilot is assisted by an experienced pilot.
4. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

B. **RADIO CONTROL (RC)**

1. All pilots shall avoid flying directly over unprotected people, vessels, vehicles or structures and shall avoid endangerment of life and property of others.
2. A successful radio equipment ground-range check in accordance with manufacturer's recommendations will be completed before the first flight of a new or repaired model aircraft.
3. At all flying sites a safety line(s) must be established in front of which all flying takes place. (AMA Document #706.)
   (a) Only personnel associated with flying the model aircraft are allowed at or in front of the safety line.
   (b) At air shows or demonstrations, a straight safety line must be established.
   (c) An area away from the safety line must be maintained for spectators.
   (d) Intentional flying behind the safety line is prohibited.
4. RC model aircraft must use the radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. RC model aircraft will not knowingly operate within three (3) miles of any pre-existing flying site without a frequency-management agreement. (AMA Documents #922 and #923.)
6. With the exception of events flown under official AMA Competition Regulations, excluding takeoff and landing, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flightline.
7. Under no circumstances may a pilot or other person touch an outdoor model aircraft in flight while it is still under power, except to divert it from striking an individual.
8. RC night flying requires a lighting system providing the pilot with a clear view of the model's attitude and orientation at all times. Hand-held illumination systems are inadequate for night flying operations.
9. The pilot of an RC model aircraft shall:
   (a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.
   (b) Fly using the assistance of a camera or First-Person View (FPV) only in accordance with the procedures outlined in AMA Document #550.
   (c) Fly using the assistance of autopilot or stabilization system only in accordance with the procedures outlined in AMA Document #560.

C. **FREE FLIGHT**

1. Must be at least 100 feet downwind of spectators and automobile parking when the model aircraft is launched.
2. Launch area must be clear of all individuals except mechanics, officials, and other fliers.
3. An effective device will be used to extinguish any fuse on the model aircraft after the fuse has completed its function.

D. **CONTROL LINE**

1. The complete control system (including the safety thong where applicable) must have an inspection and pull test prior to flying.
2. The pull test will be in accordance with the current Competition Regulations for the applicable model aircraft category.
3. Model aircraft not fitting a specific category shall use those pull-test requirements as indicated for Control Line Precision Aerobatics.
4. The flying area must be clear of all utility wires or poles and a model aircraft will not be flown closer than 50 feet to any above-ground electric utility lines.
5. The flying area must be clear of all nonessential participants and spectators before the engine is started.

About AMA

We stand on our own for our members and for the future of aeromodeling.

The Academy of Model Aeronautics is the world's largest model aviation association. It is the official sanctioning body for model aviation in the United States, representing the interests of aeromodeling across the United States and around the world. As a self-supporting, nonprofit organization, its purpose is to promote the development of model aviation as a recognized hobby, sport, and family recreational activity that is both fun and educational.

Founded in 1936, the Academy of Model Aeronautics was charged with promoting the popularity of aeromodeling and associated contests, which coincided with the development and advancement of commercial and military aircraft design, engineering, and manufacturing. Today, the AMA still fosters the innovation born from competition on an international scale through the sanctioning of more than 2,000 aeromodeling competitions each year.

Government relations

The AMA has a long and successful history of advocating for the flying privileges of the aeromodeling community. As the liaison with the Federal Aviation Administration, Federal Communications Commission, Environmental Protection Agency, and other governmental entities, AMA works diligently with some of the most respected organizations in aviation and government to protect modelers' right to fly in the national airspace while providing an exceptional safety program.

Educational outreach

Our active educational outreach program assists teachers who utilize aviation activities in support of science, technology, engineering, and math curricula. Additionally, AMA has awarded more than $800,000 dollars in scholarships to hundreds of students in pursuit of study in the fields of aerospace design and engineering along with other aviation-related fields.

To learn more about the Academy of Model Aeronautics, or to become a member, visit **www.modelaircraft.org** or call **1-800-I-FLY-AMA.**

AUVSI®

DO'S AND DONT'S

Stay up-to-date with the latest operations limits.

PRIVACY STATEMENT

AUVSI supports the expanded use of unmanned aircraft systems (UAS) and encourages open discussion of privacy concerns and proposed changes to existing rules, regulations and laws.

AUVSI CODE OF CONDUCT

This code is intended to provide those who design, test, and operate UAS for public and civil use, a set of guidelines and recommendations for safe, non-intrusive operations.

FAA UAS WEBSITE

The Federal Aviation Administration is the national aviation authority of the United States. The use of unmanned aircraft systems (UAS) in civil airspace raises many technical, policy and procedure questions. Visit the FAA website to better understand how unmanned aircraft can be integrated into the National Airspace System.

Who will be flying the UAS?

A business (e.g. photography, filmmaking, agriculture), recreational user (e.g. hobbyists, modelers) or a public agency/university (e.g. first responders, university researchers)?

A Business | Recreational User | Public Agency or University

A Business

You must check with the FAA to obtain approval to fly. It's possible you may qualify for either a special airworthiness certificate or a commercial exemption.

The FAA grants two types of special airworthiness certificates: special flight permits and experimental certificates. Special flight permits are issued for production flight testing new production aircraft. Experimental certificates are issued only for the purposes of research and development, crew training and market surveys.

In addition, in May 2014, the FAA announced that it would consider granting exemptions for certain low-risk commercial applications such as precision agriculture, power line inspections, and movie production.

If you receive any of the above certifications or exemptions, you may fly.

To learn more about requesting a special airworthiness certificate from the FAA, click here.

To learn more about requesting a commercial exemption from the FAA, click here.

Home

AUVSI.org Increasing Human Potential FAA Request Information

Recreational User

Hobby or recreational flying (not for hire or as part of business) can be done without FAA approval, but operators should check local or state laws for usage restrictions and/or privacy rules and must follow safety guidelines including:

- Follow community-based safety guidelines
- Fly under 400 feet and within line of sight of the operator
- Not fly near manned aircraft
- Contacting the airport or control tower before flying within five miles of an airport

To learn more about these safety guidelines from the FAA, click here.

Home

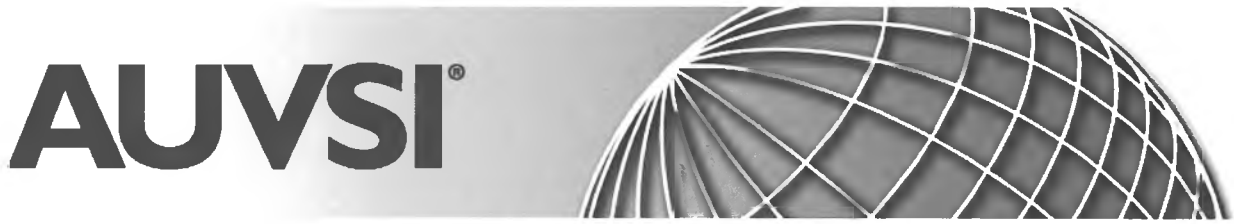
Public Agency or University

If you are a public agency or university, you must apply for a Certificate of Waiver or Authorization (COA) from the FAA. COAs allow use of UAS in a defined block of airspace and include special provisions unique to the proposed operation.

If you receive the above certifications or exemptions, you may fly.

To learn more about applying for a COA from the FAA, click here.

Home



PRIVACY STATEMENT

I. EXECUTIVE SUMMARY

The Association for Unmanned Vehicle Systems International (AUVSI)[1] supports the expanded use of unmanned aircraft systems (UAS) and encourages open discussion of privacy concerns and proposed changes to existing rules, regulations, and laws. These discussions should occur concurrently with the integration of UAS into the National Airspace System (NAS)[2] in order to fully realize the benefits of rapidly advancing UAS technology and so that a greater understanding of UAS technology's potentialcan be achieved. Enactment of legislation now – before sufficient experience with integration of UAS into the NAS exists – is premature, and will hinder the creation and development of this new industry. Barring unnecessary delays, AUVSI estimates that this new industry is poised to create over 70,000 new jobs and $13.6 billion in economic impact within the first three years of integration alone.[3]

New legislation at the federal or state level that is not technology neutral or that is inconsistent with existing privacy rules, regulations, and laws would stifle innovation and cause delay, and may prevent or discourage the use of UAS by public safety agencies and other potential users. Fourth Amendment jurisprudence, existing federal and state privacy laws, and comprehensive Federal Aviation Administration (FAA) regulations already provide extensive guidance that would allow for initial integration of UAS operations. The FAA, for example, has taken steps to address privacy concerns relating to the use of UAS at test sites, which will help gather knowledge and best practices about UAS operations. If the FAA completes its required and pending rulemaking activities for UAS integration, there will be ample opportunities for multi-stakeholder input.

II. EXISTING FOURTH AMENDMENT PROTECTIONS

The Fourth Amendment and related case law already governs UAS operations by government users, ensures accountability, and guides the use of aircraft in which the cockpit and pilot are on the ground. Federal, state, and local government agents must obtain search warrants when their use of any technology, including UAS, may violate an individual's reasonable expectation of privacy protected by the Fourth Amendment.[4] These protections are well-established and address many different privacy concerns relating to government adoption and use of advancing technologies, such as UAS. For more than 220 years, the Fourth Amendment has been applied to new technologies used in warrantless observations – including several Supreme Court decisions on aerial observationss and, more recently, thermal imaging[6] and GPS technologies[7] – and it will continue to be applied to UAS and other future technologies that have not yet been invented. The Court, in a 2013 decision, held that law enforcement use of a highly-trained drug sniffing dog, roaming outside a home, was "an unlicensed physical intrusion" distinguishable from "Girl Scouts and trick-or-treaters," and was thus an unreasonable search.[8] UAS technology is not so distinct from other advanced technologies as to require supplemental legislation.[9] On the contrary, UAS-specific legislation and laws may have unintended effects, including confusing and complicating the application of existing search warrant requirements[10] that have been carefully developed over two centuries.

AUVSI strongly supports the International Association of Chiefs of Police (IACP) recommended guidelines for UAS operations and associated data collection,[11] which the Airborne Law Enforcement Assocation (ALEA)[12] and others have adopted and even the American Civil Liberties Union (ACLU) has praised.[13] Like IACP, AUVSI recognizes the "proven effectiveness" of UAS and that the "potential benefits [to public safety] are irrefutable."[14] AUVSI opposes any legislation that hamstrings first-responders.

III. FAA'S APPROACH TO PRIVACY AND RULEMAKING

The Congressionally-mandated FAA rulemaking processes for the integration of small UAS (sUAS) will provide ample opportunities for the public to comment on privacy issues relating to UAS operations.[15] Unlike government operators, who are permitted to operate UAS, albeit through a cumbersome process,[16] civilian operators have no practical, legal means of doing so until the FAA completes its legally required, and long-delayed, rulemakings.[17] Recognizing the importance of addressing privacy concerns, the FAA has taken extraordinary measures to permit public participation in determining the privacy policies that will govern UAS test sites – the agency's first major step toward integration.[18] Indeed, FAA "aim[ed] to assure maximum transparency of privacy policies associated with UAS test site operations in order to engage all stakeholders in discussion about which privacy issues are raised by UAS

operations and how law, public policy, and operators should respond to those issues in the long run."[19] Rather than passing uninformed[20] and potentially unenforceable[21] legislation now, Congress and state lawmakers should wait for the FAA to complete its rulemaking processes.

The FAA's primary mission is, and must remain, aviation safety. Still, insofar as privacy issues are inextricably linked to the agency's creation of a regulatory framework for the integration and operation of UAS, the FAA rulemaking process is the appropriate forum to address privacy concerns. The FAA has properly recognized the role that federal and state law enforcement agencies play in enforcing laws regarding the protection of an individual's right to privacy, as well as its complementary authority to revoke or suspend a UAS operator's license. Like the Fourth Amendment jurisprudence applicable to public UAS operators, analogous state laws relevant to civil operators that "address trespass, invasion of privacy, harassment, and stalking [are] well established."[22] AUVSI supports the FAA's position that Fair Information Practice Principles (FIPPs) should inform UAS privacy policies on the collection, storage, and use of data.[23] Clearly, the registration of certain UAS and pilots with the FAA, the equipage of UAS with identification/position broadcast capability, and the guidelines set forth in AUVSI's UAS Operations Code of Conduct[24] could all contribute to the creation of an overall approach to managing privacy concerns. FAA rulemaking proceedings are the proper forum to address all of these important considerations.

CONCLUSION

AUVSI supports the integration of UAS into the NAS in a safe and responsible manner, while safeguarding the existing right to privacy and ensuring transparency and accountability. Existing federal and state privacy protections should extend to the operations of UAS, just as they do to the operations of any other advanced technology. But before consideration of any supplemental technology neutral privacy legislation, the FAA should be allowed to gain experience through the UAS test site program and to then complete the well-established regulatory processes for UAS integrationthat Congress has already mandated. Fourth Amendment jurisprudence, federal and state privacy protections, and other existing laws and regulations are sufficiently robust to guide this effort.

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1 AUVSI – the world's largest non-profit organization dedicated to the advancement of unmanned systems – represents more than 7,000 members from 55 allied countries and 2,500 organizations involved in fields of government, industry and academia.

2 The FAA Modernization and Reform Act of 2012 requires FAA to safely integrate UAS into the NAS by September 2015, and mandates, among other things, the creation of UAS test sites and rulemaking proceedings addressing the integration of civil UAS operations. P.L. 112-95, §§ 331-334, 126 Stat. 11, 72-77 (2012).

3 AUVSI, *The Economic Impact of Unmanned Aircraft Systems Integration in the United States* (Mar. 2013), at 2, http://www.auvsi.org/econreport.

4 *See Katz v. United States*, 389 U.S. 347 (1967).

5 *See Florida v. Riley*, 488 U.S. 445 (1989) (naked-eye observations through greenhouse roof from helicopter at 400 feet not an unreasonable search); *Dow Chemical Co. v. United States*, 476 U.S. 227 (1986) (precision aerial photographs of industrial complex from 1,200-12,000 feet not a prohibited search); *California v. Ciraolo*, 476 U.S. 207 (1986) (no reasonable expectation of privacy from naked-eye observations of yard from fixed-wing aircraft flying at 1,000 feet).

6 *See Kyllo v. United States*, 533 U.S. 27 (2001) (warrantless use of thermal imaging device to see heat emanating from inside home deemed an unreasonable search). 7 *See United States v. Jones*, 132 S. Ct. 945 (2012) (month-long tracking with GPS required a warrant).

8 *Florida v. Jardines*, 133 S.Ct. 1409, 1415 (2013).

9 "In combination, however, [*the Ciraolo, Riley, Dow Chemical, Kyllo and Jones*] rulings indicate that the Fourth Amendment is likely to provide significantly more protection from government UAS observations than is commonly assumed." John Villasenor, *Observations from Above: Unmanned Aircraft Systems and Privacy*, 36 HARV. J.L. & PUB.POL'Y 457, 516 (2013). 10 See Richard M. Thompson II, CONG. RESEARCH SERV., R42701, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses* (Apr. 3, 2013), at 18-21 (reviewing several bills that "establish arguably greater constraints on [UAS] usage than the Fourth Amendment requires." Id. at 18).

11 IACP, *Recommended Guidelines for the Use of Unmanned Aircraft* (Aug. 2012) ("IACP Guidelines").

12 ALEA, *Resolution in Support of the International Association of Chiefs of Police Aviation Committee's Recommended Guidelines for the Use of Unmanned Aircraft* (Aug. 29, 2012), http://www.alea.org/assets/cms/files/Resolutions/In%20Support%20of%20UAS%20Guidelines.pdf

13 See Jay Stanley, *Police Chiefs Issue Recommendations on Drones: A Look at How they Measure Up*, ACLU (Aug. 17, 2012, 9:39 AM), http://www.aclu.org/blog/technology-and-liberty/police-chiefs-issue-recommendations-drones-look-how-they-measure.

14 IACP Guidelines, at 1. What appears to be the first documented instance of a human life being saved with a UAS occurred in Canada earlier this year. *See Single Vehicle Rollover - Saskatoon RCMP Search for Injured Driver with Unmanned Aerial Vehicle*, ROYAL CANADIAN MOUNTED POLICE (May 9, 2013), http://www.rcmp-grc.gc.ca/sk/news-nouvelle/video-gallery/video-pages/search-rescue-eng.htm. It will certainly not be the last.

15 P.L. 112-95, § 332 (requiring the sUAS and integration final rules by August 14, 2014 and December 14, 2015, respectively).

16 FAA, *Unmanned Aircraft Systems (UAS): Certifications and Authorizations, http://www.faa.gov/about/initiatives/uas/cert/; see also Felicity Barringer, F.A.A.'s Concerns Hold Up Use of Wildfire Drones*, N.Y. TIMES (May 21, 2013), http://www.nytimes.com/2013/05/22/us/faas-concerns-hold-up-use-of-wildfire-drones.html?_r=0.

17 See Alissa M. Dolan and Richard M. Thompson II, CONG. RESEARCH SERV., R42940, *Integration of Drones into Domestic Airspace: Selected Legal Issues* (Apr. 4, 2013), at 4 (internal citations omitted). Indeed, the FAA's sUAS notice of proposed rulemaking has already been delayed more than two years beyond the agency's initially projected publication date of March 10, 2011. DEPT. TRANSP., *Report on DOT Significant Rulemakings* (May 10, 2013), at 13.

18 See Unmanned Aircraft Test Site Program, 78 Fed. Reg. 12,259 (Feb. 22, 2013); see also FAA, *Transcript of OnlineSession on UAS Test Site Privacy Policy* (Apr. 3, 2013), http://www.faa.gov/about/initiatives/uas/media/UAStranscription.pdf.

[19] 78 Fed. Reg. at 12,260.

[20] See *supra* note 9, at 517 (contrasting UAS with other emerging technologies in that the focus on privacy concerns has come before the benefits are widely recognized).

[21] See *supra* note 17, at 27-29 (noting that state and local regulation of UAS may be subject to challenge on federal preemption grounds).

[22] See *supra* note 9, at 514.

[23] 78 Fed. Reg. at 12,260.

[24] http://www.auvsi.org/conduct.

UNMANNED AIRCRAFT SYSTEM OPERATIONS INDUSTRY "CODE OF CONDUCT"

The emergence of unmanned aircraft systems (UAS) as a resource for a wide variety of public and private applications quite possibly represents one of the most significant advancements to aviation, the scientific community, and public service since the beginning of flight. Rapid advancements in the technology have presented unique challenges and opportunities to the growing UAS industry and to those who support it. The nature of UAS and the environments which they operate, when not managed properly, can and will create issues that need to be addressed. The future of UAS will be linked to the responsible and safe use of these systems. Our industry has an obligation to conduct our operations in a safe manner that minimizes risk and instills confidence in our systems.

For this reason, the Association for Unmanned Vehicle Systems International (AUVSI), offers this Code of Conduct on behalf of the UAS industry for UAS operation. This code is intended to provide our members, and those who design, test, and operate UAS for public and civil use, a set of guidelines and recommendations for safe, non-intrusive operations. Acceptance and adherence to this code will contribute to safety and professionalism and will accelerate public confidence in these systems.

The code is built on three specific themes: Safety, Professionalism, and Respect. Each theme and its associated recommendations represent a "common sense" approach to UAS operations and address many of the concerns expressed by the public and regulators. This code is meant to provide UAS industry manufacturers and users a convenient checklist for operations and a means to demonstrate their obligation to supporting the growth of our industry in a safe and responsible manner. By adopting this Code, UAS industry manufacturers and users commit to the following:

SAFETY

- We will not operate UAS in a manner that presents undue risk to persons or property on the surface or in the air.
- We will ensure UAS will be piloted by individuals who are properly trained and competent to operate the vehicle or its systems.
- We will ensure UAS flights will be conducted only after a thorough assessment of risks associated with the activity. This risks assessment will include, but is not limited to:
    - Weather conditions relative to the performance capability of the system
    - Identification of normally anticipated failure modes (lost link, power plant failures, loss of control, etc.) and consequences of the failures
    - Crew fitness for flight operations
    - Overlying airspace, compliance with aviation regulations as appropriate to the operation, and off-normal procedures
    - Communication, command, control, and payload frequency spectrum requirements
    - Reliability, performance, and airworthiness to established standards

PROFESSIONALISM

- We will comply with all federal, state, and local laws, ordinances, covenants, and restrictions as they relate to UAS operations.
- We will operate our systems as responsible members of the aviation community.
- We will be responsive to the needs of the public.
- We will cooperate fully with federal, state, and local authorities in response to emergency deployments, mishap investigations, and media relations.
- We will establish contingency plans for all anticipated off-nominal events and share them openly with all appropriate authorities.

RESPECT

- We will respect the rights of other users in the airspace.
- We will respect the privacy of individuals.

- We will respect the concerns of the public as they relate to unmanned aircraft operations.
- We will support improving public awareness and education of the operation of UAS.

As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct.

AUVSI.org Increasing Human Potential FAA Request Information

Federal Aviation Administration

Unmanned Aircraft Systems

(http://www.faa.gov/news/press_releases/news_story.cfm?newsId=16875)

FAA Announces Virginia Tech UAS Test Site Now Operational
(http://www.faa.gov/news/press_release newsId=16875)

Research in Virginia, New Jersey and Maryland to benefit technology development. Photo: VA Tech

Safety is the FAA's top mission, and the agency maintains the world's safest aviation system. The FAA first authorized use of unmanned aircraft in the National Airspace System (NAS) in 1990.

Today, unmanned aircraft are flying in the NAS under very controlled conditions, performing border and port surveillance by the Department of Homeland Security, helping with scientific research and environmental monitoring by NASA and NOAA, supporting public safety by law enforcement agencies, helping state universities conduct research, and supporting various other missions for public (government) entities. Operations range from ground level to above 50,000 feet, depending on the specific type of aircraft. However, UAS operations are currently not authorized in Class B airspace (http://www.faa.gov/regulations_policies/handbooks_manuals/aviation/pilot_handbook/media/PHAK%20-%20Chapter%2014.pdf) (PDF), which exists over major urban areas and contains the highest density of manned aircraft in the National Airspace System.

What are the different types of UAS operations?

There are three types of unmanned aircraft system operations: Civil, Public and Model Aircraft.

- **Civil UAS**

  Obtaining a Special Airworthiness Certificate (http://www.faa.gov/aircraft/air_cert/airworthiness_certification/sp_awcert/experiment/sac/) in the experimental category for a particular UAS is currently the only way civil operators of unmanned aircraft are accessing the NAS. Experimental certificate regulations preclude carrying people or property for compensation or hire, but do allow operations for research and development, flight and sales demonstrations and crew training. The FAA is working with civilian operators to collect technical and operational data that will help refine the UAS airworthiness certification process. The agency is currently developing a future path for safe integration of civil UAS into the NAS as part of NextGen implementation. Read more about Civil Operations (civil_operations/).

  The FAA has been working for several months to implement the provisions of Section 333 (legislative_programs/section_333/) of the FAA Modernization and Reform Act of 2012, "Special Rules for Certain Unmanned Aircraft Systems," which will allow for commercial operations in low-risk, controlled environments. Read more about Section 333 (legislative_programs/section_333/).

- **Public UAS**

  COAs (http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/) are available to public entities that want to fly a UAS in civil airspace. Common uses today include law enforcement, firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions. Applicants make their request through an online process (http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/) and the FAA evaluates the proposed operation to see if it can be conducted safely. Read more about Public Operations (public_operations/).

- **Model Aircraft**

  Recreational use of airspace by model aircraft is covered by FAA Advisory Circular 91-57 (http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf) (PDF), which generally limits operations for hobby and recreation to below 400 feet, away from airports and air traffic, and within sight of the operator. In June 2014, the FAA published a Federal Register notice (media/model_aircraft_spec_rule.pdf) (PDF) on its interpretation of the statutory special rules for model aircraft in the FAA Modernization and Reform Act of 2012. The law is clear that the FAA may take enforcement action against model aircraft operators who operate their aircraft in a manner that endangers the safety of the national airspace system. In the notice, the FAA explains that this enforcement authority is designed to protect users of the airspace as well as people and property on the ground. Read the full press release (http://www.faa.gov/news/press_releases/news_story.cfm?newsId=16474). Read more about Model Aircraft Operations (publications/model_aircraft_operators/).

What can I do with my model aircraft?

Having fun means flying safely! Hobby or recreational flying doesn't require FAA approval but you must follow safety guidelines. Any other use requires FAA authorization. Here is a list of Do's and Don'ts for flying model aircraft (publications/model_aircraft_operators).

Contact Us (contacts/)

The agency wants the public to know how and when to contact the FAA regarding safety concerns with UAS operations. You can visit the Agency's Aviation Safety Hotline website (http://www.faa.gov/contact/safety_hotline/) or call 1-866-835-5322, Option 4.

Page last modified: August 20, 2014 10:50:40 AM EDT

This page was published at: http://www.faa.gov/uas/

Federal Aviation Administration

What Can I Do With My Model Aircraft?
Hobby/Recreational Flying

Having fun means flying safely! Hobby or recreational flying doesn't require FAA approval but you must follow safety guidelines. Any other use requires FAA authorization.

Avoid doing anything hazardous to other airplanes or people and property on the ground.

"Dos"

- **Do** fly a model aircraft/UAS at the local model aircraft club
- **Do** take lessons and learn to fly safely
- **Do** contact the airport or control tower when flying within 5 miles of the airport
- **Do** fly a model aircraft for personal enjoyment

"Don'ts"

- **Don't** fly near manned aircraft
- **Don't** fly beyond line of sight of the operator
- **Don't** fly an aircraft weighing more than 55 lbs unless it's certified by an aeromodeling community-based organization
- **Don't** fly contrary to your aeromodeling community-based safety guidelines
- **Don't** fly model aircraft for payment or commercial purposes

Model Aircraft Operations Limits

According to the FAA Modernization and Reform Act of 2012 as (1) the aircraft is flown strictly for hobby or recreational use; (2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization; (3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization; (4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; (5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower…with prior notice of the operation; and (6) the aircraft is flown within visual line sight of the operator.

- More information about safety and training guidelines

The FAA welcomes comments from the public on its Interpretation of the Special Rule for Model Aircraft, which may help further inform its interpretation of the statutory language in Section 336 of the FAA Modernization and Reform Act of 2012 regarding Model Aircraft operations. Please visit the Federal Rulemaking Portal (http://www.regulations.gov/#!submitComment;D=FAA-2014-0396-0781) and follow the instructions for sending your comments electronically.

Page last modified: August 12, 2014 10:29:21 AM EDT

This page was published at: http://www.faa.gov/uas/publications/model_aircraft_operators/

1/30/2013

RATING	sUAS Student Pilot	sUAS Private	sUAS Commercial	sUAS Instrument	sUAS Instructor	sUAS Instrument Instructor	UAS Type Rating	Examiner
PURPOSE & PRIVLEDGES	Aquire sUAS training to qualify for sUAS Private	Operate sUAS for Private ops, aquire sUAS hours to qualify for Commercial	PIC sUAS for Comp or Hire	PIC sUAS outside line of Sight (OLOS), applied to sUAS Private or sUAS Commercial	Instruct to level held by Instructor	Instruct sUAS Private and Commercial pilots in BLOS operations	Required for all UAS over 55 lb, turbine powered, or capable of speeds of ???	Examine applicants to level authorized by FAA
REQUIRED EXPERIENCE	None logged	To be determined	To be determined	To be determined	sUAS Commercial	sUAS Instructor	sUAS Private or sUAS Commercial	To be determined
KNOWLEDG TEST	Pre-solo Oral Exam	Privte sUAS Ground Schools UAS written	sUAS Commercial Written	Instrument Written	Fundamentals of Instruction (unless exempt) UAS Instructor written	UAS Instrument/BLOS	Appropriate systems and operations knowledge	Needs to be written into Part 183 Posess Certificates and rating for examination given
MEDICAL	Student Pilot with demonstrated waivers for sUAS	Third Class with demonstrated waivers for sUAS	Second Class with demonstrated waivers for sUAS	Third or Second with demonstrated waivers for sUAS depending on Certificate held	None	None	Third or Second with demonstrated waivers for sUAS depending on Certificate held	None
PRACTICAL TEST to include ORAL EXAM to determine adequate knowledge of applicable regulations & systems knowledge		Demonstrate competence of LOS sUAS TO/LND, Basic Maneuvers, lost link, Emergency notification, camera operation	Demonstrate command of aircraft & sensor system in advance maneuvers with percision. Recover from emergency senarios.	Demonstrate control of the aircraft & sensors, emergency recovery procedures & waypoint manipulation without visual refference	Demonstrate abillity to teach sUAS. Recover from student loss of control senarios. Demonstrate command of required paperwork	Demonstrate abillity to teach sUAS. Recover from student loss of control senarios. Demonstrate command of required paperwork	Demonstrate command of UAS to level of certificates held, or limitations placed on certificate	Needs to be written into 183.23

Unmanned Aircraft Systems
Type and Capability Matrix

	Hobby	Commercial	Government	Military
Purpose and Common Use	recreation personal use video extreme sport video wildlife viewing hobby competition	cinematography photography real estate agriculture athletic replay structure analysis disaster response	life and safety cost savings risk reduction improved accuracy disaster response	surveillance life and safety weapon
Flight Requirements	none **line of sight operation**	**FAA approved COA** **same as manned aircraft**	**FAA approved COA** **same as manned aircraft**	**Military approval**

Capability	Accessories	Size
real time downlink to ap available on all levels		
flight duration less than 5 mins	joy stick control ready to fly out of box camera	Micro = und 1lb
flight duration 5 mins - 30 mins	image software auto home function	Macro = 1 lb - 3 lb
flight duration 30 mins - 3 hours	airport guard GPS safety features	Under 55 lbs
flight duration 3 hours - 24 hours	pre-programmed flight plan specialized software	Over 55 lbs
flight duration more than 24 hours	advanced functionality	Large

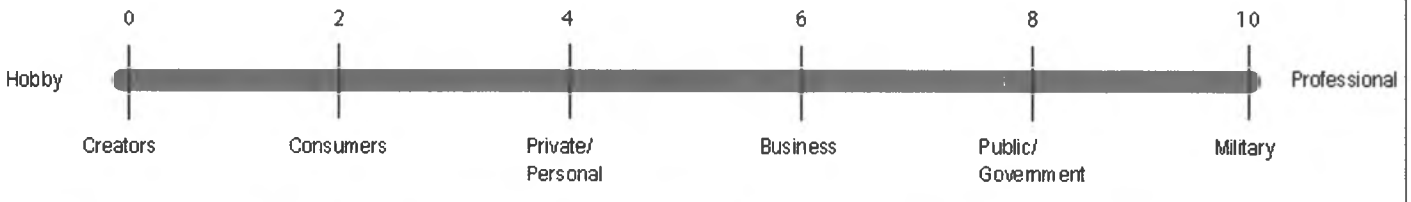
Positioning Graphic

AMA
ACADEMY OF MODEL AERONAUTICS

AMA Model Aircraft/Drone Positioning Assessment

AMA Government Relations

Below is a chart describing the spectrum of model aircraft and drone usage.
Where on the chart do you believe that AMA's interest and influence stop?



Definitions

- **Hobby:** Recreational users primarily involved for fun and/or competition.

0. **Creators:** Designers, Manufacturers, Distributors, Retailers

2. **Consumer:** Purchasers from mall kiosks/big box stores, attracted by intrigue/impulse (i.e. AR Drone)

4. **Private/Personal:** Light commercial, incidental business application, community service, personal use (i.e. aerial photography, agriculture, search and rescue, journalism, etc.)

6. **Business:** Commercial use, significant business purpose

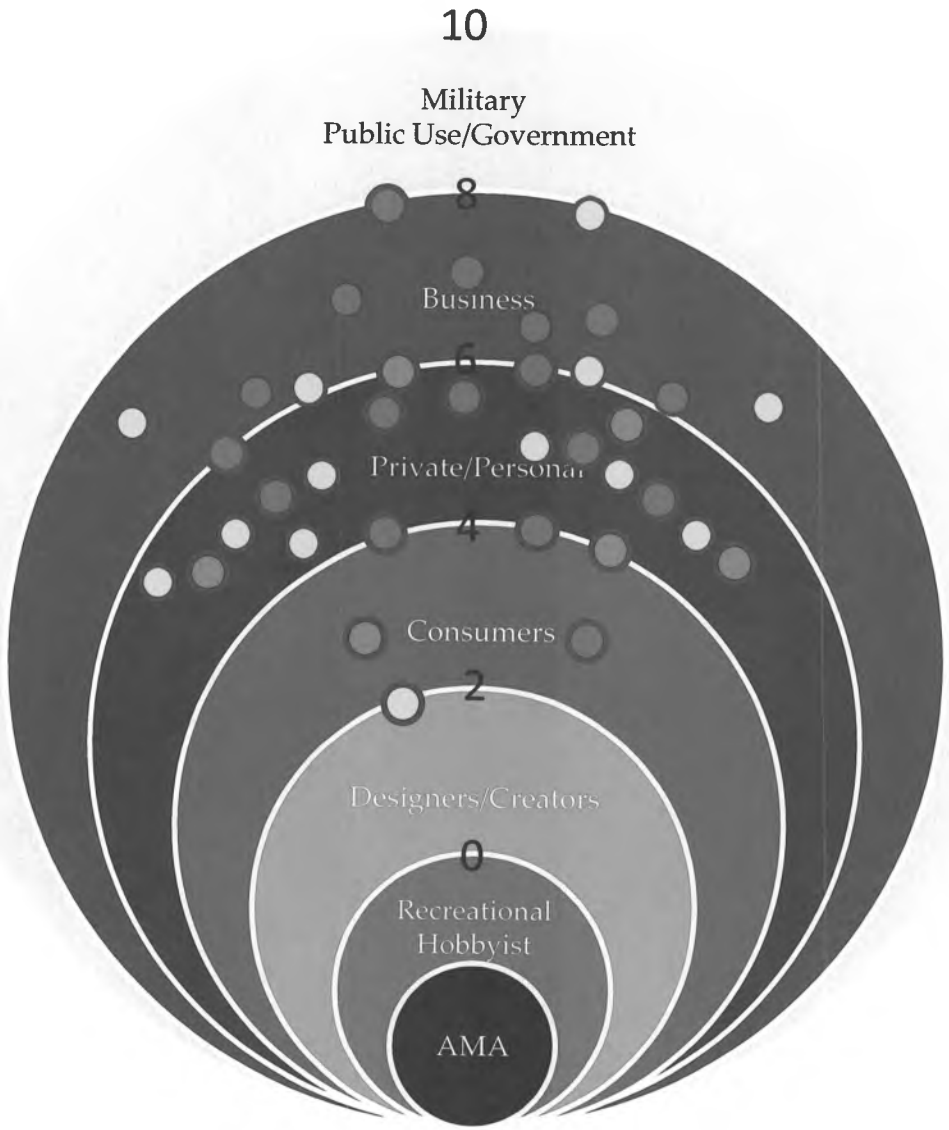
8. **Professional:** Exclusively business use, multi-million dollar community

10. **Public/Government:** Law enforcement, surveillance purposes, border patrol

10. **Military:** Warfare, military surveillance, defense

AMA Universe

- Council
- AMA Staff
- UAS Advisory Group
- FAA Workgroup



REPRESENTATIVE
SHELLEY HUGHES

Economic Development
Trade and Tourism Committee
Chairman
Energy Committee
State Affairs Committee
Military & Veterans' Affairs Committee
University Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

HOUSE OF REPRESENTATIVES

District 8 – Greater Palmer

Session:
State Capitol, Room 409
Juneau, Alaska 99801-1182

Interim:
600 E. Railroad Ave.
Wasilla, AK 99654
(907) 376-3725
Toll Free 1-800-565-3743

housemajority.org

September 19, 2014

Dear Commissioner,

The Legislative Task Force on Unmanned Aircraft Systems has identified the need for public awareness in the use of small unmanned aircraft systems (UAS) by government agencies. The Task Force respectfully requests that each State agency that intends to use UAS in its work, to provide the task force with a point of contact for your agency. We ask for this point of contact to be provided by January 1, 2015 or prior to a scheduled UAS mission if it will occur prior to January.

The Task Force is currently developing a public education strategy so that all users and observers of UAS understand the rules and expectations thereby, eliminating fear and reducing opportunity for inappropriate use of these aircraft. State agency participation is vital to the education campaign and will provide the Task Force with a better understanding of how our government agencies are planning to use UAS.

Thank you for time.

Sincerely,
Representative Shelley Hughes
Senator Donny Olson

Task Force:

- Is there anything additional that needs to be included in this request?
- Is January 1, 2015 an appropriate date?
- Address the letter to each commissioner or in general with a list in the CC:
- How should the header read?

ALASKA STATE LEGISLATURE

Please enter into the record my testimony to the Legislative Task Force on Unmanned Aircraft Systems
Committee Name

Committee on "Education Campaign"? Dated 9/19/14
Bill / Subject

Thank you for your work & attention to the need to protect the public in this fast-growing industry. It appears that industry and the desire of officials to bring industry $ to the state are leading the discussion.

Please remember that the legislature is to serve the public - the individual people of Alaska, and that other concerns are more important than $:

- Privacy, as explicitly protected by Article I-10 of our Alaska Constitution and as also protected by the 4th Amendment to the U.S. Constitution dealing with illegal search + seizure. This needs to be protected before ~~addres~~ collection, not just later.
- Safety vs. manned aircraft, including private small craft.
- Compliance with morals and international law banning use of illegal weapons systems.
- I object to our state dedicating funding and making regulatory exceptions to promoting the drone tech site.

SIGNED: Heather Kroshen

Testifier Alaska Peace Center

Representing

687 Chena Ridge, Fbks 99709 479-0981

Address / Phone Number

Thanks for Skaggs' expertise + Colligan's remarks to protect public.

→ I would like to be provided copies of letters authored by this committee.

LTFUAS PUBLIC COMMENT 9-18-14

Introductions of Task Force members.

1.) **Gary Williams**, AeroForensics, Anchorage, AK: What infrastructure currently exists to support this program, what hardware exists at the test site? What do you anticipate existing "test site to me means facilities on site, hardware, vehicles, etc..."
RO: infrastructure of PanPacific Test Site, 3 different ranges: AK, Hawaii, Oregon. A few different ranges in AK are currently available – Kodiak, Poker Flats. What we don't have is a whole lot of hardware, we have a radar system, but the system is not certified. We have eight different types of UAS, a total of over 100 items. I don't anticipate our test site will ever look like an airforce base...but we will be deployable and can meet the needs of industry.
Gary: So we obviously have the airspace, but will there will be a permanent deployable location?
Ro: Poker Flats is semi-permanent, we have facilities and a few vehicles.
Gary: How many people dedicated full time?
Ro: 21 right now, more to come. A few temporary, part-time employees.

2.) **Bernie Zak** - Sandia National Laboratory, Engineering Laboratory that is contracted through the Department of Energy: Testifying on behalf of his interest of UAF work, talked about Sandia's operations in Barrow and Ilikotok, where they study climate change and have about 100 instruments used. Sandia has operated closely with UAF for over two decades now. Glad to see these developments in regard to state involvement. Sandi/DOE now has restricted airspace over Iliktok. The main purpose of their facilities are climate research. Facilities are for public use and they have had dozens of applications for use of their Barrow and Iliktok facilities.
    - Steve Wachowski Comment: his company FairWeather has worked with Sandia in the past.

3.) **Rob Mulford**, Fairbanks, with Veterans for Peace: against military and government encroachment: talked about UAS conferences he attended where DOD and Military officials detailed the "plans" for drone roll out and future of drones in military. Went into "Network-Centric" warfare and the use of ground to air symmetry. Attended a conference in Arlington, VA: an intelligence surveillance conference, where they thanked Lockhead Martin for their production of high-frequency sensors. Concerned with privacy and assassinations on US soil via drone targeting technology. Very skeptical of the use of UAVs in commercial airspace, referred to them as "monsters in the sky."

4.) Letter form **Brandon Anderson**: concerned with outside companies crowding the market for UAS in Alaska, hopes that those who guide the development of the market will allow for Alaska's talented companies who are already here to get their fair chance at the market. Also introduced plans to base a UAS activity hub out of Seward, AK.
    - Wachowski adds that hiring of Alaska Natives is a priority of FairWeather, considering they are a subsidiary of a Native Corporation. Believes it will remain that way and is optimistic that Alaskans will have ample opportunity in the industry.

    - Steve Colligan addresses the importance of making the industry and STEM education more appealing for the younger generation. Transferability from xbox and gaming to actually flying UAS and using the tech is very possible.

5.) **Jeff Robins**, Alaska Aerospace, Palmer, AK – Are there any potential tax incentives being discussed to attract business to the state, similar to the film industry?
RO: In a military zone (set up during this past legislative session) there are tax incentives currently set up for business development within these military zones. This would include UAS related businesses. Fairbanks Northstar Borough is pushing this very hard. Slow process, but it's in the works.

- Joe Jacobson Response: Doesn't think it's a good comparison between film industry and UAS industry, but he believes that the state could possibly partner with a company like Lockhead Martin or others. Does not foresee tax subsidies as a necessity for this industry because the industry is budding and has potential to attract investment without needing incentives.
- Mike O'Hare: spoke on the fact that the incentives for UAS development in Alaska are the fact that we have so much airspace and we are a UAS friendly state.

6.) **Barbara Johnson**: Special Assistant to Mayor Hopkins: Spoke about the Military Facility Zones and Rep. Thompson's bill. They are pursuing a "tech park" in Fairbanks area with partners from both the industry and the state. Very optimistic about Alaska UAV future.

Closed meeting.

Legislative Teleconference Network

SPONSOR: Rep Hughes
SUBJECT: UAS Task Force
Date: 19 Sep 14

Please Print

NAME	CITY OF RESIDENCE	REPRESENTING	QUESTIONS ONLY (?) TESTIFY (Y or N)	BILL NO.
CHRISTI BELL	ANCHORAGE	University of AK		
Mike McCRARY	ANCHORAGE	Self		
Tyler Hawker	Fort Collins, CO	Self	N	
Robert Mulford	Fairbanks	Veterans For Peace, Alaska Peace Center	Y	
Kerry Long	ANC	FAA Regional Admin.	~~N~~	
Jay Skaggs	ANC	FAA, Flight Standards		
Tracy Higgins	ANC	FAA, Contg. Liaison		

12/05/14 Task Force Meeting: Presen-tations

<TARGET><BILL></BILL><SUBJECT>12-05-14 Task Force Meeting Presentations</SUBJECT><COMM><TARGET></COMM></TARGET>

Photo © Aeryon, Inc.

Small but Powerful Workhorse

The Aeryon Scout™ is an easy-to-use, battery powered Vertical Take-Off and Landing (VTOL) sUAS. The Scout can fly lower and slower than manned aircraft and in confined environments where fixed-wing UAVs cannot operate safely. It offers reliable flight performance even in the most demanding conditions. The Scout uses a Photo 3S EO Camera, IR FLIR Tau core camera as well as the latest and powerful GoPro Hero 3.

Performance

- Point-and-click controls, advanced features
- Advanced fly-safe features
- Weighs less than 3 lbs (1.4 kg)
- Up to 20-min flight time with payload
- Sustained winds up to 30 mph (50 kph)
- Wind gusts up to 50 mph (80 kph)
- Transport in a small case or backpack
- Altitude 100 ft – 10,000 ft (ASL)

Products made from the images include

- 3D Mosaic
- Point Cloud
- Geo-Referenced/GeoTIFF
- KML files to be used with Google Earth
- Digital Surface Models
- Stitched Aerial Images

Geophysical Institute
907-474-7558
info@gi.alaska.edu

UNIVERSITY OF ALASKA FAIRBANKS

UAF is an AA/EO employer and educational institution.

Aeryon Scout

Photo © Aeryon, Inc.

Photo © UAF/GI

Photo by Greg Walker, UAF/GI

Geophysical Institute
gi.alaska.edu

PPUTRC is a team of 58 partners that competed and won one of the FAA's six test sites. Its three key partners--Alaska, Oregon, and Hawaii--offer unique environmental and terrain conditions as well as remote locations for safe and effective testing of UAS. Combined with the normal research operations of ACUASI, this site offers extraordinary breadth of missions for collecting FAA's data needs for the establishing of UAS regulations, policies, procedures, and standards. A recent state appropriation supplements significant external funding to support creation and operation of this unique center.

PPUTRC will assist with the implementation of the Arctic airspace provisions embodied in the 2012 FAA Reauthorization Act by offering a pathway for operators planning to work in the Arctic.

Serving Alaska

With Alaska's vast size and abundance of natural resources, tremendous opportunities exist for developing and exploiting UAS technologies to benefit the State, particularly in the areas of resource mapping and wildfire monitoring.

Serving the Nation

Based in Alaska, PPUTRC is ideally situated to aid in working out the issues of separating and integrating the emerging UAS airspace from the existing National Airspace System (NAS).

Serving the Research Community

Unmanned systems are well suited to ecological and geophysical research applications, such as monitoring marine mammals and mapping glaciers and sea ice.

Geophysical Institute
907-474-7558
info@gi.alaska.edu

UAF UNIVERSITY OF ALASKA FAIRBANKS

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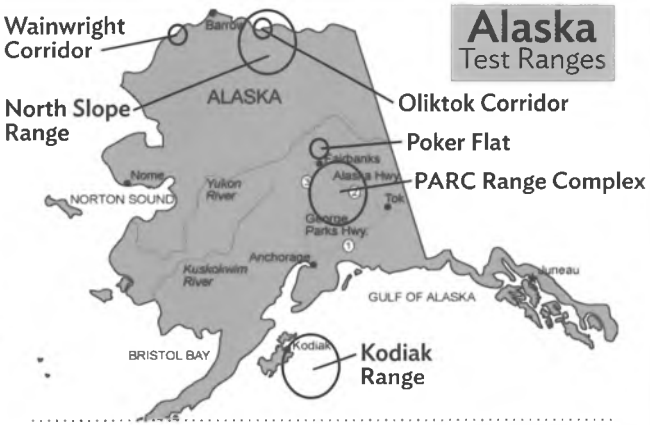
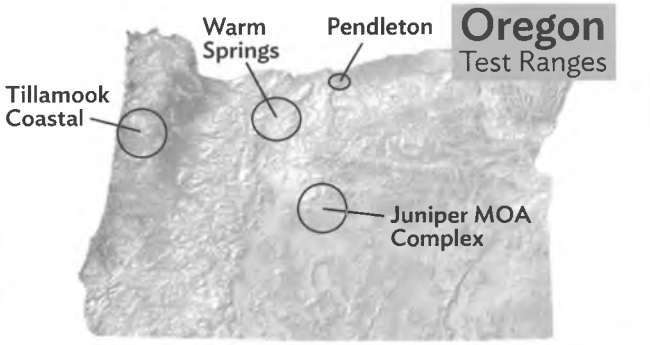
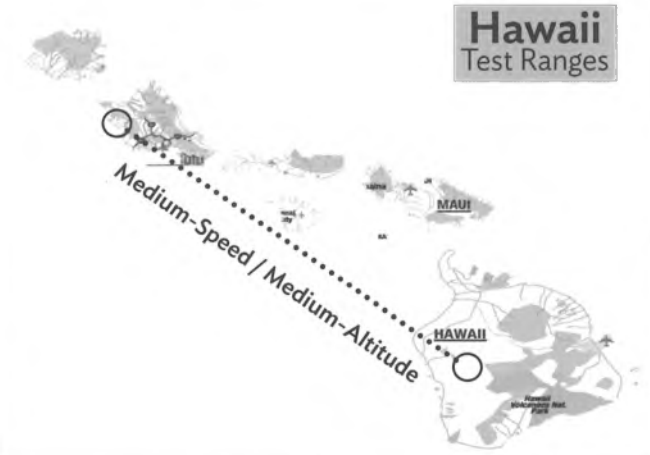
Pan Pacific UAS Test Range Complex







Geophysical Institute

gi.alaska.edu

UAS image of Alaska wildfire

ACUASI is focused on application of unmanned aircraft systems into civil commercial and scientific endeavors. The Geophysical Institute began experimenting with these technologies several years ago and is rapidly becoming a world leader in this field. A recent state appropriation has supplemented significant external funding to support creation of this unique center.

ACUASI is equipped to fly a variety of in-situ and remote sensing instruments on several types and sizes of unmanned aircraft at multiple locations in Alaska and around the globe.

Serving Alaska

With Alaska's vast size and abundance of natural resources, tremendous opportunities exist for developing and exploiting UAS technologies to benefit the State, particularly in the areas of resource mapping and wildfire monitoring.

Serving the Nation

Based in Alaska, ACUASI is ideally situated to aid in working out the issues of separating and integrating the emerging UAS airspace from the existing National Airspace System (NAS).

Serving the Research Community

Unmanned systems are well suited to ecological and geophysical research applications, such as monitoring marine mammals and mapping glaciers and sea ice.

Geophysical Institute
907-474-7558
info@gi.alaska.edu

UNIVERSITY OF ALASKA FAIRBANKS
UAF is an AA/EO employer and educational institution.

Alaska Center for Unmanned Aircraft Systems & Integration

Photo by GI Design Services

ACUASI develops and demonstrates new UAS capabilities and applications research data needs, civil support such as disaster damage assessment and search and rescue, and educational outreach for students from K-12 through post-graduate work. It focuses on Alaska and her people, high latitude issues and projects that are dangerous, difficult, or impossible by other means. Exploring commercial opportunities will assist integration into the National Airspace System for future routine flight.

Geophysical Institute

gi.alaska.edu

Cyrus Read, AVO/USGS

A&J Photography

Chuck Johnson

Sam Herreid

Study where science happens...

Alaska is a natural laboratory in which to witness Earth's geophysical processes firsthand. Launch rockets into the aurora, camp on glaciers, hike through wilderness, and travel to some of the most rugged and remote research sites in the Far North.

Graduate programs in:

Atmospheric Sciences
Chemistry
Environmental Chemistry
Geology
Geophysics
Physics
Space Physics

---

903 Koyukuk Drive
P.O. Box 757320
Fairbanks, AK 99775-7320
Phone: 907.474.7558 | **Fax:** 907.474.7125
E-mail: info@gi.alaska.edu

UNIVERSITY OF ALASKA FAIRBANKS

UAF is an AA/EO employer and educational institution.

Geophysical Institute

UAF photo by Todd Paris

Established in 1946, the Geophysical Institute is internationally renowned for studying Earth and its physical environment at high latitudes. Research is organized into the following disciplinary groups:

Atmospheric Sciences

Earth and Planetary Remote Sensing

Seismology and Geodesy

Snow, Ice and Permafrost

Space Physics and Aeronomy

Tectonics and Sedimentation

Volcanology

Operational facilities at the Institute include:

Alaska Center for Unmanned Aircraft Systems and Integration

Alaska Earthquake Center

Alaska Satellite Facility

Alaska Volcano Observatory

Poker Flat Research Range

Geophysical Institute

gi.alaska.edu

Legislative Task Force on Unmanned Aircraft Systems
December 5, 2014 Meeting at 733 West 4th Ave
Temporary Anchorage Legislative Information Office

9:00am – 12:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
  - Ginger Blaisdell, Staff to Rep. Hughes
- Senator Donny Olson, Co-Chair
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof

Task Force Responsibilities per HCR15

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications;
3. evaluating complaints and concerns expressed to the task force;
4. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to unmanned aircraft systems;
6. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;
7. conducting a public hearing concerning privacy and the capture of data by unmanned aircraft systems at the University of Alaska's test site;
8. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

AGENDA

9:00am Welcome and Introductions .....Representative Shelley Hughes

- Comments on Task Force upcoming meetings
- Review of Meeting Summary from September 9, 2014
- Introduction of Guests
- Current Events: News Articles (attached list)

AGENDA

- DRAFT Letters to Governor and Commissioners
- Mike O'Hare: Military UAS update
- Jay Skaggs: FAA update
- Type and Purpose matrix draft by Ginger Blaisdell and Steve Strait
- Press Release re: Christmas Top Ten Gift List
- Today's discussion topic: AMA Representatives on Education of Flyers
    - Steve Colligan: Interpretation of the Special Rule for Model Aircraft
- Public Testimony (as time allows)

Future Agenda Items .....as listed in September

- Data retention
- Define framework – training and education
- Dept Public Safety guidance document on enforcement of UAS
- Integration not segregation of airspace: invite DOI, FAA, Military, BP/Exxon, etc
- System for gathering citizen complaints

Follow Up – To Do .....as listed in September

- Military mission in Alaska – process and plans
- Italy data protection laws
- Who to contact? Complaint / enforcement system / responses
- FAA enforcement
- Doug Marshall UND privacy
- UTMS – unmanned traffic management system
- FAQs could be discussed at a teleconference meeting of the task force

Adjourn .....Representative Shelley Hughes

Attachments:

- Motion Picture Association of America welcomes exemption 1
- A Drone by Any Other Name... 2-4
- DHS Flew Drones for 1,726 Hours Over Interior of US 5-6
- Russia to Open Arctic Military Drone Base 420 Miles from Alaska 7-9
- FAA says Air Traffic Control isn't Ready for UAS 10-12
- FAA Issues Requirement for All UAS to Show Aircraft Registration Number 13
- US National Transportation Safety Board Rules that Drones are Aircraft 14-15
- Canada Issues Clear Guidelines for UAS Flying 16-50
- Don't Fly Drones Here – UK Edition 51-56
- Drones and Everything After 57-70
- Model Aircraft Rule 71-80

Legislative Task Force on Unmanned Aircraft Systems
September 19, 2014 Meeting at 733 West 4th Ave
Temporary Anchorage Legislative Information Office

9:00am – 12:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Donny Olson, Co-Chair (not in attendance)
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II (called in)
- Bob May, Gallery Lodge, Kasilof

- Ginger Blaisdell, Staff to Rep. Hughes

Invited Attendees:

- Director Kerry Long and Jay Skaggs, FAA

Public testimony was received at the end of the meeting.

MEETING SUMMARY

9:00am Welcome and Introductions .....Representative Shelley Hughes

- Round table discussion of remarks following UAS Interest Group Meetings:
  1. Discussion positive overall and good turnout indicates increased positive potential
  2. FAA mission expressed was good to hear
  3. Recognized that Alaska has strongest privacy laws in place
  4. Got the word out that Alaska is "Open for Business"
- Introduction of Kerry Long and Jay Skaggs of the FAA.

Presentation by Kerry Long and Jay Skaggs

Highights:

1. Alaska has the freest and safest national airspace in the world.
2. Movie exemption is coming. It has been shown that UAS filming is safer than manned aircraft in many movie scenes where the industry is pushing the limits of safe flight.
3. Iceland as a partner with Alaska FAA test site will provide additional opportunities for testing in unrestricted airspace and provides an international range.
4. Amazon is selling 18-20,000 unmanned aircraft per month with more than 10,000 of those being the DJI Phantom. The DJI aircraft have been improving their internal systems by programming timeware, GPS restrictions and other safety measures.
5. UAS are a "disruptive technology" – the AMA is a community-based organization and is working with the FAA to educate the public.
6. Model aircraft is an aircraft and therefore subject to regulations.
7. Model VS its intent and operation
8. The FAA has the authority to use regulations that are available and can enforce reckless and careless endangerment for misuse of UAS
9. The FAA and industry have done a good job in reaching out to airmen.
10. At this time there is no federal funding for the test sites – burden is on state funding of sites. It was noted that all 6 states are seeking funding. Alaska is the only test site that is unfunded.

Steve Wackowski noted that safety accidents sometimes are directly linked to underfunding. Director Kerry reiterated that he can't get federal funding for test sites. Wackowski recommended that a funding request letter be sent to congress.

Kristi Bell, University of Alaska Anchorage

1. With Joe Jacobson, Department of Community and Economic Development, drafted a report identifying how Alaska is well positioned for this industry.
2. The University and DCCED are working collaboratively to prove that UAS is economically viable in Alaska.
3. The report will be made available to the Task Force when it is further along in its draft – likely at the next Task Force meeting in December.

Ginger provided a review of the documents in members' packets:
Amazon.com "drone store" includes a fly responsibility bulletin; however it takes 18 clicks to get to the rules of flying for hobbyists

- Don't reinvent the wheel but make it more accessible to the general public
- Scatter diagram or table of commercial VS hobbyist
- Joe Jacobson offered to help with public relations work on UAS public awareness
- Rep Hughes mentioned PSAs and an education campaign
- Jay Skaggs and Mike O'Hare mention that the education campaign have a broad scope beyond UAS to include robots and robotics and include the maritime and self-drive automobiles as well

Future Meeting Agenda:

1. Letter to Alaska Congressional delegation for test site funding and issues of underfunding
2. Letter to AUVSI for clarification on Alaska passing "anti-drone" legislation
3. Letter to Commissioners on point of contact for UAS missions
4. Letter to Governor regarding data retention policies
5. Letter to FAA stating that AMA be designated as community-based organization over hobby use in Alaska with the intent for personal and recreation use, not commercial.
    - Might be a resolution
    - AMA to present at a later meeting

- Next meeting:

1. Matrix
2. Education Plan

- Follow Up – To Do

1. Military mission in Alaska – process and plans
2. Italy data protection laws
3. Who to contact? Complaint / enforcement system / responses
4. UTMS – unmanned traffic management system

3:30pm **Closing Remarks and Adjourn**

REPRESENTATIVE
SHELLEY HUGHES

Economic Development
Trade and Tourism Committee
Chairman
Energy Committee
State Affairs Committee
Military & Veterans' Affairs Committee
University Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

Session:
State Capitol, Room 409
Juneau, Alaska 99801-1182

Interim:
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Wasilla, AK 99654
(907) 376-3725
Toll Free 1-800-565-3743

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HOUSE OF REPRESENTATIVES

District 8 – Greater Palmer

December 5, 2014

send to Wynn also

Michael Toscano
Director of AUVSI
2700 S Quincy St, Ste, 400
Arlington, VA 22202

DRAFT

Dear Mr. Toscano,

The Alaska Legislative Task Force on Unmanned Aircraft Systems was formed under legislative resolve in 2012. The Task Force is made up of government agency representatives and public members and is working to advance this technology to attract economic opportunities and ~~more importantly~~ to protect Alaskans' personal privacy through public awareness in the use of ~~small~~ unmanned aircraft systems (UAS) ~~by government agencies and hobbyists.~~

I attended the Alaska Interest Group UAS meetings in September and spoke up following your key note address to the attendees. My remarks were specific to the slide in your presentation that identified the states that had passed negative legislation with regard to unmanned aircraft policy. My specific request is that the color coded slide of the 50 states appropriately reflect that Alaska is very optimistic about the use of UAS and the legislation passed regarding law enforcement use of UAS encourages the use of UAS and clarified how the data gathered could be used in a court of law. The bill was drafted with the Department of Pubic Safety's support and is viewed as a positive step toward incorporating UAS in a wide variety of missions in law enforcement.

I simply ask that the slide in your presentation be corrected so not to represent Alaska in a negative light.

Thank you for time.

Sincerely,
Representative Shelley Hughes
Senator Donny Olson

1st commercial operations took place in AK

importance of certification of pilots in the program

Task Force:

- Is there anything additional that needs to be included in this request?
- How should the header read?

CC: (RO will provide name)

REPRESENTATIVE
SHELLEY HUGHES

Economic Development
Trade and Tourism Committee
Chairman
Energy Committee
State Affairs Committee
Military & Veterans' Affairs Committee
University Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

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Toll Free 1-800-565-3743

housemajority.org

December 5, 2014

Honorable Governor Bill Walker
3rd Floor State Capitol
Juneau, AK 99811-0100

DRAFT

Dear Governor Walker,

The Legislative Task Force on Unmanned Aircraft Systems was formed under legislative resolve in 2012. The Task Force is made up of government agency representatives and public members and is working to advance this technology to attract economic opportunities and more importantly to protect Alaskans' personal privacy through public awareness in the use of small unmanned aircraft systems (UAS) by government agencies and hobbyists.

During our review of existing statutes, the Task Force recognizes that the State's data retention policies need immediate attention and review as technology is presenting new challenges for state agencies. The Legislative Task Force on Unmanned Aircraft Systems respectfully requests that data retention policies be reviewed and revised with the use of data imagery storage be considered specifically for cost benefit analysis as well as personal privacy.

The Task Force is currently developing a public education strategy so that all users and observers of UAS understand the rules and expectations thereby, eliminating fear and reducing opportunity for inappropriate use of these aircraft.

Thank you for time.

Sincerely,
Representative Shelley Hughes
Senator Donny Olson

we are asking for point of contact @ each dept.

Task Force:

- Is there anything additional that needs to be included in this request?
- Should there be an anticipated due date for retention policy update to be completed?
- How should the header read?

REPRESENTATIVE
SHELLEY HUGHES

Economic Development
Trade and Tourism Committee
Chairman
Energy Committee
State Affairs Committee
Military & Veterans' Affairs Committee
University Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

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December 5, 2014
Send Jan.

DRAFT

Dear Commissioner,

The Legislative Task Force on Unmanned Aircraft Systems has identified the need for public awareness in the use of small unmanned aircraft systems (UAS) by government agencies. The Task Force respectfully requests that each State agency that intends to use UAS in its work, to provide the task force with a point of contact for your agency. We ask for this point of contact to be provided by January 1, 2015 or prior to a scheduled UAS mission if it will occur prior to January.

The Task Force is currently developing a public education strategy so that all users and observers of UAS understand the rules and expectations thereby, eliminating fear and reducing opportunity for inappropriate use of these aircraft. State agency participation is vital to the education campaign and will provide the Task Force with a better understanding of how our government agencies are planning to use UAS.

Thank you for time.

Sincerely,
Representative Shelley Hughes
Senator Donny Olson

Task Force:

- Is there anything additional that needs to be included in this request?
- Is January 1, 2015 an appropriate date?
- Address the letter to each commissioner or in general with a list in the CC:
- How should the header read?

Recreational Use of UAS

Currently, the FAA allows the operation of small unmanned aircraft systems (sUAS) for hobby and recreational purposes under specific safety guidelines. Small UAS flown for recreational purposes are typically known as model aircraft.

Under the Special Rule for Model Aircraft, recreational UAS must be operated in accordance with a community-based safety program. Operators not operating within the safety program of a community-based organization should follow the FAA's guidance in Advisory Circular 91-57.

What is recreational use of a sUAS (Drones)?

The recreational use of sUAS is the operation of an unmanned aircraft for personal interests and enjoyment, and not for compensation or hire. For example, using a sUAS to take photographs for your own personal use would be considered recreational; using the same device to take photographs or videos for compensation or sale to another individual would be considered commercial. You should check with the FAA for further determination as to what constitutes commercial sUAS operation.

What are the safety guidelines for recreational users of sUAS (Drones)?

- Users should follow community-based safety guidelines, as developed by organizations such as the Academy of Model Aeronautics (AMA)
- Users should fly no higher than 400 feet and remain below any surrounding obstacles when possible
- Users must be able to see their sUAS at all times, and use an observer to assist them if needed
- Users should remain well clear and must not interfere with manned aircraft operations, and must see and avoid other aircraft and obstacles at all times
- Users must not intentionally fly over unprotected persons or moving vehicles, and should remain at least 25 feet away from individuals and vulnerable property
- Users must contact the airport or control tower before flying within five miles of an airport
- Users should not fly in adverse weather conditions such as in high winds or reduced visibility
- Users must not fly under the influence of alcohol or drugs
- Users should ensure the operating environment is safe and that the operator is competent and proficient in the operation of the sUAS
- Users should not operate on or fly over private property without first obtaining permission from the property owner and/or tenant
- Users should not fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc.
- Users should not conduct surveillance or photograph persons in areas where there is an expectation of privacy without the individual's permission (See AMA's privacy policy)

If you want to use a model aircraft for recreational purpose, we encourage you to read the AMA's Model Aircraft Safety Code and Community-Based Guidelines.

To learn more about these and additional safety guidelines from the FAA, click here.

Ginger Blaisdell

From: Ro Bailey <rbailey11@alaska.edu>
Sent: Tuesday, November 25, 2014 4:07 PM
To: Ginger Blaisdell
Subject: Next UASIG meeting

Hi, Ginger,

We have started planning the next UASIG meeting, which will be the week before Labor Day in 2015, probably 1-3 Sept (Tues-Thurs). Do you think Shelley will want to do a Leg Task Force meeting attached to it again? I know I will have my annual privacy report due at that point, and we could do it then.

Ro

Ro Bailey, Director
Pan-Pacific UAS Test Range Complex (an FAA Test Site), and
Deputy Director
Alaska Center for Unmanned Aircraft Systems Integration - RDT&E
Geophysical Institute
University of Alaska Fairbanks
PO Box 757320
Fairbanks AK 99775
907-455-2015
cell 907-322-2255

DIANNE FEINSTEIN
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COMMITTEE ON THE JUDICIARY
COMMITTEE ON RULES AND ADMINISTRATION

United States Senate
WASHINGTON, DC 20510-0504
http://feinstein.senate.gov

December 3, 2014

Mr. Michael P. Huerta
Administrator
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

Dear Administrator Huerta:

The recent reports of near-collisions between drones and manned aircraft in our nation's airspace are alarming. I urge you to vigorously enforce safety laws and regulations against the unsafe operation of drones and to warn operators about the potential hazards and consequences of their reckless behavior.

In July, I wrote to express my d adopt gers posed by expanded domestic drone use in the national airs Know Before You Fly n the Federal Aviation Administration so I could get a full se with date on it . Last week, I received data from your staff that corroborated led domestic drone use.

According to this data, Military update reported to the FAA over the last nine months. Sin e more than one incident per day. These numbers include n ar mid-air collisions with other aircraft and more th in proximity to other aircraft. In addition, the repor , overflights of stadiums and a power plant, and unlawf m this year include:

FAA - Jay Skaggs
- enforcement
- certification of pilots
exemption
9 movie co exempt

- October 12: an aircraft came e and took evasive action to avoid collision at 4,800 feet a City.

- September 30: an aircraft inbound to LaGuardia Airport reported a drone that "almost hit" the aircraft at 4,000 feet in elevation;

- August 23: in Burbank, California, an aircraft reported a drone "off [its] left wing passing opposite direction while [north] bound at 8,000 feet";

- May 29: two aircraft on approach to Los Angeles International Airport (LAX) reported seeing a "trash can sized" drone at 6,500 feet;

It is clear that we have a serious potential safety problem which could cause a serious threat to life. Yet, very few of these incidents resulted in FAA enforcement actions, according to reports, even though the drones' operations appear to have been plainly illegal. For example, many reports indicate commercial activity, flights above 400 feet in elevation, operation within 5 miles of an airport without authorization, flights outside the operator's line of sight, or careless and reckless activity.

I recognize that the proliferation of highly-capable, inexpensive drones operated by untrained individuals is a new challenge. But the FAA is responsible for the safety of the airspace, and it must aggressively confront this challenge now, before an airliner is brought down. I urge you to pursue vigorous enforcement and strong safety regulations, and to warn operators about the consequences of their behavior.

It is my intent to introduce legislation to codify and expand the moratorium on private drone use without specific authority from the FAA that is already in place. This expanded moratorium would cover any such use that could threaten the airspace, it would require a safety certification for expansions of private drone use, and it would be backed up by substantial criminal penalties if manned aircraft or people are put at risk. I would very much appreciate your comments and technical assistance on such legislation.

Thank you for your full attention to this matter. Please respond to this letter by no later than December 15, 2014.

Sincerely,

Dianne Feinstein
United States Senator

IBISWorld

WHERE KNOWLEDGE IS POWER

Empty inside: Industry revenue will decline as conflicts subside in the Middle East

IBISWorld Industry Report OD4424

Unmanned Aerial Vehicle (UAV) Manufacturing in the US

July 2014

Maksim Soshkin

2 About this Industry
2 Industry Definition
2 Main Activities
2 Similar Industries
2 Additional Resources

3 Industry at a Glance

4 Industry Performance
4 Executive Summary
4 Key External Drivers
6 Current Performance
8 Industry Outlook
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12 Products & Services
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About this Industry

Industry Definition

Industry firms manufacture and design unmanned aerial vehicles (UAVs) and related control systems for civilian and military applications. UAVs can be either autonomous or remote controlled, and are used in situations where the use of a human pilot is undesirable or dangerous.

Main Activities

The primary activities of this industry are

- Manufacturing UAVs for armed attack
- Manufacturing UAVs for surveillance
- Manufacturing UAVs for research
- UAV research and development

The major products and services in this industry are

- High altitude UAVs
- Low altitude UAVs
- Medium altitude UAVs

Similar Industries

33641a Aircraft, Engine & Parts Manufacturing in the US
Some operators in the larger aircraft manufacturing industry produce UAVs.

33641b Space Vehicle & Missile Manufacturing in the US
UAVs are similar to some spacecraft and missiles in that they are unmanned and either autonomous or remote-controlled.

33661a Ship Building in the US
Like the UAV industry, US shipbuilders mostly manufacture military equipment.

33699b Tank & Armored Vehicle Manufacturing in the US
Like tanks and armored vehicles, UAVs a primarily manufactured for the military.

Additional Resources

For additional information on this industry

www.defense.gov
Department of Defense

www.fas.org/
Federation of American Scientists

http://trade.gov
International Trade Administration

Industry at a Glance

Unmanned Aerial Vehicle (UAV) Manufacturing in 2014

Key Statistics Snapshot

Revenue	Annual Growth 09-14	Annual Growth 14-19
$3.4bn	2.7%	3.7%
Profit	**Wages**	**Businesses**
$392.9m	$683.8m	63

Market Share

General Atomics Aeronautical Systems 24.1%

Northrop Grumman Corporation [illegible]%

Textron Inc. 11.8%

p. 24

Key External Drivers

Federal funding for defense

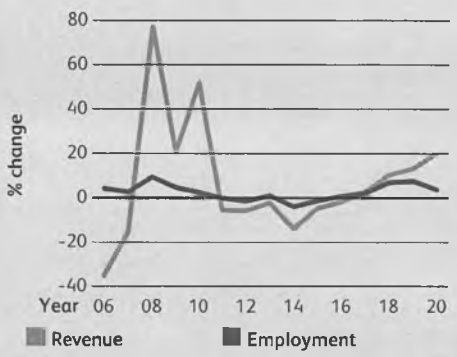
Price of semiconductor and electronic components

World price of aluminum

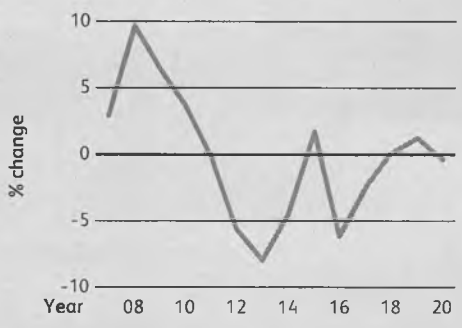
Federal funding for homeland security

p. 4

Revenue vs. employment growth

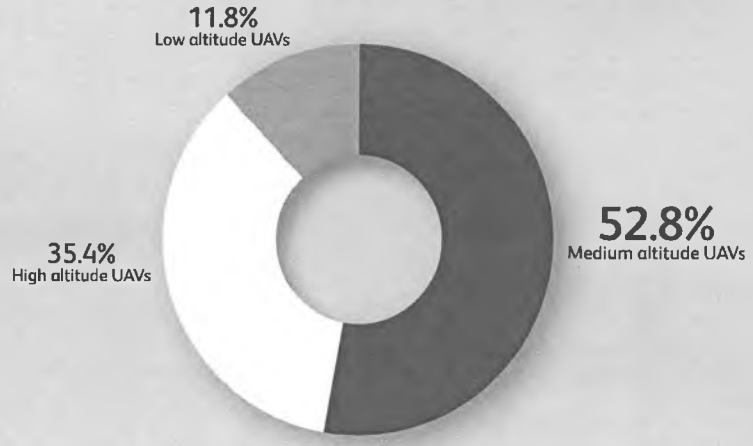


Federal funding for defense



SOURCE: WWW.IBISWORLD.COM

Products and services segmentation (2014)



SOURCE: WWW.IBISWORLD.COM

Industry Structure

Life Cycle Stage	Growth	Regulation Level	Heavy
Revenue Volatility	Very High	Technology Change	High
Capital Intensity	Medium	Barriers to Entry	High
Industry Assistance	High	Industry Globalization	Low
Concentration Level	Medium	Competition Level	High

FOR ADDITIONAL STATISTICS AND TIME SERIES SEE THE APPENDIX ON PAGE 34

Industry Performance

Executive Summary | Key External Drivers | Current Performance
Industry Outlook | Life Cycle Stage

Executive Summary

Over the past five years the Unmanned Aerial Vehicle (UAV) Manufacturing industry experienced strong growth and sharp declines. Industry players develop and manufacture remotely piloted and autonomously operated aircraft typically called UAVs or drones. From 2009 to 2010, the industry experienced a boom in demand as the Department of Defense (DoD) poured billions of dollars on the acquisition and development of drones for surveillance and strike missions. However, with combat operations in the Middle East coming to an end and the government attempting to reduce the nation's debt, federal funding for defense began to decline. As a result, funding for industry projects began to be cut and industry revenue declined. Revenue is expected to drop 13.8% in 2014 alone. Nonetheless, the earlier surge in DoD spending, combined with continued military funding for UAV development and procurement, has meant that industry revenue is still greater than 2009 levels. Therefore, in the five years to 2014, industry revenue is expected to increase an annualized 2.7% to $3.4 billion.

Conflicts in the Middle East and the need for homeland security have bolstered revenue

Outside the defense market, industry players have increased the focus on the development of UAVs for domestic use. Potential domestic uses for drones include border enforcement, humanitarian relief, search and rescue, scientific research, meteorology, firefighting, precision agriculture, infrastructure surveying, police surveillance, freight delivery and communication signals relaying. However, domestic operations of drones is highly restricted by the Federal Aviation Administration (FAA). As a result, in 2012, Congress ordered the FAA to establish rules by which UAVs can be integrated into domestic airspace by 2015.

In the five years to 2019, industry revenue is forecast to climb at an annualized 3.7% to $4.1 billion, almost recovering from recent defense funding cuts. While, the defense spending situation is only projected to improve towards the end of the next five years, the DoD is still anticipated to pour billions into industry projects. In particular, the government will seek to develop and procure next generation UAVs that will be able to operate in "contested" airspace. With the FAA anticipated to establish regulations for the domestic use of drones, demand from the civil market is projected to boom. Consequently, the number of industry enterprises is set to continue rising.

Key External Drivers

Federal funding for defense

The United States military accounts for the vast majority of funding for unmanned aerial vehicle (UAV) development and procurement. As a result, when defense spending increases, so does demand for industry products. Federal funding for defense is expected to decline in 2014, representing a potential threat to the industry.

Price of semiconductor and electronic components

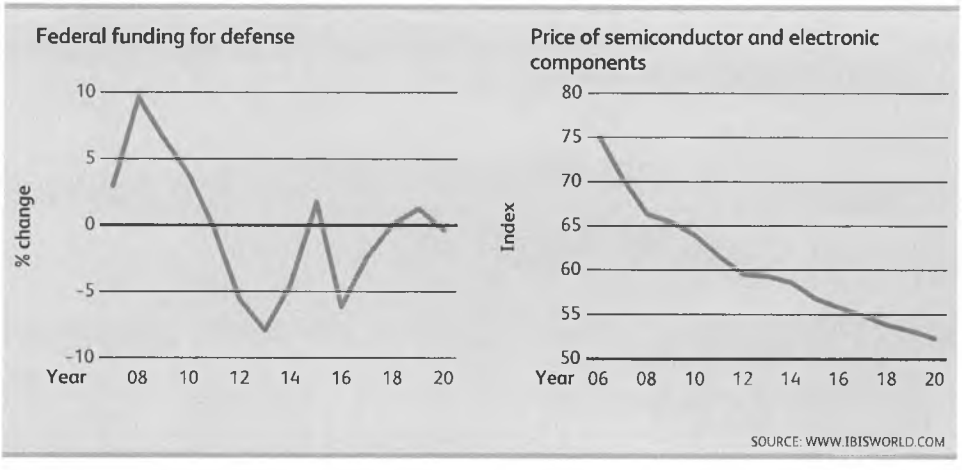
UAVs require a significant amount of electronic components for data recording and transmission purposes, as well as avionic functions. The price of semiconductors and electronic components is expected to decrease in 2014, representing a potential opportunity for the industry.

Industry Performance

Key External Drivers continued

World price of aluminum
Aluminum is one of the most commonly used raw materials in the manufacturing of UAV. When the price of aluminum increase, operators have to either pass on increasing costs to customers in the form of higher prices or reduce profit margins. The world price of aluminum is expected to decline in 2014.

Federal funding for homeland security
The Department of Homeland Security provides federal funding for domestic emergencies, including terrorism and environmental disasters. In addition, the department oversees federal agencies dealing with border security, an emerging application for UAVs. Federal funding for homeland security is expected to decrease during 2014.



Industry Performance

Current Performance

Over the past five years, the Unmanned Aerial Vehicles (UAV) Manufacturing industry has begun a slow descent after reaching new heights. Industry players manufacture UAV, or drones, which are remotely piloted and autonomously operated aircraft. From its inception, the industry has primarily relied on military funding for the development and procurement of its aircraft. At the early stage of the past five years, increased military use of drones for anti-terrorist, combat and surveillance missions led to a surge in demand for industry products and their further development. However, as US combat operations in the Middle East began to wind down and rising federal debt levels forced the government to reduce spending, federal funding for defense declined, with the Department of Defense (DoD) UAV budget shrinking. As a result, industry revenue began to descend. Nonetheless, the earlier surge in DoD spending, combined with continued military funding for UAV development and procurement has meant that industry revenue is still above 2009 levels. Therefore, in the five years to 2014, industry revenue is expected to increase at an annualized 2.7% to $3.4 billion.

Defense spending drives demand

The DoD accounts for the vast majority of spending on industry products and development, with nearly 90.0% of industry revenue coming from the United States Air Force, Army, Navy and Marine Corps. Since UAVs are unmanned and can be operated remotely or function autonomously, they reduce the risk of military casualties for troops that would otherwise have their boots on the ground or fly the required missions themselves. In addition, because there is no pilot in the aircraft, drones are typically less expensive to operate and can loiter in the air relatively undetected, making them ideal for surveillance, reconnaissance and strike missions. As a result, when the United States began its wars in the Middle East and antiterrorist operations, the Pentagon poured billions of dollars into the industry, with revenue skyrocketing 51.9% in 2010 alone. In particular, the military prioritized acquisition of new UAV platforms. This included the medium to high altitude, long endurance, Gray Eagle and Reaper surveillance and strike drones (helping replace the Predator), as well as the smaller Shadow and Raven drones that are used at a more tactical level. The military also stepped up the development and procurement of the high altitude Global Hawk surveillance UAV.

Defense funding skyrocketed, creating a boon for industry establishments

However, the boom in military spending eventually came to a halt. The combination of reduced combat operations in the Middle East and Congress' attempts to cut the deficit (including sequestration) caused military spending to decline, with federal funding for defense expected to fall at an annualized 3.0% to $620.6 billion in the five years to 2014. With US forces withdrawing from Iraq in 2011 and winding down operations in Afghanistan, the operational need for UAVs began to slowly decline. Moreover, years of drone procurement left the military enough UAVs to meet its current need, further reducing UAV procurement amid the recent budget cuts. As a result, industry revenue began to decline in 2011 and is expected to continue to do so in 2014, plunging

Industry Performance

Defense spending drives demand continued

13.8%. Nonetheless, despite the cuts, the military has continued to spend billions on UAV development and programs, including the Global Hawk, stealth combat and surveillance dorms, aircraft carrier launched drones and many other initiatives, including top secret projects.

The domestic and commercial market

The domestic and commercial applications of UAVs seem unlimited, with new platforms being developed each year. Applications include border enforcement, humanitarian relief, search and rescue, scientific research, meteorology, firefighting, precision agriculture, infrastructure surveying, police surveillance, freight delivery and communication signals relaying. However, stringent regulations have prevented the domestic market for drones from taking off. Currently, regulators fear that drones can't adequately interact with other aircraft and objects, heightening the chances of a collision or crash. As a result, drone operators have to obtain special authorization and certification from the Federal Aviation Administration (FAA) to operate UAVs in US airspace. However, in 2012, Congress ordered the FAA to create rules for the integration of UAVs into domestic airspace by 2015. Consequently, the FAA rolled out a "roadmap" for UAV integration, by which it plans to phase in domestic use of UAV by creating new regulation and certifications. The domestic use of industry products has also come under greater public scrutiny, with many worried that surveillance drones may infringe of peoples' privacy rights.

Despite some cuts in 2010, Homeland security will still bring revenue as borders are closely monitored

Despite regulatory restriction, domestic UAV use has greatly increased over the past five years. The Department of Homeland Security has been using drones to monitor the United States border for illegal immigration and drug trafficking, as well as in disaster relief operations (although the recent reduction in federal funding for homeland security is expected to stifle this demand). Other notable examples of civil UAV applications include the NASA missions in which a Global Hawk UAV was flown over tropical storms in partnership with the National Oceanic and Atmospheric Administration to collect data on severe weather information and the Department of Agriculture and NASA's wildfire support efforts. Moreover, earlier this year, BP became the first company to domestically use UAVs for commercial purposes after the FAA allowed it to use small drones to monitor its Alaskan oil pipelines.

Profitability and other trends

Due to recent reduction in government funding for UAV projects, industry profit is expected to decline from 11.8% in 2009 to 11.5% in 2014. Although, recent declines in the world price of aluminum and the price of semiconductor and electronic components (all major manufacturing inputs) have relieved some margin pressure. Moreover, defense cuts have forced some manufacturers to lay off staff, with industry employment expected to decline

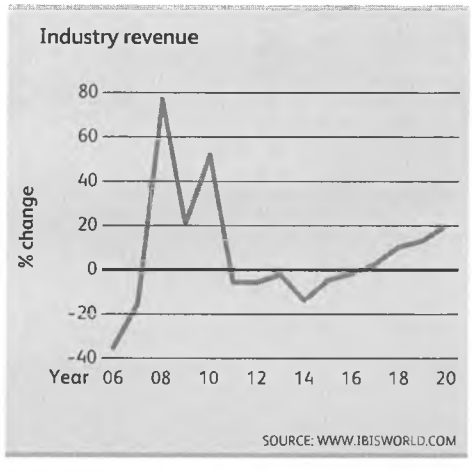
Industry Performance

Profitability and other trends continued

at an annualized 0.4% to 7,616 in the five years to 2014. However, the number of industry enterprise is expected to rise at an annualized 2.8% to 63 over the same period, as small startup companies develop new UAVs for commercial applications.

Industry Outlook

Over the next five years, the Unmanned Aerial Vehicles (UAV) Manufacturing industry is anticipated to nearly recover from recent declines. For most of the near future, the industry will continue to come under pressure from reduced defense spending. However, the military is still anticipated to invest substantial resources into UAV projects, with spending eventually increasing towards the last few years of the five-year period. Moreover, as new regulations are established, the domestic market for drones is finally projected to take off in a substantial manner. Lastly, operators will look to offset lackluster military demand at home with foreign sales. Therefore, in the five years to 2019, industry revenue is forecast to climb at an annualized 3.7% to $4.1 billion.



The defense market

As the United States reduces its presence in Afghanistan, pursues a less interventionist foreign policy and attempts to reduce the federal debt, federal funding on defense is forecast to decline at an annualized 1.1% to $585.8 billion in the five years to 2019. Consequently, Department of Defense (DoD) spending on industry projects is projected to continue falling in the near future. However, despite these cuts, the military will continue to invest significant resources into UAV development and procurement. For instance, Northrup Grumman's Global Hawk surveillance drone will continue to be further developed, with a maritime version being created for the Navy.

In particular, funding on industry projects will reflect the DoD's transition from the current generation of UAVs (whose acquisition the military is slowing down) to the development and eventual procurement of next generation systems that will be more autonomous and able to operate in "contested" airspace. For instance, Northrup Grumman is developing a stealthy surveillance (and potentially strike) UAV for the Air Force, dubbed the RQ-180. The aircraft's stealth features and other technology will allow it to operate in airspace that is too heavily defended for traditional UAVs. The Navy is also attempting to develop a next generation, aircraft carrier launched UAV through its Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) program. Northrop Grumman, Lockheed Martin, Boeing and General Atomics have all proposed aircraft, such as the X-47B and Sea Avenger. However, the program has not been spared from budget controversy. The Navy has recently changed its original proposal for

Industry Performance

The defense market continued

a highly stealthy, strike and surveillance drone to a more affordable, less risky, but less capable one. In response, members of Congress are attempting to stall the program and have its requirement changed to a higher end model.

In order to offset lackluster demand from the DoD, manufacturers are anticipated to increasingly seek foreign orders. For instance, Northrup Grumman is currently developing a Global Hawk model for the North Atlantic Treaty Organization (NATO). The company is also anticipated to deliver the Global Hawk to South Korea, with countries including Australia and Japan also showing great interest. However, major regulatory obstacles remain. Many UAVs and related components are subject to International Traffic in Arms Regulations (ITAR), which require exports to receive State Department approval. Moreover, UAVs are also covered by the Missile Technology Control Regime (MTCR), which greatly restricts the exports of UAVs. As a result, UAV exports are often carried out through the military.

Domestic market

Over the next five years, the highest growth area for the industry is projected to be the commercial and domestic markets. By 2015, the Federal Aviation Administration (FAA) is anticipated to release rules and procedures on how to integrate UAVs into domestic airspace operation. As a result, demand from markets like border enforcement, humanitarian relief, search and rescue, scientific research, meteorology, firefighting, precision agriculture, infrastructure surveying, police surveillance, freight delivery and communication signals relaying is projected to boom. However, the necessary regulations are still far from full development and many technological and political obstacles remain. Consequently, despite strong growth, the civil market for UAV is still projected to be a fraction of the defense market.

The highest growth area for the industry is projected to be the commercial and domestic markets.

Profitability and other trends

As manufacturers adjust to more lackluster demand from the military and increased prospects for commercial sales, industry profit is forecast to rise from 11.5% in 2014 to 12.8% in 2019. Additionally, the projected decline in the price of semiconductor and electronic components will further ease profit pressure. The anticipated boom in the civil UAV market is also expected to lead to more companies and workers entering the industry and offsetting defense related cuts. As a result, over the five years to 2019, industry employment is forecast to rise at an annualized 3.2% to 8,908 people, while the number of enterprises will climb at an annualized 3.8% to 76. Furthermore, merger and acquisition activity is projected to climb as aerospace and defense companies attempt to acquire smaller players to diversify into the commercial UAV market.

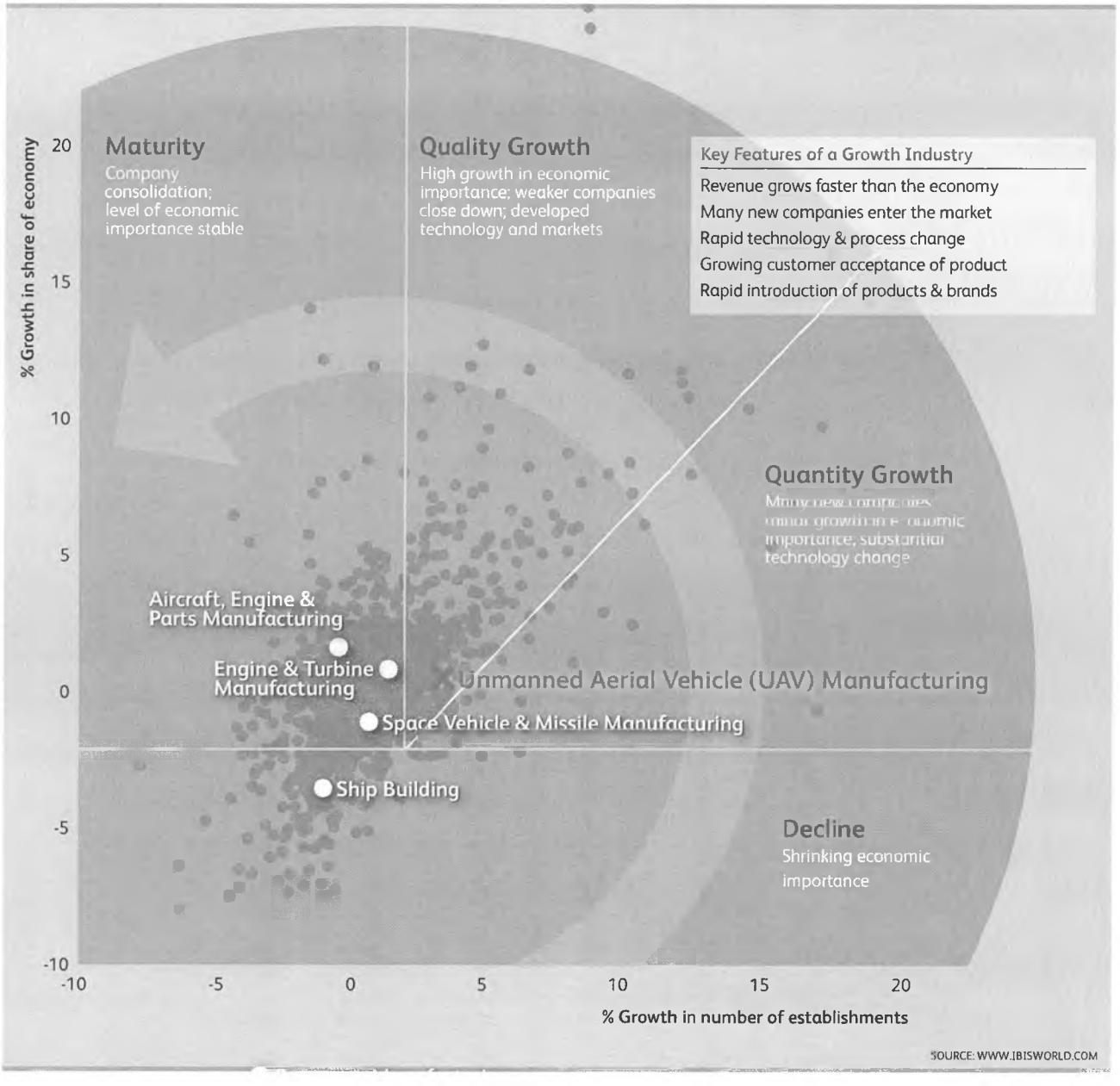
Industry Performance

Life Cycle Stage

Industry value-added is forecast to pass GDP

Industry products are being developed for new markets

Technological innovation is ongoing



Industry Performance

Industry Life Cycle

This industry is **Growing**

The Unmanned Aerial Vehicle (UAV) Manufacturing industry is in a growth stage of its life cycle. Over the 10 years to 2019, industry value added (IVA), which measures the industry's contribution to the US economy, is forecast to rise at an average rate of 3.2% per year. In comparison, US GDP is forecast to rise at an average rate of 2.7% annually during the same period. Typically, IVA growth greater than GDP indicates a growing industry. However, even this IVA performance, which was reduced by declining defense spending, underrepresents the rapid development of this industry.

Despite the military's recent funding reduction for UAV programs, the government continues to invest billions of dollars into new platforms and technologies. This includes the development of UAVs for fighter combat, stealth missions, aircraft carrier operations, surveillance and communications. The size of UAVs now varies from just a few inches to aircraft with a wingspan of 400 feet. Alternative propulsion systems have also been created, including solar and hydrogen power.

The development of commercial UAVs has also greatly expanded, with aircraft being developed for the communications, agriculture, public sector, surveying and other markets. Nonetheless, the defense sector is projected to remain the primary market for industry operators into the foreseeable future.

Another factor that indicates that this industry is in a growth stage is the increasing number of industry players, with the number of enterprises forecast to rise at an annualized 3.3% over the 10 years to 2019. Despite large defense contractors and other companies' acquisitions for smaller UAV producers, the number of operators continues to expand as companies develop UAVs for the potentially vast commercial market.

Products & Markets

Supply Chain | Products & Services | Demand Determinants
Major Markets | International Trade | Business Locations

Supply Chain

KEY BUYING INDUSTRIES

54	**Professional, Scientific and Technical Services in the US** Various surveillance, exploration, scientific and technical service firms use UAVs for civilian commercial purposes.
92	**Public Administration in the US** Government establishments in the US Department of Defense (DOD) and other government agencies purchase UAVs for defense and safety purposes.

KEY SELLING INDUSTRIES

33361a	**Engine & Turbine Manufacturing in the US** Unmanned aerial vehicles (UAVs) are powered with engines, often purchased from outside suppliers.
33411a	**Computer Manufacturing in the US** UAVs are typically controlled autonomously using computers installed within the vehicle.
33441b	**Circuit Board & Electronic Component Manufacturing in the US** Various circuits, semiconductors and related electronic components are used in the manufacture of UAVs.

Products & Services

The Unmanned Aerial Vehicle (UAV) Manufacturing industry manufactures UAVs, also commonly referred to as unmanned aerial systems (UAS), are aerial vehicles and equipment that do not carry a human operator, but instead fly autonomously or are remotely piloted.

There are various types of UAVs serving the military and civilian markets, but there is currently no widely accepted classification system for these vehicles, which vary by capability, size, weight, altitude and general operating characteristics, among other factors. In terms of function, UAVs generally fall within one of six categories: target and decoy, reconnaissance, combat, logistics, research and development (R&D), civil and commercial. Target and decoy UAVs are typically used for military training purposes, providing ground and aerial forces a target that simulates an enemy aircraft or missile. Reconnaissance and combat UAVs are used in the battlefield for intelligence attack capability in high-risk missions. Logistics UAVs are used for cargo and logistics operations, while R&D UAVs are used to further develop UAV technologies. Civil and commercial-application UAVs range from purposes of surveillance and reconnaissance to scientific data gathering or delivery of services (e.g. crop dusting and telecommunication relays).

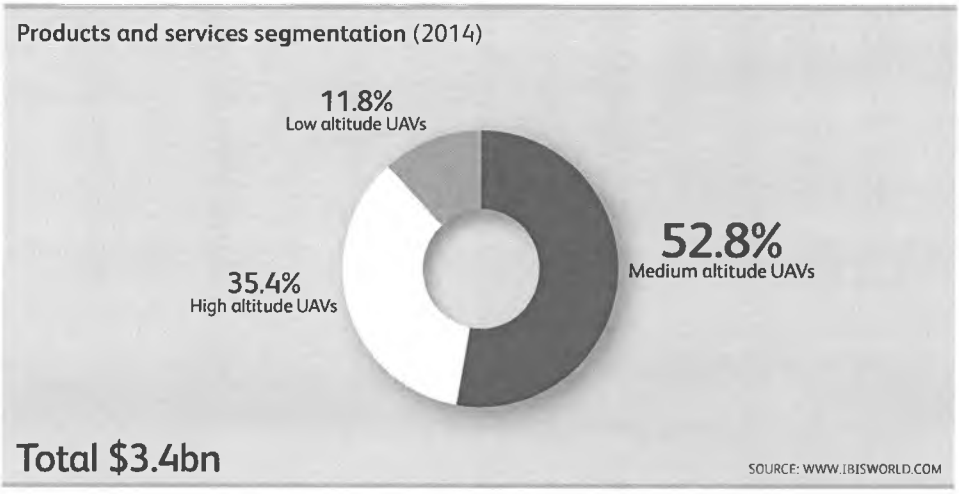
IBISWorld estimates that about 43.2% of the government's modernization spending on UAVs goes towards research development, testing and evaluation, while 56.8% goes towards procurement. Moreover, industry products can be broken down by systems components. For instance, according to Congressional Research Service, 46.0% of industry revenue comes from actual UAVs, 38.0% comes from payloads, such as surveillance components and 16.0% comes from ground control equipment.

Medium altitude UAVs

UAVs operating at a medium altitude account for about 52.8% of industry revenue. Medium altitude UAVs such as General Atomics' Predator drones are the workhorses of the military's UAV fleet, operating on intelligence, surveillance, target acquisition, reconnaissance and attack missions. These UAVs can typically fly for a relatively long time and

Products & Markets

Products & Services continued



can cover medium to sometimes long distances. Over the past five years, this segment's share of revenue has increased due to their heavy use.

High altitude UAVs

High altitude UAVs account for 35.4% of industry revenue. These UAVs fly at altitudes of above 50,000 feet and are primarily used surveillance operations, with some used for scientific purposes. The product category is dominated by Northrup Grumman's Global Hawk, which accounts for the majority of this segment's revenue. While, only a small number of Global Hawks have been built compared to medium altitude UAVs, their more sophisticated nature and developmental stage makes them a more expensive product, significantly increasing their share of revenue. Over the past five years this segment's share of revenue has declined due to defense budget cuts and a reduction in procurement.

Low altitude UAVs

Low altitude UAVs account for about 11.8% of industry revenue. UAV in this category are small, with many, like AeroVironment's Wasp, being hand launched. Their small size makes them a useful surveillance tool for unit level military groups and Special Forces. Moreover, their low price range also means they are among the most prolific types of UAVs used around the world. According to AeroVironment, one of the leaders in the low-altitude small UAV segment, the market for military small UAS is evolving rapidly and subject to changing technologies, shifting customer needs and expectations and the potential introduction of new products. Commercial applications for low altitude UAVs continue to grow, and include photography, communications and environmental and traffic monitoring. Many of these technologies, however, remain in development stages.

Products & Markets

Demand Determinants

The primary factors influencing demand for UAVs include defense funding and technological innovation. The United States Department of Defense (DoD) continues to lead the development, ownership and operation of UAVs on a global scale. The DoD has more than 10,000 UAVs in its inventory, ranging from small, hand launched UAVs to high altitude ones. The majority of these aircrafts are currently being used in support of ongoing operations overseas.

Because defense funding is the primary source of industry revenue, industry demand is highly correlated with factors that influence this funding. Increased geopolitical tensions and war both typically lead to higher defense spending and thus funding for industry projects. Moreover, increased UAV use during combat operations tends to increase wear and tear among operational UAVs, leading to more spending on parts and replacement products. Defense spending is also influenced by the economic conditions of the country. In recent years, rising federal debt levels, combined with the wind down of combat operations in the Middle East have led to a reduction in military spending. In addition, sequestration (an all across cut in government spending) has further reduced military spending, with the President's fiscal 2015 defense budget requesting nearly 40.0% less on the research development, testing, evaluation and procurement of UAVs than the fiscal 2012 request.

Technological developments are another major demand determinant for industry products. The development of new technologies like smaller UAVs or UAVs with stealth features, increase the likelihood that the DoD will buy such systems in order to expand capabilities. Spending and technological breakthroughs by foreign UAV programs also increase demand for industry products as the military attempts to maintain an edge over potential competitors.

Demand for commercial UAVs is still limited by regulations and public opinion. As of this moment, regulations prevent wide spread commercial use of UAV due to concerns about collisions with other aircraft and airworthiness. Moreover, public opinion has also been mixed, with many fearing that domestic use of surveillance UAV poses a threat to privacy.

Major Markets

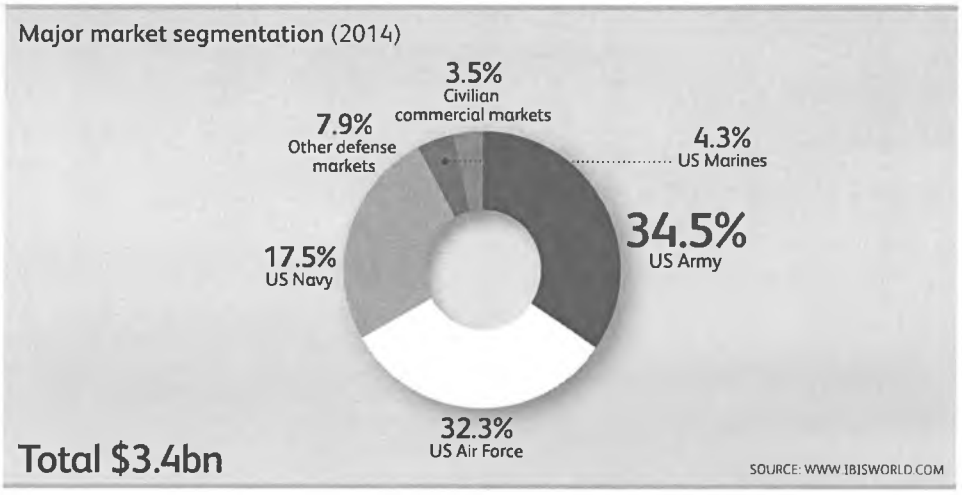
Department of Defense (DoD)

The DoD accounts for the vast majority of spending on US Unmanned aerial vehicle (UAV) research and development (R&D) and procurement. Slightly over half of DoD spending goes on procurement, with the rest going towards R&D projects. Unmanned aerial vehicle (UAVs) are considered a key component of US defense transformation and an integral part of US military strategy. Currently intelligence, surveillance, reconnaissance (ISR) and precision strikes are the predominant UAV missions, but the US Department of Defense (DOD) is closely working with the industry to develop new capabilities that will greatly enhance these systems in the future.

The United States Army accounts for 34.5% of the industry's market, mostly focusing on acquiring medium altitude or tactical UAVs. According to the Fiscal 2015 Presidential budget request, most of the Army's UAV budget is allocated towards the procurement of General Atomics' medium altitude, long endurance, Gray Eagle and the Textron's tactical, Shadow UAV. The United States Air Force (USAF) accounts for about 32.3% of industry revenue and puts more

Products & Markets

Major Markets continued



emphasis on high altitude surveillance and strike UAVs. According to the fiscal 2015 budget request, most of the USAF's budget is allocated towards the development and acquisition of General Atomics' Reaper UAV. The USAF is also one of the primary funders of Northrup Grumman's high-attitude Global Hawk surveillance UAVs. This branch is usually the largest buyer of UAVs, but has recently slowed down the procurement of the Reaper and Global Hawk drones. The United States Navy (USN) is expected to account for 17.5% of industry revenue. The USN's share of industry revenue has rapidly increased over the past five years as it began to fund the development of a maritime version of the Global Hawk, dubbed the Triton. The USN is also currently funding the Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) program, which seeks to develop a UAV able to be launched of Aircraft Carriers and operate in contested air space. Finally, the Marine Corps accounts for 4.3% of industry revenue, with most funding going on Boeing's Blackjack and AeroVironment's Raven UAVs.

Other defense markets

Defense markets outside the DoD account for about 7.9% of industry revenue. They include the Department of Homeland Security, which uses UAVs for border and coast guard patrol functions. The industry also sells UAVs to allied militaries and governments, but these purchases are typically made through the US military due to regulatory and liability issues. For instance, a North Atlantic Treaty Organization (NATO) version of the Global Hawk is currently being developed through the DoD. Most UAV exports are made up of small and tactical UAVs.

Civilian commercial markets

The civilian commercial market accounts for about 3.5% of industry revenue. Commercial applications for UAVs have grown at a rapid pace, but many remain in development stages. Civil applications include scientific research, environmental protection (e.g., oil field observation), communications (e.g., UAVs substituting satellites), disaster prevention and management and infrastructure protection (e.g., pipeline monitoring). Notable examples of civil applications include the 2010 NASA mission in which a Global Hawk (Northrop Grumman) was flown over tropical storms in partnership with the National Oceanic and Atmospheric Administration to collect data on severe weather information and the Department of Agriculture and

Products & Markets

Major Markets continued

NASA's wildfire support efforts. Other commercial applications are in use in agriculture, satellite imaging and mineral exploration. While this market has rapidly grown over the past five years, regulations and public opinion concerning the domestic use of UAV has hindered market growth. Nonetheless, this market's share of revenue is expected to continue to grow over the next five years as regulations loosen. (For more on regulation, please refer to the Regulation and Policy section).

International Trade

The Unmanned Aerial Vehicle (UAV) Manufacturing industry engages minimally in international trade, largely due to government regulations regarding the export of UAVs and dependence of industry operators on US military research funding and overall demand. In general, many UAV platforms and components are subject to International Traffic in Arms Regulations (ITAR), which require exports to receive State Department approval. However, the Obama administration has recently moved some UAV components off the ITAR list, putting them under less stringent Commerce Department oversight. Many UAVs are also covered by the Missile Technology Control Regime (MTCR), which greatly restricts the exports of UAVs. For instance, AeroVironment, generates about 15.0% of its revenue from international markets, cites in its 2013 10-K that "the unavailability of, or difficulties in obtaining any, necessary governmental authorizations for the export of our UAS products to certain foreign jurisdictions" hinders further international sales. Moreover, trade data is often not counted within the industry, as the movement of industry goods (especially complete UAV) overseas often occurs through the US government and not directly between manufacturers and customers.

Products & Markets

Business Locations 2014

SOURCE: WWW.IBISWORLD.COM

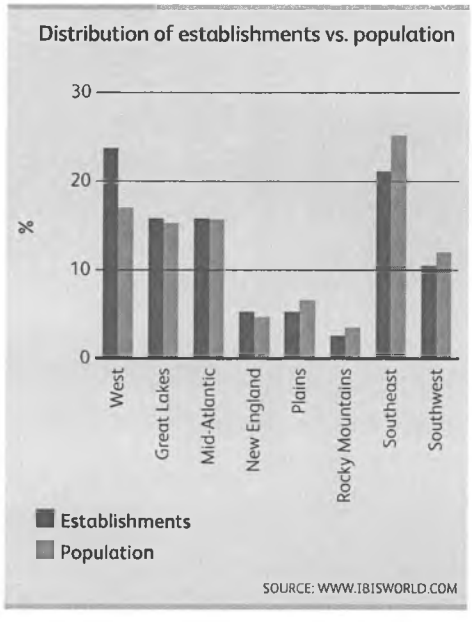
Products & Markets

Business Locations

The industry's geographical spread has not changed significantly during the past few years due to its low number of establishments (72 in 2014). The industry is mainly concentrated in states with high-tech industries and locations that are close to suppliers and highly skilled labor. As a result, companies tend to cluster around aerospace industry hubs.

The industry is concentrated in the West, which accounts for 23.7% of all industry establishments. Within this region, a large portion of industry activity is located in California, which is consistent with the state's high population. This region's dominance also reflects the historic prevalence of defense contractor activities in California. Major companies General Atomics and Northrop Grumman's Aerospace Systems subsidiary are based in California. UAV manufacturer AeroVironment is also based in California.

This industry is also prevalent in the Southeast and Mid-Atlantic regions. The Mid-Atlantic includes the Washington, DC region, while the Southeast includes Virginia where many defense contractors operate to be close to their main customer, the United States government. States in the Mid-Atlantic are home to respected universities, research institutes and organizations that support the development of highly advanced technology like UAVs.



Competitive Landscape

Market Share Concentration | Key Success Factors | Cost Structure Benchmarks
Basis of Competition | Barriers to Entry | Industry Globalization

Market Share Concentration

Level
Concentration in this industry is **Medium**

The Unmanned Aerial Vehicle (UAV) Manufacturing industry is characterized by a moderate, but nearly high level of concentration. In 2014, the four largest industry players are expected to generate 61.5% of industry revenue. The overall industry comprises about 63 companies with 72 facilities. The top two companies, Northrop Grumman and General Atomics Aeronautical Systems alone generate about 45.0% of the industry's revenue. High barriers to entry play a large role in determining concentration level, as the vast majority of industry revenue is granted through US military contracts. In addition, the costs and required knowhow associated with developing and producing sophisticated UAV systems are very high. Contracts are usually awarded to existing players in similar fields or those with a previous successful relationship with the US Department of Defense (DoD).

However, over the past five years industry concentration has declined, as the DoD began to switch from acquisition of existing UAV platforms, which are producers by the major players, to development of newer systems, which involve more players. Moreover, despite recent defense budget cuts cutting into major player's revenue, the number of industry players have increased. New startup companies continue to enter the market, developing UAVs for both defense and commercial purposes. However, because most of these companies are still in the developmental stage they account for an insignificant share of the market.

Key Success Factors

IBISWorld identifies 250 Key Success Factors for a business. The most important for this industry are:

Ability to quickly adopt new technology
UAV manufacturers increasingly compete on the basis of technical innovation. Successful firms are able to adapt quickly to technological changes and upgrade products on a regular basis.

Ability to take advantage of government subsidies and other grants
Government subsidies, contracts and grants keep the industry alive. The ability to pitch for and win these contracts is pivotal to companies in the industry. Successful approaches to winning contracts are highly regarded in the industry.

Well-developed internal processes
Good inventory and cost management systems can help firms be more competitive. As the value of goods in this industry is typically very high, businesses aim to keep inventories low.

Undertaking technical research and development
Future revenue streams are based on significant investment in research and development, which can result in successful product launches.

Cost Structure Benchmarks

Profit
Industry profit, defined as earnings before interest and tax expenses, accounts for about 11.5% of industry revenue. In general, because just a few companies dominate the industry (reducing competition) and most unmanned aerial vehicles (UAVs) are highly advanced and unique, industry profit is relatively high. Receiving long-term contracts from the government can ensure a positive source of downstream demand, but unfunded programs risk termination and revenue loss. Some of

Competitive Landscape

Cost Structure Benchmarks continued

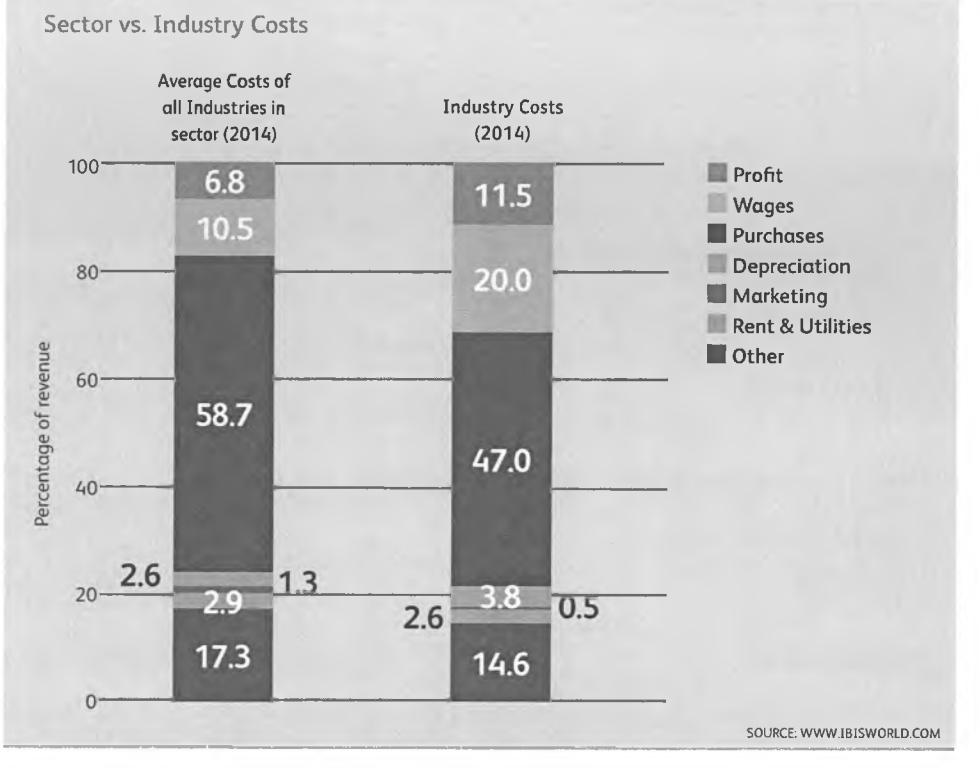
the industry's smaller companies have yet to release a production UAV and are thus not making any profit at all, instead relying on government subsidies or outside investment. Over the past five years, industry profit has slightly declined as the department of defense cut its UAV budget, while increasing emphasis on project costs.

Purchases

Purchases are the largest industry expense, consuming about 47.0% of revenue in 2014, and include the acquisition of equipment components, parts and materials (e.g. steel plates, copper tubing, and aluminum, ferrous and nonferrous castings). Operators typically source components from third party suppliers who specialize in relevant aircraft parts. However, because of the complex and often nontransparent nature of the aerospace supply chain, component purchases tend to be relatively expensive for an industry where there are only a few original equipment manufacturers.

Wages

Industry wages account for about 20.0% of industry revenue. Industry wages are relatively high due to the use of highly skilled labor in the development of sophisticated UAV products. A large portion of workers have backgrounds in engineering and science and typically demand higher pay. There has also been a shortage of people in these fields, which has increased competition for such labor not only between industry operators, but also other high-tech industries. While wages share of revenue has declined from 2009 levels, for most of the past five years it has been increasing. This is primarily due to revenue declining at a faster rate than



Competitive Landscape

Cost Structure Benchmarks continued

wages, which are protected by the high demand for skilled labor.

Depreciation, rent, utilities and marketing

Depreciation accounts for about 3.8% of industry revenue. Depreciation costs account for machinery, communication equipment, office equipment, technology and software. Operators often use some of the most advanced manufacturing equipment, including robotics, 3D printers, computer numerical control machines and other computer aided equipment. Rent and utility expenses account for about 2.6% of revenue, with many manufacturers leasing their facilities. Marketing only accounts for 0.5% of revenue because operators do not sell to consumers.

Other expenses

Other expenses such as research and development (R&D) costs, insurance, administrative costs, transport and warehousing account for about 14.6% of revenue. In particular, the high-tech and ever evolving nature of the industry means that operators spend a substantial amount of money on R&D.

Basis of Competition

Level & Trend
Competition in this industry is **High** and the trend is **Steady**

Internal competition

The Unmanned Aerial Vehicle (UAV) Manufacturing industry is highly competitive. Although initial investment is high, competition from new entrants remains, as new technologies continue to be developed for new applications, particularly in the commercial market. Major competitive factors among industry firms include: product performance, features, acquisition cost, lifetime operating cost, including maintenance and support, ease of use, integration with existing equipment, quality, reliability, customer support, brand and reputation.

Defense contracts, which account for the vast majority of industry revenue, are typically negotiated and awarded through a bid process with price being a major factor (although the bid process is sometimes avoided). Because of the technological knowhow, resources and compliance requirements required to fulfill major defense contracts, only a few companies have the capabilities to compete for them. Moreover, the government prefers to award contracts to operators with a proven track record, putting new entrants at a disadvantage. Nonetheless, although the number of industry participants is small, competition among the top players is still relatively high as the number of defense contracts is limited. In addition, new entrants that can develop a new technology have an increased chance of outcompeting larger contractors.

In the commercial sector, competition is more intense as the technological and resource requirements needed to enter the market are smaller. Moreover, commercial applications for UAVs are greater than for the defense sector, allowing for more segments in which companies can compete. Nonetheless, leaders in the defense sector still have the lead when it comes to commercial applications because they already have established platforms and facilities, which can be adjusted to serve commercial customers. However, the commercial sector of the UAV industry is still in its nascent stage, with many firms just beginning to develop viable UAV platforms.

External competition

UAVs are still are relatively new technology and often face competition from manned systems such as planes and helicopters. Moreover, with the United

Competitive Landscape

Basis of Competition continued

States' defense budget shrinking, UAV projects are having to compete with other defense programs for funding. These competitive factors can be seen in the Northrup Grumman's Global Hawk program. The Global Hawk was developed as a high-altitude surveillance drone, with similar capabilities to the manned U-2 aircraft. When the cost of the Black 30 Global Hawk began to rise, while the defense budget began to shrink, the Pentagon decided to scrap the Block 30s, while keeping the less risky and overall more capable and reliable U-2. However, Congress blocked the decision and the Pentagon's recent budget plan seeks to scarp the U-2 and keep the Block 30s, with the military claiming the operational costs of the Block 30s are lower than the U-2s.

Barriers to Entry

Level & Trend
Barriers to Entry in this industry are **High** and **Steady**

The Unmanned Aerial Vehicle (UAV) Manufacturing industry exhibits barriers to entry. The technological knowhow, resources and capital investment required to develop and manufacture UAVs is high. Manufacturing and testing facilities are typically state of the art, using the latest equipment and software. Operators also have to compete over highly skilled labor, which increases labor costs. The industry's competitive nature requires significant investment in research and development (R&D) and leveraging the expertise of employees. Companies that want to enter the industry must overcome existing R&D and come out with their own patented UAV product in order to compete.

Companies wishing to win defense contracts, which account for the majority of industry revenue, face especially high barriers to entry. UAVs developed for the military are especially advanced, requiring substantial investment into R&D, labor and advanced facilities. As a result, of these resource requirements the defense sector is dominated by a handful of large aerospace and defense companies, making it difficult for smaller players to enter. Moreover, the government typically prefers to award contracts to companies with proven track records and capabilities, making it hard for new companies to compete.

Barriers to Entry checklist	Level
Competition	High
Concentration	Medium
Life Cycle Stage	Growth
Capital Intensity	Medium
Technology Change	High
Regulation & Policy	Heavy
Industry Assistance	High

SOURCE: WWW.IBISWORLD.COM

Industry Globalization

Level & Trend
Globalization in this industry is **Low** and the trend is **Increasing**

Globalization within the Unmanned Aerial Vehicle (UAV) Manufacturing industry is low, with international trade being minimal and most of the industry's companies based in the United States. Although UAV development is global, US manufacturers primarily serve US military markets. The miniscule scope of export and imports reflects regulations limiting the trade of military technologies and preferences given to domestic contractors.

However, globalization is anticipated to increase over the next few years. Manufacturers of military UAVs are expected to look to exports to help offset declining defense spending at home. For instance, Northrup Grumman developed its Global Hawk

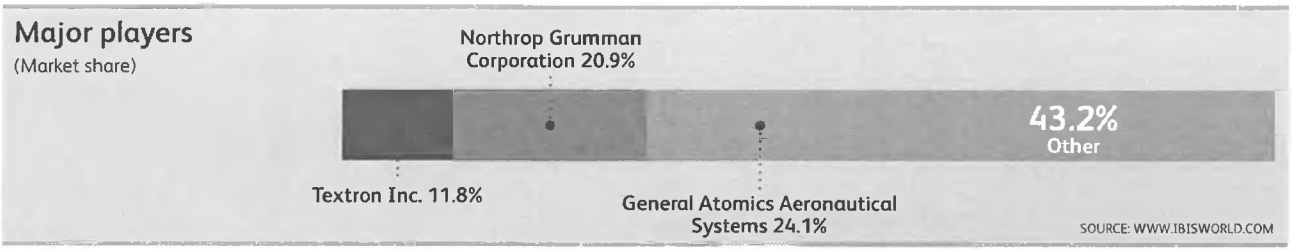
Competitive Landscape

Industry Globalization continued

UAV for Germany, collaborating with Europe based-Airbus. The company is also expected to deliver the Global Hawk to South Korea, with countries such as Australia and Japan also showing great interest.

Major Companies

General Atomics Aeronautical Systems | Northrop Grumman Corporation
Textron Inc. | Other Companies



Player Performance

General Atomics Aeronautical Systems
Market share: 24.1 %

General Atomic Aeronautical Systems (GA-ASI) is a premier developer and manufacturer of unmanned aircraft vehicles (UAVs) and related equipment. The company is a subsidiary of privately held and San Diego, CA-based General Atomics, one of the world's leading resources for high-technology systems including UAVs, nuclear fuel cycle, electromagnetic systems, airborne sensors and other advanced electronic, wireless and laser technologies. GA-ASI's employs over 6,000 personnel in San Diego and other parts of California.

The company's operations are divided into the aircraft systems and mission systems business units. Aircraft systems produces UAVs and their ground control stations, in addition to providing related services, such as pilot training and field maintenance. The mission systems unit develops airborne sensor packages, such as sensor control systems, lasers and data links for unmanned and manned aircraft.

The company's most famous product is the world renowned Predator UAV. In operational use since 1995, this remotely piloted UAV is one of the most combat proven products in the industry, providing intelligence, surveillance and reconnaissance (ISR), targeting, forward air control, laser designation, attack and bomb damage assessment mission capabilities. Multiple Predator derivatives have been developed since its inception, including the MQ-9 Reaper (a large and heavier Predator designed for long-endurance, high-altitude missions) and the Gray Eagle (a more efficient and powerful Predator). In 2009, GA-ASI test flew its new Avenger UAV for the first time. The high-altitude, high-endurance (HALE) Avenger and its naval version, the Sea Avenger, are developed from the Reaper, but are powered by jet engines (previous UAVs used turboprop engines) and include stealth features, such as an internal weapons bay.

General Atomics Aeronautics (industry-specific) – financial performance*

Year	Revenue ($ million)	(% change)	Operating Income ($ million)	(% change)
2009	904.2	33.6	101.8	25.2
2010	1,176.7	30.1	140.6	38.1
2011	1,268.6	7.8	155.8	10.8
2012	1,526.2	20.3	185.1	18.8
2013	1,318.7	-13.6	157.9	-14.7
2014	821.8	-37.7	97.1	-38.5

*Estimates

SOURCE: US DEPARTMENT OF DEFENSE AND IBISWORLD

Major Companies

Player Performance continued

Financial performance

In the five years to 2014, GA-ASI's industry-specific revenue is expected to decrease an annualized 1.9% to $821.8 million. For most of the period, the company enjoyed very strong revenue and operating income growth as the Predators/Reapers family's dominance in the medium-range, long-endurance (MALE) market segment, meant that it was the prime beneficiary of the United States' increased use of UAV for combat and ISR missions in the Middle East and other regions. However, since last year, funding for the company's products was drastically cut due to ongoing defense budget cuts (including sequestration), winding down of combat operation in the Middle East and a reduced need for new UAVs after years of procurement. As a result, the company's revenue is expected to decline 37.7% in 2014 alone.

Player Performance

Northrop Grumman Corporation
Market share: 20.9 %

Founded in 1939, Northrup Grumman is one of the world's largest aerospace and defense contractors. The company provides products, services, and integrated solutions in aerospace, electronics and information services to high priority defense and government services technology programs. Its four divisions, aerospace systems, electronic systems, information systems and customer services employed 65,300 people and generated $24.7 billion in 2013.

The company's industry-specific operations take place under the aerospace division's unmanned systems business unit. The unit develops and produces unmanned systems including UAVs, as well as land, sea and related unmanned vehicles and equipment. In particular, it focuses on developing ISR capable systems. Industry-specific products include the Fire Scout unmanned helicopter and the jet powered Global Hawk. The Global Hawk family especially dominates the company's industry-specific portfolio, accounting for the majority of unmanned system's revenue. The Global Hawk is a HALE UAV designed primarily for ISR missions and is currently the highest flying UAV in operation with US armed forces. The Global Hawk comes in a number of varieties; the current Block 30s are equipped with signals intelligence capabilities, while Block 40s, which are currently finishing development, are equipped with an active electronically scanned array radar, which provides greater air and ground detections and is less detectable. The Triton is a naval version of the Global Hawk currently under development and is designed for maritime ISR missions. The Global Hawk is also operated by NASA for science missions. Northrup Grumman has also developed Global Hawks for Germany and the North Atlantic Treaty Organization (NATO).

Despite the company's dominance in HALE type systems, its Global Hawk platform has gone through some controversy in recent years. Until recently, the Pentagon planned to terminate the Block 30 version of the Global Hawk due to its high cost, instead relying on the manned U-2 high altitude reconnaissance aircraft jet. However, Congress ordered the military to operate both the Block 30s and U-2 instead. In the fiscal 2015 Presidential budget request, the Pentagon has asked to continue operating the Block 30s while scrapping the U-2 and using its ISR equipment for the Global Hawks, citing dropping Global Hawk costs as its reason. Northrup Grumman is also developing the RQ-180, a surveillance UAV capable of aircraft carrier takeoff

Major Companies

Player Performance continued

and landing in addition to having stealth capabilities.

Financial performance

Over the five years to 2014, Northrup Grumman's industry-specific revenue is expected to decline at an annualized 7.2% to $714.4 million. One of the main reasons for the decline is the reduction in the procurement of Global Hawks as contracts were fulfilled. Recent defense spending cuts have also reduced the amount of spending allocated towards the Global Hawk program. Moreover, because many derivatives of the Global Hawk are still in the development stage, funding is subjects to volatility. Nonetheless, the company's revenue is expected to recover over the next few years as new derivatives of the Global Hawk enter full-scale production, while the development of NATO's version of the UAV steps up. Lastly, the company is also expected to secure exports orders from multiple countries, including South Korea, Japan, Australia, Canada and Norway.

Northrop Grumman (industry-specific) – financial performance*

Year	Revenue ($ million)	(% change)	Operating Income ($ million)	(% change)
2009	1,037.3	NA	118.8	NA
2010	1,198.4	15.5	138.0	16.2
2011	1,149.5	-4.1	140.4	1.7
2012	1,039.7	-9.6	126.9	-9.6
2013	877.0	-15.6	106.4	-16.2
2014	714.4	-18.5	85.7	-19.5

*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

Player Performance

Textron Inc.
Market share: 11.8%

Providence, RI-based Textron Inc. (Textron) is a leading player in the aircraft, defense, industrial and finance industries. Founded in 1923, the company employed about 32,000 people and generated $12.1 billion in revenue in 2013. The company operates through five segments: Textron aviation (which produces general aviation aircraft), Bell (a supplier of military and commercial helicopters), Textron systems (a supplier of defense and aviation equipment), industrial (a manufacturer of industrial tools and transportation equipment) and finance (which finances the purchase of the company's products).

The company operates in the Unmanned Aerial Vehicle (UAV) Manufacturing industry through its Textron systems segment, which accounts for 14.0% of the company's overall revenue. In 2007, Textron acquired UAV developer, AAI Corporation, eventually forming Textron system's unmanned aircraft systems business unit. AAI UAV designs and manufactures UAVs, while AAI Logistics & Technical Services provides logistical, training and supply chain services for UAV customers. However, only AAI UAV's operations are industry-relevant.

The company's primary UAV product is the Shadow and Shadow M2. These medium altitude UAVs are deployed on the brigade level, allowing for tactical application of UAV system for ISR,

Major Companies

Player Performance continued

targeting and assessment missions. The primary users of the Shadow vehicles are the United States Army and Marine Corps, as well as the Australian and Swedish armies.

Financial performance

In the five years to 2014, Textron's industry specific revenue is expected to decline at an annualized 2.3% to $402.2 million. The company's revenue initially increased by 23.8% in 2010 as procurement of its shadow UAV reached its peak. Since then, however, revenue and operating income have declined as demand for the shadow was satisfied, development completed and defense spending cuts reduced available funding. As a result, company revenue is expected to decline 15.4% in 2014 alone.

Textron Inc. (industry-specific) – financial performance*

Year	Revenue ($ million)	(% change)	Operating Income ($ million)	(% change)
2009	452.5	NA	57.2	NA
2010	560.3	23.8	65.1	13.8
2011	500.3	-10.7	37.7	-42.1
2012	495.3	-1.0	37.6	-0.3
2013	475.3	-4.0	42.0	11.7
2014	402.2	-15.4	43.1	2.6

*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

Other Companies

Outside of the major players there are a number of other companies with substantial UAV programs. However, estimating revenue generated by these operations can often be very difficult due to the developmental and secretive nature of these programs. For instance, Boeing has a number of UAV in operation or under development, including the small ScanEagle, Unmanned Little Bird and A160 Hummingbird helicopters and the stealth-like X-45C combat UAV. The company also has UAV that use alternative fuel sources, such as the liquid hydrogen powered Phantom Eye and the solar powered SolarEagle. Lockheed Martin is also developing a number of UAV, including the Unmanned Carrier Launched Airborne Surveillance and Strike (UCLASS) drone (developed from the RQ-170) and the operational Desert Hawk and Stalker, both of which are hand launched. Most of the remaining competitors in the Unmanned Aerial Vehicle (UAV) Manufacturing industry are small startup companies whose products are still in the development and testing stage.

AeroVironment, Inc.

Estimated Market Share: 4.8 %

Headquartered in Monrovia, CA, AeroVironment designs, develops, produces and supports unmanned aircraft systems (UAS) and related services. AeroVironment also supplies charging systems and services for electrical vehicles and power cycling and test systems to commercial, consumer and government customers. The company primarily contributes to the industry through its UAS business

Major Companies

Other Companies continued

segment, which focuses on the design, development, production and support of UAS used for situational awareness and other mission objectives. In particular, the company is famous for its small UAVs, such as the Raven, Wasp AE and Puma, many of which can be hand launched. The company is also developing a number of other UAV's such as the Global Observer (a HALE UAV) and the Tier II Unmanned Aircraft System (an unmanned helicopter). In 2014, the company is expected to generate $162.5 million in industry-specific revenue.

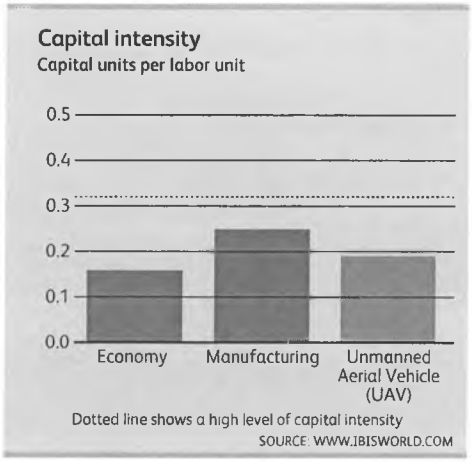
Operating Conditions

Capital Intensity | Technology & Systems | Revenue Volatility
Regulation & Policy | Industry Assistance

Capital Intensity

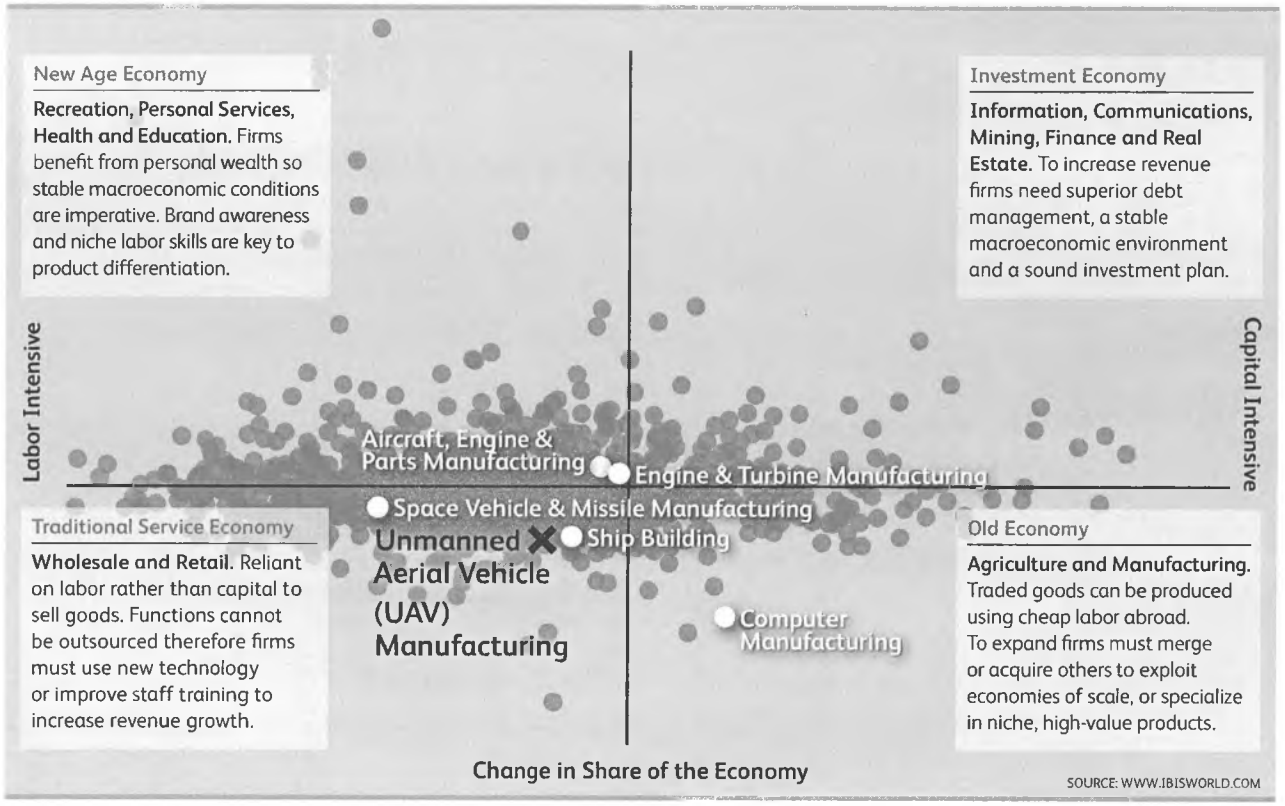
Level
The level of capital intensity is **Medium**

The Unmanned Aerial Vehicle (UAV) Manufacturing industry is characterized by a moderate level of capital intensity. In 2014, for every dollar industry operators spend on labor, an estimated $0.19 will be spent on capital. The industry requires significant investment into advanced machinery and equipment, which is used for researching, developing, manufacturing and testing new UAV systems. However, the industry also strongly depends on highly skilled labor, with many employees having engineering and other sciences backgrounds. As a result, of this highly skilled labor force, average industry wages are expected to reach nearly $90,000 in 2014.



Over the past five years, capital intensity has greatly increased.

Tools of the Trade: Growth Strategies for Success



Operating Conditions

Capital Intensity continued

Companies have invested into new facilities and equipment, including new design software and automated factories. At the same time, wage growth has stagnated as recent defense budget cuts have forced some companies to cut their labor force.

Technology & Systems

Level
The level of Technology Change is **High**

The technology behind unmanned aerial vehicles (UAVs) is rapidly evolving, with new platforms constantly being developed. The Department of Defense (DoD) is expected to spend about 43.0% of its UAV modernization budget on research, development, testing and evaluation.

Most UAVs are remotely controlled through some form of ground station. While there have been development in UAV communication technology (The Reaper UAV can be controlled anywhere in the world from within the United States via satellite links) , remotely controlled UAVs are still limited in their ability to respond to rapidly changing environments as ground pilots lack the same level of situational awareness as pilots within an aircraft. As a result, the military has invested in the development of autonomous UAV. Most current autonomous UAVs have to be preprogrammed, but UAVs such as BAE System's Taranis are being developed with software that allows the aircraft to make its own decisions. UAVs are also being designed to able to communicate with each other, thus creating swarms which can coordinate tasks.

Today's operational UAVs encompass a wide range of sizes, weights, speeds and operating altitudes (see Products and Services chapter). One of the smallest operational UAVs is the four-pound Raven that flies for about one hour at 50 knots and normally below 1000 feet. The largest operational; UAV is the Northrop Grumman Global Hawk, which weighs about 15,000 pounds, and flies at 400 knots for more than 30 hours at 65,000 feet. However, there has also been substantial progress in the development of micro UAVs. One of the smallest such UAVs is Harvard University's Robobee, which weight 80mg and has a mere 3cm wingspan.

The mission capabilities of UAVs are also rapidly changing. Currently, most operational military UAVs are used on intelligence, surveillance, reconnaissance and precision strike missions. However, they are relatively easy to detect and defeat, making them vulnerable in "contested" airspace. As a result, the military has invested into developing UAVs that can operate in such airspace. For instance, General Atomics' Avenger and Northrup Grumman's RQ-180 include stealth features such as internal weapon bays and special materials, which reduce their chance of being picked up on radar. However, even such UAVs can still be vulnerable. For instance, in 2011 Iran captured Lockheed Martin's stealthy RQ-170, claiming that it was brought down by a cyber-attack. Along with increased stealth, new military UAVs are also taking on increased combat roles. BAE's Taranis is being developed as the first unmanned jet fighter, being able to attack both ground and air targets. On the commercial front UAVs are being develop that can monitor weather, act as communication relays (also used for the military), deliver cargo and carry our search and rescue missions, among other tasks.

The propulsion systems UAVs are using are also changing. Currently, most UAVs are powered by either gasoline or electric turboprop engines. However, the development of UAVs for higher altitude or "contested" airspace mission has increased the use of jet engines (i.e. the Avenger and Global Hawk).

Operating Conditions

Technology & Systems continued

Manufacturers are also increasingly turning to alternative sources of propulsion. For instance, Boeing, AeroVironment and Lockeed Martin have developed products that use solar power, allowing their aircraft to eventually fly for months if not years without landing. Boeing and AeroVironment are also developing hydrogen powered UAVs.

On the manufacturing front companies are increasingly using automated facilities using robotics, 3D printers, computer numerical control machines and other computer aided equipment. UAV development has also been boosted by the use of advanced computer-aided design software that allow manufacturers to design and test products before building actual models.

Revenue Volatility

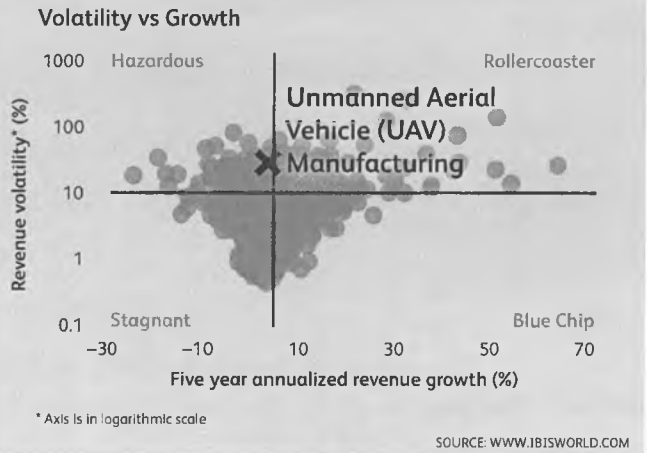
Level
The level of Volatility is **Very High**

IBISWorld analysis reveals the Unmanned Aerial Vehicle (UAV) Manufacturing industry exhibits a very high level of revenue volatility. Revenue is most closely linked to changes in federal funding for defense and congressional budget allocations to the Department of Homeland Security. As a result, the industry revenue grew by as much as 51.9% in 2010, as the government expanded the military use of UAVs. However, in more recent years revenue has gone from growth to decline due to defense budget cuts, sequestration and the wind down of combat operation in the Middle East.

In general, industry volatility can be lowered through long-term development contracts and UAV platform diversification. Over the next few years, volatility is projected to decline as the defense budget stabilizes, new UAVs are developed and the commercial market grows.

A higher level of revenue volatility implies greater industry risk. Volatility can negatively affect long-term strategic decisions, such as the time frame for capital investment.

When a firm makes poor investment decisions it may face underutilized capacity if demand suddenly falls, or capacity constraints if it rises quickly.



Regulation & Policy

The Unmanned Aerial Vehicle (UAV) Manufacturing industry is subject to a high level of regulation. UAV manufacturers, that sell most of their products to the US government, are subject to regulations that concern these contractual arrangements. These regulations include government contracts

Operating Conditions

Regulation & Policy continued

Level & Trend
The level of Regulation is **Heavy** and the trend is **Steady**

that are subject to oversight audits by government representatives. They also contain provisions that permit termination, in whole or in part, at the government's convenience or for default. If a contract is terminated at the convenience of the US government, a contractor can receive payments for its allowable costs and the proportionate share of fees or earnings for the work done. Contracts that are terminated for default generally provide that the government only pays for the work it has accepted. Therefore, they may require the contractor to pay other costs and damages. Government business is also subject to specific procurement regulations. Failure to comply with these regulations and requirements can lead to suspension from government contracting or subcontracting.

The industry is also subject to various trade regulations that have generally limited the possibility of international market expansion. Under current US export control policy, some UAVs are subject to the International Traffic in Arms Regulations (ITAR), which authorizes the State Department to control the export and import of defense articles and defense services. However, the Obama administration has recently moved thousands of defense related parts, including some UAV components, from the ITAR list and stringent State Department oversight, to more lax Commerce Department oversight. Many UAVs are also covered by the Missile Technology Control Regime (MTCR), which an informal grouping of 34 countries designed to prevent the proliferation of systems capable of delivering weapons of mass destruction. The regimes requires State and Commerice Department authorization to exports UAVs that can fly farther than 300 kilometers and carry more than 500 kilograms. Under MTCR guidelines, export of UAVs carries a "strong presumption of denial" of an export license.

The domestic use of UAVs is also heavily regulated and is widely seen as the number one deterrent in growing the commercial UAV market. Currently, UAV flight are regulated by the Federal Aviation Administration (FAA), while their wireless communications are regulated by the National Telecommunications and Information Administration (NTIA) and Federal Communications Commission (FCC). The FAA requires all that a public UAV operator must receive a Certificate of Authorization (COA), which includes certification of airworthiness of the aircraft for its intended mission as well as certification that a collision with another aircraft is extremely improbable, that the aircraft system complies with appropriate cloud and terrain clearances and that the operator or spotter of the small unmanned aircraft system is generally within one half-mile laterally and 400 feet vertically of the small unmanned aircraft system while in operation. For civil use, operators must obtain a Special Airworthiness Certificate, Experimental Category "by demonstrating that their unmanned aircraft system can operate safely within an assigned flight test area and cause no harm to the public. Applicants must be able to describe how their system is designed, constructed and manufactured".

In 2012, Congress ordered the FAA to set up rules for the integration of UAV systems into domestic airspace by 2015. As a result, the FAA has rolled out a "roadmap" for UAV integrations, by which it plans to phase in domestic use of UAV by creating new regulation and certifications. Earlier this year, BP became the first company to use commercial UAVs after the FAA allowed

Operating Conditions

Regulation & Policy continued

it to use small UAVs to monitor its Alaskan oil pipelines. The domestic use of industry products has also come under greater public scrutiny, with many worried that surveillance drones may infringe of peoples' privacy rights.

Industry Assistance

Level & Trend
The level of Industry Assistance is **High** and the trend is **Steady**

The industry is characterized by a high level of government assistance, as the vast majority of its revenue comes from the US military. Research and development activities for UAV technological development performed or funded by the US government also serve as direct government assistance. Changes in defense funding, particularly within the UAV program, have a significant impact on industry performance. The Department of Defense (DoD) plans to invest billions of dollars in the development and procurement of UAVs over the next five years.

Key Statistics

Industry Data

	Revenue ($m)	Industry Value Added ($m)	Establish-ments	Enterprises	Employment	Exports	Imports	Wages ($m)	Domestic Demand	Federal Funding for Defense ($b)
2005	2,564.6	852.9	52	50	6,347	--	--	586.5	N/A	581.4
2006	1,659.1	775.2	57	53	6,614	--	--	588.0	N/A	593.5
2007	1,404.4	791.1	58	55	6,790	--	--	625.3	N/A	609.3
2008	2,485.1	714.5	60	57	7,426	--	--	642.5	N/A	665.9
2009	2,997.5	1,101.8	58	55	7,773	--	--	688.5	N/A	707.3
2010	4,552.1	1,373.9	62	58	7,973	--	--	725.2	N/A	733.3
2011	4,300.8	1,304.2	63	60	7,966	--	--	717.0	N/A	730.3
2012	4,053.9	1,279.9	63	60	7,849	--	--	707.1	N/A	689.4
2013	3,964.3	1,289.3	67	62	7,928	--	--	715.3	N/A	660.0
2014	**3,416.3**	**1,208.2**	**72**	**63**	**7,616**	--	--	**683.8**	**N/A**	**626.8**
2015	3,253.6	1,184.6	73	67	7,519	--	--	676.1	N/A	612.3
2016	3,193.9	1,192.2	77	68	7,578	--	--	682.9	N/A	589.2
2017	3,277.4	1,233.3	78	72	7,742	--	--	701.5	N/A	589.7
2018	3,613.1	1,348.9	83	73	8,279	--	--	756.0	N/A	596.8
2019	4,090.0	1,502.7	86	76	8,908	--	--	821.4	N/A	591.8
Sector Rank	**217/369**	**189/369**	**290/369**	**280/369**	**231/369**	**N/A**	**N/A**	**183/369**	**N/A**	**N/A**
Economy Rank	**884/1287**	**846/1287**	**1184/1286**	**1156/1286**	**989/1287**	**N/A**	**N/A**	**849/1287**	**N/A**	**N/A**

Annual Change

	Revenue (%)	Industry Value Added (%)	Establish-ments (%)	Enterprises (%)	Employment (%)	Exports (%)	Imports (%)	Wages (%)	Domestic Demand (%)	Federal Funding for Defense (%)
2006	-35.3	-9.1	9.6	6.0	4.2	N/A	N/A	0.3	N/A	2.1
2007	-15.4	2.1	1.8	3.8	2.7	N/A	N/A	6.3	N/A	2.7
2008	77.0	-9.7	3.4	3.6	9.4	N/A	N/A	2.8	N/A	9.3
2009	20.6	54.2	-3.3	-3.5	4.7	N/A	N/A	7.2	N/A	6.2
2010	51.9	24.7	6.9	5.5	2.6	N/A	N/A	5.3	N/A	3.7
2011	-5.5	-5.1	1.6	3.4	-0.1	N/A	N/A	-1.1	N/A	-0.4
2012	-5.7	-1.9	0.0	0.0	-1.5	N/A	N/A	-1.4	N/A	-5.6
2013	-2.2	0.7	6.3	3.3	1.0	N/A	N/A	1.2	N/A	-4.3
2014	**-13.8**	**-6.3**	**7.5**	**1.6**	**-3.9**	**N/A**	**N/A**	**-4.4**	**N/A**	**-5.0**
2015	-4.8	-2.0	1.4	6.3	-1.3	N/A	N/A	-1.1	N/A	-2.3
2016	-1.8	0.6	5.5	1.5	0.8	N/A	N/A	1.0	N/A	-3.8
2017	2.6	3.4	1.3	5.9	2.2	N/A	N/A	2.7	N/A	0.1
2018	10.2	9.4	6.4	1.4	6.9	N/A	N/A	7.8	N/A	1.2
2019	13.2	11.4	3.6	4.1	7.6	N/A	N/A	8.7	N/A	-0.8
Sector Rank	**367/369**	**347/369**	**9/369**	**96/369**	**349/369**	**N/A**	**N/A**	**347/369**	**N/A**	**N/A**
Economy Rank	**1282/1287**	**1240/1287**	**58/1286**	**517/1286**	**1251/1287**	**N/A**	**N/A**	**1242/1287**	**N/A**	**N/A**

Key Ratios

	IVA/Revenue (%)	Imports/ Demand (%)	Exports/ Revenue (%)	Revenue per Employee ($'000)	Wages/Revenue (%)	Employees per Est.	Average Wage ($)	Share of the Economy (%)
2005	33.26	N/A	N/A	404.06	22.87	122.06	92,405.86	0.01
2006	46.72	N/A	N/A	250.85	35.44	116.04	88,902.33	0.01
2007	56.33	N/A	N/A	206.83	44.52	117.07	92,091.31	0.01
2008	28.75	N/A	N/A	334.65	25.85	123.77	86,520.33	0.00
2009	36.76	N/A	N/A	385.63	22.97	134.02	88,575.84	0.01
2010	30.18	N/A	N/A	570.94	15.93	128.60	90,956.98	0.01
2011	30.32	N/A	N/A	539.89	16.67	126.44	90,007.53	0.01
2012	31.57	N/A	N/A	516.49	17.44	124.59	90,087.91	0.01
2013	32.52	N/A	N/A	500.04	18.04	118.33	90,224.52	0.01
2014	**35.37**	**N/A**	**N/A**	**448.57**	**20.02**	**105.78**	**89,784.66**	**0.01**
2015	36.41	N/A	N/A	432.72	20.78	103.00	89,918.87	0.01
2016	37.33	N/A	N/A	421.47	21.38	98.42	90,116.13	0.01
2017	37.63	N/A	N/A	423.33	21.40	99.26	90,609.66	0.01
2018	37.33	N/A	N/A	436.42	20.92	99.75	91,315.38	0.01
2019	36.74	N/A	N/A	459.14	20.08	103.58	92,209.25	0.01
Sector Rank	**43/369**	**N/A**	**N/A**	**146/369**	**68/369**	**45/369**	**16/369**	**189/369**
Economy Rank	**569/1287**	**N/A**	**N/A**	**362/1287**	**577/1287**	**82/1286**	**112/1287**	**846/1287**

Figures are inflation-adjusted 2014 dollars. Rank refers to 2014 data.

SOURCE: WWW.IBISWORLD.COM

Jargon & Glossary

Industry Jargon

STEALTH Technology designed to reduce an aircraft's radar cross section.

UNMANNED AERIAL VEHICLE (UAV) Also known as drones, any aircraft without a pilot that operates either autonomously or via remote control to perform missions considered too dangerous or tedious for human pilots.

UNMANNED AIRCRAFT SYSTEM (UAS) The sum of the components required to operate UAVs, including the unmanned aircraft, control system, control link or specialized datalink and other equipment.

UNMANNED COMBAT AIR VEHICLE (UCAV) A UAV with offensive capabilities, such as onboard missiles that can be fired remotely.

IBISWorld Glossary

BARRIERS TO ENTRY High barriers to entry mean that new companies struggle to enter an industry, while low barriers mean it is easy for new companies to enter an industry.

CAPITAL INTENSITY Compares the amount of money spent on capital (plant, machinery and equipment) with that spent on labor. IBISWorld uses the ratio of depreciation to wages as a proxy for capital intensity. High capital intensity is more than $0.333 of capital to $1 of labor; medium is $0.125 to $0.333 of capital to $1 of labor; low is less than $0.125 of capital for every $1 of labor.

CONSTANT PRICES The dollar figures in the Key Statistics table, including forecasts, are adjusted for inflation using the current year (i.e. year published) as the base year. This removes the impact of changes in the purchasing power of the dollar, leaving only the "real" growth or decline in industry metrics. The inflation adjustments in IBISWorld's reports are made using the US Bureau of Economic Analysis' implicit GDP price deflator.

DOMESTIC DEMAND Spending on industry goods and services within the United States, regardless of their country of origin. It is derived by adding imports to industry revenue, and then subtracting exports.

EMPLOYMENT The number of permanent, part-time, temporary and seasonal employees, working proprietors, partners, managers and executives within the industry.

ENTERPRISE A division that is separately managed and keeps management accounts. Each enterprise consists of one or more establishments that are under common ownership or control.

ESTABLISHMENT The smallest type of accounting unit within an enterprise, an establishment is a single physical location where business is conducted or where services or industrial operations are performed. Multiple establishments under common control make up an enterprise.

EXPORTS Total value of industry goods and services sold by US companies to customers abroad.

IMPORTS Total value of industry goods and services brought in from foreign countries to be sold in the United States.

INDUSTRY CONCENTRATION An indicator of the dominance of the top four players in an industry. Concentration is considered high if the top players account for more than 70% of industry revenue. Medium is 40% to 70% of industry revenue. Low is less than 40%.

INDUSTRY REVENUE The total sales of industry goods and services (exclusive of excise and sales tax); subsidies on production; all other operating income from outside the firm (such as commission income, repair and service income, and rent, leasing and hiring income); and capital work done by rental or lease. Receipts from interest royalties, dividends and the sale of fixed tangible assets are excluded.

INDUSTRY VALUE ADDED (IVA) The market value of goods and services produced by the industry minus the cost of goods and services used in production. IVA is also described as the industry's contribution to GDP, or profit plus wages and depreciation.

INTERNATIONAL TRADE The level of international trade is determined by ratios of exports to revenue and imports to domestic demand. For exports/revenue: low is less than 5%, medium is 5% to 20%, and high is more than 20%. Imports/domestic demand: low is less than 5%, medium is 5% to 35%, and high is more than 35%.

LIFE CYCLE All industries go through periods of growth, maturity and decline. IBISWorld determines an industry's life cycle by considering its growth rate (measured by IVA) compared with GDP; the growth rate of the number of establishments; the amount of change the industry's products are undergoing; the rate of technological change; and the level of customer acceptance of industry products and services.

NONEMPLOYING ESTABLISHMENT Businesses with no paid employment or payroll, also known as nonemployers. These are mostly set up by self-employed individuals.

Jargon & Glossary

IBISWorld Glossary continued

PROFIT IBISWorld uses earnings before interest and tax (EBIT) as an indicator of a company's profitability. It is calculated as revenue minus expenses, excluding interest and tax.

VOLATILITY The level of volatility is determined by averaging the absolute change in revenue in each of the past five years. Volatility levels: very high is more than ±20%; high volatility is ±10% to ±20%; moderate volatility is ±3% to ±10%; and low volatility is less than ±3%.

WAGES The gross total wages and salaries of all employees in the industry. The cost of benefits is also included in this figure.

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FOR IMMEDIATE RELEASE
September 25, 2014

SENATOR DODD WELCOMES FAA APPROVAL OF OPERATOR EXEMPTIONS TO USE SUAS FOR FILMING

WASHINGTON — *The following is a statement from Senator Chris Dodd, Chairman and CEO of the Motion Picture Association of America, Inc., on today's announcement that the FAA has approved operator exemptions to use small unmanned aircraft systems for filming motion pictures and television:*

"Today's announcement is a victory for audiences everywhere as it gives filmmakers yet another way to push creative boundaries and create the kinds of scenes and shots we could only imagine just a few years ago. Our industry has a history of successfully using this innovative technology overseas – making movies like "Skyfall" and "Transformers: Age of Extinction," to name a couple – and we are proud to now be on the leading edge of its safe commercial use here at home. By creating a climate that further encourages more movie and TV production in the US, today's decision also supports job creation and revenue growth around the country. I commend and thank Secretary Foxx, Administrator Huerta and everyone at the FAA for their leadership and commitment to achieving this great result."

About the MPAA
The Motion Picture Association of America, Inc. (MPAA) serves as the voice and advocate of the American motion picture, home video and television industries from its offices in Los Angeles and Washington, D.C. Its members include: Walt Disney Studios Motion Pictures; Paramount Pictures Corporation; Sony Pictures Entertainment Inc.; Twentieth Century Fox Film Corporation; Universal City Studios LLC; and Warner Bros. Entertainment Inc.

# # #

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A Drone By Any Other Name...

At a drone conference in Washington, D.C., last year, the trade group running the event sent a not-so-subtle message to the journalists there: The Wi-Fi password was DONTSAYDRONES in the press room.

As the drone industry takes off, many people in it say it needs a different name. They say "drone" suggests the devices are dumb, it is technically inaccurate and now has a militaristic reputation. Unmanned-aircraft advocates scold reporters and even congressmen who use the term.

But they have another problem: Few of them agree on what the devices should be called.

"Maybe we call it the 'crone' for commercial drone?" said John Mulcahy, a patent attorney with clients in the commercial-drone industry.

The alternatives are an alphabet soup. There is "UAV" (unmanned aerial vehicle), "RPA" (remotely piloted aircraft), and "UAS" (unmanned aircraft system). Some prefer the more digestible "unmanned aircraft," or just "robot," while European Union officials opt for the bulkier "RPAS," or remotely piloted aircraft systems.

"We need another name for it, but I'm not sure what that new name should be," said Zack Porter, a venture-capital executive considering investments in commercial drones.

The Federal Aviation Administration is still working out rules for the commercial use of drones—which U.S. farmers, filmmakers and others have been flying in growing numbers, even

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without permission. But both the agency and Congress have settled on a name: they use UAS in legislation and official documents.

"If the FAA calls these things bullfrogs, then I'll call them bullfrogs," said Michael Toscano, chief executive for the Association for Unmanned Vehicle Systems International, the trade group that urged reporters not to say "drones" last year.

Mr. Toscano said the term drone makes most people think "weaponized, hostile, large and autonomous." He prefers UAS because it encompasses the entire system, including "the technology on the ground with the human at the controls," he told Congress last year. "As I like to say, there's nothing unmanned about unmanned systems."

Sen. Patrick Leahy (D., Vt.) responded at that hearing: "I appreciate you telling us what we should call them, but...why don't you leave that decision to us? We'll decide what we'll call them. You call them whatever you'd like to call them."

But it isn't hard to find advocates who drone on about why they don't like the term UAS and its "unmanned" cousins. "I hate the word unmanned," said Don Wirthlin, a drone-pilot instructor in Douglas, Ariz. "Last time I checked, I was a human flying a UAV."

Ben Gielow, the former general counsel of the unmanned-aircraft trade group, said that "unmanned" isn't ideal. "We have to stop defining the technology by what it's not," he said. "They used to call the car a horseless carriage."

Some of the aerospace companies that shy away from using "drone" assign their devices intimidating-sounding names such as the Wasp, TigerShark, Predator and Reaper.

Other technical names for the devices touch on the number of propellers they have, such as a quadcopter or an octocopter. And then there's Deutsche Post DHL's delivery drone, which the company calls the Paketkopter.

The name confusion is a headache for some. "You try to explain what you do to your families on Thanksgiving...and no one knows what the hell a UAV is," said Zach Rosenberg, a freelance journalist who covers drones.

Even the military can't seem to agree on a name. For example, on their websites, the Army has used drone, the Navy has used UAV and the Coast Guard has used UAS. The Air Force's preferred term, RPA, recently received endorsement from top brass.

"You will never hear me use the word 'drone,' and you'll never hear me use the term 'unmanned aerial systems,' " Gen. Martin Dempsey, chairman of the Joint Chiefs of Staff, told reporters in May. "Because they are not. They are remotely piloted aircraft."

However, it was the military that originally nicknamed the devices "drones," said Ben Zimmer, a lexicographer who has researched the history of the term. In 1935, the U.S. Navy began using unmanned aircraft as aerial targets for shooting practice. The British Royal Navy had named its unmanned target aircraft the Queen Bee, Mr. Zimmer said, so in homage, the Navy called its targets "drones," which means male bee.

Many unmanned-aircraft enthusiasts say that is why the term drone is inaccurate—because it should refer only to aircraft used for target practice. But Mr. Zimmer disagrees, saying the military began arming unmanned aircraft and calling them "assault drones" in World War II.

As early as 1946, the media had picked up the term. "Drones, as the radio-controlled aircraft are called, have many potentialities, civilian and military," the magazine Popular Science wrote that year.

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During a question-and-answer session with U.S. Rep. Frank LoBiondo (R., N.J.) at a drone conference this year, Dick Rumpf, head of a consulting firm, took the congressman to task for using the term drone. "If you guys stop using the word drone...the press won't poison the minds of John Q. Public with thinking we're going to be hitting them with weapons," he said to applause.

"I totally agree with you," Rep. LoBiondo replied. "I will try to sensitize my colleagues."

Not everyone in the industry dislikes the word. Andrew Petersen, a drone videographer, named his Los Angeles company Drone Dudes. Sven Juerss, CEO of German drone maker Microdrones GmbH, said having the word in a company name helps customers find a firm. "Everyone types drones into Google, not UAS," he said.

U.S. residents generally searched more for the term UAV than drone from 2004 through 2009, according to data from Google Trends, which tracks search-term volume. But in 2010, Google searches for "drone" soared past the alternatives and the term remains by far the top choice today, the data show.

Popular Science writer Kelsey Atherton, who writes weekly roundups of unmanned-aircraft news called "Keeping up with the droneses," said opponents of the term should give up. "The battle is over and drone won," he said.

Source: Wall Street Journal

8+1

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Posted in News on October 13, 2014 by The Editor. 2 Comments

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2 COMMENTS

Paul Stephenson
October 13, 2014 at 15:56

I wouldn't get too worked up about acronyms.
The military are horrible for making names of a system ofr action based on how the acronym sounds.
They even make up names so they sound cool and use the same acronym three times or steal ones from Commercial acronym lists to really confuse things.
Legislation was passed in Canada calling them UAV's
Now they want to change it to UAS because big brother USA is calling them that
I own a Drone company and consider them Drones, UAV , UAS
I will consider Bullfrogs at a later date
I am not changing the name of my company because some pencil pushing bureaucrat sitting at a desk has nothing better to do than come up with new flashy names instead of getting the FAA to pull its head out of the sand and write some FAR's for commercial operations.

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GAO: DHS Flew Drones for 1,726 Hours Over Interior of U.S.

October 3, 2014 - 2:45 PM
By Brittany M. Hughes

(CNSNews.com) - The Department of Homeland Security flew drones equipped with video cameras over the United States--away from border and coastal areas--for 1,726 hours from fiscal 2011 through this April, according to the Government Accountability Office.

At times, the drones--or Unmanned Aerial Systems (UAS)--were being used for purposes other than border or immigration enforcement. But the GAO does not have a full accounting of when and where the drones were flown, or what they were used for during the flight hours spent in "other airspace."

In a series of briefing slides provided in August to the staffs of the House and Senate appropriations subcommittees on homeland security (and publicly released this week), the GAO examined whether DHS's use of drones complied with U.S. privacy and civil liberty laws. In the slides, the GAO noted that DHS border patrol drones, which are primarily used to "support border security operations," were sometimes flown away from the border "in support of other federal, state or local law enforcement activities and for emergency humanitarian efforts."

"DHS's review reported that CBP operates UAS in accordance with its authorities, which do not limit use to border and coastal areas," the GAO reported on briefing slide No. 2. "The location of UAS operations is limited by FAA requirements and CPB policies and procedures."

These flights included missions to "provide aerial support for local law enforcement activities and investigations," to agencies including the FBI and multi-agency task forces, and to "provide aerial support for monitoring natural disasters," the report added on slide No. 11.

The GAO also referenced the 639-page Consolidated Appropriations Act of 2014 -- the law that Congress passed with bipartisan support in January that fully funded the federal government for the remainder of fiscal 2014. Buried on page 250 of that law is verbiage that provides DHS with the authority to fly border patrol drones inside the United States for purposes other than border or immigration enforcement at the "discretion of the Secretary of Homeland Security."

On briefing slide No. 27, the GAO quoted the Consolidated Appropriations Act, which states: "For necessary expenses for the operations, maintenance, and procurement of marine vessels, aircraft, unmanned aircraft systems, and other related equipment of the air and marine program, including salaries and expenses, operational training, and mission-related travel, the operations of which include the following: the interdiction of narcotics and other goods; the provision of support to Federal, State, and local agencies in the enforcement or administration of laws enforced by the Department of Homeland Security; and, at the discretion of the Secretary of Homeland Security, the provision of assistance to Federal, State, and local agencies in other law enforcement and emergency humanitarian efforts."

This language has been included in annual appropriations bills since at least fiscal 2011, and was most recently included in the Consolidated Appropriations Act signed into law in January.

Between Fiscal Year 2011 and last April, border patrol drones logged 18,089 flight hours, the GAO reported. Of these, 3,184 hours, or 18 percent, were spent at the Northern border from Michigan to Washington. Another 10,396 hours, or 57 percent, were flown at the Southwest border, while 1,189 hours, or 7 percent, came from the Southeast border off the coast of Florida.

Another 1,594 hours, or 9 percent, were used for non-operational purposes such as training and transit.

An additional 1,726, or 9 percent, were used in "other airspace" outside of a border zone.

Responding to CNSNews.com's email request for a more detailed breakdown of the "other airspace" flight hours logged by CBP drones, Rebecca Gambler, director for Homeland Security and Justice for the Government Accountability Office, stated: "We do not have a further breakdown of the UAS flight hours (9 percent/1,726 hours) listed in our report as 'other airspace.'"

According to the GAO, CBP has nine drones equipped with a video camera, infrared cameras, radar to detect movement, imaging systems to show terrain and buildings, and radar used to detect images of maritime vessels, the report stated.

The GAO added that the video recorded by drones is stored for a maximum of five years "to use in analysis and intelligence products."

While the GAO found that drones "do not have the capability to collect images from nonpublic areas, such as the interior of homes or business," the report does not mention whether air surveillance is taken of backyards or other outdoor private property.

Of the nine drones, three of the drones are located in Sierra Vista, Ariz., three are in Grand Forks, N.D., and three are in Corpus Christi, Texas. A center in Jacksonville, Fla., "remotely operates aircraft launched from other [centers]," the report stated.

The GAO reported CBP began using drones in 2006, with all four centers operational by Fiscal Year 2011. The report added the CBP is allowed to use the drones only in airspace and locations defined by the FAA."

The report also noted a recent review of CBP drone use by DHS "did not address the extent to which CBP use of UAS is within border and coastal areas."

5

The GAO also stated that CPB utilizes an "oversight framework and procedures" to ensure compliance with all privacy laws, as well as a "Working Group" tasked with "identifying potential privacy, civil rights and civil liberties concerns with current or planned UAS uses."

Source URL: http://cnsnews.com/news/article/brittany-m-hughes/gao-dhs-flew-drones-1726-hours-over-interior-us

Russia Establishes Military UAV Unit

Russia has reportedly established a dedicated unmanned air vehicle unit in the eastern region of Chukotka, believed to stem from a $9.2 billion investment in the technology pledged by the nation's defence ministry in May.

According to the state-owned Sputnik news agency, Alexander Gordeev, spokesperson for the Russian Eastern Military District (EMD), says the unit was formed at the Ugolny military and civil airfield, and it is expecting to receive a number of indigenously-designed Orlan-10 surveillance UAVs by the end of the year.

Flight testing with the type in cold conditions is expected to take place in early 2015, and the type will be operated by Orlan to begin with, until the military unit is fully trained on the aircraft.

On 20 May, the Russian defence ministry said it would invest some $9.2 billion on UAVs by 2020.

Separately, President Vladimir Putin has ordered the establishment of a public body responsible for the implementation of Russian policies in the Arctic, Sputnik says. Putin also requires that a naval force of warships and submarines be positioned near the Arctic to bolster the country's border defence in the region.

In August it was reported that EMD personnel had started assembling Russian-built Forpost UAVs, which were to carry out patrol missions over Russia's Kamchatka peninsula.

The unit was to operate six of the type, which entered service at the beginning of 2015, and as of August operators had already completed a training course on the system, Sputnik says.

The use of unmanned technology by Russia is prevalent. This is demonstrated by the reported Russian use of UAVs over Ukraine, as observed by the Organization for Security and Co-operation in Europe's special monitoring mission (SMM) to the country.

According to the OSCE, the SMM visited Strelkov on the Arabat Spit on 1 December to meet with representatives of the Ukrainian army, who said they had observed military activities on the Crimean side of the peninsula, with a UAV flying every 2-3 days. The SMM could not verify this information, however.

These flights, the National Security and Defence Council of Ukraine says, are increasing. Seven flights took place - alongside terrorist attacks - on 24 November alone.

On 28 November, the NSDC said a Russian UAV was shot down in the Shchastya region of Ukraine, using a ZU-23-2 anti-aircraft weapon.

Source: Flight Global

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Russia to Open Arctic Military Drone Base 420 Miles from Alaska

Russia has announced plans to build a drone base for military reconnaissance in a town just 420 miles off mainland Alaska and just over 300 miles off the US state's St Lawrence Island, Russia's state news agency reported.

"The command of the eastern military district in charge of the military development of the Arctic zone has moved forward with plans to form an unmanned aerial vehicle division," Alexandr Gordeev, spokesperson for the district said.

Gordeev explained the base will be stationed around the Russian town of Anadyr, considered the administrative centre of the country's eastern-most region of Chukotka and currently recruitment is underway for experienced personnel to be sent there.

According to Gordeev beside functioning as an air drone base, the facility will also be equipped with other "mobile units" operated by entirely by professional servicemen as opposed to conscripts, who still make up a large proportion of Russia's ground forces.

The new base's key objective will be to provide air reconnaissance for the Russian navy in its eastern waters which directly border U.S. waters.

Since last year Russia has been in an ongoing territorial dispute with Canada over both countries' presence in the Arctic. Following an appeal from Canada to the UN for increased control over the

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Arctic, which the North American nation currently shares with Russia, the US, Denmark and Norway, Russia responded by strengthening military presence in its regions close to the North Pole.

The stretch of land known as the continental shelf which remains out of the reach of any of the five countries is speculated to be rich in gas and oil.

This latest move is also part of a long-term strategy on Russia's part of modernising its military with unmanned air vehicles. General major Edward Cherkasov also announced today the armed forces' Chemical Corps is also developing a drone programme.

Moscow intends to modernise its specialist branch, which deals with chemical, biological and nuclear threats, by updating 70% of its facilities to improve efficiency of operation and long distance reconnaissance, Cherkasov added.

Last month, Russian armed forces presented the latest addition to their drone arsenal in the form of the "weatherproof" Zala 421-08M, developed to be easily carried by land infantry and remain airborne for up to 100 hours at a time.

Larger drones for the Russian military are also under development, with a 30kg version of the Zala which can stay airborne for longer carrying more weight, while earlier this spring Russian state television unveiled a long endurance, army drone with the capability of performing strike missions called the UAV Altius 001.

The announcement comes a day after the Russian air force announced that it plans to fly patrol missions around the world, including sending bomber flights above the Gulf of Mexico. According to NATO, Russian incursions into European airspace have increased by 300% in the last year, with bomber flights spotted as far west as Portugal.

Safety concerns over the military posturing have been raised after a Russian reconnaissance plane with its transponder turned off came within 90 metres of a passenger jet taking off from Copenhagen airport.

Photo: Russia's President Dmitry Medvedev holds a drone while Defense Minister Anatoly Serdyukov looks on as they are visiting a military camp at a training range Gorokhovetsky in Nizhny Novgorod region - VLADIMIR RODIONOV/RIA NOVOSTI/KREMLIN/REUTERS

Source: Newsweek

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FAA says Air Traffic Control isn't Ready for UAS

The Federal Aviation Administration is facing significant problems with integrating UASinto US airspace. The AP reports that plans for modernizing air traffic control can't cover the unique challenges posed by unmanned aerial vehicles (UAVs), given that they were made years before UAVs were used for more than military missions. "It's becoming painfully apparent that in order to get [drones] in there, there is going to have to be a fair amount of accommodation, at least in the beginning," National Air Traffic Controllers Association representative Chris Stephenson is quoted as saying.

That's going to add yet another set of goals for NextGen, an FAA programme that promises to create a nationwide satellite-based location tracking system, provide better tools for sharing information, and update aging technology. Launched in 2004, NextGen has made progress on these projects, but it's also been consistently over budget and behind schedule. And large drones — which are currently mostly used for surveillance but could also carry commercial cargo or even wireless internet signals — throw a wrench in its current plans. "We didn't understand the magnitude to which [drones] would be an oncoming tidal wave, something that must be dealt with, and quickly," says NextGen administrator Ed Bolton.

Congress passed legislation creating NextGen in 2003, and directed the agency to accommodate all types of aircraft, including drones.

The programme, which is not expected to be completed for at least another decade, is replacing radar and radio communications, technologies rooted in the early 20th century, with satellite-based navigation and digital communications.

The FAA has spent more than $5 billion on the complex programme and is nearly finished installing hardware and software for several key systems. But the further it progresses, the more difficult it becomes to make changes.

Government and industry officials have long maintained that drones must meet the same rules that apply to manned aircraft if they are to share the sky. That is changing, however, said Chris Stephenson, who represents the National Air Traffic Controllers Association on several U.S. and international unmanned aircraft committees.

"It's becoming painfully apparent that in order to get (drones) in there, there is going to have to be a fair amount of accommodation, at least in the beginning," he said.

Michael Whitaker, the FAA's deputy administrator, acknowledged that drones "weren't really part of the equation when you go back to the origin of NextGen."

The NextGen plans for the next five years do not address how drones will fit into a system designed for planes with pilots on board, but the agency will have to consider whether to do that,

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Whitaker told a recent meeting of the NextGen Institute, a nonprofit association sponsored by the FAA so that industry can assist with research.

Most of the initial demand to fly unmanned aircraft came from the departments of Defense and Homeland Security, which wanted to test military drones or use them to monitor U.S. borders.

Later, interest began to build around potential uses for smaller drones, especially by police departments, but also for those wanting to spray crops, monitor pipelines and inspect offshore oil platforms. These drones can weigh anywhere from a few pounds to several hundred.

More recently, commercial demand has soared - from wedding videographers and real estate agents to Amazon and Google, eyeing potential package deliveries.

The FAA bans commercial drone operations with a few, limited exceptions. That ban, however, is undermined almost daily by frustrated small drone operators.

Bolton, also addressing the institute, said the NextGen office is working closely with a drone research team at the FAA's technical center in Atlantic City, New Jersey.

FAA officials are under pressure from Congress and industry to loosen restrictions on smaller drones. The agency is expected to propose safety rules in November for businesses that want to operate them.

Smaller drones are less an issue for NextGen because the FAA is expected to limit their altitudes to less than 400 feet. Air traffic controllers generally don't separate aircraft at such low altitudes, except near airports.

But there is also concern about potential traffic and collisions with low-flying smaller drones. NASA researchers are working with the FAA and industry to develop an air traffic control system for aircraft flying at 500 feet or lower. There is no such system today except around airports.

Medium to large drones that are eventually expected fly in "Class A" airspace - over 18,000 feet, where they must be able to avoid collisions with other aircraft - are more of a problem for NextGen.

They will be controlled by a ground pilot, who will be able to see where the drone is on a computer screen and can communicate with controllers. But there won't be a pilot on board who can look out and adjust course to avoid a collision.

There are other differences as well.

Pilots who fly in Class A airspace file flight plans identifying their routes. But some larger drones are expected to stay aloft at high altitudes for days or weeks at a time, and their flight plans will be much more complex.

ERAM, a NextGen computer system that controllers use to guide high-altitude air traffic, won't be able to handle such voluminous flight plans and will have to be adjusted, aviation experts said. ERAM is already over budget and years overdue.

A greater concern is that drones fly much slower than other planes in Class A airspace, Stephenson said.

Planes at high altitudes are supposed follow designated highways in the sky to avoid collisions. A typical airliner on that highway might fly at over 500 mph, while a drone at the same altitude might fly at only 175 mph, he said. The more drones, the worse the traffic jam.

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"Some people think you won't be able to see the sun anymore because of all the (drones) that are going to be up there," Stephenson said. "Other people say, `No, it's just going to be a few. It's no big deal.' "

Sources: FAA Managers Association, Associated Press

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Posted in Regulatory Matters on September 30, 2014 by The Editor. 1 Comment

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ONE COMMENT

Werner von Stein
September 30, 2014 at 18:31

The FAA is working on this NEXT Gen... stuff since 2004. Well I am sure even before then.
I just checked my calendar.... that is more than 10 years ago.

If this keep going we have a real problem on our hands. I am not sure but I think we are using the wrong guys to implement something which can and should be done in MONTHS not years.

I am sure you all know the KISS system " keep it simple stupid "

First of all point or add the cell network transmitters so that they cover up to 1100 feet or so into the air. Then make sure every low flying UAV or UAS has a bidirectional black box on it so that it can and receive data from a cloud based data base. this way you know where any UAV or UAS is in space when covered by the cell phone network..... This system would allow you to track, file and force the UAS to fly or land. At the same time to have an interface running with the big planes when or before they hit the 1100 feet or higher that they know that there are other smaller planes in the area....

This is stuff which can been done thanks to the smart phone technology in months not years..... you could even use SAT phones for higher or low flying aircraft's....

This is all basic stuff.....

You will see this sense and avoid stuff is just basic stuff as GPS is much more important for longer flight as sensor can only really work larger aircraft's.

only my two sense.

REPLY

FAA Issues Requirement for All UAS to Show Aircraft Registration Number

The FAA UAS Integration Office issued an email to the industry outlining the requirement for all commercial UAS to bear an aircraft registration number when applying for a COA:

UAS, other than those owned by the Armed Forces, intended to operate under a new COA must be registered and marked prior to COA application. The aircraft registration number (N-number) must be entered into the "Aircraft Registration" field, of the System Description section in COA on-line.

Additionally, UAS, other than those owned by the Armed Forces, currently operating under an existing COA must be registered and marked within 90 days of the date of this email. COA holders will confirm their aircraft have been registered by entering the registration number, (N-number) in the Monthly Operational Report, in the block labeled, "Describe any other Operational / Coordination Issued". Failure to comply with the registration requirements within the prescribed timeframe may result in a suspension of the COA.

UAS must be marked with their U.S. nationality and registration marks (N-Number) in accordance with 14 CFR Part 45. The marks must be painted on the aircraft or affixed by any other means ensuring a similar degree of permanence (§45.21(c) (1), General).

Most full scale UAS are able to comply with the marking requirements, including size and location of the N-Number on the aircraft. Sub-scale or small UAS, or UAS of an un-conventional shape such as a multi-rotor (quad-copter, octo-copter, etc.) or ducted fan may not be able to comply with Part 45 or the guidance in AC 45-2D because of size or space limitations on the aircraft. In these cases, 14 CFR, §45.22(d) allows the UAS owner or operator to propose an alternative marking procedure to the FAA. Alternate marking approvals may be issued to public aircraft by FAA UAS Integration Office (AFS-80). If alternative markings were required, a copy of the Alternative Marking approval letter should be attached to application in the "Aircraft Registration" field.

Complete details for registering your UAS and reserving an N-number are provided online at www.faa.gov.

A formal letter from the FAA UAS Integration further outlining this requirement will follow this email correspondence.

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US National Transportation Safety Board Rules that Drones are Aircraft

The US National Transportation Safety Board has issued a new ruling stating that drones are, in fact, aircraft. The NTSB ruling means there could be fines for anyone operating a drone in a manner that the Federal Aviation Administration deems reckless or careless.

The ruling stems from an incident in 2011, but it could set a precedent for drones for a long time.

The FAA is still considering how to regulate the commercial use of drones, but the NTSB's ruling appears to give the agency the authority to punish operators who don't fly drones safely. The agency compared drones — or unmanned aircraft systems — to planes, which are regulated by the FAA.

Board members determined that an "aircraft" is any "device... used for flight in the air," a definition that includes, "manned or unmanned, large or small."

That could apply to the drone that led to the court case in the first place. It was flown above the University of Virginia in 2011 by Raphael Pirker, who was using it for commercial purposes to capture images of the campus. The FAA fined him $10,000, but he fought it in court and won. The FAA then appealed to the NTSB who ruled in their favor, sending the case back to an administrative law judge for further review.

The uncertainty surrounding the regulations is having a ripple effect.

Law enforcement officers can make arrests, but prosecuting cases where drones fly in restricted airspace has been difficult.

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Businesses large and small are also waiting for guidelines that will allow the use of unmanned aircraft to deliver packages and even food.

By some estimates, when drone use really takes off, it will create an industry that can support more than 70,000 jobs with an economic impact totaling more than $13 billion.

But Michael Toscano, the president and CEO of the Association of Unmanned Vehicle Systems International, said that won't happen until the FAA's rules and regulations are in place.

"It's important to have regulatory structure in place to allow for the utilization of this technology. People say well the technology has outpaced the regulatory," Toscano said. "That's true with any revolutionary type technology, so you've hit upon what has to be done — we need to have rules in place. This is one of the few industries that wants to be regulated."

Toscano said the Pirker ruling highlights unanswered questions that still exist about using drones.

Pirker, the man who went to battle with the FAA, declined CBS News' requests for an interview, but his attorney told CBS News they "disagree with the decision" and they are "reviewing the options for their next steps."

The full ruling can be downloaded here.

Source: CBS News

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Canada Issues Clear Guidelines for UAS Flying

Transport Canada has released the details of its new rules governing the commercial use of unmanned aerial systems. Last month, the agency, the equivalent of the FAA, announced a significant liberalization of so-called "low threat" UAS operations. Those were generally described as line-of-sight operations below 300 feet in rural areas away from airports by UASs weighing less than 4.4 pounds and up to 55 pounds. The advisory circular fills in the blanks, explicitly laying out the responsibilities of owners and operators and acknowledging operational circumstances in which some compromise is appropriate. It also clearly shows that Canada isn't requiring UAS pilots to be licensed per se, but they do have to complete a ground school course to fly the larger class of UAS.

The agency has also published a consumer-friendly part of its web site that guides users easily through the regulations on flying an unmanned aircraft.

Sources: AV Web, Transport Canada

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Transport Canada Transports Canada

Advisory Circular

Subject:	Guidance Material for Operating Unmanned Air Vehicle Systems under an Exemption		
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1.0 INTRODUCTION

1.1 Purpose

(1) An Advisory Circular (AC) provides information and guidance with regards to a specific issue or law. In this case, it provides general guidance, safety practices and explanatory information for operators of unmanned air vehicle (UAV) systems operating under an exemption to Sections 602.41 and 603.66 of the *Canadian Aviation Regulations* (CARs).

1.2 Terminology

(1) While media and manufacturers may use different terms when describing a remotely controlled aircraft, the aviation industry and its regulations use the term UAV system.

1.3 Applicability

(1) This document and the associated UAV exemptions apply to members of the public who operate a UAV only if:

a) it has a maximum take-off weight not exceeding 2 kilograms (4.4pounds);

or

b) it has a maximum take-off weight exceeding 2 kilograms (4.4 pounds), but not exceeding 25 kilograms (55 pounds).

(2) If you cannot or choose not to operate under the either exemption listed above you must apply for a Special Flight Operations Certificate (SFOC) if:

a) you plan to operate a UAV for any non-recreational purpose such as aerial photography, geomatic surveying, crop observation, advertising, research and development, etc.;

or

b) you want to operate a model aircraft that weighs more than 35 kilograms (77 pounds) regardless of the purpose it is used for.

1.4 Description of Changes

Not applicable.

2.0 REFERENCES AND LEGAL REQUIREMENTS

2.1 Reference Documents

(1) Although this AC provides information and guidance regarding the two (2) UAV exemptions issued by Transport Canada, UAV operators are reminded that in order to operate under the exemptions they must possess a copy of the actual exemption while operating. The applicable exemptions can be found at http://www.tc.gc.ca/civilaviation/regserv/affairs/exemptions/docs/en/2879.htm and http://www.tc.gc.ca/civilaviation/regserv/affairs/exemptions/docs/en/2880.htm.

(2) This AC should be used in conjunction with the AC on Applying for a Special Flight Operations Certificate for Unmanned Air Vehicle Systems.

(3) The aviation laws that govern the use of UAV systems in Canadian airspace are the:

(a) *Aeronautics Act;* and

(b) *Canadian Aviation Regulations.*

(4) In addition, it is your responsibility to know the other Canadian laws that might apply such as the:

(a) Canadian Transportation Accident Investigation and Safety Board Act;

(b) Charter of Rights and Freedoms,

(c) Criminal Code of Canada;

(d) Customs Act;

(e) Environmental Protection Act;

(f) National Parks Aircraft Access Regulations;

(g) Personal Information Protection and Electronic Document Act;

(h) Privacy Act;

(i) Radiocommunication Act;

(j) Transportation of Dangerous Goods Act; and

(k) Trespass Act.

2.2 Cancelled Documents

(1) The publication of a new issue of the AC on Guidance Material for Operating Unmanned Air Vehicle Systems under an Exemption renders this document null and void.

2.3 Definitions

(1) The following **definitions** are used in this document:

(a) Maximum Take-off Weight – means the weight of the aircraft at the time of the operation, including the weight of any payload (e.g. a camera) and fuel.

(b) Model Aircraft – means an aircraft with a total weight not exceeding 35 kg (77 lbs) that is mechanically driven or launched into flight for recreational purposes and that is not designed to carry persons or other living creatures.

(c) Special Flight Operations Certificate – is a Canadian aviation document required for operating an unmanned air vehicle system.

(d) Unmanned Air Vehicle – means a power-driven aircraft, other than a model aircraft, that is designed to fly without a human operator onboard. Unmanned air vehicles exclude fireworks, kites, rockets and large unmanned free balloons.

(e) Visual Line-of-Sight – means unaided (corrective lenses and/or sunglasses exempted) visual contact with the unmanned air vehicle sufficient to maintain operational control of the aircraft, know its location, and be able to scan the airspace to see and avoid traffic.

3.0 BACKGROUND

(1) Greater numbers of people in Canada are flying UAVs that, by design, are flown without a pilot on board and controlled through an external device such as a remote control, tablet, smart phone, etc.

(2) For everyone's safety, aviation is governed by strict rules similar to when operating a car or a boat.

(3) While UAV systems are legitimate airspace users, they must integrate into Canada's national airspace in a safe manner to ensure the safety of other airspace users and people and property on the ground.

4.0 REQUIREMENTS

The mandatory safety conditions required to operate under either of the two (2) exemptions can be found in Appendix A (not exceeding 2kg) and Appendix B (above 2kg but not exceeding 25kgs), depending on the specific exemption you intend to operate under. You must observe and comply with all the conditions included in the applicable exemption in order to use the exemption as your authority to operate a UAV. If not you could be subject to penalties/fines.

In order for UAV operators to understand the meaning/purpose of the various exemption conditions, the following additional guidance and explanatory materials are provided.

The information below follows the format of the 2kg-25kg exemption; however the explanatory information is pertinent to both Transport Canada UAV exemptions.

When the term "Any person" is used, it signifies that anyone associated with the operation may conduct the particular task or comply with the condition. When the term "The pilot" is used, the UAV pilot is specifically responsible for conducting that task or for complying with the condition.

4.1 General Conditions

(1) Any person conducting operations under this exemption shall conduct a safe operation and shall not pose a risk to aviation safety.

> **Note:** This principle is the basis for all flight operations. Understanding and complying with the conditions contained in the applicable exemption under which you are operating will enhance your ability to conduct a safe operation.

(2) Any person operating under this exemption shall not operate a UAV system in such a reckless or negligent manner so as to endanger or be likely to endanger the life or property of any person.

> **Note:** The same principle as the condition above but is applicable to persons and property on the ground. Operating in a reckless or negligent manner can result in fine of $5,000 for individuals or $25,000 for corporations.

(3) Any person conducting operations under this exemption shall be a minimum of 18 years of age.

> **Note:** This condition is consistent with the CARs which requires pilots to be 18 years of age in order to conduct commercial aviation operations. A certain level of maturity is required to make business decisions that will not affect aviation safety. Due to the decreased risk of operating a UAV that does not exceed 2kg, a provision has been added that reduced the age to 16 for academic activities. The reduction to 16 years of age assumes that there will be adult supervision of these activities.

(4) Any person conducting operations under this exemption shall subscribe for liability insurance covering risks of public liability at the levels described in subsection 606.02 (8) of the Canadian Aviation Regulations and in any case shall have no less than $100,000 in liability insurance coverage pertaining to the operation of the UAV.

Note: Section 606.02 of the CARs sets out liability insurance requirements for all aviation activities. It should be noted that most general liability insurance policies do not cover aviation related activities. UAV operators must ensure that they possess insurance that covers third party liability for aviation related activities prior to operating under either exemption.

(5) The pilot operating under this exemption shall not operate the controls of a UAV if they have any reason to believe that they are suffering or are likely to suffer from fatigue, or suffering from any other condition which would render them unfit to perform their duties.

Note: This condition addresses risk posed by fatigue or any other situation that may impair the UAV pilot's ability to safely operate the UAV or make safety based decisions.

(6) The pilot operating under this exemption shall not operate a UAV system within eight (8) hours after consuming an alcoholic beverage or while under the influence of alcohol or while using any drug that impairs the person faculties to the extent that the safety of the operation is endangered in any way.

Note: A UAV pilot operating a UAV system while impaired or while their ability to make sound safety decisions was compromised, could lead to drastic consequences. As such, it imperative that no one operate a UAV while their judgment is impaired. Impairment from drugs could include illicit drugs or prescription and over the counter medication.

(7) Any person conducting operations under this exemption shall be familiar with the relevant aeronautical information that is appropriate to the intended flight, before commencing a flight.

Note: Sections 602.71 and 602.72 of the CARs require pilots to obtain and review all the appropriate information that is relevant for the proposed flight, prior to take-off. This requirement is also applicable UAV operations to ensure that the information required to safely conduct the flight is obtained prior to flight. Aeronautical products such as aeronautical maps and the Canadian Flight Supplement can be found at: http://www.navcanada.ca/EN/products-and-services/Pages/flight-planning.aspx Weather and NOTAM (notice to airmen) information can be found at: https://flightplanning.navcanada.ca/cgi-bin/CreePage.pl?Langue=anglais&NoSession=&Page=Fore-obs/notam&TypeDoc=html

(8) Any person operating under this exemption shall not operate a UAV in any special aviation event requiring an SFOC under Part VI, Subpart 3, Division 1 of the CARs.

Note: Participation in an air show is considered a higher risk activity for UAVs. As such participation in air shows is prohibited under either of the two (2) exemptions. Should a UAV operator wish to participate in an air show or conduct product/capability demonstration activities they would be required to obtain an SFOC.

(9) Any person conducting operations under this exemption shall obtain permission from the owner(s) of the property on which a UAV intends to take-off/launch from and/or land/recover on.

Note: operators/pilots must be aware of the need to observe the regulation imposed by the Trespass Act when conducting take-offs and landings of their UAV. Although operations over private land may be permitted, if you were to conduct operations on private property or needed to retrieve a UAV that may have strayed onto private property, you must request the property owner's permission.

(10) Any person conducting operations under this exemption shall, prior to commencing operations, perform a site survey to assess the suitability of each location and confirm that safe operations can be conducted.

Note: Pilots will be responsible for conducting an assessment of the suitability of each site, prior to conducting operations, to ensure such operations can be conducted safely. Typical elements that should be assessed would include, but are not limited to:

- Defining the boundaries of the area where the actual operation will be carried out;
- Class of airspace and specific provisions of the airspace (e.g. controlled airspace);
- Altitudes and routes to be used on the approach and departure to and from the area where the operation will be carried out;
- Other aircraft operations (e.g. proximity of aerodromes including heliports and seaplane bases, or other operating sites);
- Hazards associated with nearby industrial sites;
- Areas of high-intensity radio transmissions or electromagnetic interference (e.g. radar sites);
- Limitations and/or restrictions of local by-laws;
- Location and height of obstacles (e.g. wires, masts, buildings, cell phone towers, wind turbines, etc.);
- Airspace restrictions such as restrictions around nuclear facilities or military bases;
- Built-up areas, major roadways and recreational activity sites;
- Security provisions to limit public access;
- Predominant weather conditions for the site and proposed operating areas; and
- Minimum separation distances from persons, vehicles and structures.

(11) Any person conducting operations under this exemption shall cease operations if at any time the safety of other airspace users or persons or property on the ground is in jeopardy, or if the person conducting operations is unable to comply with the conditions of this exemption.

Note: It is expected that anytime the operation is deemed to be a risk to other airspace users or people and property on the ground, the operation will need to cease until such time as the issues that were causing the unsafe conditions are addressed/remedied. Flight operations should not resume until the issues are resolved.

(12) A copy of the following documents shall be accessible to any person conducting operations under this exemption.

(a) This exemption;

(b) Proof of liability insurance coverage;

(c) Name, address and telephone number of the UAV operator; and

(d) A copy of the UAV system operating limitations

Note: In order to provide Transport Canada Inspectors and police authorities the ability to fulfill their duties to ensure public safety, the UAV pilot/operator is required to have immediate access to the above noted documentation at the location where the UAV is

being controlled from. It is expected that a hard copy of the appropriate exemption is on site.

(13) A person conducting operations under this exemption shall immediately produce any of the documents and/or information listed in condition 12 above to a peace officer, police officer, or Transport Canada inspector upon request.

Note: This condition simply provides clarification to the pilot/operator that Transport Canada Inspectors or peace/police officers have authority to request that adequate documentation be provided so that they can verify that operations are being conducted legally

(14) No person operating under this exemption is relieved from complying with the provisions of any other relevant Acts, Regulations or laws or from any level of government.

Note: This condition reinforces the idea that there are numerous other Acts and regulations that may apply when conducting UAV operations, such as the Criminal Code of Canada, Privacy Act, Personal Information Protection and Electronic Documents Act, National Parks Aircraft Access Regulations and the Transportation Accident Investigation and Safety Board Act, to name but a few. UAV operators/pilots must ensure that they abide by applicable rules, regulations, laws and bylaws from municipal, city, provincial and national authorities.

4.2 Flight Conditions

(15) The pilot operating under this exemption shall maintain continuous unaided visual contact with the UAV sufficient to be able to maintain operational control of the UAV, know its location and be able to scan the airspace in which it is operating to decisively see and avoid other air traffic or objects.

Note: As no "sense and avoid" capability is currently available to permit safe beyond visual line-of-sight operations, both exemptions limit operations to within visual line-of-sight. This means that the pilot must keep the UAV within eyesight at all times. Vision enhancing devices such as binoculars, night visual goggles, powered vision magnifying devices and goggles designed to provide a first person view are not considered "unaided visual contact", and are therefore prohibited under the exemptions. In determining the range that will ensure the UAV can be seen, consideration must be given to the pilot's capabilities, the meteorological conditions, the size and conspicuity of the UAV and any other relevant factors

(16) The pilot operating under this exemption shall not use a first person view device.

Note: First person view (FPV) devices generate and transmit a streaming video image to a ground station display or monitor giving the pilot who is viewing this video, the illusion of actually flying the aircraft from an onboard pilot's perspective. FPV devices do not provide an adequate capability to ensure safe traffic separation and compliance with right of way requirements. An inadequate field of regard, the lack of depth perception and the inability for these systems to operate in a lost link situation all detract from the ability of FPV devices from being an adequate substitute for a see and avoid capability.

(17) The pilot operating under this exemption shall only operate a UAV from a single control station and control relays or visual observers to extend the operational area are prohibited.

Note: Due to the additional communications and coordination requirements, extended range operations using visual observers introduce a higher risk to other airspace users and people and property on the ground. As such the operator would be required to apply for an SFOC in order to determine the additional safety conditions required to mitigate the associated increased risks

(18) The pilot shall operate no more than one UAV at any one time.

Note: No research has been conducted to determine the increased risk of a single operator controlling more than one UAV in either normal or emergency situations. The ability to conduct the sense and avoid function, visually observe the UAV and deconflict from other air traffic would be greatly reduced where more than one UAV is operated, thereby increasing the risk to other airspace users and requiring a specific review of the operation through the application for an SFOC.

(19) The pilot operating a UAV shall give way to manned aircraft at all times.

Note: Given the small size and lack of visual conspicuity of the UAVs to be operated under this exemption, and the likelihood that the pilots of manned aircraft would be unable to see the UAV, it is the UAV pilot's responsibility to always give way to all other aircraft. This would include all manned aircraft (i.e. aeroplanes, helicopters, gliders, ultra-lights, hot air balloons, etc). It is expected that the UAV pilot would land the UAV anytime a manned aircraft entered or came in close proximity to the area in which the UAV is operating.

(20) The pilot operating under this exemption shall only operate a UAV during daylight hours.

Note: Allowing aircraft to be flown outside daylight hours requires specified procedures and aircraft lighting and results in a more complex operation. Where UAVs are equipped with lights, the ability of the pilot to control the UAV at night using only the onboard lights is extremely difficult, and as such, there could be a need for additional ground lighting/illumination conditions to mitigate the risks of night operations. To operate a UAV at night, an SFOC would be required.

(21) The pilot operating under this exemption shall operate a UAV at or below 300 feet above ground level (AGL).

Note: 300 feet AGL corresponds to the altitude at which obstacles are required to be lit and marked in accordance with the CARs. Operators of manned aircraft understand that below these altitudes, additional risks are present that may be difficult to see. It must be understood that at all times it is the UAV pilot's responsibility to avoid other aircraft. It is up to the UAV pilot/operators to ensure they have an effective method for ensuring they do not operate above 300 feet, such as a barometric altimeter or GPS based altitude system. Comparing the altitude of the UAV to surrounding buildings or structure could also be effective, provided that the exact height of those objects is known.

(22) The pilot conducting operations under this exemption shall only operate a UAV in Class G airspace.

Note: As these UAVs are not required to meet any mandatory communication, navigation, surveillance/air traffic management (CNS/ATM) equipment requirements, operations are limited to uncontrolled airspace (Class G). This equates to airspace in which no air traffic control is provided to pilots. Additionally, operations under this exemption are restricted from transponder airspace, restricted airspace, control zones, controlled airspace and areas with higher volumes of manned aviation where UAV operations pose a greater risk to other airspace users. For these types of operations an SFOC would be required. There are seven classes of airspace in Canada, each designated by a letter (A through G) and they are detailed below. The class of airspace can be determined through several sources including the Canadian Flight Supplement, the Canadian Aeronautical Information Manual (AIM) (TP14371E) http://www.tc.gc.ca/publications/en/tp14371/pdf/hr/tp14371e.pdf and various VFR and IFR maps/charts. In general terms,

- Class A airspace is controlled airspace and exists exclusively between flight level 180 and flight level 600 (this equates to approximately 18,000 ft to 60,000 ft above sea level (ASL)).

- Class B airspace is any controlled airspace between 12,500 ft and up to 18,000 ft ASL. Occasionally, Class B airspace exists in other locations (control zones and associated terminal control areas), although this is unusual.
- Class C airspace is controlled airspace and includes control zones (CZ) around large airports. These areas usually have a 7-10 nautical mile radius up to a height of 3,000 ft above aerodrome elevation (AAE).
- Class D airspace is controlled airspace and may include areas around smaller aerodromes that have a 5nauticalmile radius and a height of 3,000 ft AAE. Aerodromes with less busy airspace may have only a 3-nautical-mile radius control zone.
- Class E airspace is controlled airspace used for low-level flight routes and for aerodromes that need controlled airspace but do not meet the requirements for Classes A-. Air Traffic Control (ATC) is available for aircraft operating under instrument flight rules only
- Class F airspace is special use airspace. For entry into restricted Class F airspace, specific permission is required from the operating authority or user agency.
- Any airspace that is not designated, as described above, is classified as Class G airspace. This airspace is uncontrolled and any aircraft may fly in Class G airspace.

(23) The pilot operating under this exemption shall not operate a UAV over a forest fire area, or over any area that is located within five nautical miles of a forest fire area.

Note: Operations in forest fire areas are extremely high risk with many types of aircraft operating at very low level. Introducing UAVs into this airspace would add an unacceptable level of risk to manned aircraft operations. Forest fire areas are advertised through the NOTAM system and UAV pilots are expected to review applicable NOTAMs as part of their pre-flight planning requirements. As forest fires are unpredictable, a restriction of five (5) miles is included from the fire area for all aircraft, including UAVs.

(24) The pilot operating under this exemption shall not operate a UAV in airspace that has been restricted by the Minister under Section 5.1 of the Aeronautics Act.

Note: Under the *Aeronautics Act*, section 5.1, the Minister may prohibit or restrict the operation of any aircraft on or over any area or within any airspace, either absolutely or subject to any exceptions or conditions. This type of restricted airspace is implemented where a prohibition or restriction is necessary for aviation safety or security or the protection of the public. An example of such restrictions could include security operations such as a G8/G20 Conference, major sporting events (e.g. an Olympic event) or an active shooter situation. NOTAMs are issued whenever a 5.1 airspace restriction is issued. Prior to the flight, UAV pilots would be expected to ensure there are no airspace restrictions in place for the area in which they plan on operating.

(25) The pilot operating under this exemption shall only operate a UAV at least five (5) nautical miles away from the centre of any aerodrome.

Note: As the knowledge, experience and skill levels of the UAV pilots operating under these exemptions may not meet manned aviation standards and the aircraft are not required to meet any mandatory CNS/ATM equipment requirements, operations are not permitted near any aerodromes. Additionally, as these UAVs cannot integrate into the flow of air traffic arriving and departing at an aerodrome, UAV operations pose an increased risk to other airspace users in the aerodrome environment. As such, an SFOC would be required to operate in these areas. Airports, heliports, helipads and seaplane bases would all be considered aerodromes. There are several tools that can be used to

identify where aerodromes are located to include aviation maps, the Canadian Flight Supplement and potentially some on-line tools (provided they are kept up to date).

(26) The pilot operating under this exemption shall only operate a UAV at least five (5) nautical miles away from a built-up area.

Note: UAVs operated under these exemptions are not required to meet any technical airworthiness standards meaning that there is no assurance of the airworthiness or capabilities of the UAV system. This increases the risks to persons and property on the ground, therefore, UAVs must not be operated near populated areas. Built-up areas are considered areas with groups of buildings or dwellings including anything from small hamlets to major cities. Anything larger than a farmstead should be considered a built up area.

(27) The pilot operating under this exemption shall operate a UAV at a lateral distance of at least 500 feet from any building, structure, vehicle, vessel, animal or person unless:

(a) The building, structure, vehicle, vessel or animal is the subject of the aerial work; and

(b) Only persons inherent to the operation are present.

Note: This condition provides protection to person or property on the ground that are not part of the operation or have not accepted the risk of the UAV operating in their close proximity. It permits the use of the UAV closer than 500 feet from people or objects provided those people or objects are the specific reason for the operation and have accepted the risk associated with the operation (i.e. actors on a movie set, a vehicle used in a TV commercial, aerial inspection of buildings/structures, etc). This would not include activities such as filming people at an outdoor concert or sporting event. Due to the reduced risk of operating a UAV not exceeding 2kg, the lateral distances for UAVs not exceeding 2kg is reduced to 100 feet.

(28) The pilot operating under this exemption shall operate a UAV at a lateral distance of at least 500 feet from the general public, spectators, bystanders or any person not associated with the operation.

Note: For numerous reasons, the potential hazard of UAVs being flown near or over the general public and large crowds of people is significant. A security plan must be developed and adhered to in order to protect those people not involved with the UAV operation and to ensure that people do not interfere with the operation of the UAV. Due to the reduced risk of operating a UAV not exceeding 2kg, the lateral distances for UAVs not exceeding 2kg is reduced to 100 feet.

(29) The pilot operating under this exemption shall not operate a UAV over an open-air assembly of persons

Note: Similar to the previous condition, this provides protection to person or property on the ground that are not part of the operation and have not accepted the risk of the UAV operating in their close proximity.

(30) The pilot conducting operations under this exemption shall only operate a UAV under visual meteorological conditions, clear of cloud with not less than two (2) statute miles ground visibility.

Note: These weather limits are those required in Class G airspace for manned aircraft. The required visibility permits the UAV pilot to view, not only the UAV, but the surrounding airspace to ensure manned aircraft can be seen in sufficient time for the UAV pilot to take any required actions to avoid collisions. Additionally, it allows the UAV pilot to ensure that operations are kept clear of hazardous areas. The required weather forecasts and reports are accessible from several sources including the NAV CANADA

flight planning website http://www.navcanada.ca/EN/products-and-services/Pages/flight-planning.aspx

(31) The pilot conducting operations under this exemption shall be able to take immediate active control of a UAV at all times.

Note: Although the use of UAV automation is acceptable, fully autonomous systems which do not allow the pilot to intervene are not permitted due to the potential unpredictability of their flight profile. The pilot of a UAV must be able to override the pre-programmed systems at any time, should there be a technical issue with the UAV that requires pilot intervention.

(32) Any person conducting operations under this exemption shall establish and adhere to procedures to be followed in the event that control of the aircraft can no longer be maintained. Specifically:

(a) Procedures for contacting emergency responders;

(b) Procedures for landing/recovering the UAV safely;

(c) Procedures for contacting the appropriate air traffic service unit; and

(d) Name(s) of individuals responsible for following each of the above procedures.

Note: The UAV operator/pilot must have a complete set of pre-determined procedures in order to reduce the risks to other airspace users and people and property on the ground when a UAV fly-away occurs or the aircraft experiences an emergency or suffers a technical malfunction. To ensure appropriate actions are taken without delay, persons operating under this exemption must establish such procedures prior to commencement of flight operations. These procedures must be immediately available to the UAV pilot or any other individual assigned a task, so that there is no delay in the required actions being taken.

(33) Any person conducting operations under this exemption shall establish and adhere to an emergency contingency plan.

Note: Establishing and adhering to a security plan is mandatory to ensure that appropriate actions are taken without delay. This plan addresses the action to be taken should the UAV result in injury to third parties or damage to property. These procedures must be established prior to commencement of flight operations and actioned without delay.

(34) The pilot conducting operations under this exemption shall establish and follow normal, lost link and emergency procedures, including those established by the manufacturer.

Note: UAV pilots must have procedures that will address all normal operations of the UAV as well as abnormal and emergency situations. Failure to do so would impose hazards to both persons and property on the ground and other airspace users. Should the manufacturer stipulate procedures for specific occurrences, those procedures shall be followed unless they would result in an increased risk to other airspace users or people and property on the ground. Such procedures would generally be contained in standard operating procedures or checklists.

(35) Any person conducting operations under this exemption shall confirm that no unacceptable radio frequency interference to the UAV system is present prior to flight, nor is likely to be present during flight.

Note: Radio interference could come from many sources including high voltage power lines, transmission antennas and areas with large numbers of Wi-Fi transmitters or around radar dishes/antennas. Radio interference may render the UAV uncontrollable. As such the UAV

pilot/operator is responsible for confirming that no unacceptable radio interference to the UAV system exists prior to the operation of the aircraft.

(36) The pilot operating under this exemption shall not activate a flight termination system, if a UAV is so equipped, in such a manner as to endanger other airspace users or persons or property on the ground.

> **Note:** As an added safety feature, several UAVs are equipped with a flight termination system intended to bring the UAV to the ground safely during specific emergency situations. The pilot is responsible for ensuring when and where it is safe to initiate such a flight termination. If part of the emergency plans includes the use of a flight termination system, operation of the UAV should be limited to flight over areas where, should the flight termination be activated, there is no risk to persons and property on the ground.

(37) Any person operating under this exemption shall not conduct a take-off/launch of a UAV unless the risk involved with lost link circumstances has been assessed and a determination has been made as to when auto-recovery manoeuvres or flight termination shall be initiated.

> **Note:** Given the potential of UAVs to lose their communications links (lost-link) an assessment of these risks is essential. This assessment must address when it would be safe for the UAV to commence a pre-programmed "return home" manoeuvre (including routes and altitudes) or alternatively when the pilot would initiate flight termination.

(38) The pilot operating under this exemption shall operate a UAV in known or forecast icing conditions.

> **Note:** The degradation in aircraft performance and changes in flight characteristics when frozen contaminants are present are wide ranging and unpredictable. Contamination makes no distinction between large aircraft, small aircraft, helicopters or UAVs and the performance penalties can be significant. Additionally, there are no UAVs in these classes that are equipped with anti-ice or de-ice capabilities. These factors combined increase the risks associated with operating in icing conditions. Icing conditions can be experienced even when the temperatures are above the freezing mark and when no moisture is present on the ground.

(39) The pilot operating under this exemption shall not conduct a take-off/launch of a UAV that has frost, ice or snow adhering to any of its critical surfaces.

> **Note:** In addition to the issues addressed above, conducting a take-off with contaminates such as ice or snow adhering to the critical surfaces (propeller, rotors, wings, etc) will dramatically decrease flight performance resulting in an increased risk to persons and property on the ground.

(40) The pilot operating under this exemption shall not operate a UAV system unless it is operated in accordance with the operating limitation specified by the manufacturer.

> **Note:** The pilot is responsible for operating the UAV in accordance with any specifications, directions or instructions provided by the manufacturer and for ensuring that any operating limitations relating to the operation of the UAV are adhered to.

(41) The pilot operating under this exemption shall not permit the use of a portable electronic device at the control station of a UAV system where the device may impair the functioning of the systems or equipment.

> **Note:** Given the reliance on radio transmissions and off-the-shelf electronic devices, and the fact that no engineering testing has been conducted to determine the effects of portable electronic devices on the UAV, the pilot/operator must ensure that the operation of the UAV is not adversely affected by such devices. This would require that electronic devices (i.e. cell phones, tablets, two-way radios, etc), that are not part of the

UAV system, not be in the immediate vicinity of the device controlling the UAV or any radio transmission devices associated with the UAV system.

(42) The pilot operating under this exemption shall not conduct a take-off/launch of a UAV if explosive, corrosive, bio-hazard or bright light emitting (laser) payloads, or any payloads that can be jettisoned, dispersed or dropped, are carried onboard.

Note: The carriage of such payloads increases the risks associated with the operations. As such, if operational requirements require the UAV to carry such hazardous payloads, the operator would be required to apply for an SFOC. This would allow the associated risks to be assessed and the appropriate conditions imposed to ensure safe operations. Additionally, if there is intent to use a laser onboard the UAV, there are specific requirements in the CARs with regards to requesting permission to use a laser from an aircraft. The provision for "payloads that can be jettisoning, dispersing or dropping" is not included in the "Not to exceed 2kg" exemptions as the limit in aircraft weight will likely not permit such payloads to be carried. It should also be understood, that Lithium Ion and Lithium Polymer batteries are considered dangerous good. As such, should the UAV need to be shipped to another location, the operator would be required to comply with the Transportation of Dangerous Goods Act and various CARs applicable to transporting dangerous goods.

(43) A person operating under this exemption shall ensure the following operational and emergency equipment is immediately available:

(a) checklists or placards that enable a UAV system to be operated in accordance with the limitations specified by the manufacturer; and

(b) a hand-held fire extinguisher of a type suitable for extinguishing fires that are likely to occur.

Note: The pilot/operator must be prepared to handle any emergencies that occur as a result of operating the UAV (i.e. grass fire, injury to people of the ground, etc). This requires that the appropriate procedures be developed and the required equipment be immediately available to those conducting the operation

(44) The pilot conducting operations under this exemption shall remain clear of the take-off, approach and landing routes and the pattern of traffic formed by manned aircraft operating in the vicinity of aerodromes.

Note: The operation of this type of UAV in the vicinity of the traffic patterns used by manned aircraft is inherently dangerous and increases the risk to other airspace users. Although the UAVs operated under this exemption are required to remain outside 5nm from the centre of any aerodrome, there are many locations where manned aircraft can be on an instrument approach at low altitudes outside 5nm. As such, if the pilot intends to operate anywhere within 10 nm of an aerodrome it is highly recommended that they confirm where the instrument approaches and traffic patterns are located. This information could be found in various aeronautical information publications (i.e. Canadian Flight Supplement, instrument approach plates, etc), from a local flying school or an air traffic service unit service in that area.

(45) Any person conducting operations under this exemption shall ensure that the appropriate air traffic service unit(s) is advised immediately anytime the flight of a UAV inadvertently enters into controlled airspace.

Note: A UAV entering controlled airspace, without coordination/permission could present a significant risk to manned aviation. Should a fly-away occur that would result in the UAV entering controlled airspace, the UAV pilot/operator must immediately contact the applicable Air Traffic Control (ATC) facility in order to ensure that ATC can take appropriate actions and that the safety of other airspace users is addressed. The

boundaries of controlled airspace can be found on various aeronautical aviation products (i.e. Canadian Flight Supplement, visual navigation charts, terminal area charts, etc). If the pilot has not previously coordinated flight activities with the local air traffic service unit they should contact the NAV CANADA National Operations Centre at 613-563-5626 and provide the details of the situation (i.e. type of UAV, last known altitude, direction it was flying, remaining flight time, etc)

(46) The pilot operating a UAV under this exemption, before entering or operating within in the Canadian Air Defence Identification Zone (ADIZ), shall comply with section 601.145 of the CARs.

Note: The ADIZ is airspace of defined dimensions at which special procedures are required to identify aircraft entering or operating within that airspace. In order to ensure that the Air Traffic System (ATS) is aware that a UAV will be operating into or within the ADIZ, the ATS unit requires that pilots file a Defence Flight Plan or Flight Itinerary. Additional information can be found in the AIM). Failing to do so may result in the inadvertent activation/response of North American Aerospace Defense Command (NORAD) resources.

4.3 Pilot Training Conditions

(47) The pilot operating a UAV system under this exemption shall have successfully completed a pilot ground school program that provides instruction on the following subject areas:

(a) airspace classification and structure;

(b) meteorological and NOTAM reporting services;

(c) interpretation of aeronautical charts and the Canada Flight Supplement; and

(d) applicable content of the CARs.

Note: It is essential that the pilot of a UAV become knowledgeable on the items identified above in order to conduct safe flight operations. The training requirements described above are considered to be the minimum prerequisites for operating under the 2kg-25kg exemption. Such training could be provided by an existing flight training facility (manned or unmanned) or could be a self-administered training program. Unmanned Systems Canada may also be a useful resource in finding possible training programs in your area. The CARs and the) are also excellent sources of information to enhance one's understanding of aviation related activities. Pilots may also wish to refer to the document entitled, "Knowledge requirements for Pilots operating Unmanned Air Vehicle Systems (UAV) 25 Kg or less, Operating within visual line-of-sight" (TP15263E) http://www.tc.gc.ca/eng/civilaviation/publications/page-6557.html

(48) The pilot conducting operations under this exemption shall be appropriately trained and qualified for the area of operation and the type of operation.

Note: In addition to the basic knowledge requirements required in Condition 47, the pilot of a UAV must obtain training and be considered competent and proficient to operate the specific UAV system in the proposed area of operation. This would require knowledge training on the aircraft's system, the normal and emergency procedures and any limitations for the operation of the UAV. Additionally, practical training would be required to become competent with the actual flying of the UAV. This training could be provided by other pilots, manufacturers, UAV flight training organizations or could be self taught.

4.4 UAV Conditions

(49) Any person conducting operations under this exemption shall, prior to conducting a take-off/launch of a UAV, ensure that there is a means of:

(a) Controlling the flight of the UAV;

(b) Monitoring the UAV system;

(c) Navigation;

(d) Communication, as required by the CARs;

(e) Detecting hazardous environmental flight conditions;

(f) Mitigating the risk of loss of control of the UAV;

(g) Sensing and avoiding other aircraft;

(h) Avoiding flight into obstacles and terrain; and

(i) Remaining clear of cloud.

Note: Given the increased complexity and risk of operating a UAV with a maximum take-off weight of up to 25 Kg, there must be appropriate means to safely control and operate the UAV. The methods of compliance do not necessarily have to be technical solutions (e.g. sense and avoid and navigation may be conducted by the pilot using visual line-of-sight techniques).

(50) Any person conducting operations under this exemption shall ensure that a UAV system is in a fit and safe state for flight prior to take-off/launch.

Note: No aircraft, including UAVs, should be taken airborne if the aircraft is not in a condition to sustain safe flight. This would require preflight inspections and checks to ensure, among other things, that the UAV is not damaged, there is sufficient fuel/battery charge to last for the planned flight (with a reasonable reserve) and confirmation that the radio link is working properly.

(51) Any person conducting operations under this exemption shall ensure that a UAV is not flown if it has been subjected to any abnormal occurrence unless it has been inspected for damage and repaired, if needed to ensure safe operation.

Note: Should a UAV sustain any abnormal occurrence (i.e. a hard landing, crash, become wet, land in water,etc) it must not fly again until has been inspected for damage and has been repaired, including the replacement of any damaged parts/components.

(52) Any person conducting operations under this exemption shall ensure that all maintenance, servicing and disassembly-assembly of a UAV system and associated components are performed in accordance with procedures described in the manufacturer's specifications.

Note: It is critical for the safety of other airspace users and persons and property on the ground that any manufacturer specifications or instruction be followed when it comes to the repair, maintenance and assembly/disassembly of the UAV system. The pilot/operator is responsible for ensuring the any such direction is complied with.

(53) Any person conducting operations under this exemption shall ensure that the requirements of any airworthiness directives, or equivalent, issued by the manufacturer have been completed.

Note: Should the manufacturer/retailer of the UAV issue an airworthiness directive, product recall, or other such notice indicating that the UAV is defective or has a mechanical concern, the pilot/operator shall cease to operate the UAV until the issue

has been repaired/corrected. Any such repairs must be done in accordance with the guidance provided by the manufacturer/retailer.

(54) Any person operating under this exemption shall ensure that the UAV is not equipped with an emergency locator transmitter (ELT).

Note: ELTs are used to notify rescue officials of an aircraft crash and guide search and rescue (SAR) personnel to the sight of a downed aircraft so that the passengers and crew can be assisted. As UAVs carry neither passengers nor crew, it would be inappropriate to dispatch SAR assets as this would waste critical resources, unnecessarily place SAR personnel at risk and potential divert SAR assets from higher priority activities.

4.5 Reporting Conditions

(55) Any person operating under this exemption shall, prior to the commencement of operations, notify the Minister, in writing, of:

(a) Their name, address, telephone number and e-mail;

(b) The model of UAV(s) being operated including serial numbers, where appropriate;

(c) The type of work being conducted; and

(d) The geographic boundaries of the operation.

Note: This information allows Transport Canada the opportunity to assess the effectiveness of its regulatory activities and provides basic information on who is operating in various areas so that they can be contacted, should there be need to do so (e.g. recovery of a lost UAV). It is recommended that such notification be emailed to TC.UAVExemptionNotification-NotificationExemptionUAV.TC@tc.gc.ca.

(56) Any person operating under this exception shall notify the Minister within 10 working days of any change to the information provided in the above condition or upon the permanent cessation of UAV system operations.

Note: In order to ensure that the information above remains current and valid there is a requirement to notify the Minister of any changes to the original notification provided under condition 55 above. Operators should use the same email address provided above.

(57) Any person conducting operations under this exemption shall report to the closest Transport Canada Civil Aviation office, as soon as possible, details of any of the following aviation occurrences during the operation of a UAV system:

(a) Injuries to any person requiring medical attention;

(b) Unintended contact between a UAV and persons, livestock, vehicles, vessels or other structures;

(c) Unanticipated damage incurred to the airframe, control station, payload or command and control links that adversely affects the performance or flight characteristics of the UAV;

(d) Anytime the UAV is not kept within the geographic boundaries and/or altitude limits as outlined in this exemption;

(e) Any collision or risk of collision with another aircraft;

(f) Anytime the UAV becomes uncontrollable, experiences a fly-away or is missing; and

(g) Any other incident that results in a Canadian Aviation Daily Occurrence Report (CADORS).

Note: In addition to the operator's responsibilities under the *Canadian Transportation Accident Investigation and Safety Board Act*, they must also advise Transport Canada should any of the above occurrences (incidents or accidents) occur. This is to ensure that the cause of any such occurrence is determined and appropriate mitigation/corrective measures are implemented in order to reduce the likelihood of a reoccurrence.

(58) Any person conducting operations under this exemption shall, following any of the aviation occurrences listed above, cease operations until such time as the cause of the occurrence has been determined and corrective actions have been taken to eliminate the risk of reoccurrence.

Note: In order to reduce the risk to other airspace users and people and property on the ground, flight operations under this exemption must cease if one of the above occurrences is experienced.

4.6 Penalties

(1) Transport Canada is serious about safety. Using your UAV in a reckless and negligent manner (e.g. not complying with the conditions in the exemptions) could lead to penalties and fines. Additionally this type of negligence could cause fatalities, resulting in lawsuits, fines and jail time.

(2) Penalties may be assessed in the amount of $5,000 for individuals and $25,000 for corporations for those that should be operating under an SFOC, but are not.

(3) The *Criminal Code of Canada* describes several offences involving the dangerous operation of aircraft and endangering the safety of other aircraft. Committing such offences is punishable by monetary penalties and/or jail time including imprisonment for life.

(4) Other penalties may apply against other regulations outlined in section 2.1.

5.0 INFORMATION MANAGEMENT

Not applicable.

6.0 DOCUMENT HISTORY

Not applicable.

7.0 CONTACT OFFICE

For more information about the exemptions and conditions for operating your unmanned air vehicle or for operating it safely, contact the Transport Canada Civil Aviation Communications Centre:

Phone: 1-800-305-2059

Email: services@tc.gc.ca

APPENDIX A:

EXEMPTION FROM SECTIONS 602.41 AND 603.66 OF THE *CANADIAN AVIATION REGULATIONS*

Pursuant to Subsection 5.9(2) of the *Aeronautics Act*, and after having determined that the exemption is in the public interest and is not likely to adversely affect aviation safety, I hereby exempt persons conducting flight operations utilizing unmanned air vehicles (UAVs), with a maximum take-off weight not exceeding 2 kilograms, operated within visual line-of-sight, from the requirements of sections 602.41 and 603.66 of *the Canadian Aviation Regulations* (CARs), subject to the conditions set out below.

Excerpts from the CARs are included in Annex A to this exemption.

INTERPRETATION

For the purpose of this exemption:

Autonomous - means the ability to execute processes or missions using onboard decision-making capabilities. An autonomous UAV system is not designed to permit crew member intervention.

Command and Control (C2) Link – means the data link between the UAV and the control station for the purposes of managing the flight.

Control Station – means the facilities and/or equipment remote from the UAV from which the aircraft is controlled and/or monitored.

First Person View (FPV) Device – means a device that generates and transmits a streaming video image to a control station display or monitor giving the pilot who is viewing this video, the illusion of actually flying the UAV from an onboard pilot's perspective.

Lost Link - means the loss of command and control link contact with the UAV such that the pilot can no longer manage the aircraft's flight.

UAV Operator - means the person that has possession of the UAV system, as owner, lessee or otherwise.

UAV System – means a set of configurable elements consisting of an UAV, its associated control station(s), the required command and control links and any other elements as may be required, at any point during flight operation

Visual line-of-sight (VLOS) - means unaided (corrective lenses and/or sunglasses exempted) visual contact with the UAV sufficient to be able to maintain operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to decisively see and avoid other air traffic or objects.

Visual Observer - means a trained crew member, in visual line-of-sight of the UAV, who assists the pilot in the duties associated with collision avoidance and complying with the applicable rules of flight.

PURPOSE

This exemption relieves persons conducting non-recreational UAV system operations utilizing a UAV with a maximum take-off weight not exceeding 2 kilograms, operated within visual line-of-sight from the requirement to obtain a Special Flight Operations Certificate (SFOC) as required by sections 602.41 and the requirement to comply with the conditions of an SFOC as required by section 603.66 of the CARs.

The exemption will permit non-recreational UAVs with a maximum take-off weight not exceeding 2 kilograms to be operated away from built-up areas, controlled airspace, aerodromes, forest fire areas and other restricted locations. The exemption includes conditions which address the need for the safe and responsible use of certain UAV systems.

UAV operations conducted outside the terms and conditions of this exemption will be subject to the requirements for an SFOC.

APPLICATION

This exemption applies to any person conducting UAV system operations within Canadian Domestic Airspace utilizing **UAVs with a maximum take-off weight not exceeding 2 kilograms within visual line-of-sight.**

This exemption does <u>not</u> apply to:

a) **Operations of model aircraft;**
b) **Operations of an Autonomous UAV; or**
c) **Operations by a foreign UAV operator.**

CONDITIONS

<u>General Conditions</u>

1) Any person conducting operations under this exemption shall conduct a safe operation and shall not pose a risk to aviation safety.
2) Any person operating under this exemption shall not operate a UAV system in such a reckless or negligent manner so as to endanger or be likely to endanger the life or property of any person.
3) Any persons operating under this exemption shall be a minimum of 18 years of age, or be at least 16 years of age and conducting research under the supervision of an academic institution.
4) Any person conducting operations under this exemption shall subscribe for liability insurance covering risks of public liability at the levels described in subsection 606.02 (8) of the Canadian Aviation Regulations and in any case shall have no less than $100,000 in liability insurance coverage pertaining to the operation of the UAV system.

5) The pilot operating under this exemption shall not operate the controls of a UAV if they have any reason to believe that they are suffering or are likely to suffer from fatigue, or suffering from any other condition which would render them unfit to perform their duties.

6) The pilot operating under this exemption shall not operate a UAV system within eight (8) hours after consuming an alcoholic beverage or while under the influence of alcohol or while using any drug that impairs the person faculties to the extent that the safety of the operation is endangered in any way.

7) Any person conducting operations under this exemption shall be familiar with the relevant aeronautical information that is appropriate to the intended flight, before commencing a flight.

8) Any person operating under this exemption shall not operate a UAV in any special aviation event requiring an SFOC under Part VI, Subpart 3, Division 1 of the Canadian Aviation Regulations.

9) Any person conducting operations under this exemption shall obtain permission from the owner(s) of the property on which a UAV intends to take-off/launch from and/or land/recover on.

10) Any person conducting operations under this exemption shall, prior to commencing operations, perform a site survey to assess the suitability of each location and confirm that safe operations can be conducted.

11) Any person conducting operations under this exemption shall cease operations if at any time the safety of other airspace users or persons or property on the ground is in jeopardy, or if the person conducting operations is unable to comply with the conditions of this exemption.

12) A copy of the following documents shall be accessible to any person conducting operations under this exemption:

    a. This exemption;

    b. Proof of liability insurance coverage;

    c. Name, address and telephone number of the UAV operator; and

    d. A copy of the UAV system operating limitations.

13) A person conducting operations under this exemption shall immediately produce any of the documents and/or information listed in condition 12 to a peace officer, police officer, or Transport Canada inspector upon request.

14) No person operating under this exemption is relieved from complying with the provisions of any other relevant Acts, Regulations or laws or from any level of government.

Flight Conditions

15) The pilot operating under this exemption shall maintain continuous unaided visual contact with the UAV sufficient to be able to maintain operational control of the UAV, know its location and be able to scan the airspace in which it is operating to decisively see and avoid other air traffic or objects.

16) The pilot operating under this exemption shall not use a first person view device.

17) The pilot operating under this exemption shall only operate a UAV from a single control station and control relays or visual observers to extend the operational area are prohibited.

18) The pilot shall operate no more than one UAV at any one time.

19) The pilot operating a UAV shall give way to manned aircraft at all times.

20) The pilot conducting operations under this exemption shall only operate a UAV during daylight hours.

21) The pilot operating under this exemption shall operate a UAV at or below 300 feet above ground level (AGL).

22) The pilot conducting operations under this exemption shall only operate a UAV in Class G airspace.

23) The pilot operating under this exemption shall not operate a UAV over a forest fire area, or over any area that is located within five nautical miles of a forest fire area.

24) The pilot operating under this exemption shall not operate a UAV in airspace that has been restricted by the Minister under Section 5.1 of the Aeronautics Act.

25) The pilot operating under this exemption shall only operate a UAV at least five (5) nautical miles away from the centre of any aerodrome.

26) The pilot operating under this exemption shall only operate a UAV at least five (5) nautical miles from a built up area.

27) The pilot operating under this exemption shall operate a UAV at a lateral distance of at least 100 feet from any building, structure, vehicle, vessel or animal not associated with the operation and at least 100 feet from any person.

28) The pilot operating under this exemption shall not operate a UAV over an open-air assembly of persons.

29) The pilot conducting operations under this exemption shall only operate a UAV under visual meteorological conditions, clear of cloud with not less than two (2) statute miles ground visibility.

30) The pilot conducting operations under this exemption shall be able to take immediate active control of a UAV at all times.

31) The pilot conducting operations under this exemption shall establish and follow normal, lost link and emergency procedures, including those established by the manufacturer.

32) Any person conducting operations under this exemption shall confirm that no unacceptable radio frequency interference to the UAV system is present prior to flight, nor is likely to be present during flight.

33) The pilot operating under this exemption shall not operate a UAV system unless it is operated in accordance with the operating limitation specified by the manufacturer.

34) The pilot operating under this exemption shall not conduct a take-off/launch of a UAV if explosive, corrosive, bio-hazard or bright light emitting (laser) payloads are carried onboard.

35) Any person conducting operations under this exemption shall ensure that the appropriate air traffic service unit(s) is advised immediately anytime the flight of a UAV inadvertently enters into controlled airspace.

Pilot training Condition

36) The pilot conducting operations under this exemption shall be appropriately trained on the UAV system and qualified for the area and type of operation as referred to in Transport Canada guidance material.

UAV System Condition

37) Any person conducting operations under this exemption shall ensure that a UAV system is in a fit and safe state for flight prior to take-off/launch.

VALIDITY

This exemption is in effect until the earliest of the following:

a) December 21, 2016 at 23:59 (EST);

b) the date on which any one of the conditions set out in this exemption is breached;

c) the date on which this exemption is cancelled in writing by the Minister, where she is of the opinion that the exemption is no longer in the public interest, or that it is likely to adversely affect aviation safety.

Dated at Ottawa, Ontario, Canada this _____day of _____, 2014, on behalf of the Minister of Transport.

Martin J. Eley
Director General
Civil Aviation

APPENDIX B:

EXEMPTION FROM SECTIONS 602.41 AND 603.66 OF THE *CANADIAN AVIATION REGULATIONS*

Pursuant to Subsection 5.9(2) of the Aeronautics Act, and after having determined that the exemption is in the public interest and is not likely to adversely affect aviation safety, I hereby exempt persons conducting flight operations utilizing unmanned air vehicles (UAVs) with a maximum take-off weight exceeding 2 kilograms but not exceeding 25 kilograms, with a maximum calibrated airspeed of 87 knots or less, operated within visual line-of-sight from the requirements of sections 602.41 and 603.66 of the *Canadian Aviation Regulations* (*CARs*), subject to the conditions set out below.

Excerpts from the *CARs* are included in **Annex A**.

INTERPRETATION

For the purpose of this exemption:

Autonomous - means the ability to execute processes or missions using onboard decision making capabilities. An autonomous UAV system is not designed to permit crew member intervention.

Command and Control Link – means the data link between the UAV and the control station for the purposes of managing the flight

Control Station – means the facilities and/or equipment remote from the UAV from which the aircraft is controlled and/or monitored.

First Person View (FPV) Device – means a device that generates and transmits a streaming video image to a control station display or monitor giving the pilot who is viewing this video, the illusion of actually flying the UAV from an onboard pilot's perspective.

Flight Termination System - means the system that, upon initiation, terminates the flight of a UAV in a manner so as not to cause significant damage to property or severe injury to persons on the ground.

Fly-away - means an interruption or loss of the command and control link where the pilot is unable to affect control of the UAV and the aircraft is longer following its preprogrammed procedures resulting in the UAV not operating in a predictable or planned manner.

Lost Link - means the loss of command and control link contact with the UAV such that the pilot can no longer manage the aircraft's flight.

UAV Operator - means the person that has possession of the UAV system, as owner, lessee or otherwise.

UAV System – means a set of configurable elements consisting of an unmanned air vehicle, its associated control station(s), the required command and control links and any other elements as may be required, at any point during flight operation.

Visual line-of-sight (VLOS) - means unaided (corrective lenses and/or sunglasses exempted) visual contact with the UAV sufficient to be able to maintain operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to decisively see and avoid other air traffic or objects.

Visual Observer - means a trained crew member, in visual line-of-sight of the UAV, who assists the pilot in the duties associated with collision avoidance and complying with the applicable rules of flight.

PURPOSE

This exemption relieves persons conducting non-recreational UAV system operations utilizing a UAV with a maximum take-off weight exceeding 2kgs but not exceeding 25kgs, operated within visual line-of-sight from the requirement to obtain a Special Flight Operations Certificate (SFOC) as required by sections 602.41 and the requirement to comply with the conditions of an SFOC as required by section 603.66 of the CARs.

The exemption will permit non-recreational UAVs with a maximum take-off weight exceeding 2kgs but not exceeding 25kgs and with maximum calibrated airspeed of 87 knots or less to be operated away from built-up areas, airspace, controlled aerodromes, forest fire areas and other restricted locations. The exemption includes conditions which address the need for the safe and responsible use of certain UAV systems.

UAV operations conducted outside the terms and conditions of this exemption will be subject to the requirements for an SFOC.

APPLICATION

This exemption applies to any person conducting UAV system operations within Canadian Domestic Airspace utilizing a UAV with a maximum take-off weight exceeding 2kgs but not exceeding 25kgs operated within visual line-of-sight.

This exemption does not apply to:

a) Operations of model aircraft;
b) Operations of an Autonomous UAV; or
c) Operations by a foreign UAV operator.

CONDITIONS

General Conditions

1) Any person conducting operations under this exemption shall conduct a safe operation and shall not pose a risk to aviation safety.

2) Any person operating under this exemption shall not operate a UAV system in such a reckless or negligent manner so as to endanger or be likely to endanger the life or property of any person.

3) Any person conducting operations under this exemption shall be a minimum of 18 years of age.

4) Any person conducting operations under this exemption shall subscribe for liability insurance covering risks of public liability at the levels described in subsection 606.02 (8) of the *Canadian Aviation Regulations* and in any case shall have no less than $100,000 in liability insurance coverage pertaining to the operation of the UAV.

5) The pilot operating under this exemption shall not operate the controls of a UAV if they have any reason to believe that they are suffering or are likely to suffer from fatigue, or suffering from any other condition which would render them unfit to perform their duties.

6) The pilot operating under this exemption shall not operate a UAV system within eight (8) hours after consuming an alcoholic beverage or while under the influence of alcohol or while using any drug that impairs the person faculties to the extent that the safety of the operation is endangered in any way.

7) Any person conducting operations under this exemption shall be familiar with the relevant aeronautical information that is appropriate to the intended flight, before commencing a flight.

8) Any person operating under this exemption shall not operate a UAV in any special aviation event requiring an SFOC under Part VI, Subpart 3, Division 1 of the *Canadian Aviation Regulations*.

9) Any person conducting operations under this exemption shall obtain permission from the owner(s) of the property on which a UAV intends to take-off/launch from and/or land/recover on.

10) Any person conducting operations under this exemption shall, prior to commencing operations, perform a site survey to assess the suitability of each location and confirm that safe operations can be conducted.

11) Any person conducting operations under this exemption shall cease operations if at any time the safety of other airspace users or persons or property on the ground is in jeopardy, or if the person conducting operations is unable to comply with the conditions of this exemption.

12) A copy of the following documents shall be accessible to any person conducting operations under this exemption.

    a. This exemption;

    b. Proof of liability insurance coverage;

    c. Name, address and telephone number of the UAV operator; and

    d. A copy of the UAV system operating limitations.

13) A person conducting operations under this exemption shall immediately produce any of the documents and/or information listed in condition 12 to a peace officer, police officer, or Transport Canada inspector upon request.

14) No person operating under this exemption is relieved from complying with the provisions of any other relevant Acts, Regulations or laws or from any level of government.

Flight Conditions

15) The pilot operating under this exemption shall maintain continuous unaided visual contact with the UAV sufficient to be able to maintain operational control of the UAV, know its location and be able to scan the airspace in which it is operating to decisively see and avoid other air traffic or objects.

16) The pilot operating under this exemption shall not use a first person view device.

17) The pilot operating under this exemption shall only operate a UAV from a single control station and control relays or visual observers to extend the operational area are prohibited.

18) The pilot shall operate no more than one UAV at any one time.

19) The pilot operating a UAV shall give way to manned aircraft at all times.

20) The pilot operating under this exemption shall only operate a UAV during daylight hours.

21) The pilot operating under this exemption shall operate a UAV at or below 300 feet above ground level (AGL).

22) The pilot conducting operations under this exemption shall only operate a UAV in Class G airspace.

23) The pilot operating under this exemption shall not operate a UAV over a forest fire area, or over any area that is located within five nautical miles of a forest fire area.

24) The pilot operating under this exemption shall not operate a UAV in airspace that has been restricted by the Minister under Section 5.1 of the *Aeronautics Act*.

25) The pilot operating under this exemption shall only operate a UAV at least five (5) nautical miles away from the centre of any aerodrome.

26) The pilot operating under this exemption shall only operate a UAV at least five (5) nautical miles away from a built-up area.

27) The pilot operating under this exemption shall operate a UAV at a lateral distance of at least 100 feet from any building, structure, vehicle, vessel, animal or person unless:

    a. The building, structure, vehicle, vessel or animal is the subject of the aerial work; and

    b. Only persons inherent to the operation are present.

28) The pilot operating under this exemption shall operate a UAV at a lateral distance of at least 100 feet from the general public, spectators, bystanders or any person not associated with the operation.

29) The pilot operating under this exemption shall not operate a UAV over an open-air assembly of persons.

30) The pilot conducting operations under this exemption shall only operate a UAV under visual meteorological conditions, clear of cloud with not less than two (2) statute miles ground visibility.

31) The pilot conducting operations under this exemption shall be able to take immediate active control of a UAV at all times.

32) Any person conducting operations under this exemption shall establish and adhere to procedures to be followed in the event that control of the UAV can no longer be maintained. Specifically:

    a. Procedures for contacting emergency responders;

    b. Procedures for landing/recovering the UAV safely;

    c. Procedures for contacting the appropriate air traffic service unit; and

    d. Name(s) of individuals responsible for following each of the above procedures.

33) Any person conducting operations under this exemption shall establish and adhere to an emergency contingency plan.

34) The pilot conducting operations under this exemption shall establish and follow normal, lost link and emergency procedures, including those established by the manufacturer.

35) Any person conducting operations under this exemption shall confirm that no unacceptable radio frequency interference to the UAV system is present prior to flight, nor is likely to be present during flight.

36) The pilot operating under this exemption shall not activate a flight termination system, if a UAV is so equipped, in such a manner as to endanger other airspace users or persons or property on the ground.

37) Any person operating under this exemption shall not conduct a take-off/launch of a UAV unless the risk involved with lost link circumstances has been assessed and a determination has been made as to when auto-recovery manoeuvres or flight termination shall be initiated.

38) The pilot operating under this exemption shall not operate a UAV in known or forecast icing conditions.

39) The pilot operating under this exemption shall not conduct a take-off/launch of a UAV that has frost, ice or snow adhering to any of its critical surfaces.

40) The pilot operating under this exemption shall not operate a UAV system unless it is operated in accordance with the operating limitation specified by the manufacturer.

41) The pilot operating under this exemption shall not permit the use of a portable electronic device at the control station of a UAV system where the device may impair the functioning of the systems or equipment.

42) The pilot operating under this exemption shall not conduct a take-off/launch of a UAV if explosive, corrosive, bio-hazard or bright light emitting (laser) payloads, or any payloads that can be jettisoned, dispersed or dropped, are carried onboard.

43) The pilot operating under this exemption shall ensure the following operational and emergency equipment is immediately available:

    a. checklists or placards that enable a UAV system to be operated in accordance with the limitations specified by the manufacturer; and

    b. a hand-held fire extinguisher of a type suitable for extinguishing fires that are likely to occur.

44) The pilot conducting operations under this exemption shall remain clear of the take-off, approach and landing routes and the pattern of traffic formed by manned aircraft operating in the vicinity of aerodromes.

45) Any person conducting operations under this exemption shall ensure that the appropriate air traffic service unit(s) is advised immediately anytime the flight of a UAV inadvertently enters into controlled airspace.

46) The pilot operating a UAV under this exemption, before entering or operating within in the Canadian Air Defence Identification Zone (ADIZ), shall comply with section 601.145 of the *Canadian Aviation Regulations*.

Pilot Training Conditions

47) The pilot operating a UAV system under this exemption shall have successfully completed a pilot ground school program that provides instruction on the following subject areas:

    a. airspace classification and structure;
    b. meteorological and NOTAM reporting services;
    c. interpretation of aeronautical charts and the Canada Flight Supplement; and

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d. applicable content of the *Canadian Aviation Regulations*;

48) The pilot conducting operations under this exemption shall be appropriately trained on the UAV system and qualified for the area and type of operation as referred to in Transport Canada guidance material.

UAV System Conditions

49) Any person conducting operations under this exemption shall, prior to conducting a take-off/launch of a UAV, ensure that there is a means of:

a. Controlling the flight of the UAV;

b. Monitoring the UAV system;

c. Navigation;

d. Communication, as required by the *Canadian Aviation Regulations*;

e. Detecting hazardous environmental flight conditions;

f. Mitigating the risk of loss of control of the UAV;

g. Sensing and avoiding other aircraft;

h. Avoiding flight into obstacles and terrain; and

i. Remaining clear of cloud.

50) Any person conducting operations under this exemption shall ensure that a UAV system is in a fit and safe state for flight prior to take-off/launch.

51) Any person conducting operations under this exemption shall ensure that a UAV is not flown if it has been subjected to any abnormal occurrence unless it has been inspected for damage and repaired, if needed to ensure safe operation.

52) Any person conducting operations under this exemption shall ensure that all maintenance, servicing and disassembly-assembly of a UAV system and associated components are performed in accordance with procedures described in the manufacturer's specifications.

53) Any person conducting operations under this exemption shall ensure that the requirements of any airworthiness directives, or equivalent, issued by the manufacturer have been completed.

54) Any person operating under this exemption shall ensure that the UAV is not equipped with an emergency locator transmitter (ELT).

55) Reporting Conditions

56) Any person operating under this exemption shall, prior to the commencement of operations, notify the Minister, in writing, of:

a. Their name, address, telephone number and e-mail;

b. The model of UAV(s) being operated including serial number(s), where appropriate;

c. The type of work being conducted; and

d. The geographic boundaries of the operation.

57) Any person operating under this exception shall notify the Minister within 10 working days of any change to the information provided in the above condition or upon the permanent cessation of UAV system operations.

58) Any person conducting operations under this exemption shall report to the closest Transport Canada Civil Aviation office, as soon as possible, details of any of the following aviation occurrences during the operation of a UAV system:

a. Injuries to any person requiring medical attention;

b. Unintended contact between a UAV and persons, livestock, vehicles, vessels or other structures;

c. Unanticipated damage incurred to the airframe, control station, payload or command and control links that adversely affects the performance or flight characteristics of the UAV;

d. Anytime the UAV is not kept within the geographic boundaries and/or altitude limits as outlined in this exemption;

e. Any collision or risk of collision with another aircraft;

f. Anytime the UAV becomes uncontrollable, experiences a fly-away or is missing; and

g. Any other incident that results in a Canadian Aviation Daily Occurrence Report (CADORS).

59) Any person conducting operations under this exemption shall, following any of the aviation occurrences listed above, cease operations until such time as the cause of the occurrence has been determined and corrective actions have been taken to eliminate the risk of reoccurrence.

VALIDITY

This exemption is in effect until the earliest of the following:

December 21, 2016 at 23:59 (EST);

the date on which any one of the conditions set out in this exemption is breached;

the date on which this exemption is cancelled in writing by the Minister, where he is of the opinion that the exemption is no longer in the public interest, or that it is likely to adversely affect aviation safety.

Dated at Ottawa, Ontario, Canada this _____day of _____, 2014, **on behalf of the Minister of Transport.**

ANNEX A: EXCERPTS FROM THE *CANADIAN AVIATION REGULATIONS*

101.01

"model aircraft"
"model aircraft" means an aircraft, the total weight of which does not exceed 35 kg (77.2 pounds), that is mechanically driven or launched into flight for recreational purposes and that is not designed to carry persons or other living creatures; (modèle réduit d'aéronef)

[...]

"unmanned air vehicle"
"unmanned air vehicle" means a power-driven aircraft, other than a model aircraft, that is designed to fly without a human operator on board; (véhicule aérien non habité)

[...]

602.41 No person shall operate an unmanned air vehicle in flight except in accordance with a special flight operations certificate or an air operator certificate.

[...]

603.65 This Division applies in respect of the following flight operations when not conducted under Part VII:

[...]

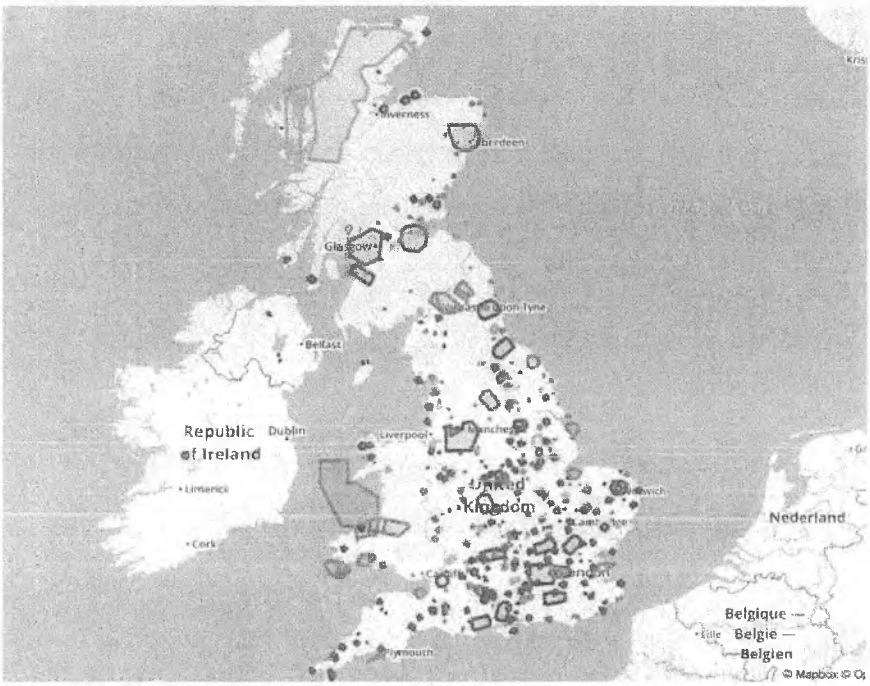
(*d*) the operation of an unmanned air vehicle;

[...]

603.66 No person shall conduct a flight operation referred to in section 603.65 unless the person complies with the provisions of a special flight operations certificate issued by the Minister pursuant to section 603.67.

603.67 Subject to section 6.71 of the Act, the Minister shall, on receipt of an application submitted in the form and manner required by the *Special Flight Operations Standards*, issue a special flight operations certificate to an applicant who demonstrates to the Minister the ability to conduct the flight operation in accordance with the *Special Flight Operations Standards*.

Don't Fly Drones Here – UK Edition



UK drone enthusiast James Harvey has created a free site, not for profit, called NoFlyDrones that just highlights the areas in the UK that RPAS operators should not operate in. He made it after he saw numerous complaints and difficulties that non aviation related people were having when reading aviation maps. So this puts the same information pertinent to RPAS operators on a simple interface.

To view an interactive version of the map, click here.

Drone Regulations in the UK are extremely mature when compared to the rest of the world, they are fair and proportionate enough to allow us to fly drones in some stunning locations across the country. The rules and regulations that do exist are in place to ensure the safety of other air-space users, third parties on the ground as well as locations of national security, such as high security prisons, royal residences and military danger areas. Breaches of these regulations are not taken lightly by the CAA and ignorance of the law is no excuse, so learn from the lessons of others and check the airspace before you fly.

This website's sole purpose is to provide drone operators with a quick and easy means of determining where they should and shouldn't be flying based on the airspace above them.

Source: website

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EUROCAE | France

FPDC | France

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Map of No Fly Zones

Tweet 29 8+1 2

Unless flying in accordance with the current CAA general exemption for FPV flight, Small unmanned aircraft should be flown in accordance with the following:

- <400ft vertically
- Within line of sight (typically <500m horizontally)
- CAP393 Air Navigation Order (including by not limited to Article 166 and 167)

Only those airspace restrictions that extend below 400ft are shown on this map below.

Use the magnifying glass to search for a location by town, city or postcode.

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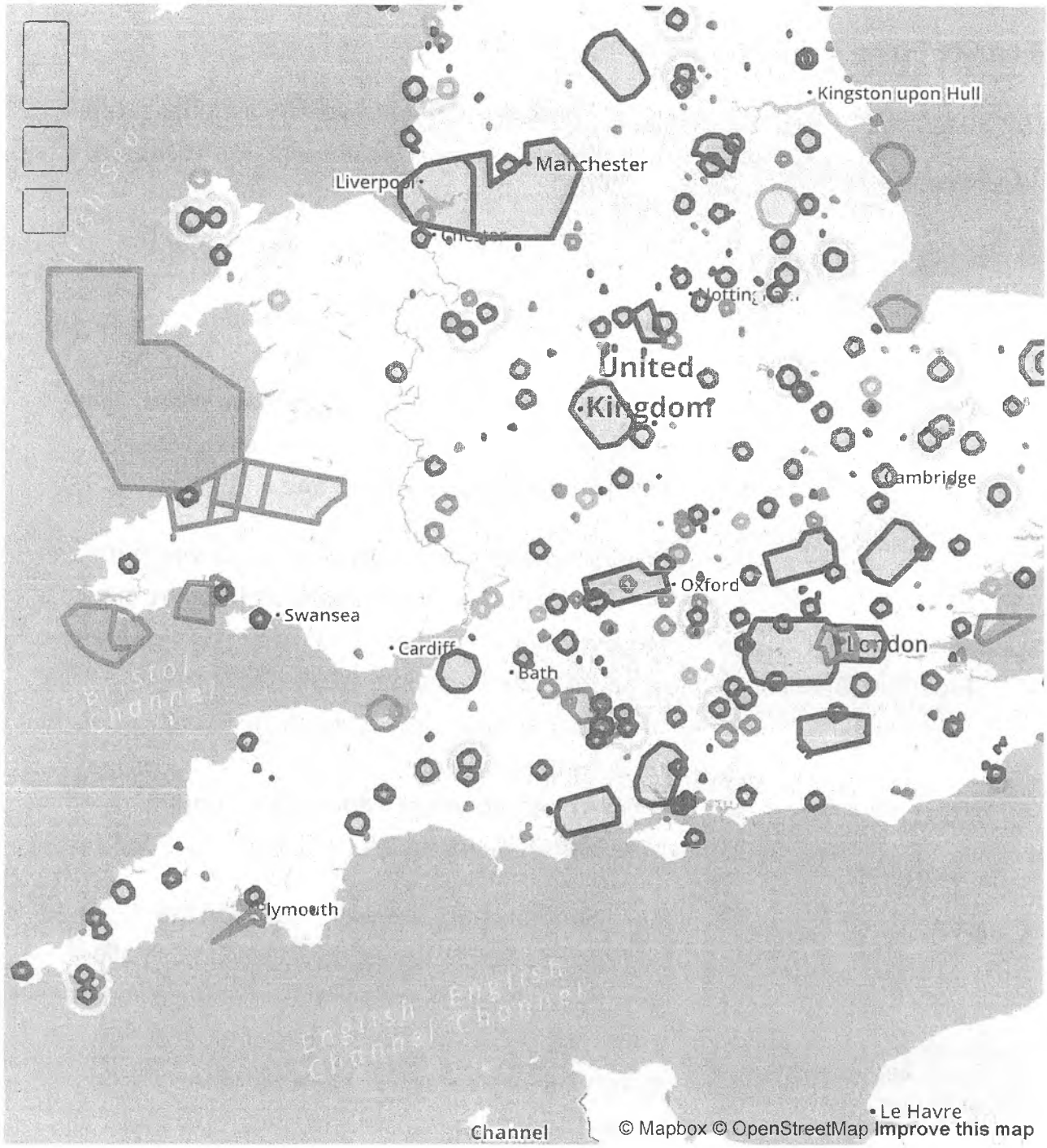

See something missing? For all enquiries and suggestions please contact info@noflydrones.co.uk

Airspace Type	Description

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Airspace Type	Description
Danger Areas and HIRTA's	Danger Areas are areas of military airspace often used for activities such as fighter pilot training, live ammunition training or weapons and systems testing (including GPS jamming exercises). The official definition is "An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified time. HIRTA's are High Intensity Radio Transmission Areas, flying through these areas could interfere with the electronics on board your drone.
Prohibited Areas	Prohibited Areas are areas of airspace which for one reason or another have been prohibited from having aircraft enter them. The official definition is "An airspace of defined dimensions above the land areas or territorial waters of a State within which the flight of aircraft is prohibited" You will have to investigate the NATS AIP for more information about why the area is prohibited.
Controlled Airspace, Aerodromes and Airports	The round blue areas on the map indicate Aerodrome Traffic Zones, they surround smaller airports and aerodromes that do not have additional controlled airspace. Other areas of blue identify Controlled Airspace. If you are operating a drone above 7kg you must not fly in these areas without prior permission from the air traffic service provider controlling that airspace.If you are under 7kg, it is still strongly advised to notify the air traffic service provider of your activity.

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Airspace Type	Description
Restricted Areas	Restricted Areas protect sensitive locations such as prisons and nuclear facilities. The official definition is "An airspace of defined dimensions above the land areas or territorial waters of a State within which the flight of aircraft is restricted in accordance with certain specified conditions"
Military Aerodrome Traffic Zones	Military Aerodrome Traffic Zones, similar to civil Aerodrome Traffic Zones, typically protect military aerodromes in the same way.

Search ...

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How to tell if I am a hobby pilot:

DJI Phantom with GoPro camera

Open the box / charge battery:
Just having fun learning to fly

Invest in GoPro camera

Scenario #1

Film the kids and dog → posting movie clips on You Tube → Grandma loves You Tube → I am still a

Others "like" my work. Maybe I can sell my images. → Commercial enterprise needs FAA approval with pilot and aircraft

Scenario #2

Use GoPro camera to film my property for new landscape → share images with landscaper

Landscaper works from information I provided → I am still a

Scenario #3

Use GoPro camera to film others' property for realestate purposes

neighbor thanks you for footage the word gets out that aerial property views are essential → I am still a

real estate agent uses images to sell property; boundary line images used in property → Commercial enterprise needs FAA approval with pilot and aircraft

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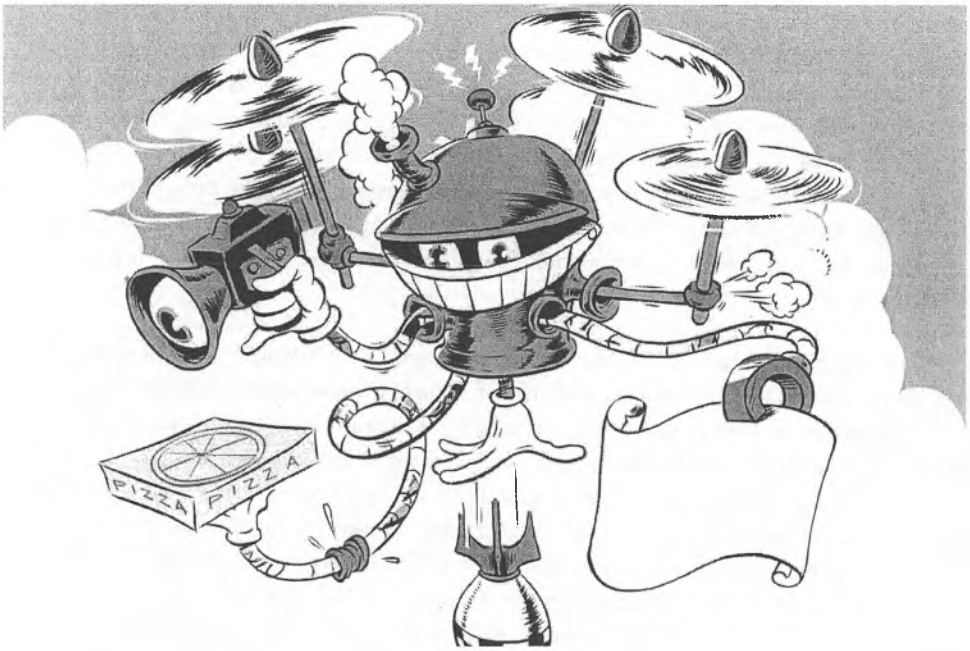
Drones and Everything After

By **Benjamin Wallace-Wells**



Drones AndEverythingAfter
The flying, spying, killing machines that are turning humans into superheroes.
By Benjamin Wallace-Wells
Illustrations by Andrew Rae

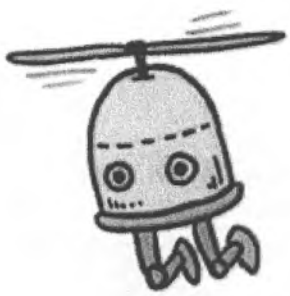
Recently, it has been getting harder to disappear on this planet. A surveilling drone began passing over the remote forests of northeastern Nigeria earlier this year, tracking the separatist group Boko Haram, catching glimpses of hasty encampments and escapes along dirt trails. When the militants kidnapped 200 schoolgirls this spring, a camera in the sky captured a large group of girls, sitting together in a clearing. Soon after, the cameras captured a similar group of girls elsewhere in the forest. Each time, the girls were moved before they could be spotted again, or rescued. What was left was just a spooky afterimage, like the impression made on a photographic plate: The most famous missing people on the planet, for an instant at least, found.

Late one afternoon in December, a drone armed with Hellfire missiles was flying low over the Yemeni desert, an audible buzzing presence, tracking a convoy of cars and trucks that were caterpillaring along a route between villages. Within the convoy were the members of two large families, escorting a bride from a wedding celebration in her own village to another in her groom's, and though they noticed the drone, its presence was not unusual. Then, while the group was stopped because of a flat tire, the noise from the drone grew louder, as if a decision had been reached, and it began to discharge missiles. Several men jumped from the fourth truck before it was destroyed, but as they fled the drone seemed to track them across the sand, and fired again, **according to Al Jazeera America**. An older sheikh ran from his car and found his son, dead and

bloodied, pierced by flying shrapnel in his face, neck, and chest. Twelve men were killed. They were farmers, shepherds, and migrant laborers, mostly. U.S. government officials would say later that the target had been a militant, affiliated with Al Qaeda, who managed to escape the attack. **A report by Human Rights Watch** suggested that he might never have been there at all.

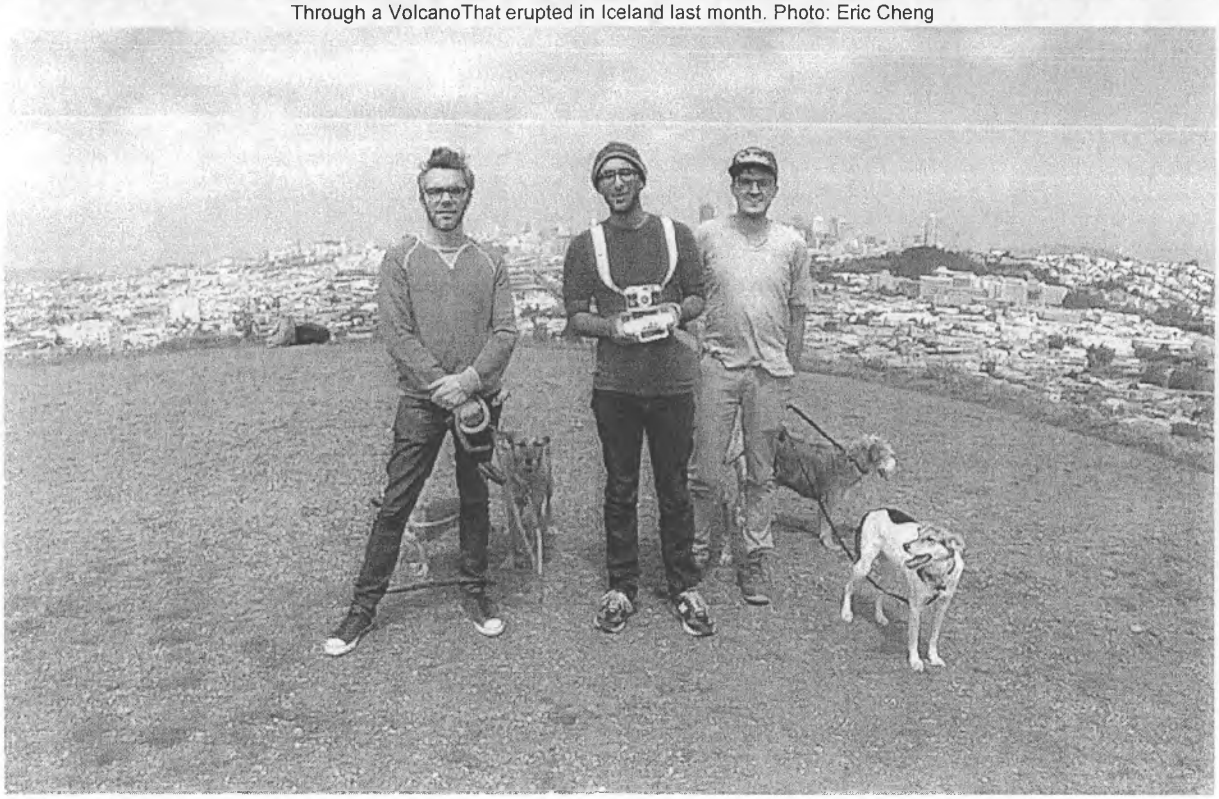
In a hobby shop in Cupertino, California, last summer, a 13-year-old boy named Kyle Ettinger noticed a tiny Nano QX drone sitting on the shelves and thought to himself, "Oh my God, I've got to have it." The machine was a marvel. It was black and yellow, weighed less than an ounce, looked a little like a Disney bug, and yet it could fly. Ettinger learned to maneuver it through the air around his yard and neighborhood; he was hooked. Soon he bought two more drones, larger and more capable. One was outfitted with a first-person-view camera, so that through a pair of goggles he could see what the drone saw. He liked to pilot the machine out of view, so far that his father would get anxious that it might crash or get lost, then bring it soaring back toward them, like a hero. Ettinger would sometimes get motion sickness flying the drone. But through the goggles, Cupertino seemed to crack open. Flying a couple of blocks from the house in which he'd been raised all his life, Ettinger noticed a large electrical station he'd never known existed, an industrial mass in the midst of his suburb. He says, "You can see a different world from up there."

If you were creating, from scratch, a taxonomy to describe all machines, these drones would not belong to the same species. They would probably not belong to the same phylum. The technology of unmanned flight has diversified so rapidly that there are now 1,500 different *kinds* of drones being manufactured, and they are participants in nearly every type of human endeavor, composing a whole flying-robot ecology so vast that to call every one by the same name can seem absurd. But *drone*, an impossible word, is also a perfect one. Each of these machines gives its human operator the same power: It allows us to project our intelligence into the air and to exert our influence over vast expanses of space. Drones have become important to the pursuit of isis, the plans of Amazon and Google, the management of farmland in Asia, the **protection of pyramids in the Andes**. Just within the past two weeks, Facebook has announced a trial of a drone-based wireless internet, the delivery conglomerate DHL has revealed that it will use the machines to ship packages to isolated German islands in the North Sea, and **the U.S. government has decided to allow Hollywood production companies** to film from drones, making possible visual angles that have so far existed only in animation.



Where the Drone Flies

Through a VolcanoThat erupted in Iceland last month. Photo: Eric Cheng



Over Bernal Hill Where Amit Gupta shot his famous drone selfie.

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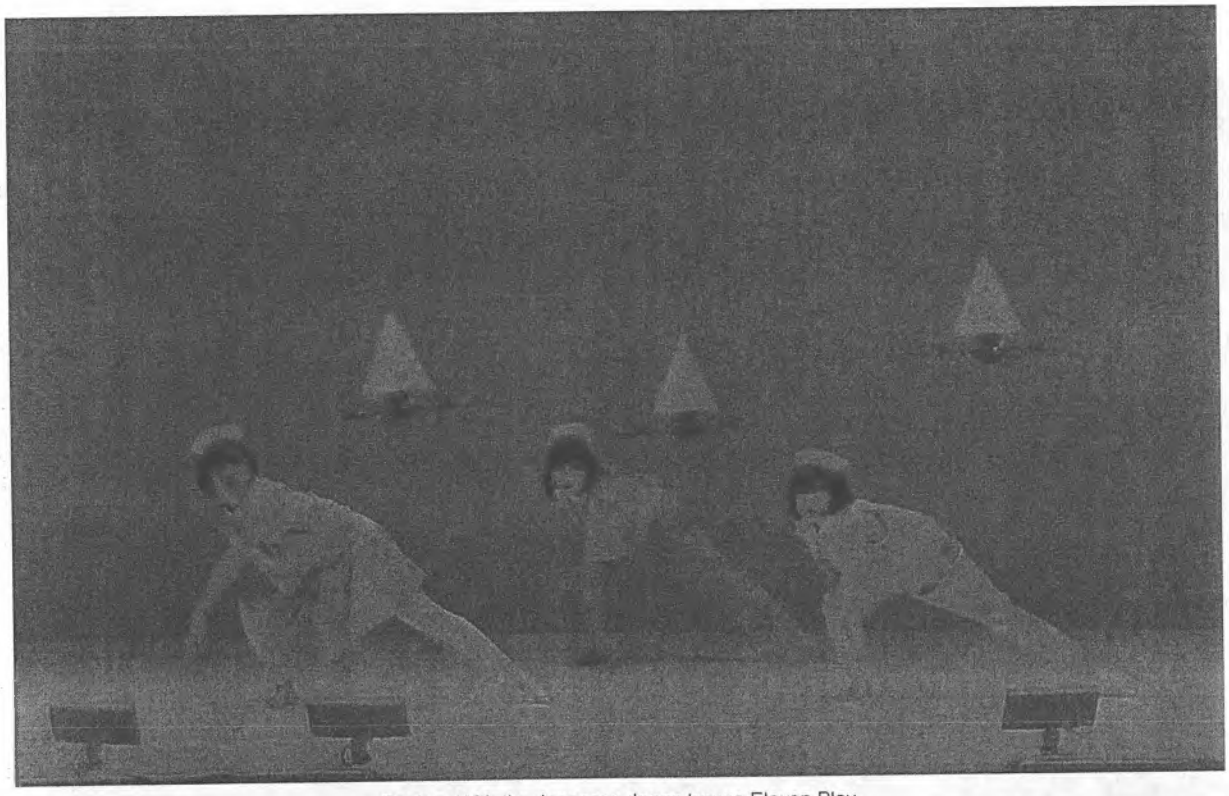
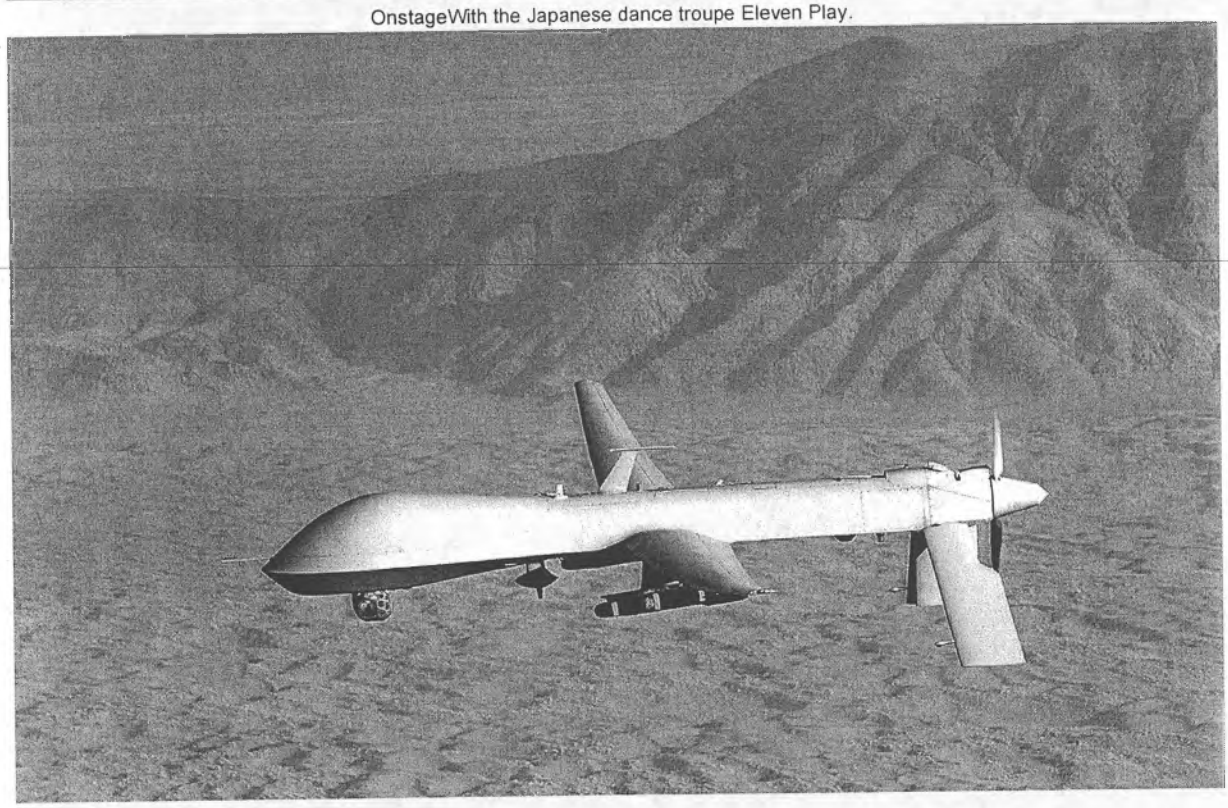


OnstageWith the Japanese dance troupe Eleven Play.



Over Enemies Surveilling and assassinating.

Through Farms Tracking the wheat crop in France.
Around NewlywedsAnd sometimes accidentally bumping into them.

Drones are a different kind of new technology from what we're used to. The communications breakthroughs of the past two decades have multiplied the connections within society, but drones offer something else: the conquest of physical space, the extension of society's compass, the ability to be anywhere and see anything. This physical presence can be creepy when seen from the ground, in ways that echo the imaginings of science fiction. "Flying," says Illah Nourbakhsh, who ran the robotics program at NASA's Ames facility, "creates this dynamic where people are no longer on top." And yet to the drone pilot, maneuvering through the air, it is liberating.

It's an incredible thing, extreme elevation. It makes you feel both alone and unsurpassable. Send a drone up, equipped with a camera, the control in your hands and your laptop rigged to see what the camera sees, and what you feel is not displacement but extension. Each of these flying robots, more than anything else, changes your perspective. Now anyone with a drone can watch the Earth from a point of view that once implied great power. This summer, the pastor of a prominent Evangelical megachurch in Texas delivered a series of sermons comparing **God to a Predator** drone.

Lost in the concern that the drone is an authoritarian instrument is the possibility that it might simultaneously be a democratizing tool, enlarging not just the capacities of the state but also the reach of the individual — the private drone operator, the boy in Cupertino — whose view is profoundly altered and whose abilities are enhanced. "The idea I'm trying to work out to simplify this whole thing — surveillance, drones, robots — has to do with superhero ethics," says Patrick Lin, a technology ethicist at California Polytechnic State University. "It's about what humans do when they have superpowers. What happens then?"

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It's an incredible thing, extreme elevation. It makes you feel both alone and unsurpassable.

In San Francisco, it no longer seems out of the ordinary for a drone to get lost in a tree. "Big thanks to the SF Fire Dept," one drone enthusiast tweeted recently over a photo of a **firefighter laboring up a ladder** to rescue a robot from a high branch. Drones have been disappearing into the playa at Burning Man. "It is white plastic with red and blue stripe stickers on the

propeller arms," ran the Craigslist post pleading for the machine's return. In Seattle, a drone saddled up to the 26th floor of an apartment building and peeped through a window, alarming the woman inside. In Los Angeles, a drone wandered high into the sky near LAX **and startled the pilot of a Canadian jetliner**; another hovered near the tenth floor of the LAPD's headquarters, drawing curious cops to the window. In Yosemite, the Park Service had to issue a ban to keep drones from spooking nesting peregrine falcons. These machines, in other words, have begun to display punkish, pubescent energies, as if we had entered drone adolescence.

It wasn't too long ago that to operate an unmanned aircraft meant standing in the middle of a field with a radio controller in your hand and toggling the vehicle through the sky — back and forth, up and down — as if tied to it by a tether. That this now seems ancient is thanks in part to the smartphone revolution, which made many of the components needed for autonomous flight (computer processors, GPS, tiny cameras, and sensors) far smaller, smarter, and cheaper. Within the past five years, these technologies have helped to produce affordable drones that can fly on their own, stabilizing themselves when the winds shift, heading for a point specified on GPS. We are deep enough into the entrepreneurial era that everyone can see a gold rush coming; hobbyists in the obscure world of radio control trade stories about cold-call emails from investors or government agents. "I have these buddies who would drop off into darpa-land for a few years, and you'd never hear from them," a Texan tinkerer named Gene Robinson says. "And then suddenly they reappear with a Ferrari, and they say, 'I can't tell you exactly what I've been working on. But it worked.' "

Robinson wanted in on the rush too. A decade ago, he was a somewhat burned-out IT guy in his mid-40s, recently divorced, and maybe a bit too garrulous for IT in the first place. He quit his job, worked to perfect his drone — a fixed-wing model that looked like a miniature Stealth Bomber — and tried to figure out how to make money on it. Robinson did the simplest thing he could think of: He stuck a Nikon camera onboard, its lens aimed down, and went searching for people who might pay for the point of view. Farmers, real-estate agents. Prospecting, and having had little luck, Robinson eventually connected with a volunteer group called Texas Equusearch, which scours rural stretches of the country on horses and ATVs looking for missing people and dead bodies. They were interested. They could see how a drone might be useful.

Robinson's first drone search was for a man named David Lee Pettiet, who had departed the modern grid in an especially barren spot of West Texas. Search parties had failed to find Pettiet for six months, long enough that the sheriff, according to Robinson, became convinced he was still alive and had begun to suspect he might be robbing banks around the county. Pettiet's sisters were despairing. The drone found him within a day—its aerial camera photographed two slashes of white, a foot apart, in a brambly clutch of downed trees, that turned out to be Pettiet's tennis shoes. The sheriff's deputies had passed just a few feet from Pettiet's body during a mounted horse search weeks earlier. But their perspective was wrong: too low.

Robinson has now flown drone searches in 31 states and several foreign countries, and this higher angle, 400 feet in the sky, has given him a view of a lot of human activities that might otherwise remain secret. Often he is called in after helicopter searches have failed; because his drone is cheaper and can stay in the air longer, it provides a more comprehensive view. It takes 15 minutes for his drone to photograph a square mile, every inch accounted for. "Human beings have left an awful lot of this world empty," Robinson says. But he has learned how to spot earth that has been churned to dig an impromptu grave, the way grass gets crushed and marked when a body is dragged through it, and the kinds of shelter that people seek when they are lost and alone. Some people he works with will try to press a suspect to confess by telling them campfire stories of what the drone can see. Robinson believes that to locate a dead body is to restore certainty to the family. **Your 2-year-old was not kidnapped; here is the spot where he drowned.** Here are the physical remains. It is as if he were reattaching stray pieces of society, putting things back in their place. Robinson says he had a devilish, misspent youth. "Now I'm earning my heaven points."

The privilege of seeing this way, and this much — it exists simply because he has a drone. Should it? Clarifying where drones are allowed to fly and under what circumstances has proved challenging. There are no consistent laws about whether police need a warrant to fly a drone over your property, searching for drugs or evidence. (A few state legislatures have passed laws requiring police to secure warrants, others have decided that cops do not need to, and most have set no guidelines at all.) It is even less clear how private operators, hobbyists, or governments should operate. The airspace above 500 feet is reserved for planes and other aircraft, but below that line the rules are "irregular and inconsistent," says Troy Rule, a law professor at Arizona State — there is little clarity, for instance, about whether a property owner can prevent her teenage neighbor from

flying a drone over her house. Congress has asked the Federal Aviation Administration to regulate the commercial use of drones by next September, but an agency audit has signaled it will likely miss its deadline. One mark of exactly how conflicted the government is about drones is that Robinson is at once a frequent collaborator with state agencies and a recipient of cease-and-desist letters from the FAA.

In Georgia once, searching for a missing woman, Robinson happened upon a huge marijuana crop, perfectly clear from the drone's camera. The local sheriff took the images and executed one of the biggest pot seizures in the state's history. (Courts have generally held that individuals have little reasonable expectation of privacy from aerial surveillance.) In Torrance, California, there is a man who uses his drone as a flying citizens' patrol, to photograph police in the act of pulling cars over or operating checkpoints, as a curb on abuses, so that cops in the Los Angeles area often find themselves subject to a scrutinizing eye in the sky. When science-fiction writers and critical theorists have warned of the surveillance future, they rarely imagined this chaos. The surveillance capacities of the state have grown. But so have these accidental private panopticons.

"It does make the libertarian side of you a little uncomfortable," Robinson allowed, when we were having lunch at a Mexican restaurant in Wimberley, Texas. He pushed across the table a drone image he'd shot in Oklahoma a few weeks earlier, in a search for a missing man, a square mile or so of empty parkland enclosed by a few houses and streets. With his thumb, he traced means of egress and ingress; there was a shopping center and power lines, evidence of the whole connected anthropological network of a town. "More people are seeing the world from that perspective," Robinson said. "Eventually, even more people will. You'll be driving a car down the road, and you'll have that aerial view in mind."

There is a four-minute shot that opens *Pretty Sweet*, a short skateboarding film from 2012 co-directed by Spike Jonze, shot entirely from a drone. The lens starts tight on a skateboarder's face — a gnarly and meaty face, the kind an Italian butcher might grab, cure, and slice. Then the camera begins to move, past him and across the street, tracking four new skaters as they jump out of a pickup truck and scale a fence, then following one skater razoring down a flight of stairs, then soaring past them and down to a bug's-eye view, another skater leaping, a girl tumbling, each figure quickly exchanged for the next but the movement continuous, as if the camera were working in cursive, until it lifts higher and disappears into a cloud of confetti. Money shot. "Even now I watch that and I get chills," says Randy Slavin, a commercial director who recently founded the first drone film festival. "There is literally no other way to get that shot. You can put a camera literally anywhere in three-dimensional space. You can design any shot."

In a movieFollowing skateboarders in Spike Jonze's *Pretty Sweet*.

Slavin bought a drone shortly after he saw that video, but it took him a while to get good enough to make much use of it. Certain moves turned out to be tricky. He wanted a shot that would track someone walking down the street, initially from the front but then turning as she passed and watching her from the back. That pivot was hard to perfect — you had to pull the camera back, dip it, and turn it all at once — and so he practiced it on a basketball court near his apartment in Tudor City. Soon, though, he could get the drone to run like a dog, low and fast along the street. He got it to skim over a swimming pool, like a bird hunting fish, and to stalk through gardens of friends' mansions in the Hamptons, **like a burglar**. On his laptop, Slavin showed me one of the most famous sequences in 20th-century film, the beginning of *The Shining*, where the camera follows a car deep into the wilderness. Kubrick shot these scenes from a helicopter — far more expensive than a drone, and also less nimble. "You can just hear Kubrick saying, 'Closer! Get closer!' " Slavin said. With a drone, you could always get closer; you could move back and forth between the intimate and the vast. "My dream," Slavin told me, "is to start a shot in a living room" — on a couple having an argument, maybe — "and then very quickly go out the window and up, so that you can see the whole city."

None of the early entrants in Slavin's festival, which will take place in February, were shot by Kubrick or Jonze. This is a novice's medium. In one infamous drone video, the camera swoops toward a bride and groom standing in a field with their foreheads touching and eyes closed. The drone flies under a flowery arch twined with flowers, then slams into the groom's head. On YouTube, there is evidence that the technique of many drone photographers is better, and there is some artistry too: **gorgeous overhead film of New Zealand's landscape**, for instance, and **one dramatic video from a drone flown into a fireworks celebration** in West Palm Beach, powder exploding all around the camera. "Pretty ballsy," Slavin said approvingly.

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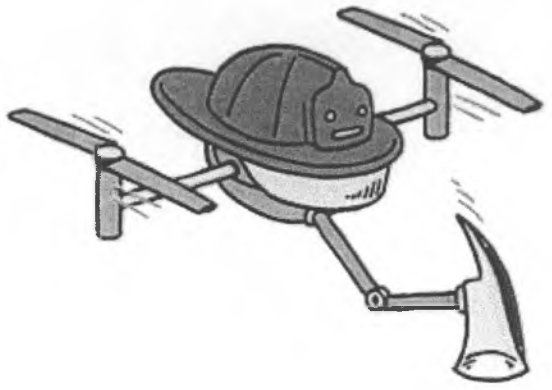
There is something uncanny about the drone perspective that creeps up on you, the more videos like this you watch. The drone's point of view emphasizes the mass scale over the individual. One of the early drone videos that got around, enough to collect nearly 2 million views, is a vision of last year's Burning Man, roving across the encampments — the huge sculptures, the big empty desert beyond. From high above the festival, individual distinctions blur and the people look almost choreographed. The man who shot it, a San Franciscan named Eddie Codel, had been going to the festival for years, and he told me he was intrigued by the way the drone removed you from the usual individual perspective — circumscribed, on the ground — and let you see the "organized chaos" of Burning Man as a whole.

Above the desertDocumenting the Burning Man festival.

When this perspective first began to proliferate through aerial photography nearly a century ago, it was greeted both with awe and alarm. Observing the world from above distanced the photographer, and the viewer, from their subject: "the God's-eye view," as the film historian Paula Amad calls it. Walter Benjamin believed there was violence inherent in this perspective — dehumanization and threat. (The Futurist poets, early theorists of Fascism, loved aerial photography.) Other intellectuals were convinced that it emphasized the essential interconnectedness of people. The aerial view resembled the perspective from which audiences gazed down on mass stadium spectacles, in which individuals become "mere building blocks and nothing more," the critic Siegfried Kracauer wrote in his famous essay "The Mass Ornament."

Both the beauty and the strangeness of drone art come from this point of view. The line of sight seduces photographers. It also affects them. There is a San Francisco outfitter called Photojojo that rents camera-equipped drones for the day, and the company's founder, Amit Gupta, told me that customers tend to take pictures of recognizable monuments from an unusual perspective, or to photograph themselves. The drone selfie has become a slightly ridiculous cultural artifact (at least since Twitter **persuaded Patrick Stewart** to take one in Cannes), but the perspective it provides is thrilling: a reminder of how small we are and how little we can see, of how awesome and humbling the God's-eye view can be.

Here, for instance, is **Gupta taking a video of himself from a drone**, a young man in a T-shirt and jeans standing on Bernal Hill, next to two of his friends. The drone hovers at eye level as if it were a fourth friend, and then Gupta touches the controller and the camera begins to back away and the frame extends; now it captures not just the three men but the whole hill they are standing on, and then the park. Then, the neighborhood, and then most all of San Francisco. And then, majestically, the bay beyond. The film lasts only 15 seconds, but in Gupta's hands the drone is not a tool of narcissism but a context machine. As the video ends, he is still in the center of the frame but his true subject has swelled all around him: San Francisco, the mass ornament.

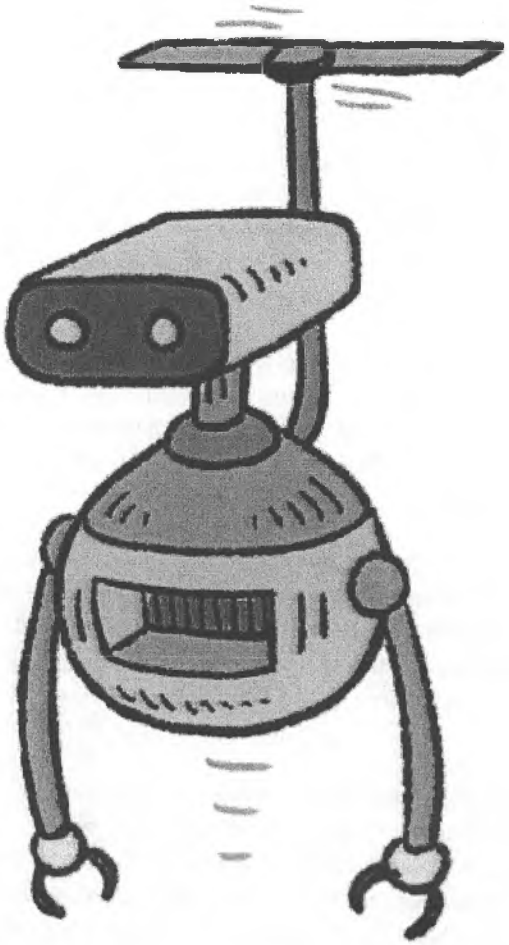


There are villages in the most remote tribal areas of Pakistan in which these context machines are such a constant, noisy presence that drones are sometimes called *bangana,* a Pashto word for wasp. While they linger, no one on the ground knows whether their mission is surveillance or assassination. It is this combination of inscrutability and remote power that makes them such a maddeningly seductive and destructive tool of foreign policy. In May 2012, a drone strike destroyed a

residential block in the Yemeni city of Jaar. Fifteen minutes later, the drone fired again, into the same houses, so that some people who had come to help the wounded were themselves killed. A pregnant woman died. A 65-year-old taxi driver, rushing to help members of his family after the first strike, saw "seven or eight" bodies scattered around him. No one seemed to really understand what, or whom, the drone had been pursuing, or even who was operating it. Some eyewitnesses who spoke with NPR were certain they had seen a gray American jet, "like an eagle." Those talking to the London *Times* were convinced the plane had been black and Saudi. Perhaps the aircraft they'd seen had nothing to do with the strike at all.

The places where drone strikes have been most common are places accustomed to violence and war. "In Pakistan, things fall out of the sky all the time," the country's former president Pervez Musharraf is supposed to have said. Things dropped from drones tend to fall more exactly in place. American drone strikes in Pakistan, Yemen, and Somalia have killed between 3,200 and 5,400 people since 2002, **according to the Bureau of Investigative Journalism**, by whose accounting about one-fifth have been civilians. In Pakistan's tribal areas, the strikes seem to have suppressed militant attacks on the local population and panicked terrorist leaders — but they haven't caused civilians to flee. Since the Pakistani army began destroying villages in North Waziristan in June, nearly 1 million people have fled their homes. But with drones there seems to be no assumption that any individual attack is likely to be followed by another. People stay put, says Christine Fair, a scholar of South Asian security at Georgetown. "There has never been a refugee crisis because of drones."

And yet something has changed. It is so much less risky to deploy drones than manned airplanes that the threat of a strike — the possibility of assassination — now exists everywhere in these zones. It is part of the everyday landscape even when no soldiers are near. A hovering weapon is sometimes the most visible image of America overseas. (And not just America: **Ukraine's government has bought drones to deploy** against Russian-backed insurgents, Chinese officials have disclosed that they'd considered sending an armed drone to assassinate a drug trafficker in Myanmar, and **Hezbollah has been flying drones**, likely provided by Iran, into Israeli airspace.) Survivors remember the strikes with a bewildered horror: "I found families ... wrapping up the body parts of people from the ground, from here and there, **putting them in grave clothes like lamb**." "A person leaves his house in the morning and he looks right and left, not knowing from where a blow might come that would be his end." "I can't think what possible connection my mother had with the Americans and why they had to kill her."



Before unmanned aircraft proliferated, the American military could track a target virtually anywhere on Earth, conducting surveillance and reconnaissance, but the cost and complexity of performing these missions limited their use and often required approval from very senior officers. Drone technology, says Ioannis Koskinas, a retired Air Force colonel, has given soldiers "at the smallest infantry level — the squad" — access to these tools. An ordinary soldier can, if the resources at that moment permit, learn what is happening in a dangerous area he is about to enter in something close to real time. His awareness is enhanced.

Pilots typically benefit from what psychologists call "the morality of altitude" — separated from their victims by thousands of feet of airspace, they tend to suffer far less post-traumatic stress than do their counterparts on the ground. But drones have collapsed that moral distance, bringing their operators into far greater intimacy with their targets. The details of how drone pilots work have, like the missions themselves, been largely classified, but by combing through unclassified medical studies of drone-operator stress, Peter Asaro of the New School has been able to pinpoint some of the changes. Asaro found that tasks that had been distributed through the military and intelligence bureaucracies (gathering intelligence on a target, conducting surveillance, weighing the risks of a targeted killing, navigating a plane, firing a missile, assessing what happened afterward) have now been concentrated, so that they are all performed by tiny teams often scattered at bases around the peacetime United States, working at night, monitoring targets halfway across the globe for whose survival or death they are responsible.

"A pilot traditionally might have to fly to a coordinate and drop a bomb, and that was it," Asaro says. "Now a drone operator has much more intimacy. Often he has to track a subject for weeks beforehand. The access to the intelligence is much greater. Sometimes they have to do damage assessment in the aftermath of an attack — to count the bodies pulled from the rubble." Two years ago, **a former drone-sensor operator named Brandon Bryant went public**, telling reporters about his difficulty shaking memories, including one of a strike in which he was sure that his crew had inadvertently killed children.

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"They aren't really like pilots, and they certainly aren't like artillerymen, where you never see the target," Asaro says. "The better analogy is to snipers."

An anonymous drone operator, interviewed by the artist Omer Fast:

Five thousand feet is the best. I love it when we're sitting at 5,000 feet ... Plus, at 5,000 feet, I mean, I could tell you what type of shoes you're wearing ... I could tell you what type of clothes a person is wearing and if they have a beard, their hair color ... If someone sits down, let's say, on a cold surface for a while and then gets up, you'll still see the heat from the person for a long time. It kinda looks like a white blossom ... It's quite beautiful. I mean, heck, if you see somebody light up a cigarette, that's a huge beacon. You just see a very white glow coming from that area. And you're just on a preset path flying a circular orbit, watching them as they're smoking from about two to three miles away.

The great Silicon Valley TacoCopter Hoax kicked off with an announcement of a new product just futuristic enough, and just fratty enough, to drive tech websites into a state. "It's an unmanned drone shooting a taco from space down at you and your colleagues during lunchtime!" the Huffington Post's Jason Gilbert enthused. "The concept behind TacoCopter is very simple, and very American: You order tacos on your smartphone and also beam in your GPS location." You can imagine the rest. The hoaxers suggested that their "tireless" drones would soon be flying tacos to customers sitting at the beach.

The idea that robots might serve as mechanical butlers has been around at least since the very first episode of *The Jetsons* aired on September 23, 1962, during the Kennedy administration, almost seven years before the moon landing. George and Jane become overwhelmed by the complexities of life in the SkyPad apartments and decide to buy a robot maid, Rosie. Under her watch, life runs more comically but also more smoothly: The meals get cooked, the house gets cleaned, and she cracks wise in almost exactly the manner and accent that Fran Drescher would, more than a quarter-century later. She helps with homework.

This notion — that a personal robot might hover near at hand, helping to ease life's small dilemmas and anxieties like a Seussian cleaning machine — tends to be the first instinct of would-be drone entrepreneurs. A roboticist in Boston named Helen Greiner envisions drones that would meet her midway through her run on the Boston Common bearing a water bottle. David Weekly, a San Francisco technologist who recently founded what he says is the first venture-capital fund devoted exclusively to drones, says that techies "think first about Follow-Me. They buy a Phantom 2 and immediately think, *Couldn't I get this to follow me around all the time and photograph me?*" Many of these drone-videography applications, Weekly believes, are prone to a looming hype-and-bust cycle. Weekly is more enthusiastic about projects that envision drones' operating on a larger scale, or in places that are hard for humans to reach: repairing and monitoring wind turbines and bridges, for instance, or cultivating large agricultural fields from the air.

Some of the most ambitious drone projects are already in trials. A few months ago, Andreas Raptopoulos, the co-founder of the Menlo Park company Matternet, raveled to Bhutan, where he has been working with its government to use drones to deliver medicine to health clinics isolated high in the Himalayas. **Raptopoulos is fond of noting** that one-seventh of the world's population — 1 billion people — are without access to roads for some part of the year. Drones, he believes, could serve to correct the geographic accidents of birth, to give people living in the most remote and often poorest corners of the globe a more tangible connection to the rest of civilization.

Bhutan had been tricky in ways that both reminded Raptopoulos of the problems he was trying to solve and suggested how difficult the solution would be. It takes up to 12 days for medicine to get up the mountains by road, or for blood samples to get down to a lab in the capital, and even driving to the mountain clinics was an anxious experience. Matternet's drones, cheap and light but with limited range, are meant to hopscotch up the mountain, each one handing off the package to the next, like a flying-robot Pony Express. The intention is for the handoff to be automated, but the technology wasn't quite there yet, and so Raptopoulos had stationed workers every 20 kilometers. The altitude posed special problems: "When you go up higher, the air is thinner, you need to spin your propellers more aggressively, and you lose some of your performance," Raptopoulos says. Flying through the Himalayan valleys, his drones couldn't always connect with cellular networks, but they were able to use their internal GPS to navigate back to their track. They made do. Medicine got up the mountain much more quickly. "We could do it in a couple of hours," he says. "Most of the time."

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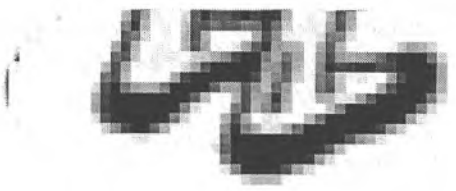


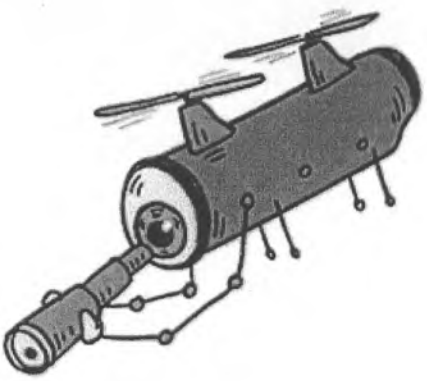
"Drone operators aren't really like pilots, and they certainly aren't like artillerymen. The better analogy is to snipers."

The interesting thing about projects like Matternet is that they suggest how a single human operator might control an entire system of drones. Vijay Kumar, a roboticist at the University of Pennsylvania, is experimenting with drone swarms, which would be more powerful and also, ironically, simpler, since in a swarm each individual drone could be assigned a different task. He showed me a video of an experiment he had run in which five drones had been given a blueprint of a skeletal structure and a row of construction materials. After a minute, the drones begin to zip over to the materials, each grabbing something in its hook, and then, a few feet away, adding the piece to a small structure that has begun to rise.

There is enough of this going around to think that swarms could be the drone's most plausible future. Both Amazon and Google have hinted at large networks of autonomous delivery drones, and Facebook recently suggested that its project would aim to have one human pilot for every 100 drones. An agricultural engineer at Georgia Tech is working to design large teams of drones and ground-based robots that can monitor and manage farmland with no human involvement.
A roboticist in Switzerland is working on designing drones that could on their own tie fibers together to create tensile structures — a rope bridge across a remote ravine, maybe, to be prepared before a human explorer arrived. Kumar has deployed his drone teams to map the destruction of Japanese buildings after the tsunami. "Think about 9/11 — those firefighters should not have run up those stairs, robots should have flown up them," Kumar says. "Who cares if you lose a hundred robots."

This humanitarian strain runs through many drone projects, and though it is often deeply felt, it also serves to disguise dramatic disparities of power. "People should not be dying because medicine cannot physically get to them," Raptopoulos says, and this is moving and true, though it is also a way to introduce what he says is his ultimate vision, of a for-profit package-delivery service. Part of the attraction of drones is that they allow their operators to tinker in faraway places—leapfrogging medicine over swamped roads, annihilating militants holed up in unreachable villages, discovering lost bodies—even though not every disruption is welcome.

And yet this is a complicated kind of privilege. Drones let you see so much more of the Earth, at once more fully and minutely, in ways that confuse the normal relationship between intimacy and distance. With a drone you roam in a peculiar disembodied manner; you move through the world a little less like an actor and a little more like a director. Your new powers make you a little less recognizably human. In some real but imperfect way you exist in more than one place at once.



One 102-degree afternoon just before Labor Day, I drove with Gene Robinson to an empty field in the Texas Hill Country to fly his drone. Robinson placed the machine on the flatbed of his truck and connected with it wirelessly, programming a flight

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plan and a launch protocol. Then he walked out into the middle of the field, gave a crow's hop, and threw the drone up into the air. Until it was 60 feet in the air, it just climbed upward. Then, having situated itself in space, it adjusted and began a slower, looping climb up toward 400 feet, high enough that you could no longer hear it.

We lost sight of it quickly. There was a noise in the distance of an engine heading our way. "General aviation," Robinson murmured — an airplane, and he turned around to look for it. Drone operators know never to get in the way of airplanes, since that is one of the clear red lines that the FAA has set. I asked Robinson whether he was concerned. "Oh, no," he said. We could see both the drone and the plane now. "We're at 400 feet," Robinson explained, pointing to the drone. Then he pointed to the airplane. "He's at 20,000."

From the ground, they were just two tacks in the same pincushion; I could not have said which one was higher. One of Raptopoulos's drawings depicts a drone highway, a horizontal band of space a few hundred feet from the ground in which machines can travel through the air undisrupted by the traffic and chaos below. But then there is space for dozens of bands like that between Robinson's drone and the airplane passing overhead, maybe more. There is just so much empty room up there. ■

**This article appears in the October 6, 2014 issue of* New York Magazine.

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U.S. Department of Transportation
Docket Operations, M-30
West Building, Ground Floor
Room W12-140
1200 New Jersey Avenue SE
Washington, DC 20590

RE: Interpretation of the Special Rule for Model Aircraft, Docket No. FAA-2014-0396

To Whom It May Concern:

EAA (the Experimental Aircraft Association) is the world leader in recreational aviation. With an international membership of more than 180,000 people in over 100 nations, EAA brings together pilots, aircraft builders, owners, and aviation enthusiasts who are dedicated to sharing *the Spirit of Aviation* by promoting the continued growth of aviation, the preservation of its history and a commitment to its future.

EAA is commenting on the FAA's Interpretation of the Special Rule for Model Aircraft, published in the Federal Register as 79 FR 36172 and recognized as Docket Number FAA-2014-0396.

EAA recognizes the need for rulemaking regarding unmanned aerial systems (UAS). We understand that the FAA must draw a clear line between UAS and model aircraft before such rulemaking can be created and implemented. UAS operations are a growing safety concern to the manned aviation community, and EAA is committed to a UAS regulatory system that protects manned aircraft from collisions and ensures unhampered access to all airspace by manned aircraft. In order to protect manned aircraft, certain unmanned aircraft must be regulated. EAA applauds the FAA's ongoing commitment to ensuring the safety of the national airspace.

However, we are concerned that the FAA's current interpretation of Public Law 112-95, section 336 exempting "model aircraft" meeting enumerated criteria from FAA regulation, could have negative and unintended consequences for the model aircraft community. This is an important community for EAA because 1) a significant portion of our membership participates in model aviation, and 2) model aviation is a key aviation low-cost "pathway" to participation in traditional recreational aviation and personal flight. The FAA's proposed interpretation, if implemented as currently presented, would have wide-ranging and universally negative effects on the model aviation community.

EAA offers the following comments:

1) The model aircraft community has been safely and successfully self-regulated for approximately 90 years. The largest community-based organization in model aviation, the Academy of Model Aeronautics (AMA), was founded in 1936 and has established a clear and effective set of guidelines that govern model aircraft flying at AMA-sanctioned events.

These rules, combined with the FAA's AC 91-57 and common sense, are traditionally recognized by the model aircraft community for all operations, sanctioned or not, and have been tremendously successful in fostering and sustaining model aviation's notable safety record. EAA is very concerned that the FAA's proposed interpretation on the special rule for model aircraft will have the unintended effect of unraveling trust and reliance upon community-based organization guidelines by subjecting model aircraft operators to a host of regulations that are completely unfamiliar to the community, including but not limited to airspace restrictions.

2) EAA is concerned that many traditional and accepted facets of the model aviation industry might be suddenly and unnecessarily jeopardized by this proposed interpretation. The FAA's interpretation suggests that any flight operations that have a financial compensation element are not conducted "strictly for hobby or recreational use" and would fall outside the rubric of "model aviation." EAA strongly disagrees with that narrow and novel interpretation.

For decades, model aircraft manufacturers and distributors have had the ability to demonstrate their products for the purpose of promotion and sales at community events and trade shows without scrutiny or regulation. Demonstration flights by staff members of manufacturers and distributors educate the community about emergent safety techniques, products, and technology. Furthermore, many individual model aircraft operators are sponsored by manufacturers and/or distributors. EAA is concerned that their sponsored operations might be construed as "commercial" in nature and therefore jeopardized by this proposed interpretation. EAA is concerned that a prohibition of these operations, or a requirement that these sponsored operators have an "airworthy aircraft" plus airman and medical certificates, would cause great damage to the model aircraft community without any responding to any demonstrated need or offering any public safety benefit. EAA also notes that many people can and do earn compensation from "hobbies," for example, woodworking, painting, or sculpting. Therefore, sponsored and manufacturer-staffed operations are not in contravention of Congress' mandate that model aircraft be operated by a "hobbyist."

3) FAA's insistence that model aircraft are "aircraft that fall within the statutory and regulatory definitions of an aircraft, as they are contrivances or devices that are 'invented, used, or designed to navigate, or fly in, the air'" is troublesome to EAA because the standard of "designed to fly in the air" is overly broad and not supported by historical precedence for the purpose of FAA oversight and enforcement. EAA believes that the definition of "aircraft" found in 14 CFR 1.1 was never intended to include model aircraft.

Many things are designed to fly in the air but have never been considered "aircraft" or subject to FAA regulation, e.g. toy balsa gliders, boomerangs, model aircraft, and paper airplanes. Even ultralights, regulated under 14 CFR 103, which are clearly invented to fly in the air carrying the operator onboard are determined by historical precedent not to be "aircraft" but rather recreational "vehicles." EAA is concerned that if the FAA regards model aircraft and other

devices "invented, used, or designed to navigate, or fly in, the air" as legitimate "aircraft," operators of these articles will be subject to the broad sweep of FAA regulation including airspace designation, equipment and communication requirements, ATC clearances, minimum altitudes, Temporary Flight Restrictions, and VFR weather minimums to name a few. EAA believes that claiming a toy airplane is an "aircraft" in the same way a Cessna 172 is an "aircraft" makes little sense, and Congress did not express intent for this stance. Subjecting model aircraft operators to regulations designed for manned aircraft defies common sense.

4) The proposed interpretation explicitly states that "the rulemaking prohibition [found in P.L. 112-95, section 336(a)] would not apply in the case of general rules that the FAA may issue or modify that apply to all aircraft, such as rules addressing the use of airspace (e.g., the 2008 rule governing VFR operations in the Washington, DC area) for safety or security reasons." If this is truly the case, then the FAA is alleging, in the case of the example provided, that any child who wishes to operate a toy remote-control helicopter in a park within 60 miles of the nation's Capital must take "special awareness training" for acting as "pilot in command" of an aircraft flying under visual flight rules. No reasonable person would support this interpretation and the risible consequences it suggests. EAA believes that the FAA's interpretation, if consistently applied, opens the door to the potential of enforcement action being levied against any "aircraft" operator the agency sees fit, Congressional intent or not.

On a related note, EAA is very concerned that the FAA's broad interpretation of what constitutes an "aircraft," combined with the interpretation's assertion that the FAA can indeed regulate model aircraft operations so long as the applicable regulations "apply to all aircraft," might result in individuals holding airman certificates being subject to certificate action for model aircraft operations. Under this interpretation, it is conceivable that the FAA could pursue enforcement action against a pilot for flying a model airplane within a TFR, resulting in that pilot's airman certificate being suspended or revoked for an infraction that does not involve flight in a manned aircraft.

5) EAA disagrees with the FAA's proposed interpretation of "visual line of sight" (referenced in P.L. 112-95, section 336(c)(2)) that excludes so-called "first-person view" (FPV) operations. We believe that FPV operations, when conducted under the guidance of AMA Document 550, are a completely acceptable and safe use of model aircraft. EAA offers that the "visual line of sight" requirement is intended as a clause to limit distance of the model aircraft from its operator, rather than a literal mandate that the model aircraft operator have his own eyes focused on the model airplane. EAA believes that the FAA's interpretation adds nothing to public safety while harming the model aviation community by disallowing the responsible use of exciting new technology. If a spotter is used to maintain visual line of sight and see-and-avoid protections, as is mandated by AMA Document 550, then the distance from the operator intent of the law's language is met.

With these comments in mind, EAA recommends that:

1) The FAA define "model aircraft" as an unmanned device, operated in the atmosphere and maintaining "see-and-avoid" separation from manned aircraft, and operated within visual line and distance of sight of either the operator or the operator's spotter;

2) The FAA follow the plainly intended spirit and intent of P.L. 112-95 section 336 and refrain from imposing any regulations on operators of model aircraft or the model aircraft themselves, even if those regulations otherwise apply to "all aircraft;"
3) The FAA explicitly confirm the right of manufacturers, distributors and sponsored pilots to continue to operate model aircraft without regulatory oversight.

Once again, we thank the FAA for engaging the complex issue of UAS integration in its ongoing commitment to aviation safety and preservation of the National Airspace System. EAA appreciates the opportunity to offer comments on the FAA's proposed interpretation, and we welcome any questions or requests for amplification of any point made above.

Respectfully Submitted,

Sean Elliott
Vice President, Advocacy and Safety

Interpretation of the Special Rule for Model Aircraft, Docket No. FAA-2014-0396
Comments submitted by the Academy of Model Aeronautics (AMA)
September 22, 2014

Comments – Section I

The Interpretive Rule states: "Historically, the FAA has considered model aircraft to be aircraft that fall within the statutory and regulatory definitions of an aircraft."

In fact the opposite is the case. Advisory Circular 91-57, issued in 1981, clearly establishes FAA's expectations in terms of a voluntary level of compliance for model aircraft operations and makes no mention of any portion of the US Code or existing Code of Federal Regulations that are applicable to model aircraft. This was reinforced in the agency's unmanned aircraft policy statement in February 2007 concerning recreational use and was most recently stated in the agency's internal guidance document, N JO 7210.873, effective July 11, 2014, two weeks after the Interpretive Rule was published in the Federal Register.

Additionally, FAA's guidance document regarding the compliance criteria for federally obligated airports, AC 150/5190-6, lists model aircraft as an example of an activity that is not an aeronautical activity, aeronautics being the "design, construction and operation of aircraft." Other documents issued by the FAA over the past several decades confirm that the FAA has historically not considered model aircraft to fall within the statutory or regulatory definitions of "aircraft."

As was concluded by National Transportation Safety Board Administrative Law Judge Patrick Geraghty in the FAA v. Pirker case (currently on appeal), the FAA "has not issued an enforceable FAR regulatory rule governing model aircraft operation; has historically exempted model aircraft from the statutory FAR definitions of 'aircraft' by relegating model aircraft operations to voluntary compliance with the guidance expressed in AC 91-57." Although Mr. Pirker was apparently not operating his model aircraft pursuant to AMA guidelines or those of any community-based organization, the underlying principle contained in the decision about the nonregulation of model aircraft is correct in light of the history of model aviation in this country. This is a viewpoint that AMA shares.

Comments – Section II

The Interpretive Rule states: "Congress' intention to define model aircraft as aircraft is further established by section 331(8) of the Act, which defines an unmanned aircraft as 'an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.'"

This statement erroneously interprets the text and Congress' intention and does so without regard to the historical context upon which the Special Rule was developed.

In developing the Special Rule for Model Aircraft, Congress recognized the long-standing history and exceptional safety record achieved by model aviation and specifically the activity conducted within the safety programming of a community-based organization such as AMA. It was Congress' intent to protect the ongoing modeling activity conducted within a community-based organization from unnecessary, onerous, and overreaching regulation.

Section 336 of the Act entitled "Special Rule for Model Aircraft" is clearly intended to separate model aircraft from other Unmanned Aircraft Systems (UAS) and to establish a freestanding definition for the recreational and hobby use of unmanned aircraft. In this regard, the definition of model aircraft is intentionally detailed within the Special Rule for purposes of that section alone, and not within Section

331 of the Act, "Definitions" of Unmanned Aircraft Systems. Congress provided a complete standalone definition that does not refer to any other definition or reference, and quite frankly needs no interpretation. Though the descriptive term "unmanned aircraft" is used in the definition, it is simply descriptive, and is used to clarify that there are no human beings onboard the model aircraft directing its operation.

Section 336(a)(2) of the Special Rule clearly states that the provisions of this rule apply only to model aircraft that are "operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization." Both the text and clear intent of the statute is that the aeromodeling activity that occurs in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization be managed by the community-based organization such as AMA.

The Interpretive Rule states: "Congress directed that the FAA may not 'promulgate any rule or regulation regarding a model aircraft …"

The Interpretive Rule fails to recognize that Congress prohibited the promulgation of two clear and distinct items: "any rule - or - regulation." In clear language, this means any rule of any kind. By definition, FAA's Interpretation of the Special Rule for Model Aircraft purports to be just that, an Interpretive 'Rule.' In its intent and context, the Interpretive Rule is both a rule by definition and de facto regulation.

The Interpretive Rule states: "… the rulemaking prohibition would not apply in the case of general rules that the FAA may issue or modify that apply to all aircraft."

This again misstates Congress' intent and implies that the freestanding definition of "model aircraft" provided in Section 336 is intended to reference the definition of aircraft in 49 U.S.C. 40102; 14 CFR 1.1. It also twists the meaning of the word "regarding" so as to purportedly allow the FAA to actually regulate model aircraft as long as the words "model aircraft" do not appear specifically in new rules and regulations. That contradicts the clear intent of Congress, which passed Section 336 specifically to exempt aeromodeling from new rules and regulations.

The Act does allow that, "nothing in (the Act) shall be construed to limit the authority of the (FAA) to pursue enforcement action against persons operating model aircraft who endanger the safety of the national airspace system (NAS)."

The Academy of Model Aeronautics does not condone the operation of a model aircraft in a manner that endangers persons or property. The AMA further believes that current statutory provisions are adequate to address aberrant activity that endangers the safety of the NAS. Congress by no means intended to grant a free pass for individuals who operate their model aircraft in a manner that intentionally places manned aircraft in imminent peril. However, it clearly intended to leave risk mitigation and the development of appropriate safety guidelines for the operation of model aircraft devices themselves to the nationwide community-based organization.

The Interpretive Rule states: "…a model aircraft must be 'flown within visual line of sight of the person operating the aircraft.' P.L. 112-95, section 336(c)(2). Based on the plain language of the statute, the FAA interprets this requirement to mean that: (1) the aircraft must be visible at all times to

the operator; (2) that the operator must use his or her own natural vision (which includes vision corrected by standard eyeglasses or contact lenses) to observe the aircraft; and (3) people other than the operator may not be used in lieu of the operator for maintaining visual line of sight."

Throughout the Interpretive Rule, the agency takes great latitude in determining Congress' intentions and in placing tightly worded restrictions through its "plain-language" interpretation of the text. In this case the definition of model aircraft in the Act requires that, "model aircraft be flown within visual line of sight of the person operating the aircraft." From a safety perspective this means that the model aircraft must remain in visual range of the operating station so that the operator can maintain situational awareness, control the aircraft, and "see & avoid" other aircraft and obstacles. Congress did not intend this as a prescribed means of operating the aircraft, but rather the manner in which model aircraft are to be flown. It limits the distance from the operator that the model aircraft can be flown "within visual line of sight." There is no ambiguity in the language provided by Congress and no need for interpretation.

The Interpretive Rule uses the plain language doctrine to create a regulatory prohibition of the use of a specific type of technology: first-person view goggles. In this regard, the rule states, "The aircraft must be visible at all times to the operator" and "An operator could not rely on another person to satisfy the visual line of sight requirement." This is well outside of the congressional intent and is inconsistent with current and acceptable two-pilot manned aircraft operations. Under a number of circumstances, two-pilot operations are recognized where one pilot is allowed to monitor the external environment in compliance with 14 CFR 91.113, while the second pilot operates the aircraft and/or manages the aircraft systems. In the case of instrument training and airmen proficiency manned aircraft are flown in virtual instrument conditions through the use of a device that completely obstructs the pilot's view of the external environment while a second pilot is relied upon to maintain situational awareness and fulfill the requirement to see & avoid other aircraft. The FAA's extremely stringent interpretation of the law again overrides Congress' intent that the modeling activities be managed by the community-based organization, and appears to target and prohibit a specific type of modeling activity and technology.

The Interpretive Rule states: "The statute requires model aircraft to be flown strictly for hobby or recreational purposes. Because the statute and its legislative history do not elaborate on the intended meaning of 'hobby or recreational purposes,' we look to their ordinary meaning and also the FAA's previous interpretations to understand the direction provided by Congress."

The Interpretive Rule's overreaching interpretation of the language in the Congressional Act is also evident in the interpretation of the requirement that model aircraft be "flown strictly for hobby or recreational use." The application of this requirement is drastically narrowed by the examples provided in the Interpretive Rule.

Although the Interpretive Rule acknowledges that manned aviation flights that are incidental to a business are not considered commercial under the regulations, the Interpretive Rule contends that "model aircraft flights flown incidental to a business are not hobby or recreational due to the nexus between the flight and the business."

This is inconsistent with current regulatory premise and the assertions of other regulatory agencies such as the Internal Revenue Service. For instance, an individual who owns and operates a full-scale aircraft for personal pleasure and recreation is allowed to conduct aerial photography as a private civil operator whether or not he/she intends it as a business pursuit or intends to sell the photographs for personal

gain. However, under the Interpretive Rule, a model aircraft enthusiast who uses his/her model aircraft for aerial photography and subsequently sells the photograph to an interested party is no longer considered a hobbyist. Moreover, the IRS would not allow the deduction of the operating expense and aircraft acquisition cost based merely on the sale of a photograph. The IRS will also tell you that a business that is recreational in nature and does not turn a profit over time is in fact a hobby.

There are many other examples of hobby interests and individual avocational talents that are employed in conjunction with an unrelated profession and that are very much incidental to the business pursuit. There are also many hobbies that involve bartering, trading, or monetary transactions that would not be considered or otherwise regarded as a business enterprise.

The language in the Interpretive Rule is unnecessarily restrictive, overreaching, and totally unrelated to the safety aspects of operating model aircraft.

The Interpretive Rule also overlooks the Congress' clear intention to encompass the supporting aeromodeling industry within the provision of the Special Rule, "aircraft being developed as a model aircraft." The Interpretive Rule's strict interpretation of hobby versus business puts in question the endeavors of the principals, employees, and advocates of the billion dollar industry that supplies and supports the activity, an industry that is integral to the success and future wellbeing of the hobby.

The language in the Rule goes to great lengths and has the clear intent to minimize and restrict the hobbyists' use of unmanned aircraft to the extent the examples given are ridiculous in nature. For instance, a grower could use his/her model aircraft to monitor the condition of his/her crops provided he or she personally consumes the entirety of the harvest. However, that same hobbyist would not be allowed to use the hobby rules to operate the identical device for the same purpose should he/she trade, barter, or sell any portion of the produce to his or her neighbor.

Again, the language in the Rule is unnecessarily restrictive, overreaching, and totally unrelated to the safety aspects of operating model aircraft.

The Interpretive Rule states: "… the statute sets a requirement for model aircraft operating within 5 miles of an airport to notify the airport operator and control tower, where applicable, prior to operating. If the model aircraft operator provides notice of forthcoming operations which are then not authorized by air traffic or objected to by the airport operator, the FAA expects the model aircraft operator will not conduct the proposed flights. The FAA would consider flying model aircraft over the objections of FAA air traffic or airport operators to be endangering the safety of the NAS."

The Special Rule states that when model aircraft are "flown within 5 miles of an airport, the operator of the aircraft (is to) provide the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation. Model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport)."

Again, the congressional language is unambiguous. Although making notification to the airport and/or air traffic control could open a dialog as to whether the planned activity poses an objectionable risk or interferes with manned aircraft, and may open a discussion regarding employing specific procedures to

ensure the safety of the operation, there is no indication in the statute of any requirement to secure prior permission when an operator is operating a model aircraft pursuant to community-based standards. Such approval has never historically been required, and the statute does not require it either. This is a new rule or regulation regarding model aircraft—which is impermissible under the statute.

The Interpretive Rule is again overreaching and attempts to rewrites the law by saying, "The FAA would consider flying model aircraft over the objection of FAA air traffic or airport operators to be endangering the safety of the NAS." In other words, the model aircraft operator must gain permission before flying. The mere act of flying the model aircraft over the objections of a potentially intolerant or indifferent controller or airport authority would ostensibly trigger enforcement action, whether or not there was a true safety issue involved. The Interpretive Rule's requirement to seek permission opens the door to a less-than-constructive response from FAA field personnel who are often unfamiliar with model aircraft operations.

The intent of the Act is abundantly clear in that the model aircraft pilot must provide "prior notice" and that the means and decision to operate in a permanent location be "mutually-agreed upon."

Comments – Section III

The Interpretive Rule concluded: "Congress intended for the FAA to be able to rely on a range of … existing regulations to protect users of the airspace and people and property on the ground. Therefore, regardless of whether a model aircraft satisfies the statutory definition and operational requirements described [in the Interpretive Rule] …, if the model aircraft is operated in such a manner that endangers the safety of the NAS, the FAA may take enforcement action consistent with Congress' mandate."

Comments – Section IV

The Interpretive Rule further states: "The FAA could apply several regulations in part 91 when determining whether to take enforcement action against a model aircraft operator for endangering the NAS … other parts of the regulations, may apply to model aircraft operations, depending on the particular circumstances of the operation. The regulations cited … are not intended to be an exhaustive list of rules that could apply to model aircraft operations."

In Sections III and IV, the Interpretive Rule establishes new restrictions and prohibitions that are clearly outside of the scope and intent of the Special Rule and to which model aircraft have never been subject to in the past, i.e. "if an operator is unable to comply with the regulatory requirements for operating in a particular class of airspace, the operator would need authorization from air traffic control to operate in that area." Nothing in the Act, current policy, or FAA's operating standards for model aircraft, AC 91-57, makes such a requirement. The application of this "interpretation" would effectively prohibit model aircraft from operating in airspace where there are requirements intended for manned aircraft that are impractical if not impossible for model aircraft and model aircraft operators to meet.

For example, under 14 CFR 91.131, "No person may operate an aircraft within a Class B airspace area (unless) the operator … receive(s) an ATC clearance. No person may … operate a civil aircraft within a Class B airspace area unless the pilot in command holds a … pilot certificate." These are requirements to which model aircraft operators cannot reasonably comply, and it is doubtful that any authorization

and/or clearance will be forthcoming despite the Interpretive Rule's suggestion that, "modelers … obtain authorization from air traffic control prior to operating" in such airspace.

It should be noted that for decades thousands of AMA members have operated their model aircraft safely and responsibly in Class B airspace under AMA's Safety Program and FAA Advisory Circular 91-57. These operations have occurred without the requirement for authorization and without incidents, and have done so since before there *was* Class B airspace. Many AMA designated flying sites were established before the FAA came into existence in 1958.

Finally, the Interpretive Rule as a whole negates the entire Special Rule for Model Aircraft. The provisions within Sections III and IV in themselves make model aircraft enthusiasts ages 6 to 96 accountable to the entire litany of federal aviation regulations found in the Code of Federal Regulations, something that was never intended by Congress and heretofore never required by the FAA.

Moreover, the AMA believes the Interpretive Rule is, in essence, a backdoor approach to enacting new regulatory requirements without complying with the congressionally mandated Administrative Procedure Act. It is an abuse of the provision for Interpretive Rule under 5 U.S. Code § 553, and is contrary to the congressional prohibition in Public Law 112-95, Sec 336 which states, "the Federal Aviation Administration may not promulgate any rule or regulation regarding a model aircraft or an aircraft being developed as a model aircraft, if … the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization."

By specifically addressing the Special Rule and model aircraft operated within the safety programming of a nationwide community-based organization such as AMA, the Interpretive Rule rebukes and curtails the activity of the one community that, as Congress itself recognized, has been operating safely and responsibly for decades and does little to affect the aberrant behavior reportedly occurring outside of AMA's community-based program.

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MODEL AVIATION

Official Publication of the Academy of Model Aeronautics

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President's Perspective

SINCE OUR INCEPTION, I would venture to guess that we have had nearly a million modelers join us as AMA members. We have enjoyed a long and diverse history, which has resulted in many hours of happiness, relaxation, and launched several careers in aviation!

Throughout the years, modelers have stepped up to the plate to volunteer in so many ways to promote aviation by working with our youth and raising hundreds of thousands of dollars for charitable organizations. We were born in the Golden Age of Aviation and have had the staying power to be the unequaled, nationally recognized leader of this great hobby.

Your AMA is the collective voice for American aeromodeling for all stakeholders in the hobby and industry which has grown to be in excess of $1 billion annually.

While we celebrate an illustrious past, we exist today to ensure a healthy and productive future. The AMA looks to the future by providing a membership value proposition that has never been stronger as we source and protect flying fields and intensely advocate for freedom from federal regulations.

We have placed a highly respected man in the position to lead our talented staff and I am confident our next 75 years will far exceed our imagination. *MA*

—Mark Smith
AMA Executive Vice President

MODEL AVIATION

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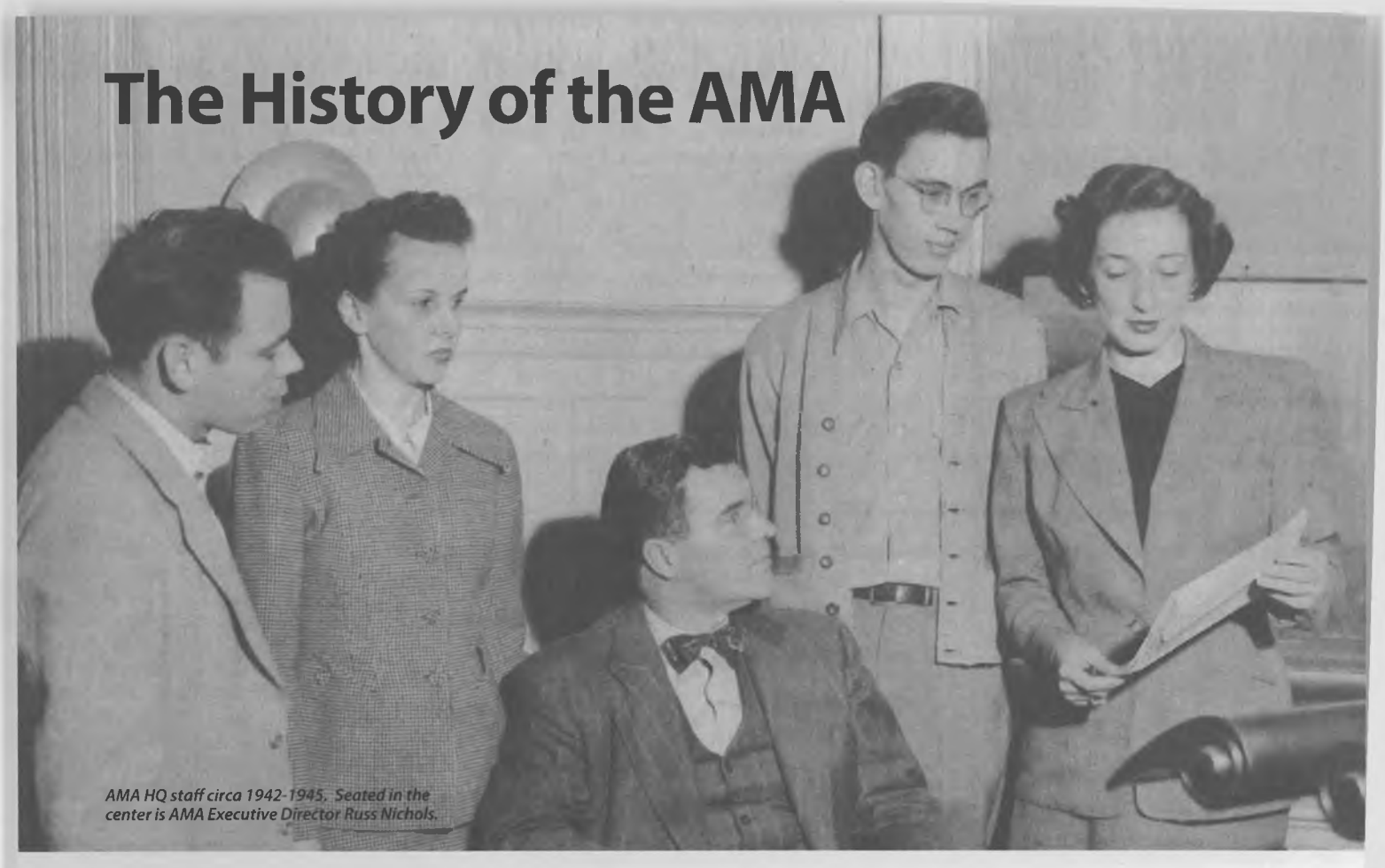
The History of the AMA



AMA HQ staff circa 1942-1945. Seated in the center is AMA Executive Director Russ Nichols.

SEVENTY-FIVE YEARS. For a human it marks the golden years of life, but for a company or an organization, especially in light of ever-changing technologies and environments, it represents a major accomplishment. In today's world it is becoming rare to see slogans such as "100 years in business," or "founded in 1870." In fact, just the other day, I saw a sign that said "founded in 1996." What does that say about longevity and a devoted clientele? For the Academy of Model Aeronautics (AMA), what does it mean to celebrate the 75th anniversary? From where have we come and where are we going?

Almost as soon as there were aeromodelers there were attempts to form a national organization. In 1910 the National Model Aero Club was formed to "promote the study of the problems of aeronautics as demonstrated by the model, to regulate and control all model contests in the United States, to promote exhibitions and contests and to secure the dissemination of the latest ideas and discoveries in the problem of flight as presented by models of either heavier or lighter than air models." (*Flying Machine Models*, *Aircraft* magazine, May 1910.)

Other similar groups emerged during the 1920s and '30s, such as the Airplane Model League of America, the McFadden Sky Cadets, the Jimmie Allen Flying Club, the Junior Birdman, and the Junior Aviators. All of these groups had hundreds of thousands of members and many even hosted their own national championships; however, none of the parent groups were capable of sustaining the organizations.

By the 1930s, events began to threaten the hobby while new technologies offered the chance to revolutionize it.

- The National Aeromodeling Championships (Nats), first held by the National Aeronautic Association (NAA) in 1923, were struggling each year to exist.
- Small, gas-pwered model airplane engines were being manufactured, but a movement to outlaw them was in full swing. In 1937, Connecticut and Massachusetts banned the flying of gas models. Massachusetts stipulated "that no gas model may be flown unless licensed, nor may it be flown by anyone unless that person is a licensed pilot." (*Model Airplane News* magazine, October 1937.) The US Department of Commerce also considered a potential national ban.
- Radio Control was beginning to grab modelers' attention, with articles appearing in various magazines and an official event appearing on the Nats schedule in 1936 (although no one participated).

The AMA logo has evolved in the past 75 years. While certain elements within the logo have changed, the torch of knowledge and the wings have remained a consistent symbol of the organization.

The blue logo on the left has primarily been in use since 1985, with only minor changes and varying tag lines. The white oval logo immediately to the right was designed during AMA's inaugural year, 1936. The red oval logo was introduced in 1940 and remained until 1949. From 1950 to 1985, the AMA logo shed its oval as the wings became more pronounced.

- News of models flown round-the-pole, tethered, whipped, or U-Control circulated as Max Sampson, Oba St. Clair, the Stanzel Brothers, and Jim Walker experimented with this form of control.
- The NAA tried to rejuvenate the nation's interest in aviation through the "Make America 'First in the Air' Campaign." It was noted that "proper appreciation of the importance of aviation in our national safety, return of the major air records to the United States, development of the interest of the nation's youth in model plane building and in model flying meets, and sponsorship of both local and national competitions … were referred to frequently as the major activities requiring immediate attention." (*NAA Junior Membership News, Model Airplane News,* August 1935.).

In October of 1933 the NAA, and in particular Lt. H.W. Alden, NAA Model Airplane Committee Chairman, and William Enyart, NAA Contest Committee Chairman, decided to take the first step in creating a national aeromodeling organization by revitalizing the NAA Junior Membership.

Alden, noted by many as the main driving force, began contacting leaders in the aeromodeling field to develop an aeromodeling advisory group for the NAA. Aeromodelers, given all the changes occurring in the hobby, realized they needed to work together and were willing to lend a hand.

Discussions were held during the 1934 Nats and more concrete plans were settled on during the 1935 Nats. The new Model Plane Council NAA Chapter was the "American Academy of Model Aeronautics (AAMA)," and its purpose "to advance model aeronautics as a science and sport and to aid constructive activities employing model aircraft as one means toward general aeronautic education." (*NAA Junior Membership News, Model Airplane News,* October 1935.)

The charter group included Capt. Willis C. Brown, Carl Goldberg, Gordon Light, Charles Tlush, John Stokes, Percy Pierce, Nathan Polk, Frank Zaic, Charles Grant, Bruno Marchi, Bill Brown, and Bert Pond.

At the 1936 Detroit Nats the first issue of *Model Aviation* introduced the new council to the aeromodeling community. The AAMA was to "consist of sincere builders and flyers, club directors, sponsors and patrons of the sport" and was to "act as a council to direct and supervise the contest and research activities of the many expert model flyers." (*Model Aviation* magazine, 1936, Volume 1, Number 1, page 3.)

During the annual technical meeting at the conclusion of the Nats, a provisional council and executive officers were approved and the membership requirements were outlined. Dues for those older than 21: $3, younger than 21: $1.50. In July 1937 the name was changed to the Academy of Model Aeronautics.

One of the first issues addressed by the new AMA was the problem with gas model airplanes. In concert with *Model Airplane News,* the International Gas Model Airplane Association, the AMA and the NAA met with the U.S. Department of Commerce.

Safety Rules were proposed, plus it was highlighted that there had not been any accidents between full-scale and gas model aircraft. The conference ended with the Department of Commerce not only refusing to ban gas models but issuing a statement of endorsement, setting out aeromodeling's value to youth.

With that battle won the NAA-AMA joined the Model Aircraft Commission of the Fédération Aéronautique (FAI), becoming the only body in the United States with the authority to represent aeromodelers worldwide.

The AMA took over responsibility for the Nats in 1938 and in 1940 the NAA leadership transferred authority of its model division. NAA announced, "It is acknowledged that model aviation in the United States has come of age, and that aeromodeling enthusiasts are at last charged with the conduct and supervision of official American model aviation activities." (*Model Airplane News*, April 1940.)

By 1941 membership had reached 12,000 and the AMA districts were established. In 1942 Russ Nichols became executive director, a post he would hold until 1963, and began additional improvements. Control Line (CL) models (G-Line, Tether, or U-Control) were

At left is Bruno Marchi, AMA's first Technical Director. Center is Madelaine Gaisser. At right is Al Lewis, AMA President (1938), Secretary-Treasurer (1939-1942), and Executive Director (1945-1946).

Scan to read more about the history of the AMA logo.

Trenton NJ, Senior NAA bus in route to 1938 Nats, the same year the AMA took over responsibility for the event.

officially recognized and these fliers were encouraged to participate in forming national rules.

With the outbreak of World War II the Nats were canceled from 1942 to 1945 and the election of AMA's national officers, previously held at the Nats, was for the first time held via mail ballot.

The 1946 "Victory Nationals," welcomed home modelers to the first Nats to feature Free Flight (FF), CL, and Radio Control (RC) events. Through a donation by the model industry all AMA members received *Model Aviation* magazine.

By 1947, the AMA's RC Committee, led by Dr. Walt Good, was able to work with the Federal Communications Commission (FCC) to open a single channel on the citizens band (27.255MHz) for RC flying. Radio operator's licenses were no longer required, as long as FCC-approved equipment was used.

In 1948 the U.S. Navy agreed to host its first Nats, beginning a relationship that would last until 1972, and be fondly remembered by all who attended.

Irwin Olson, Keith Storey, Claude McCullough, Frank Ehling, and Good helped carry the AMA through the 1940s and '50s and introduced new benefits including full-time legal liability coverage as part of an AMA member's regular license fee (as long as models were built and flown in accordance with AMA safety code).

Model Aviation was also mailed to all AMA members, not just leader members, clubs, and subscribers. Under their leadership and with the introduction of CL aeromodeling, membership reached 21,293 in 1958.

John Worth, first as AMA president in 1963 and then as executive director from 1964-1986, along with Maynard Hill, Cliff Weirick, John E. Clemmens, and John Grigg, would lead the AMA for the next several decades. During the 1960s the AMA became incorporated independent of the NAA, and through continued work with the FCC, five frequencies in the Class C citizens band were reserved for modelers.

In 1966, in search of ways to reduce costs and increase members, the AMA Executive Council agreed to provide all members with a subscription to *American Aircraft Modeler* (*AAM*) rather than continue *Model Aviation*. They hoped that by publishing in a separate magazine, AMA members would still receive their AMA news, but also read exciting modeling feature articles. They also hoped that more modelers would be exposed to AMA and become members. The membership grew to 52,000 from 16,000 between 1966 and 1975.

By the 1970s RC model aircraft, including the newly developed RC helicopters, replaced CL models as the most popular form of model aviation. The last Navy Nats was held at Glenview Naval Air Station in Illinois in 1972. AMA took over full responsibility for the Nats, and in an effort to duplicate the Navy's shifting of the event around the county, the AMA visited 27 different cities through the early 1990s.

Membership continued to rise with the 50,000th member, Robert Lockwood, joining in 1974. Following the bankruptcy of *AAM*, the AMA Executive Council decided to resurrect *Model Aviation* magazine in 1975. Under the leadership of Bill Winter and Carl Wheely, members were introduced to a new *Model Aviation*, one that is now AMA's flagship publication.

As the 1970s drew to a close, the AMA purchased slightly more than an acre of land in Reston, Virginia, for a new Headquarters and museum. A building fund was established and by 1982, individuals such as Leon Shulman, clubs such as the Toledo Weak Signals, and industry donors including Frank Garcher with Midwest Models, Sullivan Products, Top Flite, and Goldberg Models had surpassed the goal of $160,000. On September 24, 1983, a ribbon-cutting ceremony was held for the 3,000-square-foot, two-story building.

In 1985 the 100,000th member, Corbert J. Chaisson, joined the AMA and the following year the AMA celebrated its 50th anniversary.

It became apparent that additional RC frequencies would be needed. With the leadership of Bob Aberle, the Frequency Committee negotiated with the FCC for the rights to 50 RC channels, awarded in January 1983. In 1992, AMA members successfully defended these frequencies with a successful letter-writing campaign to the FCC.

With increasing concern over the loss of flying sites and increasing costs associated with traveling Nats, the AMA Executive Council formed a search committee in 1988 to locate a site for a new headquarters and national flying site. After reviewing more than 50 proposals, the Midwest was selected and in 1990 land was purchased in Muncie, Indiana.

In 1992, the new flying site hosted a grand opening, and the National Model Aviation Museum opened its doors in 1994. In 1995 the site's official name became the International Aeromodeling Center (IAC), and by 1996 AMA was in

Bill Winters, *Model Aviation* editor, and John Worth, AMA Executive Director, conferring during the mid-1970s on expanding the publication.

A rare photo of the AMA staff at the home offices in Reston VA. Front Row, third from the the right is Joyce Hager, currently AMA's most tenured staff member.

a position to host its 60th anniversary, the first "Celebration of Eagles," followed by the first complete outdoor Nats in Muncie.

The International Aeromodeling Center was improved with the addition of paved and grass runways, additional CL circles, paved roads, camping, and restrooms/showers. In 2001 a new AMA Headquarters building officially opened and the majority of the AMA's staff relocated across the drive. The space vacated in the museum building was quickly occupied by museum storage, additional exhibits, a museum theater, AMA Custom Products, and the AMA's model airplane Plans Service. The museum's Claude McCullough Education facility was completed in 2010.

The 1990s and 2000s saw the AMA address a number of major member concerns, foremost of which was the loss of flying sites. Sound, a major reason for these losses, was addressed by Howard Crispin in his ongoing *Sound and Model Aeronautics* articles in *Model Aviation* and the book of the same title.

In 1998, in an effort to further support flying site retention, the AMA created the position of Flying Site Assistance Coordinator and later developed the Flying Site Assistance Kit. Filled initially by Joe Beshar, and then assisted by Wes DeCou (representing the Western U.S.), the coordinators' regular "Flying Site Assistance" columns in *Model Aviation* featured information about key partnerships with groups such as the National Air Traffic Controllers Association, U.S. Fish and Wildlife Service and U.S. Department of the Interior.

It also highlighted when AMA representatives testified before the federal government and the signing of the Memorandum of Understanding between the AMA and the Environmental Protection Agency concerning Superfund Sites, which are landfills that have been closed and are available for alternative uses.

Another area to be addressed was improved communication. Originally print-based with *Model Aviation* magazine and newsletters such as the museum's *Cloud 9* and the *National Newsletter*, in the mid-1990s the AMA began moving toward online communication on its website: www.modelaircraft.org. Today online projects include emailed newsletters (*AMA Today* and the *AMA Insider*), an online e-zine *Sport Aviator* (http://masportaviator.com), and social media (Twitter, Facebook, and YouTube).

Updated publications such as the *NatsNews*, now available both in print form and on the Web, and new publications such as *Park Pilot*, are further improving the distribution of valuable information.

New, innovative communication tools.

In 1970, thanks to a large contribution from Matty Sullivan, plus money allocated from the AMA budget, a scholarship program was initiated and to date 236 scholarships totaling more than $758,000 have been awarded. In 1998 the Radio Controlled Hobby Trade Association made a generous contribution to help fund AMA's educational programs.

Education Committee activities have included regular attendance at the National Science Teachers Association Convention, work with the National Coalition for Aviation Education, Civil Air Patrol, Science Olympiad, NASA, Smithsonian National Air and Space Museum, the Children's Museum of Indianapolis, and the development of the Inventing Flight and AeroLab curriculums. The AMA's Youth Education Stipend Grant (YES), and now the Take-off-And-Grow (TAG) program are additional incentives developed to help clubs educate and promote aeromodeling.

The museum continues to collect items that document the history of aeromodeling. In 1996 Norm Rosenstock, as AMA historian, began to collect biographies of modelers. Today the museum has nearly 800 such stories posted online, plus more than 640 research files have been started for future biographies. The histories of 15 model airplane clubs, eight aeromodeling manufacturers, and six model aviation Special Interest Groups have also been collected.

The last two decades have witnessed many new technological advances that will significantly affect the future of aeromodeling including the introduction of the turbine engine, spread spectrum radio technology, and electric-powered aircraft. Both have the potential to open or reopen flying fields across the country to aeromodelers who have been forced from flying fields because of sound.

AMA is currently working with the U.S. Department of Homeland Security and the Federal Aviation Administration to ensure aeromodeling can be enjoyed long into the future.

Seventy-five years: a chance to reminisce and look toward exciting opportunities to come. It has been a long and arduous adventure, full of ups and downs, but thanks to a long list of dedicated and devoted individuals, both modelers and industry leaders, the organization has survived and continues to be "of, by, and for the modeler." MA

—Michael Smith
National Model Aviation Museum Director

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Nats winners in 1936, the same year AMA was founded.

National Aeromodeling Championships

AM I THE BEST? For those aeromodelers who ask themselves this question, competition is the key. Facing an opponent, and besting him or her is the only true way to know.

Aeromodeling contests began almost as soon as two people could fly a model airplane. In the early days competitions were regional affairs with exchange clubs, parks, business, and Young Men's Christian Associations sponsoring many events.

This changed in 1915 when the Aero Club of America sponsored the first national aeromodeling contest. (1) The contest was divided into three separate events: distance – launching from hand, duration – launching from water; and duration – launching from ground. Cash prizes were awarded to the individuals achieving the best scores each month and the Henry S. Villard Trophy was awarded to the club with members who had the highest collective scores. (2)

The Illinois Model Aero Club (IMAC) won the three years it was awarded, retaining the cup in 1919, and ending the only national aeromodeling event.

The IMAC recognized the need for a national event and encouraged the National Aeronautic Association (NAA) to hold an aeromodeling event. In 1923 Bernard Mulvihill, vice president of the NAA, agreed to offer prize money and a trophy if the St. Louis Air Board and the Air Race Contest Committee added the event to the schedule. After much work, Event No. 6, Mulvihill Trophy Duration Race for Model Airplanes was added to the National Air Race Program. (3)

For the next few years, it was a matter of who would sponsor the event as numerous groups came and went including the Playground and Recreation Association, the American Association of Model Aero Clubs with the First National Indoor Model Airplane Contest (4), and the Airplane Model League of America (AMLA).

When the Great Depression hit, the Nats seemed done for, but again interested modelers prevailed. With the leadership of Lt. H.W. Alden, chairman of the NAA Model Airplane Committee and financing from *Model Airplane News* magazine the Nats survived. (5) Radio control joined free flight in 1937 and following a brief halt during World War II, the "Victory" Nats were back in 1946 with almost 1,000 contestants flying in 23 events including Control Line.

For many contestants it was the Navy Nats, held from 1948-1972, that represented the glory years of the event. Each summer a different Naval Air station would host the grand event providing food, housing, manpower, and the most importantly; the great building hangars, with hundreds of tables set up for 24-hour repairs.

In 1973 the AMA took over responsibility for the entire Nats, and with the help of numerous groups and sponsors, put the show on the road. For the next 23 years, the Nats would stop in 16 cities across the country. Finally in 1996 the outdoor Nats found a home at the AMA's International Aeromodeling Center and the indoor events landed at the Mini-Dome in Johnson City, Tennessee. For the last 16 years, aeromodelers from around the world have gathered at these sites to continue the quest to see who is, indeed, the best.

MA

—Michael Smith
National Model Aviation Museum Director

Sources

1. *Flying*, p631, August 1915
2. *Flying*, p29, February 1916
3. International Air Meet program, 1923
4. *Detroit Educational Bulletin*, Volume 10, No. 6, Febuary 1927
5. *Model Airplane News*, July, 1933

Nats Construction Hangar, 1969

The National Model Aviation Museum as seen today at the International Aeromodeling Center in Muncie. Scan the code above to visit the museum's website.

Model Aviation's Time Capsule

WHEN THE Academy of Model Aeronautics Model Museum first opened to the public on September 24, 1983, it occupied the two-story center lobby space of the AMA Headquarters in Reston, Virginia. The model airplanes were displayed on mobiles hung from the ceiling and on folding tables. Modeling supplies, such as engines and radio equipment, and memorabilia such as patches and T-shirts, were displayed in glass cases that circled the center space.

The idea to display models and related objects had been suggested as early as 1946, but the project was stalled until AMA Executive President John Worth began corresponding with well-known modelers and discussing the possibility of donating items to the AMA. Although there were hints in the correspondence that items may actually have been donated earlier, the first official recorded donation was from Dr. Walt Good in February of 1978.

The collection quickly grew in the 1980s thanks to Curator Hurst Bowers, who convinced well-known modelers such as Joseph Kovel, Ed Packard, and George Clapp to donate items to the museum. Soon, the collection was growing so quickly it could not be contained in its designated space.

The move to Muncie, Indiana in 1992 meant that the museum had to be packed and shipped by truck to Indiana from Virginia. After unpacking the collection from the shipping containers and creating exhibits in the new space, the museum was again opened in 1994, along with the new Headquarters in the same building. The museum was then formally named the National Model Aviation Museum.

Unpacking in the new building in Muncie.

With roughly 7,000-square feet of gallery space, the exhibits varied from a recreation of a 1950s model hobby shop to models hanging from the ceiling, and window cases dedicated to various kit manufacturers.

During the 1990s, museum staff members focused on adding to the exhibits by collecting new models and memorabilia. Again, the museum collection outgrew its space.

In 2001, the AMA built a new Headquarters building on the property. The museum remained in the same location, nearly filling its building with the archives.

Curator-turned-Director Michael Smith has focused on improving the care given to the donations to ensure that they will last for multiple generations to see and enjoy. Work on the exhibits is continuous, and there are plans in motion to expand the hands-on exhibits and add multimedia presentations within the next year.

To help determine the museum's future, a consultant has been hired to assist in writing a long-term plan. No matter what the future holds, the museum will always be here to keep the stories of model aviation flying. MA

—Maria VanVreede
Museum Registrar

A good spot to view the museum collections in the Reston building was from the second floor balcony. The view offered a great look at the hanging models and other displays.

When the museum first opened in Muncie in 1994, it was incomplete. If you look closely in this picture, the cases set into the walls are empty. It is unclear when these were finished, but they currently display artifacts related to kit manufacturers.

The Good Brothers demonstrating their radio controlled aircraft.

A Brief History of Radio Control

WHEN I was just a small boy, I flew my rubber-powered Sleek Streak in the street in front of my house. I dreamed of somehow controlling it to keep it out of the trees and off the surrounding homes. I believe this same desire drove those who contributed to the design of radio control systems that began as very simple and evolved into the sophisticated designs we enjoy today.

Dr. Walt Good was, to say the least, one of the giants of RC history. Walt, along with his brother William, is credited with making the first radio-controlled (RC) flight. The model they used, the "Big Guff," is at the Smithsonian in Washington, D.C. There is also a model at the National Model Aviation Museum in Muncie, Indiana.

In the beginning, RC was not very reliable and was not anything like what we enjoy today! The first systems controlled the rudder only. These systems were very large and heavy and required a huge ground-based antenna to transmit signals to the receiver onboard the airplane. Such early systems were known as "relay-less reeds." The first designs may have come from Louis Scheel and Oliver Tremac in 1959, and the first commercial manufacturer was likely the Bonner Transmite.

The signal transmitters were not proportional, but rather full-travel signals, resulting in the rudder turning either full-left, full-right, or neutral. For the most part, these systems required very large Free Flight models. Many airplanes had wingspans of 6 feet or more to support the electronics and batteries required for operation.

In the late 1960s, Kraft systems introduced the multichannel proportional system. A pilot could now move the sticks and have the controls follow the movement, just as in a full-scale airplane! Finally modelers could fully control a model airplane. Along with Kraft, other companies such as Pro-Line, Orbit, EK, and World Engines sold the new system. As time went by, systems improved greatly in reliability and function.

When servo reversing came onboard, it was a great time saver for the modeler! No longer did one have to plan a radio installation so precisely. Now modelers could simply flip a switch to remedy a reverse-control situation.

American manufacturers, such as Kraft Systems and Pro-Line brought dual rates, endpoint adjustments, and slow-roll buttons to the market. The companies even introduced exponential to the world's competition fliers.

Virtually all of the future innovations were a direct result of competition modelers wanting more control. Coverage of competitions was the main goal of the model magazines of the time. Everyone wanted to know what Phil Kraft, Ron Chidgey, and Rhett Miller were using, flying, and winning with.

In the 1970s the first influence of Japanese systems penetrated the US market. Futaba and JR came onto the scene with reduced-price systems that caught the attention of American modelers. The pressure of these companies eventually spelled the end of US manufacturers in the radio market.

Futaba and JR increased productions and quickly brought more innovations to the modeler. As time went on, more companies joined the market.

During this time, the AMA was involved in procuring frequencies for modelers to use. We were blessed with obtaining 72 and 75 MHz for model use only. This was the result of many years of work by a number of individuals on the AMA Frequency Committee. We owe so much to them!

As time continues to march on, we see new things! 2.4 GHz spread spectrum equipment has brought a new excitement to RC that nearly everyone enjoys today. We eagerly await future advancements by RC manufacturers. The manufacturers' desire to improve the control on our models is much the same as our RC pioneers.

Thanks for all the fun, Mr. Good! MA

—Tony Stillman
AMA Flying Site Assistance Coordinator

75 Years of Model Engine History

IN THE BEGINNING, there were working model engines such as the Atom and Arden .049 gas-ignition engines. We call them model engines because they were used in models, but it is more accurate to call them miniature engines! These power plants were engineering marvels in their own right.

To have an engine that small with a full ignition system was quite a feat when you consider the technology and materials that were available. They used big batteries, coil ignition, and capacitors with mechanical points to make the plug spark.

More powerful gas/ignition engines, such as the Foster Brothers .99 with dual-ignition speeds, soon came along. These were used in Free Flight airplanes and fueled the imaginations of many a small child and some of our future astronauts. The hobby of model aviation owes a lot to the inventors and advanced rapidly once miniature internal combustion was available.

A gasoline/oil mix was the main fuel being used until innovators such as Ray Anderson took out the spark plug and brought us the glow plug. These engines used the less-volatile methanol-and-oil mixture. The glow-plug engine immediately had a huge advantage, because once the engine was running, all of the batteries and wires could be removed. This saved much weight in the airplane.

Initially, engines were only required to run at a fixed speed and then quit. Airplanes were either Free Flight or tethered, as in Control Line (U-Control). The engines were just required to run at full bore until they ran out of fuel or a timer cut off the fuel supply. Amazingly so, these engines are still used today in their original form by many Old-Timer flying enthusiasts around the world.

When radio control systems became available, carburetors were added with throttle arms that allowed the operator to vary the engine speed. Now the flight of a full-size airplane could be faithfully and authentically reproduced. This led to an explosion in engine design and availability.

Added to this mix were some small diesel engines, but most people tended to run glow power. In the 1980s a new development of glow-ignition, four-cycle engines reached the US market. These were initially quite small (.40 size) and were much less powerful than their two-cycle equivalents. They did however, sound great and were an inspiration for many scale warbirds.

The four-cycle model engine was an amazing piece of engineering and created quite a revolution in Scale and Aerobatic competitions. They had gears that drove cams, which lifted valve heads smaller than your little fingernail. Even with all of the extra moving parts, they were not much heavier than their equivalent two-cycle counterparts.

All of the types of engines began to increase in capacity as radio systems became more powerful. It could have been the other way around; either way this chicken-or-egg scenario led to the development of huge RC airplanes with wingspans greater than 140 inches.

Then a strange phenomenon occurred. Gas-ignition engines came full circle and bounced back with a bang! If you go to any big Scale or International Miniature Aircraft Association (IMAA) event you will see Desert Aircraft and RCS 50cc ignition engines alongside four-cylinder, horizontally opposed O.S. four-cycle engines. Alternatively, they could be next to a big O.S. BGX or Mark 2.1 two-cycle-powered airplane.

Today you can buy a 250cc, four-cylinder ignition engine and fly an RC airplane twice your own size! I wonder if those early miniature-engine pioneers dreamed this would be the case 75 years ago.

Innovations are still happening today. You can buy a miniature O.S. Wankel engine that has no piston! There are RCV four-cycle engines that have no valves. The cylinder-liner is supported by ball bearings and geared to rotate at half of the speed of the crankshaft. While this happens the piston goes up and down in the rotating cylinder. How creative is that? That's pretty amazing stuff by any engineering standards.

There is one engine that uses nearly all of the above technology. The YS 1.70 engine is a four-cycle, supercharged ignition engine that runs on nitro-based fuel. The top of the engine is a four-cycle; the bottom half has a rotary-timed rear inlet disk. The fuel is pumped by the inlet valve pushrod and the fuel/air mix is supercharged by the down stroke of the piston. The valve cover chamber is evacuated every stroke of the piston, which opens the inlet valve to stoke the combustion chamber.

Each time one of these incredible engines is run, it could be said that it represents the ghosts of all who invented and made what we use today.

There was a time when a chauffeur had to be a mechanic to drive a car. At one time you almost had to be a mechanical engineer to get these little engines to run. Today, in a car we just turn the key and go. In the world of RC internal-combustion flying, we are fortunate to have had much of the hard work done for us. MA

—Eric Henderson
Contributor

The O.S. in-line four-cyclinder four-cycle that is almost too beautiful to run. It is even more beautiful when it does!

A Salute to Aeromodeling's Lindbergh

MANY HAVE SAID that if there was a Mount Rushmore for aeromodelers Maynard Hill would certainly be on it. He was one of a kind who passed away in June at age 85. Maynard will be sorely missed.

I had the distinct privilege of not only knowing him but also the honor of landing his TAM-5 RC aircraft on the coast of Ireland in August 2003. That airplane, designed by Maynard, had just spent 38 hours, 52 minutes, and 14 seconds, traveling 1,882 miles from Cape Spear, Newfoundland. It did what no other model aircraft had ever done. The TAM-5 crossed the Atlantic Ocean—on less than a gallon of fuel.

Only two ounces of Coleman Lantern fuel, slightly modified with a lubricant, remained in the tank. This fuel was Maynard's solution for long-term engine runs that he developed during years of research. No one had ever flown a model a third of that distance before. It was a giant leap for modelers everywhere.

Maynard Hill has been hailed as "aeromodeling's Lindbergh," and it's not much of a stretch. Crossing the Atlantic was another world record, his last, for an aeromodeler who has few peers at this level.

Maynard's records were in speed, altitude, and distance. Closed-course and cross-country records, powered flights or gliders—no record was safe from Maynard Hill.

Although Maynard accumulated 25 world records between 1963 and that day in 2003, he was much more than a record-breaker. He was a great innovator and a metallurgical

January 2001. Maynard Hill's building workshop. Photo by Barrett Joseph Foster.

July 2002. A strategy session in Maynard's building workshop. L-R – Russell Howey, his father Paul Howey, Joe Foster, Maynard Hill. Photo by Leroy Leslie Hamilton.

August 2002. Cape Spear, Newfoundland. Maynard Hill and Nelson Sherren wait for launch time. Photo by Leroy Leslie Hamilton.

scientist, but mostly a tinkerer who could solve nearly any problem. He was also one of the greatest storytellers I've ever encountered. He could enthrall you for hours.

I think he was to aeromodeling who Goddard was to rocketry. His "backyard laboratory" and basement workshop were places of reverence for all who were privileged to enter.

Maynard took the propellers from all his record-breaking airplanes and nailed them to his workshop door like scalps. The display was his chronology of world records.

Maynard focused on surpassing whatever was the best at the time, especially if it was a record held by the Russians during the Space Race of the 1960s! He quipped, "Communism is very bad—no balsa wood!"

Visiting his basement was such a thrill. Aside from his records, Maynard was absolutely driven to develop practical and usable new technologies. His electrostatic autopilot invention was an incredible feat and a great service to the hobby and sport.

Maynard was an early pioneer in the development of unmanned aerial vehicles, or drones, for the military, presaging what has become a key component in our war on terror today. Many such projects were funded by Pentagon grants while he worked at the Johns Hopkins Applied Physics Lab.

Inspired by heroes such as Jimmy Doolittle, Wiley Post, and Amelia Earhart, Maynard grew up in the Golden Age of Aviation. He often said that he had acquired a serious addiction to balsa and glue before he was 10 years old!

Although he was partially deaf and legally blind for the last 10 years of his life, Maynard Hill saw possibilities where others didn't. If aeromodelers of the present generation have the forethought and ability to push beyond boundaries, it's because they stand on the shoulders of a giant: my friend, Maynard Hill. MA

—Dave Brown
Contributor

Preserving Flying Sites

FROM ITS HUMBLE beginning, the Academy of Model Aeronautics (AMA) has grown in many areas to help modelers in the United States better enjoy their hobby. Standardizing competition rules created a level playing field for AMA members to be able to compete nationally.

When AMA began publishing *Model Aviation,* it provided a vehicle by which the Academy could better communicate with its members.

As AMA grew, it began to look for ways to better serve the membership. Surveys conducted by the Academy indicated that the number-one issue on modelers' minds was obtaining and retaining good, quality flying sites. Headquarters staff members did the best they could to help, but it soon became apparent that someone was needed to deal solely with this issue.

The Academy hired Joe Beshar and Wes De Cou to take on this responsibility. Joe handled issues east of the Mississippi River, and Wes took care of the western half of the country.

Although these two men had much success in helping clubs, the AMA found that most of these cases concerned clubs that had lost a site and needed assistance. The AMA Executive Council felt that many of these situations might have been avoided if the club had taken steps to avert the issues that lead to the loss of the field.

It appeared that part of the problem was club members' lack of education concerning how they could actually protect their flying sites. It was also the Executive Council's feelings that the program needed more structure and better accountability to AMA Headquarters.

A book called *Getting and Keeping Flying Sites* had been developed throughout the years. Although it was effective, the document had become dated. There were also more than 100 other documents, many dating from the 1960s, that needed updating.

In 2009, the AMA decided to change the operation of the Flying Site Assistance Coordinators (FSAC) and have a single person who would be more directly tied to HQ. After a search, I was selected to take over the FSAC operations and make the program more proactive.

Since that time, the *Getting and Keeping Flying Sites* book has been revised; many of the documents have been revised, deleted, or replaced. Several videos, including a video of the seminar on *Getting and Keeping Flying Sites* was created and is available to the membership on the AMA website (www.modelaircraft.org) on the Flying Site Assistance page.

We have a Memorandum of Understanding with the Environmental Protection Agency (EPA) which simply states that once the EPA completes the remediation of a Superfund Site, it is recommended that a good use for it is to allow AMA clubs to use it as a flying field. This has opened many doors to clubs; as a result, several new club sites have been created, and a search for new ones is in process.

We are working with the FAA to regain access to some sites that have been taken away because of a misunderstanding of FAA rules regarding model flying on active airports. Many clubs—especially several in California—have been impacted by this ruling. I am working with our Governmental and Regulatory Affairs representative, Rich Hanson, to get this resolved so any affected clubs can get access again to flying sites.

As I write this, 78 cases are open in the Flying Site Assistance files! The Academy is busier than ever assisting clubs in the quest to find new sites, as well as educating club members on how to better protect the sites they now enjoy. MA

—Tony Stillman
AMA Flying Site Assistance Coordinator

Model Aviation Pilots Group Shot National Model Aviation Museum's Model Airplane News collection.

Scan the code to the left to watch a video about AMA's flying site program.

AMA's current Headquarters building opened in March 2001.

IAC Opens Doors

IN THE LATE 1980s, members of the Academy of Model Aeronautics (AMA) Executive Council made the boldest move in Academy history … they decided to create the world's best flying site.

The concept was developed and a request for proposals was advertised. The Executive Council received more than 60 bids from communities throughout the United States. The proposals were narrowed down and the council chose Muncie, Indiana, as the location. The Muncie site included more than 1,200 acres of farmland.

The original plan was to begin construction of the AMA museum and a multipurpose flying site. The concept changed as it became clear that the AMA Headquarters operation would be more efficient and economical if it were moved from Reston, Virginia to Muncie. The museum building was designed to also house the Headquarters. By 1993, the museum, Headquarters, and flying site were all based in Muncie.

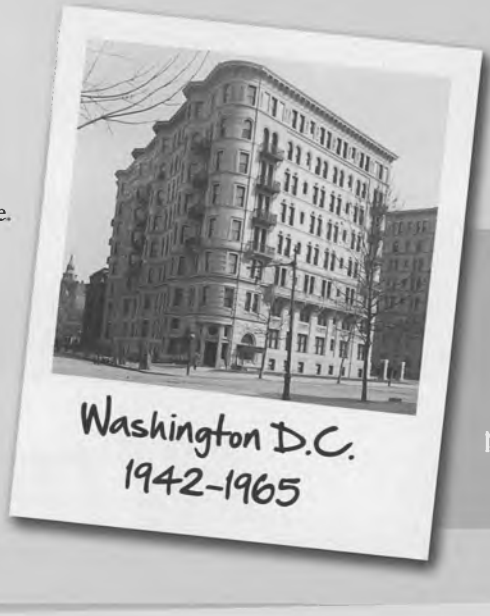
The original flying site was the L-pad, also known as Site 1. The design was intended to incorporate the needs of Control Line and Radio Control. In 1992 the Fédération Aéronautique Internationale (FAI) Scale World Championship was held at this site. The success of this event indicated that the International Aeromodeling Center fulfilled the Academy's dreams.

In 1994, the AMA Executive Council made another bold move by mandating that the National Aeromodeling Championships (Nats) be permanently held in Muncie. The Control Line speed circles and other features were created, and the 1995 Nats and Pylon World Championships were held in Muncie. The creation of Stage Center illustrated to the world how the ultimate Pylon site should be designed.

The growth of the Academy and its functions created the need for a larger and more functional Headquarters building. The concept and design of the current building were introduced in 1997. The dedication was held June 7, 2001.

Muncie could be considered the mecca for modelers throughout the world. Over the past decade many notable events have been held there, including world championships in Control Line, Scale, Pylon, Pattern, and Electric. Almost every day of the year, modelers have fun at the site. MA

—Bob Brown
AMA Executive Council member



The AMA called many places home before moving to Muncie.

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Special Interest Groups (SIGs)

As the hobby and sport of model aviation continues to evolve, small communities of aviation pilots are joining together, united by a common passion. These Special Interest Groups provide an outlet for model aviators to communicate, share knowledge, learn new technologies, and compete within their particular field.

The following timeline pays tribute to the 23 AMA SIGs.

1967

NFFS
NATIONAL FREE FLIGHT SOCIETY

The National Free Flight Society (NFFS) is committed to the preservation and promotion of FF model aviation in all of is aspects and manifestations.

The National Free Flight Society is the only organization in the United States that serves the interests of all FF categories. The Society was formed more than 30 years ago to promote FF activities and continues as a vital, growing organization dedicated to the advancement of the FF hobby and sport.

1960

The Model Engine Collectors Association (MECA) promotes the interests of model engine collecting as a recreational, educational, and historical recording activity.

MECA provides information, assistance, training, and fellowship, and acts as a governing body for the hobby involving the association's members.

MODEL ENGINE COLLECTORS ASSN
MECA
AN INTERNATIONAL ORGANIZATION

1967

The Society of Antique Modelers (SAM) promotes the competition flying of FF and RC model aircraft of vintage design. The intention is to be casual, enjoyable, and interesting to both competitors and spectators. SAM's desire isn't to advance the state-of-the-art of aeromodeling, per se, other than to increase participation in the sport generally, or to reprove that which is already recorded in aeromodeling history books.

THE SOCIETY OF ANTIQUE MODELERS
SAM

1969

The League of Silent Flight (LSF) provides collective identification for active Radio Control Soaring enthusiasts throughout the world and recognize individual proficiency and accomplishment through a defined program of standard performance criteria for RC model sailplanes.

The secondary purpose of the LSF is to foster and support all phases of sporting and competitive activity for RC model sailplanes; to encourage personal and collective advancement in knowledge of aerodynamics and related arts and sciences; and to promote the general interest in Soaring.

1973

The National Society of Radio Controlled Aerobatics' (NSRCA) objective is to promote the construction and competitive flying of RC Precision Aerobatic model airplanes. To aid, insofar as possible, the Academy of Model Aeronautics and other AMA activities, to further the advancement of model aircraft aerobatics in all of its phases.

1973

The Precision Aerobatics Model Pilots Association (PAMPA) is a Special Interest Group (SIG) of the Academy of Model Aeronautics. It is an organization of approximately 800 members in 35 countries, whose common interest is model airplanes, specifically the kind that fly tethered on control lines, and perform stunts. The models are often very beautiful, and are carefully constructed from traditional materials such as balsa wood, silkspan, and dope. Top models are beautifully finished and extremely light and strong for their size.

The mission of PAMPA is to promote and improve Control Line Precision Aerobatics events.

1973

The Miniature Aircraft Combat Association (MACA) is a Control Line model aviation organization with a focus on CL Combat.

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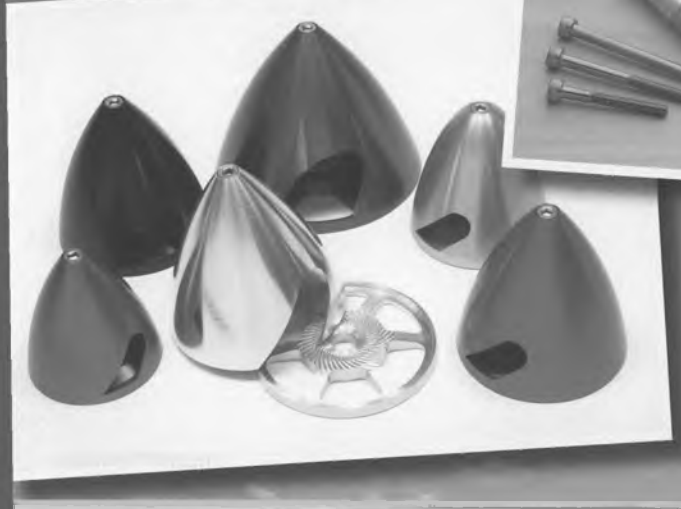

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1977

The Navy Carrier Society (NCS) came into being in the early 1950's with the first Nats that including Carrier in 1952. This National Championship event was sponsored by the U. S. Navy.

Today the Carrier event is sponsored at the national level by the Navy Carrier Society, a group formed in 1977 to promote this activity.

The National Association of Scale Aeromodelers (NASA) aims to encourage, promote, and advance all phases of Scale aeromodeling, regardless of size, power, or mode of control.

NASA encourages the formation of Scale clubs, competition, training, the sharing of resources, and good relations with media and Academy of Model Aeronautics to further enhance the image of Scale aeromodeling.

1977

1980

IMAC
INTERNATIONAL MINIATURE AEROBATIC CLUB

The International Miniature Aerobatic Club (IMAC) is inspired by full-scale aerobatics. IMAC strives to fly Acale Aerobatic model aircraft in a competitive and realistic manner that is challenging for the contestants as well as interesting for spectators. At present, the IMAC standard is being used in more than 15 countries worldwide for Scale Aerobatics competition.

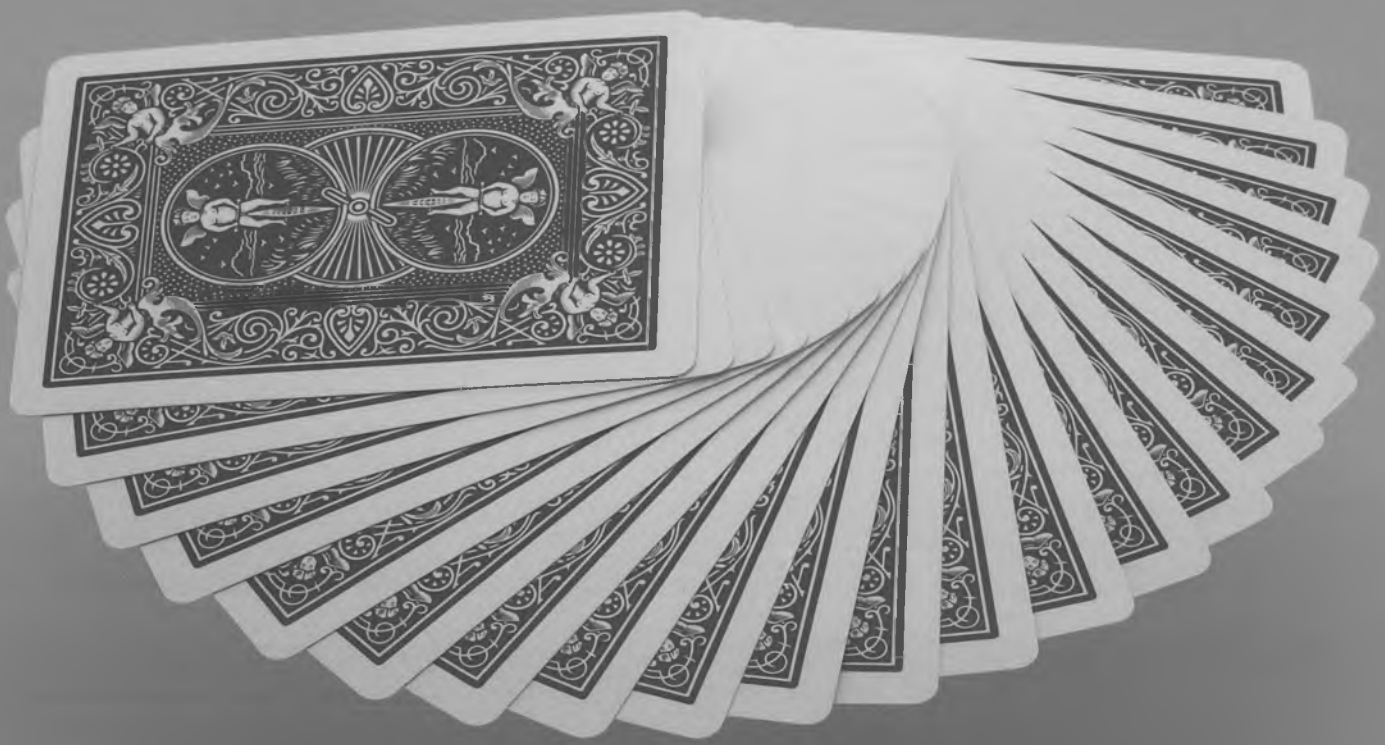
1983

The North American Speed Society (NASS) is the special interest group of Control Line Speed and is associated with the Academy of Model Aeronautics.

NASS helps formulate rules that promote the interest of the Speed fraternity as well as communicates your speed fliers' views and ideas to the AMA. The AMA has called upon the SIGs to run the Nats. NASS now runs the speed portion of the Nats.

The International Miniature Aircraft Association, Inc. (IMAA), was formed for the purpose of fostering and advancing the operation of large radio-controlled model aircraft in a setting where informality and safety of operations prevail. Additionally, IMAA was formed to create an atmosphere where pleasure, recreation, fellowship, and co-mingling can be fostered and found to exist among individuals enjoying the sport of building and flying large radio-controlled model aircraft.

1983



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1989

The Jet Pilots Organization (JPO) was founded to promote and advance jet modeling technology, and the safe recreation and general fellowship of this fast-growing segment of our model aviation. JPO officially represents USA jet modelers to our national organization insurer, the AMA. JPO strives to support the interests, goals, and concerns of jet pilots at all levels.

1989

The Vintage Radio Control Society (VR/CS) is intended to preserve and promote the memory of Radio Control Aeromodeling activity as it was in the past.

1989

The International Radio Controlled Helicopter Association (IRCHA) was established as an organization by the pilots, for the pilots. IRCHA works to promote the continued growth of radio-controlled helicopters through education, representation, service, and special events. Radio-controlled helicopters are a dynamic, evolving segment of the AMA and as such IRCHA works closely with the AMA to foster growth and acceptance. Through these endeavors, IRCHA hopes to provide its members with the opportunity to enjoy the hobby, make many new friends, and expand their intellectual interests.

1991

The Senior Pattern Association (SPA) promotes the competition flying of Radio Control Vintage Pattern aircraft. SPA's intention is to be casual, enjoyable, and to renew old friendships. There is no intent to advance the state of the art. The intent is to increase participation in the sport, and to establish an equitable and simple framework of rules and regulations for competition purposes.

1992

The National Competition Fun Fly Assocation (NCFFA) was formed to standardize tasks for radio-controlled competition fun-fly contests. Additionally, it was formed to create an atmosphere where pleasure, recreation, and fellowship can be fostered and found to exist among individuals competing in fun-flys.

1991

The Scale Warbird Racing Association (SWRA) was formed for those individuals who are interested in the thrill, excitement, and nostalgia of racing radio-controlled model aircraft of piston-driven warbirds and replicas of the Unlimited "Reno" Racers.

1992

The National Control Line Racing Association (NCLRA) is an association for persons interested in the construction and operation of Control Line Racing aircraft.

1994

The Unlimited Scale Racing Association (USRA) is an organization dedicated to the competitive sport of radio-controlled Giant Scale racing competition, capturing the thrill and excitement of this fast motor sport.

The USRA is the official sanctioning and rules body for the sport of Giant Scale Air Racing.

1998

The National Miniature Pylon Racing Association (NMPRA) promotes the general interests and welfare of all engaged in the construction and flying of radio-controlled model racing airplanes, and to aid insofar as possible the national program of the AMA.

1997

The Radio Control Combat Association (RCCA) is a Special Interest Group of the AMA. The purpose of RCCA is to provide information and technical knowledge to model aviation enthusiasts who love the War Planes of World War II.

Members enjoy competition and a place to share information, views, and discussion with others who have similar interests.

1998

The World Miniature Warbird Association, Inc. (WMWA) is an organization dedicated to building and flying RC models built after the designs of the many aircraft used for combat and defense around the world. Model size, method of power, and construction are not an issue. WMWA is about friendship, about helping each other, and about introducing this fascinating hobby to young people.

The History of *Model Aviation*

THE ACADEMY of Model Aeronautics (AMA), as an organization, has always been very interested in informing its members of current aeromodeling activities. In fact, so much so that the first issue of *Model Aviation* (*MA*) was printed and distributed before the organization even officially existed. Issue 1, Volume 1, was provided to those attending the 1936 National Aeromodeling Championships (Nats) before the first official meeting held at the end of the competition. For the next two decades, *MA* was provided to AMA Leader Members and subscribers, and in 1954, all AMA members began to receive *MA* as part of their membership benefits.

In 1966, in search of ways to reduce costs and increase members, combined with a unique opportunity offered by new owners of the magazine *American Aircraft Modeler* (*AAM*), the AMA council agreed to provide all members with a subscription to *AAM* rather than continue with its own separate publication. As part of this agreement, AMA news and events were included in a special section of the magazine. For the AMA it was hoped that by publishing a separate magazine, AMA members would still receive their AMA news, but also read exciting modeling feature articles. They also hoped that more modelers could be exposed to AMA news and events, and might therefore become members.

For AAM, because of the nature of its new ownership, the reduction in paying subscribers verses the rising numbers of AMA members paying only a fraction of the subscription rate, was not a concern. Because of the bimonthly nature of *AAM* during 1966, special *MA* issues would be mailed to chartered clubs and contest directors until *AAM* began monthly publication in 1967. From 1966 to 1975 membership increased from 16,000 to 52,000.

This arrangement worked well for nine years, until *AAM* announced in February 1975 that it was filing for bankruptcy. Suddenly the AMA was going to be without a way to communicate with its members. "AMA officers saw most members preferring to receive a magazine with well-rounded features at reasonable cost instead of a small newsletter—and authorized the revival of *MA* with 80 pages." (*Model Aviation*, July 1975, pg. 3.)

With only two months to prepare, advertisers were located and contributing editors and columnists were approached. As result of this hard work, the first issue of the new *Model Aviation* magazine was published in July of 1975.

Today, after 36 years, *MA* is the flagship of the AMA publication efforts, continuing to provide members with aeromodeling news, event coverage, new product announcements, and district reports.

Going forward, *MA* will continue to evolve to better serve our membership without losing sight of our core mission which is to inspire, inform, and instruct enthusiasts who share a passion for aeromodeling. **MA**

—Jay Smith
Model Aviation *Editor*

—Michael Smith
National Model Aviation Museum Director

Model Aviation Editors 1936 to Current

1936: Lt. H.W. Alden

1937-1940: Al Lewis (*Model Aviation* News Editor)

1941-1945: Unknown editor

1946: Al Lewis

1947: Valentine Luce

1948-April 1951: Unknown editor

May/June 1951 – April 1959: Carl Wheeley

May 1959- September 1961: Clifford Allum

October 1961-June 1966: Bill Winter

July 1966-June 1975: Unknown during the years AMA had a *Model Aviation* news section published in *American Aircraft Modeler/Aircraft Modeler* (possibly Bill Winter)

July 1975-September 1980: Bill Winter

October 1980-November 1990: Carl Wheeley

December 1990-April 1992: Ross McMullen (Executive Editor)

April 1992-June 1992: Terry Rossiter (Managing Editor)

July 1992-March1993: Ross McMullen (Managing Editor)

April 1993-May 1993: Nancy Green (Managing Editor)

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May 2011-current: Jay Smith

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A Life Lived Well, A Gift Much Appreciated

Gil in his workshop.

HE WAS KNOWN affectionately by his aeromodeling friends as "Mr. Second Place." A tenacious competitor in CL Combat, Gil Reedy of Mechanicsburg, Pennsylvania, co-founder of the Harrisburg Aeromodeling Society, had many local competition wins throughout his long career, but never first in the Nats. He loved all types of CL flying, but Gil was most avid about Combat.

Gil Reedy has passed away but his legacy lives on among the many AMA friends he has left behind, including his longtime combatant, Phil Cartier, who did win the CL Combat Nats on more than one occasion in an equally lengthy aeromodeling career.

"Gil was a real competitor," recalls Phil. "He was a great guy and a real gentleman, but when he was in the circle he was the Red Baron. I think we went to 20 out-of-state contests every year for more than 20 years."

The Academy received a generous gift from Gil's estate. The photo at left shows Gil with one of his last workshop creations. It is one of the many airplanes that gave much pleasure to him and another good friend and flying partner, Phil Spillman.

"The small P-40 was a trip down memory lane for Gil," says Phil. "It was a Monogram Speedi-Built model that many of us built when we were in fifth or sixth grade. These didn't fly well, but were still really neat to us!"

Gil was recognized in 2008 at the Brodak Annual Fly In, now the world's largest CL model competition with the Spirit of the Sport Award for "for individuals who both exemplify and promote control line."

Although Gil is gone, his legacy remains in the hearts of many friends. AMA is very pleased that he thought of the Academy with a generous gift. *MA*

—Chris Brooks, APR
Director of Public Relations

Gil testing one of his workshop CL creations.

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Make sure your legacy is fully intact. We can help. Just call us at 1-800-I-FLY-AMA (435-9262) or write to development@modelaircraft.org. There are many ways to help the Academy serve its members, students and communities. Renewal notices to members include many options for additional support, including funds for Site Development, Scholarships, Member Helping Member, the Museum Patron Program and others.

You can also help AMA and future generations with a donation and purchase of a brick in the AMA Walk of Fame. The bricks are suitable for corporate sponsorships, family and individual contributions, special memorials, clubs and civic organizations. For a donation of $100 your presence on the Walk of Fame is a 4x8-inch custom-engraved paving brick with the AMA logo, and up to two lines of copy. A "Golden Wings" brick is available for $500, and an 8x8-inch black granite brick with five lines of copy is available for a donation of $1,000.

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Investing in the Future

WHEN THE ACADEMY of Model Aeronautics (AMA) was founded in 1936, the name was chosen by the organization to acknowledge that learning about model building and flying was an important part of a young person's education.

During the so-called "Golden Age of Aviation," when the nation's youth closely followed the achievements of Charles Lindbergh and Amelia Earhart, building small-scale aircraft for competition in local, regional, and national flying events was viewed as a logical part of preparation for higher education in a variety of careers.

The "Academy" in the organization's name is no less relevant today because a major focus of the sport and hobby of aeromodeling is lifelong learning, whether a member is young or simply young at heart.

Model aviation has changed much in the last half-century. The revolution in micro technology now makes it possible for newcomers to the sport and hobby of model aviation to fly battery-powered, electric-powered Radio Control, Free Flight, and Control Line models literally in their own backyards. The recent dramatic increase in public access provides an opportunity for young people to actively engage in aviation without waiting to reach minimum-age requirements imposed by the FAA or incurring the expense involved in full-scale aviation. They can do so immediately at home, in their classrooms, in schoolyards and in local parks.

AMA is engaging classrooms across the country.

With the help of more than 140,000 AMA members in 2,400 chartered clubs, newcomers have the opportunity to become members in informal education "communities of learners," to acquire new skills in electronics, mechanical engineering, and aerodynamics, extending their reach to new horizons of achievement. *MA*

—Bill Pritchett
Director of Education

Scan to learn more about the AMA Walk of Fame.

Join the Conversation

Members of the Academy of Model Aeronautics are the lifeblood of the hobby, sport, and educational pursuit of model aviation. We offer dozens of communciation outlets inviting every member to stay connected and share their thoughts. Our goal remains the same as it did during the development of this organization that "all become united in one advisory body, having a firm official standing ... to advance model aeronautics as a science and sport and to aid constructive activities employing model aircraft as one means toward general aeronautic education." (NAA Junior Membership News, *Model Airplane News*, Oct. 1935.)

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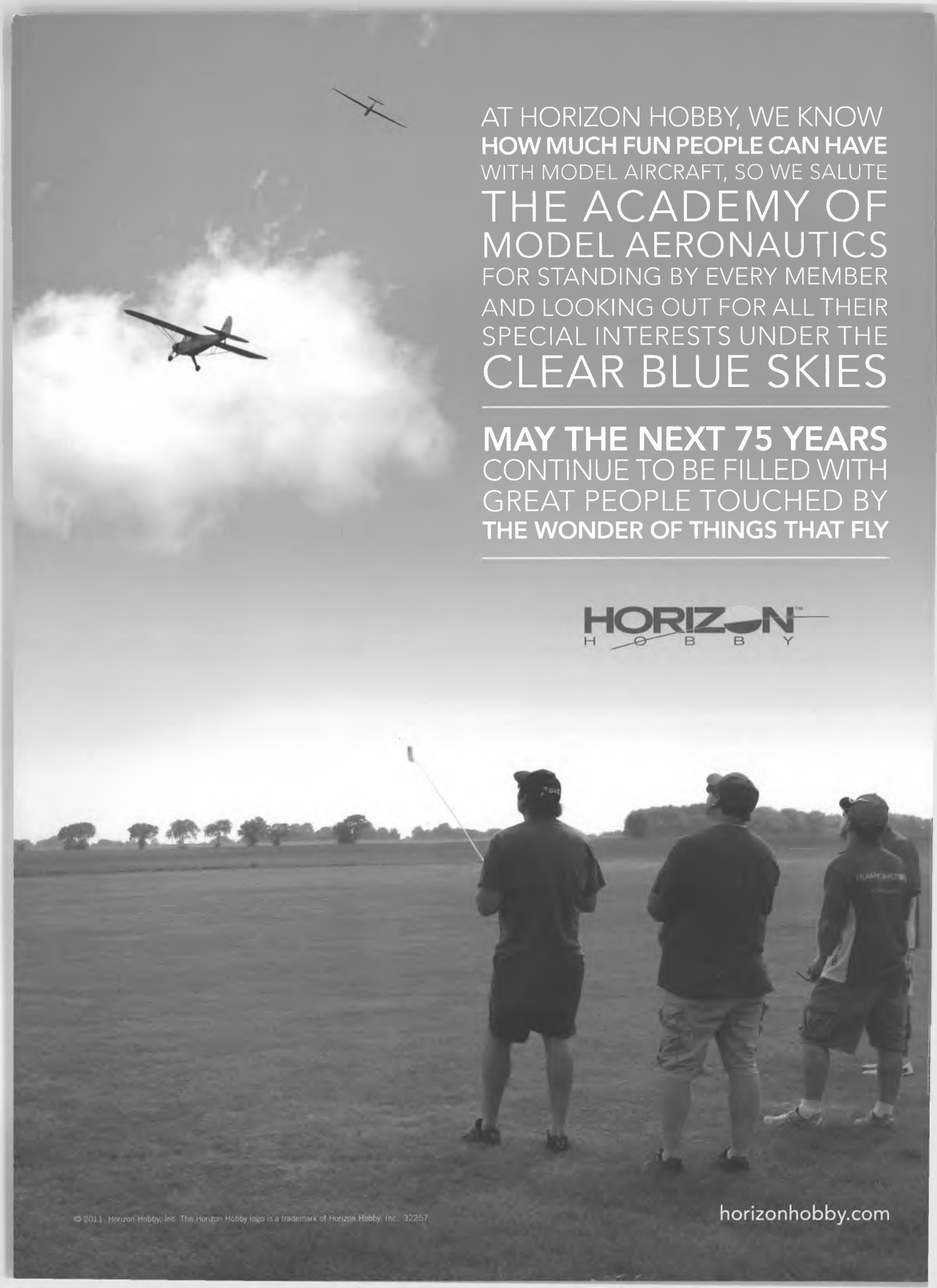
- USB firmware upgrades
- Real Time D
- Also available, the #335 11 Air module relays your model's altitude, temperature, voltage, current, engine RPM, fuel level reading and more
- Range from 3.6 V to 8.4 V (functional to 2.5V)
- 4 digital servos can be controlled simultaneously as a block with signal repetition time of 10 ms
- Over 200 systems can be used simultaneously
- Future proof.....

It's time to sell your other radios....before everyone gets HoTT!.

INNOVATIONS IN MODELING

Graupner USA

www.graupner-usa.com info@graupner-usa.com www.graupner.de


AT HORIZON HOBBY, WE KNOW
HOW MUCH FUN PEOPLE CAN HAVE
WITH MODEL AIRCRAFT, SO WE SALUTE
THE ACADEMY OF
MODEL AERONAUTICS
FOR STANDING BY EVERY MEMBER
AND LOOKING OUT FOR ALL THEIR
SPECIAL INTERESTS UNDER THE
CLEAR BLUE SKIES
MAY THE NEXT 75 YEARS
CONTINUE TO BE FILLED WITH
GREAT PEOPLE TOUCHED BY
THE WONDER OF THINGS THAT FLY
HORIZON™
HOBBY
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horizonhobby.com

Academy of Model Aeronautics

AK Legislative Task Force

Unmanned Aircraft Systems

December 5, 2014

Anchorage, AK

Introduction to AMA

AMA IS

- 170,000+ Members
- 2,400+ Charter clubs
- 2,000+ Affiliated Flying Sites
- $10 Million annual budget
- 50+ Employees
- 1,100 acre International Flying Site
- Member of the National Aeronautic Association

Little Known Facts About AMA

- AMA was established in 1936.
- Predates the FAA and the CAB which was established in 1938.
- AMA's 78 year Safety Program has achieved an exceptional safety record.
- In 1981 AMA incorporated the safety principles of AC 91-57 into the AMA Safety Program.

Little Known Facts About AMA

AMA's Liability Insurance Program

- For Members
- For Clubs
- For Site Owners

Covers members wherever they fly.

Members are required and agree to comply with AMA's safety guidelines as a condition of membership.

AMA Community Based Organization

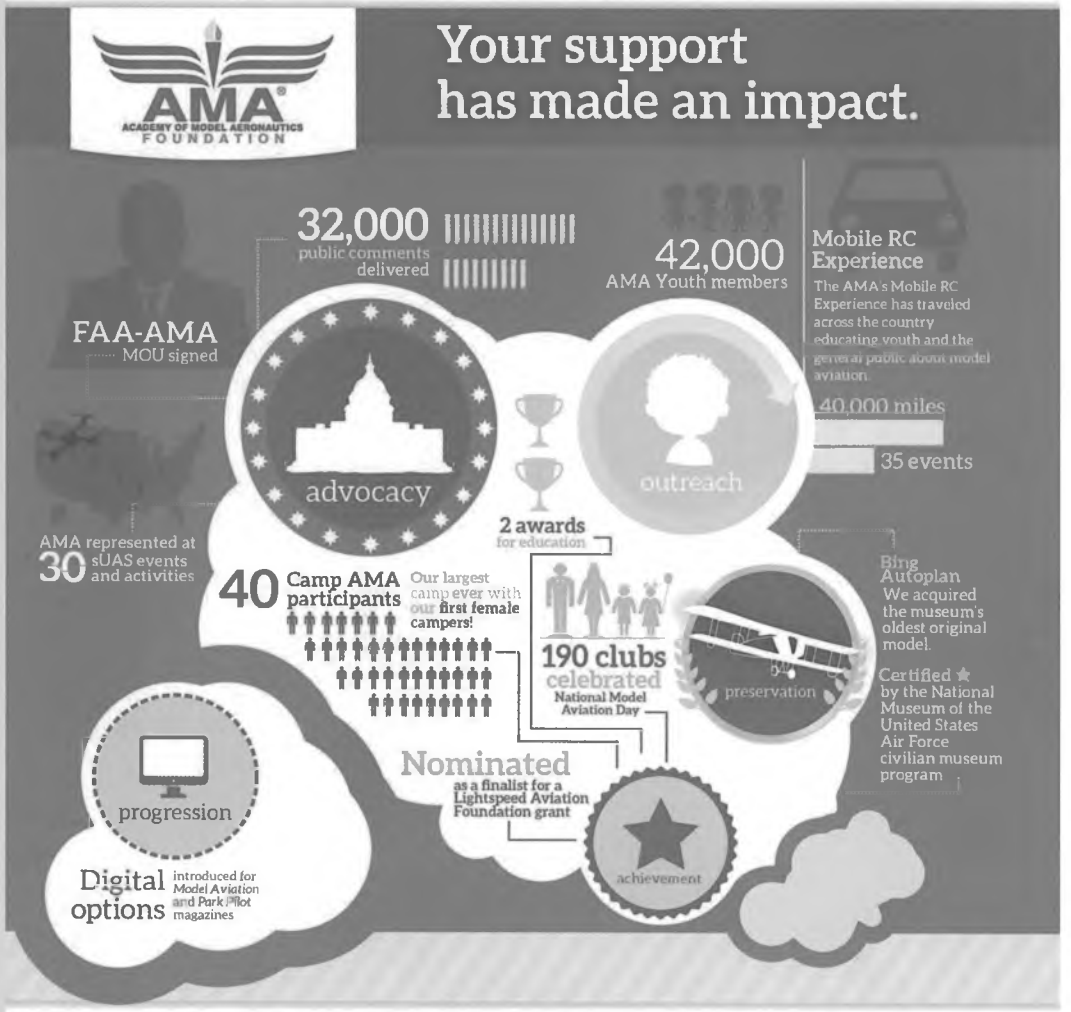
- Web presence
- YouTube, Facebook
- Marketing Outreach
- STEM Ed

AMA Foundation

What the AMA Foundation is About

The AMA Foundation exists to inspire the financial support of aeromodeling, a hobby, sport and scientific pursuit, as a legitimate and necessary component of the full aviation continuum, contributing significantly to the betterment of American society through a Congressionally-recognized community-based organization.

The AMA Foundation was established in 2013 to serve as a supporting organization that will fundraise and grant funds exclusively for and on behalf of the Academy of Model Aeronautics, founded in 1936



Donate by Dec. 31 and enjoy a tax incentive.*

In 2014, your contributions helped AMA reach out to the youth who are the future of our hobby, preserve timeless artifacts and memories, and fight to protect your right to fly.

Help us fuel the passion of flying. Donate by December 31 and enjoy a larger tax refund.

Learn more about the AMA Foundation and make a donation by visiting **amafoundation.modelaircraft.org.**

* The tax year ends at midnight on December 31. Donations must be received and/or postmarked before midnight on December 31.

FAA UAS Policies

- AC 91-57
  Model Aircraft Operating Standards
  (June 1981)

- Notice in the Federal Register (FRN)
  Unmanned Aircraft Operations in the NAS
  (February 2007)

- Interpretive Rule
  FAA interpretation of the Special Rule for Model Aircraft
  (June 2014)

FAA Re-Authorization Bill

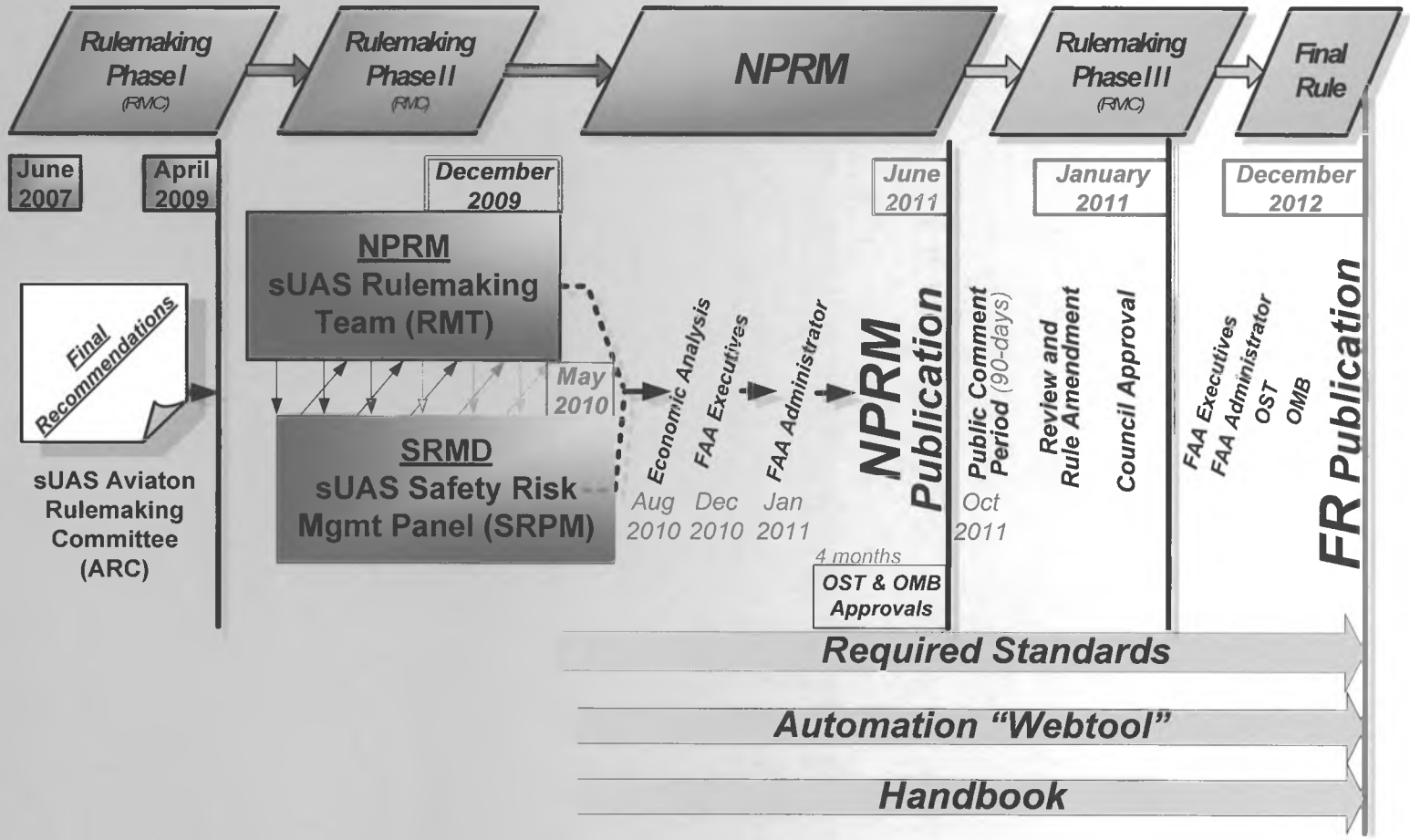
* FAA Modernization and Reform Act 2012
* Limits FAA Regulatory Oversight…
  - *Hobby and Recreational Purposes*
  - *Operating Within a Community-Based Safety Prgm*
  - *Allows for UAS up to 55 lbs, and 'Certified' LMA*
  - *Must Not Interfere with and Yields Right of Way to Manned A/C*
  - *Criteria for Operations in Proximity to A/Ps (5 miles)*
* FAA Tasked with Maintaining and Enforcing the Safety of the NAS

Community Based Organization

- FAA Modernization and Reform Act of 2012 (PL 112-95)
  - Sec 336 – "Special Rule for Model Aircraft" (sUAS)
- AMA Safety Program
  - Recreational
  - Educational
  - Purposeful
    - Hobby / Amateur
    - Personal Use

Small UAS Rule

NPRM – Dec 2014 / Jan 2015



Hot Issues

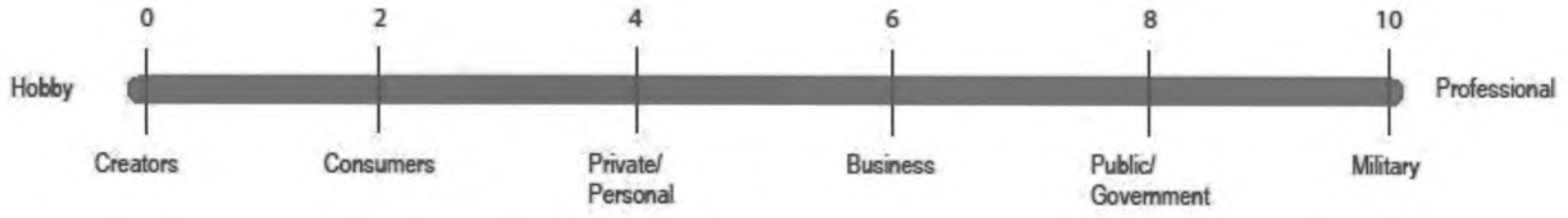
- sUAS Rulemaking
- Post 9/11 Security
- UAS Integration
  Safety - Seamless
- Privacy…
  Surveillance…
  (4th Amendment)

AMA
ACADEMY OF MODEL AERONAUTICS

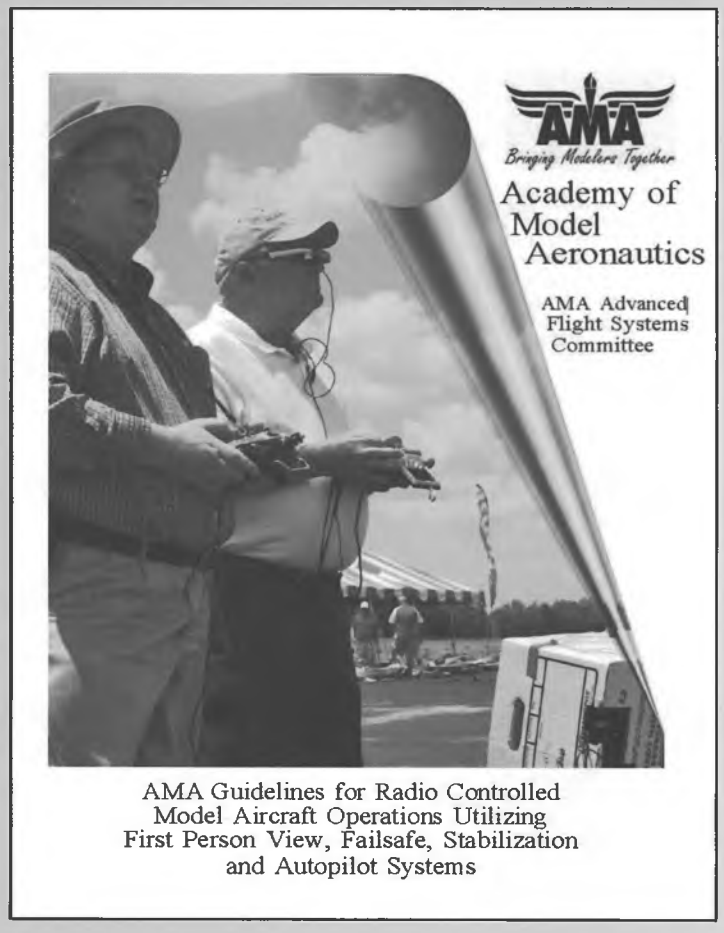
AMA Model Aircraft/Drone Positioning Assessment

Below is a chart describing the spectrum of model aircraft and drone usage.
Where on the chart do you believe that AMA's interest and influence stop?

AMA Government Relations



Where FPV and SAF Fit Into Current AMA Programming



AMA created its first program for First Person View Flight in late 2008.

In 2012 AMA created a program for the Semi-Autonomous (Automated) Community.

AMA is working with to expand its programming to incorporate the gap between recreational use and purposeful use, by working with other organizations such as AUVSI and FAA so that there is a clear public understanding from STEM education to professional use.

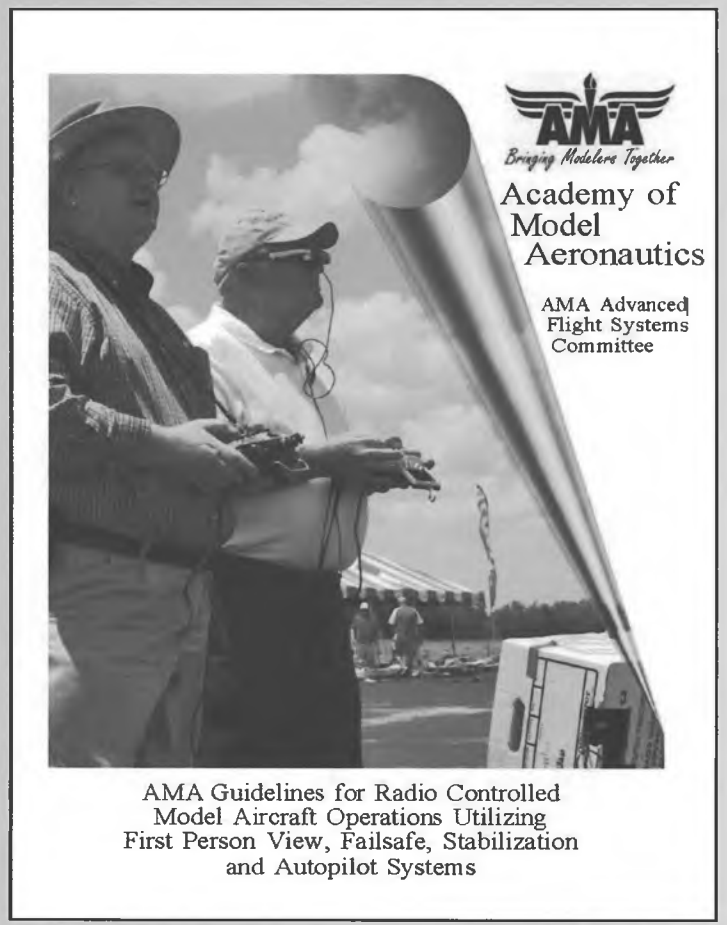
Flying Safely and Responsibly

- Don't operate on or fly over private property without first obtaining permission from the owner/authority and/or the property tenant.
- Don't fly where the operation of radio control aircraft are prohibited.
- Don't fly near open assemblies of people without first obtaining permission or otherwise making prior arrangements to do so.
- Don't fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc. without making prior arrangements to do so.

sUAS (Drone) Safety

- Do not interfere with manned aircraft operations
- Yield right of way to manned aircraft. See & Avoid other aircraft at all times (AMA Doc #540-D)
- Do not endanger persons or property, no intentional overflight, no closer than 25 feet
- Fly no higher than necessary (≤ 400'). Remain below surrounding obstacles when possible
- Avoid operations in close proximity to airports. When within 5 miles of an airport, contact the airport/ATC
- Assure pilot competency/proficiency and the safe operation of the aircraft
- Remain within VLOS. Use a spotter when necessary/appropriate

AMA's Privacy Policy



"The use of imaging technology for aerial surveillance with radio control model aircraft having the capability of obtaining high-resolution photographs and/or video, or using any types of sensors, for the collection, retention, or dissemination of surveillance data or information on individuals, homes, businesses, or property at locations where there is a reasonable expectation of privacy is strictly prohibited by the AMA unless written expressed permission is obtained from the individual property owners or managers."

Academy of Model Aeronautics

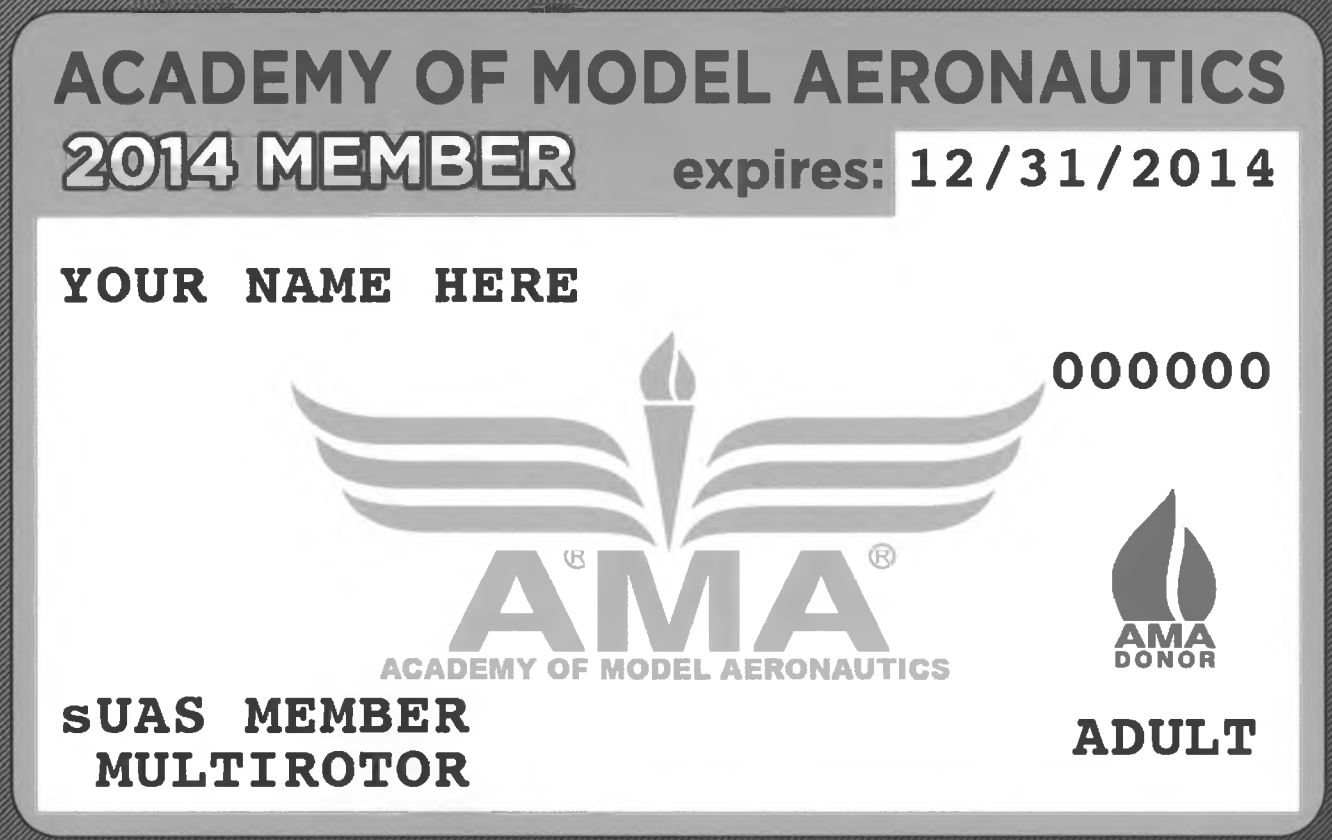
December 5, 2014

Program For sUAS Semi-Automated Flight For Personal and Purposeful Use

Individual Elements

Legitimacy
Education
Training
Safety
Registration/Endorsement
Classification
Insurance
Program Support/Advocacy
Media
Marketing

sUAS Endorsements



Special sUAS Membership Classification

- Subscription based, annual renewal.
- Supplemental to AMA membership (Junior, Adult).
- Availability of sUAS endorsements.
- Access to affinity benefits (Insurance).
- Additional sUAS program benefits

Insurance

- Personal liability coverage for sUAS and MA operations.
  - $2.5 million coverage for recreational use.
- Individually customized policyholder coverage (liability/comprehensive) for sUAS business use through AMA's affinity partner.
  - AMA rate would be more favorable than might otherwise be achieved.
  - Additional discounts with endorsements and/or endorsements from an affiliated training center.

Rich Hanson
richh@modelaircraft.org

Questions?

New technologies enable state and local law enforcement agencies to investigate crimes in ways once thought impossible or impractical. Across the nation, lawmakers are debating and enacting legislation that addresses how police can use these innovative tools to maximize public safety while complying with the Fourth Amendment's prohibition against unlawful search and seizure. Unmanned aircraft systems (UAS) and cell phones are two technologies on which much recent legislative attention has focused.

Police Use of Unmanned Aircraft Systems

Warrant Requirements for UAS Use - Fourteen states have enacted laws that address police use of UAS, commonly called drones. Thirteen of those states enable police to use UAS pursuant to a warrant, while Virginia prohibits their use by law enforcement agencies until July 1, 2015. In Iowa, law prohibits UAS from being used to enforce traffic violations.

Operational Standards for Police use of UAS - Laws in at least five states require that agencies adopt standardized protocols for police use of UAS. Alaska's law requires that law enforcement agencies adopt procedures that ensure: the appropriate Federal Aviation Administration authorization is obtained; UAS operators are trained and certified; a record of all flights is kept and there is an opportunity for community involvement in the development of the policy. Similar laws in Iowa, Texas and Virginia require state agencies to develop protocols for law enforcement's use of UAS. In North Carolina, the law requires all state personnel that operate a UAS to complete a knowledge and skills test developed by the state Division of Aviation.

UAS Reporting Requirements - States are also implementing reporting requirements for UAS use by law enforcement. Utah's law requires law enforcement agencies to report annually on their use of UAS. Among other requirements, the report must include: the number of times an unmanned aircraft was used; the number of criminal investigations that were aided; the manner in which criminal investigations were aided; the cost of acquiring, maintaining, repairing, and operating each unmanned aircraft; and the data that was collected on any person, structure, or area. Similar reporting laws have been enacted in Illinois and Texas.

Two states, Oregon and North Carolina, require government UAS to be registered with certain state offices. Oregon's law requires all public entities using UAS to register them with their state Department of Aviation while North Carolina's law requires any state entity acquiring a UAS to get approval from the state chief information officer.

Data Collection and Retention Polices – At least two states, Illinois and Utah, have created statutory standards for the retention and deletion of data obtained using UAS. Illinois' law requires law enforcement agencies to destroy all information gathered by UAS within 30 days unless there is reasonable suspicion that the information shows evidence of criminal activity. Utah's law prevents law enforcement agencies from using UAS collected data related to any person, structure, or area that was not the specified target of an investigation or is not directly displaying criminal activity.

Third Party UAS Use and Data Sharing with Law Enforcement - Laws in Illinois and Utah address how private citizens or companies can share with police information obtained by use of their own UAS. Illinois' law requires police to follow warrant protocols to compel third parties to share information. If the information is voluntarily shared with police, authorities are required to follow the state's law governing UAS data retention and disclosure. In Utah, the public can share UAS obtained information with law enforcement if the data captures the commission of a crime or imminent or ongoing danger.

Police Use of Cell Phone Surveillance Technology

Cell phones, the information they contain, and the location data they transmit can significantly aid police during investigations. State and federal decision-makers have weighed in on the appropriate police use of cellular information. On June 25, 2014, the United States Supreme Court ruled in *Riley v. California* that warrants are generally required before police can search the contents of an arrestee's cell phone. In addition, at least 10 states have enacted warrant requirements for police before they are able to acquire location or stored data from cellular devices or telecommunication companies.

Under certain emergency situations law enforcement is able to collect information from cell phones, or obtain location data without first procuring a warrant. Under Indiana and Virginia law, if a police officer obtains location data based on exigent circumstances, they must obtain a court order within 72 of their initial use of the tracking device.

Reporting Requirements - Minnesota's law requires that each request for a warrant for location data be reported to and tracked by the state court administrator. The information collected by the state court administrator must include whether the warrant application was accepted or denied, the time period of its authorization, the nature of the monitoring and the identity of the police officer or agency requesting the warrant. This information is required to be reported to the Legislature biannually.

Notification Requirements - Utah's law requires police who obtain a warrant for location data to notify the owner of the targeted electronic device within 14 days of the conclusion of the operation. Law enforcement must notify the owner that a warrant was issued, of the time period for which data was collected and of the alleged offense.

Enhanced Protections for Journalists - In Indiana, when police request a warrant for location data for a member of the media, the journalist or news entity targeted must be given notice of the request and the ability to be heard in court concerning the issuance of the warrant. Police are not required to notify journalists if they are the target of a criminal investigation and notifying them would pose a risk to the integrity of the investigation.

References:

Police use of UAS Enactments: Alaska HB 255 (2014), Florida SB 92 (2013), Idaho SB 1134 (2013), Illinois SB 1587 (2013), Illinois SB 2937 (2014), Iowa HF 2289 (2014), Indiana HB 1009 (2014), Montana SB 196 (2013), North Carolina SB 402 (2013), Oregon HB 2710 (2013), Tennessee SB 796 (2013), Texas HB 912 (2013), Utah SB 167 (2014), Virginia HB 2012 and SB 1331 (2013), Wisconsin SB 196 (2014).

Police use of Cell Phone Surveillance Enactments: Colorado SB 193 (2014), Indiana HB 1384 (2014), Indiana HB 1009 (2014), Maine SP 484 (2013), Maine SP 157 (2013), Maryland SB 698 (2014), Minnesota SF 2466 (2014), Montana HB 603 (2013), Tennessee SB 2087 (2014), Utah HB 128 (2014), Virginia HB 17 (2014), Wisconsin AB 536 (2014).

Hobby / Recreational Flying

What Can I Do With My Model Aircraft?

Having fun means flying safely! Hobby or recreational flying doesn't require FAA approval but you must follow safety guidelines. Any other use requires FAA authorization.

AVOID DOING ANYTHING HAZARDOUS TO OTHER AIRPLANES OR PEOPLE AND PROPERTY ON THE GROUND.

- ✓ **DO** fly a model aircraft/UAS at the local model aircraft club
- ✓ **DO** take lessons and learn to fly safely
- ✓ **DO** contact the airport or control tower when flying within 5 miles of the airport
- ✓ **DO** fly a model aircraft for personal enjoyment

- ⊘ **DON'T** fly near manned aircraft
- ⊘ **DON'T** fly beyond line of sight of the operator
- ⊘ **DON'T** fly an aircraft weighing more than 55 lbs unless it's certified by an aeromodelling community-based organization
- ⊘ **DON'T** fly contrary to your aero-modelling community-based safety guidelines
- ⊘ **DON'T** fly model aircraft for payment or commercial purposes

MODEL AIRCRAFT OPERATIONS LIMITS

According to the FAA Modernization and Reform Act of 2012 as (1) the aircraft is flown strictly for hobby or recreational use; (2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization; (3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization; (4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; (5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower...with prior notice of the operation; and (6) the aircraft is flown within visual line of sight of the operator.

For more information about safety training and guidelines, visit **www.modelaircraft.org**

For more information, visit Federal Aviation

July 2014

Commercial

The FAA currently authorizes the use of unmanned aircraft systems (UAS) for commercial or business purposes on a case-by-case basis. You may not fly your UAS for commercial purpose without the express permission from the FAA. You should check with the FAA for further determination as to what constitutes a commercial or business use of small UAS.

What is a commercial use of UAS?

Any commercial use in connection with a business, including:

- Selling photos or videos taken from a UAS
- Using UAS to provide contract services, such as industrial equipment or factory inspection
- Using UAS to provide professional services, such as security or telecommunications

What are some examples of commercial uses of UAS?

- Professional real estate or wedding photography
- Professional cinema photography for a film or television production
- Providing contract services for mapping or land surveys

If you want to use UAS for a commercial purpose, you have a few options. You can apply for an exemption from the FAA to operate commercially. You can use UAS with an FAA airworthiness certificate and operate pursuant to FAA rules. In both cases you would also need an FAA Certificate of Authorization (COA). For more information about how to apply for an exemption, visit https://www.faa.gov/uas/legislative_programs/section_333/.

Recreational

Currently, small unmanned aircraft systems (sUAS) may be operated for hobby and recreational purposes under specific safety guidelines as established by Congress. Small UAS flown for recreational purposes are typically known as model aircraft.

Under the Special Rule for Model Aircraft, recreational UAS must be operated in accordance with several requirements, including a community-based set of safety guidelines and within the programming of a nationwide community-based organization such as the Academy of Model Aeronautics (AMA). Operators not operating within the safety program of a community-based organization should follow the FAA's guidance at http://www.faa.gov/uas/publications/model_aircraft_operators/.

What is recreational use of a sUAS?

The recreational use of sUAS is the operation of an unmanned aircraft for personal interests and enjoyment. For example, using a sUAS to take photographs for your own personal use would be considered recreational; using the same device to take photographs or videos for compensation or sale to another individual would be considered a commercial operation. You should check with the FAA for further determination as to what constitutes commercial or other non-hobby, non-recreational sUAS operations.

What are the safety guidelines for sUAS recreational users?

- Follow community-based safety guidelines, as developed by organizations such as the Academy of Model Aeronautics (AMA).
- Fly no higher than 400 feet and remain below any surrounding obstacles when possible.
- Keep your sUAS in eyesight at all times, and use an observer to assist if needed.
- Remain well clear of and do not interfere with manned aircraft operations, and you must see and avoid other aircraft and obstacles at all times.
- Do not intentionally fly over unprotected persons or moving vehicles, and remain at least 25 feet away from individuals and vulnerable property.
- Contact the airport or control tower before flying within five miles of an airport.
- Do not fly in adverse weather conditions such as in high winds or reduced visibility.
- Do not fly under the influence of alcohol or drugs.
- Ensure the operating environment is safe and that the operator is competent and proficient in the operation of the sUAS.
- Do not fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc.
- Do not conduct surveillance or photograph persons in areas where there is an expectation of privacy without the individual's permission (see AMA's privacy policy).

If you want to use a model aircraft for recreational purpose, we encourage you to read the AMA's Model Aircraft Safety Code and Community-Based Guidelines.

Public Universities and Agencies

Public entities, which include publically funded universities, law enforcement, fire departments and other government agencies, may currently apply for a COA from the FAA in order to use sUAS in public aircraft operations.

Who can obtain a COA to operate public aircraft?

- Only government entities—such as federal and state government agencies, law enforcement agencies and public colleges and universities— can receive a COA for public UAS aircraft operations.
- Public aircraft operations must be conducted for a governmental function.
- COAs are most commonly issued to public (government) entities, but are also required for civil (private) operations.
- The FAA thoroughly evaluates each COA application to determine the safety of the proposal.
- COAs are issued for a specific period of time, usually two years, and include special provisions unique to each proposal, such as a defined block of airspace and time of day sUAS can be used.

How can I apply for a COA?

- Visit the FAA website for information on how to apply for a COA online
- Since 2009, the FAA has taken steps to streamline the application process by transitioning online
- The average authorization period is less than 60 days
- Expedited authorization is available in emergency and life-threatening situations

** For more information about public aircraft operations refer to 49 U.S.C. §§ 40102(a)(41), 40125, and FAA Advisory Circular 00-1.1A, Public Aircraft Operations (Feb. 12, 2014).*

For more information visit

WWW.KNOWBEFOREYOUFLY.ORG

Founding Members

AMA · AUVSI · SMALL UAV COALITION *A Partnership for Safety & Innovation*

Campaign Partner

FEDERAL AVIATION ADMINISTRATION

About Know Before You Fly

"Know Before You Fly" is an educational campaign that provides prospective unmanned aircraft users with the information and guidance they need to fly safely and responsibly.

About AUVSI

The Association for Unmanned Vehicle Systems International (AUVSI)—the world's largest nonprofit organization dedicated to the advancement of unmanned systems and robotics—represents more than 7,500 members from 60+ allied countries involved in the fields of government, industry and academia. AUVSI members work in the defense, civil and commercial markets.

AUVSI ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

For more information, go to www.auvsi.org.

About AMA

The Academy of Model Aeronautics (AMA) is the premier community-based organization in the United States for model aviation enthusiasts. With 175,000 members, the AMA is dedicated to the advancement and safeguarding of modeling activities. The Academy provides leadership, organization, competition, protection, representation, education and scientific/technical development to the model aviation community.

AMA ACADEMY OF MODEL AERONAUTICS

For more information, go to www.modelaircraft.org.

About Small UAV Coalition

The Small UAV Coalition advocates for law and policy changes to permit the operation of small unmanned aerial vehicles (UAVs) beyond the line-of-sight, with varying degrees of autonomy, for commercial, civil and philanthropic purposes. Its members include the leading manufacturers, operators, and service providers of small UAVs.

SMALL UAV COALITION *A Partnership for Safety & Innovation*

For more information, go to www.smalluavcoalition.org.

About the FAA

The Federal Aviation Administration is committed to providing the safest, most efficient aerospace system in the world. The agency is executing a plan for safe and staged integration of unmanned aircraft systems into the National Airspace System.

FEDERAL AVIATION ADMINISTRATION

For more information, go to www.faa.gov/UAS.

WWW.KNOWBEFOREYOUFLY.ORG

KNOW BEFORE YOU FLY

Unmanned Flight Safety Guidance

LEGISLATIVE TELECONFERENCE NETWORK

SPONSOR:_____

SUBJECT:_____

PLEASE PRINT CLEARLY!!!

DATE:_____

NAME	CITY OF RESIDENCE	REPRESENTING ("SELF" OR NAME OF ORGANIZATION)	WOULD YOU LIKE TO TESTIFY? INDICATE "YES" OR "NO"	BILL NUMBER
[illegible]	ANC	US Army Black		
SARAH HOOD	ANC	US AIR FORCE		
STEVE STRAIT	Anc	DOT Aviation Adv. Board		
Jared Mazurek	Anc	KTVA	NO	

LEGISLATIVE TELECONFERENCE NETWORK

SPONSOR: Rep Hughes

SUBJECT: UAS LTF

PLEASE PRINT CLEARLY!!!

DATE: Dec 5, 2014

NAME	CITY OF RESIDENCE	REPRESENTING ("SELF" OR NAME OF ORGANIZATION)	WOULD YOU LIKE TO TESTIFY? INDICATE "YES" OR "NO"	BILL NUMBER
J. Skaggs	Eagle River	FAA		
Mike O'Hare	Chugiak	AMWA		
Rob Mumford	Fairbanks	Alaska Peace Center	YES	Pat Martin Wasilla YES
Dot Hagen	Kasilof	Gallery Lodge	NO	
MSG Dave Meeker	Eagle River	US Army	NO	
Anthony Pennino	Anchorage	Exxon Mobil	NO	
Scott T. Eastepp	Chugiak	Self	NO	
Tommie W Baker	JBER	USAF	NO	
Christi Bell	Anchorage	UA	YES	
Elwood Brehmer	Anchorage	AK Journal of Commerce	NO	
Katie Reeves	Anchorage	State of Alaska DED	NO	
Robbie McGrew	Anchorage	FAA		
Richard Marculieff	Anchorage	Self		
Eric Bleakney	JBER	ALCOM	NO	
Carol Anderson	Area	UAA Student	No	

02/11/15 Task Force Meeting: Presentations and Public Testimony

<TARGET><BILL></BILL><SUBJECT>02-11-15 Task Force Meeting Presentations and Public Testimony</SUBJECT><COMM><TARGET></COMM></TARGET>

Legislative Task Force on Unmanned Aircraft Systems
February 11, 2015 Meeting
State Capital, Juneau Alaska, Room 13

1:00 – 3:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- Ro Bailey, University of Alaska Fairbanks
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof
- Ginger Blaisdell, Staff to Rep. Hughes

Not in attendance:

- Senator Peter Micciche, Co-Chair
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- John Parker, Integrated Robotics Imaging Systems
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF

MEETING SUMMARY

1:00pm Welcome and Introductions .....Representative Shelley Hughes

- Thank you all for coming to Juneau and attending the Lunch and Learn hosted by the University of Alaska Fairbanks and contributors

Items in meeting packets:

- Dec 5 meeting minutes – to be emailed
- Letters to department heads
- Letter to delegation
- Congressional bills introduced by Young and Murkowski – encourage public private partnerships to provide funding

- KBYF safety guidelines and the alaskadrones.org web site
- FAA is trying to ramp up drone education and regulation process
- You tube link to Swiss team 'cage' that won $1m from UAE
- FAA issued guidance for law enforcement
- UAS improvement act 2015 congressional legislation – procurement, homeland security, etc.
- Young and Murkowski bill
    a. Ro Bailey worked with congress on this legislation (Allison/Murkowski)
    b. Test sites are experiencing issues where the FAA is interpreting aspects of UAS research that makes the work they are doing very difficult
    c. Trying to break the FAA lose from restricting operations at the test sites
    d. Can't be paid to fly but can receive money for milestones

Joe Jacobson, Department of Commerce, Community and Economic Development

Update: final report on UAS economic advantages for Alaska is in today's packet

- Cultivating a resource, workforce, university program
- Entrepreneurial focus to attract them
- Canada forming alliances across industries (maritime and UAS)
- Recommending incentives to attract business without increasing cash outlay
- Job creation and revenue to the state

Barbara Johnson (past position with FNSB)

- Economic development work to establish military development zones
- Looked at a tech park near Salcha, now considering Hightop Park using University lands about 20 miles outside Fairbanks
- NOAA is very interested in what Alaska is doing
- Great opportunities in the Arctic

Steve Colligan, Academy of Model Aeronautics

- Hobby industry has the best you tube information on flying UAS you might want to see
- Safety is directly related to skills and knowledge
- "We" need to get information out there virally
- Know Before You Fly campaign
- Asks Task Force (alaskadrone.org) to "sign on" to national campaign Know Before You Fly – send a letter and a logo to the national campaign
- Discussion: letter to campaign, recommendation from Gov/Task Force?, what logo?, want all Alaska communities-agencies-vendors to 'sign on' to alaskadrones.org?, wants Gov to endorse, ask congressional delegation to draft letters
    - Joe and Steve Colligan will work with Gov office to request a letter
    - Knowbeforeyoufly.org

Bob May, Public member - Very interested in the privacy for Alaskans

Steve Wackowski, Fairweather Inc. – Top 40 Under 40

Mike O'Hare, Department of Military and Veterans' Affairs

- Offer to host next meeting on base
- Update on how military plans to use UAS

Ro Bailey, University of Alaska Fairbanks

- Interest Group Meeting
  - Interest group meeting begins on September 1, she would like the task force meeting to coincide with the interest group, consider meeting September 3 or 4 in Fairbanks
- Ro Bailey also noted that the Test Site now includes operations in Kansas and Tennessee for test site operating locations but not as a key partner

PRIVACY DOCUMENT _____

Privacy considerations for Alaskans

- Most privacy issues around the USA have been with regard to law enforcement privacy
- Ro Bailey: once we put the privacy document out, we should include the "who to call" info

Creating a document:

- Want the privacy document to fit on one page (similar to KBYF)
  - Who is the target audience?
  - How will this document be used?
  - Might be different audiences with different needs?
  - Hobby Use – Commercial Use – Law Enforcement
    - Semi-professional videographers occurring in Alaska already
    - Section 333 exemptions in the FAA reform act of 2012
- Guidelines vs Law?
- **FAQ version** of common questions to add to the web site – FAQ's would allow ginger to research statutes with legal services – questions provided to Ginger by Feb 15 - Generic or specific examples to use in the FAQs?
  - Who owns the airspace above your house?
  - How to apply the protections that Alaska already has in statute?
  - Reasonable expectation of privacy
  - How is data going to be used, stored and maintained?
  - Can I shoot it down if it's flying over my house? Destruction of another's property.
  - Circumstance: is it private or not?
  - What do I do if there's a drone flying over my house?
  - Can I use this for my business?
  - Noise ordinance?
  - Chasing my dog?
- "**Cartoon**" some of the scenarios to grab everyone's attention

Timing

- Get the information out to the public quickly and we can continue to refine
- Get our web site to the national level

New information to put on website

- Put the 5-page excerpt on the alaskadrones.org web site
- Why Alaska? Joe Jacobson has a great flyer developed
- Who do you contact and how do you contact re inappropriate drone flights?
    - Jay Skaggs – call me…
    - Get contact information on alaskadrones.org
    - Can individuals contact local police? – yes
    - DPS form/content to be made available on alaskadrones.org so individuals know what information to provide to local police (or forwarded on to FAA)
    - Don't dial 911

Public Testimony _____

Bill Tart, Arctic Slope Regional Corp – no testimony provided

Next meeting _____

- **June 19 in Anchorage on Base coordinated by Mike O'Hare – would like a UAS demo**
    - Would not be able to get the public on the base for a general meeting – look into the rules for this.
- FAA should kick out some rules by June
- Letter to congressional delegation regarding test site funding
- Matrix and Education plan to be worked on by Steve Strait and Ginger
    - KBYF one page document (and this privacy document) really delivers the education plan
- Military update
- Unmanned Traffic Management System – how do they fly, where do they fly, communication capabilities
    - Steve Colligan is aware of the relationship with NextGen, detect and avoid technology
    - Ro Bailey is under contract with NextGen working on airspace reservation information and ultimately integrate with manned aviation
    - Steve Wackowski is working with major entities and University, on the slope to be first to integrate the UTM in Alaska

Legislative Task Force on Unmanned Aircraft Systems
February 11, 2015 Meeting
Capitol Building Room 17

1:00pm – 3:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
    - Ginger Blaisdell, Staff to Rep. Hughes
- Senator Peter Micciche, Co-Chair
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof

Task Force Responsibilities per HCR15

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications;
3. evaluating complaints and concerns expressed to the task force;
4. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to unmanned aircraft systems;
6. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;
7. conducting a public hearing concerning privacy and the capture of data by unmanned aircraft systems at the University of Alaska's test site;
8. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

AGENDA

1:00pm Welcome and Introductions .....Representative Shelley Hughes

- Review of Meeting Summary from December 5, 2014
- Introduction of Guests
- Letters sent to Department heads
- Current Events: News Articles (attached list)
  - Pages 1-40
  - Sen Murkowski drone bill
  - National Journal article

AGENDA

Five-Minute Updates:

- Joe Jacobson - Unmanned Aircraft Systems: An Economic Development Strategy for Alaska
- John Binder - Alaska Airports and Aviation 2014 Annual Report
- Steve Colligan – Know Before You Fly national campaign
- Shelley Hughes – HJR 5 hearing update and who will testify

Personal Privacy in Alaska

- One page document review on Drone Privacy

Future Meeting Agenda:

- Next meeting:
  1. Letter to Alaska Congressional delegation for test site funding and issues of underfunding
  2. Matrix
  3. Education Plan

Follow Up – To Do

Mike OHara

1. Military mission in Alaska – process and plans — next meeting DoD and Natl Guard
2. ~~Italy data protection laws~~
3. Who to contact? Complaint / enforcement system / responses — call local police
4. ~~UTMS – unmanned traffic management system~~ updates

June 19 UAS TF on base military

Sept 1-2 Interest Group - PDX
Tu We.
UAS TF Sep 3-4

Scenario 1

If data is gathered by a government agency, it is a public record. However, AS 40.20.120 provides certain protections for private information. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information and whether the person whose actions have been captured has a reasonable expectation of privacy.

Government data capture is more clearly defined in statute and its intended use for public purpose. Data captured by a government-operated UAS would be treated similarly to data captured by other technology such as cell phones, manned aircraft, satellite images, voice recorders, etc. Case law is substantial in determining if the person would be considered to have a reasonable expectation of privacy and when a warrant would be required to obtain and use any data collected.

CH 48 (HB65) SLA08 Personal Information Protection Act also addresses the collection, storage, and breach of privacy. This act would include any data captured by a UAS.

Scenario 2

Can my neighbor fly his model aircraft over my fence and photograph my family?

The fear of being unknowingly watched and/or photographed is a legitimate public concern. "Reasonable expectation of privacy" is the term where you can self-analyze the public perception of your actions.

You would certainly have a reasonable expectation of privacy if you were inside your home with curtains drawn. If someone climbed the fence surrounding your home, stood outside the window and recorded your image or voice while you were inside, it is likely that person would be considered to have breached your "reasonable expectation of privacy".

What if the neighbor flies his model aircraft over my backyard during my child's birthday party? You might be able to argue that your fence creates a boundary identifying your personal space but it does not govern the air above your property. We could expect that aircraft hovering 10 feet above your head is more invasive than a manned airplane passing overhead but in reality, it's the level of technology that is in use that should be considered. We tend to accept satellite imagery as "part of life" even though it produces technologically advanced detailed imagery. The neighbor's quadcopter might just be an irritant (like a barking dog) or it could be recording your every move with high definition video and sound ~ this is a decision to be made by the courts if it comes to that.

A significant piece to this equation is "what is that person doing with the data captured"? Remember that it's not the aircraft at fault, but the operator who may be flying with suspicious intentions.

The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of the FAA Modernization and Reform Act of 2012 (FMRA) have a "line of sight" requirement.

- **Public Navigable Airspace:** The question of what constitutes "public navigable airspace" for UAS operated by the government is central to privacy policy. The Task Force found that almost every law enforcement scenario discussed was already protected by existing law.
- **Role of Imaging Technology:** Rules and case law exist that protect citizens from inappropriate use of capturing data that is "more than the human eye could ever see."
- **Extended Surveillance:** Law enforcement does not intend to use UAS for standard patrol activities at this time. Limiting flight hours was not seen as an acceptable control because long flights may be necessary in the event of search and rescue or natural disaster remediation operations.
- **Obtaining a Warrant:** After much discussion, it was decided that using UAS to gather data would require a warrant in similar situations as using any other data gathering device (such as voice recording, photography, and thermal imaging with manual technology). No additional laws are required to obtain a warrant for UAS data gathering.

Legal Services

Constitutional Protection of Privacy: *The Constitution of the State of Alaska explicitly protects the right of privacy against government intrusion. Art. I, sec. 22 provides: "The right of the people to privacy is recognized and shall not be infringed. The Legislature shall implement this section."*

Alaska Statutory Protections:

AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means

AS 11.61.116 Sending an explicit image of a minor

AS 11.61.120(a)(6) Harassment: publishing or distributing certain images

AS 11.61.123 Indecent viewing or photography

AS 11.76.113 Misconduct involving confidential information in the first degree

AS 11.76.115 Misconduct involving confidential information in the second degree

The State of Alaska and its local governments cannot dictate the use of the NAS but can consider rules that better define the FAA guidelines, can consider legal repercussion for entities found in violation of adopted laws, and can provide for specific privacy laws regarding the use of UAS in Alaska.

The State of Alaska Constitution provides privacy protection, "although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. Both the Alaska Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy."

1. ALASKA STATE LAW—SAFETY AND PRIVACY

The LTFUAS is confident that the FAA will regulate safety of UAS flights in Alaska. While safety is critically important, the LTFUAS also recognizes that certain codes of conduct must be followed to ensure harmonious UAS operations in Alaska.

1.1.1 Self-Regulation by Three National Organizations

The LTFUAS considered the recommendations of the following three national organizations that have adopted rules and codes of conduct regarding UAS operations. The LTFUAS adopted the IACP rules in the legislation introduced during the legislative session. During the committee process, the decision was made that it would be ill advised to adopt a dated publication. Instead the bill incorporated applicable guidelines from the publication.

- **IACP:** International Association of Chiefs of Police Recommended Guidelines (Appendix B) for the use of Unmanned Aircraft was adopted in August 2012. The Alaska Department of Public Safety has also adopted these guidelines as their doctrine with the exception of increasing the flight approval responsibility from a "supervisor" to the director's office.

- **AUVSI:** Association for Unmanned Vehicle Systems International states: "As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct."[1]

- **AMA**: Academy of Model Aeronautics' *AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems* guides model aircraft operators.[2]

In the same manner that the FAA does not regulate model aeronautics, the LTFUAS does not intend to adopt requirements of hobbyist activities using UAS.

1.1.2 Model Aircraft Rules and Definitions

The technology differences between UAS and model aircraft used for sport or recreation use is narrowing each day. Technology is advancing by leaps and bounds, while at the same time becoming more affordable and integrated into off-the-shelf-systems for consumers and hobbyists. While there are many technical documents and references through the FAA Modernization and

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[1] Unmanned Aircraft System Operations Industry "Code of Conduct." Accessed January 13, 2014. Available at http://www.auvsi.org/conduct

[2] AMA Policies for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems. Revision 07/20/2013. AMA Advanced Flight Systems Committee Report 101. Available at http://www.modelaircraft.org/files/AFSCREPORT101.pdf

Reform Act, the general difference between UAS and model aeronautics is the operation and intent of the operator not the aircraft.

If the activity or intent of the activity is used for commercial operations or contributing to the creation of a product or service, it is considered commercial activity, and it is subject to the FAA regulations and rule as stated in the FAA Modernization and Reform Act of 2012 and FAA UAS Road Map 2013.

If the activity is for sport and recreation use as defined by FAA SEC 336 SPECIAL RULE FOR MODEL AIRCRAFT of the Modernization Act, it is controlled by a cooperative agreement between the FAA and a Community Based Organization (CBO), such as the Academy of Model Aeronautics (AMA).

The AMA has been successful in self-regulating operations for hobbyists and aviation safety for over 77 years. During those 77 years, the AMA faced many challenges of new technologies such as analog to digital radio, coordinating operations within the airspace and the ever changing aircraft designs and capabilities not unlike the latest multi-rotor and First Person View (FPV) capabilities. To address the current safety requirements and interest of model aircraft operators, the AMA has developed and updated its general safety code AMA Publication 105-Safety Code and advanced aircraft rules publication 550-First Person View and 560-Autopilot effective January 1, 2014, to keep up with the FAA rule making and technology advances. Refer to Appendix C.

Legal Services

Constitutional Protection of Privacy: *The Constitution of the State of Alaska explicitly protects the right of privacy against government intrusion. Art. I, sec. 22 provides: "The right of the people to privacy is recognized and shall not be infringed. The Legislature shall implement this section."*

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AS 11.61.123 Indecent viewing or photography

AS 11.76.113 Misconduct involving confidential information in the first degree

AS 11.76.115 Misconduct involving confidential information in the second degree

It was discussed that a notice should be provided at the time of purchase of each model aircraft to review the AMA flight operation guidelines for appropriate use of model aeronautics. The LTFUAS did not adopt a requirement for notice regarding hobbyists since so many aircraft are purchased outside of Alaska and would not be required to provide the notice.

1.1.3 Alaska State Law and Personal Privacy

The State of Alaska and its local governments cannot dictate the use of the NAS but can consider rules that better define the FAA guidelines, can consider legal repercussion for entities found in violation of adopted laws, and can provide for specific privacy laws regarding the use of UAS in Alaska.

The State of Alaska Constitution provides privacy protection, "although not unlimited, has been held to be broader than the protection afforded by the United States Constitution. Both the Alaska

Constitution and the Fourth Amendment to the United States Constitution require a warrant by a governmental agency for the search of a place where a person has a reasonable expectation of privacy."[3]

Although much attention regarding UAS privacy focuses on government use and the Fourth Amendment, it is non-governmental use that is likely to raise some of the most significant privacy challenges in coming years. For private entities, the key constitutional question is the extent of their First Amendment privilege to gather information.

Civil use of unmanned aircraft will fall under the federal and state laws including such provisions as trespassing, invasion of privacy, intrusion upon seclusion, publication of private facts, stalking and harassment, and business privacy.

The LTFUAS, with guidance from Legislative Legal Services, considered many scenarios of possible violations of state and federal law that might occur with the use of unmanned aircraft. Legislative Legal Services provided the document, *Observations from Above: Unmanned Aircraft Systems and Privacy*.[4] that presented a variety of scenarios that have been tried in court and some that should be discussed as they pertain to UAS and personal privacy. The Legal Services memo outlining the areas of statute that protect personal privacy can be found in Appendix D.

Privacy protection considerations reviewed by the LTFUAS include but are not limited to the following.

1. **If data is gathered by a government agency, it is a public record. However, AS 40.20.120 provides certain protections for private information. Use of inadvertently captured information in a criminal prosecution may depend on who captures the information and whether the person whose actions have been captured has a reasonable expectation of privacy.**

It was discussed that data captured by a government-operated UAS would be treated similarly to data captured by other technology such as cell phones, manned aircraft, satellite images, voice recorders, etc. Case law is substantial in determining if the person would be considered to have a reasonable expectation of privacy and when a warrant would be required to obtain and use any data collected.

CH 48 (HB65) SLA08 Personal Information Protection Act also addresses the collection, storage, and breach of privacy. This act would include any data captured by a UAS.

2. **As technology continues to advance beyond "normal" application of current laws, a balanced approach that recognizes the inherent difficulty in predicting the future must be adopted when drafting new laws.**

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[3] Memorandum: Alaska Laws Protecting Privacy (Work Order No. 28-LS0990). September 30, 2013. Division of Legal and Research Services, Legislative Affairs Agency, State of Alaska, Juneau.

[4] John Villasenor. 2013. Observations from Above: Unmanned Aircraft Systems and Privacy. Harvard Journal of Law & Public Policy. Available at http://www.harvard-jlpp.com/wp-content/uploads/2013/04/36_2_457_Villasenor.pdf

The LTFUAS determined that we cannot foresee the future applications of technology (of UAS or other technologies); therefore, creating restrictions in law based on assumptions is not recommended.

Observations From Above: UAS and Privacy

This document was published in the Harvard Journal of Law and Public Privacy by John Villasenor, a senior fellow in Governance Studies and the Center for Technology Innovation, the Brookings Institution.

The Task Force discussed many of the scenarios posed by the author when considering the need for Alaska law.

3. **How should Alaska manage unintentionally captured images or data?**

Discussion as of December 2013 concluded that there are adequate statutes, case law, and data retention guidelines that resolved the concerns of the LTFUAS in the area of unintentionally captured images or data. Discussion during the legislative session of 2014 indicated that data collection will be an area the LTFUAS will need to continue to monitor.

Recommendation: The LTFUAS also requests that the Department of Administration review its data retention schedules with particular emphasis on law enforcement data captured inadvertently and allowing that data to be destroyed.

4. **The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of the FAA Modernization and Reform Act of 2012 (FMRA) have a "line of sight" requirement.**

The LTFUAS assumes that FAA regulations adopted in the next several years will continue to require visual line-of-sight operation. "Sense and avoid" technology will become more mature and some non-line-of-sight missions may be permitted by the FAA. Non-line-of-sight operations and other unknown technological advances may bring new challenges that will require the Legislature to review industry guidelines and state laws in the future.

5. **Unmanned aircraft may bring efficient advances to law enforcement; however, the public seems to be highly sensitive to law enforcement using unmanned aircraft.**

After reviewing many possible uses of UAS, the LTFUAS determined that existing law already affords the public with adequate protections.

- **Routine Technology**: The use of UAS is treated much the same as any other technological tool used to protect the public. The Department of Public Safety has adopted the IACP Guidelines for UAS, and the LTFUAS found those guidelines to be superior for rules of law enforcement use.

Specific guidelines from the IACP were offered as a provision of the legislation.

- **Public Navigable Airspace:** The question of what constitutes "public navigable airspace" for UAS operated by the government is central to privacy policy. The LTFUAS found that almost every law enforcement scenario discussed was already protected by existing law.
- **Role of Imaging Technology:** Rules and case law exist that protect citizens from inappropriate use of capturing data that is "more than the human eye could ever see."
- **Extended Surveillance:** Law enforcement does not intend to use UAS for standard patrol activities at this time. Limiting flight hours was not seen as an acceptable control because long flights may be necessary in the event of search and rescue or natural disaster remediation operations.
- **Obtaining a Warrant:** After much discussion, it was decided that using UAS to gather data would require a warrant in similar situations as using any other data gathering device (such as voice recording, photography, and thermal imaging with manual technology). No additional laws are required to obtain a warrant for UAS data gathering.

Voluntary Approaches

The International Association of Chiefs of Police (IACP) adopted model guidelines for the use of UAS for law enforcement purposes.

The Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct calls for a commitment to "respect the privacy of individuals."

Academy of Model Aeronautics (AMA) has also adopted operational policies and guidelines for advanced flight systems used in radio-controlled model aircraft.

It is the understanding of the LTFUAS that all law enforcement entities must first obtain a court order to use UAS over private property for criminal investigation against any person. This will be offered as a provision of the recommended legislation.

- **Weaponized Aircraft:** FAA guidelines do not allow anything to be dropped from an unmanned aircraft.
- **Visibility**: Law enforcement is planning to use high-visibility marking on any UAS they will use. Application of navigational lighting and/or high-visibility paint is being considered.
- **Public Education**: It is apparent that public education is necessary for all agencies using UAS but sensitivity is heightened for law enforcement uses.

Law Enforcement

Public protection will benefit greatly from unmanned aircraft for the purposes of search and rescue, crash scene documentation time, natural disaster monitoring, wildfire management, amber and silver alerts, hostage situations, and other life safety extremes. Some efforts will require warrants to proceed and some will be allowed under a Certificate of Authorization (COA).

It is the opinion of the LTFUAS that existing privacy laws are adequate to govern the use of unmanned aircraft.

It is the opinion of the LTFUAS that since Alaska has been chosen as one of the FAA UAS Test Sites, we have the opportunity to participate in the use of UAS in a variety of ways that would put Alaska in the position to establish policy guiding the use of UAS for the rest of the United States to consider.

SUBSCRIBE!

Hey Amateur Pilot, It's Time To Talk About Your Droning Problem

NEWS VIDEO *February 3, 2015 by DRONELIFE News - No comments*

We made it through the Super Bowl without a drone incident! I'll be honest, I was a little surprised.

But the threat of drone technology being grounded by poorly educated amateur pilots still looms large.

In response, The Globe and Mail has taken it upon themselves to provide new and future drone pilots with this preemptive intervention… and it's fantastic.

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Why the US Government Is Terrified of Hobbyis...

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How to Fly a Drone the Dronelife Way

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Alibaba Ramps Up the Drone Delivery Game in C...

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Tags: Globe and Mail

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Name * **Email** *

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Comment

▸ BUY A DRONE

Why do you want a drone?

Recreational Photography

How much do you want to pay?

$ $$$

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So you took your new Christmas drone for a spin and it didn't go exactly as planned? We're not... Read More »

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REPRESENTATIVE
SHELLEY HUGHES

Transportation Committee
Co-Chairman
Community & Regional Affairs Committee
Military & Veterans' Affairs Committee
DOT Finance Subcommittee
Corrections Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

Session:
State Capitol, Room 13
Juneau, Alaska 99801-1182

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Toll Free 1-800-565-3743

housemajority.org

HOUSE OF REPRESENTATIVES

District 11 – Greater Palmer

February 11, 2015

Dear Commissioner,

The Unmanned Aircraft Systems Legislative Task Force has identified the need for public awareness in the use of small unmanned aircraft systems (UAS) by government agencies. The Task Force respectfully requests that each State agency that intends to use UAS in its work, to provide the task force with a point of contact for your agency. We ask for this point of contact to be provided by March 15, 2015 or prior to a scheduled UAS mission if it will occur prior to March 15, 2015.

The Task Force is currently developing a public education strategy so that all users and observers of UAS understand the rules and expectations thereby, eliminating fear and reducing opportunity for inappropriate use of these aircraft. State agency participation is vital to the education campaign and will provide the Task Force with a better understanding of how our government agencies are planning to use UAS.

Thank you for time.

Sincerely,

Shelley Hughes

Representative Shelley Hughes

Senator Peter Micciche

LUNCH AND LEARN

UAS Industry in Alaska and Alaska Center for Unmanned Aircraft Systems Integration

Unmanned aircraft can save money, time and lives across Alaska, while diversifying the state's economy. Prior years' state investment in this important initiative has launched Arctic scientific research and the use of unmanned systems to support community and industry needs. Alaska now holds the distinction of being one of six centers in the U.S. selected by the Federal Aviation Administration to integrate unmanned aircraft into the national airspace system.

Come learn about the potential for aerospace industry expansion right here in Alaska and the new applications in this technology cluster.

Wednesday
Feb. 11, 2015
Noon-1 p.m.

Room 106,
Alaska State Capitol

Sponsored by Rep. Shelley Hughes and Sen. Peter Micciche

Presenters:

Ro Bailey
Director, Pan-Pacific UAS Test Range Complex; Deputy director, ACUASI, UAF Geophysical Institute

and invited guests

Lunch will be served using private funds.

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ALASKA STATE LEGISLATURE

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SHELLEY HUGHES

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HOUSE OF REPRESENTATIVES

District 11 – Greater Palmer

To: Legislative Task Force on Unmanned Aircraft Systems

From: Representative Shelley Hughes, Co-Chair

Shelley Hughes

Date: February 3, 2015

Re: Committee Schedule for week of February 9, 2015

Wednesday, February 11, 2015

\+ 12pm – 1pm, Room 106
Lunch and Learn session sponsored by University of Alaska Fairbanks ACUASI and the Unmanned Aircraft Systems Legislative Task Force

Wednesday, February 11, 2015

\+ 1:00pm – 3:00pm, Room 17
Update on current events
Review Alaska privacy laws as they may pertain to the use of unmanned aircraft systems

\+ teleconferenced

Ginger Blaisdell

From: Rep. Shelley Hughes <Rep.Shelley.Hughes@akleg.gov>
Sent: Friday, December 19, 2014 4:32 PM
To: lhschus+newsletter@akleg.gov
Subject: Before you finish wrapping your gifts...
Attachments: AK_KBYF_Drone_Safety_Guidelines.pdf

If unable to view the image below and/or for live hyperlinks, please see the attached PDF.

Greetings,

As some of you may have noticed, drones or small Unmanned Aircraft Systems (UAS) have been "flying" off the shelves as one of the most popular gifts this Christmas and holiday season. If you happen to be one of the many who purchased a UAS as a gift, please stick a copy of the safety guidelines 1-pager below (and attached) in with the package before you wrap it. If you're the gift recipient (or the parent of a gift recipient!), please review it. The Unmanned Aircraft Systems Legislative Task Force created this sheet to help ensure that UAS operate safely in our skies in Alaska, and do not interfere with manned aircraft with pilots and passengers on board. We want Alaskans, whether on the ground or in our skies, to be safe. This is an amazing technology; responsible operation of UAS is a priority. One in four homes in America own a small drone. After this Christmas season, I wouldn't be surprised if it will be one in three – so please feel free to share this info with others! Thank you.

December 5, 2014

Alaska's Know-Before-You-Fly Drone Safety Guidelines

FAA allows the operation of model aircraft, also known as small Unmanned Aircraft Systems (sUAS) or drone recreational purposes under the Special Rule for Model Aircraft. Recreational UAS must be operated in accordance community-based safety program and the FAA's guidance in Advisory Circular 91-57.

What is recreational use of a sUAS (Drones)?

Recreational use is the operation of a sUAS for personal interests and enjoyment, and not for compensation or hir example, using a sUAS to take photographs for your own personal use would be considered recreational; using the device to take photographs or videos for compensation or sale to another individual would be considered comm You should check with the FAA for further determination as to what constitutes commercial sUAS operation.

SAFETY GUIDELINES FOR RECREATIONAL USERS OF sUAS (DRONES)

- Users should follow community-based safety guidelines, as developed by organizations such as the Academy Model Aeronautics (AMA)
- Users should fly no higher than 400 feet and remain below surrounding obstacles when possible
- Users must be able to see their sUAS at all times, and use an observer to assist them if needed
- Users should remain well clear and must not interfere with manned aircraft operations, must see and avoic other aircraft and obstacles at all times, must avoid any activity that would cause a manned aircraft pilot tc divert from planned operations, and must give way to all other aircraft at all times.
- Users must not intentionally fly over unprotected persons or moving vehicles, and should remain at least 25 away from individuals and vulnerable property
- Users must contact the airport or control tower before flying within five miles of an airport
- Users should be aware that in addition to public airports, Alaska has many private airstrips as well as bodies waters used for take-off and landing by float planes and should not fly a UAS in the vicinity of these location
- Users should not fly a UAS weighing more than 55 lbs unless it's certified by an aeromodelling community-b organization.
- Users should not fly in adverse weather conditions such as in high winds or reduced visibility
- Users must not fly under the influence of alcohol or drugs
- Users should ensure the operating environment is safe and that the operator is competent and proficient in operation of the sUAS
- Users should not operate on or fly over private property without first obtaining permission from the propert owner and/or tenant
- Users should not fly near or over sensitive infrastructure or property such as power stations, water treatmer facilities, correctional facilities, heavily traveled roadways, government facilities, etc.
- Users should not conduct surveillance or photograph persons in areas where there is an expectation of priva without the individual's permission (See AMA's privacy policy)

Additional safety resources:
AMA National Model Aircraft Safety Code
FAA What Can I Do With My Model Aircraft?

This hand-out is a public education resource provided by Alaska's Unmanned Aircraft Systems Legislative Task Force (UASLTF) to raise awareness by providing a brief summary of the laws applicable to sUAS. For more information, contact 907-376-3725 or Rep.Shelley.Hughes@akleg.gov . The UASLTF would like to thank Academy of Model Aeronautics and the Association of Unmann Vehicle Systems for their joint campaign to promote safe operations of UAS and for providing the safety guidelines listed above. sUAS operators are responsible for reviewing and complying with applicable state and federal laws that may apply to flying sUAS

For the most up-to-date information on the work being done by the UAS Legislative Task Force, please visit http://alaskadrones.org/

Warm Christmas and holiday wishes,

Shelley

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FAA to ramp up drone education, regulation

By Sara Fischer, CNN

Updated 10:07 AM ET, Mon December 1, 2014

FAA on drones: Security always a concern 02:29

It's a bird, it's a plane, it's a ... drone?

Story highlights

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More and more often, large commercial airliners are encountering small, unmanned aircraft flying through the sky, sometimes undetected by the human eye, and often invisible from the cockpit of a large airplane.

FAA Administrator Michael Huerta says increased drone regulations are needed to increase safety

Pilots have increasingly seen drones flying higher than the current limit of 400 feet

Drone education and regulation will help prevent accidents with aircrafts, Huerta says

According to Michael Huerta, head of the Federal Aviation Administration, regulations are in place to prevent drones from interfering with large aircraft -- but education about drone safety and regulation enforcement needs to be improved in order to actually keep airways safe.

"That is certainly a serious concern and it is something that I am concerned about," Huerta told Candy Crowley on CNN's "State of the Union" Sunday. "That's why we are very focused on education. That's why we're also focused on enforcement. We've enforced hundreds of these cases where we have seen someone operating one of these things carelessly and recklessly and posing the danger to aircraft, and that can't happen."

READ: Graham search highlights Virginia drone battle

Since drones have entered the commercial market, the FAA reports pilots have seen up to 25 cases per month of drones flying above the regulated limit of 400 feet, with some flying as high as 2,000 feet in the air. Huerta says the FAA is working to educate people about the dangers of flying drones that high, since enforcement of the small, unmanned aerial vehicles can be difficult.

"(A) big part of what we're doing is educating people," Huerta said. "These are very high performance aircraft, and they are difficult to see and this is one of the big challenges, and so that's why the rules require that people stay away from airports."

"We have been working with the Model Aeronautics Association, with the model community and clubs so we can educate people because these are not your typical pilots that may be flying one of these for the first time and they may be unfamiliar with the rules," he added.

In 2012, the FAA set a September 2015 deadline to lay out a concrete list of rules and regulations for flying commercial drones, many of which are operated from the ground by untrained civilians. The current rules prohibit owners from flying drones higher than 400

feet, near an airport, or out of eyesight. But enforcing those regulations can be difficult, especially in light of the increasing rate of commercial use.

Still, proponents of drone use argue the unmanned aerial vehicles have great potential for both surveillance and commercialism, a balance which Huerta says the FAA is working to achieve.

"Yes, there are proponents of unmanned aircraft and they really see huge potential with this technology and for them, we can't move fast enough," Huerta said. "What they would like to see is free and open use of unmanned aircraft as soon as we can get there."

"On the other side, you have pilots, commercial pilots, general aviation pilots, who are very concerned that these are difficult to see, they don't really have a good understanding of how they interact with other aircraft, and bedrock principle of aviation is a principle called see and avoid. The pilots take action to avoid one another. So it's for that reason that we have a plan for a staged and thoughtful integration of unmanned aircraft where we look at lower risk uses first, and then gradually work to others. "

Of course, the added technology also creates a new avenue for national security concerns, mainly terrorism. In response to that potential threat, Huerta says the FAA will be publishing a "rule-making" that takes into consideration the qualifications of the drone operator, and the certification of the aircraft.

"I can't say what is going to be in it but broadly speaking, what we are looking at are all the questions relating to how we certify the aircraft and what are the qualifications of the operator as well as what uses they can be put to," Huerta said.

Promoted Stories

Swiss Team Wins 'UAE Drones for Good' $1M Prize

The winners of the first 'UAE Drones for Good Award', the largest award of its kind in the world, were announced on Sunday in the presence of His Highness Mohammed bin Rashid Al Maktoum, UAE ministers and international dignitaries. The competition, launched at the 2014 Government Summit, took place in Dubai Internet City in front of a large crowd of visitors. The Government Summit focuses on how technology will radically reshape government and public services through the introduction of drones, robotics and other innovations; the 2015 Summit, occurring 9-11 February, will feature exciting new initiatives.

Flyability from Switzerland won the US$1 million grant in the International Competition. The Flyability team has developed Gimball, a drone that can enter confined spaces and safely fly close to humans, proving to be highly effective in rescue missions. It is protected by a rotating cage which makes it capable of colliding with obstacles in challenging environments without losing its stability.

Flyability team lead Patrick Thevoz said, "We struggled to find funding to develop our search and rescue drone but this UAE Government Summit initiative, Drones for Good, means we can commercially develop our project within a year, and with Flyability able to go where it is dangerous for rescuers, help save lives.

"The Drones for Good Award is the first of its kind. It is inspirational, because while there are many awards for academic research there aren't many for the social application of new technology. It allows passionate teams like us to move forward and make this a reality. The Drones for Good Award is a unique opportunity to help people realize that these flying machines are capable of positively impacting society," he added.

CLASS LEADING SWaPC

Over the course of the two-day event, 39 semi-finalists in three categories presented live demonstrations of their projects to a panel of international judges. There was also a division for national competitors who won AED 1 million.

"The UAE Drones for Good Award is a tangible outcome of the vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum to make optimal use of innovation and technology for the service of humanity. The UAE Drones for Good award exemplifies our commitment to setting global benchmarks in this endeavor," said His Excellency Mohammed Abdullah Al Gergawi, UAE Minister of Cabinet Affairs.

"I congratulate the winners of this great competition, which showed the amazing ways we can use drones for good. All the entries have the capability to transform the world to make it a better place to live in and we are optimistic that they will continue to inspire new breakthroughs," H.E. Al Gergawi added.

The winners of the UAE Government Entities Award and the National Competition were Etisalat and Wadi Drones respectively.

Photo: The Drones for Good Award is presented by His Highness Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the United Arab Emirates, to the winning team Flyability.

Source: Press Release

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800 Entries for UAE Drones for Good Award

The UAE Drones for Good Award, launched by His Highness Shaikh Mohammad Bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai, during the second Government Summit last February, has received more than 800 local, Arab and international entries.

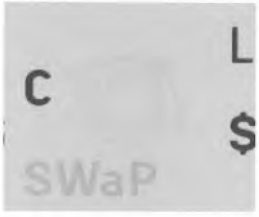
The award, which aims to make optimal use of technology to serve humanity and create happiness in the community, received submissions from 57 countries.

Spain topped the list with 62 entries, followed by the United States with 47 and India with 34 entries.

Saudi Arabia topped the list of Arab countries with 18 entries, followed by Egypt with eight entries.
The winners of the award will be announced in February based on the results of live demonstrations by qualifiers of the semi-final stage in front of the panel of judges.

Mohammad Abdullah Al Gergawi, Minister of Cabinet Affairs, praised the global response to the UAE Drones for Good Award and commended the creative level of the projects received, and the volume of entries from global educational institutions.

There were 154 entries from educational institutions with a strong presence from UAE universities, as well as international universities such as MIT, Stanford, and the University of Sanjulata.



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Al Gergawi added that the ideas have the potential to improve services in areas such as health, education, civil defence, transport and communications, as well as government services, natural disaster relief, and humanitarian assistance.

The award is also expected to significantly contribute to reduced costs of many services as well as their increased efficiency.

"The UAE government has always been the first to launch initiatives that keep pace with global changes and has harnessed creativity and innovation to serve humanity, identifying them as the real wealth of developed societies," he said.

Relief services topped the list of the entries, accounting for 20 per cent of the entries. Civil defence services came in second with 15 per cent, followed by economic development and the environment at 14 per cent, respectively, and logistics accounting for 13 per cent.

Source: Gulf News

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Posted in Launchers & Recovery Systems on January 22, 2015 by The Editor. Leave a comment

← MEXICO DEPLOYS UAS TO PROTECT ENDANGERED PORPOISE NORWAY WANTS UAS TO AID SEARCH AND RESCUE →

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The Next Steps to Implementation of Unmanned Aircraft Systems into the National Airspace

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December 2014

Disclaimer

The following is an accumulation of a student lead research project. The conclusions and recommendations are that of our student team and do not represent the views or opinions of any university, government agency, political office, or commercial entity.

December 2014

Executive Summary

The United States is a leader in the unmanned aircraft industry through our military, but we wait in anticipation for the commercial implementation of unmanned aircraft into our national airspace system (NAS). Through this intensive analysis of the industry, regulation, and policy, our group was tasked with finding the most relevant issues within the unmanned aircraft industry and develop our own recommendations for the upcoming Federal Aviation Administration (FAA) proposed rulemaking standards for small unmanned aircraft systems (sUAS).

Through our research we have found that the integration of sUAS into the NAS is expected to represent an $89 billion industry by 2025 (Table 1 – Market Analysis). While the capability of this industry is virtually limitless; our research focused on the benefits sUAS would bring to private business and commercial operations. As a group we also analyzed the FAA mandated test sites in Alaska, New York, Texas, Virginia, and Nevada. These sites are each responsible for testing specific applications for UAS and through our analysis and interviews with test site directors we created several well rounded recommendations for sUAS implementation. Through our analysis of these policy changes our group developed training, certification, and licensing recommendations for sUAS implementation, piloting, operating, and maintenance. We researched the sUAS operations and regulations in other countries and evaluated the International Civil Aviation Organization (ICAO) policies to determine what did work and aligned with our goals in the United States.

Finally we turned our attention to the air traffic control procedures and sense and avoid tactics for sUAS to operate seamlessly with our manned aircraft in the NAS. We broke down the different technologies sUAS manufacturers are using for commercial applications and developed recommendations for requirements and procedures.

Through this presentation we will share our research and recommendations for the upcoming proposed rulemaking standards regarding sUAS implementation.

FAA Issues UAS Guidance for Law Enforcement

The proliferation of small, relatively inexpensive unmanned aircraft (UAS) presents the Federal Aviation Administration with a challenge in identifying people who don't follow the rules of the air or who endanger the nation's airspace. So, the agency is asking the law enforcement community for help.

The FAA released guidance to the law enforcement community explaining the legal framework for the agency's oversight of aviation safety in the U.S., including UAS operations. The guidance describes how UAS and model aircraft can be operated legally, and the options for legal enforcement actions against unauthorized or unsafe UAS operators. The document also discusses the law enforcement community's vital role in deterring, detecting and investigating unsafe operations.

State and local police are often in the best position to immediately investigate unauthorized UAS operations, and as appropriate, to stop them. The document explains how first responders and others can provide invaluable assistance to the FAA by:

- Identifying potential witnesses and conducting initial interviews
- Contacting the suspected operators of the UAS or model aircraft
- Viewing and recording the location of the event
- Collecting evidence
- Identifying if the UAS operation was in a sensitive location, event or activity
- Notifying one of the FAA's Regional Operation Centers about the operation as soon as possible

The FAA's goal is to promote voluntary compliance by educating individual UAS operators about how they can operate safely under current regulations and laws, but the guidance makes clear the agency's authority to pursue legal enforcement action against persons who endanger the safety of the National Airspace System.

The guidance stresses that while the FAA exercises caution not to mix criminal law enforcement with agency administrative safety enforcements, the public is best served by coordinating and fostering mutual understanding and cooperation between governmental entities with law enforcement responsibilities.

The complete guidance document can be seen here.

U.S. Department
of Transportation
Federal Aviation Administration

LAW ENFORCEMENT GUIDANCE FOR SUSPECTED UNAUTHORIZED UAS OPERATIONS

Issue

There is evidence of a considerable increase in the unauthorized use of small, inexpensive Unmanned Aircraft Systems (UAS) by individuals and organizations, including companies. The FAA retains the responsibility for enforcing Federal Aviation Regulations, including those applicable to the use of UAS. The agency recognizes though that State and local Law Enforcement Agencies (LEA) are often in the best position to deter, detect, immediately investigate,[1] and, as appropriate,[2] pursue enforcement actions to stop unauthorized or unsafe UAS operations. The information provided below is intended to support the partnership between the FAA and LEAs in addressing these activities.

Discussion

The general public, a wide variety of organizations, including private sector (e.g., commercial companies), non-governmental (e.g., volunteer organizations), and governmental entities (e.g., local agencies) continue to demonstrate significant interest in UAS. The benefits offered by this type of aircraft are substantial and the FAA is committed to integrating UAS into the National Airspace System (NAS). This introduction, however, must address important safety and security considerations. The increasing number of cases of unauthorized use of UAS is a serious concern for the FAA and, in terms of safety and security challenges, many of its interagency partners.

This document is intended to assist LEAs in understanding the legal framework that serves as the basis for FAA legal enforcement action against UAS operators for unauthorized and/or unsafe UAS operations (Section 1) and to provide guidance regarding the role of LEAs in deterring, detecting, and investigating unauthorized and/or unsafe UAS operations (Section 2).

SECTION 1.

Basic Legal Mandates

The FAA's safety mandate under 49 U.S.C. § 40103 requires it to regulate aircraft operations conducted in the NAS,[3] which include UAS operations, to protect persons and property on the

[1] At least in terms of initial contact with the suspected offender.

[2] Applying any laws falling within the enforcement authority of the LEA in question.

[3] The NAS is "the common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas . . . . Included are system components shared jointly with the military." See FAA Pilot/Controller Glossary (Apr. 3, 2014), available at http://www.faa.gov/air_traffic/publications/media/pcg_4-03-14.pdf.

ground, and to prevent collisions between aircraft and other aircraft or objects. In addition, 49 U.S.C. § 44701(a) requires the agency to promote safe flight of civil aircraft in air commerce by prescribing, among other things, regulations and minimum standards for other practices, methods, and procedures the Administrator finds necessary for safety in air commerce and national security.[4]

A UAS is an Aircraft that Must Comply with Safety Requirements

A UAS is an "aircraft" as defined in the FAA's authorizing statutes and is therefore subject to regulation by the FAA. 49 U.S.C. § 40102(a)(6) defines an "aircraft" as "any contrivance invented, used, or designed to navigate or fly in the air." The FAA's regulations (14 C.F.R. § 1.1) similarly define an "aircraft" as "a device that is used or intended to be used for flight in the air." Because an unmanned aircraft is a contrivance/device that is invented, used, and designed to fly in the air, it meets the definition of "aircraft." The FAA has promulgated regulations that apply to the operation of all aircraft, whether manned or unmanned, and irrespective of the altitude at which the aircraft is operating. For example, 14 C.F.R. § 91.13 prohibits any person from operating an aircraft in a careless or reckless manner so as to endanger the life or property of another.

Model Aircraft Operations

An important distinction to be aware of is whether the UAS is being operated for hobby or recreational purposes or for some other purpose. This distinction is important because there are specific requirements in the FAA Modernization and Reform Act of 2012, Public Law 112-95, (the Act) that pertain to "Model Aircraft" operations, which are conducted solely for hobby or recreational purposes. While flying model aircraft for hobby or recreational purposes does not require FAA approval, all model aircraft operators must operate safely and in accordance with the law. The FAA provides guidance and information to individual UAS operators about how they can operate safely under current regulations and laws. Guidance may be found at: http://www.faa.gov/uas/publications/model_aircraft_operators/

Section 336(c) of the Act defines "Model Aircraft" as an unmanned aircraft that is –

(1) Capable of sustained flight in the atmosphere;

(2) Flown within visual line of sight of the person operating the aircraft; and

(3) Flown for hobby or recreational purposes.

Each element of this definition must be met for a UAS to be considered a Model Aircraft under the Act. Under Section 336(a) of the Act the FAA is restricted from conducting further rulemaking specific to Model Aircraft as defined in section 336(c) so long as the Model Aircraft operations are conducted in accordance with the requirements of section 336(a). Section 336(a) requires that—

[4] FAA action on these security concerns support and are informed by the national defense, homeland security, and law enforcement statutory responsibilities and authorities of our interagency partners.

(1) The aircraft is flown strictly for hobby or recreational use;

(2) The aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;

(3) The aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;

(4) The aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and

(5) When flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation (model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport)).

Model Aircraft that Operate in a Careless or Reckless Manner

Section 336(b) of the Act, however, makes clear that the FAA has the authority under its existing regulations to pursue legal enforcement action against persons operating Model Aircraft when the operations endanger the safety of the NAS, even if they are operating in accordance with section 336(a) and 336(c). So, for example, a Model Aircraft operation conducted in accordance with section 336(a) and (c) may be subject to an enforcement action for violation of 14 C.F.R. § 91.13 if the operation is conducted in a careless or reckless manner so as to endanger the life or property of another.

UAS Operations that are not Model Aircraft Operations

Operations of UAS that are not Model Aircraft operations as defined in section 336(c) of the Act and conducted in accordance with section 336(a) of the Act may only be operated with specific authorization from the FAA. The FAA currently authorizes non-hobby or recreational UAS operations through one of three avenues:

(1) The issuance of a Certificate of Waiver or Authorization, generally to a governmental entity operating a public aircraft;

(2) The issuance of an airworthiness certificate in conjunction with the issuance of a Certificate of Waiver or Authorization; or

(3) The issuance of an exemption under part 11 of title 14, Code of Federal Regulations that relies on section 333 (Special Rules for Certain Unmanned Aircraft Systems) of the Act for relief from the airworthiness certificate requirement, also in conjunction with the issuance of a Certificate of Waiver or Authorization.

It is important to understand that all UAS operations that are not operated as Model Aircraft under section 336 of the Act are subject to current and future FAA regulation. At a minimum, any such flights are currently required under the FAA's regulations to be operated with an

authorized aircraft (certificated or exempted), with a valid registration number ("N-number"), with a certificated pilot, and with specific FAA authorization (Certificate of Waiver or Authorization).

Regardless of the type of UAS operation, the FAA's statutes and the Federal Aviation Regulations prohibit any conduct that endangers individuals and property on the surface, other aircraft, or otherwise endangers the safe operation of other aircraft in the NAS. In addition, States and local governments are enacting their own laws regarding the operation of UAS, which may mean that UAS operations may also violate state and local laws specific to UAS operations, as well as broadly applicable laws such as assault, criminal trespass, or injury to persons or property.

UAS Compliance with Airspace Security Requirements

As an aircraft, UAS operations (including those involving Model Aircraft) must be conducted in accordance with the airspace-centric security requirements prescribed by the FAA's regulations and various implementation tools used by the FAA, specifically including airspace with special flight rules and Notices to Airmen (NOTAM) that define Temporary Flight Restrictions (TFR). It is important that UAS operators and LEAs be familiar with the airspace restrictions respectively relevant to their operations and their enforcement area of responsibility.

Flight restrictions are used to protect, but are not limited to, special security events, sensitive operations (e.g., select law enforcement activity, space flight operations, etc.), and Presidential movement. The most up-to-date list of TFRs is available at http://tfr.faa.gov/tfr2/list.html.

See Attachment A for reference resources.[5]

SECTION 2.

The Role of Law Enforcement

The FAA promotes voluntary compliance by educating individual UAS operators about how they can operate safely under current regulations and laws. The FAA also has a number of enforcement tools available including warning notices, letters of correction, and civil penalties. The FAA may take enforcement action against anyone who conducts an unauthorized UAS operation or operates a UAS in a way that endangers the safety of the national airspace system. This authority is designed to protect users of the airspace as well as people and property on the ground.

However, as noted above, State and local Law Enforcement Agencies (LEA) are often in the best position to deter, detect, immediately investigate,[6] and, as appropriate,[7] pursue

[5] Attachment A also includes a NOTAM concerning avoidance (including no loitering) over power plants, dams, refineries, industrial complexes, and military facilities. Although not a restriction, this TFR urges aircraft operators to avoid these locations.

[6] At least in terms of initial contact with the suspected offender.

[7] Applying any laws falling within the enforcement authority of the LEA in question.

enforcement actions to stop unauthorized UAS operations. Although the FAA retains the responsibility for enforcing FAAs regulations, FAA aviation safety inspectors, who are the agency's principal field elements responsible for following up on these unauthorized and/or unsafe activities, will often be unable to immediately travel to the location of an incident.

While the FAA must exercise caution not to mix criminal law enforcement with the FAA's administrative safety enforcement function, the public interest is best served by coordination and fostering mutual understanding and cooperation between governmental entities with law enforcement responsibilities. Although there are Federal criminal statutes that may be implicated by some UAS operations (see 49 U.S.C. § 44711), most violations of the FAA's regulations may be addressed through administrative enforcement measures. As with any other civil or criminal adjudication, successful enforcement will depend on development of a complete and accurate factual report contemporaneous with the event.

Although certainly not an exhaustive list, law enforcement officials, first responders and others can provide invaluable assistance to the FAA by taking the actions outlined below:

(1) **Witness Identification and Interviews.** Local law enforcement is in the best position to identify potential witnesses and conduct initial interviews, documenting what they observed while the event is still fresh in their minds. In addition, local law enforcement is in an optimum position to secure all information necessary for our safety inspectors to contact these witnesses in any subsequent FAA investigation. Administrative proceedings often involve very technical issues; therefore, we expect our own safety inspectors will need to re-interview most witnesses. We are mindful that in many jurisdictions, state law may prohibit the transmission of witness statements to third parties, including the FAA. In those circumstances it is extremely important that the FAA be able to locate and conduct independent interviews of these individuals.

(2) **Identification of Operators.** Law enforcement is in the best position to contact the suspected operators of the aircraft, and any participants or support personnel accompanying the operators. Our challenges in locating violators are marked in that very few of these systems are registered in any federal database and rarely will they have identifiable markings such as used for conventional manned aircraft. Likewise, information on few of the UAS operators will be archived in a pilot data base. Many operators advertise openly on the internet. However, in our enforcement proceedings, we bear the burden of proof, and showing who actually is operating the unmanned aircraft is critical. Therefore, evidentiary thresholds must be met even when using data or video acquired via the internet. Likewise, the purpose for the operation (such as in support of a commercial venture, to further some business interest, or to secure compensation for their services) may become an important element in determining what regulations, if any, may have been violated by the operation. Identification and interview of suspected operators early on will help immeasurably to advance enforcement efforts.

(3) **Viewing and Recording the Location of the Event.** Pictures taken in close proximity to the event are often helpful in describing light and weather conditions, any damage or injuries, and the number and density of people on the surface,

particularly at public events or in densely populated areas. During any witness interviews, use of fixed landmarks that may be depicted on maps, diagrams or photographs immeasurably help in fixing the position of the aircraft, and such landmarks also should be used as a way to describe lateral distances and altitude above the ground, structures or people (e.g. below the third floor of Building X, below the top of the oak tree located Y, anything that gives reference points for lay witnesses).

(4) **Identifying Sensitive Locations, Events, or Activities.** The FAA maintains a variety of security-driven airspace restrictions around the country to help protect sensitive locations, events, and activities through Temporary Flight Restrictions (TFR), Prohibited Areas, and other mechanisms such as the Washington, DC Flight Restricted Zone (DC FRZ). UAS operations, including Model Aircraft flights, are generally prohibited within these defined volumes of airspace. LEAs should become familiar with the steady-state airspace restrictions active within their area of responsibility, along with as-needed TFRs, which could be instituted to help protect sensitive events (e.g., major gatherings of elected officials) and activities (e.g., Presidential movements). If there is any question as to whether a TFR has been established in a given location, contact the nearest air traffic facility or flight service station for further information or visit http://tfr.faa.gov/tfr2/list.html for a graphic representation of TFRs locatable by state and effective dates.

(5) **Notification.** Immediate notification of an incident, accident or other suspected violation to one of the FAA Regional Operation Centers (ROC) located around the country is valuable to the timely initiation of the FAA's investigation. These centers are manned 24 hours a day, 7 days a week with personnel who are trained in how to contact appropriate duty personnel during non-business hours when there has been an incident, accident or other matter that requires timely response by FAA employees. A list of these centers and telephone numbers is included as Attachment B to this letter.

(6) **Evidence Collection.** Identifying and preserving any public or private security systems that may provide photographic or other visual evidence of UAS operations, including video or still picture security systems can provide essential evidence to the FAA. Many times these systems do not permanently store information but erase it as the system recycles at a given interval. Local law enforcement is in the best position to inquire and make initial requests to identify and preserve this form of evidence or obtain legal process for securing this evidence in the context of an investigation of a possible violation of state criminal law. In addition, some UAS may be marked with identification numbers ("N-numbers") signifying FAA registration. The presence or lack of these identification numbers may be significant in an FAA investigation. For example, an operator may state that he or she is conducting an approved commercial activity, which usually requires registered aircraft. However, the absence of registration markings on the UAS may indicate that the aircraft is not registered, meaning the operation may not be authorized. Note that identification numbers may not be conspicuous from a distance because of the size and non-traditional configuration of some UAS. The registered owners

of UAS bearing identification numbers can be found by searching for the N-number on the FAA's website: www.faa.gov.

Virtually all of the items listed above are already in the tool box for law enforcement officers. Other investigative methods also may prove useful, such as consensual examination of the UAS, equipment trailers and the like. However, other law enforcement processes, such as arrest and detention or non-consensual searches almost always fall outside of the allowable methods to pursue administrative enforcement actions by the FAA unless they are truly a by-product of a state criminal investigation. We do not mean to discourage use of these methods and procedures where there is an independent basis for them under state or local law. We simply wish to emphasize that work products intended for FAA use generally should involve conventional administrative measures such as witness interviews, "stop and talk" sessions with suspected violators, consensual examination of vehicles and equipment, and other methods that do not involve court orders or the potential use of force by law enforcement personnel.

It is extremely difficult to provide a "one size fits all" guide to cooperative investigation of unauthorized UAS operations considering the myriad jurisdictions and the associated statutory and constitutional restraints and requirements. State and local officials are always urged to use their governmental unit's legal resources and their own management chain to develop acceptable protocols for dealing with these instances. In some situations, there may be legal bars to the sharing of some information or the use of databases designed for conventional law enforcement. However, with appropriate data collection during first responses and early reporting to the FAA, Federal, State and local agencies will be in the best position to both collect and share information that may be of interest to each jurisdiction. FAA aviation safety inspectors are adept at coordination with our own legal resources to ensure unauthorized operators are properly accountable for the potential risk they create to both people and property. In addition, we have specially trained inspectors within the FAA UAS Integration office who can provide expertise in this area.

If you have any questions or your agency would like to pursue advance planning on how to address these situations, please feel free to contact your local FAA Law Enforcement Assistance Special Agent or the FAA's Law Enforcement Assistance Program Office at (202) 267-4641 or (202) 267-9411.

Attachment A.

Excerpts

Presidential Movements

FDC 4/7607 ZBW RI..AIRSPACE PROVIDENCE, RHODE ISLAND..TEMPORARY FLIGHT RESTRICTIONS. OCTOBER 16, 2014 LOCAL. THIS NOTAM REPLACES NOTAM 4/7600 DUE TO SCHEDULE CHANGE. PURSUANT TO 49 USC 40103(B THE FEDERAL AVIATION ADMINISTRATION (FAA) CLASSIFIES THE AIRSPACE DEFINED IN THIS NOTAM AS 'NATIONAL DEFENSE AIRSPACE'. PILOTS WHO DO NOT ADHERE TO THE FOLLOWING PROCEDURES MAY BE INTERCEPTED DETAINED AND INTERVIEWED BY LAW ENFORCEMENT/SECURITY PERSONNEL. ANY OF THE FOLLOWING ADDITIONAL ACTIONS MAY ALSO BE TAKEN AGAINST A PILOT WHO DOES NOT COMPLY WITH THE REQUIREMENTS OR ANY SPECIAL INSTRUCTIONS OR PROCEDURES ANNOUNCED IN THIS NOTAM:
A) THE FAA MAY TAKE ADMINISTRATIVE ACTION, INCLUDING IMPOSING CIVI PENALTIES AND THE SUSPENSION OR REVOCATION OF AIRMEN CERTIFICATES; OR
B) THE UNITED STATES GOVERNMENT MAY PURSUE CRIMINAL CHARGES, INCLUDING CHARGES UNDER TITLE 49 OF THE UNITED STATES CODE, SECTION 46307; OR
C) THE UNITED STATES GOVERNMENT MAY USE DEADLY FORCE AGAINST THE AIRBORNE AIRCRAFT, IF IT IS DETERMINED THAT THE AIRCRAFT POSE AN IMMINENT SECURITY THREAT.

...

C. THE FOLLOWING OPERATIONS ARE NOT AUTHORIZED WITHIN THIS TFR: FLIGHT TRAINING, PRACTICE INSTRUMENT APPROACHES, AEROBATIC FLIGHT, GLIDER OPERATIONS, SEAPLANE OPERATIONS, PARACHUTE OPERATIONS, ULTRALIGHT, HANG GLIDING, BALLOON OPERATIONS, AGRICULTURE/CROP DUSTING, ANIMAL POPULATION CONTROL FLIGHT OPERATIONS, BANNER TOWING OPERATIONS, SIGHTSEEING OPERATIONS,MAINTENANCE TEST FLIGHTS, MODEL AIRCRAFT OPERATIONS, MODEL ROCKETRY, UNMANNED AIRCRAFT SYSTEMS (UAS), AND UTILITY AND PIPELINE SURVEY OPERATIONS.

DC FRZ

FDC 0/8326 ZDC PART 1 OF 10 FLIGHT RESTRICTIONS, WASHINGTON, DC, EFFECTIVE 1012010401 UTC UNTIL FURTHER NOTICE. THIS NOTICE WILL REPLACE NOTAM 0/9477 DUE TO A CHANGE IN RESTRICTIONS. THIS NOTAM AND A NOTAM FOR THE LEESBURG MANEUVERING AREA SUPPLEMENT SUBPART V, 14 CFR PART 93 FOR THE WASHINGTON, D.C. SPECIAL FLIGHT RULES AREA (DC SFRA). PURSUANT TO 49 USC 40103(B), THE FAA HAS ESTABLISHED THE DC SFRA AREA AS 'NATIONAL DEFENSE AIRSPACE. ANY PERSON WHO DOES NOT COMPLY WITH THE REQUIREMENTS APPLICABLE TO THE DC SFRA MAY BE INTERCEPTED, DETAINED AND INTERVIEWED BY LAW ENFORCEMENT/SECURITY PERSONNEL. ANY OF THE FOLLOWING ADDITIONAL ACTIONS MAY ALSO BE TAKEN AGAINST A PILOT WHO DOES NOT COMPLY WITH THE REQUIREMENTS OR ANY SPECIAL INSTRUCTIONS OR PROCEDURES ANNOUNCED IN THIS NOTAM: A) THE FAA MAY TAKE ADMINISTRATIVE ACTION, INCLUDING IMPOSING CIVIL PENALTIES AND THE SUSPENSION OR REVOCATION OF AIRMEN CERTIFICATES; B) THE UNITED STATES GOVERNMENT MAY PURSUE CRIMINAL CHARGES, INCLUDING CHARGES UNDER TITLE 49 OF THE UNITED STATES CODE, SECTION 46307; C) THE UNITED STATES GOVERNMENT MAY USE DEADLY FORCE AGAINST THE AIRBORNE AIRCRAFT, IF IT IS DETERMINED THAT THE AIRCRAFT POSE: AN IMMINENT SECURITY THREAT.

...

A. THE FOLLOWING OPERATIONS ARE NOT AUTHORIZED WITHIN THE DC FRZ: FLIGHT TRAINING, AEROBATIC FLIGHT, PRACTICE INSTRUMENT APPROACHES, GLIDER OPERATIONS, PARACHUTE OPERATIONS, ULTRA LIGHT, HANG GLIDING, BALLOON OPERATIONS, TETHERED BALLOONS, AGRICULTURE/CROP DUSTING, ANIMAL POPULATION CONTROL FLIGHT OPERATIONS, BANNER TOWING OPERATIONS, MAINTENANCE TEST FLIGHTS, MODEL AIRCRAFT OPERATIONS, MODEL ROCKETRY, FLOAT PLANE OPERATIONS, UNMANNED AIRCRAFT SYSTEMS (UAS) AND AIRCRAFT/HELICOPTERS OPERATING FROM A SHIP OR PRIVATE/CORPORATE YACHT. B. IT IS HIGHLY RECOMMENDED THAT A PILOT CONTINUOUSLY MONITOR VHF FREQUENCY 121.5 OR UHF FREQUENCY 243.0 FOR EMERGENCY INSTRUCTIONS WHEN OPERATING AN AIRCRAFT IN THE DC FRZ, EITHER IN AN AIRCRAFT THAT IS SUITABLY EQUIPPED, OR BY USE OF PORTABLE EQUIPMENT.

Avoidance of Power Plans Etc. *(Applied to all Aircraft, including UAS)*

FDC 4/0811 SPECIAL NOTICE. THIS IS A RESTATEMENT OF A PREVIOUSLY ISSUED ADVISORY NOTICE. IN THE INTEREST OF NATIONAL SECURITY AND TO THE EXTENT PRACTICABLE, PILOTS ARE STRONGLY ADVISED TO AVOID THE AIRSPACE ABOVE, OR IN PROXIMITY TO SUCH SITES AS POWER PLANTS (NUCLEAR, HYDRO-ELECTRIC, OR COAL), DAMS, REFINERIES, INDUSTRIAL COMPLEXES, MILITARY FACILITIES AND OTHER SIMILAR FACILITIES. PILOTS SHOULD NOT CIRCLE AS TO LOITER IN THE VICINITY OVER THESE TYPES OF FACILITIES.

Select Sporting Events FDC 4/3621 FDC SPECIAL SECURITY NOTICE. SPORTING EVENTS. THIS NOTAM REPLACES FDC NOTAM 9/5151 TO REFLECT A TSA WEBSITE UPDATE AND ADDITIONAL INFORMATION CONCERNING AIRSPACE WAIVERS. FLIGHT RESTRICTIONS IN THIS NOTAM COMPLY WITH STATUTORY MANDATES DETAILED IN SECTION 352 OF PUBLIC LAW 108-7 AS AMENDED BY SECTION 521 OF PUBLIC LAW 108-199. PURSUANT TO 49 USC 40103(B), THE FEDERAL AVIATION ADMINISTRATION (FAA) CLASSIFIES THE AIRSPACE DEFINED IN THIS NOTAM AS 'NATIONAL DEFENSE AIRSPACE'. ANY PERSON WHO KNOWINGLY OR WILLFULLY VIOLATES THE RULES PERTAINING TO OPERATIONS IN THIS AIRSPACE MAY BE SUBJECT TO CERTAIN CRIMINAL PENALTIES UNDER 49 USC 46307. PILOTS WHO DO NOT ADHERE TO THE FOLLOWING PROCEDURES MAY BE INTERCEPTED, DETAINED AND INTERVIEWED BY LAW ENFORCEMENT/SECURITY PERSONNEL. PURSUANT TO 14 CFR SECTION 99.7, SPECIAL SECURITY INSTRUCTIONS, COMMENCING ONE HOUR BEFORE THE SCHEDULED TIME OF THE EVENT UNTIL ONE HOUR AFTER THE END OF THE EVENT. ALL AIRCRAFT OPERATIONS; INCLUDING PARACHUTE JUMPING, UNMANNED AIRCRAFT AND REMOTE CONTROLLED AIRCRAFT, ARE PROHIBITED WITHIN A 3 NMR UP TO AND INCLUDING 3000 F AGL OF ANY STADIUM HAVING A SEATING CAPACITY OF 30,000 OR MORE PEOPLE WHERE EITHER A REGULAR OR POST SEASON MAJOR LEAGUE BASEBALL, NATIONAL FOOTBALL LEAGUE, OR NCAA DIVISION ONE FOOTBALL GAME IS OCCURRING. THIS NOTAM ALSO APPLIES TO NASCAR SPRINT CUP, INDY CAR, AND CHAMP SERIES RACES EXCLUDING QUALIFYING AND PRE-RACE EVENTS. FLIGHTS CONDUCTED FOR OPERATIONAL PURPOSES OF ANY EVENT, STADIUM OR VENUE AND BROADCAST COVERAGE FOR THE BROADCAST RIGHTS HOLDER ARE AUTHORIZED WITH AN APPROVED AIRSPACE WAIVER. AN FAA AIRSPACE WAIVER DOES NOT RELIEVE OPERATORS FROM OBTAINING ALL OTHER NECESSARY AUTHORIZATIONS AND COMPLYING WITH ALL APPLICABLE FEDERAL AVIATION REGULATIONS. THE RESTRICTIONS DESCRIBED ABOVE DO NOT APPLY TO THOSE AIRCRAFT AUTHORIZED BY AND IN CONTACT WITH ATC FOR OPERATIONAL OR SAFETY OF FLIGHT PURPOSES, DEPARTMENT OF DEFENSE, LAW ENFORCEMENT, AND AIR AMBULANCE FLIGHT OPERATIONS. ALL PREVIOUSLY ISSUED WAIVERS TO FDC NOTAM 9/5151 REMAIN VALID UNTIL THE SPECIFIED END DATE BUT NOT TO EXCEED 90 DAYS FOLLOWING THE EFFECTIVE DATE OF THIS NOTAM. INFORMATION ABOUT AIRSPACE WAIVER APPLICATIONS AND TSA SECURITY AUTHORIZATIONS CAN BE FOUND AT HTTP://WWW.TSA.GOV/STAKEHOLDERS/AIRSPACE-WAIVERS-0 OR BY CALLING TSA AT 571-227-2071. SUBMIT REQUESTS FOR FAA AIRSPACE WAIVERS AT HTTPS://WAIVERS.FAA.GOV

Disney Theme Parks

FDC 4/XXXX ZZZ SECURITY SPECIAL NOTICE DISNEY WORLD THEME PARK ORLANDO FL THIS NOTAM REPLACES NOTAM 9/4985 TO REFLECT A TSA WEBSITE UPDATE AND ADDITIONAL INFORMATION CONCERNING AIRSPACE WAIVERS. FLIGHT RESTRICTIONS IN THIS NOTAM COMPLY WITH STATUTORY MANDATES DETAILED IN SECTION 352 OF PUBLIC LAW 108-7 AS AMENDED BY SECTION 521 OF PUBLIC LAW 108-199. PURSUANT TO 49 USC 40103(B), THE FEDERAL AVIATION ADMINISTRATION (FAA) CLASSIFIES THE AIRSPACE DEFINED IN THIS NOTAM AS 'NATIONAL DEFENSE AIRSPACE'. AN PERSON WHO KNOWINGLY OR WILLFULLY VIOLATES THE RULES PERTAINING TO OPERATIONS IN THIS AIRSPACE MAY BE SUBJECT TO CERTAIN CRIMINAL PENALTIES UNDER 49 USC 46307. PILOTS WHO DO NOT ADHERE TO THE FOLLOWING PROCEDURES MAY BE INTERCEPTED, DETAINED AND INTERVIEWED BY LAW ENFORCEMENT/SECURITY PERSONNEL. PURSUANT TO 14 CFR SECTION 99.7, SPECIAL SECURITY INSTRUCTIONS, ALL AIRCRAFT FLIGHT OPERATIONS TO INCLUDE UNMANNED AND REMOTE CONTROLLED AIRCRAFT ARE PROHIBITED WITHII A 3 NMR OF 282445N/0813420W OR THE ORL238014.8 UP TO AND INCLUDING 3000 FT AGL. THE RESTRICTIONS DO NOT APPLY TO THOSE AIRCRAFT AUTHORIZED BY AND IN CONTACT WITH ATC FOR OPERATIONAL OR SAFET OF FLIGHT PURPOSES, AND DEPARTMENT OF DEFENSE, LAW ENFORCEMENT, AND AIR AMBULANCE FLIGHT OPERATIONS. FLIGHTS CONDUCTED FOR OPERATIONAL PURPOSES OF ANY DISNEY WORLD EVEN AND VENUE ARE AUTHORIZED WITH AN APPROVED WAIVER. AN FAA AIRSPACE WAIVER DOES NOT RELIEVE OPERATORS FROM OBTAINING ALL OTHER NECESSARY AUTHORIZATIONS AND COMPLYING WITH ALL APPLICABLE FEDERAL AVIATION REGULATIONS. ALL PREVIOUSLY ISSUED WAIVERS TO FDC NOTAM 4/4985 REMAIN VALID UNTIL THE SPECIFIED END DATE BUT NOT TO EXCEED 90 DAYS FOLLOWING THE EFFECTIVE DATE OF THIS NOTAM. INFORMATION ABOUT AIRSPACE WAIVER APPLICATIONS AND TSA SECURITY AUTHORIZATIONS CAN BE FOUND AT HTTP://WWW.TSA.GOV/STAKEHOLDERS/AIRSPACE-WAIVERS-0 OR BY CALLING TSA AT 571-227-2071. SUBMIT REQUESTS FOR FAA AIRSPACE WAIVERS AT HTTPS://WAIVERS.FAA.GOV

Attachment B.

Facility	States	Office	EMail
Western ROC	AK, AZ, CA, CO, HI, ID, MT, NV, OR, UT, WA and WY	425-227-1999	9-ANM-ROC@faa.gov
Central ROC	AR, IA, IL, IN, KS, LA, MI, MN, MO, ND, NE, NM, OH, OK, SD, TX and WI	817-222-5006	9-asw-operation-center@faa.gov
Southern ROC	AL, FL, GA, KY, MS, NC, PR, SC, TN and VI	404-305-5180	9-ASO-ROC@faa.gov
Eastern ROC	DC, DE, MD, NJ, NY, PA, VA and WV	718-553-3100	7-AEA-ROC@faa.gov
New England ROC	CT, MA, ME, NH, RI and VT	404-305-5156	7-ANE-OPSCTR@faa.gov
Washington WOC		202-267-3333	9-awa-ash-woc@faa.gov

Senators McCain, Flake and Ayotte Introduce UAS Improvement Act of 2015

U.S. Senators John McCain (R-AZ), Jeff Flake (R-AZ), and Kelly Ayotte (R-NH) have introduced *The Unmanned Aircraft System Improvement Act of 2015*, legislation that would provide critical reform to the U.S. Customs and Border Protection's (CBP) mismanaged Unmanned Aircraft System (UAS) programme.

The bill addresses concerns raised in a Department of Homeland Security (DHS) Inspector General Report released last month that highlighted the management failures of CBP's UAS programme to "achieve intended results or recognise all costs of operation." Specifically, the report found that the UAS programme is not meeting current flight hour goals; is not utilizing the most effective available resources; and is failing to accurately determine programme costs.

"Unmanned Aircraft Systems, when properly utilized, are critical in our fight to effectively secure the border," said Senator John McCain. "The findings released in the Inspector General Report highlight exactly where reform is needed, and this bill is an important step to ensuring our border security efforts are effective in preventing future waves of illegal border crossings."

Until DHS can better manage and utilize its current fleet of UAS, *The Unmanned Aircraft System Improvement Act of 2015* would prohibit the procurement of new UAS. In addition, the bill would require DHS to conduct continuous, 100 percent surveillance of the Southern border and coordinate with the Department of Defense to ensure the programme is utilizing "best management practices" to improve national security. Finally, the bill would require DHS to submit a detailed report to Congress regarding the programme's effectiveness.

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114TH CONGRESS
1ST SESSION

S. _____

To improve the operation of the Department of Homeland Security's Unmanned Aircraft System Program.

IN THE SENATE OF THE UNITED STATES

Mr. MCCAIN (for himself, Mr. FLAKE, and Ms. AYOTTE) introduced the following bill; which was read twice and referred to the Committee on

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A BILL

To improve the operation of the Department of Homeland Security's Unmanned Aircraft System Program.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. DEFINITIONS.

In this Act:

(1) ILLEGAL BORDER ACTIVITIES.—The term "illegal border activities" means the illegal trafficking or smuggling of an individual or controlled substances or activities to further a Federal crime relating to United States immigration, customs, con-

trolled substances, agriculture, monetary instruments, or other border controls.

(2) SOUTHERN BORDER.—The term "Southern border" means the international border between the United States and Mexico.

(3) UAS.—The term "UAS" means unmanned aircraft systems.

SEC. 2. PERSISTENT SURVEILLANCE ALONG THE SOUTHERN BORDER.

(a) IN GENERAL.—The Department of Homeland Security shall fully utilize surveillance and detection capabilities developed or used by the various Federal departments and agencies for the purpose of enhancing the functioning and operational capability to conduct continuous and integrated manned or unmanned, monitoring, sensing, or surveillance of 100 percent of Southern border mileage or the immediate vicinity of the Southern border.

(b) PROCUREMENT OF ADDITIONAL UNMANNED AIRCRAFT SYSTEMS.—

(1) IN GENERAL.—The Secretary of Homeland Security may not procure any additional UAS until after the Secretary provides Congress with written certification that the Department of Homeland Security successfully operated its current fleet of UAS

at least 23,000 hours during the preceding calendar year.

(2) EXEMPTION.—The limitation set forth in paragraph (1) shall not apply to the procurement of unmanned aircraft that do not weigh more than 150 pounds.

(c) USE OF BEST AVAILABLE RADAR AND SURVEILLANCE TECHNOLOGY.—The Department of Homeland Security shall use the best available radar and surveillance technology—

(1) to increase awareness of illegal border activities along the Southern border; and

(2) to identify gaps in surveillance capabilities.

SEC. 3. REPORT TO CONGRESS.

Not later than 90 days after the date of the enactment of this Act, and biannually thereafter, the Secretary of Homeland Security shall submit a report to the Committee on Homeland Security and Governmental Affairs of the Senate and the Committee on Homeland Security of the House of Representatives that contains, for the reporting period—

(1) the total number of UAS hours required to provide persistent surveillance along the Southern border;

(2) the total number of UAS flight hours planned in support of any Federal or State department or agency;

(3) the number of planned UAS flight hours in support of the goal referred to in paragraph (1);

(4) the number of hours in which UAS were flown in support of the goal referred to in paragraph (1);

(5) the number of planned UAS flight hours in support of the goal referred to in paragraph (1) that were cancelled before takeoff, including the reason for such cancellations;

(6) performance measures regarding—

(A) the number of hours flown by the current fleet of UAS operated by the Department of Homeland Security;

(B) the number of subjects detected though the use of UAS;

(C) the number of apprehensions assisted by the use of UAS; and

(D) the number and quantity of illicit drug seizures assisted by the use of UAS; and

(7) all accumulated cost associated with the Unmanned Aircraft System Program within the Department of Homeland Security, including—

(A) salaries of pilots; and

(B) costs associated with radar and surveillance technology.

SEC. 4. INTERAGENCY COLLABORATION.

The Secretary of Homeland Security shall consult with the Secretary of Defense to identify the best practices used by the Department of Defense that could also be used by the Department of Homeland Security to improve the security of the Southern border by enhancing wide aerial surveillance and fulfilling the requirements set forth in section 2.

SEC. 5. SUNSET.

This Act shall be repealed on the date that is 5 years after the date of the enactment of this Act.

Ginger Blaisdell

From: Binder, John R (DOT) <john.binder@alaska.gov>
Sent: Wednesday, January 14, 2015 8:55 PM
To: Ginger Blaisdell
Subject: FW: Ask NASAO ~ Integration of UAS into the NAS

Categories: Drone

Ginger - Thought you might find the proposed California legislation linked below relating to UAS operation by public agencies interesting. Not in any way advocating for/against, but indicates the direction some states are moving on this issue. My interpretation is that state agency use in performing core missions would be unaffected, which probably begs the question of why then is legislation required?

Fodder for the next meeting.

John R. Binder III
Acting Commissioner
907-465-3901

Alaska Department of Transportation & Public Facilities
Keep Alaska Moving through Service and Infrastructure

From: Stevens, Kim [mailto:kstevens@nasao.org]
Sent: Wednesday, January 14, 2015 9:04 AM
To: Kim Stevens
Cc: carol.glatfelter@dot.ca.gov
Subject: Ask NASAO ~ Integration of UAS into the NAS

California is seeking your help. They are being asked to analyze a state bill on unmanned aerial systems and are seeking input from other states on any similar action you might be taking in regard to the integration of UAS into the NAS.

California Assembly Bill 37 Unmanned Aerial Systems, would generally prohibit public agencies from using unmanned aircraft systems, or contracting for the use of unmanned aircraft
systems: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB37

There is a section on the analysis form that says: "What other states are doing" pertaining to this bill or one similar in other states.

Please respond with any information to Carol, carol.glatfelter@dot.ca.gov and copy me. Thank you!

Kim Stevens
Director, Communications/Operations
National Association of State Aviation Officials
8400 Westpark Drive, 2nd Floor
McLean, VA 22102
703-610-0223; Fax 703-995-0837

California LEGISLATIVE INFORMATION

AB-37 Unmanned aircraft systems. (2015-2016)

CALIFORNIA LEGISLATURE— 2015–2016 REGULAR SESSION

ASSEMBLY BILL **No. 37**

Introduced by Assembly Member Campos

December 01, 2014

An act to add Section 6254.31 to the Government Code, and to add Title 14 (commencing with Section 14350) to Part 4 of the Penal Code, relating to unmanned aircraft systems.

LEGISLATIVE COUNSEL'S DIGEST

AB 37, as introduced, Campos. Unmanned aircraft systems.

Existing federal law, the Federal Aviation Administration Modernization and Reform Act of 2012, provides for the integration of civil unmanned aircraft systems, commonly known as drones, into the national airspace system by September 30, 2015. Existing federal law requires the Administrator of the Federal Aviation Administration to develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system by December 31, 2015.

This bill would generally prohibit public agencies from using unmanned aircraft systems, or contracting for the use of unmanned aircraft systems, as defined, with certain exceptions applicable to law enforcement agencies and in certain other cases, including when the use or operation of the unmanned aircraft system achieves the core mission of the agency and the purpose is unrelated to the gathering of criminal intelligence, as defined.

The bill would require reasonable public notice to be provided by public agencies intending to deploy unmanned aircraft systems, as specified. The bill would require images, footage, or data obtained through the use of an unmanned aircraft system under these provisions to be permanently destroyed within one year, except as specified. The bill would generally prohibit images, footage, or data obtained through the use of an unmanned aircraft system under these provisions from being disseminated outside the collecting public agency, except as specified. Unless authorized by federal law, the bill would prohibit a person or entity, including a public agency subject to these provisions, or a person or entity under contract to a public agency, for the purpose of that contract, from equipping or arming an unmanned aircraft system with a weapon or other device that may be carried by or launched from an unmanned aircraft system and that is intended to cause bodily injury or death, or damage to, or the destruction of, real or personal property. The bill would also provide that specified surveillance restrictions on electronic devices apply to the use or operation of an unmanned aircraft system by a public agency.

The bill would apply its provisions to all public and private entities when contracting with a public agency for the use of an unmanned aircraft system.

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Existing law, the California Public Records Act, requires state and local agencies to make public records available for inspection, subject to certain exceptions.

This bill would make certain images, footage, or data obtained through the use of an unmanned aircraft system under its provisions, or any related record, including, but not limited to, usage logs or logs that identify any person or entity that subsequently obtains or requests records of that system, subject to disclosure. The bill would except from disclosure above images, footage, data, and records obtained through the use of an unmanned aircraft system, if disclosure would endanger the safety of a person involved in an investigation, or would endanger the successful completion of the investigation.

Existing constitutional provisions require that a statute that limits the right of access to the meetings of public bodies or the writings of public officials and agencies be adopted with findings demonstrating the interest protected by the limitation and the need for protecting that interest.

This bill would make legislative findings to that effect.

Vote: majority Appropriation: no Fiscal Committee: yes Local Program: no

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. Section 6254.31 is added to the Government Code, to read:

6254.31. (a) Notwithstanding any provision of this chapter, images, footage, or data obtained through the use of an unmanned aircraft system pursuant to Title 14 (commencing with Section 14350) of Part 4 of the Penal Code, or any related record, including, but not limited to, usage logs or logs that identify any person or entity that subsequently obtains or requests records of that system, are public records subject to disclosure.

(b) Notwithstanding subdivision (a), nothing in this chapter or any other law requires the disclosure of images, footage, or data obtained through the use of an unmanned aircraft system, or any related record, including, but not limited to, usage logs or logs that identify any person or entity that subsequently obtains or requests records of that system, to the extent that disclosure of the images, footage, data, or records would endanger the safety of a person involved in an investigation, or would endanger the successful completion of the investigation.

SEC. 2. Title 14 (commencing with Section 14350) is added to Part 4 of the Penal Code, to read:

TITLE 14. UNMANNED AIRCRAFT SYSTEMS

14350. (a) A public agency shall not use an unmanned aircraft system, or contract for the use of an unmanned aircraft system, except as provided in this title. This title shall apply to all public and private entities when contracting with a public agency for the use of an unmanned aircraft system.

(b) A law enforcement agency may use an unmanned aircraft system if it has obtained a warrant based on probable cause pursuant to this code.

(c) A law enforcement agency, without obtaining a warrant, may use an unmanned aircraft system in all of the following circumstances:

(1) In emergency situations if there is an imminent threat to life or of great bodily harm, including, but not limited to, fires, hostage crises, "hot pursuit" situations if reasonably necessary to prevent harm to law enforcement officers or others, and search and rescue operations on land or water.

(2) To assess the necessity of first responders in situations relating to traffic accidents.

(3) (A) To inspect state parks and wilderness areas for illegal vegetation or fires.

(B) For purposes of this paragraph, "wilderness areas" means public lands without permanent improvements or human habitation.

(4) To determine the appropriate response to an imminent or existing environmental emergency or disaster, including, but not limited to, oils spills or chemical spills.

(d) A public agency other than a law enforcement agency may use an unmanned aircraft system, or contract for the use of an unmanned aircraft system, to achieve the core mission of the agency provided that the purpose is unrelated to the gathering of criminal intelligence.

(e) A public agency that is not primarily a law enforcement agency, but that employs peace officers or performs functions related to criminal investigations, may use an unmanned aircraft system without obtaining a warrant to achieve the core mission of the agency provided that the purpose is unrelated to the gathering of criminal intelligence, and that the images, footage, or data are not used for any purpose other than that for which it was collected.

14351. A public agency that uses an unmanned aircraft system, or contracts for the use of an unmanned aircraft system, pursuant to this title shall first provide reasonable notice to the public. Reasonable notice shall, at a minimum, consist of a one-time announcement regarding the agency's intent to deploy unmanned aircraft system technology and a description of the technology's capabilities.

14352. (a) (1) (A) Except as permitted by this title, images, footage, or data obtained by a public agency, or any entity contracting with a public agency, pursuant to this title shall not be disseminated to a law enforcement agency unless the law enforcement agency has obtained a warrant for the images, footage, or data based on probable cause pursuant to this code, or the law enforcement agency would not have been required to obtain a warrant to collect the images, footage, or data itself, as specified in Section 14350.

(B) A public agency that is not primarily a law enforcement agency, but that employs peace officers or performs functions related to criminal investigations, may disseminate images, footage, or data collected pursuant to Section 14350 if the dissemination is to others within that agency.

(2) Except as permitted by this title, images, footage, or data obtained by a public agency, or any entity contracting with a public agency, through the use of an unmanned aircraft system shall not be disseminated outside the collecting public agency, unless one of the following circumstances applies:

(A) Images, footage, or data obtained by a public agency through the use of an unmanned aircraft system may be disseminated to another public agency that is not a law enforcement agency if the images, footage, or data are related to the core mission of both public agencies involved in the sending or receiving of the images, footage, or data.

(B) Images, footage, or data obtained by a public agency through the use of an unmanned aircraft system may be disseminated outside the collecting public agency if the images, footage, or data are evidence in any claim filed or any pending litigation.

(C) Images, footage, or data obtained by a public agency through the use of an unmanned aircraft system may be disseminated to a private entity if both of the following conditions are satisfied:

(i) The collecting public agency is not a law enforcement agency.

(ii) The images, footage, or data are related to the core function of the collecting public agency.

(3) A public agency may make available to the public images, footage, or data obtained by the public agency through the use of an unmanned aircraft system if both of the following conditions are satisfied:

(A) The images, footage, or data do not depict or describe any individual or group of individuals, or the activities of any individual or group of individuals whose identity or identities can be ascertained.

(B) The disclosure of the images, footage, or data is required to fulfill the public agency's statutory or mandatory obligations.

(b) Except as permitted by this title, images, footage, or data obtained by a public agency through the use of an unmanned aircraft system shall not be used by the public agency for any purpose other than that for which it was collected.

(c) (1) Images, footage, or data obtained through the use of an unmanned aircraft system shall be permanently destroyed within one year, except that a public agency may retain the images, footage, or data in all of the following circumstances:

(A) For training purposes. Images, footage, or data retained for training purposes shall be used only for the education and instruction of a public agency's employees in matters related to the mission of the public agency and for no other purpose.

(B) For academic research or teaching purposes. Images, footage, or data retained for academic research or teaching purposes shall be used only for the advancement of research and teaching conducted by an academic or research institution and matters related to the mission of the institution and for no other purpose.

(C) For purposes of monitoring material assets owned by the public agency.

(D) For environmental, public works, or land use management or planning by the public agency.

(2) Notwithstanding paragraph (1), a public agency may retain beyond one year images, footage, or data obtained through the use of an unmanned aircraft system in both of the following circumstances:

(A) If a warrant authorized the collection of the images, footage, or data.

(B) If the images, footage, or data are evidence in any claim filed or any pending litigation or enforcement proceeding.

14353. Unless authorized by federal law, a person or entity, including a public agency subject to Section 14350 or a person or entity under contract to a public agency, for the purpose of that contract, shall not equip or arm an unmanned aircraft system with a weapon or other device that may be carried by or launched from an unmanned aircraft system and that is intended to cause bodily injury or death, or damage to, or the destruction of, real or personal property.

14354. All unmanned aircraft systems shall be operated so as to minimize the collection of images, footage, or data of persons, places, or things not specified with particularity in the warrant authorizing the use of an unmanned aircraft system, or, if no warrant was obtained, for purposes unrelated to the justification for the operation.

14355. (a) This title is not intended to conflict with or supersede federal law, including rules and regulations of the Federal Aviation Administration.

(b) A local legislative body may adopt more restrictive policies on the acquisition or use of unmanned aircraft systems.

14356. For the purposes of this title, the following definitions shall apply:

(a) "Criminal intelligence" means information compiled, analyzed, or disseminated in an effort to anticipate, prevent, monitor, or investigate criminal activity.

(b) "Law enforcement agency" means the Attorney General of the State of California, each district attorney, and each agency of the State of California authorized by statute to investigate or prosecute law violators.

(c) "Public agency" means and includes each state agency and each local agency.

(d) "Unmanned aircraft system" means an unmanned aircraft and associated elements, including communication links and the components that control the unmanned aircraft, that are required for the pilot in command to operate safely and efficiently in the national airspace system.

14357. Except as provided in this title, the surveillance restrictions on electronic devices described in Chapter 1.5 (commencing with Section 630) of Title 15 of Part 1 shall apply to the use or operation of an unmanned aircraft system by a public agency.

SEC. 3. The Legislature finds and declares that Section 1 of this act, which adds Section 6254.31 of the Government Code, imposes a limitation on the public's right of access to the meetings of public bodies or the writings of public officials and agencies within the meaning of Section 3 of Article I of the California Constitution. Pursuant to that constitutional provision, the Legislature makes the following findings to demonstrate the interest protected by this limitation and the need for protecting that interest:

In order to ensure the safety of persons involved in investigations and to preserve the integrity of those investigations, it is necessary that this act take effect.

Ginger Blaisdell

From: McKenzie, Connie (Murkowski) <Connie_McKenzie@murkowski.senate.gov>
Sent: Thursday, February 05, 2015 11:42 AM
To: Ginger Blaisdell
Subject: FW: Murkowsk, Young Introduce Bicameral Bills Pushing for Safe Drone Usage
Attachments: 15.02.05.UAS.Bill.pdf

Categories: Drone

FYI

Connie

From: Felling, Matthew (Murkowski) **On Behalf Of** Press Office (Murkowski)
Sent: Thursday, February 05, 2015 3:17 PM
Subject: Murkowsk, Young Introduce Bicameral Bills Pushing for Safe Drone Usage

FROM THE OFFICES OF...
SENATOR MURKOWSKI & CONGRESSMAN YOUNG
ALASKA

FOR IMMEDIATE RELEASE
February 5, 2015

Contact: Matthew Felling 202.224.9301
or Matthew Shuckerow 202.225-0722

Murkowsk, Young Introduce Bicameral Bills Pushing for Safe Drone Usage

Lawmakers: Policies Needed to Establish "Rules of the Road,"

Bill Can Be "Game Changer" for Arctic Research Funding Opportunities

WASHINGTON, D.C. – Senator Lisa Murkowski and Congressman Don Young announced companion legislation in both chambers of Congress aimed at urging the Federal Aviation Administration to create policies for safe usage of unmanned aerial systems (UAS) across America's skies. Senator Lisa Murkowski introduced the bipartisan Safe Skies for Unmanned Aircraft Act of 2015 with co-sponsors Heidi Heitkamp (D-ND) and Ron Wyden (D-OR) in the Senate, and Congressman Young introduced legislation by the same name in the House of Representatives.

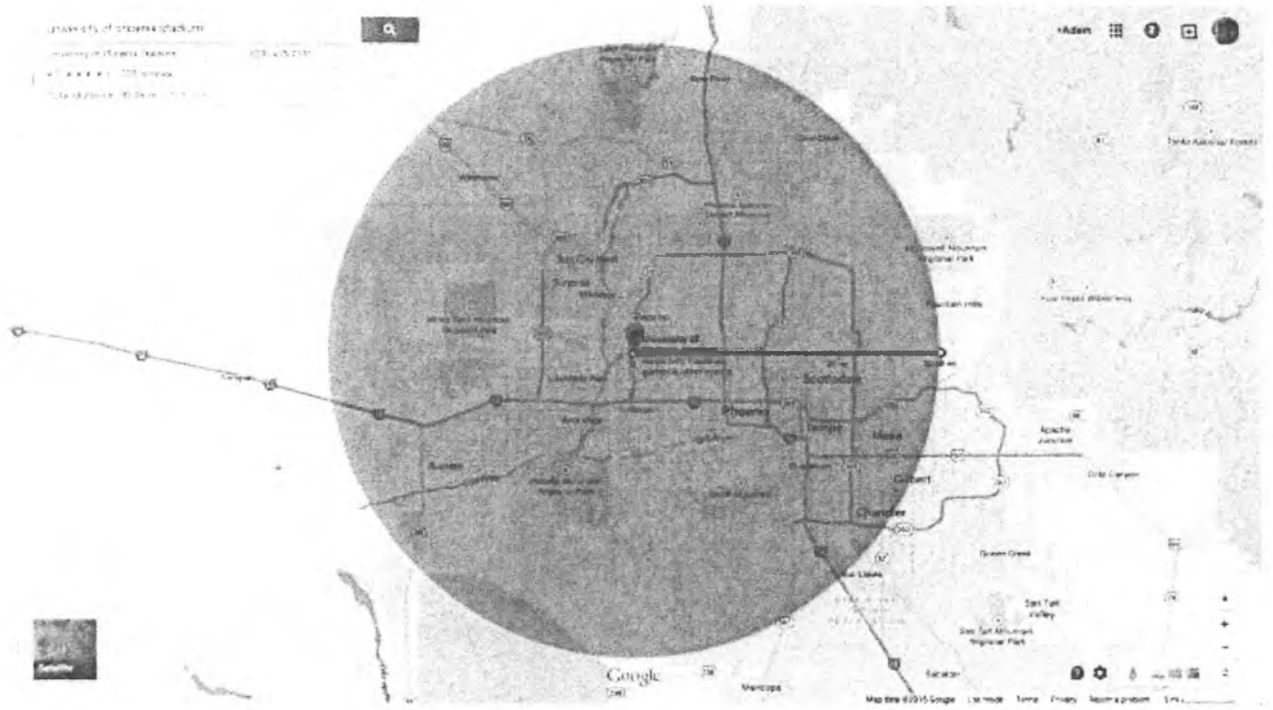
Beyond promoting safety in the air, the bill:

- Opens the door for public-private partnerships to support UAS research, allowing universities to accept research funding from the private sector, and saving American taxpayers money.
- Requires the FAA to remove bureaucratic hurdles to research operations for safe beyond 'line of sight' flying, an important research tool for medium- and long-distance applications.

"As we see more and more unmanned aircraft in use, it's critical that we lay out rules of the road – and this bill starts by telling the FAA to get to work," Murkowski said. "One of the most pressing items we discussed last week at the Arctic Encounter Symposium was how unmanned aerial systems can be game changers for Alaska, to work around our distances and lack of infrastructure. Arctic research, delivering goods in the Bush, fire-fighting and policing in rural areas are all new possibilities for us, and with the private sector investing in research today, we can all benefit tomorrow."

"In the last FAA reauthorization, Congress directed the creation of six regional UAS tests sites; however no funds were set aside to ensure their success," said Congressman Young. "Our legislation will clear significant roadblocks that stand in the way of successful research activities, and work to strengthen and empower UAS test sites for the benefit of the FAA and all stakeholders."

The lack of any rules or policies governing UAS was evident in last weekend's Super Bowl. Because the FAA had no laws to enforce, it was forced to create a "No Drone Zone" spanning 30 miles in all directions around the stadium – totaling over 2,800 square miles. (Larger than the state of Delaware.) Rules like those promoted by today's bill would help limit such overbroad restrictions.



(The "No Drone Zone" for the Super Bowl was larger than the Municipality of Anchorage and the State of Delaware.)

The Safe Skies for Unmanned Aircraft Act of 2015 aims to redefine how the FAA considers unmanned aerial systems – giving them greater autonomy and opportunities like those seen in commercial aviation. FAA's currently bans universities from working with private sponsors to develop and research unmanned aircraft technology applications. The delegation, working in conjunction with the University of Alaska Fairbanks, believe the private sector must be allowed and encouraged to invest and participate in research activities.

###

Note: Please do not reply to this email. This mailbox is unattended. For further information, please contact Senator Murkowski's press office at 202-224-9301 or 202-224-8069. Visit our website at http://murkowski.senate.gov

114TH CONGRESS
1ST SESSION

S. _____

To require the Administrator of the Federal Aviation Administration to use the definitions in section 40125 of title 49, United States Code, in determining whether an unmanned aircraft conducting aeronautical research flights qualifies for public aircraft status under that section, and for other purposes.

IN THE SENATE OF THE UNITED STATES

Ms. MURKOWSKI (for herself, Mr. WYDEN, and Ms. HEITKAMP) introduced the following bill; which was read twice and referred to the Committee on _____

A BILL

To require the Administrator of the Federal Aviation Administration to use the definitions in section 40125 of title 49, United States Code, in determining whether an unmanned aircraft conducting aeronautical research flights qualifies for public aircraft status under that section, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Safe Skies for Unmanned Aircraft Act of 2015".

SEC. 2. PUBLIC AIRCRAFT OPERATING STATUS OF UNMANNED AIRCRAFT USED IN AERONAUTICAL RESEARCH FLIGHTS; SAFETY PROCEDURES FOR SUCH FLIGHTS.

(a) PUBLIC AIRCRAFT OPERATING STATUS.—In determining whether an unmanned aircraft used in the conduct of aeronautical research qualifies as a public aircraft under section 40125 of title 49, United States Code, the Administrator of the Federal Aviation Administration shall—

(1) for purposes of determining whether the aircraft is used for a commercial purpose, use only the definition given that term in subsection (a) of such section; and

(2) for purposes of determining whether the aircraft, including airborne platforms and systems, is used for aeronautical research and platform-based research, include atmospheric and natural resources research, meteorological observation, and airborne astronomy as aeronautical research.

(b) PROCEDURES FOR BEYOND-LINE-OF-SIGHT OPERATIONS.—

(1) IN GENERAL.—Not later than 90 days after the date of the enactment of this Act, the Administrator shall develop and implement procedures for safe, beyond-line-of-sight operations in the national

airspace system by unmanned aircraft conducting aeronautical research.

(2) CONSIDERATIONS FOR APPROVAL.—In developing the procedures required by paragraph (1) relating to beyond-line-of-sight operations by unmanned aircraft described in that paragraph, the Administrator shall ensure that a decision to approve such an operation takes into consideration the safety of the entire operation, including whether any provisions required to be included in the certificate of authorization for the operation result in additional safety risk to any individual associated with the operation.

(c) UNMANNED AIRCRAFT DEFINED.—In this section, the term "unmanned aircraft" has the meaning given that term in section 331 of the FAA Modernization and Reform Act of 2012 (Public Law 112–95; 49 U.S.C. 40101 note).

Ginger Blaisdell

From: Rep. Shelley Hughes
Sent: Wednesday, February 04, 2015 8:10 PM
To: Ginger Blaisdell
Subject: FW: a picture that tells a story (on hobby UASs)
Attachments: IMG_0953.JPG

Categories: Drone

Plz include pic in packet next week.

Shelley Hughes
Representative
Alaska State Legislature
Serving Greater Palmer
Room 13 State Capitol Building
Juneau, Alaska 99801
(907) 465-3743
1-800-565-3743

If you would like to subscribe to my newsletter, please click here.

From: Steve Poirot [mailto:steve.poirot@fairweather.com]
Sent: Wednesday, February 04, 2015 4:23 PM
To: Rep. Shelley Hughes
Subject: Fwd: a picture that tells a story (on hobby UASs)

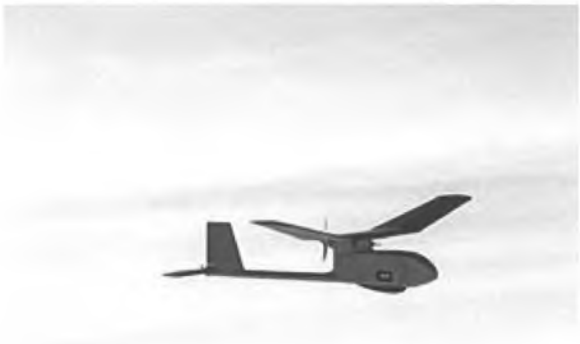
Hi Shelley, I had your address wrong when I tried to send this before.. hope you're doing well!

---------- Forwarded message ----------
From: **Steve Poirot** <steve.poirot@fairweather.com>
Date: Wed, Feb 4, 2015 at 4:09 PM
Subject: a picture that tells a story (on hobby UASs)
To: Shelley.Hughes@akleg.gov, jeremy.worrall@alaska.gov

Hi,

This picture was taken about 1/2 mile from Campbell Lake, which is a seaplane port, and less than 3 miles from the departure end of Anchorage Runway 7L, and it is on Anchorage's Chickaloon Departure route.

Bayshore
COMMUNITY EVENTS
LOST: REMOTE HELICOPTOR IF
FOUND PLEASE CALL 230 [illegible]
NO
SOLICITING
PLEASE
BAYSHORE
CLUBHOUSE



Unmanned Aircraft Systems: An Economic Development Strategy for Alaska

January 27, 2015

Prepared for the State of Alaska, Department of Commerce, Community, and Economic Development, Division of Economic Development

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Aerospace Corporation
ACTD	Advanced Concept Technology Demonstration
ACUASI	Alaska Center for Unmanned Aircraft Systems Integration
ADSB	Automatic Dependent Surveillance-Broadcast
AFB	Air Force Base
AIDEA	Alaska Industrial Development and Export Authority
AK ANG	Alaska Air National Guard
AMOC	Alternate Method of Compliance
ATTREX	Airborne Tropical Tropo-pause Experiment
AUVSI	Association for Unmanned Vehicle Systems International
AVAPS	Advanced Vertical Atmospheric Profiling System
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BP	British Petroleum
C2	Command and Control
CAD/CAM	Computer-aided Design/Computer-aided Manufacturing
CARVE	Carbon in Arctic Reservoirs Vulnerability Experiment
CBP	Customs and Border Protection
CFR	Code of Federal Regulations
CNC	Computer Numerical Control
COA	Certificate of Waiver/Authorization
CONOPS	Concept of Operations
CPB	Customs and Border Protection
CSAR	Combat Search and Rescue
CTA	Continental Control Area
DCCED	Department of Commerce, Community and Economic Development, State of Alaska
DETR	Department of Employment, Training and Rehabilitation, State of Nevada
DHS	Department of Homeland Security
DoD	Department of Defense

DOI	Department of Interior
DMVA	Department of Military and Veterans Affairs, State of Alaska
DOT&PF	Department of Transportation and Public Facilities, State of Alaska
EDCO	Economic Development for Central Oregon
EO	Electro-optical
EXCOM	UAS Executive Committee
FAA	Federal Aviation Administration
FEDC	Fairbanks Economic Development Corporation
FEMA	Federal Emergency Management Agency
FIR	Flight Information Region
FMRA	FAA Modernization and Reform Act of 2012
GDP	Gross Domestic Product
GOED	Governor's Office of Economic Development, State of Nevada
GWOT	Global War on Terrorism
HAMSR	High-Altitude MMIC Sounding Radiometer (MMIC also an acronym)
HF	High Frequency
HIRAD	Hurricane Imaging Radiometer
HIWRAP	High-Altitude Imaging Wind and Rain Airborne Profiler
HS3	Hurricane and Severe Storm Sentential
ICAO	International Civil Aviation Organization
IR	Infra-red
ISR	Intelligence Surveillance and Reconnaissance
JPARC	Joint Pacific Alaska Range Complex
LTFUAS	Legislative Task Force on Unmanned Aircraft Systems (Alaska)
MAAP	Mid-Atlantic Aviation Partnership
MIZOPEX	Marginal Ice Zone Observations and Processes Experiment
MODIS	Moderate Resolution Imaging Spectroradiometer
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NGA	National Geospatial-Intelligence Agency
NIAS	Nevada Institute for Autonomous Systems

NIC	Nanook Innovation Corporation
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NSSI	North Slope Science Initiative
NTV	Nanook Tech Ventures
OAM	Office of Air and Marine
OCS	Outer Continental Shelf
OEM	Original Equipment Manufacturer
OIPC	Office of Intellectual Property and Commercialization (UAF)
OR-UAS	Oregon Unmanned Aircraft Systems Business Enterprise
OSU	Oregon State University
PPUTRC	Pan-Pacific UAS Test Range Complex
PUR	Pendleton UAS Range
RCC	Rescue Coordination Center
R&D	Research & Development
ROW	Rights-of-Way
RT&D	Research and Technical Development
RDT&E	Research, Development, Testing and Evaluation
SAC	Special Airworthiness Certificate
SAREX	Search and Rescue Exercise
S-HIS	Scanning High-resolution Interferometer Sounder
SME	Subject Matter Expert
SSS	Sea Surface Salinity
SST	Sea Surface Temperature
TAMCC	Texas A&M Corpus Christi
TEES	Texas A&M Engineering Experiment Station
UA	University of Alaska
UAA	University of Alaska Anchorage
UAF	University Alaska Fairbanks
UAF-GI	University of Alaska Fairbanks Geophysical Institute
UAS	Unmanned Aircraft Systems

UAS	University of Alaska Southeast (for purposes of this document no acronym will be used)
UAV	Unmanned Aircraft Vehicle
USAF	US Air Force
USDA	US Department of Agriculture
USFS	US Forest Service
USGS	US Geological Survey
UNLV	University of Nevada Las Vegas
UTARI	University of Texas at Arlington Research Institute
VaCAS	Virginia Center for Autonomous Systems
VC	Venture Capital
WISPAR	Winter Storms and Pacific Atmospheric Rivers

PURPOSE

The State of Alaska Department of Commerce, Community, and Economic Development, Division of Economic Development, and the University of Alaska Center for Economic Development have developed this Unmanned Aircraft Systems (UAS) strategy document to guide the future expansion of the UAS-industry in Alaska.

The primary functions of the Division of Economic Development are research, business assistance, promotion, and development finance. These functions have influenced the focus of this study as the state hopes to leverage its existing competencies to develop UAS-related business opportunities.

This strategy document aims to advance the expansion of what is already an excellent economic opportunity for the state of Alaska. It focuses on growing related UAS industry sectors, advancing technologies in aerospace and aviation, and identifying opportunities for the Alaska workforce of the future.

Key long-term objectives related to the advancement of the UAS industry include the following:

1. Improve Alaska's unmanned system and aerospace industries business climate
2. Grow the UAS industry sector by encouraging private investment and job creation
3. Attract UAS sector anchor firms to Alaska
4. Promote UAS and aerospace research and development
5. Advance UAS and STEM education
6. Market and brand Alaska's UAS industry
7. Increase public sector education and engagement
8. Engage the FAA to produce a favorable regulatory framework for UAS operations.

The opportunities for Alaska's UAS sector are statewide. Alaska's existing geographic and technical assets, if developed in a strategic and intentional way, greatly increase the likelihood that the UAS industry will lead to economic opportunities and job creation for communities across the state.

As with any strategy document, this initial plan hopes to capture current thinking and data to frame the development of a strategy. This document is intended to be a living and changing plan and should be regularly revised and updated to reflect technological, political, and policy changes in both the public and private sectors.

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EXECUTIVE SUMMARY

Unmanned aircraft systems (UAS) are positioned to revolutionize the field of commercial aviation. This technology has already transformed the defense market and will soon have a similar impact in a variety of civilian industries. These devices can perform a number of tasks ranging from wildlife observation to search and rescue and pipeline inspection effectively, efficiently, and safely. With global UAS expenditures of $5.2 billion in 2013[1], industry analysts expect the market to more than double in the next decade, with a total value of $89 billion over the whole period. As an early leader in the testing and development of UAS regulations and applications, Alaska has the potential to benefit economically from this emerging sector. The state can increase benefits reaped by implementing investment strategies that encourage growth, innovation, and job creation.

Alaska offers unique advantages for the development of this new industry. First and foremost, the state has vast airspace available for testing UAS. While the Federal Aviation Administration (FAA) currently prohibits operating UAS in most civilian airspace, Alaska is a partner (with Hawaii and Oregon) in one of six FAA-designated test ranges across the country (see map below). Achieving this status is the culmination of a decade of path breaking research on UAS applications at the University of Alaska Fairbanks. Another regulatory advantage is the existence of the Arctic Airspace, a specially designated area over most of the Bering, Chukchi, and Beaufort Seas that will permit extensive UAS testing and some commercial operations. On the geographic front, Alaska provides a wide variety of landscapes and weather conditions for the testing and evaluation of aircraft over an immense area. Lastly, with the longstanding presence of resource development industries, military bases, civilian federal agencies, and other large actors, the state is home to a sizable potential market for UAS services.

Alaska test ranges, where FAA permits UAS testing

[1] "Teal Group Predicts Worldwide UAV Market Will Total $89 Billion in Its 2013 UAV Market Profile and Forecast" http://tealgroup.com/index.php/about-teal-group-corporation/press-releases/94-2013-uav-press-release

Despite these strengths, other states and nations see economic opportunities in the UAS industry as well. The intense competition requires that Alaska develop a competitive strategy that coordinates the efforts of numerous stakeholders within government, the University of Alaska system, private industry, and others. By 2017, the FAA will implement a regulatory framework that integrates UAS into the national airspace system (NAS), opening the skies to commercial UAS use and negating some of Alaska's current advantages. Most other states feature lower business costs and larger available workforces, as well as established incentive programs, to attract private investment. Capturing the economic benefit of a UAS industry in Alaska is thus a time-sensitive undertaking requiring strategic action.

RECOMMENDATIONS

A comprehensive strategy to grow and sustain a viable UAS industry for Alaska hinges on four major elements: business climate, innovation and entrepreneurship, workforce, and strategic partnerships.

Create a Strong UAS Business Climate

The business climate for UAS includes such elements as critical infrastructure, tax policies, and regulatory framework. Any strategies deployed to minimize taxes, finance infrastructure, and minimize the cost of doing business in Alaska will improve the overall business climate. Specific recommendations are as follows:

- **Strategically incentivize UAS investment to attract anchor firms.** Nationwide, most states and regions offer financial incentives (often in the form of tax credits or abatements) to attract businesses looking to expand or relocate. Alaska offers few incentives comparable to other states, but should consider them to offset the costs of doing business in the state. A state R&D tax credit, for instance, could provide businesses with corporate income tax relief.
- **Infrastructure investments.** Alaska must invest in critical infrastructure to support the continued development of the industry. This investment may include facilities, special use roads, airfields, or training centers. Infrastructure investments may be financed via public-private partnerships or such organizations as the Alaska Industrial Development Export Authority (AIDEA).
- **A coordinated, branded marketing effort.** Several states in competition with Alaska for UAS investment feature marketing efforts to attract investment in targeted industries, such as "Diversify Nevada." Such an effort would include a team to recruit companies and serve as business liaisons. Clearly presented financial incentives are an expected component.
- **Clear communication of the state's assets.** The state offers more airspace for UAS testing than any other, a long history with defense and aviation related industry, deeply rooted UAS expertise, and nationally-renowned aviation training programs. With a large and diverse land mass, Alaska is an excellent laboratory for testing UAS. These and other strengths need to be communicated clearly and effectively.
- **Business retention and expansion (BRE).** The State of Alaska DCCED has successfully launched a BRE initiative to identify the needs of the business community in the state and specific steps that can be taken to assist them. An aviation and UAS-specific BRE survey and engagement could yield information to encourage expansion of the industry.

- **State procurement of UAS services.** Where possible, state entities should consider employing UAS services in place of manned aircraft. This approach would be especially applicable for the Department of Natural Resources (DNR) or the Department of Environmental Conservation (DEC). In this way the state can promote UAS industry development while also realizing the greater efficiency and effectiveness of UAS.

Foster Innovation and Entrepreneurship

Alaska was an early leader in testing and evaluating UAS and has R&D capabilities within the University of Alaska system. The state and the university (along with other private sector stakeholders) must encourage spillovers of information that result in commercializing innovations. This can be accomplished through:

- **Targeted R&D efforts.** The University of Alaska system is well-suited to conduct R&D to further develop specific UAS applications, such as wildlife monitoring, search and rescue, or remote infrastructure inspection. These projects could be financed with a mix of public and private funds, with interested corporations sponsoring some of the R&D efforts. Public funding should support centers of innovation. Such centers could ensure the commercialization of research into viable products that will advance the industry. Several states have established technology funds for this purpose.
- **Development of a university research or technology park.** This real estate development integrates corporate R&D facilities into an area typically adjacent or in close proximity to a university campus. A key success factor is establishing a strong collaborative relationship between the university and industry partners. The corporations gain access to university facilities and brainpower. This access allows for the ability to recruit top graduates, and to sponsor targeted research. A business incubator or accelerator (a structured program to nurture early stage businesses) could be integrated into a research park with an emphasis on aviation and UAS-related firms.
- **Availability of early stage capital.** With the advent of the 49th State Angel Fund in Anchorage (and its spinoffs) and venture funds at UAA and UAF, the state has the capital availability to support high growth ventures. In addition to the Angel Fund, the state should consider other financing programs designed to provide early-stage capital to the state's most promising entrepreneurs. These different funding sources must be aligned to ensure that access to capital is achieved across Alaska.

Cultivate a Talented Workforce

The availability of skilled and semi-skilled workers has always been a challenge for Alaska's industrial development. A thriving UAS industry, however, requires a specialized workforce capable of piloting the vehicles as well as tending to the operational systems. A variety of ancillary services ranging from accounting to construction will also be necessary. Training and education needs can be met in the following ways:

- **Specialized coursework in UAS-related fields**. Both UAA and UAF offer aviation training

programs leading to degrees and certificates, including one course specific to UAS. Through the addition of UAS-related classes and the development of a certificate program targeted towards UAS, Alaska will be better poised as a training leader in unmanned aviation. The state will also benefit from the growth of a specialized workforce. Coursework and certificates for technicians in such fields as remote imaging and electronic systems will complement this training.

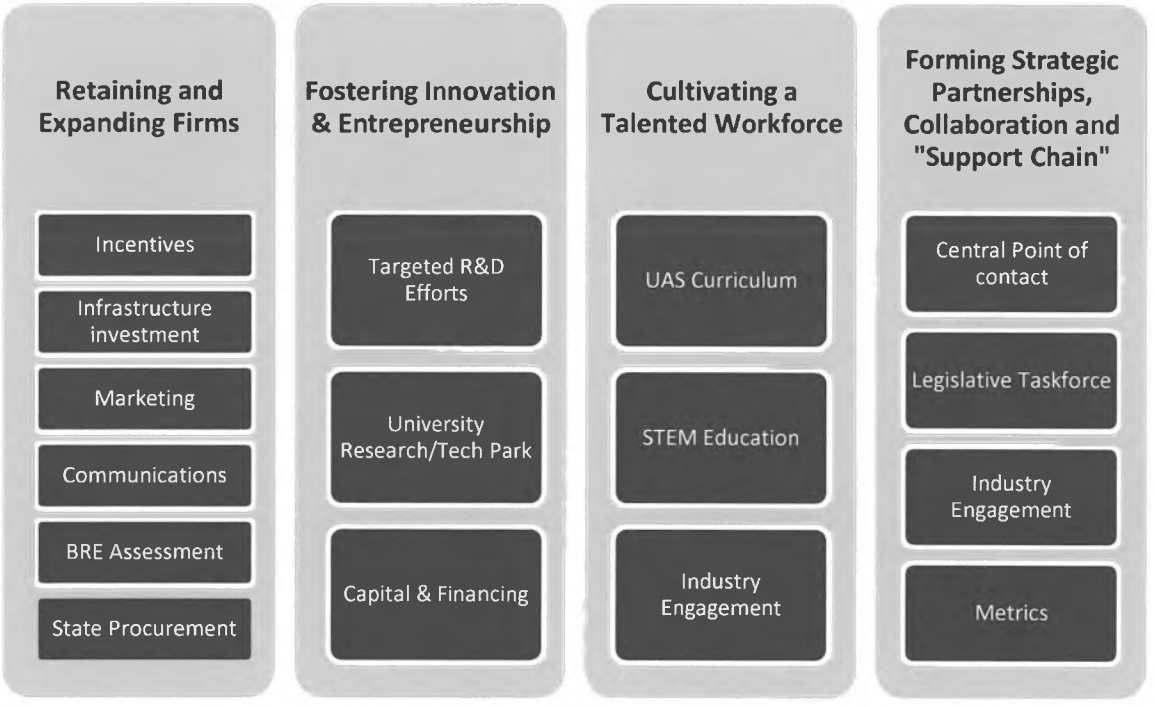
- **Invest in STEM education at all levels.** Activities could range from supporting youth robotics programs to expanding the Alaska Native Science and Engineering Program to ensure Alaska has a highly qualified workforce. Post-graduate education in advanced engineering disciplines will further help develop a specialized workforce. Funding is necessary for marketing and promotion materials dedicated to building a career in aviation-related industries.
- **Engage industry in determining needs and partnering to fund programming.** Establish an employer-driven, standardized core curriculum for post-secondary students. Provide tax incentives for specialized training programs funded by employers.

Improve Strategic Partnerships and Collaboration

Contributors to the development of the UAS strategy plan spoke to the importance of improved alignment between government, higher education institutes, and private industry to maximize the potential for successful industry development. The following strategies are recommended to improve collaboration:

- **Formalize the UAS Interest Group or create an office as a central point of contact to coordinate efforts related to UAS**. This office might initially coordinate the efforts of the major stakeholder groups to ensure that strategies are inclusive yet disciplined. It might also serve as a point of contact for private industry.
- **Continue and expand the legislative task force.** This body works to ensure policies and workforce training needs are adequately funded and aligned with industry needs. It should also make legislative recommendations on the development of incentive programs.
- **Engage industry leadership.** Promoting a dialogue with industry leaders can lead to productive and meaningful public sector activities. An industry association could help advocate for policies that encourage targeted and necessary investment.
- **Develop Metrics.** Outcome-based metrics can measure the impacts of incentives developed to support the UAS industry.

These strategies would position Alaska to compete as the UAS industry and related sectors evolve in the global marketplace. Alaska is in the enviable position of having several strong assets as it relates to leading in the UAS industry. Alaska must make a conscious decision to act in a strategic, orchestrated, and sustained way in order to stand out from competing regions across the globe.



The four major components of a UAS-centered economic development strategy for Alaska

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1. UAS Industry Background

Experiments with pilotless aircraft began at the end of World War I. These earlier aircraft were known as "aerial torpedoes" and "flying bombs" and used on an experimental or small-scale basis. Not unlike the manned aviation industry, the maturity of unmanned aircraft has sprung from military and special operations to civilian applications. These began with search and rescue before moving to non-military security, firefighting, pipeline surveillance, and agricultural applications. As the civilian industry has matured in recent years, the terminology has also evolved from "drones" to "unmanned aerial vehicles" (UAVs) to the now widely accepted term "unmanned aircraft systems" (UAS).

1.1 National UAS Background

Used sparingly in military operations prior to the Global War on Terrorism, UAS now make national headlines as they play supporting roles in both military and commercial efforts normally reserved for manned aircraft or satellites. For the past two decades, the Department of Defense (DoD) has driven the aerospace and defense industries to advance UAS related technologies with greater capabilities in the vehicles themselves as well as imaging technology. By 2009, the US Air Force (USAF) began to train more UAS pilots than manned fighter and bomber pilots.[2] Today, one-third of the USAF aircraft fleet is unmanned, and the US Army flew approximately 1 million UAS hours in 2010 alone. While the US reduces its presence in Iraq and Afghanistan, the number of UAS needed to support US military activity has remained constant, as DoD operations expand into Africa, the Philippines, and South America, and are incorporated into US and NATO maritime realms.

A note on terminology: drone, UAV, or UAS?
While unmanned aircraft are frequently referred to as "drones," unmanned aerial vehicle (UAV) is the established industry term. A UAV is defined by the *Dictionary of Military and Associated Terms* as a "powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload, or both." "Unmanned aircraft system" (UAS) describes not just the unmanned aircraft itself but all the other necessary components and infrastructure, such as the control system or ground control station, navigational equipment, communication control link or data link and ground-based pilot. For the remainder of this document, UAS will be the most frequently used term.

UAS come in a variety of sizes and configurations, ranging from those as small as an insect to as large as a commercial airliner. According to available research, small (under 55lbs) UAS constituted the vast majority of platforms in operation between 2005 and 2011 while

[2] Air Force Times http://www.airforcetimes.com/article/20090616/NEWS/906160319/More-training-UAVs-than-bombers-fighters

strategic (larger) UAS included some of the most versatile, typically operating up to 65,000 feet in altitude, with a maximum endurance (time in the sky) of more than 20 hours. The US Air Force categorizes UAS in five tiers, which will be referred to throughout this document:

- Tier N/A : Small/Micro, low altitude
- Tier 1: Low altitude, long endurance
- Tier 2: Medium altitude, long endurance
- Tier 2+: High altitude, long endurance conventional
- Tier 3: High altitude, long endurance low-observable

The success of US DoD applications for UAS has driven demand from other national governments to incorporate the technology into their own militaries. This trend is fueling a rapid growth in the international defense-related UAS marketplace.

In parallel, there is a growing understanding of non-military UAS capabilities and applications throughout civilian marketplaces to address "dull, dirty, and dangerous" or otherwise complicated tasks. UAS operations in the National Airspace System (NAS) has been primarily limited by the Federal Aviation Administration (FAA) to missions focused on public interest such as disaster relief, wildfire control, law enforcement, search and rescue, or related functions. Teal Group Corporation (a consultancy) reports indicate ***the primary challenges holding back commercial development are the lack of access to airspace for UAS research and development, as well as restrictive export control regulations for US manufacturers to other countries with more flexible airspace restrictions.***

Figure 1: Uses for UAS Technology

Non-Military UAS Applications	
Airworthiness Certification	**Provision of non-military Services**
Border surveillance	**Damage surveying**
Suspect tracking	**Aerial photography**
Traffic monitoring	**Wildlife monitoring**
Disaster response/relief	**Pipe/power line surveillance**
Damage assessment	**Agricultural applications**
Atmospheric/weather research	**Communications/broadcast**

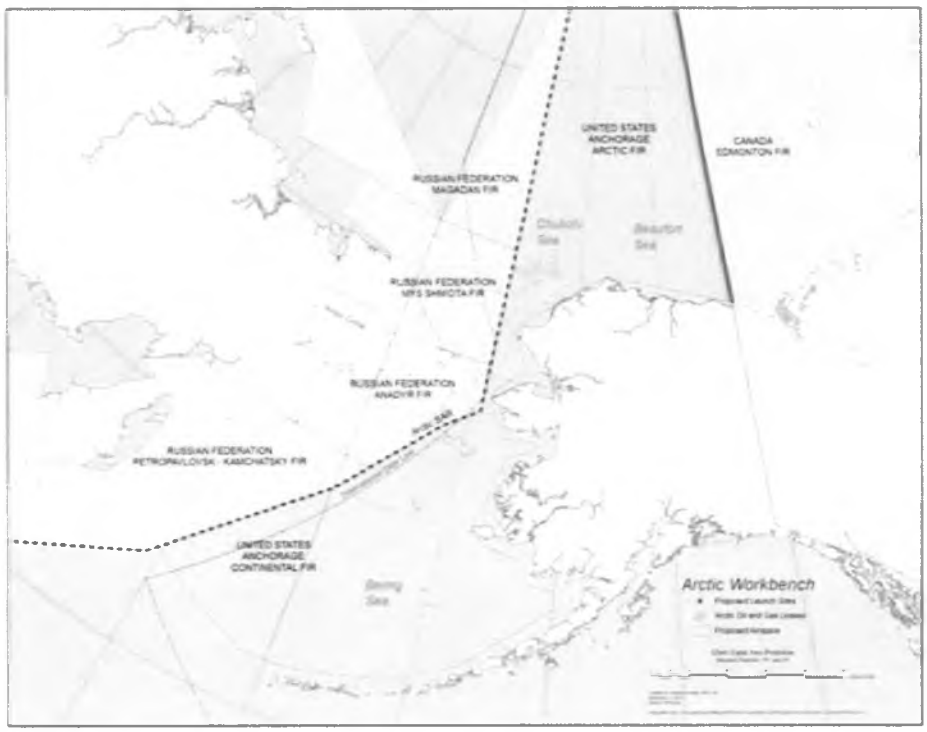
Critical infrastructure monitoring	**Movie production**
Aerial news coverage	**Flood mapping**
Mail/freight transport	**Real estate mapping**
Mining	**Sports event coverage**

Given increasing demand for use of UAS in domestic airspace, the FAA has taken initial steps to integrate UAS into the NAS, the largest, most complex air traffic system in the world. In the FAA Modernization and Reform Act of 2012 (FMRA), Congress directed the FAA to establish six "test ranges" to assist in developing the policies, procedures, and technologies required to integrate UAS into the NAS. In selecting the test ranges, the legislation mandated that the FAA, in consultation with the National Aeronautics and Space Administration (NASA) and the DoD, consider geographic diversity, climatic diversity, location of ground infrastructure and research needs in choosing the ranges.

Most significantly, the airspace encompassing Alaska's Arctic was given special consideration in the FMRA. Alaska was designated to be first in allowing commercial UAS. **In recognition of Alaska's role in UAS development, the act also established the Arctic Airspace, a unique region located off the coast of Alaska north of the Aleutians over the Bering, Chukchi, and Beaufort Seas up to at least 2000 feet, for 24-hour access by all types and users of UAS, with launch and recovery from selected coastal locations without the need for special permissions or waivers (see map below).**[3]

[3] The FAA is currently in the process of designating the Arctic Airspace, and as such the map reflects proposed areas.

Figure 2: Arctic Airspace



In 2013, the first commercial offshore UAS flights in the US were conducted about 50 miles northwest of Wainwright in the Chukchi Sea. Conoco Phillips, Insitu, and Olgoonik Fairweather conducted two commercial Scan Eagle flights from the R/V Westward Wind to investigate the viability of using UAS to conduct marine mammal surveys and ice reconnaissance. In the summer of 2014, BP and AeroVironment, Inc. conducted the first terrestrial UAS operations near Deadhorse, the center for Alaska's North Slope oil production. The UAS industry partnered with Alaska operators to conduct these historic flights and have scheduled many more promising operations to highlight the effectiveness of the technology.

The six FAA test ranges were announced in December 2013 and began operations in January 2014, initiating airspace access for researchers, government agencies, and industry towards assisting in the assimilation of requirements for integration of UAS into the NAS. The test range selection established range operators in Alaska, Nevada, New York, North Dakota, Texas, and Virginia. While the selection of test ranges does not provide wide-scale access to national airspace for commercial and civil purposes, the operational data collected will provide the FAA an opportunity to develop regulations for future commercial and civil uses in the NAS.[4]

[4] FAA UAS Fact Sheet - http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=15575

1.2 National UAS Economic Impact

UAS will likely become the most dynamic growth sector of the world aerospace industry this decade. UAS in civilian use will likely become a multi-billion dollar industry while opening new opportunities in scientific research and student education. The Teal Group Corporation, in its 2013 Small UAS (SUAS) Market Profile and Forecast, estimated that the global UAS market could be worth up to $89 billion over the next decade, and the US is expected to account for almost two-thirds of the world's research and development (R&D) investment in the field.[5] The same study predicts a UAS demand worldwide for R&D, testing, and procurement, rising from $6.6 billion in 2013 to $11.4 billion in 2022. Teal expects the US share of R&D to account for 62% of worldwide spending. In short, the development and manufacture of UAS for use by public entities and commercial consumers is expected to grow in the coming years despite the many regulatory and technical issues remaining to be addressed.

A number of US and international firms currently manufacture UAS for military and civil government operations. Depending on the mission, unmanned aircraft are typically equipped with payloads that provide multiple capabilities, including reconnaissance (surveillance and intelligence gathering) and in some cases attack capabilities. All UAS require a ground control component and a communications link to the unmanned aircraft. According to Forecast International, unmanned air vehicles will account for 46% of UAS spending, payloads for 38%, and ground control equipment for 16% during the next decade. US manufacturers with the largest share of the global UAS market are listed below.[6]

Figure 3: Global UAS Market Share (manufacturing)

Company	Global Market Share
General Atomics	20.4%
Northrop Grumman	18.9%
Boeing	1.5%
AAI	1.2%

The Association for Unmanned Vehicle Systems International (AUVSI) estimates that by 2029 more than 23,000 UAS jobs could be created in the US as the result of UAS integration into the NAS. New jobs will not only result with this industry growth, but also expand into academia, federal government agencies, and the civilian/commercial UAS support community. These new positions could translate into more than $1.6 billion in wages over the next 15 years. These jobs will emerge from the manufacturing sector; pilots and operators, data analysts, maintenance personnel, range and air traffic control management, and consultants will also

[5] World Unmanned Aerial Vehicle Systems. 2011 Market Profile and Forecast, The Teal Group Corporation, 2011.
[6] Graham Warwick and Larry Dickerson, "Cooling Down? Export and civil unmanned aircraft demand will grow, but mainstay military markets may slow." Aviation Week & Space Technology, December 31, 2012 p. 84

result. Universities are already developing curriculums targeted for these future positions and as preparation for related workforce training. Student demand has led to operator certification and maintenance programs. In a few instances, four-year professional degrees as well as advanced degrees are offered.

The increased demand for UAS will spur secondary employment growth in ancillary markets. For instance, sensor manufacturers, avionics providers, software developers, and composite manufacturers will add manufacturing and engineering personnel. Companies anticipate adding support staff, such as accountants, sales associates, managers, human resources specialists, insurers, and administrators to ensure business efficiency. Regions with a large UAS manufacturing or R&D presence will experience employment growth across employment sectors as spillover effects materialize.

An additional opportunity area—and perhaps the most relevant to Alaska—is an emerging market for UAS services. Large resource development companies and civilian government agencies have already exhibited need for a variety of imaging, mapping, and other services (Chapter 3 will describe several examples). The ability to operate UAS fleets and analyze data collected from unmanned aircraft will likely become a profitable business opportunity.

1.3 Alaska UAS Background

Within Alaska, UAS currently have an expansive breadth of applications. Several factors drive the use of UAS, including Alaska's vastness, abundance of natural resources, limited road access (and therefore remoteness), and extreme weather and terrain. These realities, coupled with Alaska's strong aviation-centric orientation (with six times more pilots per capita than the rest of the nation) have made the leap to UAS technologies a natural fit. UAS already support a wide array of activities, such as conducting scientific research and environmental monitoring by NASA and the National Oceanic and Atmospheric Administration (NOAA), oil spill mapping (response/environmental cleanup), weather forecasting, wildlife monitoring and counts, atmospheric sampling during wildfires, power line inspections, air quality monitoring and examination of sea ice build ups. Further applications tried in Alaska include whale observing, cadastral mapping, maritime navigation support, industrial plant and pipeline monitoring, oil and gas flare stack maintenance, and environmental cleanup response.[7] Furthermore, the opening of the Northwest Passage to shipping, the additional burden of providing potential assistance to those vessels, and related port developments lend themselves to UAS technologies. As evidenced by these examples, aviators, researchers, and industry collaborate

[7] Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) presentations and interviews

closely to use unmanned aircraft for missions previously requiring manned aircraft at higher cost, greater risk, and with fewer capabilities.

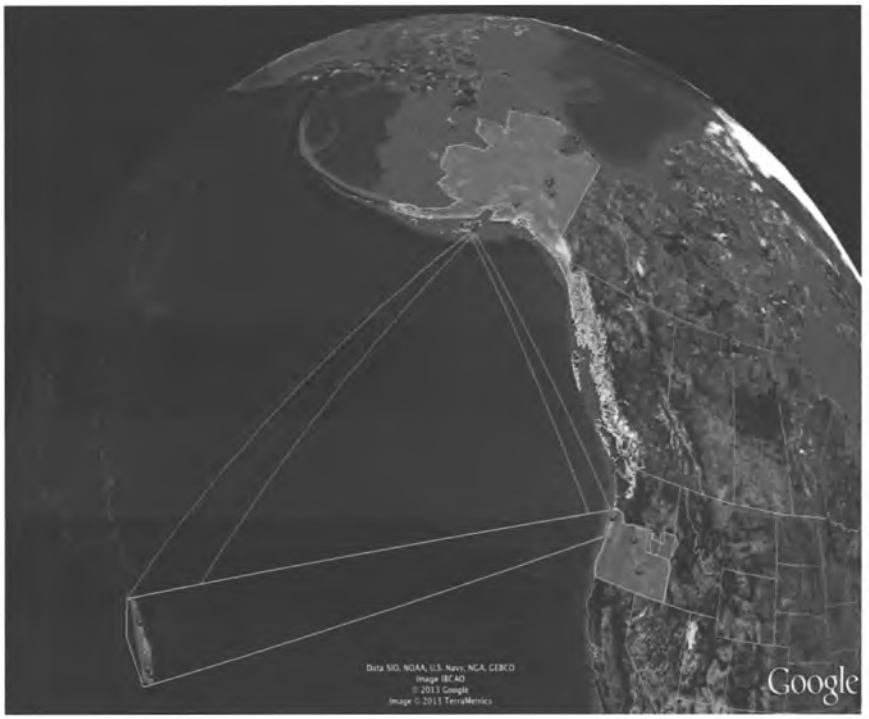
Throughout these initiatives, the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) at the University of Alaska Fairbanks Geophysical Institute has been instrumental in developing a world-class program and successfully securing one of the six FAA test ranges to further this capacity. ACUASI was formally established in December 2012 by the University of Alaska Board of Regents to advance the study of UAS capabilities. Program roots reach back to 2001; over the years it has expanded its scope, obtained more advanced equipment, and increased the variety and complexity of research executed. The ACUASI mission is to serve as a research center for small, unmanned aircraft systems providing integration of unique payloads and supporting pathfinder missions within the government and scientific communities, with special emphasis on the Arctic region. ACUASI has worked on UAS projects all across the world, including projects in Iceland, Chile, and South Africa. For instance, ACUASI led a trip to South Africa in which they deployed UAS technology in an effort to find rhinoceros and elephant poachers. In recognition of the important role of UAS in Alaska, the Legislature appropriated $5 million from the state Capital Budget in 2012 to the UAF for the specific purpose of "Research and Development of Unmanned Aircraft Systems" and to support the development of sustainable high-tech industry in Alaska.

Who can legally operate UAS?
Until the FAA fully integrates UAS into the National Airspace System, unmanned aircraft may only operate under certain highly controlled circumstances. Under current FAA rules, there are three types of UAS that can be operated: civil UAS, public UAS, and model aircraft. Flying Civil UAS requires a Special Airworthiness Certificate to be issued for experimental purposes, such as R&D. UAS may not be used to transport people or property for hire. Public UAS requires a Certificate of Airworthiness (COA) that may be issued to a public entity to carry out a public purpose, such as law enforcement or search and rescue. Model aircraft are those operated by hobbyists at 400 feet or less within sight of the operator.

In 2012, ACUASI began collaborating with Oregon State University, the University of Hawaii, and several industry and government entities to propose a Pan-Pacific UAS Test Range Complex (PPUTRC). The PPUTRC, led by ACUASI, proposed test range research targeted towards the development of standards for UAS categories, state monitoring and navigation, and safety standards for UAS operations. **In December 2013 the FAA announced that PPUTRC was successful in its bid, awarding approval for 9 of its 13 proposed test ranges located in Alaska, Hawaii, and Oregon.** Of the 13 proposed ranges, six ranges are in Alaska (Denali, Kodiak, North Slope, Oliktok Corridor, Poker Flat, and Wainwright Corridor), three ranges are in Hawaii, and three ranges are in Oregon. Since designation, the FAA has opened the opportunity for PPUTRC to propose additional locations, and several have already been approved. In late 2014, ACUASI

entered into an agreement to expand testing operations to Iceland. The FAA test range designation runs through February 2017 in accordance with the FMRA. However, the FAA has stated that it expects to grant an extension, and after expiration will view the test sites as continuing operations to support long-term testing of new design UAS and supporting systems. Another issue of strategic importance is that the FAA test range designation comes with no fiscal support.

Figure 4: Alaska, Hawaii, and Oregon, the three states that form the Pan-Pacific UAS Test Range Complex (PPUTRC).



While this strategy plan focus is UAS related activities, **the University of Alaska Fairbanks via its School of Fisheries and Ocean Sciences, is also developing expertise with Marine Autonomous Underwater Vehicles (AUV).** The AUV program is symbiotic and complementary to other work with which the University of Alaska system is engaged relating to UAS and may ultimately lead to some crossover research, innovation and commercialization opportunities. At a later update this strategy document may want to incorporate AUV strategies for the emerging AUV sector.

1.4 Strategic Considerations

As the nation races to transition UAS from military to civil and scientific applications, an opportunity exists for Alaska to participate in the development of this industry and benefit from the associated economic development resulting in additional jobs. As already presented, Alaska

has some clear advantages or assets to leverage when considering UAS industry expansion including:

- Access to comparatively vast airspace for UAS research and development;
- Location (Arctic Airspace, a unique region located off the coast of Alaska north of the Aleutians over the Bering, Chukchi, and Beaufort seas);
- Aviation-centric orientation;
- An engaged university (the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) at the University of Alaska Fairbanks within the Geophysical Institute has focused on UAS since 2001);
- FAA test range (the Pan-Pacific UAS Test Range Complex was awarded multiple test ranges located in Alaska, Hawaii, and Oregon).

While Alaska's position is enviable, unless the state strategically grows its opportunities from a nascent occurrence to an established industry, the potential value will not be realized. Over the next few years Alaska must transition from being a lead test range to an expanding center for UAS-related industries. Currently, all focus is on conducting missions and collecting the data the FAA needs to implement rules for the civil and commercial use of UAS. Simultaneously, more formal efforts to support the application of current UAS capabilities and development of new technologies and the advancement of uses for UAS are necessary. Other states with fewer strategic assets, even in some instances lacking a "test range" designation, are ramping up to further expand their presence.

Alaska has an opportunity to tap distinctive expertise and develop a new industry for the state, one that leverages its global position and unique competencies. Alaska has the potential to market and position itself as the best place nationally and globally to work out the issues of integrating the emerging UAS systems into the NAS, as well as commercializing technologies into private sector uses. Alaska must face the challenge of how best to link and align these assets to grow a prospering new industry.

2. Alaska's UAS-Anchor Assets

Alaska possesses key anchor assets which, if coordinated properly, can help the state to develop a thriving and integrated UAS industry. These assets come from a broad spectrum of organizations, including the University of Alaska, the US military, and several public sector stakeholder groups that have formed in response to the development of UAS within Alaska. The key moving forward will be to align the efforts of these diverse organizations as they work toward the common goal of building a strong UAS industry within Alaska.

2.1 University of Alaska

A key asset in developing its Unmanned Aircraft Systems industry is the University of Alaska system. The University of Alaska Fairbanks (UAF) and the University of Alaska Anchorage (UAA) both possess a number of core competencies that position them well in supporting the development of a UAS industry within the state. The two universities have significant experience in aviation, aviation maintenance, aerospace, and unmanned systems. In addition to offering coursework each possesses state-of-the-art facilities and training equipment. Through the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI), the UA system has emerged as an early leader in testing and evaluating UAS.

Moreover, the University of Alaska system is committed to economic development and industry partnerships. The Shaping Alaska's Future Initiative details the commitment to continuous improvement and innovation. Relevant themes of the initiative include: Productive Partnerships with Public Entities and Private Industry; R&D to Enhance Alaska's Communities and Growth; and Accountability to the People of Alaska. Through these initiatives the UA system is working to modernize, streamline and improve by investing in areas of real need and eliminating areas of barrier. The following table outlines the major assets of both UAF and UAA in terms of their collective coursework, facilities, and other relevant attributes. This chapter also reviews Alaska's other anchor assets such as its UAS Interest Group, military presence, aviation/aerospace competencies, and Arctic location.

Figure 5: University System Anchor Assets

Entity	Asset	Details
University of Alaska Fairbanks	Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)	A nationwide leader in the testing of UAS applications; one of the first centers of its kind and the lead entity in the Pan Pacific Test Range Complex
	Poker Flats Research Range	Largest land-based research rocket range in the world. Alaska's first UAS test site.

	Office of Intellectual Property and Commercialization (OIPC)	Leases university-owned patents to businesses. Also manages Nanook Tech Ventures spinoff, a venture capital fund.
	Aviation Program	Possesses large hangar and degree or certificate programs in aviation, airframe, and power plant maintenance.
University of Alaska Anchorage	Office of Technology Commercialization	Leases university-owned patents to businesses. Also manages Seawolf Venture Fund.
	Aviation Program	One of nation's top ranked aviation programs, with programs in air traffic control, professional piloting, aviation technology, and aviation administration. Under Center of Excellence designation, performs aviation safety research with other top aviation schools.
	Business Enterprise Institute	Hosts Center for Economic Development, Alaska Small Business Development Center and other entities. Serves as a bridge between academia and private industry.

2.1.1 University of Alaska Fairbanks

Leading the charge for the development of an unmanned aircraft systems industry in Alaska is the University of Alaska Fairbanks (UAF). The university is the official host of the Pan Pacific UAS Test Range Complex, and has a long history of working with UAS technology. In fact, UAF was one of the first universities in the country to begin working with unmanned systems. UAF took on a leadership role in establishing ACUASI, the only center of its kind in Alaska, and one of only a small number nationwide. ACUASI began its operations in 2001, when it began investigating UAS technology and potential applications. Since then, the center has conducted associated research and flight missions with the aid of UAS technology in a variety of areas including sea ice, fish and wildlife observations, firefighting, environmental cleanup, and climate research. ACUASI has conducted significant UAS-related research in Alaska, across the nation as well as internationally.

Another UAF asset is its Poker Flat Research Range, which serves as one of the state's six test ranges through the FAA test range selection. The Poker Flat Research Range is one of the

most advanced ranges of its kind anywhere. The range is the single largest land-based rocket range in the world and is the only high-latitude rocket range in the United States. The range first began its testing of UAS in 2004, and has scaled up its research activities since that time. The range is now home to more than two dozen UAS models, including everything from the 2.5 pound Aeryon Scout (the range's smallest UAS) to the 40 pound Insitu A-20, the range's largest. In addition to its core competencies directly related to UAS technology and research, the range is also unique in being the only university-owned rocket range in the world.

Poker Flat Research Range

UAF conducts approximately $120 million per year in research. The Office of Intellectual Property and Commercialization (OIPC) leads efforts to commercialize UAF research in direct support of business development and job creation. While OIPC develops and protects intellectual property for UAF, the separate nonprofit, Nanook Innovation Corporation (NIC), is charged with licensing new technologies to existing companies or creating startup companies through its subsidiary, Nanook Tech Ventures (NTV). In 2014 alone, 75 inventions were reported to OIPC, patent filings were up over 130% from FY13, 2 patents were granted, and 40 technologies were licensed through 6 licensing agreements from NIC to private companies. Royalties from NIC licenses are returned to the University to promote innovation and development. Also in FY14, NTV created the startup company ArcticFire Development Corporation that will commercialize unmanned aircraft software.

UAF is also a core partner of the proposed FAA UAS Center of Excellence team being led by Mississippi State University. This team, called the Alliance for System Safety of UAS through

Research Excellence (ASSURE), consists of eighteen of the world's leading research universities and roughly one hundred leading industry and government partners. ASSURE possesses the expertise, infrastructure, and outstanding track record of success that the FAA Center of Excellence for Unmanned Aircraft Systems requires. In addition to UAF, members include Oregon State University, the University of Kansas, and Auburn University. ASSURE members are core to three FAA UAS test sites, lead four FAA research centers, have seven airfields and a 340 UAS fleet—24 more UAS than the USAF. If ASSURE succeeds, each core University team member will receive a contract with the FAA to support UAS research in their individual areas of expertise. For Alaska this will include a focus on low altitude operations, efforts related to extreme climates, human factors, and pilot training and certification.

UAF's many resources and core competencies, including its expertise in rocketry, unmanned aircraft systems, technology transfer, and aviation maintenance, make it a strong resource in developing an integrated UAS industry in Alaska.

2.1.2 University of Alaska Anchorage

The University of Alaska Anchorage (UAA) possesses many core competencies allowing it to play a significant role in the UAS industry. UAA is especially well known for its aviation programs, which are often regarded as among the best in the nation. UAA also supports a growing research portfolio, is expanding its technology transfer competencies, and has decades of experience supporting industry through addressing technical assistance needs. Offering education, providing industry technical assistance, engaging in public policy needs and research related to unmanned aircraft systems are natural extensions of UAA's already existing programming.

UAA's aviation students can obtain degrees in air traffic control, professional piloting, aviation maintenance technology, and aviation administration or choose to minor in aviation technology. The FAA ranked UAA's air traffic control program 3rd out of 31 certified Collegiate Training Initiative (CTI) schools. CTI schools are those designated by the FAA for meeting the specific requirements necessary to produce certified air traffic controllers for the agency. A state-of-the-art air traffic control simulator is a central asset of the program, with a full 360-degree interface, and is one of only a handful worldwide.

UAA's specialties in the aviation and aviation maintenance fields feature several core competencies that have clear applications in the UAS field. Seeing this potential opportunity, UAA has taken on a leadership role in developing curriculum around unmanned aircraft systems. Starting in the fall 2014 semester, UAA became the first school in the state of Alaska to offer a UAS class. The class, "Introduction to Unmanned Aircraft Systems," provides students with an overview of UAS technology. The course informs students of present and future missions, as well as a detailed study of sensors and mission development. Further, the UAF ACUASI team helped develop the course.

Another program at UAA, the Business Enterprise Institute (BEI), links economic development programs across the UA system and supports businesses with technical assistance and the expansion of entrepreneurial capacities across Alaska. Providing economic development-related research and technical assistance, high-level professional education, small business development services and youth entrepreneurship programming, BEI serves as a bridge to expertise and talents throughout the UA system. BEI's programs, which include the Alaska Small Business Development Center and the Minority Business Development Agency, are becoming better versed in the needs and opportunities of UAS related business development and will assist both existing and startup firms with their business development needs. The UA Center for Economic Development also reports through BEI and provides technical assistance in the form of information, research, data and "know-how" in evaluating, shaping and implementing specific projects and programs that promote economic development.

UAA expertise in aviation and economic development, coupled with its leadership in establishing course offerings on UAS, position the university well to aid the coalition of organizations in helping to grow a UAS industry in Alaska.

2.2 Military[8]

The military represents a major sector of Alaska's overall economy, as military personnel routinely relocate to Alaska to receive specialized training. This strong influence on Alaska's economy is highlighted by the Department of Labor, which has pointed out that the military's influence on Alaska can be viewed as one of the state's leading exports, as troops positioned in Alaska bring new revenues to the state and thus provide large numbers of indirect jobs.

Beginning in 1993, the military presence in Alaska began declining from a peak of 30,800 personnel. The terrorist attacks of 2001 and the wars in Iraq and Afghanistan then led to a large influx of military to Alaska. While total troops fell to 17,631 in 2000, by 2009 the active duty count in Alaska climbed to 24,449. The vast majority of current UAS innovation and use is via the Army and Air Force, both of which have substantial installations in Alaska.

According to the *Alaska Economic Trends* magazine, the military's economic reach includes a large civilian workforce as well. In 2012 Alaska had more than 7,000 defense-related civilian jobs with a payroll of $452 million and average earnings of $62,278. Civilians provide base support ranging from highly technical skillsets to construction to retail workers in the commissaries. The Anchorage and Fairbanks areas are home to 90 percent of all Alaska-based uniformed military and their dependents.

[8] Alaska Economic Trends, December 2013 – The Military and Alaska's Economy

The military has increasingly outsourced or sought private contracting opportunities. In 2010 approximately $2.2 billion in military contracts were awarded in Alaska. In 2009, Arctic Slope Regional Corporation topped the Alaska contractors list at $151 million. These contracts include utilities, housing, security, specialized technical support, food services, and janitorial services.

In 2009, defense spending in Alaska totaled $44.9 billion, or about 10.77% of Alaska's total GDP. Procurement contracts account for approximately $2.2 billion or 45% of total defense spending, with salaries and wages accounting for $2.7 billion. On a national comparison, defense spending equated to $6,999 on a per capita basis as compared to $1,719 nationally.[9]

One strategy for Alaska is to work with the federal government through our Congressional Delegation not only to maintain, but also grow our military presence in Alaska by expanding its current focus to include UAS competencies and innovation. Similarly, targeting future defense spending toward UAS activities and capturing those dollars for Alaska will further strengthen UAS industry development. Alaska's strategic location and the opening of the Arctic call for expanded military and homeland security measures. While much work has already been placed here, it will be imperative to deploy strategies that focus on military expansion, particularly UAS-related business development strategies that involve federal investment.

Figure 6: Alaska's Military Anchor Assets

Entity	Asset	Details
US Army	Fort Richardson (now JBER)	62,000 acres, a helipad, and firing ranges. Located near Anchorage.
	Fort Greeley	Part of US missile defense system and home to Cold Regions Test Center for testing vehicles and weapons systems in cold climates. Located near Delta Junction in the state's Interior.
	Fort Wainwright	Long history as aviation testing center (Ladd Field) with large airfield. Located near Fairbanks.
US Air Force	Eielson AFB	Home to F-16 fighters and a candidate to receive F-35 fighters. Currently hosts Gray

[9] Source: Impact of Defense Spending: State by State Analysis, Bloomberg Government Study November 17, 2011.

		Eagle. Located near Fairbanks.
	Elmendorf AFB (now JBER)	Home to F-22 fighter and part of the Pacific Command. Located near Anchorage
US Coast Guard	Bases and support operations throughout coastal regions	Assets include bases in Ketchikan and Kodiak, air stations in Sitka and Kodiak, and cutters stationed in 13 communities.

2.3 Other Anchor Assets

In addition to its university and military assets, the State of Alaska also possesses many other key anchor assets that will support the development of a strong UAS industry. These assets include geographic and industry-related core competencies, as well as several public entities that have formed to guide leadership on UAS and other aviation-related issues.

One of Alaska's key anchor assets within the public sector is the Alaska UAS Interest Group. The group was formed in 2006 to bring together UAS industry members from both the public and private sectors. The interest group includes a broad cross section of entities, including the Department of Interior, the US military, FAA, Department of Energy, and several UAS manufacturers. The interest group has an immediate goal of building a stronger network of Alaska UAS entities and projects, and a longer goal of positioning Alaska as the UAS location and test range in the US for both commercial and military sectors.

Another asset for Alaska's UAS industry is the formation of the FAA Arctic Team. The team was formed to address the many changes occurring within the Arctic. Increasing global temperatures have caused the melting of Arctic sea ice. This rapid melting may provide an opportunity for the development of Arctic shipping lanes, and a need for research into the changing climactic conditions of Alaska's Arctic.

Within the FAA Modernization and Reform Act of 2012, specific language was included to address the expanding use of UAS technology within the Arctic. This UAS expansion in the Arctic will provide such benefits as increased scientific research, environmental analysis, fisheries and marine mammal observations, oil and gas leasehold management and maritime route planning. According the Act, the Secretary of Transportation must develop a plan to designate permanent areas in the Arctic where small UAS may operate 24 hours per day for research and commercial purposes. Having a specially-designated zone for UAS use within Alaska could prove crucial in attracting and developing a thriving UAS industry within the state.

Key stakeholder members of the FAA Arctic Team are as follows:

- National Oceanic and Atmospheric Administration (NOAA)
- United States Coast Guard
- National Aeronautics and Space Administration
- Department of Energy
- Department of Interior
- UAS Executive Committee Senior Steering Group
- Department of State
- Arctic Council and its member states
- Cross Polar Working Group
- Marine Mammal Commission
- International Civil Aviation Organization (ICAO)
- State of Alaska

Figure 7: Alaska's Public Entity Anchor Assets

Entity	Asset	Details
Alaska UAS Interest Group	Participants include FAA, Department of Interior, DoD, Department of Energy, ACUASI, and private industry	Group exists to provide leadership and coordinate UAS related activities.
FAA Arctic Team	Various public entities including Department of State, Department of Energy, Coast Guard, NASA, State of Alaska, Arctic Council, and others.	A stakeholder group advising on policies related to Arctic aviation
Alaska Aerospace Corporation	Kodiak Launch Complex	The only high-latitude rocket launch complex in US.

2.4 Strategic Considerations

Alaska is well positioned to lead the nation in the integration of UAS into the NAS. Such assets as the University of Alaska, the UAS Interest Group, the US Military, and its other public sector assets make Alaska a potential leader in research and testing, and in the establishment of a UAS education and business development system. As it relates to UAS education, there is great opportunity to design, test, and exhibit to FAA a proto-type UAS pilot certification program, which would include the following:

- Degree or Certification Completion Standards
- Practical Test Questions
- Manual System (similar to Part 141)

- Integration of UAS into existing degree programs (i.e. engineering or business)

Similarly, ACUASI and the UAA Business Enterprise Institute could align and become a stronger focal point for UAS industry development in support of leveraging the University of Alaska's other assets. Each of these programs is well versed in serving as the face of the university to public and private entities as well as to economic development organizations across Alaska. Each of these programs is also well situated to identify and secure additional sources of funding to support research, teaching expansion and business and economic development growth.

It is also recommended that the Alaska UAS interest group develop plans for a more formal organization. The Cascade Chapter of the Association of Unmanned Vehicle Systems International (AUVSI), which represents the states of Oregon and Washington, offers one model. The Cascade Chapter was established in 2009 with 25 members and is now the second largest chapter with just over 292 members in 2014. The Cascade Chapter has spurred the formation of working groups to address specific areas of industry development including: programming, membership, finance, government and media relations, and education initiatives. Ultimately this form of organization encouraged the sharing of resources to allow for the hiring of an executive director to promote and lead the industry working group. This level of organization has been significant in facilitating collaboration across industry, academia and government agencies. Supporting the transition of the UAS interest group towards becoming a standalone organization that has a sole purpose of linking and aligning industry members is recommended.

Figure 8: a UAS flight station

3 ALASKA UAS MARKET OPPORTUNITIES

One of Alaska's chief advantages for the development of a thriving UAS industry is the significant federal investment within the state. Many federal agencies have significant expenditures within Alaska because of the state's strong military presence, and the many natural resources under the federal government's control. As a whole, the state consistently ranks at or near the top nationally in federal expenditure per capita. (e.g. $17,762 in 2010) Defense spending accounted for over $7,000 in 2010, placing the state second nationally. These federal funding sources drive a substantial portion of the state's economy; they will likely be instrumental in the success or failure of a UAS industry within Alaska.

The oil and gas sector is another large potential customer for UAS services. As mentioned in Chapter 1, both ConocoPhilips and BP, Alaska's two largest oil companies, have used UAS to monitor wildlife and sea ice conditions. Other oil-and-gas related applications include pipeline inspection and emergency response.

The technology has high potential application within the state, with broad research and data collection needs possible from many agencies at both the federal and state level. This demand could spur the growth of the UAS industry. The potential for substantial demand within the government sector presents Alaska with an opportunity to grow its UAS capabilities and to build its core competencies, allowing the state to be ready to capture the private sector demand as it becomes available following the implementation of UAS into the NAS.

We anticipate that much of the statewide demand for UAS technology will come from research activities, including research into UAS capabilities and testing, and activities carried out by UAS, such as volcano monitoring and wildlife management. If the demand for the technology is great enough, it may become large enough to support some level of UAS components manufacturing and maintenance, as well as the operation of UAS services for government or the private sector

This chapter provides an overview of the existing and potential demand for UAS services in Alaska and includes a table that outlines the major likely customers for UAS technology.

3.1 FEDERAL MARKET DEMAND

One of the largest sources of market demand will continue to come from the federal side. Many federal agencies have unique demands currently serviced through UAS technology and could be expanded with Alaska in mind. **In order for Alaska to serve the federal marketplace, it will be important to identify those areas in which the state is best suited to compete. This will require an honest and ongoing assessment of the state's core competencies and weaknesses.** By focusing energy on those markets in which it has the best opportunity to succeed, the state will allow itself maximum return on investment for any

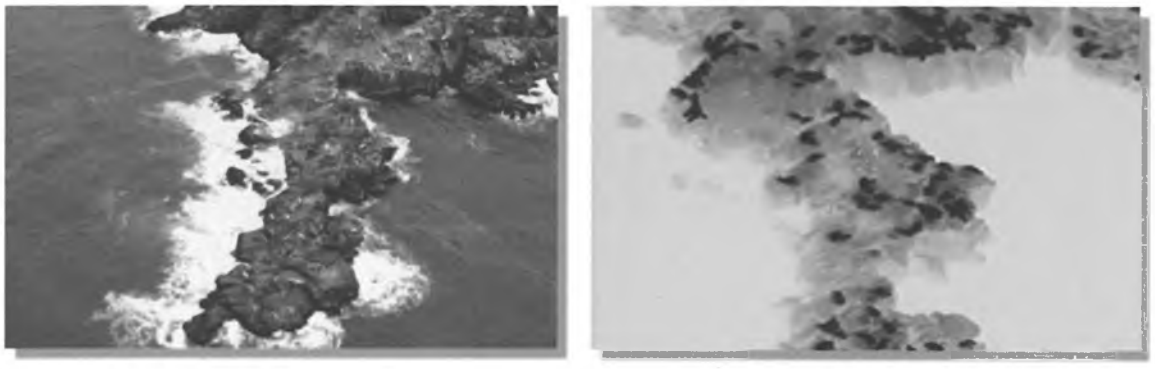
financial investments made. Within the federal sector, two areas show the most promise: agencies with a research emphasis and the military. Each will be discussed in turn.

3.1.1 Civilian Agency Demand

Government agencies outside of the DoD have pioneered several UAS applications in Alaska (although NASA falls under DoD, it is discussed separately from other military agencies). Some specific examples highlight the utility of UAS technology in the state and suggest a variety of applications that can be built into viable business opportunities:

- In 2009, NOAA began using Scan Eagle UAS developed by Insitu, a subsidiary of Boeing, to monitor sea lions in the Aleutian Islands as well as volcanic ash in multiple locations.[10] The Scan Eagle and Aeryon Scout UAS, both equipped with infrared image sensors and cameras were used to locate hot spots within wildfire perimeters.
- The Scan Eagle was also used to combat fires including the Crazy Mountain Complex fire of 2009[11] and the Funny River fire of 2014.[12]
- In 2010, NASA and Northrop Grumman partnered to launch the Global Hawk Advanced Concept Technology Demonstrator under NASA operation. NASA's Global Hawk Pacific environmental science campaign took the Global Hawk on its longest flight from California over Alaska and the Arctic Ocean.[13] In 2011, the Global Hawk was again used in Alaska to complete the Winter Storms and Pacific Atmospheric Rivers (WISPAR) research to explore atmospheric conditions and collect observations to improve weather forecasting.[14]
- In 2012, NASA also supported the Marginal Ice Zone Observations and Processes EXperiment (MIZOPEX) research, which was flown by UAF's Nanook version of the ScanEagle. The MIZOPEX mission collected data on ocean surface temperature and salinity by employing the unique capabilities of multiple UAS, including the NASA SIERRA, Scan Eagle and a micro UAS.[15]

[10] National Marine Mammal Laboratory - http://www.afsc.noaa.gov/nmml/polar/research/uastests.php
[11] Unmanned Aircraft Maps Alaskan Forest Wildfires - https://www.youtube.com/watch?v=sYfOyriR-ws
[12] UAF Geophysical Institute - http://www.gi.alaska.edu/node/1826
[13] NASA's Global Hawk Aloft on 28-Hour Arctic Flight - http://www.nasa.gov/centers/dryden/status_reports/Global_Hawk_03_11_10.html#.VASkhPldUvw
[14] NASA Global Hawk Complete Atmospheric Rivers Study - http://www.nasa.gov/centers/dryden/status_reports/global_hawk_03_10_11.html#.VASlwPldUvw
[15] NASA Airborne Science Program - https://airbornescience.nasa.gov/content/Marginal_Ice_Zone_Observations_and_Processes_EXperiment_MIZOPEX



UAS pared with heat sensing technology is used to count Stellar Sea Lions in the Aleutians for NOAA (photo courtesy of ACUASI).

The most promising agencies with regard to UAS technology use in Alaska are those with a dedicated research purpose, such as NOAA, NASA, and US Geological Survey, and those managing lands in the state, such as the National Park Service and US Forest Service.

3.1.2 U.S. Department of Defense (DOD) Demand

The DoD is charged with coordinating and supervising all agencies and functions of the government concerned directly with national security and the United States Armed Forces. Given the significant budget of the DoD, and historical activity within the industry, it is likely that the DoD will continue to be one of the largest buyers and operators of UAS technology in the coming years. The DoD will continue to require support from UAS platforms and services, particularly the platforms currently in use. It will also need significant airspace to test the technology across a variety of landscapes and conditions. Growing challenges around the world will drive the need for greater enhanced, long-range ISR (Intelligence, Surveillance, and Reconnaissance) capability while any troops on the ground will require light, flexible platforms and payloads.

The DoD currently uses a wide variety of platform and payloads to meet the needs of the Army, Air Force, Marines, and Navy. The Army currently employs AAI's RQ-7 Shadow in Alaska for ISR, target acquisition and battle damage assessment. **In 2015, the army will expand its operations by adding the Grey Eagle platform to Ft Wainwright. The Army and USAF are both likely to base additional UAS units in Alaska, particularly as the Arctic generates geopolitical and commercial interest.**

3.1.3 State Government Demand

While the bulk of demand for UAS technology has historically come from the federal level, an emerging market will be those agencies and organizations at the state level with similar or complementary purposes as their federal counterparts. These agencies (i.e. Environmental Conservation, Fish and Game, Natural Resources, etc.) may potentially benefit from incorporation of UAS technology. **Given the state's mission and efforts already underway**

to support the development of an Alaska-grown UAS industry, meeting the State of Alaska's own demands with the incorporation of UAS technology is a natural expectation. This strategy may prove an effective means to build core industry competencies, enable for testing of additional uses and ultimately position Alaska to better compete for increased market share out-of-state.

Opportunities may exist to support Alaska's Air National Guard, the Alaska State Troopers and municipal police programs. Given Alaska's geographic challenges, permitting Alaska State Troopers the use of UAS may be beneficial in addressing agency needs as well as testing and further proving uses for the emerging technology. Agencies such as, the Alaska Department of Fish and Game, which often use manned aircraft to accomplish wildlife management activities, may find value in augmenting their services with UAS and thereby improve safety as well as information access.

3.1.4 Oil & Natural Gas Development Demand

The security of pipeline infrastructure and emergency response support for oil spills directly affect US national security. Given the special importance placed on the security and proper operations of oil infrastructure, UAS technology may have potential application within the oil and gas industry. The oil and gas industry has been responsible for much of Alaska's economic growth for 40 years.[16] Oil revenues fund most state services including the education system, transportation infrastructure, public health, and safety services. Since statehood, Alaska has received $164 billion in revenues from oil. An industry of this size brings the need for continued exploration, risk mitigation, and security monitoring. For these reasons, Shell, Conoco Phillips, and others all await unrestricted use of UAS in the Arctic.

Currently, the oil companies employ aerial technology throughout the course of their operations, including some early use of UAS. The industry is expected to become a major customer for the technology once a regulatory framework is in place. State entities with a regulatory role in the oil and gas industry, such as the Departments of Environmental Conservation (CED) and Natural Resources (DNR), should work with the FAA to ensure their interests are represented.

[16] State of Alaska Resource Development Council, website, http://www.akrdc.org/issues/oilgas/overview.html

Figure 9: BP Utilized Aeryon Scout for Pipeline Inspections Jun 2013 [17]

Presently, oil companies have incorporated a variety of manned fixed wing and rotary platforms to collect data and monitor infrastructure. These firms have been early adopters and experimenters with varied UAS platforms. Current adoption seems restricted only by FAA regulations on their use.

3.1.5 International Market Demand

At present, the United States is the world's key market for UAS technology. However, the limited availability of airspace for UAS restricts market growth. Other countries are pursuing efforts to develop the technology for their own purposes, but are also eagerly awaiting the US, specifically the FAA's integration of UAS with manned aircraft. The current efforts toward development of a UAS industry in Alaska will continue to attract potential international market opportunities, particularly in high-interest nations such as Canada and Japan. The Canadian military continues to research UAS uses and programs, and opportunities exist for synergistic missions across the scientific research and environmental monitoring communities. Further, opportunities exist to launch flight simulation and other UAS training programs to reposition the US and Alaska as leaders in this arena. The successful implementation of a UAS industry within Alaska will need to focus on domestic customers, while at the same time expanding research, training and other opportunities via international markets.

3.2 Strategic Consideration

As reviewed throughout this chapter, significant market opportunity exists across Alaska from federal, state and private sector stakeholders. These industry players are already deriving mutual benefit from their proximity, shared needs, and connections.

A more structured UAS interest group will provide significant benefits to the advancement of the UAS industry sector in Alaska and spur the ability of Alaska to compete in the global UAS economy. The role of the UAS interest group will facilitate a stronger

[17] Alaska Uses Drones to Inspect Oil and Gas Pipelines at a Fraction of the Cost, The Raw Story, June 7, 2013, http://www.rawstory.com/rs/2013/06/07/alaska-uses-drones-to-inspect-oil-and-gas-pipelines-at-a-fraction-of-the-cost/

environment for success. The focus should be on expanding and growing the UAS industry strategically beyond its present state. The UAS interest group will need to act as the hub and in this role facilitate engaged and strategic conversations involving all stakeholders to improve production and sharing of information, logistics, workforce development, and the identification of infrastructure needs. Alaska must compete with the rest of the nation and the world by staying abreast of innovations and leading advancements in business and workforce development.

As previously noted, the Cascade Chapter of the Association of Unmanned Vehicle Systems International (AUVSI) representing the states of Oregon and Washington, may be an industry group to emulate. A significant outcome of the Cascade Chapter has been the collaboration of private sector leaders, elected officials, education leaders, and even interested non-governmental entities. Key has been the formation of working groups or initiative areas to address specific needs common to industry development including deepening skills and talent, aligning innovation investments, accelerating entrepreneurship, and raising global awareness of the industry. Membership with the industry group, however, is not enough to achieve industry expansion. A successful Alaska based industry group must use the platform to encourage tighter relationships between industry stakeholders and then leverage the relationships to drive forward shared actions, policies and programs for ultimate expansion of the industry.

The State of Alaska can aid in the development of a stronger industry group through supporting tax and incentive policies, targeting education, training and research investments, streamlining regulations, and encouraging greater access to seed and venture capital. Conversely, a strong industry group can advocate for UAS-friendly policies (such as those recommended in this report) within the Legislature. The appointment of a special liaison to the interest group will likely be beneficial until the group can afford its own executive director. While the state—through DED or another entity—can help spur the creation of a strong industry group, it must ultimately be led by the private sector.

Potential or Actual Customers for UAS Services

Market Segment	Customer	Current/Potential Usage	Other Information
Federal Government			
	Department of Defense	• Long range ISR(Intelligence, Surveillance, and Reconnaissance) • Target acquisition and battle damage assessment	• US Army currently uses UAS for ISR in Alaska. • One of the largest current buyers of UAS technology.
	NASA	• Climate/weather research • Volcano research and remote thermal sensing • UAS traffic management research	• NASA is exploring ways to integrate UAS into the NAS. Their Traffic Management Project is interested in testing in Alaska.
	NOAA/National Marine Fisheries Service	• Fisheries research/monitoring • Climate/weather research • Arctic sea ice monitoring • Oil spill surveys • Marine mammal surveys/monitoring	• NOAA/NMFS have a strong Alaska footprint • NOAA currently uses UAS technology in their scientific research
	Department of Homeland Security	• UAS for Alaska/Canada border patrol • Drug trade monitoring	• DHS currently uses UAS technology for border patrol with Mexico and Canada

	Bureau of Land Management	• Mineral and energy development • Land-use planning and monitoring • Fire management • Evaluation of stream & watershed enhancement projects • Water quality & habitat analysis • Climate change analysis • Management of fish and wildlife resources	• BLM currently uses manned aviation with visual scanning/counting techniques. Not currently using UAS technology. • BLM currently manages 1/5 of Alaska's surface lands and wetland areas
	Bureau of Ocean Energy Management	• Oil & Gas site identification for land leasing • Resource evaluation and assessment • Geological data acquisition • Environmental stewardship • Regulations and guidance	• BOEM uses collected data to create a database for environmental and mammal health trend analysis. • BOEM does not currently employ UAS technology. • BOEM currently uses manned aircraft w/ visual counting techniques.
	National Park Service	• Fire and aviation management • Lands management • Personnel transport • Law enforcement • Information technology • Resource/wildlife management • Visitor protection (search and rescue)	• Alaska has 60% of all land managed by NPS in the US. • NPS currently uses manned aircraft for visual monitoring and detection.
	US Geological Survey	• Climate change and land usage • Energy and minerals research • Environmental management • Natural hazard research	• USGS incorporates UAS technology into many data collection methods. • Most data collection is still generated through manned aircraft methods.
	US Department of Agriculture	• Precision agriculture • Vegetation mapping • Terrain extraction/monitoring	• USDA is currently experimenting with Tier I, small UAS for precision agriculture, vegetation mapping, and terrain extraction/monitoring.

	US Forest Service	• Land mapping • Forest management • Fire prevention/management	• USFS serves as the premier leader in wildland fire management operations, computer simulated fire management programs and sophisticated resource tracking systems. • USFS currently uses UAS equipped with low-cost digital cameras to acquire thousands of images. • USFS uses UAS technology to generate mosaics for the creation of vegetation maps of arid rangelands.
	Federal Emergency Management Agency	• Disaster response • Disaster assessment • Search and rescue	• FEMA currently uses manned aircraft, but does not has not yet incorporated UAS technology.
State/University			
	Alaska Air National Guard	• Combat search and rescue • Arctic shipping lane management	• AANG has expressed interest in hiring UAS services on an as-needed basis. • AANG currently uses manned aircraft for search and rescue. • AANG could potentially be used to identify soft areas of sea ice to improve ice breaker success in Arctic shipping lanes.
	Alaska State Troopers	• Emergency response • Search and rescue • Law enforcement	• AST do not currently implement UAS technology.
	Department of Fish and Game	• Wildlife monitoring/management • Fisheries data collection • Marine mammal detection	• DFG currently uses sonar for collection of fish counts. • Department is not currently implementing UAS technology.

	Department of Natural Resources	• Lands mapping • Environmental studies and assessments	• DNR is not currently implementing UAS technology.
	University of Alaska	• UAS and other applied research • Student/workforce training (for UAS operations)	• UAA offers a class specific to UAS technology. • University has potential to become a national leader in UAS training and research.
Private Sector/Other			
	Oil & Gas Industry	• Pipeline monitoring • Emergency spill response	• Industry has employed some UAS technology for pipeline monitoring. • Industry currently uses manned technology for data collection and infrastructure monitoring.
	Alaska Native Corporations	• Trespass detection • Land surveying	• Native Corporations hold roughly 13% of the state's land area which must be secured and surveyed periodically.

4 COMPETING LOCATIONS

The Federal Aviation Administration (FAA) is responsible for the integration of UAS into the National Airspace System (NAS). This integration requires the development of standards and protocols (regulation, policy, procedures, guidance material, training requirements, etc.) for all aspects of operation of UAS. In furtherance of this charge, and amid mounting pressure to expedite the integration, the FAA Modernization and Reform Act of 2012 directed the FAA, in coordination with NASA and the DoD, to designate six test ranges to research the safety and other operational aspects of the technology. This testing will ultimately inform and assist the regulatory process.

As in Alaska, leaders in each of the states hosting a test range hope to develop strong, local UAS-related economic opportunities. In addition, several states without a test range also hope to capture economic benefits from a homegrown UAS sector. This chapter discusses each of the states that have been identified as potential competitors, including the assets they offer to the emerging industry.

4.1 FAA TEST RANGE LOCATIONS

To accomplish safe integration of UAS into the NAS, the FAA needs to develop a specific regulatory framework as expediently as practical. These regulatory protocols will ultimately cover all aspects of UAS from aircraft design specification to pilot certification and comprehensive operational standards. The selected test ranges will address the agency's overarching UAS research goals: (1) system safety and data gathering, (2) aircraft certification, (3) command and control link issues, (4) control station layout and certification, (5) ground and airborne sense-and-avoid, and (6) environmental impacts.

Key among the range selection criteria was geographic and climatic diversity. While individual ranges may be more suited to specific research areas than others, they are each free to expand research and testing activities into multiple UAS applications. Following a 10-month process, the FAA awarded six test ranges from a field of more than 25 applications representing 24 states. A total of 19 teams were not chosen; some of these unsuccessful teams have abandoned UAS plans and others have joined forces with designated test ranges. The six ranges selected by the FAA to carry out its research goals include the following:

- University of Alaska
- State of Nevada
- New York's Griffiss International Airport
- North Dakota Department of Commerce
- Texas A&M University
- Virginia Polytechnic Institute

What follows is a more comprehensive profile of each of the six FAA test ranges. Each is identified by the lead for the range with the goal of providing a format for understanding each of the range's specific capabilities with respect to the FAA's goal of integrating UAS into the NAS. Each of the ranges selected by the FAA has a specific advantage or charge for the furtherance of UAS integration into the national airspace. Following the profiles a brief overview of non-FAA test range activity is also provided.

University of Alaska[18]

Lead Organization & Assets

The Pan-Pacific UAS Test Range Complex (PPUTRC) is the designation for this test range. The PPUTRC represents the largest of the FAA test ranges with 59 contributing partners as well as expansive geographic coverage. The PPUTRC spans seven climate zones, allowing UAS manufacturers and users to test their equipment in the Arctic, the tropics, and arid environments. The Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) oversees all operations for the test range and in this role represents the entire PPUTRC, which includes test ranges in Alaska, Oregon and Hawaii.

The team proposed six test ranges in Alaska that included the Kodiak Range, Denali Range, Poker Flat, Oliktok Corridor, Wainwright Corridor, and the North Slope Range. Oregon proposed four ranges including Tillamook coastal, Warm Springs, Pendleton Range, and Juniper MOA. Lastly, Hawaii proposed three test sites at Humuula-R-3103, Makua-R-3109, and Maku-R-3110. After selection, the FAA initially approved a smaller set of ranges, but has since approved additional range locations.

Stakeholder Organizations

The University of Alaska (UA) leads the PPUTRC effort and has the most experience of any school in the country with regard to UAS technology. ACUASI was established in 2012 under the Geophysical Institute at UAF. The ACUASI team conducted UAS research for more than ten years prior to 2012 and has successfully managed more than 50 FAA Certificates of Authorization. Additionally, UA has strong pilot, air traffic control and mechanic training programs that directly align with UAS and range needs.

The PPUTRC represents a collaboration of academia, state agencies, Native organizations, private sector firms, economic development organizations, and related stakeholder organizations. Oregon State University is the primary research lead for Oregon and

[18] http://acuasi.alaska.edu/about
http://www.wired.com/2012/06/64-drone-bases-on-us-soil/
http://higherlogicdownload.s3.amazonaws.com/AUVSI/656942e4-4448-41c3-877d-0c5f3ea40e63/UploadedImages/2013AprilSymposium/Pan-Pacific-UAS-Test-Site_OSU.pdf
http://www.faa.gov/uas/legislative_programs/test_sites/

University of Hawaii-Hilo is the primary research lead for Hawaii. These entities manage the ranges in their respective states, but both report to ACUASI as PPUTRC's lead organization.

The armed forces in Alaska represent a key stakeholder group. The RQ-7 Shadow is in use at Fort Richardson, Fort Greely/Allen Army Airfield, and Fort Wainwright/Ladd Army Airfield. The Army uses the unmanned Shadow for global reconnaissance, surveillance, and damage assessment. Fort Wainwright is also home to the RQ-11 Raven. These smaller, fixed wing systems can be hand launched, but have limited range and endurance due to their small size. The Army is preparing to host the Grey Eagle system at Ft Wainwright starting in 2015. These expansion plans should have an impact on PPUTRC.

Economic impact

The AUVSI has projected the following economic growth from the UAS industry for Alaska:

Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total Taxes ($K)	Percent Change Over Previous Year
2015	16	32	$41.21	$77.14	$0	
2016	33	64	$82.41	$154.28	$0	100.00%
2017	49	95	$123.62	$231.42	$0	50.00%
2018	52	100	$129.80	$242.99	$0	5.00%
2019	54	105	$136.29	$255.14	$0	5.00%
2020	57	110	$143.11	$267.89	$0	5.00%
2025	73	141	$182.64	$341.91	$0	5.00%

Incentive Structure

Alaska is still maturing in its creation of incentives for business expansion and attraction. The Alaska Industrial Development and Export Authority (AIDEA) provides financing to a wide range of commercial facilities and assets in the state. AIDEA's financing options include loan participations, revenue bonds, equity investment, and asset purchase. The 49th State Angel Fund, run by the Municipality of Anchorage, also makes venture capital available to firms operating in that city.

Oregon provides research tax credits for firms engaged in advanced computing and

materials, environmental assessment, and electronic device technology. The state also offers property tax breaks for new or expanding facilities and the potential for an income tax holiday spanning multiple years.

Hawaii offers a range of programs aimed at the attraction and development of high-tech firms. Blue Startups is Hawaii's venture accelerator and the state's technology incubator. Key components of Blue Startups include seed funding, mentorship, access to business expertise, product testing, peer review, pitch development, and introductions to investors. Twice a year, teams are selected to go through an intensive 12-week program, to kick-start their business. Businesses looking to make foreign sales can benefit from its foreign trade zone designation, reducing trade duties. Hawaii also hosts Mbloom, an incubator and early stage technology investment fund created as a public-private partnership.[19]

Each state exhibits a growing demand for incentives and programs to support business starts as well as to attract new innovative firms. States often align technical assistance providers and funds to sustain a start-up through the "valley of death," or the critical years between initial investment and sustainable cash flow.

Nevada

Nevada is sparsely populated, not unlike Alaska, which makes it attractive for UAS testing. The state hosts a large military presence, including Nellis Air Force Base, Fallon Naval Air Station, the Nellis Test and Training Range, and the Nevada National Security Site (NNSS). Also of interest, the federal government owns approximately 80% of the land in Nevada. Further, Creech Air Force Base is home to the premier UAS military support units. Creech personnel have logged more than 10 million hours of flight time in UAS platforms, training, experimental, and operational modes. Likely because of this, Nevada boasts the largest numbers of trained UAS pilots and sensor operators in the world.

Nevada has developed capabilities and infrastructure that will make it a strong competitor within the UAS industry. Many of the large UAS manufacturers, including Lockheed Martin, General Atomics, and Northrop Grumman, maintain operations within Nevada. Sierra Nevada Corporation, Arcata Associates, and Science Application International Corporation are other defense contractors located in Nevada. The University Nevada, Las Vegas, through the Desert Research Institute, is developing a Center of Excellence, an incubator designed to aid in the commercialization of UAS technology. **Furthermore, the University of Nevada, Reno offers an engineering minor in unmanned technology, and is working on the construction of the Nevada Advanced Autonomous Systems Innovation Center, a Reno-based UAS research hub.**[20]

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[19] A Range of Choices", Dee Ann Divis, Inside Unmanned Systems, Spring 2014, http://insideunmanned.epubxp.com/i/307674/0
[20] A Range of Choices", Dee Ann Divis, Inside Unmanned Systems, Spring 2014, http://insideunmanned.epubxp.com/i/307674/0
http://www.unr.edu/autonomous-systems

New York – Griffiss International Airport

Griffiss International Airport is the official designee of the FAA test range. Griffiss is teamed with the Northeast UAS Airspace Integration Research Alliance (NUAIR), a New York nonprofit regional consortium of more than 50 private industry, academic, and military entities collaborating to support the testing of UAS in New York and Massachusetts. Griffiss International Airport in Rome, New York (a former Air Force base) and Joint Base Cape Cod in Massachusetts serve as the two approved test ranges. The range received its certificate of authorization (COA) by the FAA on August 7th 2014 and had its first unmanned aircraft test operation in early November 2014 for Lockheed Martin.

Griffiss International is charged with the development of sense and avoidance capabilities to prevent collisions with other aircraft. The specific UAS projects include detection of insects, weeds, diseases, crop characteristics, crop biomass, and background soil characteristics. Research at the range will evaluate methods for scouting agricultural fields using different types of sensors. The range also expects to manage agricultural research flights from Joint Base Cape Cod in Massachusetts. Combined, New York and Massachusetts offer more than 7,000 square miles of diverse airspace available for UAS testing.

North Dakota Department of Commerce

The FAA certified the Northern Plains UAS Test Site as the first range ready for operation in April, 2014. This range relies on various test sites in the Grand Forks area, including Grand Sky, Grand Forks AFB, Carrington, and Sullys Hill Game Preserve. Grand Sky in Grand Forks County provides a 217-acre site for potential development, testing, training, sensor technology development, data analysis, and management. The site is adjacent to Grand Forks AFB and thus provides access to runways for testing. To date, the state has invested over $19 million to advance UAS research and development and is collaborating with organizations statewide to expand this industry.

The University of North Dakota established the John D. Odegard School of Aerospace Sciences in the 1960s and, more recently, the Center for Unmanned Aircraft Systems. The Center leads the research, education, and training for UAS. The UND offers a BS degree in Aeronautics with a major in Unmanned Aircraft System Operation. The university was the first in the nation to offer a focus area in unmanned aircraft systems. University researchers are also developing a ground-based radar system capable of detecting low-flying aircraft such as sailplanes and hot air balloons. North Dakota State University, located in Fargo, is a partner as well, with a world-class engineering department specializing in electronic and electrical engineering, including nano and micro-scale electronics[21].

[21] A Range of Choices", Dee Ann Divis, Inside Unmanned Systems, Spring 2014, http://insideunmanned.epubxp.com/i/307674/0

Texas A&M University

The Texas FAA test range will focus its efforts on applications involving coastal and ocean areas (tracking of marine mammals, environmental monitoring, and drill platform assessment). Texas also offers a one-of-a-kind testing area for UAS emergency response applications. "Disaster City" is a recreated urban training environment composed of simulated rubble in which emergency response scenarios are executed for first responder personnel and technology insertion training[22]. The test range has developed a partnership with the University of Texas at Arlington Research Institute (UTARI), which is currently focusing on several facets of UAS research for commercial applications. UTARI is researching UAS command and control link operations, general system safety and data gathering, and sense and avoid technology, both in air and on the ground, as well as aerial refueling possibilities.

Virginia Polytechnic University (Virginia Tech)

VPU's primary goal as an FAA test range is to conduct individual and collaborative work with the FAA, as well as economic modeling and marketing for the commercial applications of UAS. Additionally, the group will focus on the research of failure mode testing as well as operational and technical risks specific to UAS. The Mid-Atlantic Aviation Partnership (MAAP) has several sites used for test flights including the Kentland experimental air station in Blacksburg, VA. The range had its first flight on August 13th, 2014, and is now fully operational.

MAAP is one of the largest UAS groups supporting the UAS integration into the NAS with ten universities, seven government departments, and dozens of industry and economic development firms as members of the core group. Since the universities and government agencies are spread over the East Coast (primarily Virginia, Maryland and New Jersey), MAAP expands the Virginia Tech test range borders well beyond simply the state of Virginia.

Virginia Tech does much of its research through the Virginia Center for Autonomous Systems (VaCAS), which has over a decade of experience working with UAS. The VaCAS UAS fleet is ever growing with systems constantly being built by students and faculty. One set of systems is the SPARROs, which help build on failure rate versus cost research. These systems are inexpensive to manufacture, but have sophisticated safeguards to accommodate failures. VaCAS has performed this variety of research since 2009. Other areas of research are vehicle guidance and control, sensing and navigation advancement, mobility and actuation development, dynamic vehicle modelling and analysis, and overall vehicle design.

[22] "A Range of Choices", Dee Ann Divis, Inside Unmanned Systems, Spring 2014, http://insideunmanned.epubxp.com/i/307674/0

	Nevada	North Dakota	New York (including Massachusetts)	Virginia (including Maryland and New Jersey)	Alaska (including Hawaii and Oregon)	Texas
Cost of Living	• CPI*** Oct. 2014: 241.650; • Inflation Oct. 2014 to Oct. 2013: 2.0%	• CPI Oct. 2014: 225.793; • Inflation Oct. 2014 to Oct. 2013: 1.6%	• CPI first half 2014: 260.5; • Inflation (12 month change): 1.3%	• CPI Sep. 2014: 155.52; • Inflation Sep. 2014 to 2013: 1.3%	• CPI first half 2014: 214.777; • Inflation (12 month change): 1.9%	• CPI Oct. 2014: 214.791 • Inflation Oct. 2014 to 2013: 3.4%
Per Capita Personal Income****, 2013, $	• $39,235	• $53,182	• $54,462 (NY)	• $48,838 (VA)	• $50,150 (AK)	• $43,862

	Nevada	North Dakota	New York (including Massachusetts)	Virginia (including Maryland and New Jersey)	Alaska (including Hawaii and Oregon)	Texas
Incentives	• No personal income, corporate income, unitary, warehouse, or franchise taxes. • Sales and use tax abatement, business tax abatement, personal property tax abatement; • Train Employees Now program; • Nevada's Catalyst Fund (expansion or relocation of businesses). • Knowledge Fund (promote research and technology commercialization).	• State appropriated $5 million for UAS development. • Abatements on income tax for up to 5 years, breaks on sales tax, investment tax credits, interest rate buy-downs and gap financing, property tax abatement • State programs for workforce training and interns positions financing (Job Training Assistance). • Research North Dakota for firms in support of R&D (up to $300,000 in matching funds). • Agricultural Products Utilization Commission: 15 grants annually.	**NY:** • 80 different technology incubators. • Income tax exemptions, sales tax exemption. • Grants to promote targeted industries like UAS. • The Essential New York Initiative. • Start-Up New York tax-free zones. **MA:** • Emerging Technology Fund (loans or loan participations for emerging firms up to $1.5 million and loan guarantees of up to $1.5 million). • Bridge financing offered to private sector businesses.	• Virginia Economic Development Incentive Grant (for starting-up or moving to the state firms). • Governor's Agriculture and Forestry Industries Development Fund. • Virginia Investment Partnership Grant; • Virginia Enterprise Zone Program; • Technology Zone Program; • Virginia Jobs Investment Program; • Tax credit programs: corporate income tax credit, sale and use tax credits, and property tax credits; • Center for Innovative Technology.	**AK:** • Small Business Loans of up to $300,000. • AIDEA's financing options • 49th State Angel Fund financing **OR:** • research tax credits; • property tax breaks; **HI:** • Blue Startups tech. incubator; • Mbloom incubator;	• State incentives: tax breaks, tax refunds, and expansion and relocation financing. • The Texas Emerging Technology Fund ($485 million). • Texas Enterprise Fund (helps businesses to locate in Texas). • Workforce Development: Self Sufficiency Fund and Skills Development Fund.
Available Aerospace	More than 30,000 square miles of airspace[23]	More than 13,000 square miles of airspace[24]	More than 7,000 square miles of diverse airspace (NY	More than 2700 square miles	More than 663,300 square miles of	11 test regions cover about 6,000 square miles across

[23] http://www.insidegnss.com/node/4143
[24] http://www.uasresearch.com/aboutus/projects.aspx

	Nevada	North Dakota	New York (including Massachusetts)	Virginia (including Maryland and New Jersey)	Alaska (including Hawaii and Oregon)	Texas
			and MA together)	of airspace[25]	airspace[26]	the state[27]
R&D personnel at higher education institutions	3,144	3,963	60,706 (NY), 39,089 (MA)	22,016 (VA), 38,204 (MD), 14,724 (NJ)	1,558 (AK), 5,086 (HI), 14,806 (OR)	57,529
R&D Expenditures (in thousands), FY 2012 (information on states leading the project)	Total: $153,325 Federal –70.31%; State and Local – 3.09%; Institution Fund – 22.53%; Business –1.60%; Non-Profit –2.34%; Other –0.13%	Total: $215,642 Federal –46.82%; State and Local – 24.78%; Institution Fund – 19.28%; Business –5.20%; Non-Profit –1.43%; Other –2.49%	Total: $5,361,113 Federal –59.92%; State and Local – 5.26%; Institution Fund – 20.91%; Business –5.37%; Non-Profit –7.14%; Other –1.40%	Total $1,379,440 Federal –55.61%; State and Local – 9.37%; Institution Fund – 25.54%; Business –3.94%; Non-Profit –5.06%; Other –0.46%	Total: $181,983 Federal – 61.23%; State and Local – 5.23%; Institution Fund – 27.49%; Business – 3.51%; Non-Profit – 1.64%; Other – 0.91%	Total: $4,651,322 Federal –46.71%; State and Local – 15.63%; Institution Fund – 21.18%; Business –6.52%; Non-Profit –8.95%; Other –1.01%
Number of Universities with R&D Activities (state and private)	3	2	66 (NY), 26(MA)	15 (VA), 13 (MD), 16 (NJ)	3 (AK), 3 (HI), 11 (OR)	47
Universities Involved in UAS Development	• University of Nevada;	• University of North Dakota (John D.	20 universities total,	• Virginia Polytechnic University (the	• University of Alaska	• Texas A&M University-College

[25] http://www.navair.navy.mil/nawcad/index.cfm?fuseaction=home.download&id=744
[26] http://commerce.state.ak.us/dnn/portals/6/pub/unmannedaircraftsystems.pdf
[27] http://www.theeagle.com/news/local/faa-names-texas-a-m-corpus-christi-as-drone-test/article_ac269367-7611-5d8c-a97e-c21d656c47f1.html

	Nevada	North Dakota	New York (including Massachusetts)	Virginia (including Maryland and New Jersey)	Alaska (including Hawaii and Oregon)	Texas
Programs	• Reno (College of Engineering); • College of Southern Nevada; • Las Vegas Desert Research Institute	Odegard School of Aerospace Sciences, the Center for Unmanned Aircraft Systems); • North Dakota State University	including: • Rochester Institute of Technology; • Massachusetts Institute of Technology; • Boston University; • Cornell University; • Embry-Riddle Aeronautical University and others.	Virginia Center for Autonomous Systems); • Rutgers University; • State University of New Jersey; • National • Institute of Aerospace; • Liberty University; • New Jersey Institute of Technology; • Rowan University; The Richard Stockton College of NJ; • Virginia State University	Fairbanks (the Pan-Pacific UAS Test Range Complex; Alaska Center for Unmanned Aircraft Systems Integration); • Oregon State University; • University of Hawaii-Hilo	Station; • Southwest Research Institute; • University of Texas at Arlington Research Institute (UTARI)
Labor Pool	Total Civilian Labor Force Oct. 2014 (thousands): 1,368.4 Unemployment Rate Oct. 2014: 7.1%	Total Labor Force Oct. 2014 (thousands): 415.5 Unemployment Rate Oct. 2014: 2.8%	Total Labor Force Oct. 2014 (thousands): 9,539.7 Unemployment Rate Oct. 2014: 6.0%	Total Labor Force Oct. 2014 (thousands): 4,263 Unemployment Rate Oct. 2014: 5.3%	Total Labor Force Oct. 2014 (thousands): 364 Unemployment Rate Oct. 2014: 6.8%	Total Labor Force Oct. 2014 (thousands): 13,039.2 Unemployment Rate Oct. 2014: 5.1%

	Nevada	North Dakota	New York (including Massachusetts)	Virginia (including Maryland and New Jersey)	Alaska (including Hawaii and Oregon)	Texas
Share of labor employed in Industries supportive to UAS development, 2013	Manufacturing – 4.2% Information – 1.7% Science* - 11.2% Transportation** - 5.2%	Manufacturing – 7.1% Information – 1.4% Science* - 6.6% Transportation** - 5.4%	Manufacturing – 6.6% Information – 2.9% Science* - 11.7% Transportation** - 4.9%	Manufacturing – 7.2% Information – 2.1% Science* - 14.8% Transportation** - 4.1%	Manufacturing – 3.7% Information – 1.8% Science* - 9.4% Transportation** - 7.9%	Manufacturing – 9.3% Information – 1.8% Science* - 11.1% Transportation** - 5.2%

5 MARKET DEVELOPMENT CONSIDERATIONS

Alaska's traditional industries, which include oil and gas extraction, mining, fishing and seafood processing, tourism and military operations, are part of complex ecosystems that developed gradually over time. Forestry and wood products form a declining industry while commentators point to logistics and international trade, advanced business services, specialized machinery and social services as emerging areas of opportunity. The current concentration on UAS activity has the potential to develop a strong economic base in Alaska, in part by leveraging a number of established industries of importance including military operations, and those oriented towards resource monitoring and extraction. A potential UAS industry also benefits from Arctic or "cold climate" competencies as well as rocket launch expertise. The following provides an overview explaining how an industry focus might be established.

5.1 ANCHOR TENANT

The introduction of an anchor tenant to a region will in many cases spur or advance an industry's development.[28] An anchor tenant will attract other firms. These co-located businesses will then benefit from greater innovation and economic performance due to the sheer proximity, resulting workforce, and even from the drawing of symbiotic players like venture capital investors to an area.

Definition of Anchor Tenant: An anchor tenant is a large firm, often engaged in R&D, which can promote the development of an industry concentration, encouraging smaller firms to locate in close proximity. For the purposes of UAS development, the role of an anchor tenant may be filled by the oil and gas industry or military. While these do not meet the conventional definition, they may support UAS by serving as large customers. Alternatively, the UAS industry in Alaska may benefit more from the attraction of a firm that is drawn by the FAA test site designation and has a sincere interest in engaging in and even serving as the champion for the development of a UAS industry.

An anchor tenant is considered one of the central elements necessary for stronger industry formation and ultimate growth. Attracting an anchor tenant for industry development purposes is not a new idea. This strategy has been borrowed from commercial real estate development practices, particularly for retail or mall developments. The classic anchor tenant is a large department store associated with a shopping mall. These department stores typically have name recognition and are known for creating demand, and thus generate traffic for the overall retail development. In many cases, a retail developer won't pursue a sites development

[28] Michael Porter, *Cluster and the New Economics of Competitions*, Harvard Business Review, Nov. – Dec. 1998

until an "anchor tenant" can be locked in for the site. As an initial step in encouraging growth of UAS industry in Alaska, an anchor tenant is an important component that may actually involve multiple tenants or the engagement of multiple key stakeholders. The attraction of a large or multiple smaller private sector firms is essential. Further, large public entities such as the University of Alaska and other institutes of higher learning, public laboratories and/or public entities with interest such as the FAA, all serve critical tenant roles, but are not typically an anchor tenant due to the need to integrate private sector capital and market practices into the mix. Similarly, national public stakeholders that will positively influence the dynamics of the emerging industry are also worth attracting if they are not already present (i.e. Department of Defense or NASA). In addition, the military bases and oil and gas companies may play the role of anchor tenant by serving as large potential customers of UAS services. The state itself can act as an anchor tenant by becoming a purchaser of UAS services.

In reviewing aerospace development activity across decades of the aircraft industry's existence, it is common to find companies from other sectors that acted as "incubators" by dedicating part of their activity to aircraft production. Afterwards, based on their performance, some of these incubators converted themselves entirely to aircraft production, while others returned to their previous activity, and closed or split their aircraft production unit, which continued to develop in an independent way.

These aviation industry anchor tenants positively influenced the innovation activity of a region (i.e. increasing number of patents and number of entrepreneurial firms) as well as attracted other innovators and smaller firms working in the same or related industries. Other examples were noted in which the anchor tenants attracted specialized suppliers when relevant to the industry sector, or when firms believed proximity would benefit their entry into the nascent industry. Once co-located within a region, these firms then attracted skilled labor with specialized training. As a result, it is important to understand the factors that will influence the decision of an anchor tenant, including:

- A pool of potential entrepreneurs or startup talent;
- A workforce or qualified manpower capable of understanding the complexity and satisfying the Requirements of the emerging industry;
- Access to capital – including both private and public sources of funds; and
- Inputs to research and development as well as manufacturing.
    - Further, based on the study of aerospace anchor tenants a UAS anchor tenant will also seek:
- Strategic military and or federal player engagement if it is believed the government will have a strong involvement in the financing and supervision of the ultimate development of the industry.

To encourage the development of healthy industry linkages, It will be useful to build a

collaborative regional strategy that emphasizes:

- Alignment of regional leaders in common direction and provides opportunity for collaboration;
- Promotion of skill and talent development as well as career advancement paths;
- Support for study tours, networking and learning exchanges;
- Direction of R&D funds and mobilizes capital to encourage UAS business starts; and
- Acceleration of a robust UAS related entrepreneurial ecosystem.

5.2 Incentive Structures

One of the most important aspects in attracting UAS industry investment or an anchor tenant to Alaska will be providing key incentive packages to private industry. Incentives are cash or cash equivalent forms of assistance provided to firms on a discretionary basis to attract or retain business operations. Popular incentives include property tax abatements, discretionary credits under the state's corporate income tax, low-interest financing, and even free land and buildings. Alaska is faced with a number of challenges that make business development and attraction difficult, particularly the high supply chain and labor costs when compared with other states. However, the state can offer many unique incentives that can help spur industry development within the state and create a more even and comparative business investment environment. (Please see appendix 3 for table summary of incentives.)

Given the many challenges that Alaska faces from a business attraction standpoint, the state already finds itself at a disadvantage compared to other test range locations. Alaska is not currently a major hub for defense contractors or aerospace manufacturing, like some competing test ranges are (Nevada, for example). These realities do not make it impossible to develop a thriving, successful, and integrated UAS industry within the state. They do, however, reduce the margin for error as the state moves forward with its efforts to grow the industry. **Making a concerted, coordinated attempt to customize incentives for private industry investment within the state is therefore paramount.** With the right incentive structure in place, Alaska can help mitigate its current challenges, while at the same time promote those positive attributes and resources that the state currently holds.

As detailed throughout this section, a number of states have begun (or are planning to begin) offering tax incentives to private industry. For instance, California introduced a bill that provides a tax credit to firms choosing to manufacture UAS within their state. This could be a major opportunity area for Alaska with its industry attraction efforts. The state's current corporate income tax rate, 9.4%, ranks as the 5th highest in the nation. This, coupled with the high supply chain and labor costs associated with Alaska, make it difficult to entice businesses to relocate or invest in the state. However, Alaska could begin offering targeted tax credits aimed at creating a positive business environment ripe for investment from the UAS industry.

These tax credits can come from the State, as well as from the respective Borough or Municipality. Possible tax credits at the State level that could be used to entice UAS industry investment include:

- **Research and development tax credits**. According to *Forbes*, 38 states offer an R&D tax credit as of 2013, thereby reducing state income tax liability for qualifying R&D expenses.[29] Under most accepted definitions, working to develop UAS technology for the market would qualify as R&D. Formulas for calculating the value of the credit vary widely from state to state, but generally include two components: a credit rate and a base level. The credit rate is the percentage of R&D expenses by which the tax liability is reduced. A base level is the minimum amount of expenditure before the credit applies. For instance, a state may offer a 10% R&D credit for qualified activity over $1M. Some states attempt to make the credit more lucrative for small businesses by reducing or eliminating the base level, or making other adjustments. To promote sustained R&D activity, some states require multiple years of R&D activity before the credit can be claimed; others offer a higher credit to companies with multiple years of qualified activity. The effectiveness of state R&D tax credits is the subject of some debate; a 2007 study by the San Francisco Federal Reserve found that the credits often increase the amount of R&D activity occurring within a state. The report added, however, that these gains are usually "zero-sum," meaning that they largely shift R&D activity between states rather than incentivizing new expenditure.[30]
- **Hiring tax credits**. This type of credit reduces a company's state income tax liability for hiring certain classes of employees. In Alaska, a credit could apply to specific skillsets such as aerospace engineers to advance the development of a UAS industry. As an example, the State of Mississippi offers a tax credit of $1,000 per employee each year for five years to companies that hire in scientific and technical fields and meet other requirements. Oklahoma also has incentives in place to spur their UAS industry. The state offers employers a tax credit of up to $12,500 per qualified employee per year for five years for each aerospace engineer it hires. The State also offers a separate $5,000 annual tax credit to each aerospace engineer who relocates to Oklahoma for their job, for up to five years. This provides incentives for both employers and employees to relocate to Oklahoma. This program is set to expire, however, on December 31, 2014.
- **Manufacturing tax credits**. These can take several different forms, including credits or exemptions for property, sales, or corporate income taxes. The State of Wisconsin, for instance, exempts manufacturing-specific machinery and equipment from property taxes. (The exemption does not extend to land or buildings associated with

[29] "Eight Myths That Keep Small Businesses From Claiming The R&D Tax Credit" http://www.forbes.com/sites/deanzerbe/2013/03/28/eight-myths-that-keep-small-businesses-from-claiming-the-rd-tax-credit/
[30] "Overview of Research and Development Tax Incentive Strategies," http://www.lbb.state.tx.us/Other_Pubs/Overview%20of%20Research%20and%20Development%20Tax%20Incentives.pdf

manufacturing, however.) Other states exempt manufacturing equipment purchases from sales tax, or provide credits against income taxes for such investments. It remains to be seen whether or not a UAS industry in Alaska would have a manufacturing component, but such credits could help to offset the cost of business if manufacturers show interest in locating production to the state. Given Alaska's current tax structure, however, the only manufacturing tax credits that would be available at the State level would be for corporate income taxes. Other taxes, such as property and sales taxes, would have to come at the Municipal or Borough level. An alternative option at the state level would be to replace any lost revenues to local governments who promote UAS development. This would provide additional incentives for local governments to help work with the state to develop a friendly climate for UAS development.

In addition to those tax credits and incentives offered at the State level, additional credits and incentives can be made at the Borough or Municipality level, including the following:

- **Property tax abatements** for businesses operating in "Military Facility Zones." A more specific type of incentive which the Alaska Legislature passed is an exemption or partial exemption from property taxes for up to 10 years if the property is in a military facility zone that creates or supports industry, development, or educational or training opportunities beneficial to a facility. HB 223, was introduced in January 2014, and signed into law September 2014. This bill permits local governments in the state to exempt businesses that serve military bases. Since the state does not levy a property tax, the exemptions are provided by municipalities or boroughs. As such, in this case municipalities and boroughs have the strongest ability to make UAS related investments more cost effective.
- **Manufacturing tax credits (local level).** As mentioned above, many states incorporate manufacturing tax credits through property and sales tax incentives. Given that within Alaska these taxes occur at the local level, these tax credits would need to come from boroughs and municipalities.
- **Sales tax abatements.** An additional form of tax incentive that can be offered at the borough or municipality level is a sales tax incentive. These would allow local governments to exempt particular purchases, or businesses within particular industries, from sales taxes. Local governments can craft these abatements in specific ways to help incentivize development of a UAS industry within their community.

On the whole, Alaska is positioned as one of the states with the best overall tax climate, despite having a relatively high corporate tax structure. The state levies no personal income or state sales tax, which offers great incentives for small businesses looking to establish within the state. However, the state's high corporate income tax will make it difficult to attract investment from the largest industry participants. By offering tax credits aimed at large corporate

investment within the state, Alaska can help to reduce some of the high costs of doing business in the state.

In addition to potential tax credits, the state can consider offering other useful incentives to help spur investment. As an example, Alaska could follow North Dakota's lead by offering matching research and development grants for businesses in the UAS industry sector. These grants could be focused on projects involving a joint effort between private industry and the University of Alaska. This would allow the state's university to receive targeted funding for projects of economic importance while at the same time aiding the industry's development. Alaska could also choose to focus on expansion of Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants or rather contract funding from various agencies of the US government. The purpose of these awards is to provide early-stage research and development funding to advance technology. The state could consider matching successful SBIR and STTR awardees.

One important incentive available within the state stems from the recent passage of HB 316 during the 27th Alaska Legislature. The bill allows for the designation of Military Facility Zones, which would allow the Alaska Industrial Development and Export Authority (AIDEA), as well as the Alaska Housing Finance Corporation (AHFC) to fund projects occurring within these zones. The MFZ designation would allow AIDEA to fund not only just the structures within the zones, but also for infrastructure development within the MFZ (such as sewers, sidewalks, and potential UAS infrastructure).

Other similar incentive opportunities include gap loans, equity financing, venture capital assistance, and interest rate buy downs. In some cases states are also developing targeted technical assistance support by providing information on how to start up a business, or make one more profitable within a specific industry. In these instances states are typically collaborating with existing technical assistance providers such as the Small Business Development Center to further bolster and support existing programs. The aim of state support in these instances is to reduce the overall risk and make the participating businesses more attractive for leverage of other resources.

Other incentives for consideration might include customized services targeted towards meeting the needs of individual businesses such as conducting relevant research, performing basic due diligence on high target locations for development, providing assistance programs to aid firms in navigating through state or local regulations, workforce development programs, and developing site-related infrastructure such as road access. Customized services are those incentives that will ultimately save firms in their development expenditures as well as convey a message to industry that Alaska is not only open for business, but keen in its understanding of what firms require to be successful in the UAS industry sector.

In order for Alaska to be competitive with attracting industry to the state, incentives will play a key role. Incentives will help to attract industry if they reduce costs associated with

development within the state as compared to other locations. Incentives alone will not be enough, however. Nor should Alaska ignore its other attributes that make it a prime candidate for corporate investment.

Economic development practitioners are often criticized for developing incentive packages without first critically taking into consideration if the incentives are in the best interest of the state and/or local government and actually relevant to the business being attracted. Incentives can become too costly for the jobs created and may actually result in hurting businesses that are already in the marketplace. As Alaska moves forward in developing incentives to attract UAS industry it may be beneficial to focus first on those incentives that bolster existing Alaska firms already in the industry and then on those incentives that target new business activities that will again further support and bolster existing firms or bring about desired performance by the firms being attracted. **In all cases, a more comprehensive cost-benefit analysis should be conducted along with the establishment of performance metrics associated with incentives to ascertain they are achieving desired results.**

5.3 Tech Park

One approach to commercializing the University of Alaska's expertise on UAS is through the formation of a university research or technical park. These developments, also referred to as research parks or tech parks, are a common means of spurring regional innovation by connecting business with the research assets of a university. The Association of University Research Parks (AURP) defines the term as "physical environments that can generate, attract and retain technology companies and talent in alignment with sponsoring research institutions (universities and public and private research laboratories)."[31] Famous examples include the Research Triangle Park in North Carolina (leveraging three large universities) and the Stanford Research Park in the heart of Silicon Valley. At the most basic level, these tech parks are real estate developments with leasable property for commercial tenants in targeted industries, allowing them to partner or affiliate with one or more universities. These research partnerships are a vital component to a successful tech park, as the availability of inexpensive real estate alone will not likely attract targeted industries. According to AURP, tech parks exhibit the following attributes:

- A property master plan designed for research and commercialization;
- Partnerships with at least one university or other research institution(s);
- Encouragement of the establishment and growth of new companies;
- Technology translation from the lab to the marketplace; and
- A focus on technology-led economic development.[32]

[31] https://aurp.memberclicks.net/assets/documents/aurp_batelllestudy2012-final.pdf
[32] https://aurp.memberclicks.net/assets/documents/aurp_batelllestudy2012-final.pdf, page 6.

The University of Alaska, in partnership with other public entities and private investors, may find that a tech park is a viable development vehicle. Companies wishing to establish R&D facilities related to UAS, ranging from large defense contractors or startup firms, would be potential tenants (parks often contain incubator components to support the startup of new firms). Chief benefits to the tenant include the ability to sponsor targeted research, access university labs and other facilities, utilize faculty as consultants, hire students and/or graduates, and license intellectual property. In essence, the university could act as an amplifier to the tenant firms' R&D operations, creating value for their intellectual property portfolios. As UAF has emerged as one of the nation's leaders in testing UAS in a variety of climates and geographies, it has also made itself a viable partner to industry for this purpose, and could leverage other assets in the Fairbanks area, including the four Interior military bases (Fort Wainwright, Eielson Air Force Base, Clear Air Force Station and Fort Greely) and access to runways and an international airport. Likewise, Anchorage would offer access to Joint Base Elmendorf Richardson, a university campus, as well as a large international airport. In either city, companies hoping to build a business around UAS would find adequate space to test the technology in consultation with leading experts.

Proximity to military bases would make a potential tech park attractive to defense contractors engaged in R&D. Of potential consideration, the US Army is expected to place one of its 17 Gray Eagle companies in Alaska. This company will have responsibility for 12 unmanned Gray Eagle aircraft, and includes a support staff of approximately 120 soldiers. The need to service and support these aircraft may present new business opportunities that dovetail with a tech park.

From the public sector standpoint, the benefits to a successful tech park are substantial. First the development would serve as the focal point for a new industry by building a knowledge center where expertise passes from university labs directly to interested firms. The park would provide a space for ideas to disseminate rapidly, helping to cement the state's status as a thought leader for UAS integration into the national airspace. Ultimately, the spillovers of knowledge—crucial to new industry formation—would spur the creation of new businesses statewide and bolster employment opportunities. Additional benefits include the generation of revenue through facility leases, and the enhancement of university stature. It should be noted, however, that success (defined as the attraction and retention of tenant firms, as well as formation of startups) depends on several critical factors. According to AURP, these include:

- Alignment between university competency and that of the targeted firms;
- Ability to assist early stage firms in commercialization;
- Access to investment capital for tenants;
- Access to university facilities, faculty, and students;
- Support of university leadership; and

- Support within the economic development community.[33]

Foremost among these factors is the strength of the university partnership. Numerous university tech parks nationwide have failed to attract commercial tenants because they treated the development purely as commercial property to be marketed and leased in a manner similar to other types of real estate. This approach fails to differentiate the tech park from other leasable property. Instead, businesses must see tangible value in the access to university facilities and expertise, and these are the features that should be used to attract commercial tenants. For this reason, the park should be physically an extension of the campus, intermingled closely with other university facilities to maximize the sharing of resources and knowledge. Locating a tech park far from its affiliated university can often doom it to irrelevance, as core university assets, including faculty, students, and research facilities, become less accessible.

The physical layout and location of the tech park are thus important elements of success. The type of leasable space available to firms is also a relevant consideration. While the Research Triangle Park was able to attract technology companies in the 1950s by offering inexpensive land on which to build their own facilities, this model has lost much of its effectiveness as many corporations have scaled back their R&D facilities. Instead, businesses are looking for less capital-intensive mixed-use space in shared buildings. Occupying this type of real estate requires less upfront cost and strengthens the offering, as well as provides an open, collaborative environment where knowledge can be shared and new ideas take form. Nationwide, innovative firms are choosing to co-locate with complementary firms, research labs, and universities so they can share ideas and practice "open innovation". Entrepreneurs and entrepreneurial firms increasingly seek to interact with like-minded firms and have efficient access to industry-specific guidance in addition to sophisticated equipment. New communication technologies make it possible for entrepreneurs to be successful nearly anywhere in the world, yet the "magic" occurs when entrepreneurs are able to leap forward due to shared thinking and utilization of space, workforce and innovations coming from an industry.

To help advance this type of innovation, university tech parks often include a business incubator or an accelerator to nurture startups. Both are facilities that provide physical space for new businesses, along with mentorship, assets such as laboratories and technology, and in some cases seed capital. Incubators generally host businesses for indefinite time periods (often years) until they are ready to "graduate" and leave the incubator. Accelerators, on the other hand, are designed to provide intensive guidance as part of a structured mentorship program for a fixed term, usually no more than 6 months. In either case, the operation may take equity in the startup businesses, or simply charge rent for use of the facilities. Incubators and

[33] https://aurp.memberclicks.net/assets/documents/aurp_batelllestudy2012-final.pdf, page 10.

accelerators can be centered on a specific type of industry segment, such as biotechnology or in this case, UAS. An operation of this sort might serve as an additional vehicle for commercializing university research, and established firms in the tech park could mentor, invest in, or ultimately acquire businesses started in an incubator.

As an additional note, Alaska's remote location will present challenges for the development of a university tech park, as with many other types of business developments. UAS technologies in particular can be operated from remote locations, so project leaders will need to focus on the strength and value proposition of a university partnership to attract companies, and emphasize features unavailable elsewhere, such as the airspace and unique expertise. These alone may not be enough, however, as several other states are exploring similar concepts. The state may also need to explore financial incentives to attract targeted firms to the tech park (or elsewhere in Alaska) as explored earlier in this chapter.

5.4 Strategic Considerations

- University tech parks are a common strategy to advance innovation for the purposes of regional economic development, and a possible option to advance UAS commercialization in Alaska.
- Tech parks encourage linkages between university expertise and businesses with complementary needs, and provide opportunities to move innovations into the marketplace.
- UAS industry development could benefit from the formation of a tech park and/or systems for establishing a core knowledge center. See appendix 2 – Central Oregon example.
- Alaska based private sector firms commented via interviews on their need for special use airspace to allow for experimental UAS flights to prove airworthiness – a tech park could address this need.
- Success hinges on several critical factors, including financial, political, and market feasibility, as well as alignment between university competencies and those of the targeted industry.
- Tech park development closely resembles that of any other real estate project, with phases including pre-development, feasibility, site development, financing, and construction. See appendix 3 – Real Estate Development Process defined for greater explanation.
- An incubator or accelerator to help launch startups to scale could be incorporated into a tech park as an additional means to commercialize UAS technology and create an innovative environment.

6 ALASKA UAS STRATEGIC ASSESSMENT

The successful development of a UAS industry in Alaska will benefit the Alaska economy in terms of high wage/high talent job creation and new private sector investment. In addition to building a core competency for the state (UAS research and development), a successful industry development strategy will also strengthen existing and emerging sectors within the state, such as metal fabrication, aviation, and resource development. Foundational to a development strategy is understanding the current position or conducting a strategic assessment outlining the current competitive position of Alaska as a player within the global UAS industry, including current strengths and weaknesses (internal factors), as well as opportunities and threats (external). These are summarized by the **Current Position** table below:

6.1 CURRENT POSITION

	Beneficial	Harmful
Internal	**Strengths** • Abundance of airspace for safe operations • Diversified need for this technology in the state – (public and private sector) • Strong aeronautical awareness (large number of pilots and aeronautic jobs) • Varied weather (good for R&D) • ACUASI leading UAS for over 10 years with great success • Strong legislative support for UAS development • UAS test range designation from FAA • FAA-certified aviation schools and strongly established maintenance and operation programs within these schools • Alaska UAS Interest Group	**Weaknesses** • High cost of logistics, energy, and labor • Limited road infrastructure (necessary for small UAVs) • Public skepticism (must educate public on positive uses of UAS) • Lack of formal structure to receive inquiries from prospective UAS range users • Lack of methodology to guide prospective UAS range users through range selection and scheduling

Although this strategy document has addressed the strengths and opportunities of a UAS industry in Alaska at length, threats and weaknesses must also be addressed and mitigated. These include a litany of common barriers to economic development in Alaska, such as high energy costs, a small workforce, long supply chains, and limited infrastructure (although this latter issue has probably helped spur the state's aviation competencies).

Alaska must identify the most significant obstacles to private sector investment in UAS-related enterprise, and explore policy solutions. Similarly, state entities such as the Alaska Industrial Development and Export Authority (AIDEA) and the Alaska Aerospace Corporation (AAC) can participate in financing critical infrastructure if such investments can be justified in terms of economic development and then tied to an overall strategic plan for the launch of a new UAS industry.

	Opportunities	Threats
External	• Education/informing the public as UAS are integrated in Alaska • Education/public schools system and University degree programs • Implementation in environmental monitoring, national security, and the oil industry • Opportunity to grow support industries (small aircraft maintenance, manufacturing, and metal and composite fabrication) • Ability to position Alaska on the cutting edge for UAS testing and implementation • Job creation and new investment	• Safety of airspace in Alaska. Need to establish rules governing integration in common airspace • Declining value of test site designation as UAS are accepted into NAS • Budget cuts at the state and university level • Possibility of value creation not benefitting state—UAS could be built and operated out-of-state, not benefitting local economy

6.2 Core Competencies and Competitive Advantages

A Leader in Small Aircraft Maintenance and Knowledge

Alaska has several distinct core competencies and competitive advantages which make it an ideal climate for the development of a strong, well-integrated UAS industry. The state has the largest number of pilots per capita, at a rate of three times the next highest state in the country. This high concentration of pilots has allowed the state to develop small aircraft and aviation as a core competency. Accordingly, the state's aviation support infrastructure and

expertise, including hundreds of remote airfields and aircraft service businesses, can be leveraged as assets for UAS development.

The importance of small aircraft has allowed this industry to develop within the state. The state possesses more than an adequate supply of trained small aircraft technicians and parts suppliers. Several specialized metal fabricators operate in Alaska that currently serve this niche market. For instance, one aircraft manufacturer in Southcentral Alaska manufactures components included on the Cessna Caravan, which are shipped all around the world to Africa, New Zealand, and Australia. This core competency also spills over into the state's educational institutions, which offer associate degrees and certifications related to aircraft maintenance and operations. When viewed in this context, the state of Alaska has the proper support infrastructure in place (relating to small aircraft) to compete effectively in the UAS industry.

A Harsh, Diverse Climate in America's Last Frontier

One of Alaska's greatest strengths is its harsh, varied climate and rugged topography, which make it a perfect testing site for emerging UAS technology and applications. Although these factors have historically inhibited economic development in Alaska, they provide nearly limitless applications for UAS technology. Such opportunities have been mentioned previously, and include the following:

- Volcano monitoring systems
- Oil pipeline monitoring
- Fish and Game monitoring
- Arctic weather deployment
- Mountain navigation and testing
- Extreme cold weather testing and innovation

Alaska provides opportunities for testing UAS in torrential rain (some Alaska locations receive the most rain in the US outside of Hawaii), extreme cold (temperatures in Interior Alaska can routinely reach -50 degrees Fahrenheit in winter), and in Arctic blizzards (a few of Alaska's cities can have extreme levels of snowfall compared to other locations in the US). This varied and extreme climate provides opportunities for the testing of UAS technology in some of the harshest of climates on Earth. This reality, combined with Alaska's other core competencies, makes it one of the best locations in the US for the development of this technology.

While the state can market its climate as a unique strength setting Alaska apart with regard to testing UAS capabilities, competitive locations will identify this as a disadvantage or weakness. Testing of UAS is typically conducted in clear, calm, dry locations. Poor weather conditions, icing, or strong winds may ultimately delay the ability to test UAS. Every day that testing is stalled costs associated with testing increase. Ultimately Alaska must communicate the benefits of unique mountainous terrain, cold weather, Arctic, and maritime testing

opportunities and work closely to assist industry with best times for testing.

Strong Leadership at the State Level

One of the chief advantages for Alaska with regard to the development of a strong UAS industry is the strong leadership shown at the state and university level. These entities have taken the lead to ensure that Alaska is among one of the six designated test ranges nationwide for UAS technology. This designation should ensure Alaska's place within this emerging industry. Furthermore, the state government has shown the necessary leadership to form a task force not only to identify opportunities and threats within the industry, but also to introduce proactive legislation to guide the industries development. This leadership has primed Alaska for success in the UAS industry.

Alaska's leadership has also played a prominent role in current efforts which strive to better understand the Arctic. Fran Ulmer (former Alaska Lt. Governor and UAA Chancellor) is Chair of the U.S. Arctic Research Commission. She was appointed by President Obama in March 2011. Additional state leaders are involved in the Arctic Council, an intergovernmental forum consisting of Arctic nations such as Canada, Denmark, Finland, and others. For instance, ACUASI's deputy sits on the UAS Expert Group, a committee of the Arctic Monitoring and Assessment Group, one of the standing committees of the Arctic Council. State leaders are also active in other Arctic groups such as Arctic Circle, a nonprofit organization which offers a dialogue for key Arctic stakeholders. Alaska's strong leadership in Arctic policy and Arctic issues will be a key asset in developing its UAS industry and furthering the Arctic applications and research of the technology.

In addition to a review of core competencies, a macro-marketing analysis was conducted to identify global and local factors that could potentially influence the UAS industry success in Alaska. This analysis is included as appendix 4.

6.3 Strategic Considerations

Critical to establishing an effective and growing UAS industry in Alaska is engaging all the players in a dialogue that purposefully focuses private sector firms along with economic development practitioners and public sector actors that with an interest in or the development of the industry. While the public sector should not be the driver of an emerging industry, **it is often the public sector that initiates the convening of industry members and may even fund an entity to serve as a public/private convening organization or designate staff to coordinate regular industry meetings.**

Pursuit of an anchor tenant or tenants is another strategy that often provides the ingredient for an industry to emerge. **Policymakers and economic development practitioners need to promote economic conditions supporting the emergence of a new industry via the**

attraction of firms interested in developing the industry. Business development practices might include support for academic programs, encouragement of a strong entrepreneurial climate, and even ensuring access to capital or incentives that may make the relocation of a firm to the area more economically viable.

Crucial to the establishment of an industry group is the interactions of competing and complementary firms. In Alaska, the leveraging of existing and mature industry sectors such as the military, aviation, and aerospace will provide crossovers when it comes to suppliers, professional service firms, distribution chains, customers. **It will be important to involve not just UAS related firms, but to reach across sectors to seek clear crossover competencies as well as other areas to be leveraged.** Key is ascertaining that firms and other economic actors derive some economic advantage from their proximity to and engagement with the various industry stakeholders.

7 STRATEGY AND POLICY CONSIDERATIONS

In light of Alaska's current strength in UAS and the economic potential, a strategic framework for the continued development of the industry is an essential next step. Timing is critical as other states implement their own strategies to grow and attract a UAS industry. Alaska must respond to this challenge.

Alaska has aspirations to achieve the following in an effort to grow the UAS industry sector:

- Promoting research, development, and innovation;
- Advancing education and human resource development;
- Infusing marketing and branding; and
- Educating and engaging the public sector.

To achieve the objective of moving Alaska's UAS industry toward global competitiveness leaders must advance six interrelated drivers concurrently. These drivers, listed below, and the following broad goal areas (innovation and entrepreneurship, education and training, communications, and public sector engagement) provide an actionable framework:

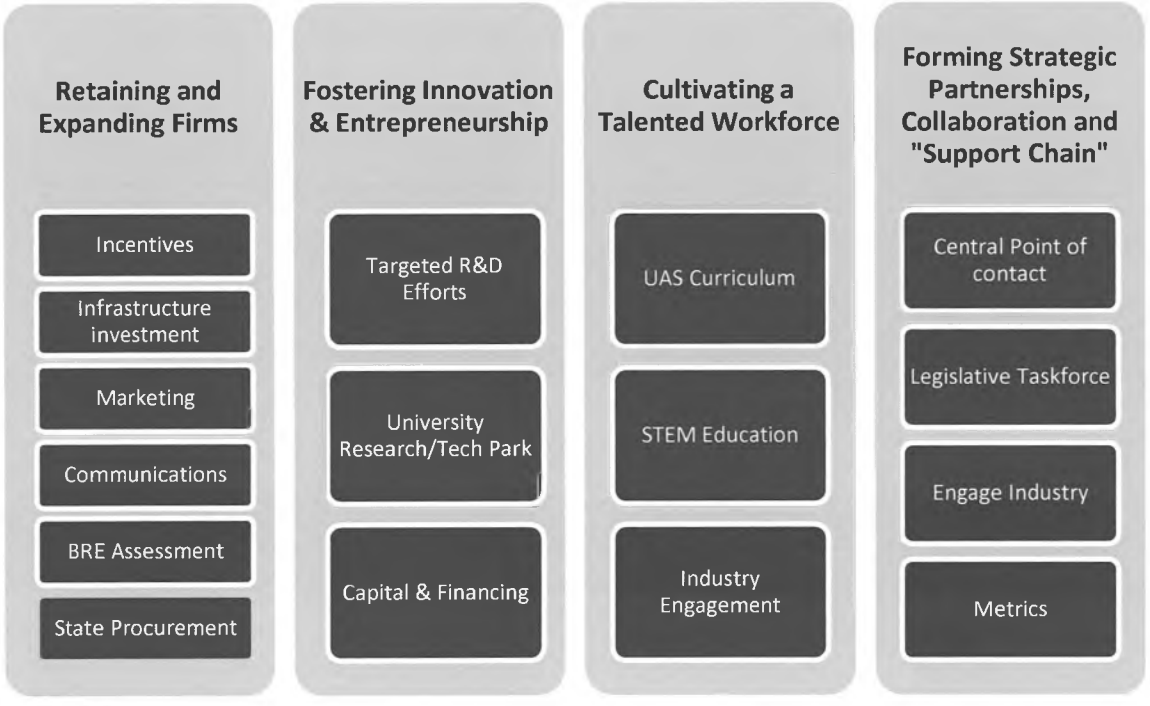
- Research and Networking
- Innovation and Technology
- Business Expansion
- Education and Training
- Commercial Cooperation
- Policy Action

The following strategies are intended to be implemented via a joint industry, government and university collaboration. The formation of an industry leadership council representative of these key anchors is an essential first step. The leadership council will further refine these strategies and then lead the implementation of critical actions. Implementing a joint industry, government and university strategy will bring cohesion and shared vision to growing the UAS sector.

The State of Alaska (including the Legislature) can play a role in convening the right leaders and industry stakeholders. The State of Alaska, specifically through its Department of Commerce, Community, and Economic Development, can serve a critical leadership role through the provision of staffing to the industry leadership council until the working council is firmly established. Over the long-term the leadership council will need to migrate towards self-structure.

A comprehensive strategy to grow and sustain a viable UAS industry for Alaska hinges

on four major elements: strengthening the overall business climate, fostering innovation and entrepreneurship, cultivating the talent of tomorrow, and growing strategic partnerships.



Collectively these strategies seek to create a stronger business climate via:

- **Strategically incentivizing UAS investment to attract anchor firms.** Nationwide, most states and regions offer financial incentives (often in the form of tax credits or abatements) to attract businesses seeking expansion and relocation.
- **Infrastructure investments.** Alaska must invest in critical infrastructure to support advancement of the industry: facilities, special use roads, airfields, or training centers.
- **A coordinated, branded marketing effort.** States in competition with Alaska for UAS investment feature marketing efforts to attract investment in targeted industries, such as "Diversify Nevada."
- **Clear communication of the state's assets.** The state offers more airspace for UAS testing than any other, a long history with defense and aviation related industry, deeply rooted UAS expertise, and nationally-renowned aviation training programs. These and other strengths need to be communicated clearly.

7.1 Goal Area #1 Retaining and Expanding Firms

The FAA test range designation is attracting major, mid-size, and small businesses wishing to expand their UAS presence in Alaska. As a result, Alaska must review its public policy and related business attraction tools to encourage a strong business climate which supports existing, and attracts greater, business investment. The development of a UAS industry in Alaska create a number of spillover effects, including the expansion of existing businesses with niche skills. Many small aircraft maintenance and fabrication shops, along with other types of support businesses, will likely benefit from a strong UAS industry in Alaska. There are also crossover applications from the small aircraft industry to the UAS industry, and these must be leveraged and expanded upon. While an industry development strategy will benefit small businesses, the reverse is also true: an industry cannot take shape without capacity expansion for the state's aviation-related firms. The following strategies aim to retain existing and expand on complementary firms that will support this sector.

To support an improved ability to attract outside firms, state and local governments could offer tax and other specialized incentives. Property tax abatement for new businesses at the borough or municipal level is one avenue. Recent legislation (HB 223) at the state level established a property tax exemption for Military Facility Zones, as mentioned earlier.

Infrastructure needs should be better documented and a plan established to address deficits. The Alaska Department of Transportation and Public Facilities has responsibility for managing and maintaining Alaska's aviation infrastructure, such as its international airports and airfields throughout the state. These are assets in a UAS industry development effort. A needs assessment should be undertaken to determine any deficits as well as a plan to address any discovered.

Establishing a UAS industry in Alaska will require stronger marketing. As one example, the State of Nevada is leading an aggressive marketing campaign to attract the interest of UAS businesses nationwide. The State of Nevada website (www.diversifynevada.com) is hosted through the Governor's Office of Economic Development. While web marketing and attraction efforts are not unique, the focus on UAS business development is. The UAS portion of the website focuses on the advantages of the state over its competitors. Further, Nevada has created an eight-page brochure on the multiple advantages and extensive history of UAS in Nevada.

While Alaska has attracted firms already due to our strong UAS assets and geographic location, improving efforts and producing more at-a-glance information packages will improve the overall understanding of Alaska for targeted firms. Marketing efforts should focus rebrand Alaska as the national and international leader for development of policies, procedures, and flight safety protocols relating to UAS entering the NAS.

Attraction of new firms is one aspect of economic development, but strengthening

existing businesses is another. A possible model for engagement is a traditional business retention and expansion (BR&E) effort, in which economic development organizations identify the needs of the business community through surveys or interviews and develop tailored strategies in response. To support this approach, the state must take inventory of such businesses to determine which are growth-oriented and what their specific needs are. The state should also provide these businesses with opportunities to participate in industry development efforts, as they will have a vested interest in its success.

Lastly, since state government has an interest in spurring private investment in UAS in Alaska, it should itself employ UAS services where appropriate. DNR, DEC, and the Department of Public Safety, for instance, all use manned aircraft for a variety of tasks related to their core missions. If the state began incorporating UAS, it could act as a large customer helping to develop the industry while realizing the increased safety and efficiency benefits provided by unmanned aircraft.

Focus Area	Strategy
Incentives	Incentives • Tax credits • Loans • Equity investments
	Venture Capital Competencies • Need to educate and develop potential VC's as investors make decisions locally
	AIDEA • Investment and Lending policies related to UAS
Infrastructure Investment	Airport(s) Readiness for UAS • Needs assessment
Marketing	UAS marketing presence through the State of Alaska or Public/Private entity marketing Alaska
	• Web presence
	• Collateral pieces (brochures, leaflets, etc.)

Communications	Clear, consistent and compelling messaging
BRE Assessment	Market access to airspace and varied environments. Develop financing and incentive programs.
	Identify private sector champions to support development. Seek avenues for industry participation (i.e. UAS Interest Group). Use BR&E approach to identify needs.
State Procurement of UAS	Create a policy of using UAS services as an alternative to manned aircraft for such activities as wildlife monitoring.

7.2 Goal Area #2 Fostering Innovation & Entrepreneurship

"Growing the Sector" & "Promoting Research"

This goal area requires that the state convey a clear message to industry that Alaska is open for business, encourage the growth of this economic sector, and allow Alaska to lead the country in aviation innovation.

A key driver for industry development will be Alaska's ability to develop useful technology related to UAS. **Although the state has been an early leader in the testing of UAS technologies, it must continue to innovate and harness the intellectual capital of the university system.** Alaska can build upon past successes by encouraging UAS manufacturers and operators to use Alaska as a laboratory, and partner with the university to benefit from its expertise. Alaska is well positioned to be on the front lines for research and innovation with regard to UAS deployment in a multitude of settings.

Each of the FAA test ranges relies heavily on the university system within their respective states. Further, each of the lead universities has developed partnerships with universities in other locations. UAF has partnerships with Oregon State University and the University of Hawaii, for instance. Increasing these partnerships will strengthen Alaska's position as a research hub. UAA would be a good choice as would other university systems in the Pacific Northwest (University of Oregon, Washington State University). The further development of international relationships may also prove beneficial.

Alaska will continue to serve as an important research laboratory for UAS testing, but

taking research forward to the point of commercialization will lay the groundwork for a sustainable future. The university and its research partners must seek avenues to connect this expertise to private sector firms in order to realize economic benefits. They could achieve these benefits through: assisting in the launch of startup businesses utilizing UAS, or making the expertise available to existing firms through customized trainings or technology licensing, if appropriate.

Focus Area	Strategy
Targeted R&D Efforts	Promote University of Alaska Research & Development • Data Collection • Data Analysis
	Become international hub for UAS research
	Pursue innovations (i.e. sensors, data collection, and data processing)
	Develop relationships and agreements with public entities and private sector firms to support shared research leading to commercialization
University Research & Technology Park	Pursue an FAA Center of Excellence designation for UAS
	Expand rapid prototyping capacity to provide support for UAS innovations (i.e. 3D printing, CNC millwork, CAD/CAM)
	Encourage growth of light manufacturing – critical UAS components and systems
	Establish a legislative increment to support research as well as technology transfer and commercialization operations at the UA system

Capital and Financing	Technology Park • Feasibility Study • Location Determination • Financial Plan Developed • Anchor Tenant(s) Identified • Business Plan
	Venture Capital Competencies • Develop potential VCs as investors make decisions locally
	AIDEA • Investment and lending policies related to UAS

7.3 Goal Area #3 Cultivating a Talented Workforce

The limited availability of skilled and semi-skilled workers has always been a challenge for Alaska's industrial development. A thriving UAS industry, however, requires a specialized workforce capable of piloting the vehicles as well as tending to the operational systems. The growth of the UAS industry in Alaska will require advancement of educational programs from pre-K through high school, vocational, and university levels.

Both UAA and UAF offer nationally recognized aviation-related coursework, including degree programs in piloting, aviation administration, air traffic control, and aircraft maintenance. The University of Alaska is already testing courses for the emerging UAS industry. The next step is to develop curriculum that will lead to a certificate or degree. A certificate or degree program will allow Alaska to better position itself as an educational leader, giving it a key competitive advantage over other regions.

The State of Alaska should undertake a labor needs assessment related to the UAS industry and identify ways in which the Department of Labor and Workforce Development can provide support.

Focus Area	Strategy
World-Class Training Infrastructure – Specialized coursework in UAS field	Support the targeted expansion of workforce training with objective of becoming international hub for training and education relating to aviation and in particular unmanned aircraft systems • Payload operators and pilots • Mechanics and maintenance workers • Technicians
Invest in STEM education	Strengthen STEM education focus throughout Pre-K to High School
Higher Education and Vocational-Technical	Establish clear programming and degrees for unmanned ground systems
Engage Industry - Statewide Workforce Development	Undertake needs assessment of workforce gaps. Explore development of apprenticeship programs related to UAS work, and make training funds available.
Training Legislation	Encourage legislation at the local and federal level to support diploma or airman certification prior to FAA regulations being in place.

Funding for Initiatives	Secure funding for a variety of training programs and infrastructure: • UAA aviation requires software change to add UAS component to ATC simulator • UAS component to 141 flight school • Performance Training Standard test • UAS staffing and staff training

7.4 Goal Area #4 Forming Strategic Partnerships, Collaboration and "Support Chain"

Alaska will need to act strategically to realize potential value from UAS industry development. In the coming years Alaska must transition from holding a lead test range designation to becoming a state recognized for its established UAS-industry. Other states with fewer strategic assets and even in some instances no test range designation are simultaneously ramping up to claim the mantle.

Alaska has a unique opportunity given its competencies as well as geographic location to advance strategic relationships and develop a new industry for the state. Alaska is well suited to position and market itself as a premier place to address the needs and challenges of integrating UAS systems into the NAS. In so doing, Alaska must link and align its assets to grow a prospering new industry that advances collectively all stakeholders.

A key component in the development of a UAS industry in Alaska will be establishing clear roles for both the private and public sector. The public sector must lead initially without competing with the private sector. Developing a framework by which the public sector can facilitate the success of the private sector will be of essential importance. Wherever possible, industry should champion and lead.

Establishing a central point of contact, such as formalizing the Alaska UAS Interest Group or establishing a like entity and providing it with the authority, responsibility and resources to lead will serve to further the industry in significant ways. A key scope of work envisioned for the organization is establishing working groups to address membership, finance, government and media relations, and workforce development initiatives. Ideally, this central point of contact would serve as chief liaison for the industry. This level of organization can facilitate a stronger collaboration across industry, academia and government agencies.

Working through the UAS Legislative Task Force, the State of Alaska (including the Legislature) can aid the solidification of a UAS industry in Alaska. Firms seeking to relocate or establish additional offices in Alaska will first review the state tax structure and incentives in place for industry. The Legislative Task Force can lead initiatives to establish or rewrite existing

incentive policies. Incentives should not only benefit industry, but also encourage behaviors desired of industry. For instance, incentives that support greater education and training investments, as well as research will serve to benefit anchors such as the university as well as industry. In addition to improving the structure of incentives, the UAS Legislative Task Force may also explore how to support industry having greater access to seed and venture capital as well as seeking to minimize any regulatory hurdles. Further, a special liaison to the central point of contact or UAS Interest Group will likely prove beneficial until the group can afford its own executive director.

Focus Area	Strategy
Central Point of Contact	Formalize UAS Interest Group or like entity – a standalone 501c3 model is envisioned • Programming – sharing of information • Membership – reaching stakeholders • Infrastructure needs • Capital and Financing • Government and Media Relations • Workforce Development
Legislative Taskforce	Provide recommendations and guidance to state policy to support UAS for public and private applications • Incentives • Seed and Venture Capital • Streamlining regulatory hurdles
Engage Industry	Seek ways to empower the private sector to lead
Metrics	Establish tool to ensure success measures are established and used • Incentive tracking

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APPENDIX 1. UAS TIERS DEFINED

Prior to jumping into a full market consideration discussion it is first important to understand how UAS are typically classified as this classification system drives market behaviors. An "Unmanned Aircraft System" can be applied to a broad range of vehicle types, configurations, and sizes. For the DoD, "tiers" are used to differentiate UAV by size, speed, flight ceiling, functionality and capabilities. This tier system was developed by military planners to ensure integration of various models in an overall use plan. The US Air Force and Marine Corps each has its own tier system, and the two systems are themselves not integrated. Additionally the Army has designated UAS based on the nature of support received from other units. The US Air Force categorizes UAS in five tiers including:

- Tier : Small/Micro, low altitude
- Tier 1: Low altitude, long endurance
- Tier 2: Medium altitude, long endurance
- Tier 2+: High altitude, long endurance conventional
- Tier 3: High altitude, long endurance low-observable

Table A1.1. developed by Unmanned Aircraft Vehicles and System Services to classify UAS.

UAS Description	Weight (Pounds)	Size (Feet)	Mission (Altitude)	Mission (Speed M/Hr)	Mission Radius (Miles)	Mission Endurance (Hours)
Nano	<1	<1	<400	<25	<1	<1
Micro	1 to 4.5	<3	<3,000	10 to 25	1 to 5	1
Small UAS	4.5 to 55	<10	<10,000	50 to 75	5 to 25	1 to 4
Ultralight Aircraft	55 to 255	<30	<15,000	75 to 150	25 to 75	4 to 6
Light Sport Aircraft	255 to 1,320	<45	<18,000	75 to 150	50 to 100	6 to 12
Small Aircraft	1,320 to 12,500	<60	<25,000	100 to 200	100 to 200	24 to 36

Medium Aircraft	12,500 to 41,000	TBD	<100,000	TBD	TBD	TBD

FAA Defined Manned Aircraft Weight Categories

While already confusing, additional UAS Categories are also referenced by Grouping from 1 to 5 according to maximum gross takeoff weight, normal operating altitude and speed.

DoD Unmanned Aircraft Systems (As of 1 JULY 2011)

General Groupings	Depiction	Name	(Vehicles/GCS)	Capability/Mission	Command Level
Group 5 • > 1320 lbs • > FL180		•USAF/USN RQ-4A **Global Hawk/BAMS-D** Block 10	•9/3	•ISR/MDA (USN)	•JFACC/AOC-Theater
		•USAF RQ-4B **Global Hawk** Block 20/30	•20/6	•ISR	•JFACC/AOC-Theater
		•USAF RQ-4B **Global Hawk** Block 40	•5/2	•ISR/BMC	•JFACC/AOC-Theater
		•USAF MQ-9 **Reaper**	•73/85* *MQ-1/MQ-9 same GCS	•ISR/RSTA/EW/ STRIKE/FP	•JFACC/AOC- Support Corps, Div, Brig, SOF
Group 4 • > 1320 lbs • < FL180		•USAF MQ-1B **Predator**	•165/85*	•ISR/RSTA/STRIKE/FP	•JFACC/AOC-Support Corps, Div, Brig
		•USA MQ-1 **Warrior**/MQ-1C **Gray Eagle**	•31/11	•(MQ-1C Only-C3/LG)	•NA
		•USN **UCAS**- CVN Demo	•2/0	•Demonstration Only	•NA
		•USN MQ-8B **Fire Scout** VTUAV	•14/8	•ISR/RSTA/ASW/ ASUW/MIW/OMCM/ EOD/FP	•Fleet/Ship
		•SOCOM/DARPA/USA/USMC A160T **Hummingbird**	•8/3	•Demonstration Only	•NA
Group 3 • < 1320 lbs • < FL180 • < 250 knots		•USA MQ-5 **Hunter**	•45/21	•ISR/RSTA/BDA	•Corps, Div, Brig
		•USA/USMC/SOCOM RQ-7 **Shadow**	•368/265	•ISR/RSTA/BDA	•Brigade Combat Team
		•USN/USMC **STUAS**	•0/0	•Demonstration	•Small Unit
Group 2 • 21-55 lbs • < 3500 AGL • < 250 knots		•USN/SOCOM/USMC RQ-21A **ScanEagle**	•122/13	•ISR/RSTA/FORCE PROT	•Small Unit/Ship
Group 1 • 0-20 lbs • < 1200 AGL • < 100 knots		•USA / USN / USMC / SOCOM RQ-11 **Raven**	•5628/3752	•ISR/RSTA	•Small Unit
		•USMC/ SOCOM **Wasp**	•540/270	•ISR/RSTA	•Small Unit
		•SOCOM SUAS AECV **Puma**	•372/124	•ISR/RSTA	•Small Unit
		•USA gMAV / USN T-Hawk	•270/135	•ISR/RSTA/EOD	•Small Unit

Source: US Department of Defense

APPENDIX 2. CENTRAL OREGON EXAMPLE

The Columbia River Gorge/Hood River example is provided to give further detail to how a specific area of a state is benefiting economically from UAS industry development. Oregon offers three specific Ranges including Pendleton, Tillamook and Warm Springs. The range designations have boosted what was already becoming a UAS focused cluster of Oregon startups and established companies.

Pendleton: Located in eastern Oregon, the Pendleton UAS Range (PUR) is centered at the Eastern Oregon Regional Airport and City of Pendleton. The airport enjoys 347 visual flight days per year and can accommodate up to a Boeing 757. In addition to two conventional runways, the airport provides a 2,800 foot UAS dedicated strip and a full-service UAS operating area. Beyond the airport the range extends over 14,000 square miles: North to the Columbia River; east over the Blue Mountains and Umatilla National Forest; south into the Elkhorn Mountains; and west outlining the borders of Restricted Area 5701 to allow easy access for specialty testing.

Tillamook: Tillamook Range is managed by Near Space Corporation, specializing in engineering, manufacturing and stratospheric balloon operations. The Range spans across miles of Oregon coastline, home to a mild and wet climate with very little seasonal temperature variation due to its proximity to the Pacific Ocean offering interesting marine and coastal research options.

Warm Springs: This FAA designated airspace directly overlies Warm Springs Reservation in the central Oregon Cascade Range near Madras and is managed by the Warm Springs Tribe. The Range supports controlled access to 1,000 square miles from the surface to 18,000 MSL of high desert and forest for testing a variety of UAS missions.

Since 2010, Economic Development for Central Oregon (EDCO), the organization leading the region's economic and business development activities, has been spearheading an effort to create a local hub of unmanned aviation technology. The emphasis behind this effort comes from Central Oregon having expertise in aerospace and aircraft industry manufacturing since 1992, but following the economic recession new attention was placed here as a way to diversify the region's aviation industry. Initially focus was placed on manufacturing SUAS airframes, but shortly thereafter more emphasis was placed on manufacturing the equipment that rides on UAS as well as developing systems for obtaining data, including sensors and optics.

Central Oregon lies near the center of Oregon, encompassing the Deschutes River Basin. Central Oregon is separated from Western Oregon by the Cascade Mountain range, which extend from southern British Columbia through Washington and Oregon to Northern California. Central Oregon's weather is mostly dry and sunny in the summer, snowy and cold in the winter,

with light rainfalls and some cloud cover in the spring and fall. Central Oregon falls away from the Interstate-5 corridor nor does it provide access to a large population base, so resources had to be leveraged to draw in large companies. One of those resources is open air space.

Economic Development for Central Oregon launched the Oregon Unmanned Aircraft Systems Business Enterprise (OR-UAS), a 501(c)(6) nonprofit. Today, OR-UAS is known as SoarOregon. The intent of SoarOregon is to establish Oregon as a leader in civilian UAS development. The organization's goal is to create jobs and economic growth by capitalizing on the development of SUAS and their associated applications. One of the first activities of OR-UAS was to solicit grant proposals for projects that will create UAS-related jobs or generate other UAS-related long-term economic activity in Oregon.

SoarOregon's initial funding came from a two-year, $882,000 state grant from the Oregon Business Development Department and the Oregon Innovation Council, which was approved by the 2013 legislature. In the 2013-15 budget, the Legislature allocated $882,000 to create the Unmanned Aircraft Systems Center of Excellence — a research center and business incubator, that would include a flight-test site with proposed headquarters in Redmond or Bend. SoarOregon has worked to match this state funding with private investments, grants and other programs to get innovative projects off the ground and firmly establish a cluster of UAS activity.

The seed money provided by the state legislature to SoarOregon seeks to:

- Expand existing Oregon companies that support UAS technology;
- Assist Oregon companies in winning new contracts and grants;
- Recruit UAS firms to test vehicles, sensors, systems and applications in the state and to establish offices and facilities here; and
- Generate industry-leading applications that promote innovation

As Oregon hopes to position itself to be a national leader in the research, development, and manufacturing within the SUAS sector it has been working in close conjunction with its institutes of higher learning.

Oregon State University (OSU) has also raised the region's UAS profile, with about 20 faculty working on UAS-related research and technologies. OSU is working closely with Economic Development for Central Oregon, the US Department of Defense, OSU-Cascades Campus, the state of Oregon, Oregon Congressional leaders, private industry and others to help get the state involved. Specifically, Oregon State University's College of Engineering is growing its faculty expertise in this area, responding to burgeoning student interest, and offering the first SUAS engineering course in the Pacific Northwest this fall. "OSU's researchers are looking at unmanned vehicles for precision agriculture, forestry, snow pack observation, land-use

monitoring, wildlife tracking and oceanographic mapping," said Rick Spinrad, vice president for research at Oregon State University and board president of SoarOregon.

Similarly, Central Oregon Community College has established the Unmanned Aircraft Systems Degree Program. The Aviation Unmanned Aircraft Systems Operations (UAS) trains individuals to work as professional UAS operators in the national/ international arena. Students learn to operate UAS to include conducting mission and preflight planning, mission briefings, and programming. Students are also taught to perform limited UAS and ground support equipment testing, troubleshooting and maintenance.

Oregon is leveraging an advantage based on the growing cluster of UAS companies located in close proximity. Firms were initially concerned about not having product testing, but with the new test site designation that is no longer an issue. Not unlike the development of aviation systems in the early 1900's, the commercialization of UAS activity is taking off now as military uses are moving toward commercial uses.

Boeing-owned, Insitu Inc., which makes and designs unmanned aircraft systems including the Scan Eagle™, Integrator as well as other UAS systems, is the anchor tenant. The Bingen, Washington based company employs about 800 people in the Columbia Gorge region and has provided a pipeline of talented engineers and aviators who have spun out to create their own firms. Other UAS companies and those who supply the industry in the region include Aerovel, American Aerospace Engineering, Cloud Cap Technology, Hood Technology, Sagetech Corporation, Sightline Applications, Trillium Engineering, Custom Interface Inc., Innovative Composite Engineering, Prigel Machine and Fabrication, Real Carbon and Zepher. The Gorge Technology Alliance collected data regarding the economic impact of the UAS industry for the region and reported that the more than 1,000 employees working in the UAS industry enjoyed an average annual income of approximately $68,000 in 2012.

Oregon offers precision manufacturing, airframes, propulsion systems, applications and software from all corners of the state. From this core, suppliers followed and as aviation manufacturing slowed with the national recession, core competencies began focusing on UAS development.

The Portland metro area is also a rich hub for aviators. Companies include Columbia Helicopters in Aurora and Erickson Air-Crane Inc. in Portland. McMinnville-based Evergreen International Aviation operated both helicopter and UAV businesses before selling them off in advance of filing for bankruptcy protection. Outback Manufacturing currently boasts 20-40 percent of the company's business in manufacturing parts for the SUAS industry with this segment anticipated to increase in the coming years.

APPENDIX 3. INCENTIVES REVIEWED

	ED Incentive	Description	Advantages	Disadvantages
Tax Incentives	**Research and development tax credits (state level)**	The tax credit formula includes two components: • Credit rate (percentage of R&D expenses the tax liability is reduced;) • Base level (the minimum amount of an expenditure before the credit applies.)	• Increases the amount of R&D activity; • Helps attract businesses from other states; • Allows the private sector to decide about allocation of funds; • Usually neutral and not aimed at a specific industry;	• Shifts R&D activity between states rather than creating new expenditure; • Level-based R&D tax credits, with an increase in R&D expenses, the base level is also increasing every year and therefore it is more and more difficult to get a tax credit; • Aimed mostly at big companies rather than small businesses, as the base level is usually calculated based on reported average expenses in R&D. • May lead to projects with a low rate of return, unprofitable without tax credit.
Tax Incentives	**Hiring tax credits (state level)/Job Creation Tax Credit**	There are several variants of the hiring tax credit: • For employer: it may reduce a company's state income tax liability for hiring certain classes of employees or provide certain class jobs (rural, technology or high-wage) or enable hiring of certain employees with a specific level of payroll. • For employee: it may be provided to an employee for relocation to a particular state (may also exist in a shape of employee's relocation assistance program).	• Provides incentives for both employers and employees to relocate to the state; • Promotes efficient allocation of resources;	• Availability of tax incentives is only one factor among many that businesses consider when deciding about relocation, and it is not the main one. • Zero-sum game;

Tax Incentives	**Manufacturing tax credits**	Municipal or borough level: • Credits or exemptions for property; • Credits of exemptions for sales; State level; • Credits or exemptions for corporate income taxes;	• Allows tax money to stay in private hands and be used more efficiently; • Promotes efficient allocation of resources;	• Availability of tax incentives is only one factor among many that businesses consider when deciding about relocation, and it is not the main one; • Zero-sum game;
Tax Incentives	**Property tax abatements (municipal or borough level)**	In Alaska: an exemption or partial exemption from property taxes for up to 10 years if the property is in a military facility zone that creates or supports industry, development, or educational or training opportunities beneficial to a facility	• It is simpler and less restrictive than tax credit; • It is more useful for smaller projects. • Stimulates relocation of businesses to specific zones to which tax exemption is applied.	• Availability of tax abatements is usually limited.
Tax Incentives	**Sales tax abatements (municipal or borough level)**	These would allow local governments to exempt particular purchases, or businesses within particular industries, from sales taxes, if the company relocates and retains jobs within the state.	• It is simpler and less restrictive than a tax credit; • It is more useful for smaller projects.	• Availability of tax abatements is usually limited.

Investment incentives	Matching research and development grants	Funding from federal, state and private sources for research grants, research equipment acquisition, and product development/commercialization;	Promotes cooperative efforts between private businesses and the university system; Promotes early-stage research and development funding to advance technology;	Funding usually requires availability of matching funds.
Investment incentives	**Funding by AIDEA and the AHFC to projects within Military Facility Zones (MFZ).**	AIDEA has several financing programs: Loan Participation, Conduit Bonding authority, Loan Guarantees and Development Finance.	• Helps build UAS infrastructure within MFZ. • The trend of using these zones as a primary incentive tool has moved towards supplementing them with broader programs;	• Funding usually requires availability of matching funds.
Investment incentives	**Gap loans**	It is used when the banks and business owner are unable to secure funds necessary to complete the total project amount, leaving a "gap" between the two. Usually this type of financing is limited to specific geographical location.	• Provides business with cash to operate while waiting for the funding;	• Usually comes with high interest rate.
Investment incentives	**Equity financing**	The process includes selling shares of the company to raise capital. This incentive is efficient only if there are potential equity investors or business angels within the state.	• Cash infusion with flexible timeline to pay back; • Potential partnering with local professionals (business angels) which are aimed at positive financial results;	• Splitting profits with equity investor.
Investment incentives	**Venture capital assistance**	The process includes investing in startup companies, which are usually highly-technological. This incentive is efficient only if there are potential venture investors within the state. In Alaska one of the examples is Alaska Venture Partners, LLC.	• Potential investment is usually up to $5 million; • Access to knowledge and technical assistance.	• Venture investors expect large return on investment; • The necessity to share company equity.

Other Types of Incentives	**Job Creation Grants**	Depending on the industry, companies creating a minimum required a number of new jobs and making a minimum required capital investment is eligible to receive discretionary cash grants (e.g. job creation grants provided by SBA.)	• Stimulates small businesses to create new jobs.	• A lot of paper-work to apply for grant; • Competitive basis, so grant availability is not guaranteed.
Other Types of Incentives	**Energy Discounts**	Some utility providers may offer grants and reduced rates to projects resulting in new job creation and investment. This incentive may also exist in a view of energy incentive loan which includes a no interest loan to pay for energy costs for a particular period of time.	• Important incentive to stimulate businesses to relocate to Alaska as it helps reduce high energy costs; • Creates competitive advantage for the business;	• Usually limited to specific industries or projects.
Other Types of Incentives	**Free or discounted land**	Negotiated lease or sale of land owned by a locality or state, often at a below market cost. Approach is often used via a sole source contract to assist a company needed land for location or expansion.		
Other Types of Incentives	**Technical assistance**	Local economic development organizations may provide technical assistance for new businesses or companies relocating facilities.		

APPENDIX 4. REAL ESTATE DEVELOPMENT PROCESS DEFINED

The basic approach to developing a tech park is essentially similar to any business planning process. Elements include due diligence on the part of the owner and research surrounding market characteristics and product factors that then drive decisions surrounding the business venture. For a tech park in the Fairbanks area with an emphasis on UAS technology, these characteristics include land availability, access to airfields, and proximity to university facilities.

From an economic development practitioner's perspective, project planners must follow an established process to establish a tech park. Much like any real estate project, steps include:

1. Pre-development
2. Feasibility – (market; financial and political)
3. Site characteristics and considerations (site and engineering analysis)
4. Financing
5. Contractor selection (negotiations and public approval process precede)
6. Construction
7. Marketing
8. Facilities occupancy and ongoing management

The pre-development phase focuses on aligning a business development idea such as a tech park with a specific site or sites. Typically the businesses targeted for the tech park have an idea of what they want and can well describe their ideal location. This phase typically includes a pre-feasibility or basic low cost assessment, to determine whether the concept "pencils out." It is critically important to engage in conversations early with all key stakeholders including tenants, owners, lenders, and partner organizations.

The feasibility phase is about determining the market; political and financial viability of the proposed development. With regard to a UAS tech park, the key question to be addressed is whether market demand is sufficient to offset the development and operational costs associated with the project. Political feasibility requires determining if the local political climate will support the proposed development. For instance, some communities are more concerned about UAS activities than others (for example: has the community supported any bans on UAS or business development?). Financial feasibility requires identifying the various costs associated with business and site operations and factoring these into a pro forma or financial analysis to prove to investors (debt or equity) that risks associated with the financial investment are less than the ultimate reward of financial returns.

Site review and engineering assessments include working with local municipal permitting and regulatory entities to determine if characteristics associated with the site will ultimately impact operations and plans for site development. This includes researching and

seeking expert opinion on items such as environmental impacts, flood plain characteristics, run off patterns, earthquake zone, parking requirements, special restrictions, egress and ingress characteristics, and similar concerns.

Financing is a critical hurdle for nearly every real estate development project. In most cases, multiple investors will negotiate terms and ownership interests in the development. In the case of a UAS tech park, investors may include stakeholders such as city or borough governments, the University of Alaska, federal agencies, Native Corporations, or private sector anchor tenants. In many cases both debt and equity investments are necessary due to the high costs associated with real estate development. For a public-private project such as a tech park, highly sophisticated and hybrid financing packages are typically needed to meet these expenses.

Contractor selection can be challenging if the developer is new to real estate development, particularly when led by a public sector entity. In short, this involves outlining the type of construction to be undertaken and providing bidding contractors with architectural and engineering schematics to follow. In some cases, contactors are asked to design and build, which can result in a less expensive and at times higher use property if there is cohesion of vision between the contractor and the developer. The contractual process can also be driven by financing requirements. For instance, if the public sector is contributing funds, a competitive bidding process will most likely be required.

Marketing is often a forgotten element, but really should be started early on in the process and may require an ongoing effort to lease all available space. At times, marketing is also necessary to raise capital for construction. In all circumstances, outreach and relationship building are essential to ensuring initial contracts with key anchor tenants are in order and confirm base operational costs are covered. For a UAS tech park, marketing efforts may form one component of an attraction program to recruit new businesses to Alaska. In turn, this may require tax or financial incentives to draw firms to the state. Of crucial importance is the targeting of firms that complement existing university research efforts.

The ongoing management of the property, once it is developed, typically involves two critical areas: day to day management and then longer-term renewal, replacement and eventual sale of the property. Both of these factors are of particular importance if the developers do not have real estate professionals on staff.

Appendix 4. Macro Market Environment Review

A macro-marketing analysis was conducted to identify global and local factors that could potentially influence the UAS industry success in Alaska. These factors include: political, economic, social, technological, maintenance, concept of operations, environmental, and legal considerations.

Political Considerations

All types of UAS have US domestic and international applications for law enforcement, land surveillance, wildlife tracking, search and rescue operations, disaster response, border patrol and photography, among many other tasks. Federal agencies, along with most states and foreign countries, are debating if and how this emerging technology should be regulated; taking into account privacy concerns, the benefits of use, and business interests. As mentioned previously, FEMRA established the program to integrate UAS into civilian airspace, including the formation of the six test ranges. This was a highly competitive process with at least 50 primary teams representing 37 states requesting FAA-portal access for proposal submissions. The international effort to incorporate UAS into respective airspace is primarily led by the International Civil Aviation Organization (ICAO) which "mirrors" many of the policies engaged by the FAA, but is aggressively leading the manned - unmanned airspace integration effort thus far. There continues to be an ever-changing political landscape in the United States relating to and for UAS. A recent FAA list, spurred by Freedom of Information Act lawsuits, indicates that an additional 81 public agencies have applied to the FAA for authorization to use UAS. Pending State Legislative measures focus on a variety of issues including:[34]

- Definition of a drone or unmanned aerial vehicle;
- Use of unmanned aerial vehicles by law enforcement and other state agencies;
- Use of UAS by the general public;
- Formation of various study committees;
- Bans and moratoriums on operations; and
- Resolutions requesting to be an FAA test site.

The Alaska Legislature adopted a joint Concurrent Resolution (HCR006C) in 2013, creating a Legislative Task Force on Unmanned Aircraft Systems (LTFUAS) tasked with reviewing FAA regulations on drones and creating written recommendations and legislation that "protects privacy and allows for the use of unmanned aircraft systems for public and private applications." In addition to members of the legislature, the task force is comprised of members representing the commissioner of public safety; the Adjutant General of the Department of

[34] National Conference of State Legislatures, website, http://www.ncsl.org/issues-research/justice/unmanned-aerial-vehicles.aspx

Military and Veterans' Affairs (DMVA); the ACUASI at UAF; the Academy of Model Aeronautics, the state Aviation Advisory Board and most recently a public representative and two industry members. The task force provided a final report to the Legislature on June 30, 2014.[35] In this report, the LTFUAS concluded that the FAA is adequately addressing the safety concerns of integrating UAS into the National Airspace System (NAS).

Alaska has prime airspace to prove an assortment of civil applications for UAS. "Alaska's extreme and ever-changing environment can put these systems to the test," Lt Gov. Mead Treadwell stated, "and the technology, along with our university's new supercomputer, can show how unmanned aircraft can support Arctic science, help manage natural resources and respond to emergency situations." Treadwell continued, "The synergy between the two technologies here in Alaska keeps us on the cutting edge of aerospace development....and an investment of $5 million approved by Gov. Sean Parnell to further the University of Alaska's UAS research helps too."[36]

Political debate, discussion and efforts to understand the consequences of UAS operating in the NAS will continue. Most of the debate stems from concerns regarding use in the military to the potential for invasions of privacy. At the core of the debate surrounding UAS advancement is uncertainty associated with the widespread use of a relatively new technology, and the potential for misuse by government or industry. The emerging regulatory framework should mitigate most of these concerns.

Economic Considerations

Economic issues such as federal sequestration and the continuance of budget resolutions are expected to keep producing uncertainty in the marketplace. Federal sequestration legislative actions took place in FY 2014 (and are further scheduled for 2015-21). Fiscal politics in congress currently attempt to cap defense and non-defense discretionary spending; a rise in one area will generally be offset elsewhere, limiting grants or R&D funding with potential impacts on UAS.[37]

According to the Unmanned Vehicle Systems International (AUVSI) 2013 "New Economic Report,"[38] the main inhibitor of US commercial and civil development of UAS is the lack of a regulatory structure. Due to current airspace restrictions, non-defense use of UAS has been, and will continue to be, extremely limited. This primarily affects *Tier I and II platforms,

[35] Legislative Task force on Unmanned Aircraft Systems, Final Report to the Legislature as required by Legislative Resolve 17 SLA-13, June 30, 2014.
[36] Alaska can be Arctic Proving Ground for UAS, Office of Lt Gov Mead Treadwell, 2012
[37] Center on Budget and Policy Priorities, website, various articles, http://www.cbpp.org/cms/?fa=view&id=3635
[38] The Economic Impact of Unmanned Aircraft Systems Integration in the National Airspace, AUVSI, March 2013, http://higherlogicdownload.s3.amazonaws.com/AUVSI/958c920a-7f9b-4ad2-9807-f9a4e95d1ef1/UploadedImages/New_Economic%20Report%202013%20Full.pdf

whereas Tier III UAS is able to comply with FAA requirements for operations in the NAS with thorough coordination. **To better understand UAS tiers, please refer to appendix 1.*

AUVSI further projects an $82.1 billion infusion into the US economy due to UAS operations over the 10 years following the mandated 2015 integration deadline. Agricultural applications of UAS alone could pump $75.6 billion into the economy over the decade, according to an optimistic report published by AUVSI in March.[39] Public safety and "other applications, like natural resource management, will produce $3.2 billion each," the report claimed. The industry is projected to create just over 100,000 jobs during the same period, two-thirds of which will spring up in the first three years after integration into the NAS. Many of those jobs will be manufacturing positions that pay more than $40,000 annually.

AUVSI identifies the following criteria required before any viable UAS growth in the US:

- The FAA must develop new regulations integrating UAS into the nation's airspace; this effort is directly tied to the successful operation of the six test ranges.
- Job growth distribution in the US will mimic current aerospace manufacturing employment; reflective of UAS design/production and not necessarily applicable to UAS services support.
- There must be sufficient capital available to encourage smaller manufacturing companies.
- There must be financing available to UAS purchasers, foreign and domestic.
- There must be adequate insurance to cover liabilities associated with UAS design/production as well as operations.
- US Gross Domestic Product (GDP) needs to grow at least 3% annually over the designated time period for assumptions to hold.[40]
- Overall, NAS integration is the greatest factor effecting UAS market growth whereas Original Equipment Manufacturers (OEMs) will be more affected by the health of the economy.

Social Considerations

There are widespread public assumptions that domestic integration of UAS will result in "lethal war machines buzzing their neighborhoods" and personal privacy will diminish as result. Overcoming these fears will continue to be a challenge. Some opposition camps view the

[39] Booming Unmanned Aircraft Industry Straining to Break Free of Regulations, June 2013, http://www.nationaldefensemagazine.org/archive/2013/May/Pages/BoomingUnmannedAircraftIndustryStrainingtoBreakFreeofRegulations.aspx

[40] The Economic Impact of Unmanned Aircraft Systems Integration in the National Airspace, AUVSI, March 2013, http://higherlogicdownload.s3.amazonaws.com/AUVSI/958c920a-7f9b-4ad2-9807-f9a4e95d1ef1/UploadedImages/New_Economic%20Report%202013%20Full.pdf

aircraft as a "Big Brother" technology that will bring prying eyes into citizens' homes.[41] Consequently, there continues to be a significant effort by states to understand and regulate UAS operations. Conversely, there is a growing realization of the economic value of the domestic UAS marketplace and associated opportunities for applying this technology across federal, academic, and commercial arenas.

Similar to the earliest days of manned aviation, increased education about UAS applications, cost-benefits, safe and regulated operations, and the ability to take the human risk out of the "dull, dirty and dangerous" jobs will eventually bring greater acceptance across society.

Technological Considerations

UAS technologies for UAS continue to develop rapidly. Small, *Tier I UAS appear to be generally developing faster than Tier II or III as manufacturers are able to enter the market more quickly and with less capital investment. Tier II UAS is led by Boeing-Insitu with their service-proven Scan Eagle™ mentioned previously, and follow-on program of record, "Integrator," primarily supporting DoD in the GWOT. The trend (for both Tiers I and II) is for vehicles that can carry an array of smaller, interchangeable, more capable sensor systems (Electro-optical, infrared, optical/Infrared/Multi or Hyperspectral); the addition of hard point for wing-mounted payloads; and standardized ground control systems. Tier III design has relatively slowed as the full range of capabilities have for the most part been demonstrated, and now the focus is on greater fidelity and expansion of sensor suites, along with reducing the overall operation and sustainment costs. There is also a significant cost barrier to enter the Tier III market, even as a service provider rather than an original equipment manufacturer (OEM).
**To better understand UAS tiers, please refer to appendix 1.*

Specific technology considerations include:

Vehicles: UAS can be fixed wing, rotary or a combination of both. Historically, the most common options have been fixed wing as these operate more quietly, with greater efficiency and longer duration. This is not necessarily true as technology is advancing rapidly. As an example, Rotary Tier I options are becoming more common in law enforcement (e.g. Aerovironet Qube) which can be tailored for low altitude/short range/short duration missions ranging from security support to precision agriculture.

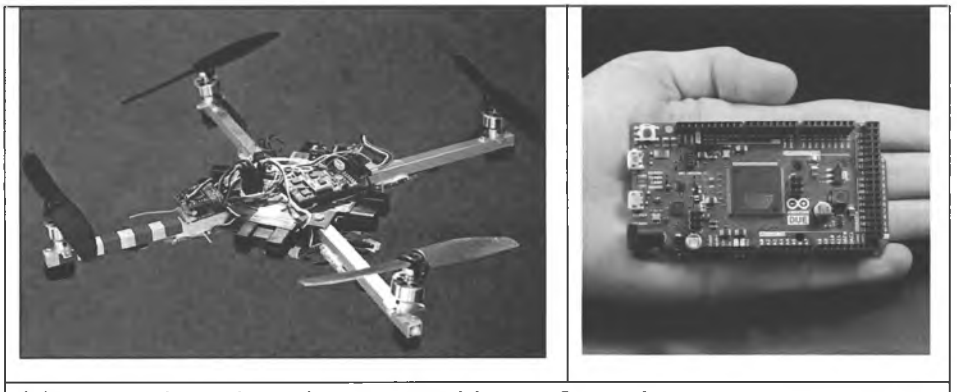
Payload/Sensor Suite: Primarily Electro-optical (EO), Infrared (IR), and Hyperspectral capabilities. Cameras are getting smaller, as well as integrated with higher fidelity. Synthetic Aperture Array-based Hyperspectral systems are rapidly being miniaturized

[41] Booming Unmanned Aircraft Industry Straining to Break Free of Regulations, June 2013, http://www.nationaldefensemagazine.org/archive/2013/May/Pages/BoomingUnmannedAircraftIndustryStrainingtoBreakFreeofRegulations.aspx

for small platforms. Overall, greater fidelity in data collection is being provided with smaller equipment, expanding the flexibility to meet customer needs.

Data storage/transfer/analysis/processing: Data storage (physical volume, weight, cost-per-Giga Byte) continues to plummet, which translates to a greater ability to collect and store more streams of data simultaneously aboard the platform. Likewise, data transfer algorithms and processing power have become more efficient (and compact). Manufacturers, universities and even hobbyists are now able to create sophisticated *Tier I UAS platforms (e.g. Tier I Quad Copter) using open-source processing (e.g. Arduino, Raspberry PI). This disruptive technology, is in essence aiding in the creation of a new market that may displace an earlier technology. As a result, this technology may produce similar changes in the UAS industry, like the introduction of personal computing over 40 years ago. **To better understand UAS tiers, please refer to appendix 1.*

Figure 10: Tier I Quad Copter



(L) – An Arduino based copter. Hobbyists & Academics are using open source hardware (R) that puts a computer in your hand. < $ 75 / unit via Amazon or Radio Shack.

Training/Simulators: The DoD's "Report to Congress on Future UAS Training, Operations, and Sustainability," of April 2012 provides details regarding the requirements and initiatives being addressed regarding UAS in the NAS for UAS Executive Committee (EXCOM) activities (DoD, DHS, FAA, and NASA) out to 2017.[42] Of note:

- UAS will not achieve their full potential or utility unless they can achieve the same freedom of navigation, responsiveness, and flexibility as manned aircraft.

[42] DoD Report to Congress on Unmanned Aircraft Systems Training, Operations, and Sustainability, Under Secretary of Defense for Acquisition, April 2012, https://www.fas.org/irp/program/collect/uas-future.pdf

- Many DoD UAS now require rapidly expanded access to the NAS and international civil airspace to support operations, training, testing, and broader governmental functions.

Traditional training provided by OEM as part of the UAS sale and sustainment logistics support, is giving way to smaller companies specializing in UAS training across a range of different UAS platforms (particularly with the standardization of ground control systems). Some customers (DoD and most foreign countries) are requiring the OEM to support a "train the trainers" approach so that training can be accomplished "in-house" to save money. Some of this is the result of DoD acquisition managers' efforts to reduce the life cycle sustainment costs of UAS developed under "programs of record" and by foreign countries to develop their own capabilities, avoiding the continued dependence on foreign OEMs. Simulators are quickly being developed to support training in lieu of having to coordinate limited airspace for flight time, affording operators and maintainers the opportunity for platform and payload training.

Maintenance Considerations

Logistics and field maintenance support became critical as UAS were incorporated into the battle force within combat zones. Consequently, focus expanded to include requisite field maintenance of software and hardware, requiring Subject Matter Expertise (SME) functions to be continuously available. Configuration management and field upgrades resulted in total integration of civilian contractors into the military combat environment. Those same contractors have brought their expertise back to the home front where they anxiously await integration into the NAS.

Concept of Operations Considerations

Two types of approaches are prevalent in the UAS marketplace: own/operate and fee for service (FFS). Own/operate follows the conventional model with direct purchase of a UAS product from an OEM (or a growing number of independent integrators tailoring specific UAS for customer needs, like UAV Factory (http://www.uavfactory.com/). Training and sustainment support derives from the OEM directly or thru certified vendors. Each OEM provides the customer a UAS product from a growing array of available platforms. Typically the systems are highly proprietary (not "plug & play") with various additional sensor packages/equipment purchases required. The customer, in this case is also responsible for upgrades, training and sustainment requirements.

The FFS model primarily grew from the incorporation of Boeing-Insitu's Tier II Scan Eagle™ and AAI's "Aerosonde" in support of the US Marine Corps operating out of Iraq in 2005, and expanded into Afghanistan and elsewhere around the world. This customer-focused approach requires the contractor or vendor to identify user mission requirements, or "end-product," and provide everything needed to meet those requirements: UAS platform and ground equipment, training, certification, sustainment/upgrades, and data collection/transfer

to the customer.

Overall, as UAS proliferate into non-DoD applications, mission profiles must also accommodate ever-changing requirements while minimizing costs to customers. A UAS program with customer-driven focus on securing requisite data of the highest quality at the least cost will require the right platform/sensor selection to meet mission requirements, and effective planning of sustainment costs.

Legal Considerations

The regulations and standards affecting the UAS community are in a rapid state of change and modernization.

The latest legal information regarding State legislative actions are found at: http://www.aclu.org/blog/technology-and-liberty/status-domestic-drone-legislation-states

Alaska Airports and Aviation
2014 Annual Report

Alaska Department of Transportation & Public Facilities
4111 Aviation Avenue • Anchorage, Alaska 99502
www.dot.alaska.gov

2014 Alaska Airports & Aviation Annual Report

Message from: John Binder Deputy Commissioner

2014 was another successful year in Alaska aviation. Despite a challenging winter characterized by multiple freeze/thaw events that brought unprecedented icy conditions, our Alaska Department of Transportation & Public Facilities (ADOT&PF) personnel continued to operate the nation's largest airport system and provide the aviation lifeline essential to Alaska. Several accomplishments and initiatives posture us well for what looks to be an equally challenging year.

Rural Airport System

Last year's rural aviation strategic plan provided a mechanism by which several key initiatives were achieved. Performance metrics were developed that will soon be incorporated into the Alaska Aviation System Plan (AASP) website, providing critical insight into those areas where we are performing well and those that can use improvement. An emphasis on employee development resulted in an annual training plan that is benefitting airport maintenance and operations (M&O) personnel statewide, both within and outside ADOT&PF. Finally, a refined communication plan will ensure consistent dialogue and collaboration between the myriad stakeholder groups critical to Alaska aviation.

2015 Statewide Aviation Strategic Plan

Purpose

To sustain and improve the quality of life throughout Alaska.

Core Values

Integrity, Innovation, Excellence, and Respect

Vision

By 2025 we will lead the world in rural aviation reliability, service, and safety management.

Initiatives/Improvement Projects

- Performance Scorecard Development
- Capital Project Optimization
- Airport Database
- Non-Standard Aircraft Policies
- Revenue Optimization

This year's initiatives will focus on adapting to new technologies, and optimizing both capital project development and revenue opportunities as we continue to be good stewards of our limited resources.

Working Together

As I mentioned with the airport training, ADOT&PF continues to make a concerted effort to partner with local, state, and federal agencies as we all advance our aviation interests. A ADOT&PF panel at the Alaska Air Carriers Association conference in February was able to facilitate valuable discussion on a variety of topics impacting the state from obstruction marking and lighting, to snow and ice control, to adjusting operating hours to accommodate industry needs. We truly do want to know about any issues or concerns the traveling public may have, and appreciate the opportunity to work together towards solutions.

A trip to Washington D.C. in February provided an opportunity to meet with FAA and TSA directors to address several national policies that present challenges to Alaska aviation. Meetings like these, and the subsequent opportunity to show several of our federal agencies the "real" Alaska during their travels this year, continue to be invaluable to ensuring strong partnerships and cooperation moving forward. As the fiscal climate becomes increasingly challenging at both the state and national level, cooperation is vital in maintaining a safe aviation system that continues to meet the needs of our residents.

The Great Alaska Aviation Gathering, a legislative trip to the Mat-Su valley, and several Governor's Aviation Advisory Board meetings provided many opportunities to hear from communities and stakeholder groups. A common theme is the increasing demand for airport development opportunity, particularly at those airports in the most rapidly growing regions of the state. DOT&PF will be looking closely at this issue and developing options for meeting the growing need.

Progress

On the capital project front, 2014 saw a better than expected allocation of FAA Airport Improvement Program (AIP) funding of ~$200 million that facilitated large Runway Safety Area projects in Kodiak, Nome, and Kotzebue as well as multiple runway rehabilitation projects in Hooper Bay, Koliganek, Ambler, Petersburg, Barrow and Juneau. In addition, multiple pieces of Aircraft Rescue & Fire Fighting equipment were purchased, Snow Removal Equipment Building projects begun, and several aviation planning studies initiated. Kudos to all of the people and sections responsible for another outstanding grant cycle.

Alaska International Airport System

The Fairbanks and Anchorage International Airports comprise the Alaska International Airport System (AIAS). Ted Stevens Anchorage International was honored for the second year in a row by Air Cargo World as the best cargo airport in North America. The award serves to acknowledge not only the tremendous airport staff, but also the partnership and dedication of the air carriers, ground handlers, and local community in making TSAIA such a great team.

Both Anchorage and Fairbanks finalized airport master plans culminating 18 months of rigorous public engagement, analysis, and planning to develop a common sense strategy for addressing forecast growth. These master plans were unique in that they incorporated "trigger points" for future capital improvements rather than focusing on a specific date. As the airports work in collaboration as an airport system, much of the analysis included how the airports can cooperate to accommodate cargo and passenger activity using current infrastructure, so as to maximize the system's potential prior to initiating new construction. The completed plans can be viewed at the following websites: www.ancmasterplan.com and www.pdcprojects.info/FAIMasterPlan
Lake Hood Seaplane Base just began its master plan process, which will continue throughout 2015. I encourage all Anchorage residents, pilots and passengers alike, to be involved in the process so that the final product represents the interests of all stakeholders.

Finally, while cargo activity through AIAS has continued to slip slightly year to year, I'm pleased to report that passenger traffic continues to rise. Furthermore, we were thrilled to hear that Dynamic Airways will begin weekly, international passenger service between Changsha (a community of 7 million people), in the Hunan Province of China, and ultimately Los Angeles, Las Vegas, Boston, and New York. Each flight will stop in Anchorage for refueling and for customs/immigration processing providing not only a tremendous tourism opportunity in Alaska for Changsha citizens, but also providing Alaskans non-stop service to several new cities both nationally and abroad. Beginning with charter operations, the flights will transition to regularly scheduled passenger service in the spring of 2015.

I close with sincere appreciation for the tremendous work our airport personnel do each day to keep our aviation system operating safely in the face of ever increasing challenges. It truly is the lifeline to most of our rural communities, and their professionalism each and every day sets an example to be emulated by all.

Fly safe Alaska and Happy New Year!

John

ADOT&PF Photo credits:
Cover: ANC Airfield Maintenance Team, Zaramie Lindseth
Painting runway markings at Cold Bay Airport, Hap Kremer
Back page: Unalaska Airport , Lynn Cason

DOT&PF Maintenance & Operations Crews Efficient and Innovative

By Mike Coffey
Chief, Statewide Maintenance and Operations

The Department's Maintenance and Operations (M&O) personnel are responsible for the State's transportation system that includes over 5600 miles of state owned roadways, 254 airports, 845 bridges, 720 State owned and/or managed buildings, and over 7,000 State vehicles and equipment. Alaska's transportation system lies within one of the most extreme and challenging environments on the planet with temperatures ranging from 100F to -80F, snowfalls as high as 974 inches of snow at Thompson Pass, and 80% of the State is under laid by ice-rich permafrost.

M & O responsibilities include pavement maintenance and preservation, highway and airport anti-icing and deicing, snowplowing, snow hauling, avalanche hazard mitigation, vegetation management, guardrail repair, sign maintenance, street/traffic light repair, drainage structures, fence maintenance, airport light repair, airport rescue and firefighting, airport security, and facility repairs. It also includes responding to all emergency/weather related situations such as snow and ice removal, fallen trees, mud and landslides, and roadway/airport flooding.

The Department is continually promoting workplace efficiency; seeking innovative ideas; and providing training. The following are new programs and highlights from this year:

Everyday Lean Innovations & Ideas

The Everyday Lean Innovations and Ideas initiative was developed to promote sharing of innovations and ideas of the DOTPF workforce. An excellent example of a great employee innovation is the "Yeti" (shown below). The "Yeti" is the brainchild of John Frison, a Mechanic Auto Advanced Journeyman at the Fairbanks International Airport. The Yeti provides several benefits and efficiencies by allowing field maintenance staff to fracture ice and create pockets with a pathway to the underlying asphalt so the deicing chemical can get under the ice and start to work versus melting down through the ice. It will also help in the actual removal of ice by leaving pockets for sand to sit in and give texture to provide traction for aircraft operating on the active surfaces. Finally, the unit will be much easier to maintain as each individual tooth can be replaced separately. The width of the unit is approximately 9.5 feet and costs approximately $18,000 dollars to fabricate. The commercially available ice breaking units range in cost from $30,000 to $45,000 so this represents a significant cost savings to the department. This is just one example of the many outstanding innovations and ideas that are developed within the ranks of the ADOTPF workforce. Checkout the Everyday Lean Innovations and Ideas webpage at https://web.dot.state.ak.us/everydaylean/index.shtml.

The department is constantly exploring new technologies, procedures, and methods for accomplishing our mission in a more cost-effective and efficient manner. ADOT&PF is the first in the world to deploy a TowPlow to an airport. This winter the Kodiak Airport will be utilizing a TowPlow, a specialized piece of equipment that is towed behind a normal snow plow that allows one truck and operator to do the work of more than two conventional snow plow trucks. The TowPlow is also good for the environment. It reduces the number of vehicles required to clear a given airport/roadway and, in turn, reduces fuel usage.

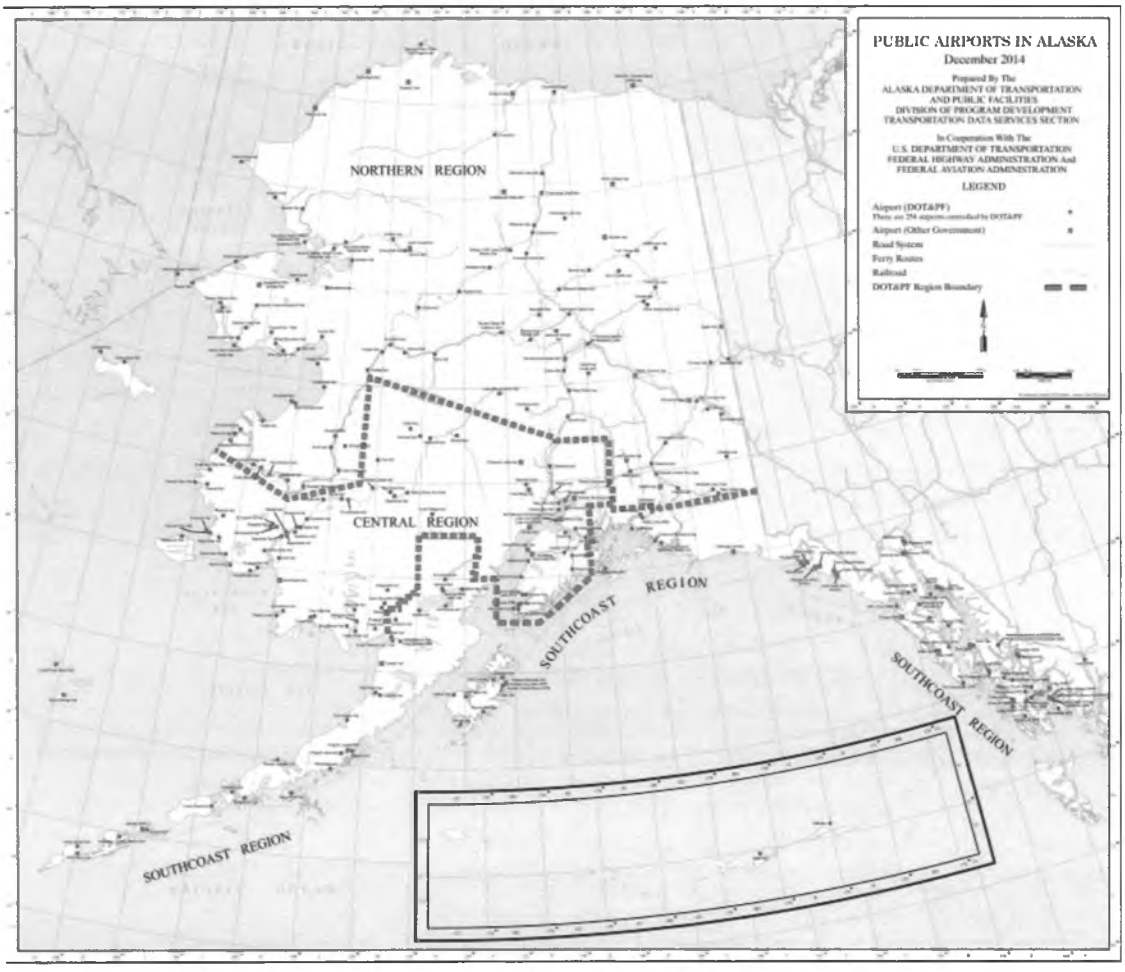
In an effort to mitigate the challenges associated with winter airport and highway maintenance decisions, the ADOTPF initiated a pilot program aimed at developing an Alaska specific winter enhanced Maintenance Decision Support System (eMDSS). The primary goal of the MDSS program is to provide objective guidance to winter road and airport maintenance decision-makers concerning the appropriate treatment strategies to employ to control snow and ice during adverse winter weather events. The eMDSS utilizes current weather observations and numerical model predictions from multiple sources to produce route/ airport-specific analyses and forecasts of environmental conditions. The broad needs met by the Alaska specific MDSS include the following:

Enhanced strategic planning capability
Improved tactical response capability
Improved adverse road weather notification
Operation-specific decision support

The department recently created a new maintenance foreman position in Bethel that combines the skills of an airport maintenance professional with that of a skilled aircraft pilot. By requiring the maintenance foreman to possess a pilot's license the department has been able to dramatically increase the Level of Service provided at the 64 rural airports in the Southwest District. Prior to the creation of this position, the SW District had attempted to inspect each remote rural airport once a year but tended to concentrate efforts on reacting to reported problems rather than being proactive. In the first six weeks after this position was filled, 26 airports were inspected and a vast amount of airport maintenance was performed to include; brush cutting, runway lighting repair, windsock repair, runway grading, beacon repair and contractor training. The airport inspections also included the equipment and buildings. State Equipment Fleet and Facilities have also utilized the aircraft when weather and schedules allow.

Photo - LJ Davis, DOT's Flying Maintenance Foreman at the Tuluksuk Airport. ADOT&PF leased a Cessna 182 to assist with airport maintenance in rural Alaska.

As part of its commitment to developing leaders for the agency, ADOTPF created the Alaska Maintenance Leadership Academy (AMLA). The AMLA is helping superintendents, foreman, airport managers, and lead men become more effective and efficient supervisors. The Academy is a five-day intensive, interactive series that prepares our leaders for the challenges of today and tomorrow. The first leadership academy was held in October 2012, and four have been completed to date. We are proud to say that approximately 110 of our leaders have graduated from AMLA.



New Southcoast Region

Southeast Region's boundaries are expanding to include the majority of southern coastal communities and will be renamed the "**Southcoast Region**." We are updating our website content to reflect this change as quickly as possible. This transition is on-going so your patience is appreciated. Fact sheet available online at www.dot.alaska.gov

Mail Delivery in Hooper Bay, Rich Sewell, ADOT&PF

Cargo Delivery at Galena Airport, Shawn Crites, ADOT&PF

Alaska Aviation System Plan

Being charged with the management of North America's largest airport system is no easy task. It takes a long range vision and extensive planning to ensure the safe, effective and efficient operation of Alaska's 251 state-owned airports. The FAA certainly sees the value in planning as they provide annual grants for ADOT&PF to build the Alaska Aviation System Plan (AASP), a compilation of policies and plans that guide the future design, maintenance and operations of our airports. The implementation of the AASP will address the many challenges facing aviation in the last frontier and lay the foundation for our vision to lead the nation in rural aviation reliability, service, and safety management by the year 2030.

An online report that covers the AASP's multiple studies and products from 2008 through mid-2013 is available at this link:
www.alaskaasp.com/media/998/aasp_final_report.pdf

An evaluation of the effectiveness and outcomes of prior AASP work is available at this link:
http://www.alaskaasp.com/media/1278/d61408.01.evalofprioraasps.tmm.lrh.062014.tjc.pdf

Key accomplishments of the AASP in 2014 include:

- Evaluation of the Prior AASP Efforts & Deliverables
- Pavement Classification Number (PCN) Reporting
- Capital Improvement & Maintenance Program (CIMP) (web-based)
- Rural Airport Rates & Fees Study
- Inventory Updates & Website Updates
- Airspace Coordination & Backcountry Airstrips Working Groups

Airport inspection in Holy Cross this past summer. Photo credit - Jason Sakalaskas, DOT&PF

The future of the AASP involves strategic planning and implementation of the plans goals, objectives, and recommendations. The plan will continue to include inter-agency and public coordination, special studies to address pertinent issues, development of the web-based information systems and tools, and periodic assessment of plan goals and performance measures.

The following tasks are proposed for future aviation system planning work:

- Strategic Planning
- Website Enhancement & Updates
- Weather Coordination Working Group
- Capital Improvement Plan (CIP) Development Integration
- APEB Automation
- Public Involvement
- Capital Improvement & Maintenance Program (CIMP)
- Performance Measures Scorecards

It's important that the story of aviation in Alaska be told to as many people, organizations, and agencies as possible, and to be told often. The AASP is a tool to tell that story as well as assist those working to make Alaska aviation stronger, safer, and more efficient now and in the future.

ALASKA
Aviation System Plan

2014 Alaska Airports & Aviation Annual Report

Alaska International Airport System (AIAS)

"To Keep Alaska Flying and Thriving"

The Alaska International Airport System - comprised of Ted Stevens Anchorage and Fairbanks International Airports - is home to over 30 international and domestic airlines providing passenger and cargo service throughout Alaska, the United States, Europe, and Asia. Both airports are equipped to handle any size and type aircraft, anytime, with state-of-the-art landing systems and terminal facilities. They are important economic engines; serving nearly 6 million passengers per year and accounting for 1 in 10 jobs in Anchorage and 1 in 20 jobs in Fairbanks.

Ted Stevens Anchorage International Airport (ANC)

ANC is renowned as the 6th largest airport in the world for cargo throughput and the 2nd largest in the United States for landed weight.

The airport was honored with the Air Cargo Excellence award as the best cargo airport in North America. A testament to the collaborative efforts in the cargo operations at the airport and its focus on providing first class service to the aviation community.

2014 Air Cargo Award

"As a carrier, UPS is proud of the outstanding partnership we have with the Ted Stevens Anchorage International Airport," said UPS Airport Properties Manager Kevin Hoffmann. "We are not surprised that Anchorage has won this award. Anchorage plays a vital role in our global network, helping us serve customers in more than 220 countries and territories around the world."

Lake Hood Seaplane Base

Lake Hood Seaplane Base (LHD) has been serving Alaska's general aviation needs for generations. On a busy summer day, LHD seaplane base and 2,200' gravel runway can see more than 400 operations by float and wheeled aircraft. A 2013 study found that LHD has a total economic impact of $42 million.

A Master Plan Update was initiated in 2014 to reassess LHD issues, needs, and priorities, and provide a blueprint for responsible airport development and operation for the next 20 years. Public involvement is critical and there will be multiple opportunities to participate in the coming months. More information and contacts available here: www.lhdmasterplan.com

Lake Hood - Busiest Seaplane Base in the World!

Construction projects were in full swing last summer at ANC - including reconstruction of Taxiway E2 (above), Taxiway M, Taxiway L, and Runway 7L.

Fairbanks International Airport (FAI)

As Alaska's second busiest passenger airport, FAI serves as a hub for more than 50 communities in Interior and Northern Alaska that rely upon air freight, mail, and commuter services.

The airport also plays a role in the state's tourism industry. In 2014, the airport documented more than 1,000,000 passengers at FAI. Passengers traveling to or through Anchorage, Seattle, and seasonal traffic to Minneapolis, Minnesota accounted for more than 80 percent of the traffic with the remaining traffic heading to outlying communities.

With the addition of the Holland America Princess flights to Dawson City, Yukon, FAI saw more than 14,000 passengers enplaned and deplaned for international flights, representing 1.4 percent of total passenger traffic at the airport.

Some of the larger projects this past year included completing the airport master plan, rehabilitating the Airport Rescue & Firefighting/warm storage building (ARFF), constructing a sand and chemical storage building, re-roofing the FAA Base/Tower building, remodeling the pilots lounge, and upgrading gate security.

ARFF building at FAI was rehabilitated in 2014

AIAS Business Report 2014

Overall, AIAS experienced a generally improved year. Our managers did a superb job of providing for a safe and enjoyable travel experience while remaining within budget. A significant increase in the cost of deicing chemicals made remaining within budget a noteworthy achievement. The diversification of airline customers generally continued with passenger traffic growing slightly better than 3%. Aircraft weight (our primary revenue driver) did not grow as fast due to continued airline efficiencies from higher load factors and fleet upgrades. In addition, cargo volume growth was generally flat for the year. Our capital improvement program tracked within expectations and AIAS was able to early retire approximately 7% ($35.7 million) of outstanding long-term bond debt.

This past year we focused on our vision of AIAS becoming a global AeroNexus for aviation-related commerce by the year 2030. Solid progress was made in areas such as business development, information technology, metrics development and employee engagement.

In the coming year, we expect continued moderate (1-2%) growth in passenger traffic and a partial recovery in the all-freighter cargo traffic due to lower fuel costs and continued West Coast port labor disputes and related congestion. Significant prolonged reduction in global energy costs over the next year would likely serve to stimulate both passenger travel and air cargo traffic volumes. Our main market remains the all-cargo freighter traffic travelling between Asia and the US. We have benefitted from significant growth in cargo freighter traffic between Asia and Mexico and are well positioned to support greater growth in trans-pacific. The majority of imports to Alaska via air cargo are perishables from the contiguous US. Very few exports travel by air, fresh fish exported to the contiguous US being the largest by weight. The type of imports and exports has not changed significantly in recent years.

2015 Major Rural Airport Projects

Adak Airport:
Construct runway safety area

Ambler Airport:
Rehabilitate all runway surfaces, extend the main runway, runway safety area work, replace runway lighting and new equipment building

Barrow Airport:
Runway 07 surface variation repair

Coldfoot Airport: Resurface all operational surfaces and install new lighting, clear brush and trees obstructing the airspace, and protect the runway and airport access road from imminent erosion by the Koyukuk River

Deadhorse Airport: Airport Fire & Rescue Bay addition with sand storage - Stage 1

Hooper Bay Airport:
Apron, runway and taxiway resurface

Koliganek Airport:
Apron, runway and taxiway resurface and access road realignment

Kodiak Airport:
Continue work on runway safety area

Kotzebue Airport:
Continue work on the runway safety area - Stage II, lighting system, wind cone installation, new gates, and North apron access road embankment and surface course placement, and security fence

Nome Airport:
Runway safety area and apron Improvements - completion date September 2016

Pilot Station Airport:
Complete design, survey, and purchase native allotments for proposed airport relocation

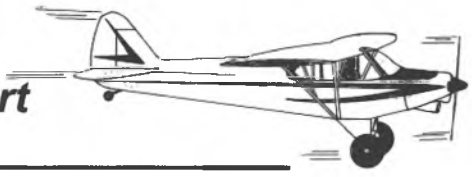
Shismaref Airport:
Resurface the runway, taxiway, and apron

Tununak Airport:
Continue work on airport relocation including new taxiway, apron, access road, snow removal equipment building, airport lighting and other improvements as needed

Kotzebue Airport - view of new runway safety area constructed on runway east end.
Photo credit - Neil Strandberg, DOT&PF

Nome Airport - new runway safety area constructed on Runway 3. DOT&PF Project Photo

2014 Completed Rural Airport Projects



Dillingham Airport:
Completed runway safety area

Ketchikan Airport:
Apron and taxiway paving and lighting repairs

Petersburg Airport:
Runway and taxiway paving

Platinum Airport:
Completed runway extension

Unalaska Airport:
Completed runway safety area

Key Aviation Planner Contacts:

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Aviation in Alaska is Huge!

- Alaska has 8,066 active pilots and 9,515 registered aircraft
- Aviation contributes $3.5 Billion to the state economy (includes operations of airports and direct spending associated)
- 47,000 jobs, represents 10% of all jobs in Alaska

What Are AIP Funds?

The Airport Improvement Program (AIP) provides grants to public agencies for the planning and development of public-use airports. Funds for the AIP come from the Airport and Airway Trust fund, which is supported by user fees, fuel taxes, and other similar revenue sources. In general, AIP funds are used for projects that enhance airport safety, capacity, security, and environmental concerns. Airport planning, surveying, design, construction and right-of-way acquisition are eligible for AIP funds.

How Does FAA Determine Which Projects Receive AIP Funds?

Because the demand for AIP funds exceeds the availability, the FAA and ADOT&PF fund projects based on each agencies highest priorities. Airports sponsors who accept a grant offer are also accepting conditions and obligations associated with the grant assurances. These include obligations to operate and maintain the airport in a safe and serviceable condition, not grant exclusive rights, mitigate hazards to airspace, and use airport revenue properly.

How Are Rural State Airport Projects Identified and Prioritized?

Airport projects are submitted by ADOT&PF regional planning sections with significant input from community representatives, the FAA, legislature, and aviation stakeholders.

After the airfield improvement projects have been identified they are evaluated and scored by the Airport Project Evaluation Board, a six member board that meets annually. After projects are scored, Statewide Aviation develops the rural airport system spending plan and reports.

KNOW BEFORE YOU FLY

Unmanned aircraft systems (UAS), or drones as they are often called, are increasingly available online and on store shelves. Prospective operators—from consumers to businesses—want to fly and fly safely, but many don't realize that, just because you can easily acquire a UAS, doesn't mean you can fly it anywhere, or for any purpose. "Know Before You Fly" is an educational campaign that provides prospective users with the information and guidance they need to fly safely and responsibly.

Among the basic guidelines is:

- Don't fly drones above 400 feet
- Keep your drone within eyesight at all times.
- Users MUST contact airport or control tower before flying within five miles of airport.

The Alaska Unmanned Aircraft Systems Legislative Task Force has issued a handout to help users and provide safety guidelines. This information and more is available at - www.alaskadrones.org

Know Before You Fly was founded by the three leading organizations with a stake in UAS safety – the Association for Unmanned Vehicle Systems International (AUVSI), the Academy of Model Aeronautics (AMA) and the Small UAV Coalition. The Federal Aviation Administration (FAA) is partnering with the founding members to spread the word about safe and responsible flying.

Additional safety resources:

FAA What Can I Do With My Model Aircraft?

AMA National Model Aircraft Safety Code

Airport Managers & Operators Receive Training

Alaska's airport managers and staff are receiving advanced airport technical training through certification programs offered by the American Association of Airport Executives (AAAE). AAAE trains thousands of airport employees each year, and our department has been working to bring these programs to Alaska.

Three programs were held in 2014; ACE Operations, ACE Trusted Agent, and Certified Member Academy. The trusted agent program focused on understanding the requirements for vetting, issuing, tracking and auditing airport credentials and TSA Security Directives. The CM Academy is a week-long comprehensive overview of airport management that keeps our airports and state in compliance with FAA and TSA regulations.

The ACE Operations program brought together 49 airport managers from across the state including many from non-ADOT&PF airports. The 5 day course covered all aspects of airfield operations including airport surfaces, safety areas, lighting, air traffic control, emergency response, and wildlife management. The program ended with a 3 hour written exam and ACE designation for those that pass.

Participants in the ACE Operations Program board the Anchorage International Airport bus for an airfield tour.

Tradeshows, Conferences, and Community Outreach Efforts

ADOT&PF Division of Aviation managers and staff can be found throughout the year at numerous trade shows, conferences, and events with the goal of educating, increasing communication, and providing better customer service. Aviation stakeholders, and the general public can find information on airport projects, aviation policy issues, airport activity surveys, contacts, business opportunities, and more at these events and on the Department's website - www.dot.alaska.gov You can also, sign up there to receive notifications, news alerts, and press releases.

Subscribe to Receive News & Updates

(L-R) Ms. Jane Tian, KPA Cargo Consultant and Trudy Wassel, Division Operations Manager for Anchorage International Airport at The International Air Cargo Association Exhibition in Seoul Korea. Staff from both ANC and FAI travel to Asia frequently to meet with existing customers and network with new industry contacts.

Members of the Birchwood Airport Association and ADOT&PF staff painted markings on the Goose Bay Runway to assist pilots wanting to practice short take-off and landings. Currently there are six airports around the state participating in this program. Volunteers are always needed - please contact Rich Sewell for more information - 269 -0725

One of the bigger events kicking off the summer flying season is the Valdez Fly-In. Over 300 aircraft from all over the state and lower 48 compete in a poker run, STOL competitions and Flour Bombing! Fly-ins are held at many airports around the state including Fairbanks, Anchorage, Talkeetna and Kenai Airports. Photo Credit - Melissa Osborn, ADOT&PF

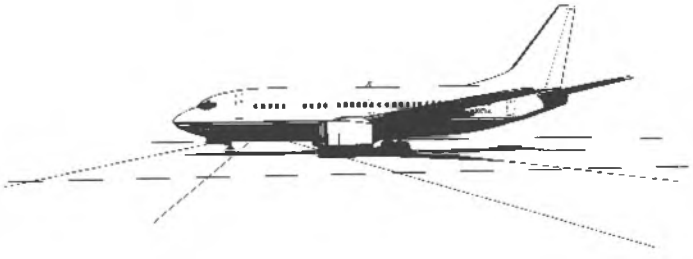
(L-R) Senator Huggins, Commissioner Kemp, Rep. Neuman, and Deputy Commissioner Binder participated in a briefing and tour of Mat-Su airports. ADOT&PF coordinates many airport visits and briefings for state and federal officials providing them with a first-hand look at challenges and issues facing Alaska's airports.

2014 Alaska Airports & Aviation Annual Report

Certificate of Compliance

Alaska Statute 02.40.020 Certification of Compliance of Air Carriers requires all air carriers operating in Alaska to have a Certificate of Compliance to show they have ample and current liability insurance. SWA manages the Certificate of Compliance and issued 157 Certificates to air carriers in 2014.

For more information please call (907) 269-0730 or email megan.byrd@alaska.gov



Statewide Airport Leasing

Statewide aviation leases property to the general public at rural airports owned by the State of Alaska. Leasing manages lands at over 200 rural airports. There is also a statewide tiedown program with spaces available for rent at these airports: Aniak, Homer, Nome City, Bethel, Iliamna Field, Big Lake, King Salmon Talkeetna, Birchwood, Kotzebue, Tok, Dillingham, McGrath, Unalakleet, Gulkana Nome, and Willow.

eLeasing - is the on-line system for processing applications for leases, building permits, land-use permits, mobile fuel dispensing permits, and aircraft tiedown permits at airports owned by the State of Alaska.

Information on leasing regulations, leasing and tiedown documents, concession fee report forms, and more is available on the leasing **webpage**.

eleasing
AVIATION LEASING

Emergency Airport Lighting Program

Top –DLG's new runway lights trailer fits into smaller aircraft that serve rural airports.
Bottom - on a clear night emergency lights are visible 5 miles out on approach to the airport.

Cheaper, quicker, brighter! Our crew at the Dillingham Airport (DLG) reconfigured the trailer for our deployable emergency runway lights from a bulky four-wheel design to a slender two-wheel design. Previously the aircraft required to transport the 4-wheel trailer was a cargo aircraft such as a Skyvan, but now the lights packed in the two-wheel trailer will fit into more aircraft types, such as the smaller and less expensive Cessna 207.

Norm Heyano and John Dunson worked with Tom Eveslage, owner of Northern Welding & Machine to come up with the innovative design that not only saves money, but will ensure better service for our rural airports. Great job DLG!

Aviation Advisory Board

The Governor's Aviation Advisory Board (AAB) met four times in 2014 in Juneau, Anchorage, Nome, and Fairbanks. The board advises and provides recommendations to the Commissioner on public policy related to the department's exercise of its aviation functions assigned by law. The board represents many user groups and stay engaged with aviation stakeholders to ensure statewide aviation issues and concerns are known and addressed where possible.

The meeting in Nome included a tour of the Nome, Shismaref, Port Clarence, and Wales airports. Nome Airport is a state owned, public airport that functions as a critical element of the transportation network of the Bering Strait, serving over 59,000 passengers and 19,000 tons of cargo and mail annually.

Board members and the user groups they represent are as follows:

Jim Dodson
(Mayors of Fairbanks & North Star Borough)
Tom George
(Statewide organizations of pilots, aircraft owners & other aviation supporters)
Bob Hajdukovich
(Alaska Air Carriers Association)
David Karp
(Alaska International Airport System Operating Agreement Signatory Airlines)
Ken Lythgoe
(Non-Airline Tenants, Anchorage)
Dale Shaw
(All Cargo Air Carrier)
Frank Neitz
(Unorganized Borough)
Tom Nicolos
(Public)
Lee Ryan
(2nd Judicial District)
Mike Stedman
(Regional Air Carriers)
Steve Strait
(Mayor of the Municipality of Anchorage)

Lee Ryan is the Board Chair and can be contacted at ***dot.aviationadvisory@alaska.gov***

More information on the Board available here: ***www.dot.alaska.gov/stwdav/AAB.shtml***

(L-R) DOT&PF Commissioner Kemp, Shismaref Airport Manager Curtis Nayokpuk, and Deputy Commissioner Binder toured rural airports with the AAB during the Nome meeting.

The Board toured Lake Hood Seaplane Base (LHD) and met with tenants last April. LHD is undergoing a master planning effort that will help guide further development and reassess needs, issues, and priorities.

From:
Statewide Aviation
Alaska Department of Transportation & Public Facilities
P.O. Box 196900
Anchorage, Alaska 99519

NationalJournal

Few Privacy Limitations Exist on How Police Use Drones

Only 14 states require law enforcement get a warrant to use drones for surveillance.

BY KAVEH WADDELL

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+ An operator lands a commercial drone on July 4, 2014 in Sydney, Australia. (Brendon Thorne/Getty Images)

February 5, 2015 As drones become cheaper and more capable, more police departments across the country are asking for and getting federal approval to use them for law enforcement.

But the Federal Aviation Administration only takes safety into consideration when it grants a law enforcement agency approval to use drones, leaving privacy protections to legislation—which, depending on the state in question, may or may not exist.

Agencies as large as the Michigan State Police and as small as the Grand Forks County [N.D.] Sheriff's Department have received FAA approval to use drones. Most departments use them for missions like search-and-rescue or for photographing a crime scene or an accident site.

But unless a law enforcement agency is within one of the 14 states that have passed privacy legislation [http://www.ncsl.org/research/civil-and-criminal-justice/current-uas-state-law-landscape.aspx] limiting how police can use drones, there's little in theory keeping it from using a drone for a less innocuous end—such as surveillance without a warrant. "While the federal government retains responsibility for the airspace, under most circumstances a state/local government can impose restrictions on the agencies for which it's responsible," an FAA spokesperson said in an emailed statement.

Members in the House and Senate introduced bills in the previous Congress that would have required police everywhere in the country to obtain a warrant before using drones for surveillance, but the bills died at the end of the year.

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"In the states that don't require warrants, it's pretty much a Wild West" in terms of what's allowed, says Jay Stanley, senior policy analyst at the American Civil Liberties Union. "There's nothing stopping a police department from using [drones] in all kinds of ways to spy, except for the Constitution."

Within that unregulated "Wild West," police have very different approaches to their drone programs. One of the longest-running law enforcement drone programs is at the Mesa County Sheriff's Office in Colorado. Ben Miller, its director, says the department has a 17-page policy that outlines when and how it can use drones and for how long it retains data.

The department has never run a surveillance mission with its drones, Miller says, which are generally used for search-and-rescue and crime-scene photography. "If we had a need to look into an area where someone would have a legitimate expectation of privacy, we'd get a warrant," he says.

Colorado is one of the states [http://www.ncsl.org/research/civil-and-criminal-justice/current-uas-state-law-landscape.aspx] without any legislation about drones at all, according to the National Conference of State Legislatures, which means that the limitations on the Mesa County drone program were instituted at the department's prerogative.

Unlike the Mesa County Sheriff's Office, some law enforcement agencies have been less than forthcoming with their drone programs. Last year, the San Jose Police Department in California secretly bought [http://www.mercurynews.com/crime-courts/ci_26279254/san-jose-police-apologize-secret-drone-purchase-promise] a $7,000 drone, and was faced with uproar in the community when freedom-of-information requests brought the purchase to light six months later.

The police department said the drone was meant for helping bomb technicians access hard-to-reach places, but left the door open for using the drone to address "dangers such as active shooters, hostage taking, or other such tactical situations where lives might be in immediate danger."

And this December, the sheriff in Alameda County, Calif., revealed [http://www.sfgate.com/crime/article/Alameda-County-sheriff-reveals-that-he-s-bought-5930981.php] that he spent $97,000 of his own department's money to buy a pair of drones after he was barred from using federal funds to make the purchase. The sheriff told the *San Francisco Chronicle* that the drone won't be used for surveillance "in any shape, manner or form," but California, like Colorado, has no state law that requires warrants for surveillance.

The California state assembly passed a bill last year that would have required police to obtain a warrant to fly drones in any event other than an "emergency situation." But Gov. Jerry Brown vetoed it [http://www.cnet.com/news/california-police-can-fly-drones-without-a-warrant/] in September, because he said the exceptions the bill allowed "appear to be too narrow."

While advocates are worried that law enforcement could use drones in ways that violate citizens' privacy, there's little fear that they're being abused yet. "Safety restrictions are so strict that most police departments are still using them in quite limited ways," the ACLU's Stanley said. "This is still an issue of looking down the road to what we know is coming."

The technology is new enough that police groups are still grappling with its implications and limitations. "We're doing some research right now to come up with some model policy," said John Thompson, deputy executive director of the National Sheriffs' Association. "We don't have a statement or opinion on it at this point."

Miller, who runs the drone program at the sheriff's office in Mesa County, says he often hears from other law enforcement agencies who need help getting their drone program off the ground. But there's no formal coordination: "It's all very word-of-mouth," he said, and suggested that others find him simply by searching the Internet.

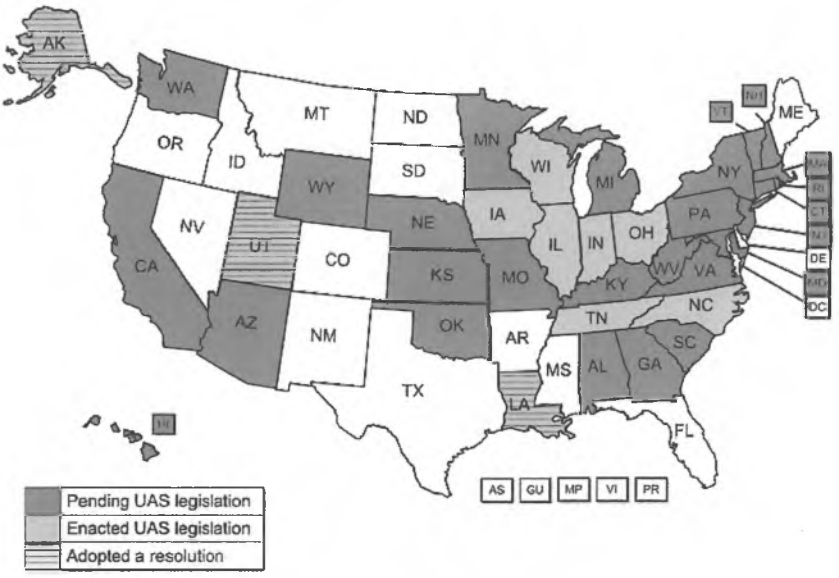
For the time being, privacy advocates are not focusing on fighting for federal legislation. "For activists, it's generally easier to do things at the local and state level," says Nadia Kayyali of the Electronic Frontier Foundation, a privacy and free speech advocacy organization. "Any fight at the local level is more likely to see results, but also does take a much more significant investment in time."

2014 STATE UNMANNED AIRCRAFT SYSTEMS (UAS) LEGISLATION

9/16/2014 Rich Williams

In 2014, 35 states considered UAS or UAV (also commonly called drones) bills and resolutions; 10 states enacted new laws.

State UAS Legislation



Alaska enacted HB 255 creating procedures and standards for law enforcement's use of unmanned aircraft, as well as, regulations for the retention of information collected with UAS. It requires law enforcement agencies to adopt procedures that ensure: the appropriate Federal Aviation Administration flight authorization is obtained; UAS operators are trained and certified; a record of all flights are kept and there is an opportunity for community involvement in the development of the agencies' procedures. Under the law, police may use UAS pursuant to a search warrant, pursuant to a judicially recognized exception to the warrant requirement and in situations not involving a criminal investigation. Images captured with UAS may be retained by police under the law for training purposes or if it is required as part of an investigation or prosecution. The law also authorizes the University of Alaska to develop a training program for operating UAS. The state senate also adopted a resolution HCR 15 to extend the operating time and expand the duties of the state UAS task force.

Illinois enacted SB 2937 creating regulations for how law enforcement can obtain and use information gathered from a private party's use of UAS. The law requires police to follow warrant protocols to compel third parties to share information, and if the information is voluntarily given to police, authorities are required to follow the state's law governing UAS data retention and disclosure. The law also loosens regulations around law enforcement's use of UAS during a disaster or public health emergency.

Indiana is the first state to enact a UAS law in 2014. HB 1009 creates warrant requirements and exceptions for the police use of unmanned aircraft and real time geo-location tracking devices. It also prohibits law enforcement from compelling individuals to reveal passwords for electronic devices without a warrant. If law enforcement obtains information from an electronic service provider pursuant to a warrant, the provider is immune from criminal or civil liability. The law provides that if police seek a warrant to compel information from media entities and personnel, then those individuals must be notified and given the opportunity to be heard by the court concerning issuance of the warrant. The new law also creates the crime of "Unlawful Photography and Surveillance on Private Property," making it a Class A misdemeanor. This crime is committed by a person who knowingly and intentionally electronically surveys the private property of another without permission. The law also requests that the state's legislative council study digital privacy during the 2014 interim.

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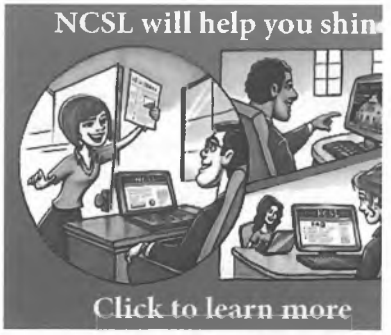

Iowa enacted HF 2289, making it illegal for a state agency to use a UAS to enforce traffic laws. The new law requires a warrant, or other lawful means, to use information obtained with UAS in a civil or criminal court proceeding. It also requires the department of public safety to develop guidelines for the use of UAS and to determine whether changes to the criminal code are necessary. The department must report on their findings to the general assembly by Dec. 31, 2014.

Louisiana enacted HB 1029, creating the crime of unlawful use of an unmanned aircraft system. The new law defines the unlawful use of an unmanned aircraft system as the intentional use of a UAS to conduct surveillance of a targeted facility without the owner's prior written consent. The crime is punishable by a fine of up to 500 dollars and imprisonment for six months. A second offense can be punished by a fine up to 1000 dollars and one year imprisonment.

North Carolina enacted SB 744 creating regulations for the public, private and commercial use of UAS. The new law prohibits any entity from conducting UAS surveillance of a person or private property and also prohibits taking a photo of a person without their consent for the purpose of distributing it. The law creates a civil cause of action for those whose privacy is violated. In addition, the law authorizes different types of infrared and thermal imaging technology for certain commercial and private purposes including the evaluation of crops, mapping, scientific research and forest management. Under the law, the state Division of Aviation is required to create a knowledge and skills test for operating unmanned aircraft. All agents of the state who operate UAS must pass the Division's knowledge and skills test. The law enables law enforcement to use UAS pursuant to a warrant, to counter an act of terrorism, to oversee public gatherings, or gather information in a public space. The bill creates several new crimes: using UAS to interfere with manned aircraft, a class H felony; possessing an unmanned aircraft with an attached weapon, a class E felony; the unlawful fishing or hunting with UAS, a class 1 misdemeanor; harassing hunters or fisherman with a UAS, a class 1 misdemeanor; unlawful distribution of images obtained with a UAS, a class 1 misdemeanor for; and operating a UAS commercially without a license, a class 1 misdemeanor. The law addresses launch and recovery sites of UAS, prohibiting their launch or recovery from any State or private property without consent. In addition the law extends the state's current regulatory framework, administered by the chief information officer, for state use of UAS from July to December 31, 2015.

Ohio enacted HB 292 creating the aerospace and aviation technology committee. One of the committee's duties is to research and develop aviation technology including unmanned aerial vehicles.

Tennessee has enacted two new laws in 2014. The first, SB 1777, makes it a class C misdemeanor for any private entity to use a drone to conduct video surveillance of a person who is hunting or fishing without their consent. SB 1892 makes it a Class C misdemeanor for a person to use UAS to intentionally conduct surveillance of an individual or their property. It also makes it a crime to possess those images (Class C Misdemeanor) or distribute and otherwise use them (Class B Misdemeanor). The law also identifies 18 lawful uses of UAS, including the commercial use of UAS under FAA regulations, professional or scholarly research and for use in oil pipeline and well safety.

Utah enacted SB 167, regulating the use of UAS by state government entities. A warrant is now required for a law enforcement agency to "obtain, receive or use data" derived from the use of UAS. The law also establishes standards for when it is acceptable for an individual or other non-governmental entity to submit data to law enforcement. The new law provides standards for law enforcement's collection, use, storage, deletion and maintenance of data. If a law enforcement agency uses UAS, the measure requires that agency submit an annual report on their use to the Department of Public Safety and also to publish the report on the individual agency's website. The new law notes that it is not intended to "prohibit or impede the public and private research, development or manufacture of unmanned aerial vehicles."

Wisconsin enacted SB 196, requiring law enforcement to obtain a warrant before using drones in a place where an individual has a reasonable expectation of privacy. The law also creates two new crimes; "possession of a weaponized drone" and "use of a drone." Use of a drone creates a class A misdemeanor for a person who, with intent, observes another individual in a place where they have a reasonable expectation of privacy. Possession of a weaponized drone is a class H felony.

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DATE: 2/11/2015

SUBJECT OF MEETING: Privacy issues and "drones"

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Bill Tart	Beltsville, MD	Arctic Slope Regional Corp. Federal	?

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Police investigate complaints of drone following Eagle River children

Chris Klint, Senior Digital Producer, cklint@ktuu.com

POSTED: 12:24 PM AKDT Mar 26, 2015 | UPDATED: 01:27 PM AKDT Mar 26, 2015

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ANCHORAGE - Parents in Eagle River have complained to police about a small drone aircraft that they say has been spotted this week following school children and hovering near homes. The reports highlight growing concern over laws that govern how and where drones can be used in Alaska.

Concerned grandparent Patricia Bailey said her experience with the aerial intruder began Tuesday, when she saw the drone hovering above her and 2-year-old granddaughter as they stood in their driveway.

After speaking with other parents, Bailey learned that the craft, which she described as "a very elaborate drone" -- a quadcopter model equipped with a camera in a ball turret -- had also been spotted outside windows of homes in the area.

Bailey said the final straw came when she spoke with children returning home from Eagle River Elementary School.

"One of them asked, 'Did you see the drone?'" Bailey said. "I asked, "What drone?"'

"'The one that followed us home.'"

"That's what got me fired up," Bailey said.

When Bailey and other parents called Anchorage police, she said they were told that the letter of the law bars firing guns at drones, but that they were within their rights to throw rocks and fire slingshots at the device if they felt threatened.

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Police investigate complaints of drone following Eagle River children

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Anchorage police spokeswoman Anita Shell says police took one call each Monday and Tuesday about the drone from residents near Eagle River Elementary. She said several people had apparently decided to have one person call police on behalf of the group.

"There were two separate calls that neighbors (made), about a drone following children home or near windows," Shell said.

Police told the parents involved that they spoke with the drone's operator and gave him a "very stern talking-to" about their concerns, Bailey said.

When the man complained about the potential risk of damage to his expensive drone, she said, officers told him that the best way to keep his drone safe was by not flying it over other people's property.

Bailey said the intervention by officers on parents' behalf had an apparent effect when people next saw the drone Wednesday.

"It wasn't following kids," Bailey said. "It was over the school, but it was high up."

Shell said police did speak to the drone operator but did not talk about specifics of the exchange.

"We did make contact with the drone owner," Shell said. "He was using the drone to practice for some upcoming business venture."

Police would not identify the drone operator Thursday, because Shell said he wasn't arrested or charged after officers contacted him.

"He wasn't committing a crime," Shell said. "There wasn't anything we could do but advise him of the neighbors' concerns about following children home or flying near windows."

Since then, Shell said, "We haven't received any other complaints on him."

Channel 2 on Thursday visited the operator's residence, as identified by Bailey, but an occupant said the man was not at home.

With the Federal Aviation Administration taking the lead in the emerging field of legislation governing drone use, Shell said the Eagle River incident highlighted the lack of local rules doing so.

"It's not a city law, it's not a state law," Shell said.

FAA spokesman Allen Kenitzer said in a Thursday email that the agency is investigating this week's Eagle River incident. The FAA is also looking into another Anchorage drone incident, involving a craft which entered airspace at Merrill Field.

One section of FAA regulations concerning drone use quoted by Kenitzer offers stern consequences for encroaching on manned aircraft, warning that the agency "may take enforcement action against anyone who operates a (drone) in a way that endangers the safety of the national airspace system." The excerpt doesn't directly address privacy concerns, however, citing a list of do's and don'ts released by the agency in June.

"In the notice, the FAA restates the law's definition of 'model aircraft,' including requirements that they not interfere with manned aircraft, be flown within sight of the operator and be operated only for hobby or recreational purposes," FAA officials wrote. "The agency also explains that model aircraft operators flying within five miles of an airport must notify the airport operator and air traffic control tower."

Privacy is being addressed on the state level, however, with lawmakers taking increasing interest in how to protect people from encroachments by drones. Ginger Blaisdell, the chief of staff for Rep. Shelley Hughes (R-Palmer), said Thursday that Hughes' office was aware of the Eagle River incident and had spoken with Bailey.

According to Blaisdell, flying a drone up to someone else's window doesn't currently violate state law -- unless it's equipped with a camera.

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"That's not a criminal issue at all," Blaisdell said. "What is a criminal issue is peeking into people's windows and photographing them -- that could lean into harassment."

Hughes is entering her third year as a member of the Unmanned Aircraft Systems Legislative Task Force, a group which includes lawmakers as well as representatives from the FAA and the state Department of Public Safety. The task force hasn't specifically discussed the Eagle River incident, but Blaisdell said it has considered some very similar scenarios.

"(For instance), what if a person flies up and takes pictures of you changing your clothes?" Blaisdell said. "Should you close your curtains?"

The discussions accompany a rising wave of drone activity on the Last Frontier, with the FAA naming Alaska one of six states where it plans to develop test sites for drones in 2013 and the University of Alaska conducting drone research at an in-state flight range.

Despite that uptick in unmanned flights, Blaisdell said state activity on drone bills has been limited since last year, when then-Gov. Sean Parnell signed into law a bill governing the use of drones by law enforcement. She cited the FAA's lead on drone rules as a factor in that slowness.

"We haven't put together another actual bill this year," Blaisdell said. "They're really the ones establishing the regulations for drone use."

Back in Eagle River, Bailey said keeping drones like the one spotted this week from following her children is a victory in itself.

"As long as he stays high in the sky, I'm OK with him," Bailey said.

Editor's note: The sequence of events in Patricia Bailey's account of encounters involving the drone Tuesday has been corrected.

Channel 2's Dan Carpenter contributed information to this story.

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Sean Doogan [1]
March 26, 2015
Main Image:
Drone150325-002.JPG-1427402666 [2]
Main Image Caption:
An Eagle River resident launches his DJI Inspire quadcopter drone off a landing pad on the front deck of his home on Wednesday, March 25, 2015.

A man operating his high-tech, remote-controlled quadcopter -- more commonly known as a drone -- caused a stir among residents of one Eagle River neighborhood earlier this week. Anchorage police were called to the area Tuesday after residents complained that a drone was following children home from a nearby school, but officers found no laws had been broken.

The incident has highlighted both the growing popularity of private drone use and the possible privacy and safety concerns the devices can raise for neighbors of drone enthusiasts.

Patricia Bailey-Ruiz, who lives near Eagle River Elementary School, said she was outside her home playing with her grandchildren at about 3:30 p.m. Tuesday when she heard a buzzing noise overhead.

"It came right down to us at the height of the light poles and just hovered there," Bailey-Ruiz said. "And it was making a clicking noise and it was shifting around in the sky."

Bailey-Ruiz said that's when a neighborhood child walked by her house on his way home from school.

"I said, 'Did you see the drone?' and he said, 'Oh, yeah, he has been out for a few days and he comes home with us from school, and follows kids to their houses,' " Bailey-Ruiz said. "And that's when I called Anchorage police."

A group of angry residents a few blocks away told officers where the drone operator lives.

Police said the man in the house told them that he was practicing flying his drone for an upcoming business venture. Officers told the man to stop flying his drone near the school or children and to respect people's privacy. But there was little else they could do.

"There is no state or local law for the misuse of drones," said APD spokeswoman Anita Shell. "Can we prove anything illegal has been done? No."

For three years, the Unmanned Aircraft Systems Legislative Task Force [3], a group made up of lawmakers and Federal Aviation Administration and state officials, has been considering how to craft laws that would regulate the private use of drones in Alaska. So far, no bill has been drafted because the group is waiting for federal regulators to weigh in on the issue. The only current state regulations addressing drones are bans against using them for hunting or to spot animals in preparation for a hunt.

The FAA regulates all aerial vehicles, including drones. Drone operation is currently banned for commercial purposes with some exceptions for closed movie sets and experimental programs -- like the one at the University of Alaska Fairbanks [4].

But there are few regulations for private drone use. Current guidelines [5], written in 1981 to cover the use of model and remote-controlled aircraft, suggest that operators fly at a safe height and away from crowds or airports.

Generally, remote-controlled aerial devices, including drones, are not allowed within 5 miles of airports and must not fly above 400 feet.

The FAA said it was working on clear rules for civilian drone use that could be finished by the end of this year.

FAA spokesperson Allen Kenitzer said the agency is investigating the Eagle River drone incident.

The man flying the drone was not identified by Anchorage police because he had broken no laws. After being contacted by Alaska Dispatch News on Wednesday, the man agreed to show reporters how the drone worked and flew it for about five minutes before accidentally crashing the $3,400 device, breaking a propeller and damaging its landing gear.

The drone operator asked not to be identified for this story because he said he was worried about escalating neighborhood tensions. He claims other drones operate in the area and denies that he has ever followed children or flown low enough to look into people's homes with his drone's camera. The man said he is considering painting his drone a bright, noticeable color so that it is easily identifiable and distinguishable from other drones. He also told Alaska Dispatch News that he would no longer fly his drone while children were walking home from school.

The man said he bought the drone -- a DJI Inspire [6] quadcopter -- online because he used to fly drones for the military and wanted to see what civilian models could do.

The FAA estimates there could be as many as 7,500 civilian drone users within the next four years. Highly publicized drone crashes -- including at the White House [7] -- and near misses with aircraft have heightened the need for a clear set of rules for drones. But for now, local police are on their own when it comes to deciding if any privacy laws have been broken by drone use in neighborhoods and around people.

"The technology is moving faster than the laws, basically," Shell said.

In the absence of legal restrictions about drone use, it remains up to the operator to make sure his device is being flown safely and ethically.

"You can't regulate stupid," said Alaska Zoo photographer and drone enthusiast John Gomes.

Gomes said he only flies his device away from people, usually in parks. Gomes said ethical operators always keep their drones in sight, never relying on the onboard cameras as the only means to see where they are.

Gomes said most drones don't have cameras with great resolution and that it would be difficult to use them to spy on people. He added that it's always a good idea to get a property owner's permission before flying over their land. Gomes said drones get a bad reputation because of people's fears and incidents like the one in Eagle River.

Still, Gomes claimed the aircraft are fun to fly and can be useful for photography and entertainment, if operated ethically.

Source URL: http://www.adn.com/article/20150326/neighbors-worry-over-privacy-after-report-drone-following-kids-eagle-river

Links:
[1] http://www.adn.com/author/sean-doogan
[2] http://www.adn.com/image/drone150325-002jpg-1427402666
[3] http://alaskaaircarriers.org/servlet/download?id=677
[4] http://acuasi.alaska.edu/
[5] https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentid/22425
[6] http://www.dji.com/product/inspire-1
[7] http://www.nytimes.com/2015/01/27/us/white-house-drone.html?_r=0

06/19/15 Task Force Meeting

<TARGET><BILL></BILL><SUBJECT>06-19-15 Task Force Meeting</SUBJECT><COMM><TARGET></COMM></TARGET>

Legislative Task Force on Unmanned Aircraft Systems
June 19, 2015 Meeting
Anchorage Legislative Information Office ~ 716 W 4th Ave ~ Auditorium
1:00pm – 5:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
    - Ginger Blaisdell, Staff to Rep. Hughes
- Senator Peter Micciche, Co-Chair
- Ethan Tyler, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof

Task Force Responsibilities

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications;
3. evaluating complaints and concerns expressed to the task force;
4. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to unmanned aircraft systems;
6. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;
7. conducting a public hearing concerning privacy and the capture of data by unmanned aircraft systems at the University of Alaska's test site;
8. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

AGENDA

1:00pm Welcome and Introductions ..... Representative Shelley Hughes

- Review of Meeting Summary from February 11, 2015
- Introduction of guests and new task force representative

AGENDA

1. Summary of military briefing – Pages 1 - 23
   - Russia to Deploy Military UAS to Monitor Arctic
   - Senators, Congressmen, Praise New UAS Research
   - Alaska Delegation: Fort Wainwright Soon Welcoming Gray Eagle "Sky Warriors"
   - Alaska Command PowerPoint: DoD UAS in Alaska
2. Current events:
   - News Articles Pages 24 – 37
   - FAA Articles Pages 38 – 52
   - Department of Justice Guidelines Pages 53 – 58
     - www.alaskadrones.org
3. Invited testimony
   - Ryan Marlow, Alaska Aerial Media
   - Captain Dave Koch, Anchorage Police Department
4. Privacy document and legal memo regarding privacy for Alaska citizens
     - www.alaskadrones.org
5. Drone insurance for commercial and recreational users
6. Public testimony
7. Wrap-up and adjourn
   - Future Meeting Agenda:
     - Next meeting: September 3rd 1 – 5pm
   - Follow Up – To Do
     - Letter to Congressional Delegation regarding funding of FAA Test Sites

Legislative Task Force on Unmanned Aircraft Systems
February 11, 2015 Meeting
State Capital, Juneau Alaska, Room 13
1:00 – 3:00pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Joe Jacobson, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- Ro Bailey, University of Alaska Fairbanks
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof
- Ginger Blaisdell, Staff to Rep. Hughes

Not in attendance:

- Senator Peter Micciche, Co-Chair
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- John Parker, Integrated Robotics Imaging Systems
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF

MEETING SUMMARY

1:00pm Welcome and Introductions .....Representative Shelley Hughes

- Thank you all for coming to Juneau and attending the Lunch and Learn hosted by the University of Alaska Fairbanks and contributors

Items in meeting packets:

- Dec 5 meeting minutes – to be emailed
- Letters to department heads
- Letter to delegation
- Congressional bills introduced by Young and Murkowski – encourage public private partnerships to provide funding

- KBYF safety guidelines and the alaskadrones.org web site
- FAA is trying to ramp up drone education and regulation process
- You tube link to Swiss team 'cage' that won $1m from UAE
- FAA issued guidance for law enforcement
- UAS improvement act 2015 congressional legislation – procurement, homeland security, etc.
- Young and Murkowski bill
    a. Ro Bailey worked with congress on this legislation (Allison/Murkowski)
    b. Test sites are experiencing issues where the FAA is interpreting aspects of UAS research that makes the work they are doing very difficult
    c. Trying to break the FAA lose from restricting operations at the test sites
    d. Can't be paid to fly but can receive money for milestones

Joe Jacobson, Department of Commerce, Community and Economic Development

Update: final report on UAS economic advantages for Alaska is in today's packet

- Cultivating a resource, workforce, university program
- Entrepreneurial focus to attract them
- Canada forming alliances across industries (maritime and UAS)
- Recommending incentives to attract business without increasing cash outlay
- Job creation and revenue to the state

Barbara Johnson (past position with FNSB)

- Economic development work to establish military development zones
- Looked at a tech park near Salcha, now considering Hightop Park using University lands about 20 miles outside Fairbanks
- NOAA is very interested in what Alaska is doing
- Great opportunities in the Arctic

Steve Colligan, Academy of Model Aeronautics

- Hobby industry has the best you tube information on flying UAS you might want to see
- Safety is directly related to skills and knowledge
- "We" need to get information out there virally
- Know Before You Fly campaign
- Asks Task Force (alaskadrone.org) to "sign on" to national campaign Know Before You Fly – send a letter and a logo to the national campaign
- Discussion: letter to campaign, recommendation from Gov/Task Force?, what logo?, want all Alaska communities-agencies-vendors to 'sign on' to alaskadrones.org?, wants Gov to endorse, ask congressional delegation to draft letters
    - Joe and Steve Colligan will work with Gov office to request a letter
    - Knowbeforeyoufly.org

Bob May, Public member - Very interested in the privacy for Alaskans

Steve Wackowski, Fairweather Inc. – Top 40 Under 40

Mike O'Hare, Department of Military and Veterans' Affairs

- Offer to host next meeting on base
- Update on how military plans to use UAS

Ro Bailey, University of Alaska Fairbanks

- Interest Group Meeting
  - Interest group meeting begins on September 1, she would like the task force meeting to coincide with the interest group, consider meeting September 3 or 4 in Fairbanks
- Ro Bailey also noted that the Test Site now includes operations in Kansas and Tennessee for test site operating locations but not as a key partner

PRIVACY DOCUMENT _____

Privacy considerations for Alaskans

- Most privacy issues around the USA have been with regard to law enforcement privacy
- Ro Bailey: once we put the privacy document out, we should include the "who to call" info

Creating a document:

- Want the privacy document to fit on one page (similar to KBYF)
  - Who is the target audience?
  - How will this document be used?
  - Might be different audiences with different needs?
  - Hobby Use – Commercial Use – Law Enforcement
    - Semi-professional videographers occurring in Alaska already
    - Section 333 exemptions in the FAA reform act of 2012
- Guidelines vs Law?
- **FAQ version** of common questions to add to the web site – FAQ's would allow ginger to research statutes with legal services – questions provided to Ginger by Feb 15 - Generic or specific examples to use in the FAQs?
  - Who owns the airspace above your house?
  - How to apply the protections that Alaska already has in statute?
  - Reasonable expectation of privacy
  - How is data going to be used, stored and maintained?
  - Can I shoot it down if it's flying over my house? Destruction of another's property.
  - Circumstance: is it private or not?
  - What do I do if there's a drone flying over my house?
  - Can I use this for my business?
  - Noise ordinance?
  - Chasing my dog?
- "**Cartoon**" some of the scenarios to grab everyone's attention

Timing

- Get the information out to the public quickly and we can continue to refine
- Get our web site to the national level

New information to put on website

- Put the 5-page excerpt on the alaskadrones.org web site
- Why Alaska? Joe Jacobson has a great flyer developed
- Who do you contact and how do you contact re inappropriate drone flights?
    - Jay Skaggs – call me...
    - Get contact information on alaskadrones.org
    - Can individuals contact local police? – yes
    - DPS form/content to be made available on alaskadrones.org so individuals know what information to provide to local police (or forwarded on to FAA)
    - Don't dial 911

Public Testimony

Bill Tart, Arctic Slope Regional Corp – no testimony provided

Next meeting

- **June 19 in Anchorage on Base coordinated by Mike O'Hare – would like a UAS demo**
    - Would not be able to get the public on the base for a general meeting – look into the rules for this.
- FAA should kick out some rules by June
- Letter to congressional delegation regarding test site funding
- Matrix and Education plan to be worked on by Steve Strait and Ginger
    - KBYF one page document (and this privacy document) really delivers the education plan
- Military update
- Unmanned Traffic Management System – how do they fly, where do they fly, communication capabilities
    - Steve Colligan is aware of the relationship with NextGen, detect and avoid technology
    - Ro Bailey is under contract with NextGen working on airspace reservation information and ultimately integrate with manned aviation
    - Steve Wackowski is working with major entities and University, on the slope to be first to integrate the UTM in Alaska

Russia to Deploy Military UAS to Monitor Arctic

Russian drones will start monitoring the situation in the Arctic as well as on a part of the Northern Sea Route starting May 1, authorities announced. The vehicles can be used in navigation as well as in search and rescue missions.

"The drones' task is to maintain impartial control of the situation in the Russian sector of the Arctic, including the ecological and ice situation in the adjoining sea areas and along the Northern Sea Route," Colonel Aleksandr Gordeev said.

The division of UAV [Unmanned aerial vehicle] Orlan-10 of Eastern Military District will deploy in Chukotka [Peninsula] from May 1.

Produced at the Special Technological Centre of Saint Petersburg, the Orlan-10 drones are capable of reaching speeds of 90-150kph.

The drones will perform such tasks as *"managing objective control over the situation in the Russian Arctic,"* and section of the Northern Sea Route, Gordeev added.

The vehicles will be delivered aboard Mi-26 heavy transport helicopters to any area for monitoring the situation in the Russian Arctic, navigation as well as in search and rescue missions.

Plans to implement drones in the Arctic were revealed at the end of 2014. The test flights of Orlan-10 started in March 2015.

Russia has recently started developing its northern regions, which includes the production of hydrocarbons, with national companies developing the exploration and construction of drilling facilities.

Home to the largest icebreaker fleet in the world, Russia is the only nation to use nuclear-propelled icebreakers. With climate change making the Arctic region more accessible, Moscow sees its development a priority both for the sake of its natural resources and as a potential route for transport vessels from Asia to Europe.

Photos: Orlan 10 - RIA Novosti / Evgeny Biyatov

Source: RT

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Posted in News on April 27, 2015 by The Editor. Leave a comment

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US AIR FORCE ORDERS 25 MORE QF-16S →

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Senators, Congressmen, Praise New UAS Research

Members of the U.S. Senate and House of Representatives pledged to continue their support for a newly-designated FAA Center of Excellence for Unmanned Aircraft Systems that will research and develop technologies and policies for the use of unmanned aerial systems, or drones, in the United States.

At a news conference Thursday, lawmakers praised the Federal Aviation Administration (FAA) selection of Alliance for System Safety of UAS through Research Excellence (ASSURE), a consortium of universities headed by Mississippi State University (MSU), to lead the UAS COE. ASSURE is tasked with identifying issues critical to the integration of unmanned aircraft systems (UAS) into the nation's airspace and engaging in research and policy development on the growing use of unmanned aerial systems.

FAA Administrator Michael Huerta, MSU President Mark Keenum and consortium members joined U.S. Senators Thad Cochran (R-Miss.), John Hoeven (R-N.D.), Lisa Murkowski (R-Alaska), Roger Wicker (R-Miss.), and U.S. Representatives Kevin Cramer (R-N.D.) and Gregg Harper (R-Miss.) at the event to discuss the next steps and goals for the COE UAS.

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"Unmanned aircraft technology is here to stay, and we are all excited that our states will have an active role in figuring out the safest and most efficient way to incorporate this evolving technology into our airspace to assist on issues ranging from precision agriculture to disaster recovery," Senator Cochran said. "We are interested in continuing to support what will be a collaborative process to address the complicated nature of integrating unmanned aircraft into our national airspace system, as well as privacy and other issues that arise with their use."

"We are extremely pleased that UND is a key member of the UAS team selected for the Center of Excellence," Senator Hoeven said. "UND brings not only its resources as a premier school of aviation, but also the northern tier UAS test site and the Grand Sky Technology Park."

"From the Alaska perspective, unmanned aerial systems can be game changers for my state - to work around our vast distances and lack of infrastructure. Whether in the form of Arctic research, delivering goods in the Bush, fire-fighting or policing in rural areas, UAS deserve serious and thoughtful consideration as we map out an intelligent rule book for their use and applications," Senator Murkowski said.

"Advances in Unmanned Aircraft Systems are making a big impact on the ways we live and work - revolutionizing how we engage with the world," Senator Wicker said. "These technologies help create tens of thousands of jobs, grow our crops more efficiently, improve our response to humanitarian crises, and protect our troops. This consortium of research universities, led by Mississippi State University, will play a leading role in the future development of this exciting, emerging field."

"This alliance is its own evidence of excellence. In addition to the scientific and intellectual assets of these institutions, North Dakota brings the highest ethical standards born out of the culture of the prairies to be applied to the execution of technology," Congressman Cramer said.

"I commend FAA Administrator Huerta's search selection of the ASSURE consortium, headed by Mississippi State University, to lead the UAS Center of Excellence," Congressman Harper said. "Over the past decade and a half, we have seen UAS technology and capabilities grow exponentially and this selection speaks strongly to the important partnership between the FAA and academia. I applaud Senator Cochran's leadership on this issue. Dr. Keenum, Mississippi State University and ASSURE are uniquely positioned to be an integral part of the growth of UAS research and technological advancements."

The directive to the FAA to establish the national center has been included in congressional appropriations bills since FY2012, with Congress appropriating $5.0 million to support a five-year agreement with the COE UAS. Federal funding will be matched by ASSURE team members.

The FAA expects the COE to begin research in 2015 and be fully operational in 2016 in its exploration of evolving new technological developments regarding unmanned aircraft and their uses, including detect-and-avoid technology, low-altitude operations safety, privacy safeguards and other areas. Research will also involve the deployment of UAS for emergency response, bio-fuel and clean fuel technologies, law enforcement activities, and agricultural and environmental monitoring.

Moreover, the COE UAS will coordinate research and development activities with the National Aeronautics and Space Administration, the Department of Defense, the Department of Homeland Security, Department of Agriculture and other agencies. Its work will also lead to recommendations on aircraft certification, flight standards and air traffic requirements, and facilitate UAS technology transfer to other civilian and defense agencies.

In addition to Cochran, Hoeven, Murkowski and Wicker, other Senators who have been instrumental in supporting the formation of the COE UAS include Ron Wyden (D-Ore.), Pat Roberts (R-Kan.), Heidi Heitkamp (D-N.D.), Richard Shelby (R-Ala.), Jeff Sessions (R-Ala.), Bill Nelson (D-Fla.), Richard Burr (R-N.C.), Bob Casey (D-Pa.), Tom Udall (D-N.M.), Jeff Merkley (D-Ore.), Jerry Moran (R-Kan.), Martin Heinrich (D-N.M.), Jon Tester (D-Mont.).

ASSURE members include Mississippi State University, Drexel University, Embry-Riddle Aeronautical University, Kansas State University, Montana State University, New Mexico State University, North Carolina State University, Oregon State University, University of Alabama-Huntsville, University of Alaska-Fairbanks, University of Kansas, University of North Dakota, Wichita State University, Ohio State University, University of California-Davis, Auburn University (associate member), Concordia University (associate member), Indiana State University (associate member), Louisiana Tech University, Tuskegee University (associate member), and University of Southampton (associate member).

Source: Political News

g+1

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Posted in Regulatory Matters on May 18, 2015 by The Editor. Leave a comment

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ALASKA CONGRESSIONAL DELEGATION

NEWS RELEASE

SENATOR LISA MURKOWSKI — Matthew Felling 202-224-9301
SENATOR DAN SULLIVAN — Mike Anderson 202-224-6727
CONGRESSMAN DON YOUNG — Matthew Shuckerow 202-225-0722

Alaska Delegation: Fort Wainwright Soon Welcoming Gray Eagle "Sky Warriors"

U.S. Army Informs Lawmakers of Basing Decision,

Further Reinforcing Alaska's Military Footprint

WASHINGTON, D.C. – Alaska's Congressional Delegation received good news today from the United States Army, that Fort Wainwright will be the home base for nine "Gray Eagle" Unmanned Combat Air Vehicles. This announcement solidifies the Department of Defense's investment of manpower and infrastructure in Alaska, the "most strategic location in the world."

The Gray Eagle Company will bring 128 military personnel and their families to Interior Alaska beginning next month, and represents a major addition of military hardware that complements Alaska's two combat infantry brigades, the Apache helicopters and Air Force assets.

The U.S. Army also informed the delegation that while the aircraft will be housed at an existing facility in the short-term, it plans to seek constructing for a UAV facility in the President's 2017 budget.

"Alaska is the tip of the spear when it comes to the Pentagon's strategic shift to the Asia-Pacific, but the Pentagon clearly sees it as a superior choice to also respond to increasing military activities in the Arctic region," said **Senator Lisa Murkowski.** "It was not too long ago that the Department of Defense was taking a closer look at its investment and presence in Alaska; it's now evident that officials came away from examining Alaska extremely impressed and convinced that we are the optimal location and community for men and women in uniform."

"Today's announcement from the Army is the latest in a string of good news for military basing and positioning in Alaska. The Gray Eagle Company will provide benefit to Alaskan service members by allowing them to train as they fight—with support from Gray Eagles, Apaches, and Air Force assets at JBER and Eielson," **said Congressman Don Young.** "I proudly supported the procurement of the Gray Eagle in this year and last year's National Defense Authorization, so I was thrilled to learn they would be positioned at Ft. Wainwright."

"In an increasingly dangerous world, Intelligence, Surveillance, and Reconnaissance (ISR) capability has never been in greater demand," **said Senator Sullivan.** "Now more than ever, ground commanders need to see and understand the battlefield, and the Gray Eagle is a critical component for the U.S. Army to do that. Importantly, basing the Gray Eagle at Ft. Wainwright, near the Joint Pacific Alaska Range Complex (JPARC), will give the U.S. Army access to some of the world's most expansive and robust training ranges. I am pleased to see a

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company of Gray Eagles on its way to Alaska, and I am hopeful that the U.S. Army will continue to see value in the benefits of Alaska's great training ranges and strategic location, as the Senate Armed Services Committee already has."

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Ginger Blaisdell

From: McKenzie, Connie (Sullivan) <Connie_McKenzie@sullivan.senate.gov>
Sent: Thursday, June 04, 2015 4:12 PM
To: Ginger Blaisdell
Subject: FW: Alaska Delegation: Fort Wainwright Soon Welcoming Gray Eagle "Sky Warriors"

Categories: Drone

Hi Ginger,

I thought Rep. Hughes would be interested in this release dealing with UAVs.

Best,

Connie McKenzie

Delegation Representative – Juneau

U.S. Senator Lisa Murkowski

U.S. Senator Dan Sullivan

800 Glacier Ave., Suite 101

Juneau, AK 99801

Ph: 586-7277

Fax: 586-7201

Sent: Thursday, June 04, 2015 3:51 PM
To: Anderson, Mike (Sullivan)
Subject: Alaska Delegation: Fort Wainwright Soon Welcoming Gray Eagle "Sky Warriors"

Note to journalists: For photos of the Gray Eagle aircraft, click here. For video/b-roll of the Gray Eagle in operation, click here.

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Sam's Club Bets Drones Will Fly Off the Shelves at Christmas

NEWS NEWS REPORTS *June 11, 2015 by DRONELIFE News - No comments*

(Source: wsj.com)

Move over BB guns and videogames. Christmas morning may have a new menace.

Sam's Club is betting drones will be a popular holiday gift this year and plans to stock about a dozen kinds—from $100 models to $4,000 versions with high resolution cameras or the ability to pick up small objects, said Dawn vonBechmann, senior vice president of technology, entertainment and office products for the wholesale chain owned by Wal-Mart Stores Inc.

The move comes as drones are capturing attention at a time when little else in the battered consumer electronics market is clicking at the register. Sam's started thinking about expanding its drone line after noticing a $1,169 model with a digital camera was selling "like crazy" online, Ms. vonBechmann said.

Sam's surveyed customers earlier this year and found about half bought the pricey drone for professional reasons; real-estate agents taking bird's eye view pictures of their high-end properties, wedding photographers hoping to get a client's ceremony from a new angle—and at least one rancher who uses it to check whether perimeter fences are intact from the comfort of his home. The rest are buying it for fun, Ms. vonBechmann said.

The Bentonville, Ark.-based discount chain, with $58 billion in annual sales, is hoping it can grow sales and increase memberships by offering more new and unexpected products.

Sales at U.S. Sam's Club existing stores inched up 0.4% in the most recent quarter excluding gas, while competitor Costco Wholesale Corp. notched a 5% gain in the same period.

To boost its sales, Sam's Club needs more excitement and newness, "re-engaging there like we did when we first started Sam's Club," said Rosalind Brewer, chief executive of the retailer. Ms. Brewer spoke during a news conference ahead of Wal-Mart's annual meeting of shareholders last week.

Drones are a niche part of the consumer electronics market that includes emerging technologies such as 3-D printers, Ultra High Definition televisions, wearable fitness devices and smartwatches. Such sales are expected to reach almost $11 billion this year, according to trade group Consumer Electronics Association. Three years ago, those sales were too small to track, the association said.

▸ BUY A DRONE

Why do you want a drone?

Recreational Photography

How much do you want to pay?

$ $$$

$1000

FIND MY DRONE

▸ BEFORE YOU BUY

Where Are All The DJI Phantom 3 Reviews?

When DJI's Phantom 3 was first announced in April, it seemed like every media outlet ran a story about it.... Read More »

Drone Safety: What You Should Know Before Yo Fly With 3DR

by Roger Sollenberger It's getting easier and easier to fly drones—or, like with Solo, to have the drones fly... Read More »

My New Contingency Plan for Drone Fly Aways

As drone fliers we tend to go to great lengths to protect our investments from flying away. There's nothing... Read More »

The Parrot Bebop: A DRONELIFE Review

The Parrot Bebop is an excellent drone for beginners and is the perfect model for demonstrating why has drones... Read More »

How Easy Is It To Travel Internationally With A Drone?

Summer is (finally) right around the corner. As people gear up to go on vacation this year, drones are sure to be... Read More »

The 5 Best "Bang-for-Your-Buck" Drones

With cultural icons like Amazon.com flying into the Game of Drones, there's little doubt that UAVs will soon –... Read More »

6 Things to Consider Before You Hire a Drone

Ninety percent of Sam's electronics come from six big companies including Samsung Electronics Co. and Apple Inc., a spokeswoman for the retailer said. The retailer hopes that drones, like flat screen TVs and computers in years past, will appeal to shoppers looking for a holiday gift that makes a big splash.

Phantom 2 Vision by DJI

Battery Life: Under 30 Minutes
Camera: 1080p HD
PRODUCT INFORMATION

$699
PURCHASE INFO

Sam's found the $1,169 DJI Phantom Vision 2+, made by SZ DJI Technology Co., as part of an event that gives smaller companies 30 minutes to pitch their products. The company put the drone on its website, which it often uses to test interest in new products, Ms. VonBechmann said.

Continue Reading at wsj.com...

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Drones 'Flying Off the Shelves' Ahead of UK's...

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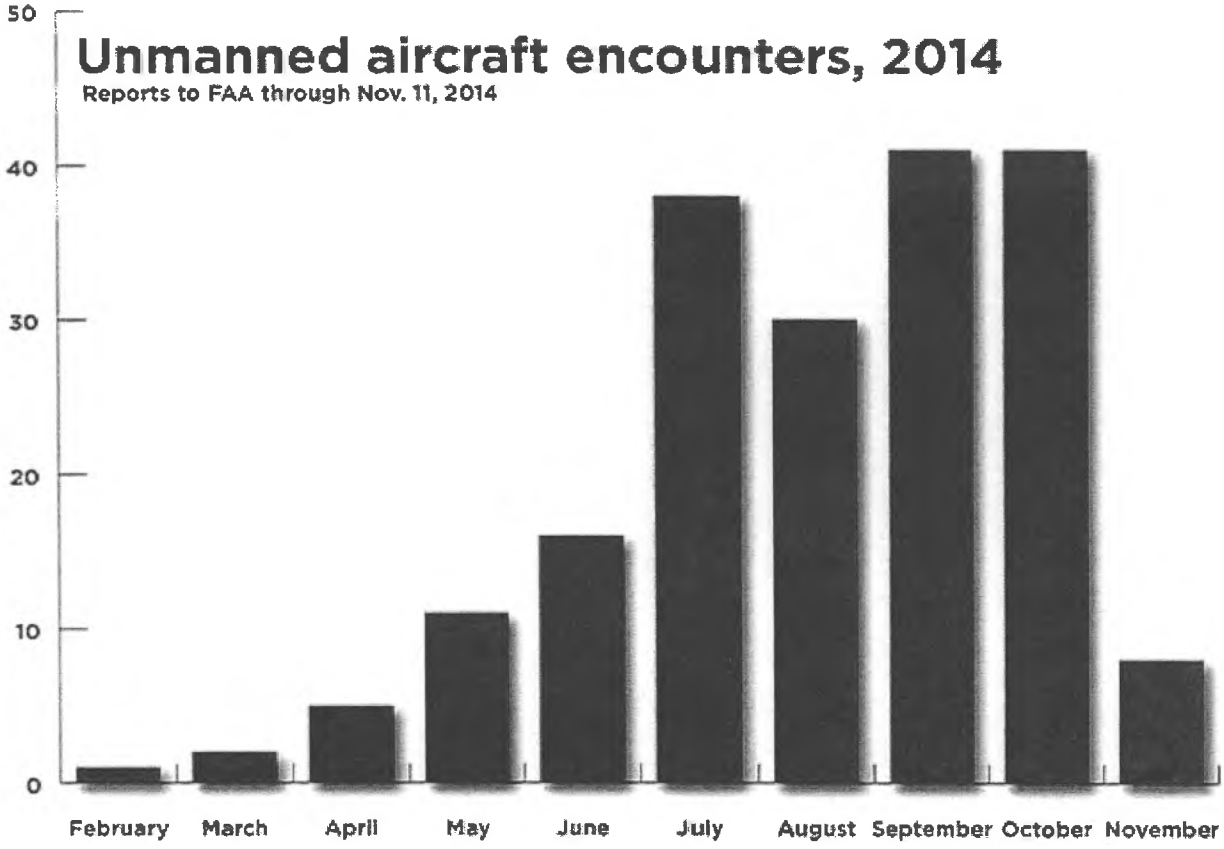
FEATURED VIDEO

Unmanned Aircraft Encounters Increasing in USA



Nearly 200 encounters with unmanned aircraft, ranging from amusing to chillingly dangerous, were reported to the FAA between February and November of 2014; a list published by a New Orleans television station May 26 documents the growing use of drones—authorized and otherwise—and their infiltration of the National Airspace System.

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The U.S. Coast Guard reported that a DJI Phantom quadcopter operated by a photographer flew over the admiral's residence at Diamond Head Lighthouse on Nov. 8, though no property damage or National Airspace System penetration was noted. But many of the reports documented on the list published May 26 by Fox 8 News, a copy of which was sent to AOPA on request, detail more troubling encounters: unmanned aircraft flying much higher, in some cases near manned aircraft, airports, or navigation aids.

The reports were collected by various FAA facilities (most of them relayed through air traffic control, according to an FAA spokesman), and show a steady increase from just one report in February 2014 to 41 reports in July and August of 2014. The FAA is working to establish a systematic process for collecting these reports. So far they have been supplied by flight crews and public safety agencies on their own initiative. The FAA redacted the names and telephone numbers of those filing reports, a spokesman said, and "anything related to national security," but the reports are otherwise unaltered.

One report details unmanned aircraft activity being conducted on a runway in Joplin, Missouri, while the airport also hosted normal operations, though no notam was published for the unmanned operation. The person filing the report investigated and was told the activity was apparently illegal, and the operation ceased after the airport manager was notified. At least one aircraft in the pattern for the runway requested a different runway.

That same month, a report filed in Oklahoma documented an aircraft taking evasive action to avoid a small unmanned aircraft at 4,800 feet; the unmanned aircraft was described as two feet wide and black, with a camera attached. The pilot who took evasive action reported that the drone came within 10 to 20 feet of a collision.

Such near-misses were the exception, though several reports document unmanned aircraft operating well inside controlled airspace. In many cases the intention of the operators is unknown, though at least one military drone (a small, hand-held model) flew onward after losing data communication with the ground station. "The UAS last known altitude 650 feet, SW bound with a fuel exhaust time of approx 40 minutes. Expected to remain in the restricted area," the report, filed Oct. 24 in Columbus, Georgia, states.

In another case, operators lost control of an unmanned aircraft being used to record a high school football game in Madison, Mississippi, and it flew into controlled airspace. Local police investigated the incident, which resulted in no property damage or injuries, though that unmanned aircraft was spotted a mile from an airport by a passing pilot.

AOPA has long advocated for safety above all when it comes to unmanned operations, stressing the need for all aircraft operators to be able to "see and avoid" other aircraft at all times, whether the pilots are on the ground or in the air. AOPA participated on the FAA's Small Unmanned Aircraft Systems (UAS) Aviation Rulemaking Committee, which started meeting in 2008 to develop recommendations for the agency to integrate UAS safely. In 2009, the committee recommended that small UAS operators be required to keep the craft in sight and take training. In April, AOPA submitted formal comments on proposed rules, asking the FAA to limit commercial-use UAS to 400 feet agl to mirror the regulations already in place for model aircraft. AOPA asserted that lowering the ceiling for UAS from the FAA's proposed 500 feet to 400 feet would add a "small buffer between manned and unmanned operations in most areas."

The FAA is testing a smart phone application for unmanned aircraft operators designed to help them avoid dangerous or illegal operations; a link to that app, currently in testing, is posted online along with other information about current regulations, limitations, and other aspects of unmanned aircraft operations.

The AOPA Air Safety Institute offers a free online course, *Unmanned Aircraft and the National Airspace System*, to educate pilots on the different types of unmanned aircraft and how to safely coexist. AOPA has also joined with unmanned aircraft organizations to support the "Know Before You Fly" education campaign.

Source: AOPA

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Posted in Regulatory Matters on June 2, 2015 by The Editor. Leave a comment

← ANTI-UAV DEFENCE SYSTEM DETECTS UAVS AT 8KM NEW ZEALAND SOON TO INTRODUCE UAS LEGISLATION →

DJI and Accel Announce SkyFund

Accel invested $75 million into DJI this month, sparking this new partnership. Skyfund will make $250,000-plus investments in early stage drone startups through convertible notes or traditional seed and Series A rounds. DJI and Accel will have the option to make follow-on investments.

Along with a closer relationship with DJI's hardware business, portfolio companies will get access to expert advisors, including Dropcam founder Greg Duff, former head of Facebook product management Sam Lessin, Twitter director of developer platform Jeff Seibert, and Emmy award-winning TV producer Dick Wolf, who has used drones in shows like Law & Order.

Both Airware (with its recently announced investment fund) and DJI seem to have realized that the drone industry is too big and the use cases too broad for a single company to build the whole technology stack. Instead, both are trying to become platforms, making flexible core software and hardware that can be customized for niche needs in different verticals. Just like Apple or Facebook didn't try to build every end application, these drone giants are trying to become the foundation of an ecosystem.

Companies around the world are eager to replace dangerous and expensive helicopters, planes, and satellites, and dangling humans with drones. Airware and DJI could entrench themselves in this budding commercial drone business by building a network of startups around themselves. At this rate, Airware and DJI could emerge as the software and hardware titans of dronetech.

Source: Tech Crunch

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Posted in Business News, Non-Military & Commercial UAS on June 1, 2015 by The Editor. Leave a comment

← US DRONE DOWN IN IRAQ AIRWARE LAUNCHES DRONE INVESTMENT FUND →

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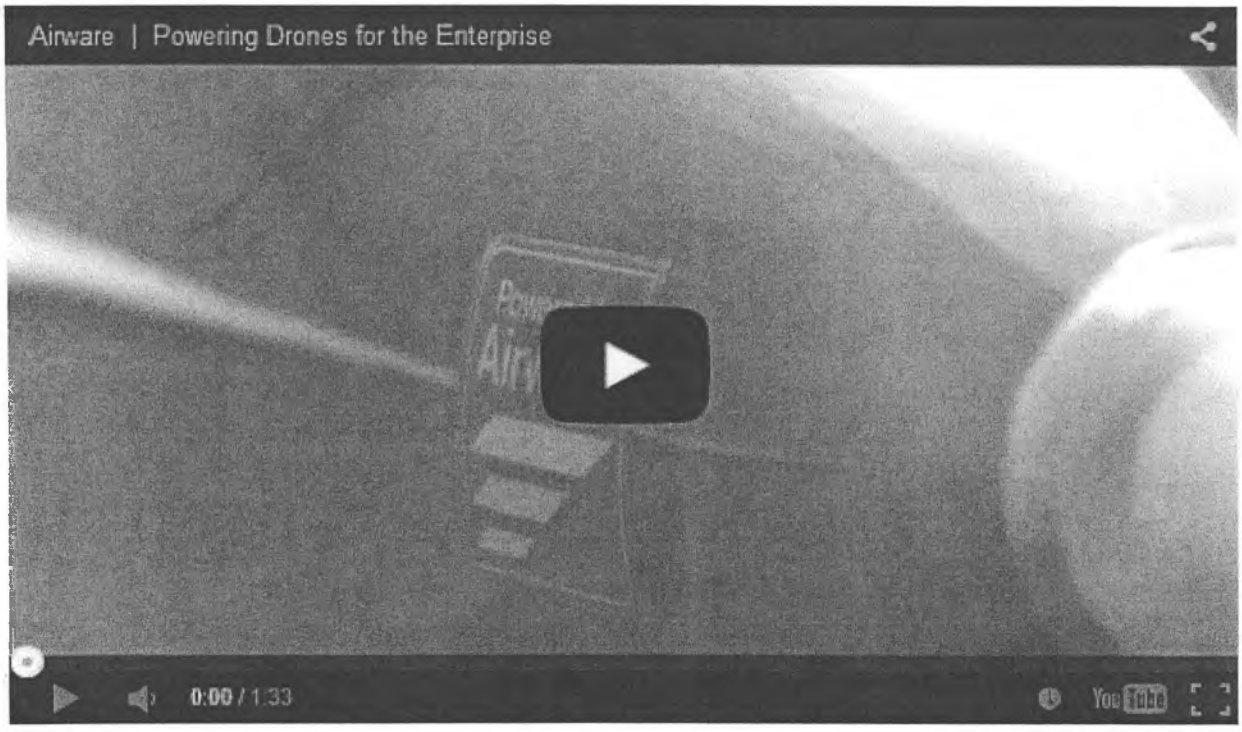
Airware Launches Drone Investment Fund



Airware is announcing the Commercial Drone Fund, which will invest $250,000 to $1 million in dozens of early stage startups that are building out other components of the enterprise drone ecosystem. The fund's first two investments are in RedBird, a Paris-based drone data processing startup, and Sky-Futures, a London company that builds drone sensors for monitoring oil and gas infrastructure.

Airware has raised over $40 million to scale its drone flight computer, operation software, and cloud data system.

Rather than invest from its own balance sheet of venture capital, or simply co-invest with traditional firms, Airware raised a separate fund from a set of limited partners. Airware's founder and CEO Jonathan Downey will be its general partner. The fund's size and LPs aren't being disclosed, but the backers may include traditional VCs, as Downey says they're open to investing in follow-on growth rounds beyond the fund.

"In the same way Airware's platform is acting as a catalyst on the technology side of things for companies looking to deploy drones for commercial applications, we're launching the Commercial Drone Fund to help catalyze these companies in a different way — by investing directly into them" Downey tells me. "These are technologies that are critical to scaling commercial drones."

The commercial Drone Fund will concentrate on five areas over the next two to three years:

1. **Sensor Hardware** - to improve the precision, speed, cost, and scale of what data drone can collect
2. **Software Applications** - that make deploying commercial drones easier
3. **Cloud-Based Aerial Data Analysis Tools** - for pulling insights from the data collected
4. **Drone-Based Services** - including companies that fly drones or sell data
5. **Complete Solutions For Specific Industries** - that pull together different hardware and software systems into full packages for commercial customers

Portfolio companies will get access to Downey, who built drones for MIT and Boeing, and help raising additional funding. Airware's own investors, including Andreessen Horowitz, First Round, Kleiner Perkins, Google Ventures, and Felicis Ventures, give it plenty of connections to share.

Source: Tech Crunch

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Posted in Business News, Non-Military & Commercial UAS on June 1, 2015 by The Editor. Leave a comment

AMA Provides sUAS Education Online

The Academy of Model Aeronautics (AMA), an organisation that promotes the development of model aviation, has announced the latest addition to its AMA Flight School online learning centre: small Unmanned Aircraft Systems (sUAS) education with partner Fly Robotics.

The Fly Robotics team brings with it an unprecedented portfolio of UAS experience and instruction. With multiple Department of Defense certified flight instructors and national champions, Fly Robotics will be an integral piece of AMA Flight School, serving as the sUAS online course and regional flight school provider. Additionally, Fly Robotics has provided basic safety and introductory sUAS content for anyone interested in learning more about drones.

Based upon the criteria presented in FAA's sUAS Notice of Proposed Rulemaking, this course will be of great value to anyone wanting to get a head start on the upcoming FAA sUAS commercial use certification test, or those wanting to learn safe unmanned aircraft operations.

The AMA celebrates nearly 80 years of safe operations in the National Airspace System and continues, through educational content, to provide the knowledge necessary to safely fly a drone or sUAS.

Source: Press Release

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Posted in Non-Military & Commercial UAS on April 21, 2015 by The Editor. Leave a comment

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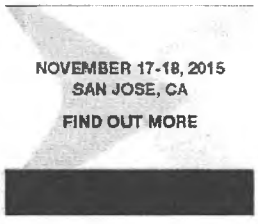

Alaska Researchers Use Drones to Study Otters

Scientists wanting to know what sea otters eat while floating far from shore have turned to the sky. During an April mission in Kachemak Bay, researchers tested unmanned drones to see if they could be used for future sea otter surveys. The project also used drones to study the prevalence of sea grass in intertidal flats.

Using drones for the intertidal flats mission was mostly to streamline the process, allowing a larger area to be surveyed in a shorter amount of time.

When it comes to otters, scientists want to know what the predators regularly eat to better understand how it may affect fisheries management. Current observation techniques are restricted to watching sea otters with high-powered spotting scopes. The practice is only viable on land, as swells and turbulent boats make scopes unfeasible.

Close to shore, otters eat clams, crab, octopus, fish and the occasional sea urchin or star fish. But in open water, scientists "have no idea what they're feeding on," Brenda Konar, professor of marine biology at the University of Alaska Fairbanks, said.

During the project, most drone flights were conducted from land so researchers could use spotting scopes to see if otters avoided the drones.

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According to Konar, the project was "really successful," even without recording new feeding data. "At this point, all we did with them was to see how close we can get to them and see if the would try to freak out or not."

Konar said drones were able to be flown within about 10 feet of the otters, and most animals paid the quadcopters no attention.

Kachemak Bay's otter population is doing better than most around Alaska, Konar said. That is in contrast to the Bay's crab population. "They're not coming back the way people are hoping," Konar said of crabs. Konar hopes drones can help determine if otters' fishing habits contribute to low crab numbers.

Team members learned both from successes and challenges during the mission.

Sam Vanderwaal, project manager and drone pilot, said tricky technical issues arose. Maintaining connectivity with drones was problematic while trying to catch otters in the bay. Common issues — like recharging batteries in the field and keeping equipment dry — also popped up.

Vanderwaal is an embedded contractor at the Alaska Center for Unmanned Aircraft Systems Integration at UAF's Geophysical Institute. The Center for Unmanned Aircraft has a certificate of authorization from the Federal Aviation Administration to operate drones professionally.

The GoPro cameras equipped on the drones also lacked sufficient resolution for the tidal flats survey. A better camera would require drones with larger payloads.

When it came to otters, simple techniques were practiced to get drones as close as possible. As otters dove to find food drone operators would lower the aircraft for when the animal resurfaced. "We learned if you did it in steps the otter didn't seem to care," Konar said.

Konar is working to procure funding for the next mission, when she would like to get some actual feeding data.

Source: newsminer.com

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FAA SELECTS MISSISSIPPI STATE-LED TEAM FOR UAS CENTER OF EXCELLENCE

FAA Selects Mississippi State-Led Team for UAS Center of Excellence
By AUVSI News posted Fri, May 08, 2015 07:41 PM

MSU demonstrates using UAS for a river survey in the Mississippi Delta in December 2014. Photo: AUVSI.

AUVSI President and CEO discusses unmanned systems with FAA Administrator Michael Huerta at AUVSI's Unmanned Systems 2015. Photo: Robb Cohen.

by AUVSI News

The U.S. Federal Aviation Administration has named a team led by Mississippi State University as its new Center of Excellence for Unmanned Aircraft Systems.

The new center will be run by MSU's Alliance for System Safety of UAS through Research Excellence, or ASSURE, which comprises top UAS research universities and over 100 government and industry partners. The COE will study technical issues needed for the successful introduction of UAS into the National Airspace System, including detect-and-avoid technology, low-altitude operations safety, control and communications, training and certification of UAS pilots, and compatibility with air traffic control operations. Other research areas may be added over time.

"This world-class, public-private partnership will help us focus on the challenges and opportunities of this cutting-edge technology," said U.S. Transportation Secretary Anthony Foxx. "We expect this team will help us to educate and train a cadre of unmanned aircraft professionals well into the future."

AUVSI President and CEO Brian Wynne congratulated the team and said AUVSI looks forward to working with ASSURE and the FAA to advance research and development on UAS.

"It's critical that we begin looking to the future now and laying the groundwork for more transformational uses of UAS technology, notably beyond-line-of-sight operations," Wynne said. "The Center of Excellence designation, the Pathfinder Program announced earlier this week and ongoing industry and government research efforts all point to a future where the possible will one day become reality."

The FAA announced at AUVSI's Unmanned Systems 2015 conference earlier this week that it has partnered with three companies to perform beyond-line-of-sight operations, which it called the Pathfinder Program.

The new Center of Excellence will coordinate with the six existing UAS test centers, but how that will be done hasn't yet been determined. When it issued the final solicitation for universities competing to house the center, the FAA said that process will be set up once the COE is selected and develops its own detailed research plans.

"This has been a six-year effort for Mississippi State and three years for our partner universities," said ASSURE executive director James Poss, also a retired major general from the Air Force. "We picked our team because they know unmanned systems and they know the FAA. That will make it easier to turn UAS research into FAA rules quickly."

Congress approved $5 million for the five-year agreement with the COE. The center's academic team members will match the federal grants dollar for dollar from nonfederal sources.

"This team has the capabilities and resources to quickly get up and running to help the FAA address the demands of this challenging technology over the next decade," said FAA Administrator Michael Huerta.

The FAA expects the COE will be able to begin research by September 2015 and be fully operational, with at "robust research agenda," by January 2016.

The center joins seven others set up by the FAA, which cover topics such as commercial space, general aviation, alternative jet fuels and the environment.

For more information about the members of ASSURE, visit the ASSURE website here.

Click here for more information on the MSU Center of Excellence and the university's plans.

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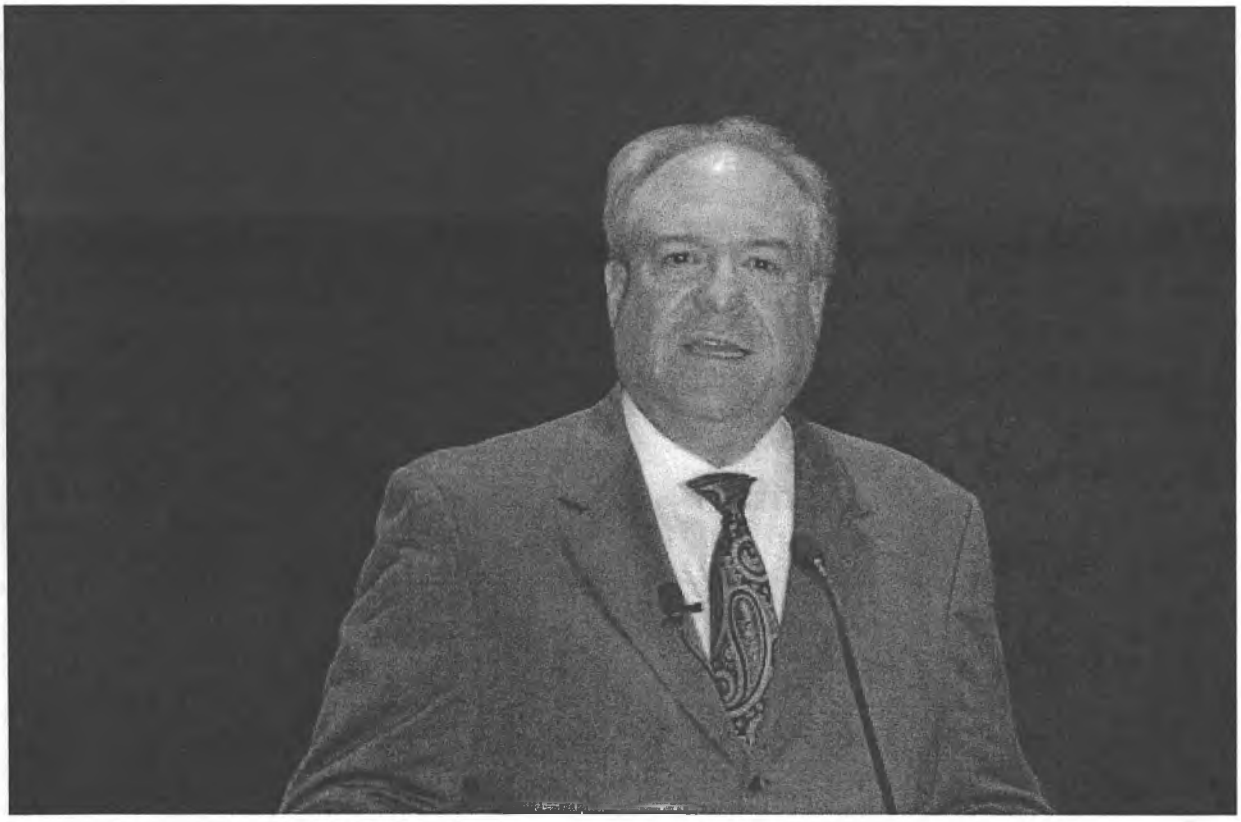
7 Insights from the FAA's Former Leader



Jim Williams, who managed the FAA office to integrate drones into the U.S. airspace, retired last week. Before departing for a vacation of visiting ballparks with his family, Williams spoke at McKenna Long & Aldrige's unmanned aircraft systems symposium in Washington, D.C.

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Now that he is outside the FAA Williams can speak more freely about the path and challenges to drones operating safely in American skies. Here are some points that stood out as he reflected on his time at the FAA, and looked to the future of unmanned flight:

1. He expects drone package delivery in five years

"That'll be fairly routine, be it in rural areas. It's going to be real tough to do it in a built-up major metropolitan area outside of Washington, D.C., because how do you deal with the helicopters that are flying sort of randomly," Williams said. "When they figure that out I think it'll happen. There's no other reason, no other barrier to doing that."

2. Amazon's drone program is a juggernaut, but seems out of touch with the challenges of flying safely in cities

"They're pushing the envelope in every realm. They want a fully automated system. They want it to be able to take random routes to deliver wherever they want to deliver. It's really a big challenge," Williams said. "If the small rule [for commercial drone flight] is walking then they're sprinting."

Williams stressed the challenges of autonomous drones flights in major cities, particularly working around helicopters and small planes.

"I think their understanding of the difficulties is probably on the low end," Williams said. "But they're working hard. They're motivated, they're well funded."

3. He thinks we may eventually see unmanned cargo jets

"In 20 years, who knows, large cargo aircraft could be flying and hauling cargo — especially over the oceans — those long, boring flights," Williams said. "There's already a couple of the air carrier type cargo haulers that want to look at reducing the crew required during a long-haul cargo flight to one."

4. He described his former job as enough work for three people.

Williams said he was pleased to have convinced the FAA's program management agency to take on one aspect of his former duties, managing radio spectrum and allocating it fairly for unmanned commercial flights. Williams described this as a big problem for the agency to solve.

"It really is a full-time job," Williams said. "I was the only one who was really working that for about three years. And it really is a big barrier for the industry."

The rest of Williams's former duties are being divided between two new positions, which will split up internal and external work.

"The job was worthy of three people doing it," Williams said. "Not that I could do three people's work."

5. He would've liked to get the proposed rules for commercial drone flight done sooner

When moderator Mark Dombroff asked Williams about his greatest disappointment with respect to drones, he cited the time it took to release the proposed rules for drones weighing under 55 pounds. These missed deadlines were a point of frustration for many in the drone community.

"When I took over I thought we'd get it out in a few months," Williams said. "But the bottom line was what I inherited wasn't very good. And so it needed a lot of work. And what you see is I think a much better product than what I inherited when I took over."

6. Having the White House's attention isn't fun

"Everybody who thinks having the White House interested in your program is a great thing, no," Williams said. "Just a lot of scrutiny from them and everything is questioned about how it is going to fit in the bigger scheme of things. It's very much a blessing and a curse to have that level of attention."

After all of the delays, the FAA surprised observers by releasing its proposed drone rules on the Sunday morning of President's Day weekend. On that same Sunday, the White House issued a presidential directive ordering federal agencies to publicly disclose where they fly drones in the United States and what they do with the data from aerial surveillance.

7. He's not a big fan of the proposed drone legislation from Sen. Cory Booker (D-N.J.) and John Hoeven (R-N.D.)

"Their heart was in the right place. They really were trying to do what they could to help the FAA," Williams said. "They missed the mark. The good news is they did come to the FAA and ask what we thought of it. And we told them. So hopefully the bill — if there is one passed — it'll be different than the one that was proposed."

Photo: Bill Carey

Source: Washington Post

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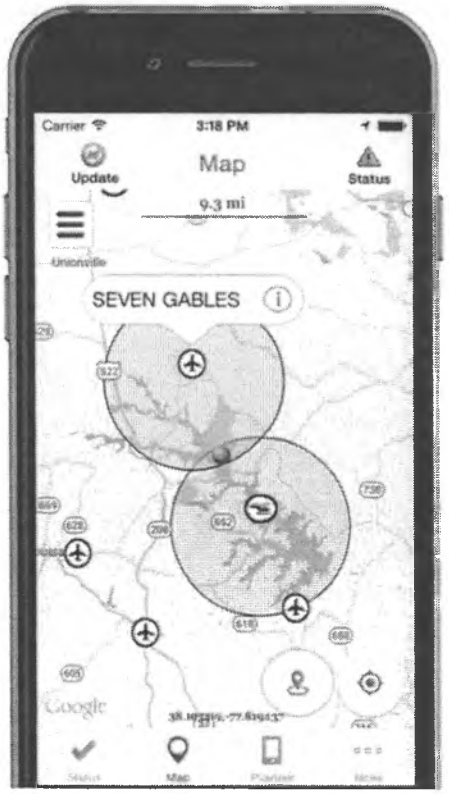
FAA Launches B4UFLY App for UAV Operators

The FAA has announced a smartphone application that aims to make it clear to Unmanned Aerial Vehicle (UAV) enthusiasts where it's legal to fly in the National Airspace System (NAS). The B4UFLY app, announced at the 2015 Association for Unmanned Vehicle Systems International (AUVSI) Conference in Atlanta, Ga. will allow hobbyists to determine whether there are any restrictions or requirements in effect at the location where they want to fly a UAV.

"It's a simple, easy-to-use app that answers a very basic safety question: is it safe and legal to fly my unmanned aircraft at a particular location?" FAA Administrator Michael Huerta explained to journalists during a press conference for the roll out of the new app. "Longtime members of the unmanned aircraft community may already know the answer to that question. Someone who got their first unmanned aircraft as a gift under the Christmas tree probably doesn't. That's a knowledge gap we need to fill."



That's a knowledge gap we need to fill. The United States has the most complicated airspace in the world. We need to make sure hobbyists and modelers know where it's okay to fly and where it isn't okay to fly - because there can be very real consequences if you don't. The incident on the White House lawn earlier this year is a good example.

We plan to make B4UFLY available to approximately 1,000 beta testers using Apple devices this summer, and we'll be working on an Android app in the future.

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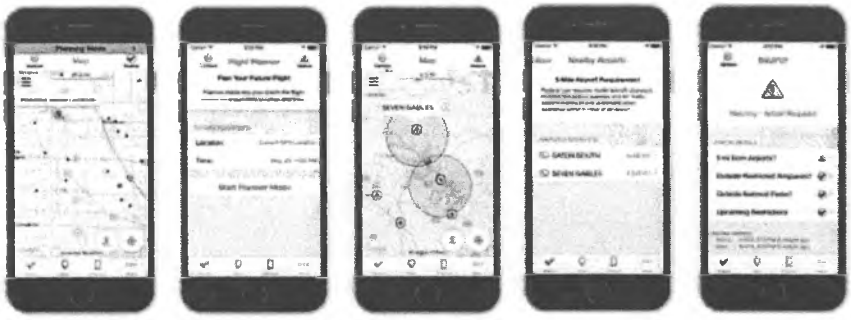
The B4UFLY app is the latest action the FAA has taken to encourage the responsible use of unmanned aircraft. In December, we partnered with the Academy of Model Aeronautics, the Small UAV Coalition, and our friends here at AUVSI to launch the "Know Before You Fly" campaign. This was an important first step in educating operators about the rules of the sky.

The B4UFLY app takes a lot of that information and puts it right in your pocket – available to use anytime, anywhere. It only takes a few taps to find out if you're cleared to fly. While other resources like this exist, we believe B4UFLY will have the most user-friendly interface with the most up-to-date information.

The agency is planning to release the app to an estimated 1,000 beta testers during the summer. Limited beta tests are expected to run for several months, after which the FAA will make the app available to the general public on Apple iOS devices, with an Android version to follow.

Key features of the B4UFLY app include:

- A clear "status" indicator that immediately informs operators about their current or planned location.
- Information on the parameters that drive the status indicator.
- A "Planner Mode" for future flights in different locations. Informative, interactive maps with filtering options.
- Contact information for nearby airports.
- Links to other FAA UAS resources and regulatory information.



click to enlarge

The app features interactive maps and a clear status indicator that immediately informs the operator about the area surrounding their current or planned flying location. For example, it would indicate that flying in Special Flight Rules Area around Washington, D.C. is prohibited and other similar restricted flight areas. It also provides information on such parameters that may restrict airspace, contact information for nearby airports and links to other FAA UAS resources and regulatory information to keep operators updated to the fullest extent.
Source: FAA

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Posted in Regulatory Matters on May 8, 2015 by The Editor. Leave a comment

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NOTICE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8900.292

National Policy

Effective Date:
4/8/15

Cancellation Date:
4/8/16

SUBJ: Aviation-Related Videos or Other Electronic Media on the Internet

1. Purpose of This Notice. This notice provides guidance to aviation safety inspectors (ASI) regarding actions to be taken when notified of videos or other electronic media posted to the Internet depicting the operation of aircraft in the National Airspace System (NAS) that may be contrary to Title 14 of the Code of Federal Regulations (14 CFR) or statute.

2. Audience. The primary audience for this notice is all Flight Standards District Office (FSDO) ASIs, regional Flight Standards divisions (RFSD), and International Field Offices (IFO)/International Field Units (IFU). The secondary audience includes Flight Standards (AFS) branches and divisions in the regions and in headquarters (HQ).

3. Where You Can Find This Notice. You can find this notice on the MyFAA employee Web site at https://employees.faa.gov/tools_resources/orders_notices. Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at http://fsims.avs.faa.gov. Operators can find this notice on the Federal Aviation Administration's (FAA) Web site at http://fsims.faa.gov. This notice is available to the public at http://www.faa.gov/regulations_policies/orders_notices.

4. Background. There are an escalating number of videos or other electronic media posted to the Internet which depict aviation-related activities. Some of these posted videos may depict operations that are contrary to 14 CFR, statute, or safe operating practices. ASIs and other AFS personnel are expected to use critical thinking when addressing electronic media showing such activity. The FAA will use education to encourage voluntary compliance with applicable statutory and regulatory requirements when appropriate. However, the FAA will use administrative action or legal enforcement action to gain compliance if such action is necessary to maintain safety within the NAS.

5. Unmanned Aircraft Systems (UAS). UAS videos, in particular, are increasingly appearing on the Internet. UAS videos may depict aircraft being flown in a variety of classes of airspace and at varying altitudes. Inspectors are to follow the protocol below when receiving notification of videos with potentially noncompliant UAS operations posted to the Internet. This notice provides an outline and protocol for inspectors when initiating educational outreach. When responding to a notification that requires contact with a UAS operator, follow the guidance contained in FAA Notice N 8900.268, Education, Compliance, and Enforcement of Unauthorized Unmanned Aircraft Systems Operators. If counseling in the form of an informational letter is

warranted, send the UAS Informational Letter Template for Inspectors (see Appendix A). The letter must not be altered other than to fill in the appropriate address of the operator and FSDO along with your contact information and signature. If the educational outreach is ineffective in gaining compliance, the UAS operator is noncompliant or uncooperative, or the UAS operation resulted in a medium to high potential or actual endangerment to the NAS, the inspector is to continue their investigation as outlined in N 8900.268.

6. **Manned Aircraft.** When receiving notification of videos or other electronic media with potentially noncompliant manned aircraft operations posted to the Internet, inspectors are to follow guidance provided in FAA Order 8900.1, Flight Standards Information Management System (FSIMS), Volume 14; and the current edition of FAA Order 2150.3, FAA Compliance and Enforcement Program.

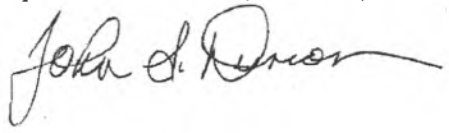
7. **Evidence.** In all cases, the FAA must have acceptable evidence in support of all alleged facts in order to take legal enforcement action. Inspectors are reminded that:

- Electronic media posted on the Internet is only one form of evidence which may be used to support an enforcement action and it must be authenticated;
- Electronic media posted on the Internet is ordinarily not sufficient evidence alone to determine that an operation is not in compliance with 14 CFR; however, electronic media may serve as evidence of possible violations and may be retained for future enforcement action; and
- Inspectors have no authority to direct or suggest that electronic media posted on the Internet must be removed.

  Note: Electronic media posted on a video Web site does not automatically constitute a commercial operation or commercial purpose, or other non-hobby or non-recreational use.

8. **Action.** Until further notice, the above procedures are in effect for gathering videos or other electronic media on the Internet as evidence and interpreting the status of a Web site that contains electronic media relevant to an investigation.

9. **Disposition.** We will incorporate the information in this notice into Order 8900.1 before this notice expires. Direct any questions concerning this notice to Ronald Forsyth, Commercial Operations Branch (AFS-820) at ronald.a.forsyth@faa.gov, (717) 774-8271 ext. 253.



John S. Duncan
Director, Flight Standards Service

Appendix A. UAS Informational Letter Template for Inspectors

U.S. Department
of Transportation
Federal Aviation
Administration

Flight Standards District Office
FSDO Address

Date

Name
Address

Dear :

The purpose of this letter is to provide you with information about the laws and regulations regarding Unmanned Aircraft System (UAS) operations conducted within the National Airspace System (NAS). The NAS is "the common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas . . . . Included are system components shared jointly with the military."[1] The Federal Aviation Administration's (FAA) safety mandate under Title 49 of the United States Code (49 U.S.C.) § 40103 requires it to regulate aircraft operations conducted in the NAS, which include UAS operations, to protect persons and property on the ground and to prevent collisions between aircraft and other aircraft or objects.

A UAS is an Aircraft

A UAS is an "aircraft" as defined in the FAA's authorizing statutes and is therefore subject to regulation by the FAA. Title 49 U.S.C. § 40102(a)(6) defines an "aircraft" as "any contrivance invented, used, or designed to navigate, or fly in, the air." The FAA's regulations (Title 14 of the Code of Federal Regulations (14 CFR) part 1, § 1.1) similarly define an "aircraft" as "a device that is used or intended to be used for flight in the air." Because an unmanned aircraft is a contrivance/device that is invented, used, and designed to fly in the air, it meets the definition of "aircraft." The FAA has promulgated regulations that apply to the operation of all aircraft, whether manned or unmanned, and irrespective of the altitude at which the aircraft is operating. For example, 14 CFR part 91, § 91.13 prohibits any person from operating an aircraft in a careless or reckless manner so as to endanger the life or property of another.

An important distinction for UAS operators to be aware of is whether the UAS is being operated for hobby or recreational purposes or for some other purpose. This distinction is important because there are specific requirements in the FAA Modernization and Reform Act of 2012,

[1] Refer to the FAA Pilot/Controller Glossary (Apr. 3, 2014), available at http://www.faa.gov/air_traffic/publications/media/pcg_4-03-14.pdf.

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Public Law (PL) 112-95 (the Act), that pertain to "Model Aircraft" operations, which are conducted solely for hobby or recreational purposes.

Model Aircraft Operations

Section 336(c) of the law defines "Model Aircraft" as ". . . an unmanned aircraft that is—

(1) capable of sustained flight in the atmosphere;
(2) flown within visual line of sight of the person operating the aircraft; and
(3) flown for hobby or recreational purposes."

Each element of this definition must be met for a UAS to be considered a Model Aircraft under the Act. Under Section 336(a) of the Act, the FAA is restricted from conducting further rulemaking specific to Model Aircraft as defined in section 336(c) so long as the Model Aircraft operations are conducted in accordance with the requirement of section 336(a). Section 336(a) requires that—

"(1) the aircraft is flown strictly for hobby or recreational use;
(2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;
(3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;
(4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and
(5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation (model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport))."

Section 336(b) of the law, however, makes clear that the FAA has the authority under its existing regulations to pursue legal enforcement action against persons operating Model Aircraft in accordance with section 336(a) and 336(c) when the operations endanger the safety of the NAS. Nothing in section 336 otherwise alters or restricts the FAA's statutory authority to pursue enforcement action against any UAS operator, even those whose operations are conducted in accordance with sections 336(a) and (c) that endanger the safety of the NAS. For example, a model aircraft operation conducted in accordance with section 336(a) and (c) may be subject to an enforcement action for violation of § 91.13 if the operation is conducted in a careless or reckless manner so as to endanger the life or property of another.

UAS Operations that are not Model Aircraft Operations

Operations of UASs that are not Model Aircraft operations as defined in section 336(c) of the law and conducted in accordance with section 336(a) of the law, may only be operated with specific authorization from the FAA. The FAA currently authorizes UAS operations that are not for hobby or recreational purposes through one of two avenues: 1) the issuance of Certificates of

Waiver or Authorization (COA); and 2) the issuance of special airworthiness certificates. The FAA also has a third avenue with which to potentially authorize UAS operations through its exemption process when it determines that such operations are in the public interest.

1. **COA.** In accordance with § 91.903, the FAA grants COAs to applicants waiving compliance with certain regulatory requirements listed in § 91.905. The applicants must be able to show that they are able to safely conduct operations in the NAS. The COA contains terms with which the applicant must comply in order to conduct operations. The FAA generally has restricted the issuance of these certificates to government entities that operate UASs as it implements the provisions in its Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap. The entire Roadmap is available on our Web site at: http://www.faa.gov/uas/media/UAS_Roadmap_2013.pdf. The FAA also issues COAs on an emergency basis when: 1) a situation exists in which there is distress or urgency and there is an extreme possibility of a loss of life; 2) the proponent has determined that manned flight operations cannot be conducted efficiently; and 3) the proposed UAS is operating under a current approved COA for a different purpose or location. The FAA is also using the COA process to expand the use of civil UASs in the arctic region as required under section 332 of the law.

2. **Airworthiness Certification.** For civil operators, you can apply for a special airworthiness certificate under 14 CFR part 21 (refer to the current edition of FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft). The full civil type certification process allows for production and commercial operation of UAS and is a lengthy process typically undertaken by aircraft manufacturers.

3. **Issuance of Exemptions.** In accordance with 14 CFR part 11, §§ 11.15 and 11.61–11.103 and the FAA's authority in 49 U.S.C. § 44701(f), the FAA may grant exemptions from regulatory requirements. The exemption process allows for the submission of a petition to the FAA outlining why the granting of an exemption would be in the public interest, the need for the exemption, and the reasons why granting the petition would not adversely affect safety or would provide a level of safety equal to the rules from which the exemption is sought. The FAA has indicated its willingness to review petitions for exemption by civil UAS operators that want to operate for other than hobby or recreational purposes. Under section 333 of the Act, operators in appropriate circumstances can be exempted from airworthiness certification and other related regulatory provisions.

Finally, UAS operators must understand that all UAS operations that are not operated as Model Aircraft under section 336 of the Act are subject to current and future FAA regulation. At a minimum, any such flights are currently required under the FAA's regulations to be operated with a certificated aircraft, with a certificated pilot, and with specific FAA authorization.

For All UAS Operators

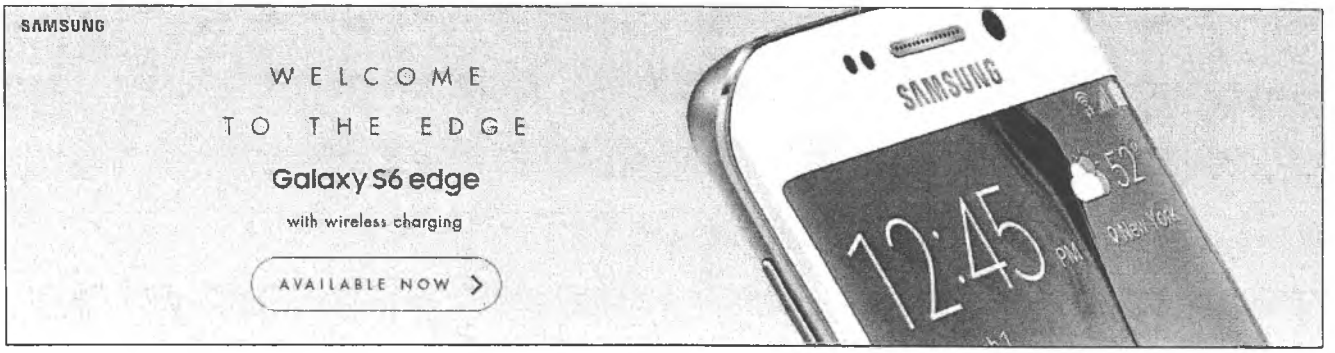
More information regarding UAS operations is available at the FAA UAS Integration Office's (AFS-80) Web site: http://www.faa.gov/uas/

If you require additional information please contact me at [contact information].

In conclusion, we hope the information provided to you in this letter will assist you in conducting safe UAS operations in compliance with the FAA's regulations.

Sincerely,

Aviation Safety Inspector—Operations



Gregory S. McNeal (http://www.forbes.com/sites/gregorymcneal/) Contributor
I'm an expert in law & policy focused on security, technology & crime
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SCIENCE & TECHNOLOGY (/SCIENCE-TECHNOLOGY) 4/10/2015 @ 7:28PM | 4,463 views

FAA Admits That They Shouldn't Be Ordering People To Delete Drone Videos

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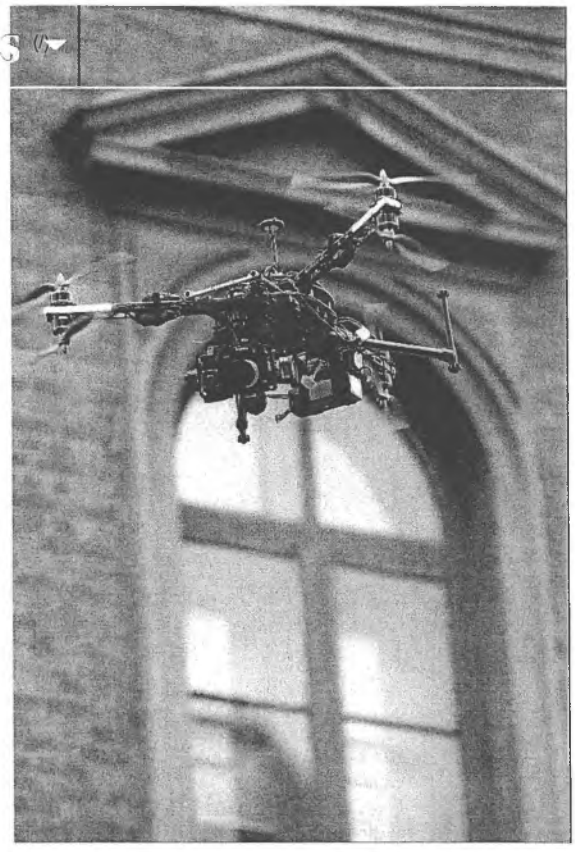
For more than a year, FAA officials have been engaged in a campaign of subtle threats and intimidation tactics that have persuaded many businesses to not use drone videos. This week, officials in Washington D.C. have finally weighed in on the legality of these tactics and in a published policy document

(https://www.faa.gov/documentLibrary/media/Notice/N_8900.292.pdf) have made clear that the intimidation tactics and take down orders must cease.

Previously, officials in various jurisdictions and across a range of use cases had been telling people that commercial use of drones was prohibited by FAA regulations, therefore, the use of drone videos was similarly prohibited by the FAA. On its face, the guidance amounted to intimidation tactics (undertaken mostly by FAA safety inspectors) and it was a clear violation of the First Amendment. Drone videos are not contraband, and the FAA has no authority to police what is posted to the internet, they only have the authority to enforce aviation regulations.

50



The FAA released updated guidance, informing their safety inspectors that they cannot order individuals to delete drone videos from the internet. (Photo by Christopher Furlong/Getty Images)

Nevertheless, the unsanctioned enforcement campaign succeeded in intimidating Coldwell Banker and other realtors (http://www.forbes.com/sites/gregorymcneal/2014/07/11/faa-intimidates-coldwell-banker-and-other-realtors-into-shunning-drone-photography/) to not use drone videos. The campaign raised questions about whether watching YouTube was a good use of safety inspector's time (https://www.facebook.com/GregorySMcNeal/posts/367542416769890) and as I noted back in January (https://www.facebook.com/GregorySMcNeal/posts/365779583612840), telling a publisher of a video to delete the video is akin to telling a bookstore or Amazon to stop selling a book with drone aerial images — it would be a clear First Amendment violation (see my comments (https://www.facebook.com/GregorySMcNeal/posts/365779583612840) to the FAA at CES on this point).

The new policy guidance (https://www.faa.gov/documentLibrary/media/Notice/N_8900.292.pdf) from the FAA, is directed primarily at Flight Standards District Office (FSDO) Aviation Safety Instructors (ASIs), regional Flight Standards divisions (RFSD), and International Field Offices (IFO)/International Field Units (IFU). The secondary audience includes Flight Standards (AFS) branches and divisions in the regions and in headquarters (HQ). The letter specifically states (emphasis added):

> **Inspectors have no authority to direct or suggest that electronic media posted on the Internet must be removed.** Note: Electronic media posted on a video Web site does not automatically constitute a commercial operation or commercial purpose, or other non-hobby or non-recreational use.

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Importantly, the FAA is telling their inspectors that they can't modify a form letter that is included in the Appendix to the policy guidance, thus minimizing the possibility of intentional or inadvertent threats being communicated by FAA officials.

What this means is that the FAA is likely to only pursue the operators of unmanned aircraft who fly for commercial purposes without authorization. This is good news for individuals like realtors, publishers, journalists, and others who might use commercially derived imagery. It was never lawful for the FAA to go after the end users who were not part of the non-approved operation, it's nice to see them acknowledging that fact.

Gregory S. McNeal is a professor at Pepperdine University. SIGN UP (http://asmcneal.us10.list-manage.com/subscribe?u=2097228f03d779af3abe4d6cb&id=82cab195b7) for his weekly email update here (http://eepurl.com/bi_hqn). You can also follow him on Twitter (http://twitter.com/gregorymcneal) or Facebook (https://www.facebook.com/GregorySMcNeal).

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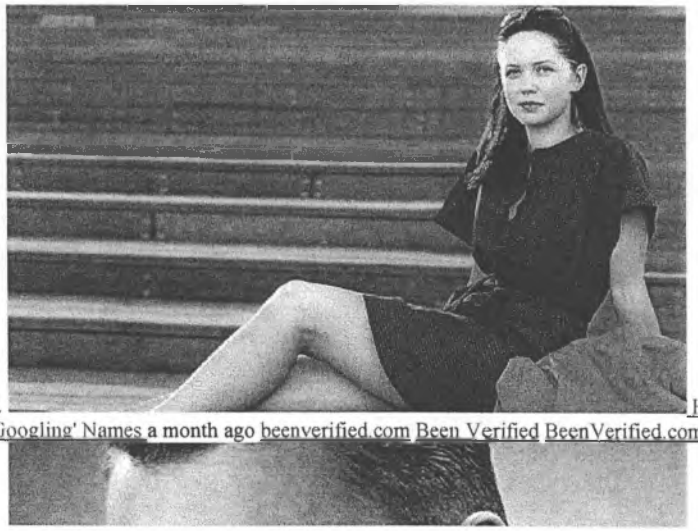

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JUSTICE NEWS

Department of Justice

Office of Public Affairs

FOR IMMEDIATE RELEASE

Friday, May 22, 2015

Department of Justice Establishes Policy Guidance on Domestic Use of Unmanned Aircraft Systems

The Department of Justice issued agency-wide policy guidance today on the use of Unmanned Aircraft Systems (UAS) that sets standards of use and management controls of UAS by the department and its components.

UAS are used at times by law enforcement agencies as cost-effective, efficient and potentially life-saving tools to support public safety efforts. The policy highlights protections of privacy, civil rights and liberties and makes clear that UAS use must be consistent with the protections afforded by the U.S. Constitution. Justice Department components are barred from using UAS solely for the purpose of monitoring activities protected by the First Amendment, and components can only operate UAS on properly authorized investigations and activities. The collection, retention and dissemination of information collected by UAS is also subject to Privacy Act protections.

To ensure accountability, the department will also require that personnel operating UAS are appropriately trained and supervised, including but not limited to a mandatory training on the department's policies. Annual privacy reviews will be conducted to ensure compliance with the department policy, existing laws and regulations and to identify potential privacy risks.

The guidance issued today is a result of various discussions and research – and meetings will continue to be held at least twice a year to ensure that the department strikes the appropriate balance between its law enforcement and national security missions and respect for civil rights and civil liberties.

Justice Department UAS Policy

15-665

Office of Public Affairs

Updated May 22, 2015

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Department of Justice Policy Guidance[1]

Domestic Use of Unmanned Aircraft Systems (UAS)

INTRODUCTION

The law enforcement agencies of the Department of Justice ("the Department") work diligently to protect the American people from national security threats, enforce our nation's laws, and ensure public safety. In doing so, these agencies use a wide variety of investigative methods. Some of these methods have been in use for decades; others are relatively new and rely on technological innovation. In all cases, investigations and other activities must be conducted consistent with the Constitution and the laws of the United States—and with our commitment to protecting privacy and civil liberties.

In recent years, Unmanned Aircraft Systems (UAS)[2] have emerged as a viable law enforcement tool. UAS have been used to support kidnapping investigations, search and rescue operations, drug interdictions, and fugitive investigations. While they are, in many ways, similar to the manned aircraft that have been in use for many years, they have the potential to provide law enforcement with additional flexibility and yield life-saving benefits. UAS also have the potential to be cost-effective in a time of shrinking government resources. For these reasons, UAS are likely to come into greater use.

As technology advances and enhances our ability to use these new tools, it is important to continue to assess how we use them. A Departmental working group[3] has studied the Department's use of UAS over the last several years and has considered how the technology is likely to evolve in the near future. This policy guidance flows from the working group's discussions and sets forth principles that will apply Department-wide. This policy also applies to

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[1] This policy guidance is intended only to improve the internal management of the Department of Justice. It is not intended to and does not create any right, benefit, trust, or responsibility, whether substantive or procedural, enforceable at law or equity by a party against the United States, its departments, agencies, instrumentalities, entities, officers, employees, or agents, or any person, nor does it create any right of review in an administrative, judicial or any other proceeding.

[2] "Unmanned Aircraft System" means an unmanned aircraft (an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft) and associated elements (including communication links and components that control the unmanned aircraft) that are required for the pilot or system operator in command to operate safely and efficiently in the National Airspace System. For purposes of this policy, reference to "UAS" includes all onboard sensor equipment.

[3] The Department's working group was led by the Office of Legal Policy and included the Department's Chief Privacy and Civil Liberties Officer and representatives of the Bureau of Alcohol, Tobacco, Firearms and Explosives, the Criminal Division, the Office of Community Oriented Policing, the Civil Rights Division, the Office of the Deputy Attorney General, the Drug Enforcement Administration, the Federal Bureau of Investigation, the National Security Division, the Executive Office for United States Attorneys, the Office of Justice Programs, the Office of Privacy and Civil Liberties, the United States Marshals Service, and the Office of the Chief Information Officer.

all instances in which Department components use UAS to support Federal agencies and/or State and Local law enforcement agencies.

This guidance will help ensure that the Department continues to carry out its law enforcement and national security missions while respecting individuals' privacy, civil rights, and civil liberties. It will also help ensure an appropriate level of accountability and transparency. This policy guidance does not replace, and is complementary to, the Federal Aviation Administration rules and regulations that control each and every UAS deployment and help ensure the safe operation of all aircraft, including UAS. This policy guidance is also consistent with the Presidential Memorandum, "Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems," issued by President Barack Obama on February 15, 2015.

RESPECT FOR CIVIL RIGHTS AND CIVIL LIBERTIES

Respect for civil rights and civil liberties is a core tenet of our democracy. In executing the Department's law enforcement and national security missions, personnel must rigorously support and defend the Constitution and continue to uphold the laws, regulations and policies that govern our activities and operations.

As with all investigative methods, UAS must be operated consistent with the U.S. Constitution. The Fourth Amendment protects individuals from unreasonable searches and seizures and generally requires law enforcement to seek a warrant in circumstances in which a person has a reasonable expectation of privacy. Moreover, Department personnel may never use UAS solely for the purpose of monitoring activities protected by the First Amendment or the lawful exercise of other rights secured by the Constitution and laws of the United States. Department personnel may never use UAS to engage in discrimination that runs counter to the Department's policies on race, ethnicity, gender, national origin, religion, sexual orientation, or gender identity. Department personnel must also be trained to understand and abide by all relevant federal legal standards applicable to the use of UAS, and to seek advice from legal counsel as necessary.

In addition, UAS may only be used in connection with properly authorized investigations and activities. Statutory authorities, the Attorney General's Guidelines, and other relevant agency policies and guidance define the scope of authorized investigations and activities and require regular supervisory review and approval. UAS must continue to be used within the context of these existing safeguards.

Further, even within the context of properly authorized activities, personnel often must choose among different investigative methods that are operationally sound, reasonable, and effective, but may be more or less intrusive relative to individuals' privacy and civil liberties. Prior to using UAS, Department personnel must assess the relative intrusiveness of the

proposed use of UAS, and balance it against the particular investigative need.[4] This is both a logical process and an exercise in judgment, but the overall principle remains: in deciding whether to use UAS, Department personnel must consider and, if reasonable based on the facts and circumstances of the investigation, use the least intrusive means to accomplish an operational need.

PROTECTION OF PRIVACY

The Department operates under a set of rules, policies, and laws that control the collection, retention, dissemination, and disposition of records that contain personally identifiable information. For example, the Privacy Act contains provisions on unauthorized use and disclosure of information about individuals, and imposes civil penalties on agencies and criminal penalties on agency personnel for violations of applicable requirements. As with personally identifiable information collected in the course of any investigation, these authorities apply to information collected via UAS. Consistent with applicable existing laws and requirements, the Department's use of UAS shall include the practices identified below.

As noted above, the Department shall only collect, use and disseminate information obtained from UAS for an authorized purpose. The Department shall not retain information collected using UAS that may contain personally identifiable information for more than 180 days unless retention of the information is determined to be necessary for an authorized purpose or is maintained in a system of records covered by the Privacy Act.

Data collected by UAS that is retained must be safeguarded in accordance with applicable Federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. These authorities ensure that Department personnel with access to such data follow practices that are consistent with the protection of privacy and civil liberties. Use of all Department information systems may be monitored, recorded, and subject to audit, and unauthorized collection, retention, or dissemination of data is prohibited. Further, the Department has procedures in place to review, investigate, and address privacy and civil liberties complaints.

Senior Component Officials for Privacy in agencies using UAS must conduct annual privacy reviews of their agency's use of UAS to ensure compliance with existing laws, regulations, and Department policy, and to identify potential privacy risks. They must also, where appropriate, make recommendations to ensure that UAS will continue to be used in a manner consistent with the U.S. Constitution and all applicable laws, regulations, and policies, including those protecting privacy and civil liberties.

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[4] In assessing the intrusiveness of UAS and the investigative need, personnel must consider factors such as whether the subject enjoys a reasonable expectation of privacy relative to the proposed use of UAS, the scope of the information sought, the scope of the proposed use of UAS, the risk of disclosure to the subject, the seriousness of the crime or national security threat, the strength and significance of the information to be obtained, the efficiency of the method and alternative means available, the amount of information already known about the subject, and the operational security needs of the investigation.

ACCOUNTABILITY

The Department promotes accountability by requiring its personnel to accept responsibility for the actions they undertake—and to evaluate the potential consequences of their decisions. The Department imposes codes of conduct to guide employees in the use of all investigative methods, including UAS. As with the use of any technology, there must continue to be mechanisms to hold the Department and its employees accountable.

Part of accountability is ensuring that Department personnel are appropriately trained and supervised. Department personnel whose responsibility it is to manage, supervise, maintain, fly, and/or otherwise use UAS must receive training on this policy and the underlying policies incorporated herein.

Moreover, approval authority for the use of UAS will be set at an appropriate and consistent level across the Department. At a minimum, each time UAS are deployed, approval must be granted (1) at the Assistant Special Agent in Charge-or-equivalent level at the relevant field office, and (2) by an executive level supervisor within the agency's aviation support unit or a designated executive level supervisor at the agency's headquarters. Additionally, since the Department may only operationally deploy UAS in connection with authorized investigations or activities, supervisors must ensure that the underlying investigations themselves have been authorized consistent with applicable guidelines and other Department policies.

Finally, federal records must be captured, managed, and retained in a manner consistent with the Federal Records Act and all other applicable authorities. As with federal records collected by other investigative tools, components are obligated to retain UAS-collected data in accordance with applicable records retention schedules.

ONGOING POLICY MANAGEMENT

As UAS technology evolves and improves, it is important that the Department continue to have adequate information about its use to ensure strategic alignment and proper evaluation of the Department's policy. To that end, this policy imposes certain new requirements.

Each component that uses UAS must designate a point of contact through which field offices will report the information outlined below to the component's headquarters and Department leadership on the use of UAS on an ongoing basis.

In addition, Department agencies that use UAS must report annually to the Deputy Attorney General on the use of UAS. The report should incorporate privacy reviews, as well as the number of UAS operational deployments (not including training or research and development flights) conducted during the reporting period and a brief description of types or categories of missions flown along with the number of each type of mission. Additionally, to the extent the agency sought assistance from, or provided assistance to, another federal, state, local, or tribal agency during the relevant time period, the number of these operational deployments and a brief

description of types or categories of missions flown along with the number of each type of mission should also be provided.

Components that have not previously disclosed any UAS operations as part of these annual reporting requirements, or that have discontinued UAS use for the duration of an annual reporting period, must notify the Deputy Attorney General prior to initiating or re-introducing UAS operations.

Department leadership will continue to engage in meaningful review of UAS as the technology advances. To facilitate this review, a standing committee comprised of a broad range of Department components will meet twice a year to evaluate any policy or regulatory changes that may be needed as a result of innovations or developments in UAS technology.

TRANSPARENCY

Rigorous adherence to the requirements set forth in this policy is not enough—to be successful in our law enforcement and national security missions, we must continue to facilitate relationships of trust with the communities we serve. Enhancing our transparency about agency operations, including how we operate UAS, creates an informed citizenry and greater confidence in the Department's decision-making.

Education of the public can enhance the Department's ability to fulfill its missions and serve the American people. As appropriate, while not revealing information that might compromise law enforcement or national security needs, the Department will update its website to reflect its current policy on UAS on an ongoing basis, and will provide a general summary of UAS operations conducted by the Department during the previous year, including a brief description of types or categories of missions flown and the number of times the Department provided assistance to other federal, state, local and tribal agencies or entities.

Alaska's Citizen Guidelines for Drone Privacy
Frequently Asked Questions

When is flying my drone a breach of privacy?

Alaskans are serious when it comes to personal privacy. How do you define privacy when it comes to drones? This question is being contemplated worldwide because with such new technology, new boundaries must be identified and defined. Safety is easier to tackle because a person can see the aircraft, operator and the effects of a flight. Privacy includes thoughts, sentiments and emotion.

Alaska's Constitution guarantees Alaskans the Right to Privacy. Article 1, Section 22 states, "The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section." The legislature has a long-standing history of protecting Alaskans' privacy by instituting statutes regarding stalking, harassment, indecent viewing, sending explicit images, and misusing confidential information. The Legislative Task Force continues to review these protections particularly as they relate to unmanned aircraft systems.

For the purpose of Alaska's Drone Privacy Guidelines this document will imply that the definition of privacy includes the more specific individual interest of not permitting others to pry into personal affairs with which they have no legitimate concern, and exposing them against an individual's will. This concept has been recognized as "the right to be let alone."

Private Citizen: Please recognize that individuals experience different levels of sensitivity to interruption to privacy. Was the drone flight intentionally directed at you or just passing through? Do you believe the operator of the drone was flying in an inappropriate way? Be as specific as possible so that you can report the incident to local law enforcement.

Drone Operator: Might you be perceived as interrupting someone's freedom? Would you complete the same action in person as you are doing with your drone? Be courteous and respectful to others.

I have a "reasonable expectation of privacy."

Yes, all Alaskans have a reasonable expectation of privacy to live without fear of unwarranted personal invasion. With equal importance, Alaskans enjoy the right to be left alone.

The definition for **Reasonable Expectation of Privacy** directly relates to law enforcement requirements to obtain a warrant before actions of search and seizure.

United States Constitution provides:

First Amendment guarantees the right to peaceably assemble including the liberty for any group to associate in private.

Fourth Amendment forbids the government from performing warrantless and unreasonable searches of any area in which a person maintains a reasonable expectation of privacy.

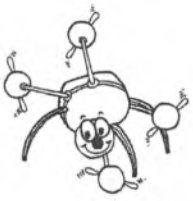
More sections of the Constitution support other areas of personal privacy.

Who owns the airspace above my house?

Private Citizen: The FAA governs the airspace from the ground up without limitations regarding private, public, government or other categories of property owners. While we enjoy the sense of privacy in our backyards for the most part, we do not control what happens in the air above our heads.

Drone Operator: Fly with respect. Don't fly your drone where people typically expect privacy. Don't use your drone to harass people. In public areas, don't invade people's personal space and their solitude.

I'm sunbathing on my deck and my son is flying his drone ...



The FAA governs the airspace from the ground up. Help your son understand courteous flying so he doesn't disturb the neighbors or fly somewhere he shouldn't.

Know Before You Fly provides recreational flying rules for hobby pilots. www.alaskadrones.org

Someone is flying their drone and interrupting my restful afternoon at the beach. They won't stop even when I "shoo" it away...

Try to identify from where the operator is controlling the drone. Provide as much information as possible to local law enforcement. This might be a situation of harassment. AS 11.16.120(a)(6)

Can I shoot it down if it's flying over my house?

Private Citizen: While news articles have referenced drones as "skeet," this presumption is not appropriate in Alaska. As a practical matter, the value associated with a recreational drone could be $25 to more than $1,000. As commercial use is rapidly becoming allowed by the FAA, that small drone you see could carry specialized equipment and cost more than $100,000. Both the hobby drone and the commercial drone may look very similar as you view it from the ground.

Drone Operator: Before you fly over private property, obtain the owner's permission and explain the purpose for your flight path. Generally, you should always fly away from populated areas.

Looks like a moving target to me!
Remember that drone is someone else's personal property.

It's best to know;

"Why is a drone flying over your property?"

" Is it engaged in a violation of law?"

"Who and where is the drone operator?"

If you shoot it down or damage it:
(Legislative Legal)
Destruction of property

Discharging a weapon in a restricted area

Cannot take the law into your own hands

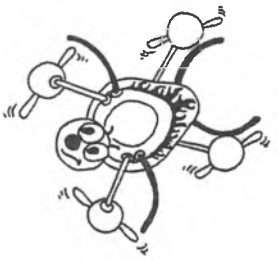
What can I do if the drone's "buzzing" annoys me? Noise Ordinance

Private Citizen: Many annoying noises are allowable in both public and private areas. The decibel limit separating acceptable noise level is generally compared to the noise from a standard lawn mower or small engine.

Drone Operator: The drone's "buzzing" may not be the only problem. The proximity of the aircraft to another person may be the primary issue of concern. Be courteous to others and stay away unless invited.

That buzzing sound is as irritating as a mosquito!

(Legislative Legal)
A drone typically makes less noise than a standard lawn mower.



I can't swat it away like a mosquito but I can call local authorities if it is a persistent pest.

If the drone is flown during locally recognized waking hours, a drone is probably not in violation of a noise ordinance.

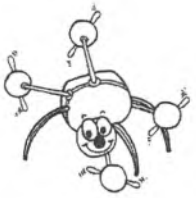
Because drones are relatively quiet, any noise you hear might instead be an alert to the bystander that the drone operator is flying too close to people and should be reported to the FAA for unsafe operations. This might be a situation of harassment. AS 11.16.120(a)(6)

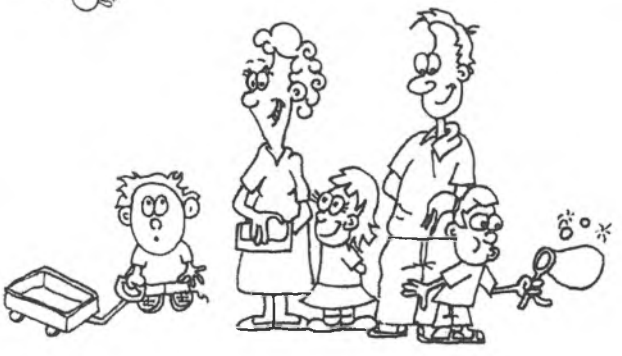
What do I do if a drone is photographing through my window or hovering around my house?

Private Citizen: A drone can be treated in the same way as another camera. If an individual is flying a drone in such a way that you feel violated, the local law enforcement can investigate for breach of privacy laws.

Drone Operator: Enjoy your drone with your family and friends who welcome its presence.

Welcomed Drone:
The family drone hovering and taking a portrait when grandma came to visit.





Unwelcomed Drone:
You weren't dreaming. And the buzzing sound was not your alarm clock. The drone was spying through the bedroom window. Who knows where the pilot is and how those pictures might be used.

The drone operator may be violating one or more of the following laws:

AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means
AS 11.61.120(a)(6) Harassment, publishing or distributing certain images
AS 11.61.123 indecent viewing or photography

The neighbor is chasing my dog with his drone!

Private Citizen: Know your animal control laws.

Drone Operator: Harassing an animal may come with criminal penalties.

Although the pet's owner may have introduced the dog to a flying toy, the noise and unfamiliarity of the neighbor's drone buzzing around could frighten Fido and could be considered harassment.

If the dog swats the drone out of the sky and chews it up, would it be considered damaging another's personal property or self defense by the dog?

Would this be governed by local ordinance or statute?

How will the photos/video be stored or used?

Private Citizen: Many recreational drone operators have posted video and pictures on social media sites. This is a great way to share interesting photography.

Drone Operator: If you are photographing something with your drone, in a place where you would not be welcomed if you were taking pictures in person, you shouldn't be there.

A drone is used to record your PIN over your shoulder while you are at the ATM.

A drone records images through your office window of a newly signed contract.

A drone peers through the window while your child is napping.

There are many examples of inappropriate use of photography or capturing information using technological devices that Alaskans are concerned about. If you believe someone has obtained unapproved images, contact local law enforcement.

Does the drone operator record the images for inappropriate purposes?

Was personal identification stolen?
AS 45 Personal Information Protection Act

Are images being posted in an inappropriate way?
AS 11.61.116 Sending an explicit image of a minor
AS 11.61.120(a)(6) Harassment: publishing or distributing certain images
AS 11.61.123 Indecent viewing or photography

Are the images being used for personal gain?
AS 11.76.113 and AS 11.76.115 Misconduct involving confidential information in the first and second degree

Can I use a drone for my business?

Private Citizen: I see lots of images on commercial web sites and social media where drones are used for business purposes. Can I use mine for business?

Drone Operator: Be aware that commercial use of unmanned aircraft systems has not been generally approved by the FAA. The time will come when all safety concerns have been well vetted and business use will become more commonplace. But remember, at this time, if you make money by using your drone, obtain authorization from the FAA.

Today, **the FAA prohibits commercial use of unmanned aircraft systems** unless the business has been granted a waiver to use the aircraft for specific purposes in the business. Businesses are beginning to receive authorization to use unmanned aircraft systems for commercial use. Thus far, the most common authorizations have been awarded for specific movie production and specific agriculture tasks.	Recreational aircraft continues to advance technologically and many people are waiting for the opportunity to use drones as part of business.

I understand the safety concerns for not flying a drone in traffic but what about privacy?

Private Citizen: Drones flying over moving traffic is dangerous but I also don't want GPS tracking and photographing me while driving.

Drone Operator: Flying over roads can cause distraction and potential automobile accidents on a road system. Electronic parenting is not yet allowed; you cannot follow your teenage driver with a drone without consent.

	A drone flying into traffic could distract drivers and create unsafe driving conditions; physical contact with an automobile could cause damage, and the distraction could distract a driver thus creating unsafe driving conditions. It is unlawful to use a GPS device to surveille an automobile without the driver's consent. AS ...

What privacy concerns can there be when you're in a crowd?

Private Citizen: Typically if you're in a crowd, privacy is limited. Although the safety concerns are paramount when a drone is flying above a crowd, the photography could identify something that a citizen would not want shared; like your secret fishing hole.

Drone Operator: Never fly above a crowd. As a drone operator, you know how easy the slightest wind change can cause your aircraft to change direction quickly or drop out of the sky. Although most recreational aircraft are very light weight, when it drops with propellers spinning, injury could occur.

Even a happy drone flying above a crowd can create quite a stir.

Safety: If the drone were to fall out of the sky it could injure a bystander. The drone could also inhibit the safety of the crowd by interfering with the activity, distracting people rendering them unaware of happenings nearby, and it could have a run-in with a pesky seagull.

Privacy: During the popular Kenai River fishing season, this drone inadvertently photographed Clyde's map to grandpa's secret fishing hole. Because the map was visible in a public area, the photo of the map can be shared with others. Clyde's secret fishing hole is no longer secret.

Sometimes photographing a crowd could result in the capture of **inadvertent images**. If the drone image shows Captain Blowhole with a catch beyond his limit, that image could be provided to the authorities for legal review.

What happens if a drone captures inadvertent images?

Private Citizen: What happens if a drone captures inadvertent images and those images are posted on social media or reveal something questionable? Photographing in a public area could result in capturing an image that may not have been planned. The image could be of a person not wanting to be photographed but would not be a breach of privacy since it occurred in a public place.

Drone Operator: Be aware of and be sensitive to what you are photographing. Are you capturing proprietary information; is the map to the secret fishing hole copyrighted? If you capture an image of someone appearing to break the law, you may want to surrender images to local authorities. Know your crowd. Some people may not want to be photographed and their sensitivity level to privacy could result in an angry situation.

LEGAL SERVICES

DIVISION OF LEGAL AND RESEARCH SERVICES
LEGISLATIVE AFFAIRS AGENCY
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MEMORANDUM June 8, 2015

SUBJECT: Unmanned Aircraft Systems (Work Order No. 29-LS0823)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Hilary V. Martin
Legislative Counsel

You have asked a number of questions related to unmanned aircraft systems (UAS) and privacy issues. Please be aware that any situation with a UAS will depend heavily on the specific circumstances of the particular situation. I have answered the questions you asked with the general statutes that might apply. If you have questions about a specific fact scenario, please let me know.

Can a person issue a no trespass or restraining order against the pilot of a UAS so the aircraft cannot be flown over private property?

There are a number of options a person can take regarding a UAS flying over the person's property.

If the activities of the UAS operator amount to stalking under AS 11.41.260 or 11.41.270[1], a person could obtain a protective order under AS 18.65.850 or AS 18.66.100. Using a UAS to follow, record, take pictures of, or otherwise harass someone with a protective order against the operator of a UAS would likely violate the terms of the protective order.

There are some situations where a person operating a UAS could be committing harassment[2] in the second degree under AS 11.61.120(a), which states:

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[1] Under AS 11.41.270, a person commits the crime of second degree stalking when a person knowingly engages in repeated acts of nonconsensual contact that recklessly places another person in fear of death or physical injury. Nonconsensual contact includes "following or monitoring . . . with a global positioning device or similar technological means."

[2] AS 11.61.118, harassment in the first degree, prohibits specific types of offensive conduct that would not apply to a situation involving a UAS.

> (a) A person commits the crime of harassment in the second degree if, with intent to harass or annoy another person, that person
>
> (1) insults, taunts, or challenges another person in a manner likely to provoke an immediate violent response;
>
> (2) telephones another and fails to terminate the connection with intent to impair the ability of that person to place or receive telephone calls;
>
> (3) makes repeated telephone calls at extremely inconvenient hours;
>
> (4) makes an anonymous or obscene telephone call, an obscene electronic communication, or a telephone call or electronic communication that threatens physical injury or sexual contact;
>
> (5) subjects another person to offensive physical contact;
>
> (6) except as provided in AS 11.61.116, publishes or distributes electronic or printed photographs, pictures, or films that show the genitals, anus, or female breast of the other person or show that person engaged in a sexual act; or
>
> (7) repeatedly sends or publishes an electronic communication that insults, taunts, challenges, or intimidates a person under 18 years of age in a manner that places the person in reasonable fear of physical injury.

Under AS 09.45.230(a), a person could bring a civil action against a UAS operator to enjoin or abate a private nuisance. A "nuisance" is defined as "a substantial and unreasonable interference with the use or enjoyment of real property, including water."[3] If the person bringing the nuisance action prevails, a court will issue an order to abate the nuisance.[4] The person bringing the actions may also be entitled to damages.[5]

Is there a noise ordinance that pertains to UAS operation or is there a harassment law that might protect a person from the UAS operator?

There is no state statute that specifically regulates noise level. However, AS 11.61.110, relating to disorderly conduct, prohibits activity that involves "unreasonably loud noise." AS 11.61.110(a)(1) and (a)(2) state:

> (a) A person commits the crime of disorderly conduct if,
>
> (1) with intent to disturb the peace and privacy of another not physically on the same premises or with reckless disregard that the conduct is having that effect after being informed that it is having that

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[3] AS 09.45.255.

[4] AS 09.45.240.

[5] AS 09.45.255.

> effect, the person makes unreasonably loud noise;
>
> (2) in a public place or in a private place of another without consent, and with intent to disturb the peace and privacy of another or with reckless disregard that the conduct is having that effect after being informed that it is having that effect, the person makes unreasonably loud noise . . . .

"Unreasonably loud noise" is defined in AS 11.61.110(b):

> As used in this section, "noise" is "unreasonably loud" if, considering the nature and purpose of the defendant's conduct and the circumstances known to the defendant, including the nature of the location and the time of day or night, the conduct involves a gross deviation from the standard of conduct that a reasonable person would follow in the same situation. "Noise" does not include speech that is constitutionally protected.

It is unclear if a UAS would be loud enough to be considered "unreasonably loud" under this statute.[6]

If the use of a UAS places a person in fear of death or physical injury, the operation of a UAS could potentially be considered stalking.[7] As mentioned above, using a UAS to follow, take pictures of, or otherwise harass a person could be prohibited by a protective order.

Should there be restrictions on UAS use to above fifty feet or the tallest roof line over private property without permission from the property owner?

You asked if the task force should consider a flight restriction to prohibit a UAS from flying below fifty feet or the tallest roof line over private property without permission from the property owner. While the state can pass laws related to UAS and restrictions on their flights, the law could be subject to a challenge on federal preemption grounds.

Under the Supremacy Clause of the U.S. Constitution, federal law may preclude a state from legislating in an area in four ways: (1) Congress may expressly state that state law is preempted; (2) the scheme of federal regulation may be sufficiently comprehensive so that there is a reasonable inference that federal law left no room for state law in that area; (3) if state law actually conflicts with federal law; or (4) state law may "stand[ ] as an

---

[6] Note that a number of municipalities regulate noise levels. *See, e.g.,* Juneau Ordinance 42.20.095, which prohibits disturbing the peace. The ordinance broadly prohibits a person from making an "unreasonable noise."

[7] AS 11.41.260 - 11.41.270.

obstacle to the accomplishment and execution of the full purposes and objectives of Congress."[8]

In the FAA Modernization and Reform Act of 2012,[9] the FAA was directed to write regulations to integrate the use of civil UAS into the national airspace. Section 336 of the law also set limits for recreational or hobby use of UAS. These limits include requirements that the UAS weigh less than 55 pounds, that the UAS be in the visual line-of-sight of the operator at all times, and that a UAS not fly within 5 miles of an airport.[10]

It is possible that this comprehensive scheme created by the FAA will preempt any state regulation in the area of UAS. However, this is a rapidly evolving area of the law, and there is very little federal law or regulation on the recreational or hobby use of UAS. Therefore, it is possible that the state could place limits on the recreational or hobby use of UAS, so long as the state law does not conflict with federal law or regulation.

The United States has ruled that a property owner owns only that much airspace above the ground as the owner can occupy or use in connection with the land.[11] Therefore, it is possible that if a UAS is flying at a level that does not interfere with the property owner's use of the land, then the UAS flight would be permissible. This holding, however, does not necessarily place any limits on the ability of the state to set a limit on how low a UAS can fly over private property.

As this is a constantly changing area of law, it is difficult to predict with any degree of certainty whether any state regulation would be preempted by federal law.

What happens if someone shoots down a UAS? What if a UAS crashes into a backyard and the property owner does not want to return the UAS?

Shooting a firearm at a UAS or shooting down a UAS would likely be a crime. There are a number of state laws that are implicated if a person shoots down a UAS, depending on the specific circumstances. If, for example, other people are nearby or in the trajectory of the firearm, the activity could potentially be reckless endangerment or assault.[12]

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[8] *Hillsborough County, Fla. v. Automated Medical Laboratories, Inc.*, 471 U.S. 707, 713 (1985).

[9] Public Law 112-95.

[10] You may wish to review the information the FAA has provided regarding UAS on their website: www.faa.gov/uas.

[11] *United States v. Causby*, 328 U.S. 256, 265 (1946).

[12] AS 11.41.200 - 11.41.230 (assault statutes), and AS 11.41.250 (reckless endangerment).

Additionally, shooting down a UAS could be criminal mischief in the third, fourth, or fifth degree, depending on the amount and dollar value of damage to the UAS.[13] State and municipal law prohibit discharging a firearm in certain places that would prevent a person from attempting to shoot down a UAS.[14]

Depending on the particular circumstances, a person who shoots at or shoots down a UAS could potentially claim self-defense or defense of property and premises. Under AS 11.81.350(a):

> A person may use nondeadly force upon another when and to the extent the person reasonably believes it is necessary to terminate what the person reasonably believes to be the commission or attempted commission by the other of an unlawful taking or damaging of property or services.

A person could potentially also argue self-defense,[15] although again this would be highly fact dependent.

A person is not entitled to keep a UAS that is not theirs, even if the UAS crashes into their backyard. Refusing to return the UAS could be theft[16] or theft of lost or mislaid property.[17]

Any situation involving a UAS that is shot down or crashes into private property will be heavily fact dependent, so it is difficult to determine the consequences of such actions. However, it is very unlikely that a person could keep a UAS that crashed onto the person's property.

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[13] AS 11.46.482 - 11.46.486.

[14] *See* AS 11.61.190 - 11.61.220 (misconduct involving weapons).

[15] AS 11.81.330(a) states in relevant part: "A person is justified in using nondeadly force upon another when and to the extent the person reasonably believes it is necessary for self-defense against what the person reasonably believes to be the use of unlawful force by the other person . . . . "

[16] AS 11.46.100.

[17] Under AS 11.46.160 a person commits theft of lost or mislaid property if the person obtains "property of another knowing that the property was lost, mislaid, or delivered under a mistake as to the nature or amount of the property or the identity of the recipient and the person fails to take reasonable measures to restore the property to the owner with intent to deprive the owner of the property."

Is there a reasonable expectation of privacy that could relate to a private person operating a UAS that invades another person's privacy?

The Constitution of the State of Alaska contains an express right to privacy.[18] However, the Alaska Supreme Court has so far refused to extend this right to apply against private actors.[19] In the same case, however, the Court found that the privacy clause in the Alaska Constitution does evidence a public policy supporting privacy,[20] and that there is a common law right to privacy.[21]

The Court recognized the tort of "intrusion upon seclusion" from the Restatement (Second) of Torts § 652B, which states:

> One who intentionally intrudes, physically or otherwise, upon the solitude or seclusion of another or his private affairs or concerns, is subject to liability to the other for invasion of his privacy, if the intrusion would be highly offensive to a reasonable person.[22]

Therefore, even though the right to privacy in the Constitution of the State of Alaska would likely not apply against a private UAS operator, a person could bring a civil suit against a UAS operator for the common law tort of intrusion upon seclusion.

Notes on "Alaska Privacy Guidelines for Drones"

You had asked for some feedback on the "Alaska Privacy Guidelines for Drones" that you sent. Many of the pictures and headings are blank with no commentary or

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[18] Art. I, sec. 22, Constitution of the State of Alaska, which states in relevant part: "The right of the people to privacy is recognized and shall not be infringed."

[19] *Luedtke v. Nabors Alaska Drilling, Inc.*, 768 P.2d 1123, 1130 (Alaska 1989). The Court did leave open the possibility that the right could be extended against private actors:

> The parties in the case at bar have failed to produce evidence that Alaska's constitutional right to privacy was intended to operate as a bar to private action. . . . Absent a history demonstrating that the amendment was intended to proscribe private action, or a proscription of private action in the language of the amendment itself, we decline to extend the constitutional right to privacy to the actions of private parties.

[20] *Id.* at 1132 - 1133.

[21] *Id.* at 1133.

[22] *Id. quoting* The Restatement (Second) of Torts § 652B.

information. I have not addressed any of these "blank" pictures or headings. If you have a specific question about something to be covered by the handout, please let me know.

The first picture refers to AS 11.16.120(a)(6). This is an incorrect citation. If you are referring to the harassment statutes, the correct citation is AS 11.61.120. Additionally, AS 11.61.120(a)(6) only prohibits publishing or distributing "electronic or printed photographs, pictures, or films that show the genitals, anus, or female breast of the other person or show that person engaged in a sexual act." This is not a situation that would apply to every instance of a UAS flying over someone's private property.

If I may be of further assistance, please advise.

HVM:dla
15-388.dla

LEGISLATIVE RESEARCH SERVICES

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Research Brief

TO: Representative Shelley Hughes
FROM: Chuck Burnham, Legislative Analyst
DATE: April 6, 2015
RE: Legal Decisions on Drones and Privacy
LRS Report 15.367

You asked whether any courts have decided cases regarding citizens' expectation of privacy with regard to the use of unmanned aircraft systems.

As you know, unmanned aircraft systems (UAS), also variously referred to as unmanned aerial vehicles (UAV) and "drones," have no onboard pilot and are operated remotely. Drones range from palm-size devices with a range of only a few dozen yards that must be flown within sight of the operator, to vehicles with wingspans as great as a Boeing 737 that can fly hundreds of miles at great speeds and at altitudes of greater than 60,000 feet while using sophisticated satellite navigation, video, and detection systems monitored by operators on the other side of the globe. The possible applications of UAS include military and covert missions, law enforcement, search and rescue, weather and other scientific research, border surveillance, and others. The Federal Aviation Administration (FAA) expects the use of drones, particularly by law enforcement agencies, to expand rapidly in coming years as the devices become more readily available and their costs decrease.[1] The specter of the proliferation of drones for domestic surveillance has raised concern for advocates of privacy and civil liberties.

We located no court case that is precedential with regard specifically to the interaction between UAS and privacy rights. The American Civil Liberties Union (ACLU) is among the organizations advocating for stricter regulation of drones to ensure citizens' privacy rights are not infringed upon by the extraordinarily powerful surveillance systems on board certain UAS. In a 2011 report on the topic, the ACLU reviewed U.S. Supreme Court decisions on the use of *manned* aircraft and other methods of surveillance, and the variations from those decisions the Court may make in future cases involving UAS, as follows:

> In the 1986 decision *California v. Ciraolo* [476 U.S. 207 (1986)], the Supreme Court focused on whether an individual has a privacy interest in being free from aerial surveillance of his backyard. The police had received a tip that Dante *Ciraolo* was growing marijuana in his backyard, but high fences prevented them from viewing his backyard from the street. The police borrowed a plane, flew it over the backyard and easily spotted marijuana plants growing there. *Ciraolo* argued that his Fourth Amendment rights were violated because the government did not get a warrant. The Court rejected this argument, explaining that there was no intrusion into his privacy because "[a]ny member of the public flying in this airspace who glanced down could have seen everything that these officers observed."
>
> In *Dow Chemical Co. v. United States* [476 U.S. 227 (1986)], also decided in 1986, the Supreme Court addressed whether the Environmental Protection Agency violated Dow's Fourth Amendment rights when it employed a commercial aerial photographer to use a precision aerial mapping camera to take photographs of a chemical plant. The Court found no violation, in part because the camera the EPA used was a "conventional, albeit precise, commercial camera commonly used in mapmaking," and "the photographs here are not so revealing of intimate details as to raise constitutional concerns." However, the Court suggested that the use of more sophisticated, intrusive surveillance might justify a different result. It wrote, "surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant."

[1] The FAA maintains a website on its activities regarding UAS at *http://www.faa.gov/about/initiatives/uas/*.

In *Florida v. Riley* [488 U.S. 445 (1989)], decided in 1989, the police had received a tip that Michael Riley was growing marijuana in a greenhouse on the property surrounding his home. The interior of the greenhouse was not visible from the ground outside the property, and the greenhouse had a ceiling, though two panels in the ceiling were missing. A police officer flew over the greenhouse and spotted marijuana through the openings in the roof. While no reasoning commanded a majority of the Court, four justices concluded that its decision in *Ciraolo* applied because Riley had left part of the greenhouse open to public view, and so the search was constitutional

Because of their potential for pervasive use in ordinary law enforcement operations and capacity for revealing far more than the naked eye, drones pose a more serious threat to privacy than do manned flights. There are good reasons to believe that they may implicate Fourth Amendment rights in ways that manned flights do not.

Government use of UAVs equipped with technology that dramatically improves on human vision or captures something humans cannot see (such thermal or x-ray images) should be scrutinized especially closely by the courts. This follows from the Supreme Court's statement in Dow Chemical that using sophisticated technology not generally available to the public may be considered a search under the Fourth Amendment. It is also suggested by the 2001 case *Kyllo v. United States* [533 U.S. 27 (2001)], in which the court rejected the use of thermal imaging devices to peer into a suspect's home without a warrant.

Further, the Supreme Court has suggested that the pervasive or continuous use of a surveillance technology may heighten Fourth Amendment concerns. In *United States v. Knotts* [460 U.S. 276, 283-84 (1983)], the Supreme Court addressed whether attaching primitive "beeper" tracking technology to a car violated the driver's Fourth Amendment rights. Although it concluded that the use of the beeper in that case did not violate the Fourth Amendment, it held that if "such dragnet type law enforcement practices" as "twenty-four hour surveillance of any citizen of this country" ever arose, it would determine if different constitutional principles would be applicable. Citing to this language in *Knotts*, the federal appeals court in Washington D.C. recently ruled that attaching a GPS device to a person's car and tracking his movements for 28 days fell into this category of dragnet-type surveillance and held that the government's warrantless tracking violated the Fourth Amendment [*United States v. Maynard*, 615 F.3d 544, 556 (2010)].[2]

The 2012 case *United States v. Jones* (132 S. Ct. 945, 949) addressed whether police can use a global position system (GPS) device to track the movement of a suspect without a warrant. The U.S. Supreme Court found the tactic to be an unlawful search and seizure. In separate concurring opinions, Justices Alito and Sotomayor indicated that the persistent surveillance enabled by rapid advances in technology may be constitutionally problematic. In a concurrence joined by three of his colleagues, Justice Alito wrote "in circumstances involving dramatic technological change, the best solution to privacy concerns may be legislative" (*Jones* at 964). As you know, numerous states have enacted or are considering legislation on drones, and several bills to increase federal oversight of UAS have been introduced in Congress in recent years.[3]

The cases discussed above deal with government use of drones. In circumstances involving the use of UAS by private businesses or individuals, FAA regulations on airspace may be implicated in addition to state and local laws on trespassing, stalking, harassment and other property and privacy issues, depending on the specific facts of the case in question. If you have question about the legality of the use of drones by private entities under specific scenarios, we recommend that you consult with Legislative Legal Services.

We hope this is helpful. If you have questions or need additional information, please let us know.

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[2] Jay Stanley and Catherine Crump, "Protecting Privacy from Aerial Surveillance: Recommendations for Government Use of Drone Aircraft," American Civil Liberties Union, December 2011, pp. 13-15, ***https://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf***.

[3] The Electronic Privacy Information Center advocates for, among other concerns, strict regulation of UAS. The Center tracks state and federal legislation on the issue on its website at ***https://epic.org/privacy/drones/#topnews***.

ALASKA UAS INTEREST GROUP

Alaska Unmanned Aircraft Systems Interest Group Annual Meeting

September 1-3, 2015, Fairbanks, Alaska

As the lead for the University of Alaska, Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) and the Pan-Pacific UAS Test Range Complex, I cordially invite you to attend the 2015 Alaska Unmanned Aircraft Systems Interest Group annual three-day workshop and meeting from September 1–3, 2015. We are excited to host this year's event in Fairbanks where ACUASI and arctic research are located within the University of Alaska Fairbanks Geophysical Institute.

The meeting is open to interested government, industry, and private participants in all fields of unmanned systems and robotics, as well as potential users from a variety of agencies, associations, institutions, and commercial interests who might benefit from the use of these new and emerging technologies.

Themes will include:

- UAS operations in the Arctic; lessons learned, challenges, and opportunities
- The role of UAS in emergency response, interagency communications, and the path forward
- UAS Test Sites; what they mean to the UAS community, and how to work with them
- UAS outside the U.S.; what is happening in Canada and Europe, and what that means to us
- A requirements-driven future and economical and efficient use of UAS technology
- Understanding government, industry, and private unmanned systems and robotics needs and issues
- Exploration and identification of ways we can work together to safely achieve common goals
- The impact on civil and commercial manned and unmanned aircraft activity in Alaska
- The role of unmanned systems and robotics in education, research, science, natural resource management, natural disasters, emergency response, search and rescue and much more
- Working with educational institutions in transforming and shaping the minds of young people through the National Science Foundation's science, technology, engineering and mathematics (STEM) goals

In addition several special meetings will be occurring that you may want to attend:

- The U.S. Department of the Interior will be demonstrating the benefits of UAS for geophysical measurements and natural resource monitoring in Alaska and the Arctic with a full day of presentations on August 31st.
- The Alaska Legislative Task Force on Unmanned Aircraft Systems will convene on the final day of the UAS Interest Group meeting.

We expect the 2015 AUASIG meeting to be a fulfilling and informative event and hope that you will attend. We'll notify you when registration is available at http://www.uasalaska.org/. The venue, call for papers, cost and registration, hotel/lodging information, vendor information, and agenda will be announced shortly, as well.

Thank you all for your interest in the Alaska UAS Interest Group. We hope to see you all in Fairbanks this coming September.

Marty W. Rogers

Marty W. Rogers, Director
Alaska Center for Unmanned Aircraft Systems Integration
Geophysical Institute, University of Alaska Fairbanks

Ginger Blaisdell

From: Rep. Shelley Hughes <Rep.Shelley.Hughes@akleg.gov>
Sent: Wednesday, June 17, 2015 9:39 AM
To: 'lhschus+unmannedaircraft@akleg.gov'
Subject: Alaska UAS Interest Group meeting announced
Attachments: 2015 Save the Date.pdf

Associates, Colleagues & Friends – Mr. Marty Rogers, Director of the Alaska Center for UAS Integration (ACUASI) and the Pan Pacific UAS Test Range Complex (PPUTRC), has asked me to inform you of, and send you his personal invitation, regarding the 2015 Alaska UAS Interest Group meeting in Fairbanks Alaska this coming 1 thru 3 September.

Please find attached, Mr. Rogers' personal invitation, and please do not hesitate to ask any of us here at the ACUASI and PPUTRC for guidance on any matter regarding the planning of your travel to join us this year.

In addition to the Alaska UASIG Meeting, the Departments of both the Interior and Energy will host a full day event on Monday that same week. These two Federal Government agencies have much information to convey regarding ongoing and planned activities in Alaska and throughout the Arctic, and have asked that we extend to you an invitation to join them on Monday, 31 August.

Finally, be sure to plan your trip so that you can take advantage of your travel to Alaska. If time permits, might I suggest looking into taking the Alaskan Railroad's "Denali Star" either to or from Fairbanks to/from Anchorage. September is Autumn in Alaska, and while beauty abounds at that time of the year, the wildlife is in high gear getting prepared for Winter and can be seen most anywhere you look.

So please, open Mr. Roger's attached invitation, and join us so that we might see you in Fairbanks in September. And if you have any questions at all, feel free to contact myself, Barbara Johnson or Diana Campbell (CC'd), and I promise we'll get you an answer.

Respectfully, Leonard Ligon
Airspace Integration & Operations
Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)
Pan-Pacific UAS Test Range Complex (PPUTRC)
University of Alaska Fairbanks (UAF)
ACUASI (907) 455-2013
Mobile (505) 417-4488

Provided by:
Ginger Blaisdell

Chief of Staff
Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 13
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

LEGISLATIVE TELECONFERENCE NETWORK

SPONSOR: _____

SUBJECT: UAS LTF

DATE: June 19, 2015

PLEASE PRINT CLEARLY!!!

NAME	CITY OF RESIDENCE	REPRESENTING ("SELF" OR NAME OF ORGANIZATION)	WOULD YOU LIKE TO TESTIFY? INDICATE "YES" OR "NO"	BILL NUMBER
David Palmer	Palmer, AK	Arctic ATC and Aviation Technologies LLC	NO.	
Beau Bivins	Anchorage- AK	Alaska Aerial Media LLC		
Tyler Currier	"	"		
Ryan Marlow	"	"		
George Kobelnyk	CHUGIAK, AK	70° NORTH LLC + Aviation Systems World Service	?	
Elwood Brehmer	Anchorage	Alaska Journal of Commerce	NO	
~~Jeff~~ Hagen-May	Kasilof, AK	Self -	NO	
Mark Greby	Anchorage AK	AAC	No	
PARKER MARTYN	ANCHORAGE, AK	National Park Service	NO	
ELIZABETH PARSONS	PALMER, AK	70 NORTH LLC	NO	
Jay Sekaas	Eagle River	FAA	NO	

Ginger Blaisdell

From: Apache <apache@wwwjnu04.akleg.gov>
Sent: Friday, May 08, 2015 2:09 PM
To: LIO Juneau; Ginger Blaisdell
Subject: Teleconference Order Form

Meeting: new

Sponsor and/or Committee Name: Unmanned Aircraft Systems Task Force

Date of Teleconference: June 19, 2015

Start Time: 12:00pm

End Time: 5:00pm

originals

Chairing Site: Anchorage LIO

Juneau Room:

Bill Information:

Agenda: Privacy considerations for unmanned aircraft systems

Streamed to akl.tv: yes

Executive Session: no

Contact Person: Ginger Blaisdell

Telephone Number: 465-5265

Email Address: ginger.blaisdell@akleg.gov

LIO Sites:

May other LIO's add: yes

Offnet Name(s):

Other Information:

All participants should be at the Anc LIO
we will allow for public testimony where calls will be accepted

Ginger Blaisdell

From: Rep. Shelley Hughes <Rep.Shelley.Hughes@akleg.gov>
Sent: Wednesday, June 17, 2015 10:02 AM
To: 'lhschus+unmannedaircraft@akleg.gov'
Subject: Alaska UAS Task Force meeting Friday June 19

You are receiving this email because you have expressed interest in Alaska's Unmanned Aircraft Systems Legislative Task Force meetings.

Friday June 19, 2015
Anchorage Legislative Information Office Building
716 West 4th Ave
1st floor Auditorium

Public meeting from 1:00pm – 5:00pm Alaska Time
Please watch on www.akltv.com or call in toll free at 844-586-9085 to listen or provide comment during public testimony
Public testimony will be taken between 4-5pm

The afternoon DRAFT agenda is as follows:
1:00pm welcome and announcements
1:15pm Drone insurance for commercial and recreational users
2:00pm Proposed FAA Rule for UAS – invited testimony
3:00pm Privacy document and legal memo regarding privacy for Alaska citizens
4:00pm Public testimony
5:00pm Adjourn

Documents and final agenda will be posted on Thursday June 18 at
http://www.akleg.gov/basis/Meeting/Detail?Meeting=HUNM 2015-06-19 12:00:00#tab1_4

Thank you for your interest in Alaska's UAS Task Force
Ginger Blaisdell

Chief of Staff
Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 13
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

If you would like to subscribe to Representative Hughes' newsletter, please click http://www.housemajority.org/members/hughes/.

Ginger Blaisdell

From: Jessica Geary
Sent: Wednesday, June 17, 2015 9:18 AM
To: Ginger Blaisdell
Subject: RE: Unmanned Aircraft

Hi Ginger,
Yes – it does. $8,900 again for FY16. Availalble July 1.

Jessica

Jessica Geary, Finance Manager
Legislative Affairs Agency
465-6626
Please note new email address:
Jessica.Geary@akleg.gov

From: Ginger Blaisdell
Sent: Wednesday, June 17, 2015 9:17 AM
To: Jessica Geary
Subject: FW: Unmanned Aircraft

Does the UAS task force have a budget this year?
ginger

From: Rep. Shelley Hughes
Sent: Tuesday, June 16, 2015 4:23 PM
To: Ginger Blaisdell
Subject: RE: Unmanned Aircraft

Can you doublecheck the fy2016 budget and see if perhaps by some miracle it got funded again?

Representative Shelley Hughes

Serving Greater Palmer, District 11
Alaska State Legislature
600 East Railroad Avenue
Wasilla, Alaska 99654
(907) 376-3725

Communicating with Alaska via
Facebook Twitter Instagram

From: Ginger Blaisdell
Sent: Tuesday, June 16, 2015 1:48 PM
To: Rep. Shelley Hughes
Subject: FW: Unmanned Aircraft

From: Jessica Geary
Sent: Friday, April 03, 2015 2:04 PM
To: Ginger Blaisdell
Subject: Unmanned Aircraft

Hi Ginger,
I was just running the March authorization balance numbers and I see the Task Force on Unmanned Aircraft Systems is almost out of money for FY15.
There is $518.13 left. Joanna has paid everything that has come over so far, but if it stays in the budget there will be new money in FY16 for any travel that takes place after July 1. Please let me know if you have questions or concerns.

Jessica

Jessica Geary
Finance Manager
Legislative Affairs Agency
(907) 465-6626 phone
(907) 465-1772 fax
Please note new email address:
Jessica.Geary@akleg.gov

Ginger Blaisdell

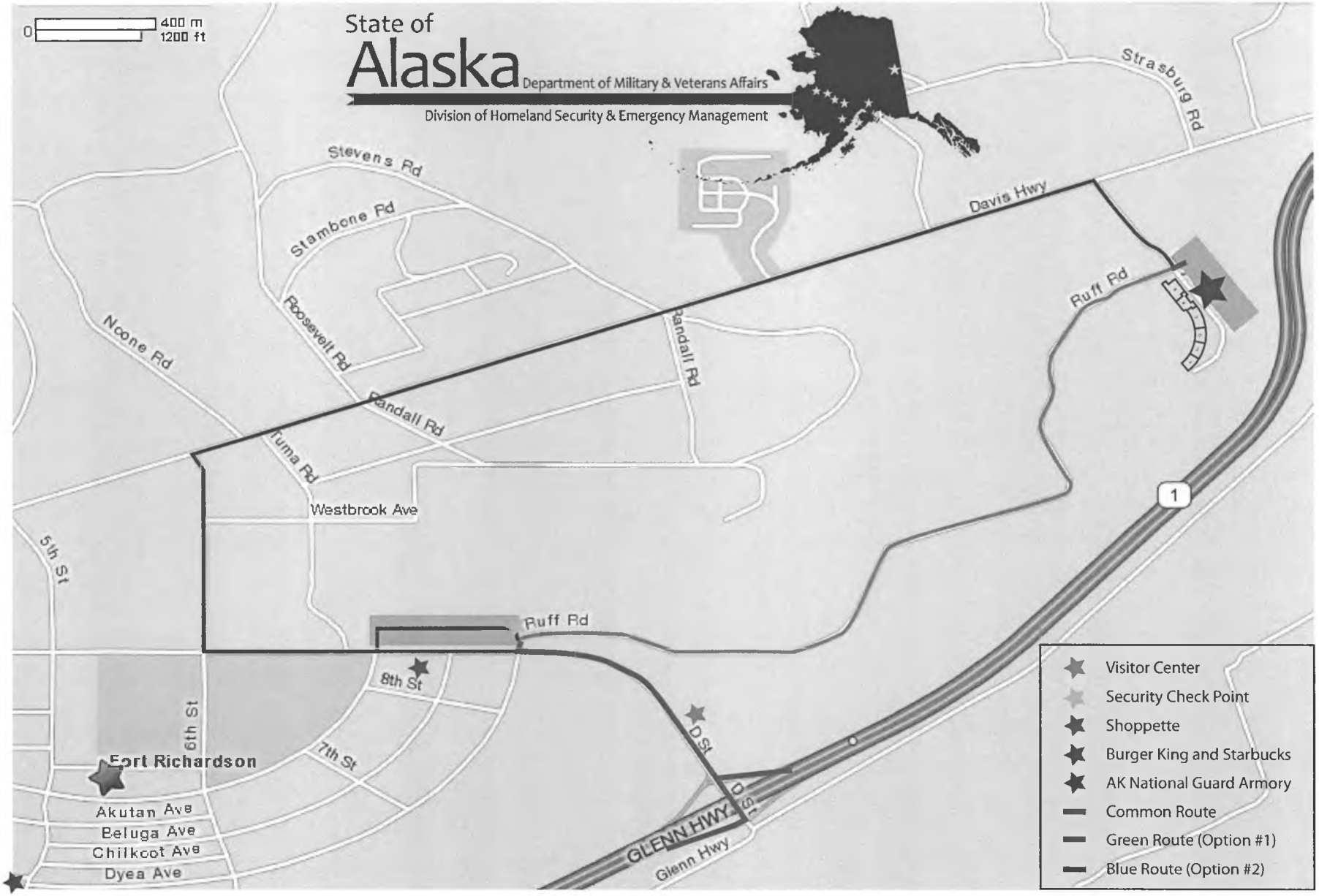
From: Meyer, Marty A (MVA) <marty.meyer@alaska.gov>
Sent: Thursday, June 18, 2015 2:21 PM
To: Tyler, Ethan A (CED); 'steve@straitmedia.us'; Ginger Blaisdell; 'bob@gallerylodge.com'; 'iris@uav-alaska.com'; Rep. Shelley Hughes; 'scolligan@e-terra.com'; Stuart Krueger
Cc: O'Hare, Michael F (MVA); Gordon, Catherine M (MVA); Jarrell, James R (MVA)
Subject: UAS/UAV Legislative Task Force Meeting Tomorrow, June 19th

Hi Everyone,
Tomorrow's meeting will start at 9:00am and will be held in the Executive Conference Room (Room C-207) in the National Guard Armory on JBER. You will need to enter JBER via the Ft Richardson gate, but first you will need to stop at the visitor's center just prior to entering to give them your picture I.D., vehicle registration, and proof of vehicle insurance. They already have your name on a list which lists me as your sponsor. If you need further directions, or have any other questions, please don't hesitate to call me.
thanks

Marty Meyer
Special Assistant I
Department of Military & Veterans Affairs
Office of the Commissioner
Phone : 907-428-6008
Fax: 907-428-6019

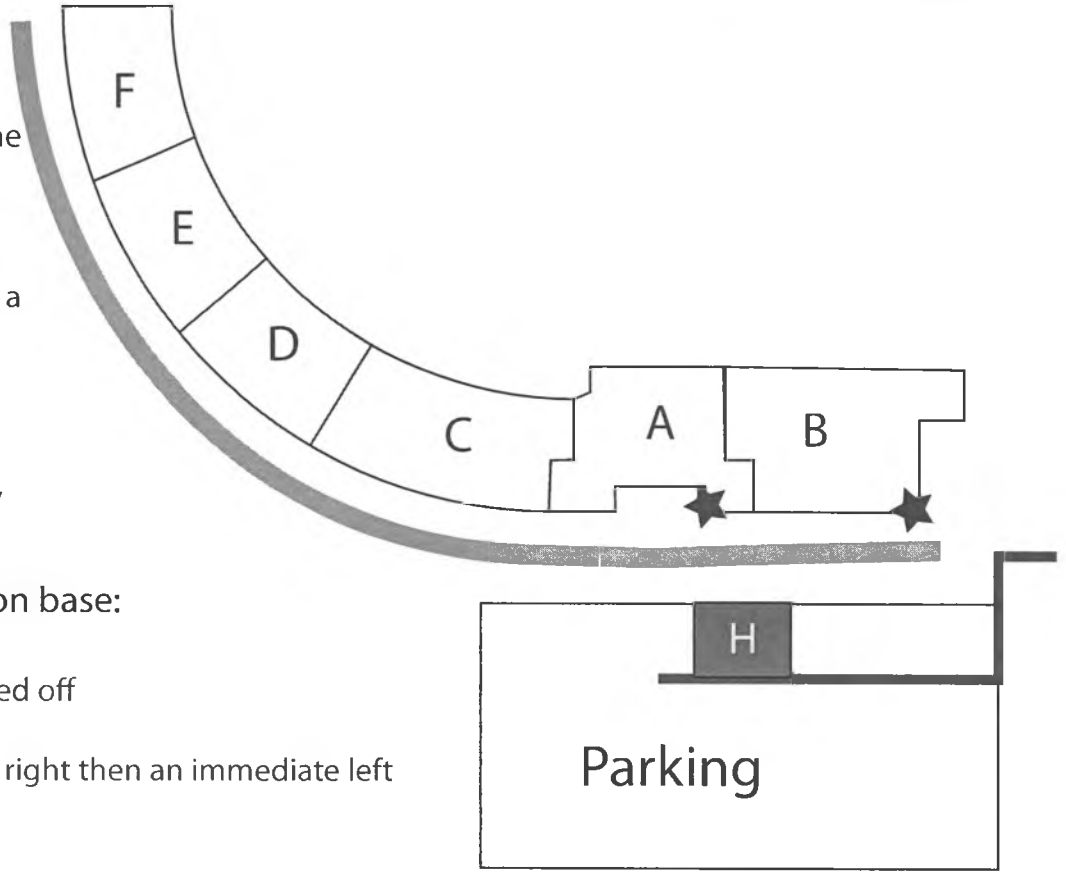
Directions to the Divsion of Homeland Security and Emergency Mangement

Located in the Alaska National Guard Armory - Ft. Richardson, AK



Directions to get to the Armory:

1. From the Glenn Highway: Take the Ft Richardson Exit. At the top of the ramp go left from Anchorage - right from the Valley
2. Stop at the Visitor's Center to get a pass.
   - You'll need the car's registration, proof of insurance and a valid ID
   - Your car may be subject to search
3. Get back onto the main road
4. Take the very first right and keep to the right – there are several lanes of k-rails - you may have to stop at a security check point.



Two options (due to construction or a security issue on base:

#1 - Green Route (indicated on map)

1.1 - Take a right at the first road you come to if it is not blocked off

1.2 - Follow the road for about 2 miles (enjoy the scenery).

1.3 - You will come to a T in the road with a Yield sign, make a right then an immediate left into the parking lot.

#2 - Blue Route (indicated on map)

2.1 - Veer left to exit the security check point then make an immediate right onto D Street.

2.2 - Make a right at the light. (6th Street)

2.3 - Make a right at the "T" in the road. (Davis Hwy)

2.4 - Follow the road about 2 miles.

2.5 - There will be a sign on the right directing you to the National Guard Armory (if you go through a gate in the fence you have passed it.

2.6 - Follow the road till you come the barrier, make a left into the parking area.

If you need handicap parking it is near the main entrance of the building.

Enter through the farthest door to the right as you look at the building or the right set of doors at the main entrance (marked with blue stars above).

Go upstairs, to room B-201; if you get lost or no one is there - ask to be directed to room B-214. Our wonderful admin staff will help direct you to the classroom.

If you have questions or get lost, call Admin at 428-7000.

DEPUTY SECRETARY OF DEFENSE
1010 DEFENSE PENTAGON
WASHINGTON, DC 20301-1010

February 17, 2015

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS
UNDER SECRETARY OF DEFENSE FOR POLICY
UNDER SECRETARY OF DEFENSE FOR PERSONNEL AND READINESS
UNDER SECRETARY OF DEFENSE FOR INTELLIGENCE
COMMANDER, U.S. NORTHERN COMMAND
COMMANDER, U.S. PACIFIC COMMAND
CHIEF, NATIONAL GUARD BUREAU
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
ASSISTANT SECRETARY OF DEFENSE FOR LEGISLATIVE AFFAIRS
DEPARTMENT OF DEFENSE CHIEF INFORMATION OFFICER
ASSISTANT TO THE SECRETARY OF DEFENSE FOR PUBLIC AFFAIRS
SENIOR INTELLIGENCE OVERSIGHT OFFICER

SUBJECT: Policy Memorandum 15-002, "Guidance for the Domestic Use of Unmanned Aircraft Systems"

EXPIRATION DATE: February 17, 2018

POINT OF CONTACT: For more information, contact OASD(HD&GS) at (571) 256-8322.

This policy memorandum provides guidance for the domestic use of unmanned aircraft systems (UAS) to ensure that Department of Defense (DoD) UAS are used in accordance with U.S. law and DoD policy, and to ensure the appropriate use of DoD UAS assets in domestic operations, training, exercises, and testing.

DoD domestic aviation operations support Homeland Defense (HD), Defense Support of Civil Authorities (DSCA), and military training and exercises. Unless specifically provided for in this policy, law, or other guidance, the approval of the Secretary of Defense is required for all domestic UAS operations (including HD, DSCA, and National Guard (NG) State support operations, including DoD UAS operated by NG personnel in Title 32 or State Active Duty status). Any domestic use of UAS requires consultation with the Federal Aviation Administration (FAA) and must be consistent with applicable laws, regulations, and memoranda of agreement concerning the operations of UAS in the National Airspace System (NAS). This guidance applies to all DoD UAS use in the United States (hereafter "domestic use" or "domestic

operations"), whether operated by or under contract to Active or Reserve Component military personnel, or by other DoD personnel.

Unless permitted by law and approved by the Secretary of Defense, any DoD personnel using UAS for domestic operations, whether or not the DoD UAS use is related to an intelligence activity, may not conduct surveillance on U.S. persons. This restriction includes using any domestic DoD UAS as part of an authorized DoD response to a lawful request from another Federal department or agency. Consistent with DoD Directive 5200.27[1] and applying the oversight guidance contained in DoD 5240.1-R[2] to intelligence and non-intelligence related domestic UAS use, all UAS acquisition, collection, retention, and dissemination of information during domestic DoD UAS employment will be in accordance with standing DoD and DoD Component intelligence oversight guidance and will require coordination and review of a proper use memorandum (PUM).

The following guidance on the domestic use of UAS is effective immediately.

DoD Operations

In appropriate circumstances, UAS may be used in lieu of manned aircraft for domestic missions. Appropriate circumstances may include when:

- sustained endurance efforts are required;
- unmanned aircraft provide superior capabilities; or
- physical infrastructure limitations prohibit the use of manned rotary- or fixed-wing aircraft.

DoD UAS in the United States may only be used for HD, DSCA, and NG State support operations, including operations to support Federal, State, local, and tribal government organizations, if approved by the Secretary of Defense. DoD UAS may not be used for Federal, State, or local immediate response.

Armed DoD UAS may not be used in the United States for other than training, exercises, and testing purposes.

In the event of a request for Federal support, the Chairman of the Joint Chiefs of Staff, in consultation with the appropriate geographic Combatant Commanders, will provide a recommendation to the Secretary of Defense concerning the use of DoD UAS. To seek approval for other missions, DoD Components should use the approval authorities, procedures, and reporting requirements contained in applicable laws and regulations, such as CJCS Instruction 3710.01B, "DoD Counterdrug Support." Support will be provided on a reimbursable basis unless otherwise required by law, or on a non-reimbursable basis if such support is both authorized by law and approved by the Secretary of Defense.

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[1] DoD Directive 5200.27, Acquisition of Information Concerning Persons and Organizations Not Affiliated with the Department of Defense.

[2] DoD 5240.1-R, Procedures Governing the Activities of DoD Intelligence Components that Affect United States Persons.

State/National Guard Operations

Governors in States where DoD UAS assets are fielded to the State's National Guard may not employ DoD UAS without the approval of the Secretary of Defense; however, these Governors may consider DoD UAS employment in their planning for disaster response activities. Governors who seek to use DoD UAS assets in support of State disaster response should submit a formal request in writing to the Secretary of Defense. Such requests should contain the analysis conducted that determined that other manned air assets were not appropriate. The Chairman of the Joint Chiefs of Staff, in consultation with the appropriate geographic Combatant Commander, the Chief of the National Guard Bureau (NGB), and the appropriate Military Department Secretary, will provide a recommendation to the Secretary of Defense concerning the use of DoD UAS in support of a State request.

Plans should factor in the procedures and time required for FAA consultation for access to the necessary airspace and to obtain Secretary of Defense authorization. In concert with Federal Emergency Management Agency-coordinated regional planning, any State that proposes the use of DoD UAS in its plans should consult with the corresponding geographic Combatant Commander to ensure that State and DoD plans maximize unity of effort and efficiency.

Search and Rescue Exception

The only exception to the requirement for approval by the Secretary of Defense for the use of DoD UAS for domestic operations are search and rescue (SAR) missions involving distress and potential loss of life that are coordinated by the Air Force Rescue Coordination Center (AFRCC), Alaska Rescue Coordination Center (AKRCC), or Joint Rescue Coordination Center (JRCC)-Pacific. Specifically, the following commanders may approve the use of DoD UAS on an AFRCC/AKRCC/JRCC-Pacific coordinated mission with a properly issued SAR mission number after a determination that UAS would be the best platform to assist in the SAR mission and that its use would not interfere with the primary military duties of the unit concerned:

- Commander, U.S. Northern Command, through the Commander, Air Forces Northern, in the delegated role of Inland SAR Operations Coordinator for the continental United States Search and Rescue Region;
- Commander, U.S. Northern Command, through the Commander, Alaskan Command, as SAR Operations Coordinator for the Elmendorf Search and Rescue Region, landmass of Alaska; or
- Commander, U.S. Pacific Command, in the role of SAR Coordinator for the landmass of Hawaii, in close coordination with the U.S. Coast Guard.

Each commander will ensure that all legal, intelligence oversight (including the requirement to obtain a PUM), Privacy Act, and airspace issues are properly addressed. Each commander will promptly inform the Secretary of Defense, through appropriate channels, after the use of DoD UAS has been approved.

The Assistant Secretary of Defense for Homeland Defense and Global Security (ASD(HD&GS)) will include this SAR exception in the next revision of DoD Directive 3025.18, "Defense Support of Civil Authorities."

DoD-Required Training and Exercises

The primary purpose of domestic UAS training and exercises is for DoD forces to conduct realistic training in their core Federal military mission areas. DoD UAS used in training and exercises will not acquire or collect information (except for incidental collection) about specified U.S. persons or non-DoD controlled property or facilities located outside DoD-controlled installations without consent. All UAS acquisition, collection, retention, and dissemination of information will be in accordance with standing DoD regulations and policy, including DoD Component intelligence oversight guidance, and will require a PUM.

Use of DoD UAS assets in domestic training and exercises requires:

- Prior notification to the Secretary of Defense if the platform is a large DoD UAS[3] and is to be used in training and exercises outside DoD-scheduled special use airspace (SUA);[4]
- Prior approval by the Secretary of Defense if the UAS is armed and will be used in a training, exercise, or testing event outside DoD SUA; and
- Prior approval by the Secretary of Defense for any DoD UAS training and exercises conducted with Federal, State, or local law enforcement agencies (LEAs), including any DoD UAS training and exercises planned in coordination with LEAs to meet LEA information needs in accordance with 10 U.S.C. § 371(b).

The notification to or request for approval by the Secretary of Defense required by this section will be submitted to the Secretary at least 30 days prior to the training, exercise, or testing event through appropriate Military Department/Service, Combatant Command, or NGB channels via the Joint Staff (J-3), and may be submitted either on a case-by-case basis or in batch format for periods not to exceed one calendar year in advance of the proposed exercise or training.

Exercises, Training, and Activities Not Required by DoD

Although DoD equipment issued to the NG is often available for use by State Governors for non-DoD purposes, Secretary of Defense approval is required for the use of DoD UAS assets for non-DoD purposes, for DSCA training and exercises, or for NG UAS training and exercises that provide incidental support to civil authorities. This includes DoD UAS operated by forces in Title 10 status and National Guard personnel in Title 32 or State Active Duty status.

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[3] Group 4/5 UAS, as currently defined in CJCSI 3255.01, *Joint Unmanned Aircraft System Minimum Training Standards, Incorporating Change 1*, para. 9(a)(1)-(5) (October 31, 2011) and Joint Publication 3-30, *Command and Control of Joint Air Operations*, Figure III-15, page III-30 (February 10, 2014).

[4] DoD Scheduled Special Use Airspace (SUA): Warning Areas, Restricted Areas, Military Operations Area (MOA), Prohibited Areas, Controlled Firing Areas, and National Security Areas. For purposes of this Guidance, FAA-designated military training routes are also included. It is acknowledged that DoD UAS, in some cases, may have to transit the NAS from their departure/arrival airfield to DoD SUA to conduct their assigned mission. In all cases, appropriate airspace approval is required.

State officials who wish to propose the use of DoD UAS in support of major State disaster response exercises (or training requiring approval by the Secretary of Defense) should factor in the procedures and time required to consult with the FAA for access to the necessary airspace and to obtain Secretary of Defense approval. States in which DoD UAS assets are fielded that have a requirement for their use in these exercises (or training requiring approval by the Secretary of Defense) will submit the Governor's request in writing at least 30 days in advance to the Secretary of Defense through appropriate Military Department/Service, Combatant Command, or NGB channels via the Joint Staff (J-3), and may submit such requests either on a case-by-case basis or in batch format for periods not to exceed one (1) calendar year in advance of the proposed exercise or training.

Access to the U.S. National Airspace System

In order to conduct domestic operations, exercises, and training, DoD UAS operations will likely not be confined to segregated airspace; therefore, routine access to the national airspace will likely be required. The Department must continue to make progress in advancing regulatory policy and guidance associated with UAS operations in the NAS, as well as in aggressively developing detect-and-avoid technology to ensure safe operation of UAS in unsegregated airspace.

The Chair of the DoD Policy Board on Federal Aviation (PBFA) will lead the Department's efforts to advocate for the elimination of unnecessary regulatory restrictions that prevent routine access to the NAS for DoD UAS. The PBFA Chair will work through the multi-agency UAS Executive Committee to pursue regulatory changes and/or arrangements and develop reasonable standards of safety that address liability and take into account the excellent safety record of the Department's global UAS operations.

DoD will continue to promote the development of technologies, standardized operating procedures, and policies that ensure that DoD UAS are able to operate safely within the national airspace while also balancing and protecting personal privacy.

Other Designated Responsibilities

Under Secretary of Defense for Policy

The Under Secretary of Defense for Policy (USD(P)) is authorized to establish the appropriate policy for domestic use of UAS for force protection and protection of other DoD assets, whether in DoD Instruction 2000.16, "DoD Antiterrorism Standards," or other appropriate DoD issuance.

Assistant Secretary of Defense for Homeland Defense and Global Security

The ASD(HD&GS), under the authority, direction, and control of the USD(P), is the principal civilian advisor to the Secretary of Defense for the domestic use of DoD UAS. The ASD(HD&GS) will conduct a comprehensive review of this policy every three years and seek approval of appropriate revisions, if required. All policy development will be coordinated with

the Chairman of the Joint Chiefs of Staff, the DoD General Counsel, the Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict, and the heads of other appropriate DoD organizations.

Assistant to the Secretary of Defense for Public Affairs

The Assistant to the Secretary of Defense for Public Affairs (ATSD(PA)) is responsible for coordinating public affairs inquiries with the Military Departments/Services, Joint Staff, Combatant Commands, National Guard Bureau, State departments and agencies, and other Federal departments and agencies as required. The ATSD(PA) is the lead DoD official for establishing public affairs guidance on domestic use of DoD UAS. Additionally, to promote transparency, the ATSD(PA) will work with the PBFA and the ASD(HD&GS) to develop a webpage outlining DoD UAS domestic operations.

This guidance replaces and rescinds the Deputy Secretary of Defense Memorandum, "Interim Guidance for the Domestic Use of Unmanned Aircraft Systems," September 28, 2006.[5]

[5] New operational and training requests/notification requirements take effect 60 days after the date that this policy memorandum is signed.

09/03/15 Task Force Meeting

<TARGET><BILL></BILL><SUBJECT>09-03-15 Task Force Meeting</SUBJECT><COMM><TARGET></COMM></TARGET>

Legislative Task Force on Unmanned Aircraft Systems
September 3, 2015 Meeting at 813 Noble Street, Fairbanks
Westmark Hotel Fairbanks

1:00pm - 4:45pm

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Peter Micciche, Co-Chair
- Ethan Tyler, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof

- Ginger Blaisdell, Staff to Rep. Hughes
- Chuck Kopp, Staff to Senator Micciche

Task Force Responsibilities per HCR15 and Review of Resolution

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications;
3. evaluating complaints and concerns expressed to the task force;
4. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to unmanned aircraft systems;
6. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;

7. conducting a public hearing concerning privacy and the capture of data by unmanned aircraft systems at the University of Alaska's test site;
8. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

AGENDA

1:00pm Welcome and Introductions .....Representative Shelley Hughes

- News review and task force updates
- Public Testimony
- Josh Waite – presentation on UAS integration and safety
- UAS and Personal Privacy Guidelines document
- Discussion on final actions of the UASLTF

4:45pm Adjournment - members may join the Interest Group Meeting closing remarks from Marty Rogers followed by no host dinner on the Riverboat Discovery Dinner cruise beginning at 6:30pm

Invitation to attend:

9:30am - Friday, September 4 - Ro Bailey and ACUASI have made arrangements for demonstration flights of UAS downtown Fairbanks at the Fire Training facility for the benefit of the UAS Task Force to see working drones in action. Interest Group Meeting participants are invited to attend.

STATE CAPITOL
P.O. Box 110001
Juneau, AK 99811-0001
907-465-3500
fax: 907-465-3532

550 West Seventh Avenue, Suite 1700
Anchorage, AK 99501
907-269-7450
fax 907-269-7461
www.Gov.Alaska.Gov
Governor@Alaska.Gov

Governor Bill Walker
STATE OF ALASKA

September 3, 2015

Mr. Dave Mathewson
Executive Director
Academy of Model Aeronautics
5161 East Memorial Drive
Muncie, IN 47302

Dear Director Mathewson:

Thank you for leading the Academy of Model Aeronautics (AMA) in their quest to educate recreational aircraft pilots about safety and the responsibilities of flying and fully enjoying model aircraft. With the integration of unmanned aircraft systems (UAS) into the National Air Space, the public's attention on, and awareness of, government, commercial, and hobby pilots has increased dramatically. The AMA's role in educating the public by publishing safety guidelines is critical to keeping both our skies above, and the ground below, free from tragic accidents.

Alaska is known for its vast land mass and few roads. Many of our communities are not on the road system and are only primarily accessible by air. Alaska has the highest number of private pilots per capita (2006). It is estimated that 45 percent of all jobs in Alaska are related to the aviation industry in some way, according to a statement by the former Alaska Lt. Governor. Given these factors, it is quite realistic to assume that UAS will have a significant impact on Alaska, on our lives and our well-being. Generally, Alaskans are very receptive to UAS and are eager to receive the safety, cost savings, and improved data capture benefits of UAS. UAS are used not just for recreational purposes, but also practical public and business purposes such as search and rescue, wildlife counts, infrastructure monitoring, mapping, fire and disaster relief, real estate, surveying, photography and videography, oil and gas exploration and development, and mining.

The Alaska State Legislature established the Unmanned Aircraft Systems Legislative Task Force in 2012 to review existing laws regarding safety and privacy applicable to UAS. The Task Force is made up of 12 members including legislators, State of Alaska department designees, industry and public members, and a representative of the Academy of Model Aeronautics. The Task Force was instrumental in the passage of legislation pertaining to the parameters for law enforcement use of UAS, to provisions for public input, to the authority for training programs at the University of Alaska, and to the duty of the Task Force to report recommendations regarding privacy and other policy related to UAS to the Legislature each year.

I want to thank your organization for its assistance to the Task Force in creating and distributing a safety flyer during the last holiday season as small UAS were flying off the shelves as gift purchases. The Task Force is currently working on privacy guidelines flyer for operators and other interested

Alaskans. Lastly, the Task Force holds quarterly meetings to receive updates on UAS topics, address current issues, consider policy recommendations, and provide regular opportunities for public input.

House Joint Resolution 5, passed by the Alaska State Legislature this year, recognizes the important role of the Academy of Model Aeronautics in educating the public on safety and privacy guidelines. The AMA reaches a broad audience of interested pilots around the world. Alaska is proud to recognize your organization as a leader in model aeronautics and in the promotion of safe operations and privacy rights. While the State's policies regarding use of the Alaska State prevent our inclusion of the State Seal in your "Know Before You Fly" safety publications and your web page relating to the materials, we encourage you to utilize the Alaska Flag or outline of the state to symbolize my administration's support of your work. As Alaska has a great history and appreciation of aviation, it is appropriate that it be the first state to offer such support.

Sincerely,

Bill Walker
Governor

Commissioner XXXXXX XXXXXXXXXX
Department of YYYYYYYYYYYYY
ADDRESS
CITY, Alaska 99ZZZ

June 26, 2015

Dear Commissioner,

The Unmanned Aircraft Systems (UAS) Legislative Task Force has been considering policy the last two years regarding the use of UAS by public entities as well as by commercial users and recreational operators. This rapidly advancing technology is becoming more and more common place as one in every four homes in America now owns a small UAS, and the Federal Aviation Authority is beginning to grant authorizations for commercial users to employ UAS for business purposes. Our goal as a Task Force is to harness this tool for good in Alaska, always keeping safety and the privacy rights of Alaskans as top priorities.

As Co-Chair, I am relaying a request of the Unmanned Aircraft Systems Legislative Task Force, asking that you provide a contact at your department, the name of a point person with whom we can communicate regarding UAS as it relates to your department and state business. At this present time, no one department of the State of Alaska is a central contact for UAS, and until such time that one may be designated in the future, as the Task Force, we want to ensure good communications are occurring. We foresee that the list will be used only for information updates as UAS pertain to government operations or citizen inquiries regarding a specific departments' UAS activity. We also hope that the point of contact at your department would communicate with the Task Force when activities related to UAS occur.

I would like to have a contact for each department compiled into a list by the next Task Force meeting on September 3, 2015. Please forward your contact person's name, email and phone number to Ginger Blaisdell at ginger.blaisdell@akleg.gov by August 24, 2015.

The Task Force would also like you to be aware that we have developed a web site www.alaskadrones.org to help keep the public informed about UAS, particularly in regard to safe operations of small UAS and the privacy rights of Alaskans. We welcome any suggestions to make the website and information user-friendly and easy to understand.

Sincerely,

Representative Shelley Hughes
Co-Chair, UAS Legislative Task Force

State Agency Point of Contact for UAS Information

Office of the Governor
None designated

Department of Administration
Megan Collie, Special Assistant to the Commissioner
Department of Commerce, Community and Economic Development
* (Ethan Tyler)
Department of Corrections
Phil Cole, Special Assistant to the Commissioner
Department of Education and Early Development
Bjorn Wolter,
Department of Environmental Conservation
Alida Bus, Legislative Liaison
Department of Fish and Game
Carol Petraborg, Director of Administrative Services
Department of Health and Social Services
*
Department of Labor and Workforce Development
Anna Latham, Legislative Liaison
Department of Law
Kaci Schroeder, Special Assistant to the Attorney General
Department of Military and Veterans Affairs
Mike O'Hare, Director of Homeland Security and Emergency Management
Department of Natural Resources
*
Department of Public Safety
Lt Steve Adams, Alaska State Troopers
Department of Revenue
*
Department of Transportation and Public Facilities
Rich Sewell, Transportation Planner for Statewide Aviation

Alaska Court System
University of Alaska
* Ro Bailey

Risks of UAS Integration

EXCERPTS FROM NPRM RESPONSE

JOSH WAITE

Aircraft

Current

- Section 333 Exemption
  - Airworthiness requirement is waived
- Amateur
  - Airworthiness is self-determined

Proposed

- Airworthiness inspection / certification not required
- No standard

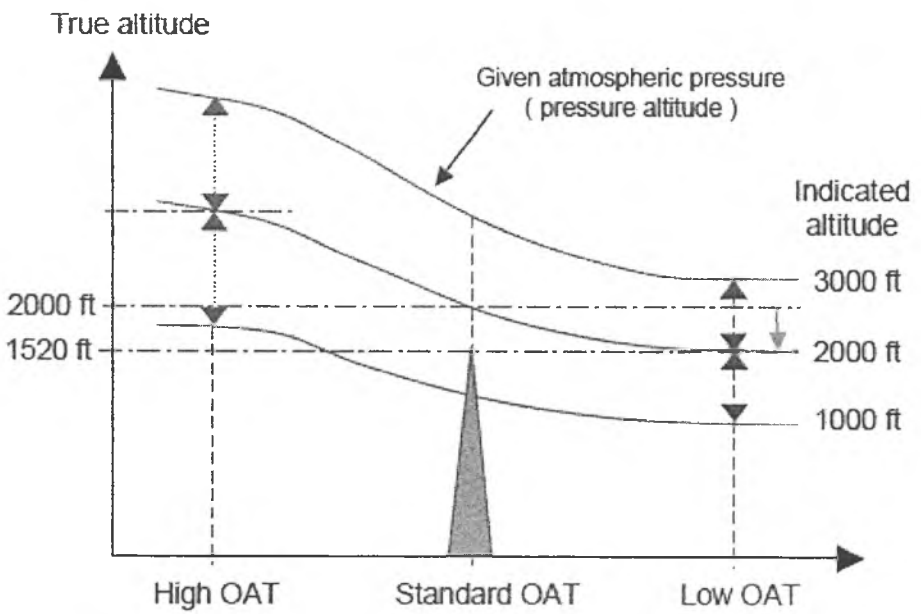
"Standard" Design Concerns

GPS Altimeter

Lack of Certified ADS-B & Transponder

GPS-derived altitude vs Barometric Altitude

- GPS reports true altitude vs barometric
- GPS altitude error ~1.5x the horizontal error



"Standard" Design Concerns

GPS Altimeter

Lack of Certified ADS-B & Transponder

Non-certified Alerting equipment

- ADS-B
- Transponder

FAA cites Size / Weight / Availability

- Multiple versions of <.25 lb ADS-B units
- Including Mode S Transponder / ADS-B out / Integrated GPS
- DoD has issued AIMS Transponder Certification
  - This includes performance / interoperability evaluation and certification of systems and sub-systems at both the end item and integrated platform level.

Risks Without Testing & Certification

Loss of Positive Control (Flyaway)

Single Points of Failure Unidentified

e.g. Electrical System Failures

- Concurrent Loss of Link and Loss of Navigation

Signal Strength, Latency, Direction

Airspace

FAA Proposal would allow commercial UAV use of airspace up to 500' AGL,

Proximity to airports is limited to:

- 5 nautical miles (nm) from an airport having an operational control tower; or
- 3 nm from an airport with a published instrument flight procedure, but not an operational tower; or
- 2 nm from an airport without a published instrument flight procedure or an operational tower; or
- 2 nm from a heliport with a published instrument flight procedure.

Highest Risk Airspace

Near Airports

Low Altitude Traffic

Military Training Routes

Airports

An aircraft on a 3° approach will be at 600' AGL in 2nm. There is no requirement for every approach to be 3°.

Low altitude traffic (14 CFR 91.119)

- "Other than congested areas"
  - 500' AGL limit
- "Sparsely populated areas"
  - 500' from person, vessel, vehicle or structure
  - Agriculture, helicopters, cub pilots

Military Training Routes

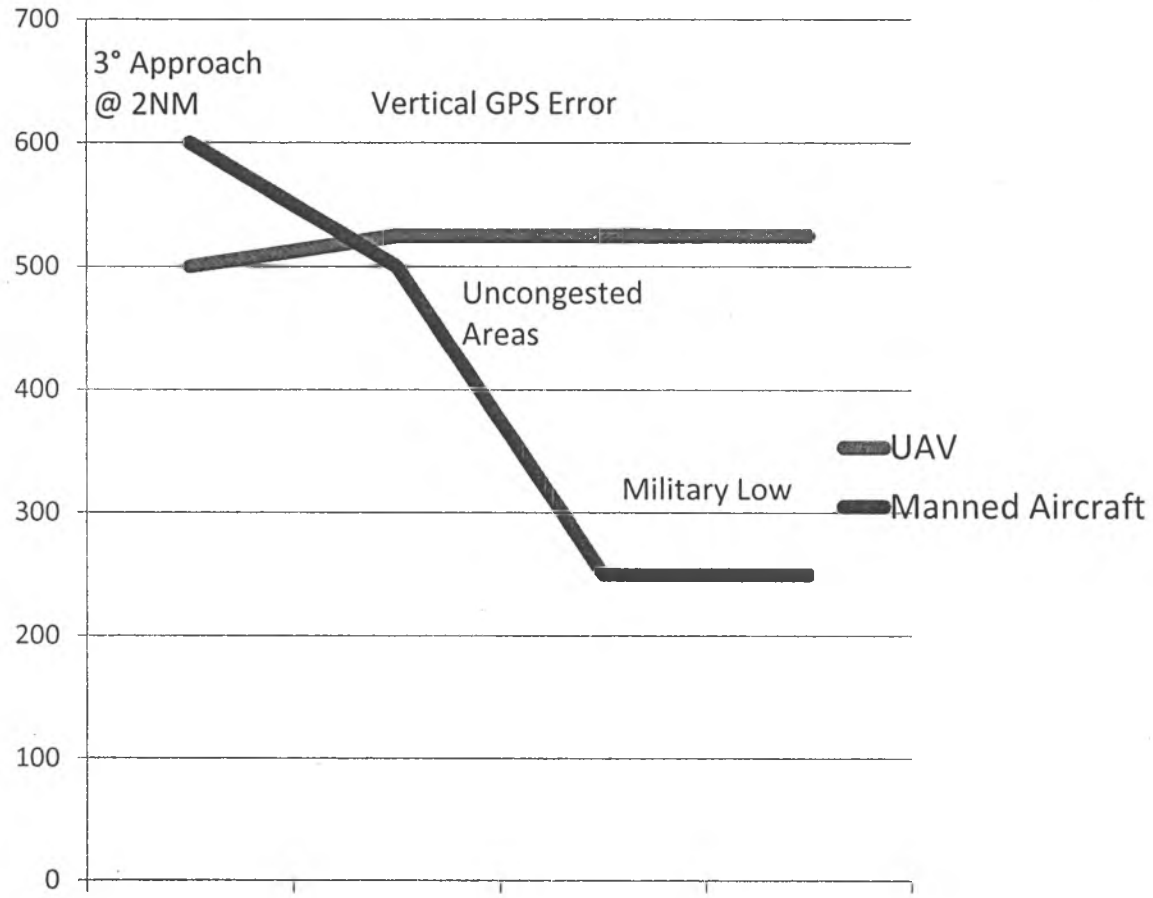
- Military aircraft low-level training (~300' AGL and higher)
- In excess of 250 kts (may be up to 420 kts)

Highest Risk Airspace

Near Airports

Low Altitude Traffic

Military Training Routes



Airman

Lack of Formal Training

Insufficient Testing

No Insurance

Risk Assessment

Training Vs Cost

Formal Training

Knowledge Test

Liability Insurance

Risk Assessment

"Formal training is too great a burden for operators wishing to commercially operate small UAS in the NAS" (from NPRM)

Training requirements for other commercial operations

- commercial drivers
- commercial vessel captains
- commercial pilots

Knowledge Test "would not require any specific form of training or studying in order to pass" (from NPRM)

- What is covered?

Lack of liability Insurance requirement

- No insurance-driven mitigations

Risk Assessment

- Lack of full understanding of the situation

Math $KE = \frac{1}{2} MV^2$

Analysis shows that KE of ~30,000 ft/lb can cause structural damage to large aircraft

KE of a 55lb object moving at 87 kts (100 mph) is 18,386.1 ft/lb

Analysis of aircraft damage and pictures from *Kinetic Energy of Bird Strikes & Damage to Aircraft* by Roger Nicholson, PhD

Bird Strike Requirements

(14 CFR Part 23, 25, 29)

Transport Airplane vs 8lb bird

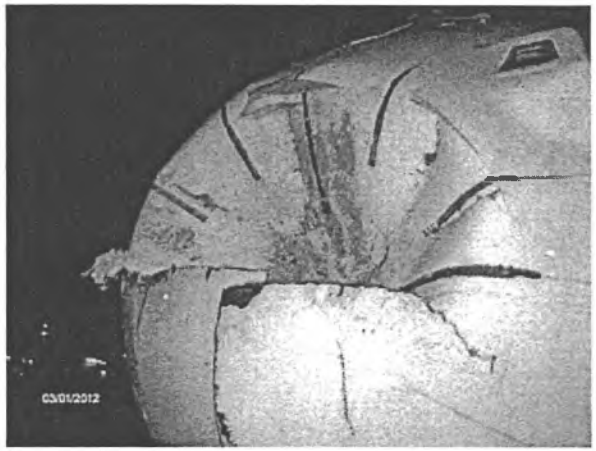
Transport Airplane vs 4lb bird

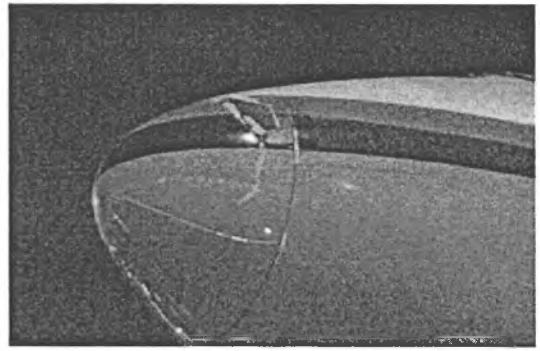
Normal/Utility/Commuter vs 2lb bird

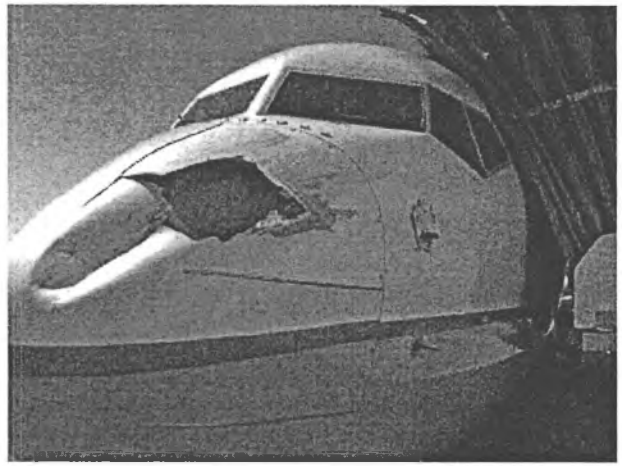
Transport Rotorcraft vs 2.2lb bird

- *Empennage structure* of transport category airplane vs **8 lb bird**
  - *If cruise speed is 400 kts, then* ***KE = 56,666 ft-lb***
- *Structural damage and windshield damage* of transport category airplanes vs **4 lb bird**
  - *If cruise speed is 400 kts, then* ***KE = 28,333 ft-lb***
- *Windshield* of normal, utility, acrobatic and commuter category airplanes vs **2 lb bird** at maximum approach flap speed
  - *If this speed is 180 kts, then* ***KE = 2,869 ft-lb***
- *Structure* of transport category rotorcraft vs **2.2 lb bird**
  - *If using the high Vne of a UH-60 (194 kts), then* ***KE = 3,666***

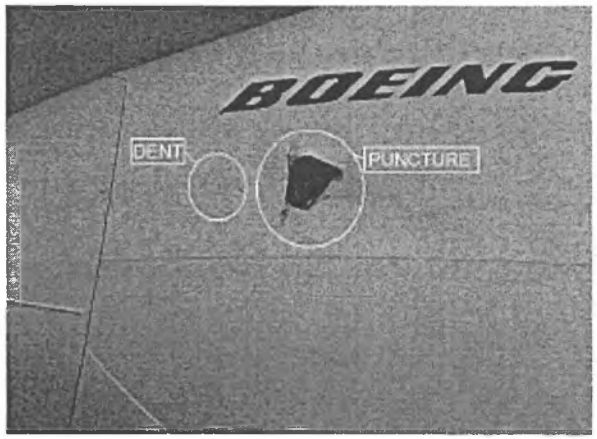
Radome

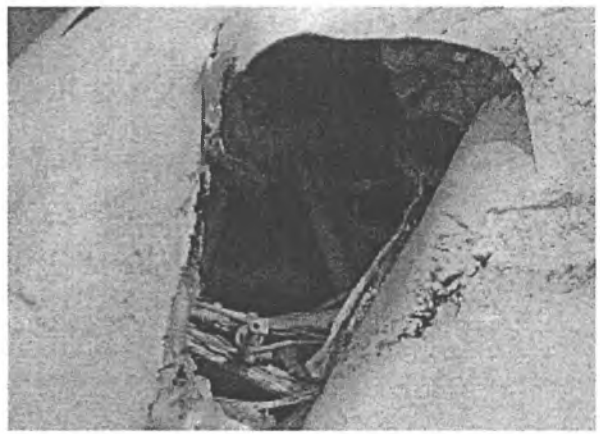




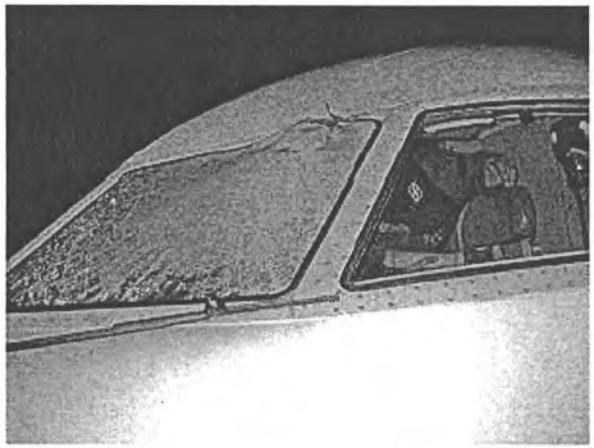


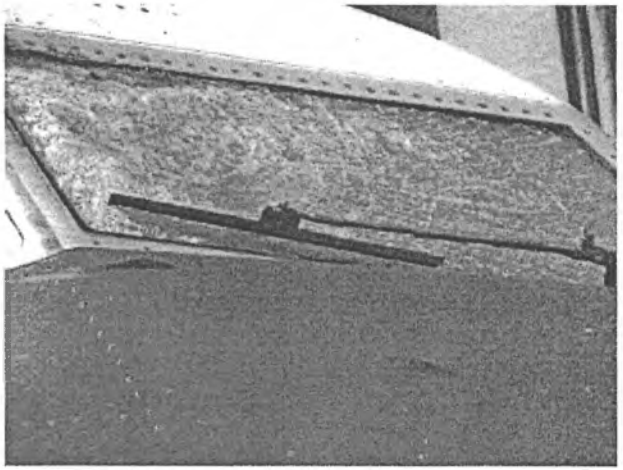
Nose

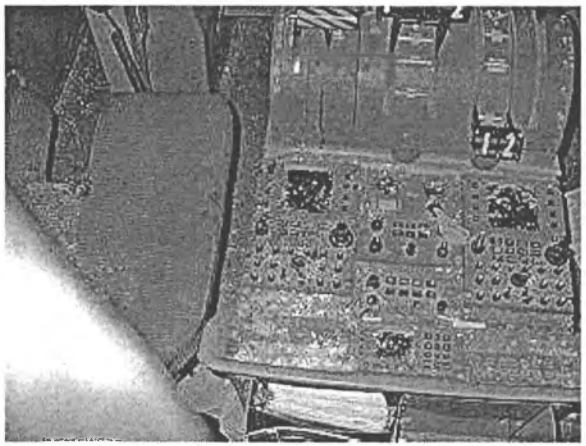


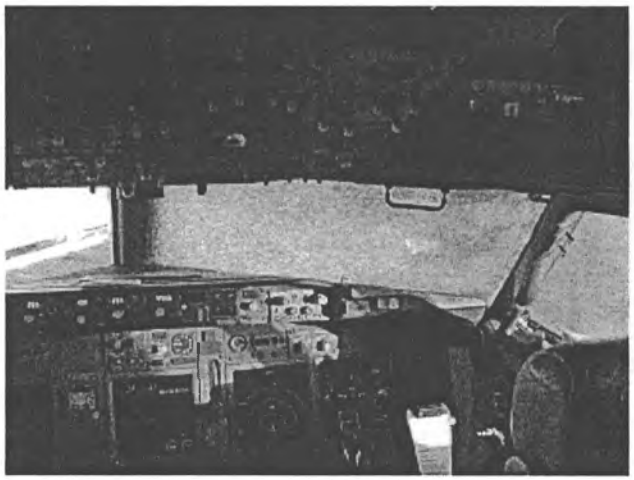


Windshield

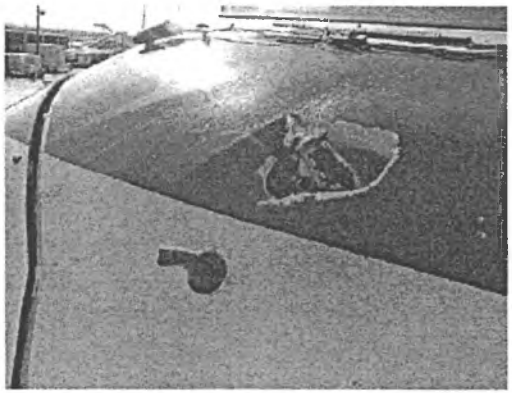


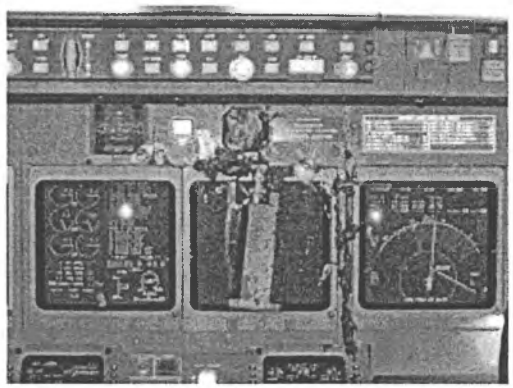




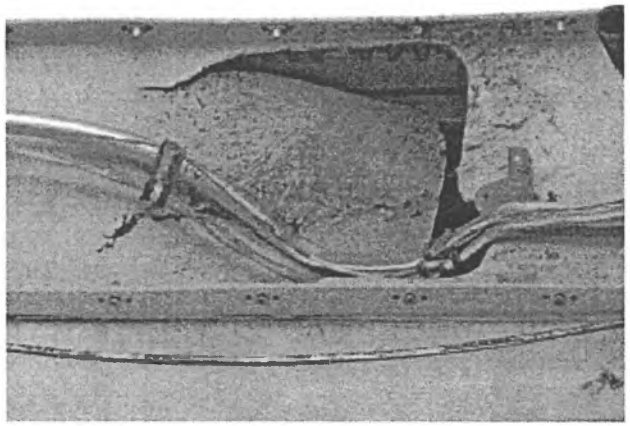


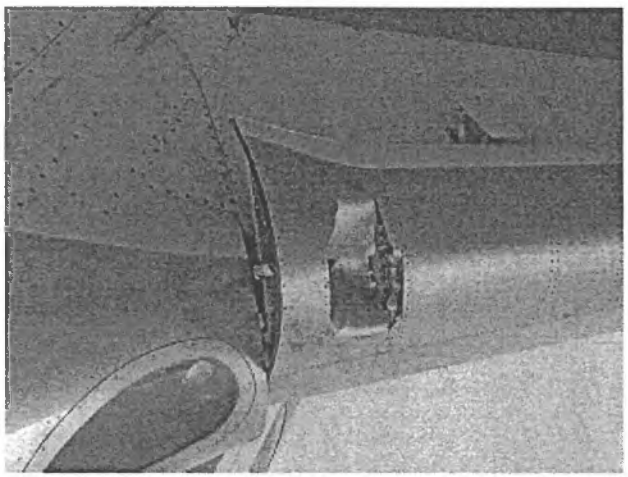
Flight Deck Penetration

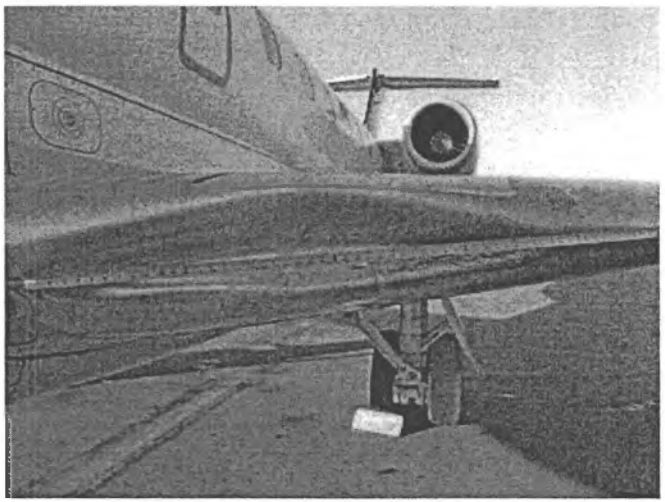




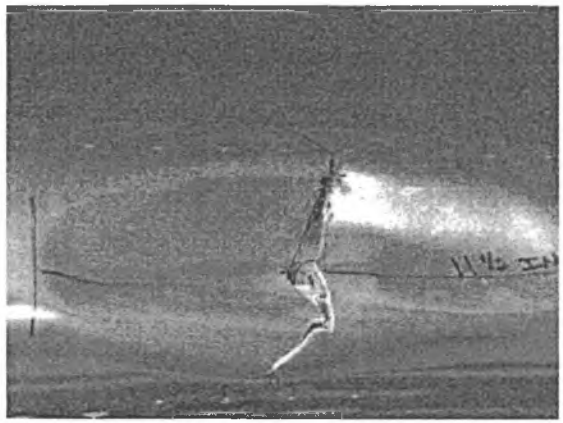
Wing

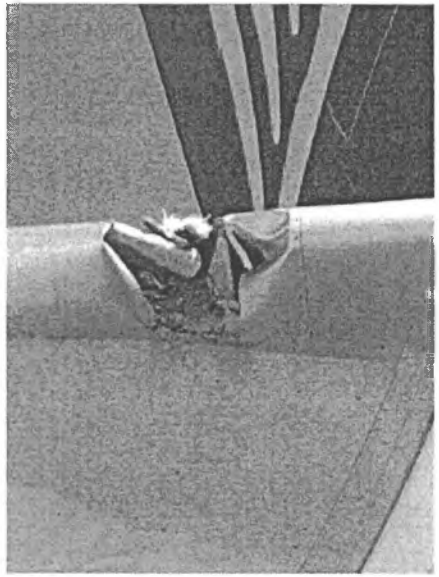




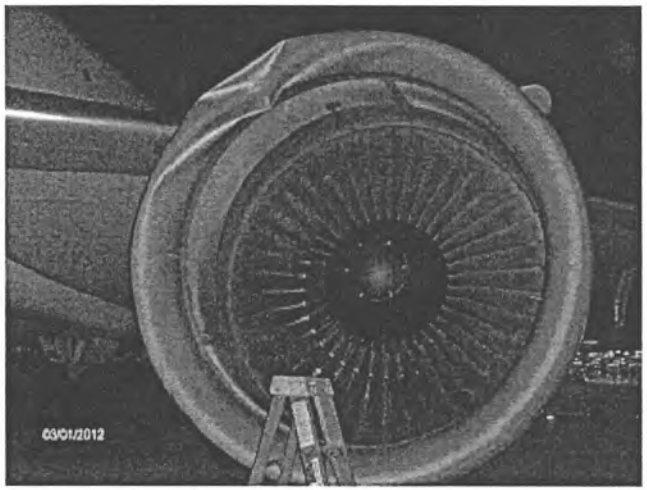


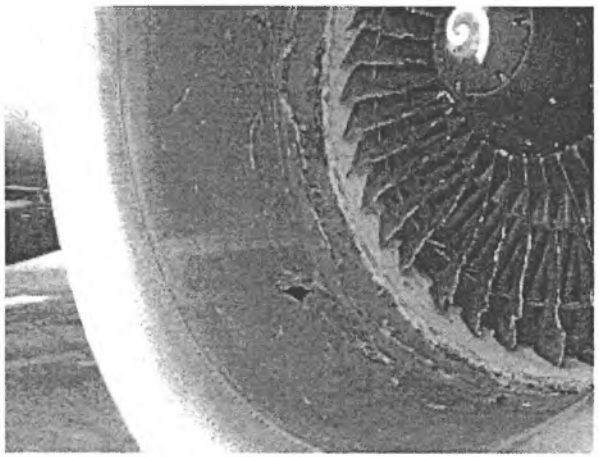
Empennage

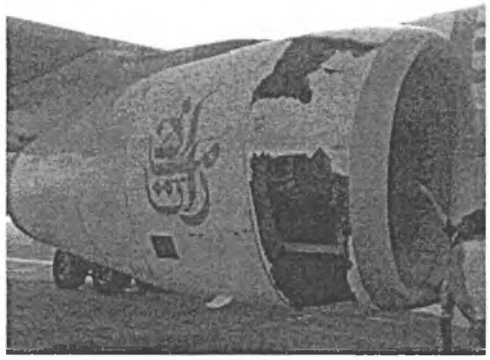




Powerplant







Bird Strike Requirements

(14 CFR Part 23, 25, 29)

Transport Airplane vs 8lb bird

Transport Airplane vs 4lb bird

Normal/Utility/Commuter vs 2lb bird

Transport Rotorcraft vs 2.2lb bird

- *Empennage structure* of transport category airplane vs **8 lb bird**
  - *If cruise speed is 400 kts, then* ***KE = 56,666 ft-lb***
  - ***55 lb UAV → 389,578 ft-lb***
- *Structural damage and windshield damage* of transport category airplanes vs **4 lb bird**
  - *If cruise speed is 400 kts, then* ***KE = 28,333 ft-lb***
  - ***55 lb UAV → 389,578 ft-lb***
- *Windshield* of normal, utility, acrobatic and commuter category airplanes vs **2 lb bird** at maximum approach flap speed
  - *If this speed is 180 kts, then* ***KE = 2,869 ft-lb***
  - ***55 lb UAV → 78,889 ft-lb***
- *Structure* of transport category rotorcraft vs **2.2 lb bird**
  - *If using the high Vne of a UH-60 (194 kts), then* ***KE = 3,666***
  - ***55 lb UAV → 91,638 ft-lb***

Bird Strike Requirements

(14 CFR Part 23, 25, 29)

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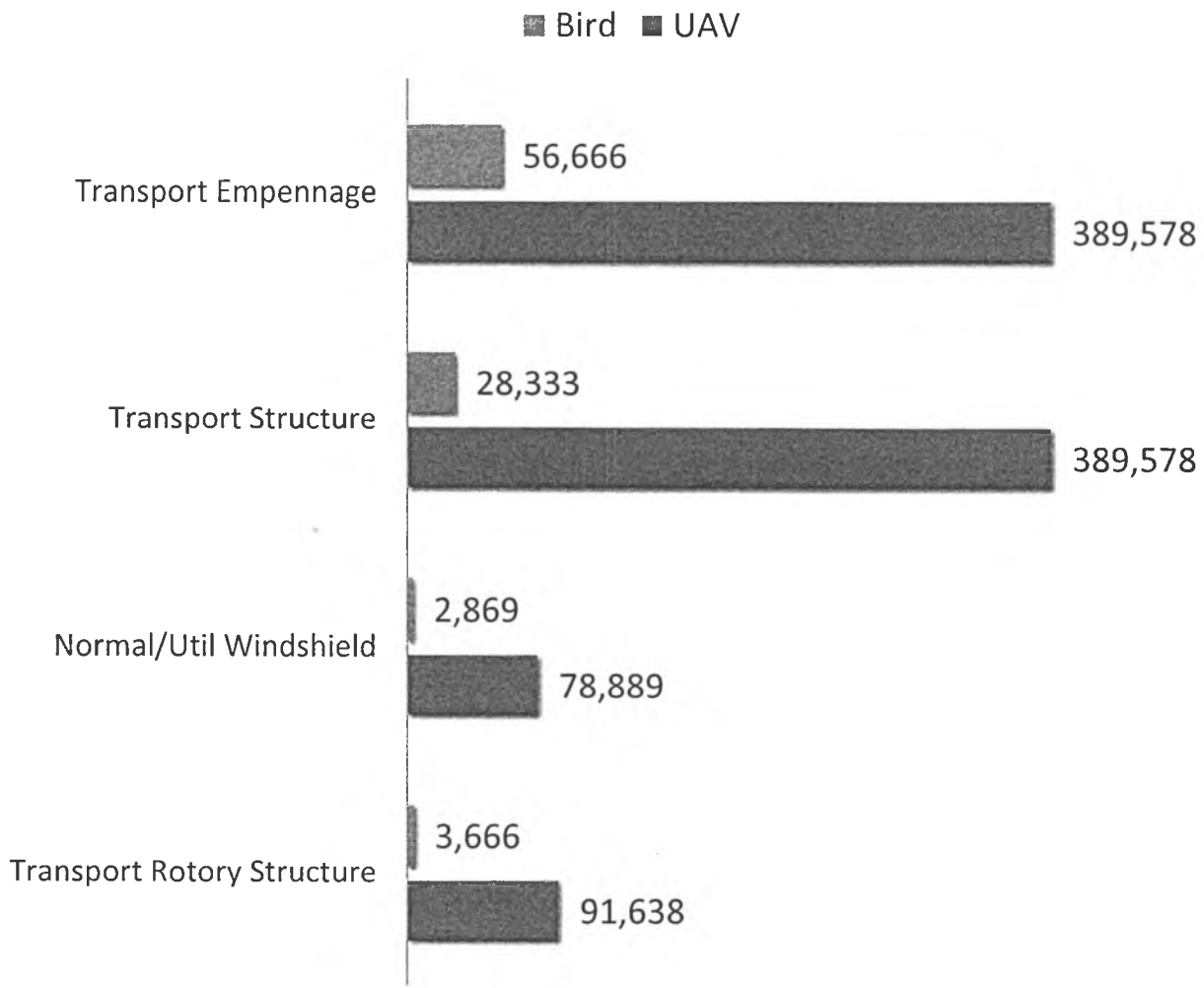
Normal/Utility/Commuter vs 2lb bird

Transport Rotorcraft vs 2.2lb bird



KE Analysis

Assumptions
55 lb UAV at 87 kts
130 kt approach speed of airliner

Same Direction

Crossing

Head-On

MTR

Same Direction

- closure rate of 43 kts – KE of the UAS is **4,502 ft-lb**

Crossing

- Closure Rate of 130 kts – KE is **41,149 ft-lb**

Head-On (Airliner)

- Closure Rate of 217 kts – KE is **114,655 ft-lb**

Head-On (Military Aircraft @ 240 kts)

- Closure Rate of 327 kts – KE is **260,357 ft-lb**

Head-On (Military Aircraft @ 400 kts)

- Closure Rate of 487 kts – KE is **577,473 ft-lb**

KE Analysis

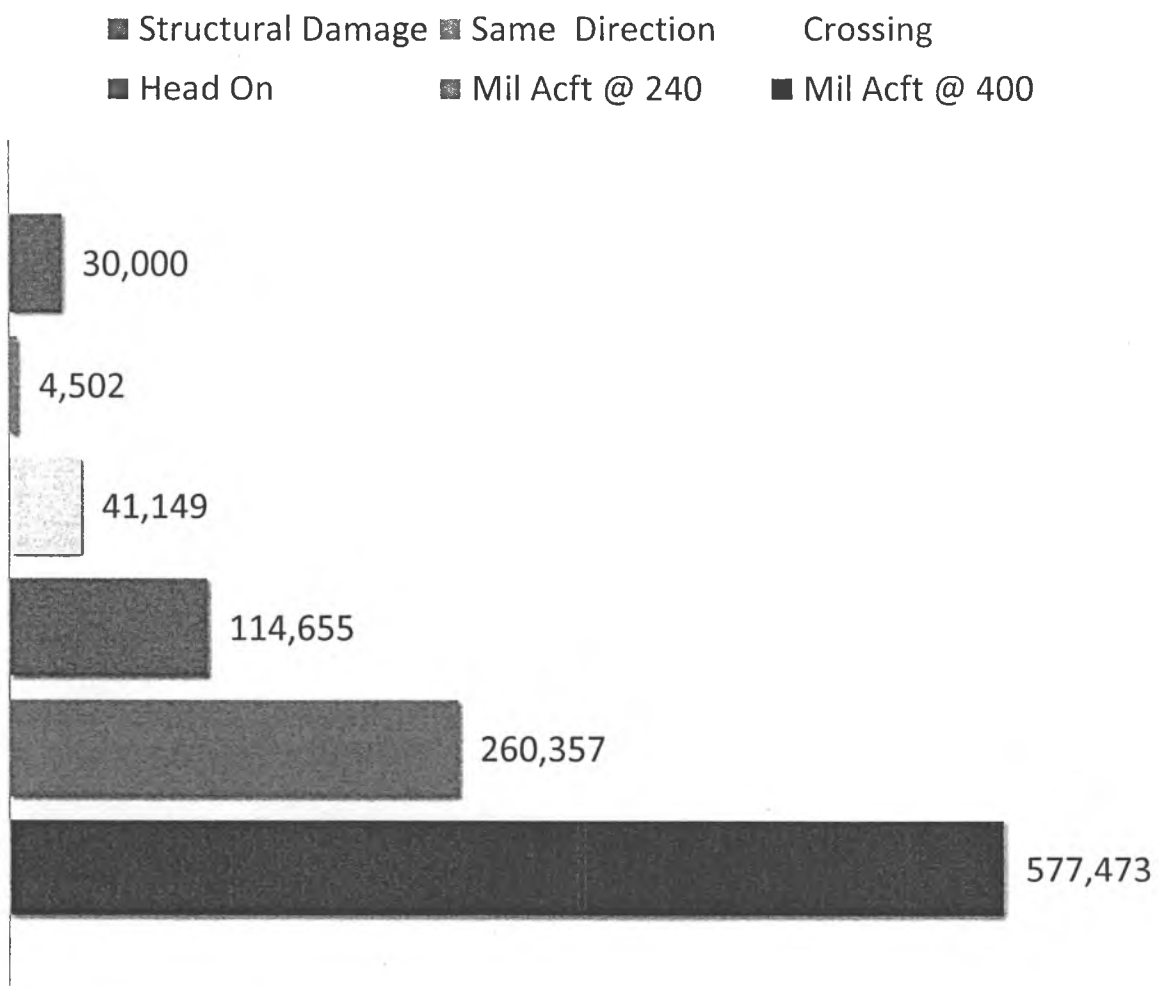
Assumptions
--55 lb UAV at 87 kts
--130 kts approach speed of airliner

Same Direction

Crossing

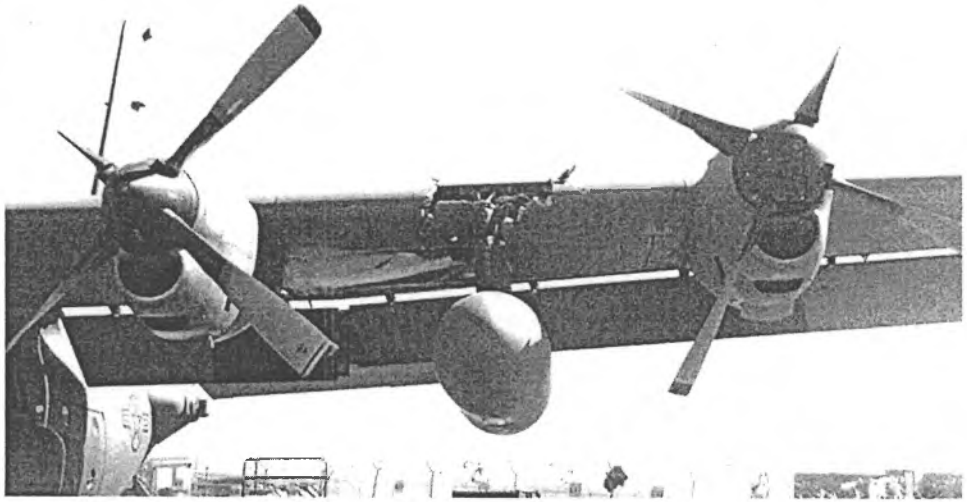
Head-On

MTR



- 375 lb UAV impacted C-130 head on
- Closure rate ~300 kts.
- KE was on the order of 1.5 million ft-lb

- UAV was almost 7 times larger than the small category
- UAV struck the C-130 directly in the wing (through the spar and into the fuel tank)
- C-130 is engineered for ruggedness more than efficiency
- C-130 has a fuel tank designed to limit the possibility of internal fires
- The strike was not directly into an engine or the cockpit



Mitigations

Aircraft

- Airworthiness standards and testing
- Required equipment

Airspace

- 250' AGL max with exceptions for obstacles and obstructions (towers, wind turbines, etc)
- 60 kts limit
- Notification / approval for any higher altitude

Airman

- Training & Certification (pilot license, in-seat training, checkrides)
- Liability insurance

Mitigations

Airworthiness Standards and Testing

- Required Equipment

Lower Altitudes and Airspeeds

- Notification for exceptions

Training and Certification

- Liability Insurance

Questions?

Pan Pacific UAS Test Range Complex
Privacy Policy

Sept 2014

PPUTRC Privacy Policy

1. All operations conducted under the sponsorship of a PPUTRC Test Range will comply with this privacy policy, whether operated by the test range itself or by the client of the test range.
2. PPUTRC will manage a record of each UAS flight, including the time date, and purpose of the flight, and the identity of the authorizing official.
3. PPUTRC will establish an auditable flight record system, including the documentation of a change in a flight time record.
4. PPUTRC will notify the public of UAS operations, either through the establishment of special or restricted use airspace, which should be depicted on FAA navigation charts, or through the issuance of a NOTAM.
5. Images and data collected through UAS flights shall not be considered public records subject to disclosure under applicable public records laws. All images and data collected shall be considered confidential and/or proprietary.

PPUTRC Privacy Policy (cont)

6. PPUTRC shall not provide images and/or data collected through UAS operations to law enforcement agencies unless required by a duly issued subpoena or court order
7. PPUTRC shall separately establish an image and data retention policy.
8. This privacy policy shall be publicly available. The public may comment on this policy at any time by contacting the following:

Geophysical Institute
PO Box 756180
Fairbanks, AK 99775-6180
gido@gi.alaska.edu
907-474-7282

Dave Mathewson, Executive Director
Academy of Model Aeronautics
5161 E Memorial Drive
Muncie, Indiana 47302

September XX, 2015

Dear Director Mathewson,

Thank you for leading the Academy of Model Aeronautics (AMA) in their quest to educate recreational aircraft pilots about safety and the responsibilities of flying and fully enjoying model aircraft. With the integration of unmanned aircraft systems (UAS) into the National Air Space, the public's attention on, and awareness of, government, commercial and hobby pilots has increased dramatically. The AMA's role in educating the public by publishing safety guidelines is critical to keeping both our skies above, and the ground below, free from tragic accidents.

Alaska is known for its vast land mass and few roads. Many of our communities are not on the road system and are only primarily accessible by air. Alaska has the highest number of private pilots per capita (2006). It is estimated that 45% of all jobs in Alaska are related to the airline industry in some way, according to a statement by the former Alaska Lt. Governor. Given these factors, it is quite realistic to assume that UAS will have a significant impact on Alaska, on our lives and our well-being. Generally, Alaskans are very receptive to UAS and are eager to receive the safety, cost savings, and improved data capture benefits of UAS as they are used not just for recreational purposes but also practical public and business purposes such as search and rescue, wildlife counts, infrastructure monitoring, mapping, fire and disaster relief, real estate, surveying, photography and videography, oil, and mining.

The Alaska State Legislature established the Unmanned Aircraft Systems Legislative Task Force in 2012 to review existing laws regarding safety and privacy applicable to UAS. The Task Force is made up of 12 members including legislators, state department designees, industry and public members, and a representative of the Academy of Model Aeronautics. The Task Force was instrumental in the passage of legislation pertaining to the parameters for law enforcement use of UAS, to provisions for public input, to the authority for training programs at the University of Alaska, and to the duty of the Task Force to report recommendations regarding privacy and other policy related to UAS to the legislature each year.

I want to thank your organization for its assistance to the Task Force in creating and distributing a safety flyer during the last holiday season as small UAS were flying off the shelves as gift

purchases. The Task Force is currently working on privacy guidelines flyer for operators and other interested Alaskans. Lastly, the Task Force holds quarterly meetings to receive updates on UAS topics, address current issues, consider policy recommendations, and provide regular opportunities for public input.

House Joint Resolution 5, passed by the Alaska State Legislature this year recognizes the important role of the Academy of Model Aeronautics in educating the public on safety and privacy guidelines. The AMA reaches a broad audience of interested pilots around the world. Alaska is proud to recognize your organization as a leader in model aeronautics and in the promotion of safe operations and privacy rights. While the State's policies regarding use of the Alaska State prevent out inclusion of the state seal in your "Know Before You Fly" safety publications and your web page relating to the materials, we encourage you to utilize the Alaska Flag or outline of the state to symbolize my administrations support of your work. As Alaska has a great history of, and appreciation of aviation, it is appropriate that it be the first state to offer such support.

we hope to

Sincerely,

Bill Walker
Governor

Alaska Drone Ban in Effect Next Week (Aug 31-Sept 2) – FA Airspace Restrictions Due to President's Visit Extend to Recreational Users

Thank you for visiting our website. It is a public education resource provided by Alaska's Unmanned Aircraft Systems Legislative Task For (UASLTF) to raise public awareness of the laws applicable to sUAS.

Shelley A. Hughes Representative Shelley Hughes

December 5, 2014

Alaska's Know-Before-You-Fly Drone Safety Guidelines

FAA allows the operation of model aircraft, also known as small Unmanned Aircraft Systems (sUAS) or drones, f recreational purposes under the Special Rule for Model Aircraft. Recreational UAS must be operated in accordance with community-based safety program and the FAA's guidance in Advisory Circular 91-57.

What is recreational use of a sUAS (Drones)?

Recreational use is the operation of a sUAS for personal interests and enjoyment, and not for compensation or hire. F example, using a sUAS to take photographs for your own personal use would be considered recreational; using the sam device to take photographs or videos for compensation or sale to another individual would be considered commercia You should check with the FAA for further determination as to what constitutes commercial sUAS operation.

SAFETY GUIDELINES FOR RECREATIONAL USERS OF sUAS (DRONES)

- Users should follow community-based safety guidelines, as developed by organizations such as the Academy of Model Aeronautics (AMA)
- Users should fly no higher than 400 feet and remain below surrounding obstacles when possible
- Users must be able to see their sUAS at all times, and use an observer to assist them if needed
- Users should remain well clear and must not interfere with manned aircraft operations, must see and avoid other aircraft and obstacles at all times, must avoid any activity that would cause a manned aircraft pilot to divert from planned operations, and must give way to all other aircraft at all times.
- Users must not intentionally fly over unprotected persons or moving vehicles, and should remain at least 25 feet away from individuals and vulnerable property
- Users must contact the airport or control tower before flying within five miles of an airport
- Users should be aware that in addition to public airports, Alaska has many private airstrips as well as bodies of waters used for take-off and landing by float planes and should not fly a UAS in the vicinity of these locations
- Users should not fly a UAS weighing more than 55 lbs unless it's certified by an aeromodelling community-based organization.

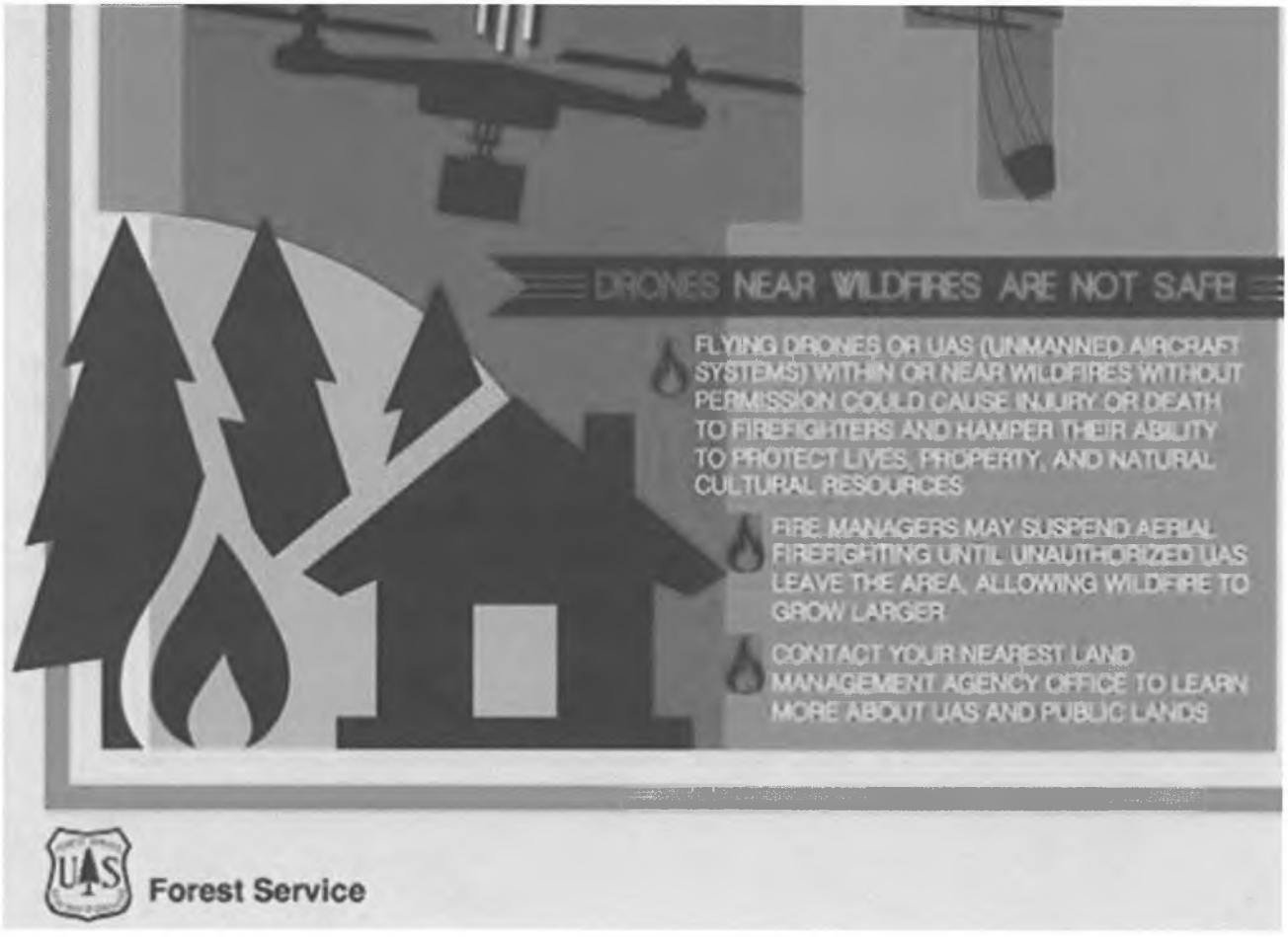
- Users should not fly in adverse weather conditions such as in high winds or reduced visibility
- Users must not fly under the influence of alcohol or drugs
- Users should ensure the operating environment is safe and that the operator is competent and proficient in the operation of the sUAS
- Users should not operate on or fly over private property without first obtaining permission from the property owner and/or tenant
- Users should not fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc.
- Users should not conduct surveillance or photograph persons in areas where there is an expectation of privacy without the individual's permission (See AMA's privacy policy)

Additional safety resources:
AMA National Model Aircraft Safety Code
FAA What Can I Do With My Model Aircraft?

This hand-out is a public education resource provided by Alaska's Unmanned Aircraft Systems Legislative Task Force (UASLTF) to raise awareness by providing a brief summary of the laws applicable to sUAS. For more information, contact 907-376-3725 or Rep.Shelley.Hughes@akleg.gov . The UASLTF would like to thank Academy of Model Aeronautics and the Association of Unmanned Vehicle Systems for their joint campaign to promote safe operations of UAS and for providing the safety guidelines listed above. All sUAS operators are responsible for reviewing and complying with applicable state and federal laws that may apply to flying sUAS. While this hand-out provides a summary of the laws applicable to sUAS, users of sUAS should not rely on this hand-out for a full understanding of applicable laws and are responsible for independently reviewing federal and state law before flying sUAS.

USDA

United States Department of Agriculture



The Unmanned Aircraft Systems Legislative Task Force encourages prospective drone operators to review the following important safety sheet to know where you are authorized to fly, for what purposes, an other safety guidelines. This sheet is also for drone vendors, drone purchasers, drone owners, and others to make available to those wh may or will be flying UAS/drones.

- Alaska "Know Before You Fly" Safety Guidelines.
- FAA "What Can I Do With My Model Aircraft?"
- Local hobby clubs. (slow loading)
- FAA's Model Aircraft Operating Standards Advisory Circular – 91-5

- Academy of Model Aeronautics' (AMA) Privacy Policy and Guideline Conduct Surveillance or Photograph Where There is an Expectatio Privacy.
- Contact the FAA to determine if your operations fall under FAA's recreational or commercial rules.

Representative Shelley Hughes
Co-Chair, Unmanned Aircraft Task Force
Toll Free: 800-565-3743
email: Rep. Shelley Hughes

Session Info:
State Capitol, Room 409
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Drone/UAS Operator Safety Guidelines and FAQ's about Privacy

Prepared by the UAS Legislative Task Force
29th Alaska State legislature

Alaskans guard their personal privacy very seriously. How do we define privacy when it comes to Unmanned Aircraft Systems (UAS) commonly known as drones? Because of the rapid development of UAS technology, this question is being contemplated worldwide, and new boundaries must be identified. A threat to safety can be pinpointed more easily because a person can see the aircraft, operator and its effects; on the other hand, a threat to privacy is not so easily pinpointed because it involves thought, sentiment, emotion and perception.

add date / version #

Header on all pages: Alaska's Drone Privacy Guidelines
Incident Reporting: FAA Aviation Safety 907-271-2000 or your local law enforcement

Inside cover page

Unmanned Aircraft Systems Legislative Task Force established by HJR 15, SLA 14

Representative Shelley Hughes, Co-Chair
Senator Peter Micciche, Co-Chair
Ethan Tyler, Commissioner Designee, Department of Commerce, Community Economic Devel.
Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
John Binder, Commissioner Designee, Department of Transportation, Public Facilities
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Steve Strait, Aviation Advisory Board
Steve Colligan, Representative Member for the Academy of Model Aeronautics
John Parker, Integrated Robotics Imaging Systems, industry representative
Steve Wackowski, Tulugaq II, industry representative
Bob May, Gallery Lodge, Kasilof, public representative

Many thanks to those who have contributed:

Ginger Blaisdell, Staff to Rep. Hughes
Jay Skaggs, FAA UAS Integration Office, Anchorage, Alaska

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disclaimer . . .

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1. When does a flying drone breach privacy?

All Alaskans have a reasonable expectation of privacy to live without fear of unwarranted personal invasion. With equal importance, Alaskans enjoy the right to be left alone. The definition for **Reasonable Expectation of Privacy** directly relates to law enforcement requirements to obtain a warrant before actions of search and seizure.

The **United States Constitution Fourth Amendment** forbids the government from performing warrantless and unreasonable searches of any area in which a person maintains a reasonable expectation of privacy.

Alaska's Constitution guarantees Alaskans the right to privacy. Article 1, Section 22 states, "The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section." The legislature has a long-standing history of protecting Alaskans' privacy by instituting **statutes** regarding stalking, harassment, indecent viewing, sending explicit images, and misusing confidential information. The UAS Legislative Task Force (UASLTF) continues to review these protections particularly as they relate to unmanned aircraft systems.

The UASLTF has prepared this document to address privacy guidelines with respect to drones and to educate UAS operators and citizens. We will look at privacy as it pertains to the specific act of intrusion into another's privacy, the prevention of intrusion into one's own privacy, and/or the act of exposing elements of one's privacy against an individual's will. This concept is recognized as **"the right to be left alone."**

Private Citizen: Please recognize that individuals experience different levels of sensitivity to interruption to privacy. Was the drone flight intentionally directed at you or just passing through? Do you believe the operator of the drone was flying in an inappropriate way? Be as specific as possible so that you can report the incident to local law enforcement.

Drone Operator: Will you be perceived as intruding on someone's privacy? Would you act in person as you do with your drone? Be courteous and respectful to others.

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FAA and the Role of Law Enforcement

The FAA promotes voluntary compliance by educating individual UAS operators about how they can operate safely under current regulations and laws. The FAA also has a number of enforcement tools available including warning notices, letters of correction, and civil penalties. The FAA may take enforcement action against anyone who conducts an unauthorized UAS operation or operates a UAS in a way that endangers the safety of the national airspace system. This authority is designed to protect users of the airspace as well as people and property on the ground.

However, State and local Law Enforcement Agencies (LEA) are often in the best position to deter, detect, immediately investigate, and, as appropriate, pursue enforcement actions to stop unauthorized UAS operations. Although the FAA retains the responsibility for enforcing FAAs regulations, FAA aviation safety inspectors, who are the agency's principal field elements responsible for following up on these unauthorized and/or unsafe activities, will often be unable to immediately travel to the location of an incident.

While the FAA must exercise caution not to mix criminal law enforcement with the FAA's administrative safety enforcement function, the public interest is best served by coordination and fostering mutual understanding and cooperation between governmental entities with law enforcement responsibilities. Although there are Federal criminal statutes that may be implicated by some UAS operations (see 49 U.S.C. § 44711), most violations of the FAA's regulations may be addressed through administrative enforcement measures. As with any other civil or criminal adjudication, successful enforcement will depend on development of a complete and accurate factual report contemporaneous with the event.

Although certainly not an exhaustive list, law enforcement officials, first responders and others can provide invaluable assistance to the FAA by taking the actions outlined below:

(1) **Witness Identification and Interviews.** Local law enforcement is in the best position to identify potential witnesses and conduct initial interviews, documenting what they observed while the event is still fresh in their minds.

(2) **Identification of Operators.** Law enforcement is in the best position to contact the suspected operators of the aircraft, and any participants or support personnel accompanying the operators. Our challenges in locating violators are marked in that very few of these systems are registered in any federal database and rarely will they have identifiable markings such as used for conventional manned aircraft.

(3) **Viewing and Recording the Location of the Event.** Pictures taken in close proximity to the event are often helpful in describing light and weather conditions, any damage or injuries, and the number and density of people on the surface, particularly at public events or in densely populated areas. During any witness interviews, use of fixed landmarks that may be depicted on maps, diagrams or photographs immeasurably help in fixing the position of the aircraft, and such landmarks also should be used as a way to describe lateral distances and altitude above the ground, structures or people.

(4) **Identifying Sensitive Locations, Events, or Activities.** The FAA maintains a variety of security-driven airspace restrictions around the country to help protect sensitive locations, events, and activities through Temporary Flight Restrictions (TFR), Prohibited Areas, and other mechanisms such as the Washington, DC Flight Restricted Zone (DC FRZ). UAS operations, including Model Aircraft flights, are generally prohibited within these defined volumes of airspace.

(5) **Notification.** Immediate notification of an incident, accident or other suspected violation to one of the FAA Regional Operation Centers (ROC) located around the country is valuable to the timely initiation of the FAA's investigation.

(6) **Evidence Collection.** Identifying and preserving any public or private security systems that may provide photographic or other visual evidence of UAS operations, including video or still picture security systems can provide essential evidence to the FAA.

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~~2.~~ My neighbor is sunbathing on her deck and my son is flying his drone...

Although the FAA governs the airspace from the ground up, help your son understand courteous flying so he doesn't disturb the neighbors or fly somewhere he shouldn't. He should never hover over your neighbor's yard.

Know Before You Fly provides recreational flying rules for hobby pilots: www.alaskadrones.org.

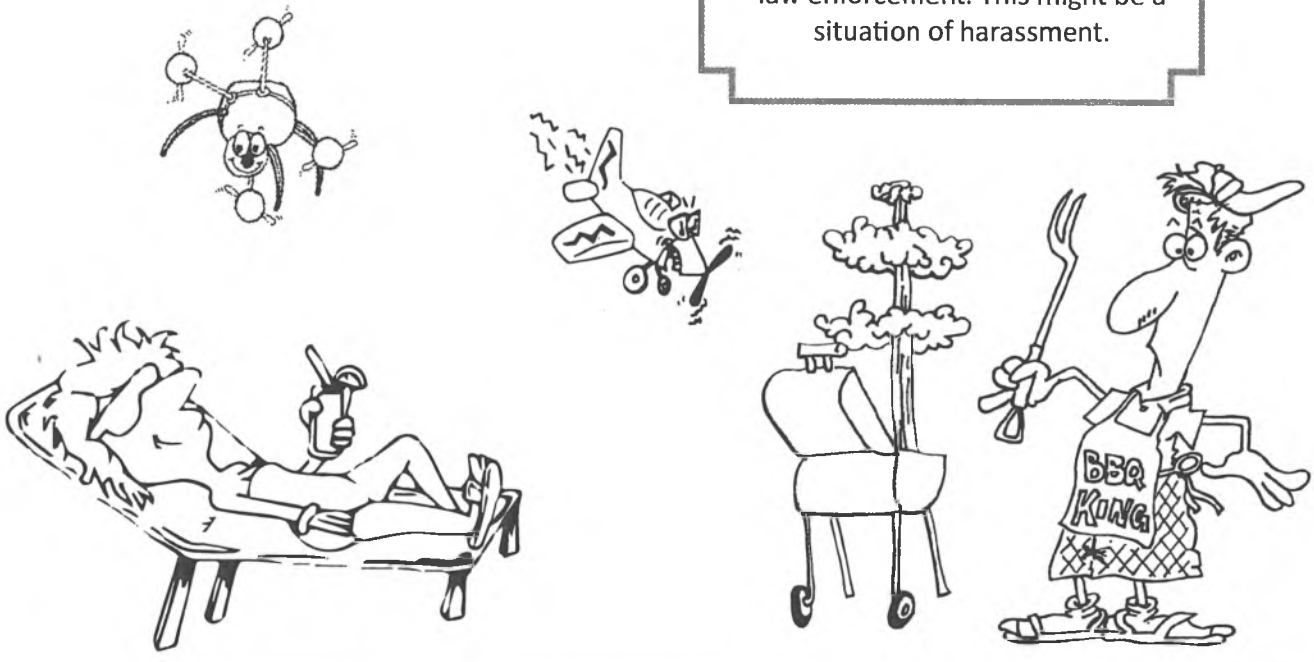
Private Citizen: The FAA governs the airspace from the ground up regardless of whether the property owner is private, public, corporate, or government. While we enjoy the sense of privacy on our property, we may not control what occurs above our heads.

Drone Operator: Fly with respect. Don't fly your drone where people typically expect privacy. Don't use your drone to harass people. In public areas, don't invade people's personal space and their solitude.

EXAMPLE

Someone is flying their drone and interrupting my relaxing evening barbequing in my backyard. They won't stop even when I "shoo" it away...

Try to identify where the drone operator is located. Provide as much information as possible to local law enforcement. This might be a situation of harassment.



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December 5, 2014

Alaska's Know-Before-You-Fly Drone Safety Guidelines

FAA allows the operation of model aircraft, also known as small Unmanned Aircraft Systems (sUAS) or drones, for recreational purposes under the Special Rule for Model Aircraft. Recreational UAS must be operated in accordance with a community-based safety program and the FAA's guidance in Advisory Circular 91-57.

What is recreational use of a sUAS (Drones)?

Recreational use is the operation of a sUAS for personal interests and enjoyment, and not for compensation or hire. For example, using a sUAS to take photographs for your own personal use would be considered recreational; using the same device to take photographs or videos for compensation or sale to another individual would be considered commercial. You should check with the FAA for further determination as to what constitutes commercial sUAS operation.

SAFETY GUIDELINES FOR RECREATIONAL USERS OF sUAS (DRONES)

- Users should follow community-based safety guidelines, as developed by organizations such as the Academy of Model Aeronautics (AMA)
- Users should fly no higher than 400 feet and remain below surrounding obstacles when possible
- Users must be able to see their sUAS at all times, and use an observer to assist them if needed
- Users should remain well clear and must not interfere with manned aircraft operations, must see and avoid other aircraft and obstacles at all times, must avoid any activity that would cause a manned aircraft pilot to divert from planned operations, and must give way to all other aircraft at all times.
- Users must not intentionally fly over unprotected persons or moving vehicles, and should remain at least 25 feet away from individuals and vulnerable property
- Users must contact the airport or control tower before flying within five miles of an airport
- Users should be aware that in addition to public airports, Alaska has many private airstrips as well as bodies of waters used for take-off and landing by float planes and should not fly a UAS in the vicinity of these locations
- Users should not fly a UAS weighing more than 55 lbs unless it's certified by an aeromodelling community-based organization.
- Users should not fly in adverse weather conditions such as in high winds or reduced visibility
- Users must not fly under the influence of alcohol or drugs
- Users should ensure the operating environment is safe and that the operator is competent and proficient in the operation of the sUAS
- Users should not operate on or fly over private property without first obtaining permission from the property owner and/or tenant
- Users should not fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc.
- Users should not conduct surveillance or photograph persons in areas where there is an expectation of privacy without the individual's permission (See AMA's privacy policy)

Additional safety resources:

AMA National Model Aircraft Safety Code FAA What Can I Do With My Model Aircraft?

This hand-out is a public education resource provided by Alaska's Unmanned Aircraft Systems Legislative Task Force (UASLTF) to raise awareness by providing a brief summary of the laws applicable to sUAS. For more information, contact 907-376-3725 or Rep.Shelley.Hughes@akleg.gov . The UASLTF would like to thank Academy of Model Aeronautics and the Association of Unmanned Vehicle Systems for their joint campaign to promote safe operations of UAS and for providing the safety guidelines listed above. All sUAS operators are responsible for

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3. Can I shoot it down if it's flying over my house?

Remember that drone is someone else's personal property. It's best to know:

- "Why is a drone flying over your property?"
- "Is it violating the law?"
- "Who and where is the drone operator?"

If you shoot it down or damage it, you may be liable for:

- Destruction of property
- Discharging a weapon in a restricted area
- If you think a drone operator is in violation of the law, immediately contact your local law enforcement agency, and provide as much detail as you can about the encounter.

Private Citizen: The value associated with a recreational drone could be $25 to much more than $1,000. The FAA is rapidly authorizing commercial use, so that a small drone could be carrying specialized equipment and cost more than $100,000. Both the hobby drone and the commercial drone may look very similar as you view it from the ground.

Drone Operator: Before you fly over private property, consider the impact of your flight on someone's privacy. Obtain the owner's permission if you plan to hover and take photos or video. If you do not have permission, data you capture should not exceed what a smart phone could capture from a public viewpoint or area nearby. Avoid flying over populated areas.

"Looks like a moving target to me!"

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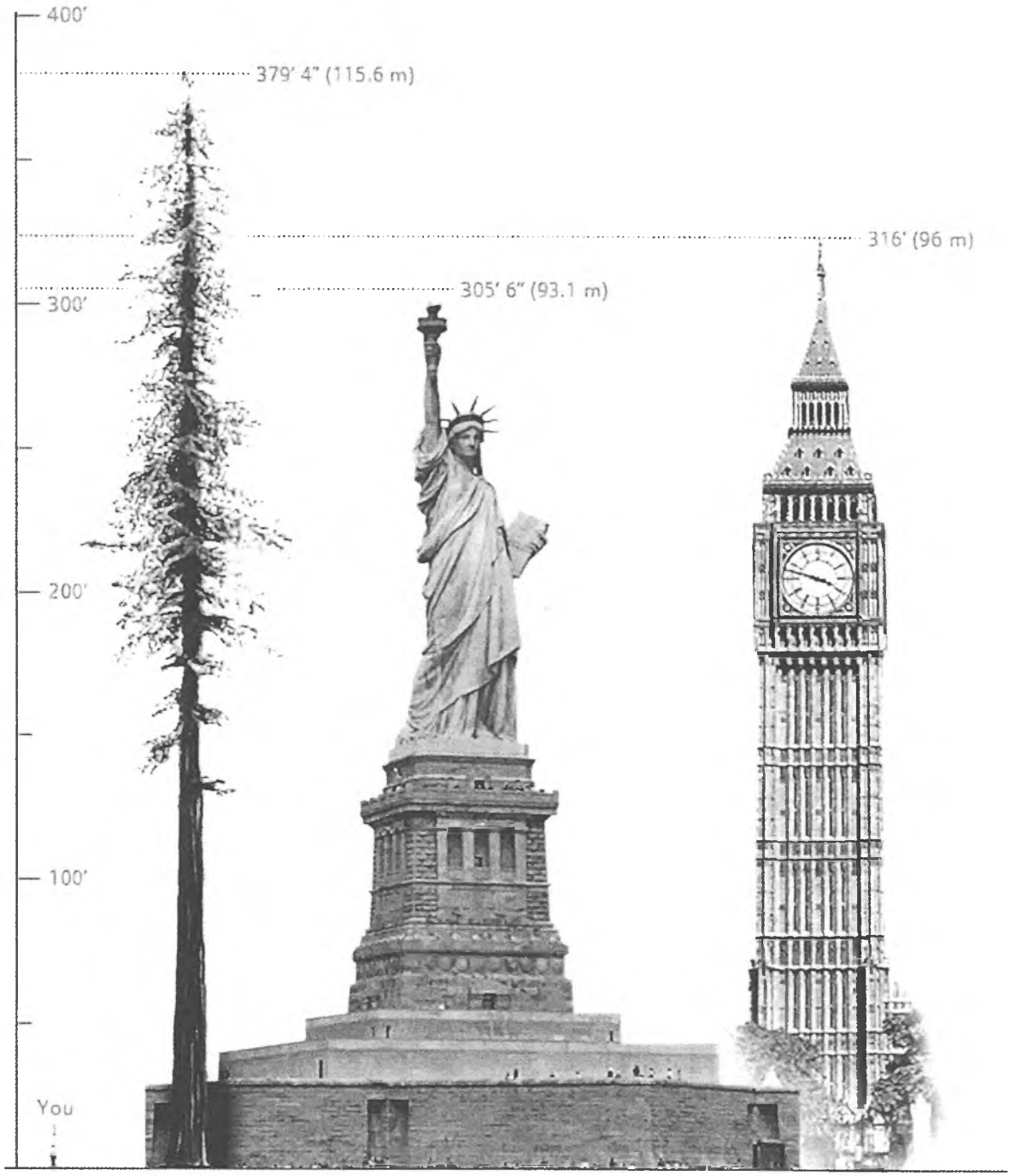
How high is 400 feet?



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4. What if a drone is photographing through my window or hovering around my house?

If you feel threatened or concerned, contact local law enforcement. Alaska has laws that address stalking and "peeping Tom" activities.

Private Citizen: A camera mounted on a drone may be treated in the same way as another camera. If an individual is flying a drone in such a way that you feel violated, local law enforcement should be contacted.

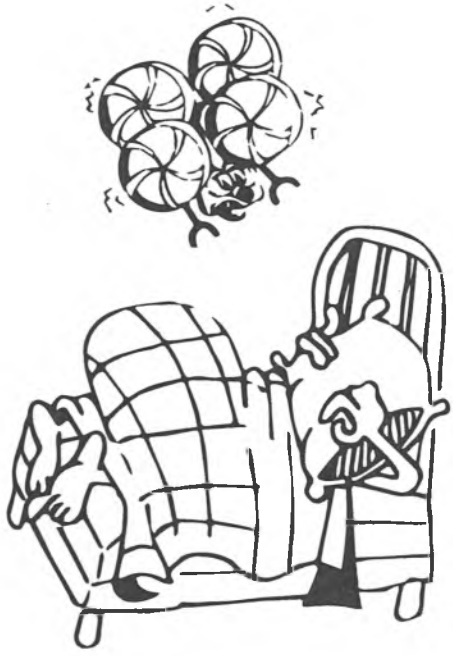
Drone Operator: Enjoy your drone with your family and friends who welcome its presence. When you don't have permission, don't hover and capture images that you couldn't capture on your smart phone while walking down the street, or from a nearby building, or from a manned aircraft overhead.

Welcomed Drone

The family drone hovering and taking a portrait when grandma came to visit.

Unwelcomed Drone

You weren't dreaming and the buzzing sound was not your alarm clock. The drone was spying through the bedroom window. Who knows where the pilot is and how those pictures might be used?



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5. The neighbor is chasing my dog with his drone!

Although the pet's owner may have introduced the dog to a flying toy, the noise and unfamiliarity of the neighbor's drone buzzing around could frighten Fido and could be considered harassment. If the dog swats the drone out of the sky and chews it up, would it be considered damaging another's personal property or self defense by the dog? Who is harrassing who? Did it occur on the dog owner's property or in a public place? There are many factors to consider.

Private Citizen: Know and follow your local animal control laws. If you're in a public area such as a local park, keep your pet away from people flying model aircraft and drones.

Drone Operator: Harassing an animal may come with criminal penalties. Be smart and protect your expensive piece of technology from animals that might view your drone as a threat and attack it.

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6. What can I do if the drone's "buzzing" is annoying me?

A drone typically makes less noise than a standard lawn mower, so fortunately you probably won't find the noise overbearing. But if the noise is annoying, likely the drone is too "near ears" and should be redirected away from people. If the drone is flown during locally recognized waking hours, a drone is probably not in violation of a noise ordinance. Because drones are relatively quiet, any noise you hear might instead be an alert to the bystander that the drone operator is flying too close to people and should be reported to the FAA for unsafe operations. This might be a situation of harassment.

Private Citizen: Many annoying noises are allowable in both public and private areas. The decibel limit separating acceptable noise level is generally compared to the noise of a standard lawn mower or small engine.

Drone Operator: The drone's "buzzing" may not be the only problem. The proximity of the aircraft to another person and the length of time in that proximity may be the real issue. Be courteous to others, don't hover your UAS "near ears," and stay away unless invited.

replace picture with mean drone bothering sunbathing man

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do we want to add: ?

UAS are aircraft - please know the rules

cannot use to assist in hunting (regs)
" " " fishing (regs)

when in doubt check NOTAMS
or call your local airport

left side

I understand why it's not safe to fly a drone near heavy traffic but what about privacy?

A drone flying near traffic could distract drivers and create unsafe driving conditions including accidents. Drivers should keep their eyes on the road, and drone operators should keep their UAS away from traffic.

Private Citizen: Not only are drones dangerous over busy traffic but most drivers don't want to be GPS tracked and photographed. If you see one, keep your eyes on the road. Pull over to report it to local law enforcement if you think it's creating unsafe conditions or collecting data inappropriately.

Drone Operator: Flying over roads can cause distraction and potential automobile accidents on a road system. Don't fly your drone near high traffic roadways.

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~~left~~ Right side

safety

happy drone

track meet image

left side

8. What safety and privacy concerns can there be when you're in a crowd?

Sometimes photographing a crowd could result in the capture of inadvertent images. If the drone image shows Captain Blowhole with a catch beyond his limit, that image could be provided to the authorities for legal review.

Private Citizen: Typically, if you're in a crowd, privacy is limited. Although the safety concerns are paramount when a drone is flying above a crowd, the photography could identify something that a citizen would not want shared, such as your secret fishing hole.

Drone Operator: Never fly above a crowd; even a happy drone can create quite a stir. As a drone operator, you know how easy the slightest wind change can cause your aircraft to change direction quickly or drop out of the sky. Although most recreational drones are very light weight, spinning propellers can cause injury.

Safety

If the drone were to fall out of the sky it could injure a bystander. The drone could also compromise the safety of the crowd by interfering with the activity or distracting people, thus rendering them unaware of happenings nearby.

Privacy

During fishing season, this drone inadvertently photographed Clyde's map to Grandpa's secret fishing hole. Because the map was visible in a public area, the photo of the map might be shared with others. Clyde's secret fishing hole is no longer secret.

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How will the photos/video be stored or used?

Inappropriate use of images or data captured by technological devices concern Alaskans. If you believe someone has obtained images or data illegally or plans to use them illegally, contact local law enforcement. Be able to answer the following questions: Is the drone operator using the images for inappropriate purposes? Are images being posted in an inappropriate way? Are the images being used for personal gain? Was personal identification stolen?

Private Citizen: Many recreational drone operators have posted video and pictures on social media sites. Enjoy this new interesting form of photography. If you come across footage that you believe may be a violation of privacy, contact local law enforcement.

Drone Operator: If you are photographing something with your drone in a place where you would not be welcomed if you were taking pictures in person, you shouldn't be there. Make sure you don't save or post footage that breaches someone's privacy. If you don't want someone else posting similar footage of you or your property, destroy the footage. Don't post it.

EXAMPLE

A drone is used to record your PIN over your shoulder while you are at the ATM.

A drone records images through your office window of a newly signed contract.

A drone peers through the window while your child is napping.

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10. What happens if a drone captures inadvertent images?

Private Citizen: What happens if a drone captures inadvertent images and those images are posted on social media or reveal something questionable? Photographing in a public area could result in capturing an image that may not have been planned. The image could be of a person not wanting to be photographed but may not be a breach of privacy since it occurred in a public place.

Drone Operator: Be aware of and be sensitive to what you are photographing. Are you capturing proprietary information? If you capture an image of someone appearing to break the law, you may want to surrender images to local authorities. Some people may not want to be photographed and their expectation of privacy could result in an angry situation. Again, if you are photographing something with your drone, in a place where you would not be welcomed if you were taking pictures in person, redirect your drone elsewhere.

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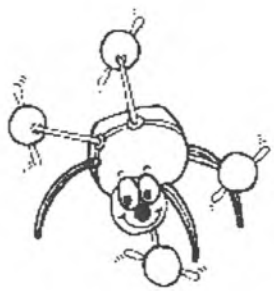
Not about privacy, but another common question...

~~11.~~ Can I use a drone for my business?

Today, the FAA prohibits commercial use of unmanned aircraft systems unless the business has been granted a waiver to use the aircraft for specific purposes in the business. Businesses are beginning to receive authorization to use Unmanned Aircraft Systems for commercial use. Thus far, the most common authorizations have been awarded for specific movie production and specific agriculture tasks.

Aircraft continue to advance technologically and many people are waiting for the opportunity to use drones as part of business.

You must obtain authorization from the FAA if you want to use your drone for commercial purposes. The time will come when safety concerns have been well vetted and business use will become commonplace, but at this time, any commercial use of your drone must be authorized by the FAA at the Aviation Safety Hotline 866-835-5322 option 4 for unmanned aircraft reporting and information or online at FAA.gov/contact/safety.



DISCLAIMER: The purpose of this publication, "Drone/UAS Operator Guidelines FAQs about Privacy" is to provide informational aid and overview of certain federal and state laws that may apply to drone/UAS operation. This publication is not intended to provide legal advice or a comprehensive review of all federal and state laws relating to drone/UAS operation. Laws will almost certainly change, particularly in the rapidly developing areas of the law at the federal and state level regarding drone/UAS operation. Before a person operates a drone/UAS, or pursues a legal claim related to drone/UAS operation, it is the sole responsibility of that person to review applicable laws, and seek legal advice if necessary, regarding the person's rights and liabilities. The publishers of this publication disclaim all liability and are not responsible for damages related to the contents of this publication.

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Thank you for reviewing these guidelines!

Know your rights and your responsibilities.

Now go enjoy life in a world where UAS technology is changing daily and where the UASLTF continues to look out for you!

Please visit the following web sites for additional information regarding flying your drone:

Federal Aviation Administration, unmanned aircraft section www.faa/gov/uas
Academy of Model Aeronautics, www.modelaircraft.org
Alaska State Legislature, www.alaskadrones.org
University of Alaska Fairbanks, www.acuasi.alaska.edu
FAA UAS Test Range, www.acuasi.alaska.edu/pputrc

To report suspicious behavior of a drone and its operator, please contact your local law enforcement authority.

Alaska Statutes that could be applied to inappropriate drone use:

AS 11.16.120(a)(6)
AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means
AS 11.61.120(a)(6) Harassment, publishing or distributing certain images
AS 11.61.123 indecent viewing or photography
~~AS 11.16.120(a)(6)~~
AS 45 Personal Information Protection Act
AS 11.61.116 Sending an explicit image of a minor
~~AS 11.61.120(a)(6) Harassment: publishing or distributing certain images~~
~~AS 11.61.123 Indecent viewing or photography~~
AS 11.76.113 and AS 11.76.115 Misconduct involving confidential information in the first and second degree

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for more information and hyperlinks to web sites go to:

www.alaskadrones.org

footer

name	affiliation	would you like to testify
Ron Tremain	INSITU SCANEAGLE	Y (N)
Ken Kokjer	Self	?
Rachel Thomas	Self	No
Terry Hinman	self	?
Rich Sewell	DOT&PF/statewide Aviation	No.
ERIC FOLKESTAD	CASCADE AUVSI	YES
Jeremy Worrall	DOT&PF	NO
Jay Skaggs	FAA	NO
John Nevadomsky	UAF	No
BILL TART	ASRC	?
TED RALSTON	U HAWAII/NDPTC	YES
ROBERT HESS	LOCKHEED MARTIN	No.
Dorothy Hagen/My	Self	No
Rebecca Hatfield	self	No.

EventDATETIME	LocationCITY	LocationSTATE	EventREPORTNARRATIVE	Item Type	Path
11/13/2014 15:34	Viginia Key	Florida	PRELIM INFO FROM FAA OPS: VIRGINIA KEY, FL/UAS INCIDENT/1534E/MIA TRACON RECEIVED REPORT FROM AMERICAN 397, B737, SJU-MIA, OBSERVED A CYLINDRICAL RED AND SILVER UAS HEADING EASTBOUND AT 8,000 FEET 6 W VIRGINIA KEY, FL. MIAMI DADE PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/13/2014 16:44	Las Vegas	Nevada	PRELIM INFO FROM FAA OPS: LAS VEGAS, NV/UAS INCIDENT/1644P/LAS VEGAS ATCT ADVISED MERCY AIR 21, HELICOPTER, 3 NW LAS AT 2,800 FEET W BOUND, REPORTED A UAS OFF THE RIGHT SIDE OF THE AIRCRAFT HEADING N BOUND. NO CONFLICTS REPORTED. LAS VEGAS METRO PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/14/2014 13:55	Los Angeles	California	PRELIM INFO FROM FAA OPS: LAX/UAS INCIDENT/1355P/SCT RECEIVED REPORT FROM CANADA REGISTERED ROUGE 1874, A319, CYYC-LAX, OBSERVED A PURPLE UAS AT 2,600 FEET 6 E LAX. LEOS NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/14/2014 16:09	Norfolk	Virginia	PRELIM INFO FROM FAA OPS: ORF/UAS INCIDENT/1609E/ORF ATCT ADVISED PA32, AT 3,000 FEET REPORTED A UAS OFF RIGHT SIDE OF ACFT AT 2,100 FEET FLYING AT 85 KNOTS 20 S ORF. UAS HAD A TRANSPONDER AND SQUAWKING. TARGET WILL BE TRACKED ATC.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/14/2014 18:58	Scottsdale	Arizona	PRELIM INFO FROM FAA OPS: SCOTTSDALE, AZ/UAS INCIDENT/1858P/PHOENIX TRACON ADVISED THAT A CITIZEN REPORTED A UAS WITH MULTIPLE LIGHTS WAS FLYING ABOUT 100 FEET ABOVE HIS HOME , SCOTTSDALE. PHOENIX PD NOTIFIED .	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/15/2014 14:30	Tuscaloosa	Alabama	PRELIM INFO FROM FAA OPS: TUSCALOOSA, AL/UAS INCIDENT/11-15 1430C/LEO'S REPORTED UAS OPERATION IN TFR OUTSIDE UNIVERSITY OF ALABAMA FOOTBALL STADIUM PRIOR TO GAME. DURING ATTEMPTED LANDING UAS STRUCK BYSTANDER IN MIDSECTION. LEO'S RESPONDED. FSDO INVESTIGATING INCIDENT. NO REPORTED INJURY TO INDIVIDUAL STRUCK BY UAS.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/15/2014 19:10	Fort Lauderdale	Florida	PRELIM INFO FROM FAA OPS: FORT LAUDERDALE, FL/UAS INCIDENT/1910E/FLL ATCT ADVISED ROBINSON R44 REPORTED A UAS WITH A SINGLE RED LIGHT FLYING AT 700 FEET 5 W FLL. BROWARD SHERIFF NOTIFIED	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/18/2014 17:10	New York	New York	PRELIM INFO FROM FAA OPS: NEW YORK, NY/UAS INCIDENT/1710E/JETBLUE CORPORATION REPORTED JETBLUE 1572, A319, SAW POSSIBLE UAS FLY UNDER NOSE OF ACFT WHILE INBOUND TO LA GUARDIA ARPT BETWEEN 1,500 AND 2,000 FEET ON 11-18 AT 1639E.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/19/2014 13:57	New York	New York	PRELIM INFO FROM FAA OPS: NEW YORK, NY/UAS INCIDENT/1357E/JFK ATCT ADVISED JETBLUE 842, A320, SAVANNAH, GA - JFK, ON 2 MILE FINAL FOR RUNWAY 31R OBSERVED A UAS OPERATING AT 300-400 FEET. NASSAU COUNTY PD AND NYPD AVIATION UNIT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/19/2014 16:17	Boston	Massachusetts	PRELIM INFO FROM FAA OPS: BOSTON, MA/UAS INCIDENT/1617E/BOSTON ATCT ADVISED LOCAL VFR HELICOPTER SPOTTED A LARGE UAS ORBITING AT 400 FEET IN CLASS B AIRSPACE 5 SW BOSTON LOGAN INTERNATIONAL ARPT. MASSACHUSETTS STATE POLICE NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/20/2014 14:50	New York	New York	PRELIM INFO FROM FAA OPS: NEW YORK, NY/UAS INCIDENT/1450E/LGA REPORTED SIKORSKY S76B OBSERVED 2 UAS OPERATING AT 500 FEET 4 W LGA, VCNTY EAST RIVER 59TH STREET BRIDGE.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/21/2014 13:03	Fort Rucker	Alabama	PRELIM INFO FROM FAA OPS: FORT RUCKER, AL/UAS INCIDENT/1303C/TEXAN 2, T6, REPORTED NMAC WITH UAS, 4 S CAIRNS AAF AIRPORT, AT 2,000 FEET. UAS WAS 6-10 FEET IN LENGTH. LEOS NOTIFIED (MILITARY PD).	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/21/2014 16:57	Macon	Georgia	PRELIM INFO FROM FAA OPS: MACON, GA/UAS INCIDENT/1657E/MACON ATCT ADVISED THAT HAWKER BEECHCRAFT BE35 PASSED A UAS ON HIS LEFT SIDE WHILE SOUTHBOUND AT 2,500 FEET JUST NORTH OF THE MEDICAL CENTER OF CENTRAL GEORGIA. UAS DESCRIBED AS LIGHTED BLACK AND RED IN COLOR AND ABOUT 14 INCHES IN DIAMETER. UNKN IF LEOS NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/24/2014 14:50	Beaumont	Texas	PRELIM INFO FROM FAA OPS: BEAUMONT, TX/UAS INCIDENT/1450C/HOUSTON ARTCC ADVISED THUNDER WINGS AVIATION 303, CESSNA C501, 50 N BPT AT FL200 REPORTED A UAS 2 FEET IN DIAMETER APPROXIMATELY 1,000 FEET BELOW. NO CONFLICTS REPORTED. LEOS NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database

11/28/2014 11:25 Santa Ana	California	PRELIM INFO FROM FAA OPS: JOHN WAYNE ARPT, SANTA ANA, CA/UAS INCIDENT/1125P/SOUTHERN CALIFORNIA TRACON ADVISED PIPER PA28 REPORTED A UAS HOVERING BETWEEN 2,000 - 3,000 FEET 4 MILES SOUTH OF JOHN WAYNE ARPT. NO DESCRIPTION OF THE UAS WAS GIVEN OR EVASIVE ACTIONS TAKEN. ORANGE COUNTY PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/28/2014 11:50 West Palm Beach	Florida	PRELIM INFO FROM FAA OPS: WEST PALM BEACH, FL/UAS INCIDENT/1150E/WEST PALM BEACH ATCT REPORTED SEVERAL ACFT : NORTH AMERICAN NAVI; DASSAULT F2TH; AND NETJETS 955, CESSNA C750, ALL WESTBOUND ON 1 MILE FINAL FOR RUNWAY 28R REPORTED A UAS OVER THE BEACH DESCRIBED AS A "GO PRO" AT 700 TO 800 FEET. NO EVASIVE ACTIONS TAKEN. PALM BEACH COUNTY SHERIFF NOTIFIED , POLICE HELICOPTER EAGLE 1 SEARCHING THE AREA.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/28/2014 15:35 Beverly	Massachusetts	PRELIM INFO FROM FAA OPS: BEVERLY MUNI ARPT, MA/UAS INCIDENT/1535E/BOSTON TRACON ADVISED CESSNA C175 REPORTED A BLACK UAS WITH A SINGLE RED LIGHT, BETWEEN 3 - 10 FEET WIDE IN THE VCNTY OF BEVERLY MUNI ARPT AT 8,500 FEET. NO EVASIVE ACTIONS TAKEN OR NO LEO NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/29/2014 11:28 Houston	Texas	PRELIM INFO FROM FAA OPS: HOUSTON INT'L, TX/UAS INCIDENT/1128C/HOUSTON TRACON ADVISED EXPRESSJET 4277, E145, REPORTED A UAS HAD PASSED OFF OF HIS LEFT SIDE AT 2,500 FEET 14 MILES SE HOUSTON INT'L ARPT. NO EVASIVE ACTION TAKEN. NO DESCRIPTION GIVEN. LOCAL FBI NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/29/2014 15:22 Washington	District of Columbia	PRELIM INFO FROM FAA OPS: WASHINGTON, DC/UAS INCIDENT/1500E/POTOMAC TRACON ADVISED PIPER PA31 REPORTED A UAS AT 9,000 FEET 50 MILES SOUTH OF DCA ARPT. NO DESCRIPTION WAS GIVEN. NO LEO NOTIFIED. FOLLOW-UP INFO FROM FAA OPS: WASHINGTON, DC/UAS INCIDENT/1522E/POTOMAC TRACON REPORTED THE UAS WAS DESCRIBED AS SILVER AND BLACK, 3 FEET LONG WITH THINGS STICKING OUT OF IT. NO DIRECTION OF TRAVEL WAS GIVEN. FAA NOTIFIED ESSEX COUNTY SHERIFF.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/29/2014 16:14 Daytona Beach	Florida	PRELIM INFO FROM FAA OPS: DAYTONA BEACH, FL/UAS INCIDENT/1614E/DAYTONA BEACH TRACON ADVISED CESSNA C172 REPORTED A UAS BLUE IN COLOR HEADING NORTHEAST BOUND AT 4,500 FEET 10 MILES EAST OF DAYTONA BEACH. NO EVASIVE ACTION TAKEN. VOLUSIA COUNTY SHERIFF NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
11/30/2014 17:20 Andrews AFB	Maryland	PRELIM INFO FROM FAA OPS: ANDREWS AFB, MD/UAS INCIDENT/1720E/ANDREWS ATCT ADVISED THAT AN UNIDENTIFED GULFSTREAM REPORTED A UAS ON A 3 MILES FINAL TO RUNWAY 19R. UAS WAS DESCRIBED AS A LARGE VULTURE. PRINCE GEORGES COUNTY PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/4/2014 10:57 Los Angeles	California	PRELIM INFO FROM FAA OPS: LOS ANGELES, CA/UAS INCIDENT/1057P/LAX ATCT ADVISED MESA 5400, CRJ9, REPORTED A UAS AT 2,600 FEET WHILE ON A 12 MILE FINAL FOR RUNWAY 24R. UAS WAS WHITE, 1 FOOT BY 1 FOOT AND CAME WITHIN 500 FEET OF THE ACFT. NO EVASIVE ACTION REPORTED. LAPD AVIATION UNIT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/5/2014 13:14 Herndon	Virginia	PRELIM INFO FROM FAA OPS: HERNDON, VA/UAS INCIDENT/0930E/FAA NCRCC RECEIVED TELEPHONE CALL AND EMAIL FROM FAIRFAX COUNTY POLICE HELICOPTER DIVISION REGARDING ONGOING DRONE ACTIVITY. THE UAS DESCRIPTION WAS RED AND GREEN LIGHTS PROTRUDING FROM IT. THIS INCIDENT HAPPENED ON 5TH OF DECEMBER AT 2200E.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/7/2014 16:35 Miami	Florida	PRELIM INFO FROM FAA OPS: MIAMI, FL/UAS INCIDENT/1635E/MIAMI APCH ADVISED SKY10, HELICOPTER, AND METRO POLICE 6, HELICOPTER, REPORTED UAS AT 150 FEET, 3 E MIA ON THE RUNWAY 26R FINAL. UAS DESCRIBED AS HELO TYPE WITH 4 PROPELLERS. NO CONFLICTS REPORTED. METRO PD AVIATION UNIT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/8/2014 8:25 Los Angeles	California	PRELIM INFO FROM FAA OPS: LAX/UAS INCIDENT/12-8 0825P/COMPASS 6423, E170, SFO-LAX, POSSIBLE DRONE SIGHTING RUNWAY 25L FINAL APPROACH 1 EAST LAX AT 400 FEET. UAS WAS ROUND/CYLINDRICAL MOVING RIGHT TO LEFT AWAY FROM THE RUNWAY. SUNLIGHT APPEARED TO REFLECT OFF OBJECT. NO CONFLICTS OR EVASIVE ACTION REPORTED. LEO NOT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database

12/11/2014 12:55	New Orleans	Louisiana	PRELIM INFO FROM FAA OPS: NEW ORLEANS, LA/UAS INCIDENT/1255C/CHAUTAUQUA 6172, E145, NEW ORLEANS - MEMPHIS, REPORTED A LARGE WHITE SINGLE PROP UAS 100 YARDS AWAY WHILE WESTBOUND ON FINAL APPROACH FOR RUNWAY 1 AT 900 FEET. NO EVASIVE ACTION REQUIRED. ST. CHARLES SHERIFF DEPT. NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/12/2014 12:31	Jacksonville	Florida	PRELIM INFO FROM FAA OPS: JACKSONVILLE, FL/UAS INCIDENT/1231E/MILITARY VVAJ700, H60, REPORTED AN UNKN UAS AT 1,000 FEET 4.2 W OF JACKSONVILLE NAS. NO EVASIVE ACTION TAKEN. NO LAW ENFORCEMENT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/14/2014 12:50	Tamiami	Florida	PRELIM INFO FROM FAA OPS: TAMIAMI, FL/UAS/1250E PIPER P28A REPORTED A MODEL AIRPLANE FLYING OFF HIS RIGHT WING AT 1,200 FEET VCNTY TAMIAMI. CZECH PIPER SPORT, ALSO REPORTED SEEING THE MODEL ACFT.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/14/2014 13:12	Carlsbad	California	PRELIM INFO FROM FAA OPS: CARLSBAD, CA/UAS INCIDENT/1312P/CRQ ATCT ADVISED AN OFF DUTY PILOT REPORTED 3 REMOTE CONTROL HELICOPTERS OPERATING 1.5 E CRQ, ALTITUDE UNKN. CARLSBAD PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/14/2014 20:15	Miami	Florida	PRELIM INFO FROM FAA OPS: MIAMI, FL/UAS INCIDENT/2015E/LIFE FLIGHT HELICOPTER, REPORTED SEEING A UAS AT OR ABOUT 150 FEET EQUIPPED WITH NAV LIGHTS 5 S MIA. MIAMI DADE POLICE AVIATION UNIT WAS NOTIFIED. FOLLOW UP INFO FROM FAA OPS: MIAMI, FL/UAS INCIDENT/2048E/ZMA REPORTS MIAMI DADE POLICE FOUND OPERATOR FLYING UAS 5 S MIA AND ADVISED NOT TO FLY .	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/16/2014 15:04	Kansas City	Missouri	PRELIM INFO FROM FAA OPS: MKC/UAS INCIDENT/12-14 1504C-DELAYED REPORT/KANSAS CITY ARTCC ADVISED THAT AN OFF DUTY PILOT REPORTED A QUAD COPTER OVER THE SOUTH END OF THE BROADWAY BRIDGE HOVERING 50 FEET ABOVE THE TOP OF THE BRIDGE. UNKN IF LEO NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/16/2014 15:59	Van Nuys	California	PRELIM INFO FROM FAA OPS: VAN NUYS, CA/UAS INCIDENT/1559P/VAN NUYS ATCT ADVISED ROBINSON R66 REPORTED SMALL UAS OVER THE NW CORNER OF THE PARKING RAMP AT 100 FEET. NO CONFLICTS REPORTED BUT ADVISED IT WAS A HAZARD. LEO'S NOT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/19/2014 11:08	Savannah	Georgia	PRELIM INFO FROM FAA OPS: SAVANNAH, GA/UAS INCIDENT/12-19 1108E CIRRUS SR22 REPORTED UAS OPERATING 1 TO 2 MILES OFF RIGHT WING AT 6,000 FEET 9 NNE SAVANNAH. DIRECTION OF MOVEMENT UNKNOWN. UAS APPEARED ROUND BODIED AND APPROXIMATELY 15 FEET ACROSS. NO EVASIVE ACTION TAKEN. LEO NOTIFICATION UNKNOWN.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/20/2014 14:00	Los Angeles	California	PRELIM INFO FROM FAA OPS: LAX/UAS INCIDENT/1400P/SCT ADVISED CANADAIR CL60 AT 5,000 FEET REPORTED A UAS AT SAME ALTITUDE 15 E LAX. LA CO SHERIFF NOTIFIED. NO EVASIVE ACTION TAKEN.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/22/2014 22:31	West Palm Beach	Florida	PRELIM INFO FROM FAA OPS: WEST PALM BEACH, FL/UAS INCIDENT/2231E/WEST PALM BEACH APPROACH ADVISED THAT WEST PALM BEACH ARPT OPS CALLER REPORTED A UAS (ALTITUDE AND DIRECTION OF FLIGHT NOT REPORTED) ORBITING AROUND THE APPROACH FOR RUNWAY 10L 6 W WEST PALM BEACH ARPT. PALM BEACH SHERIFF AIR AND GROUND UNITS SEARCHING AREA FOR UAS AND OPERATOR.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/24/2014 9:16	Honolulu	Hawaii	PRELIM INFO FROM FAA OPS: HONOLULU, HI/UAS INCIDENT/0916L/2 TOUR HELICOPTERS WEST OF DIAMOND HEAD CRATER, REPORTED A UAS OPERATING AT 200 FEET VCNTY BEACH FRONT PARK. USSS AND LOCAL PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/25/2014 15:01	Wichita	Kansas	PRELIM INFO FROM FAA OPS: WICHITA, KS/UAS INCIDENT/1501C CESSNA C172 REPORTED A RED AND WHITE UAS 2 FEET IN DIAMETER AT 6,000 FEET 4 SE WICHITA. PILOT STATED THAT UAS ALMOST HIT ACFT. LEO NOTIFICATION UNKNOWN.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/27/2014 10:02	Princeton	New Jersey	PRELIM INFO FROM FAA OPS: PRINCETON/ROCKY HILL, NJ/UAS INCIDENT/0945E/NEW YORK TRACON ADVISED CESSNA C172 REPORTED A UAS OVER PRINCETON ARPT (39N) AT 3,500 FEET. NO CONFLICTS REPORTED. NJ STATE PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/27/2014 14:20	Salem	New Jersey	PRELIM INFO FROM FAA OPS: SALEM, NJ/UAS INCIDENT/1420E/HOPE CREEK NUCLEAR PLANT PERSONNEL REPORTED A UAS TRANSITIONING THE COASTLINE ADJACENT TO THE PLANT FROM SOUTH TO NORTH, NO ADDITIONAL INFO PROVIDED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database

12/28/2014 15:02	San Carlos	California	PRELIM INFO FROM FAA OPS: SAN CARLOS, CA/UAS INCIDENT/1502P/SAN CARLOS ATCT ADVISED CESSNA C172 REPORTED A WHITE UAS, SMALL IN SIZE, AT 1,500 FEET 4 S SAN CARLOS. NO CONFLICTS REPORTED. PRELIM INFO FROM FAA OPS: SAN CARLOS, CA/UAS INCIDENT/1512P/SAN CARLOS ATCT ADVISED SAN CARLOS FLIGHT CENTER 44, ROBINSON R44, WHILE ON 3 MILE FINAL RUNWAY 30, REPORTED A WHITE UAS, SMALL IN SIZE, WITH 4 PROPELLERS AT 1,500 FEET 4 SW SAN CARLOS. NO CONFLICTS REPORTED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/28/2014 16:25	Ft Lauderdale	Florida	PRELIM INFO FROM FAA OPS: FT LAUDERDALE, FL/UAS INCIDENT/1625E/MIAMI APCH ADVISED US AIRWAYS 1760, A320, AFTER LANDING REPORTED A WHITE UAS AT 3,400 FEET 7 NW FLL. NO CONFLICTS REPORTED. LEO'S NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/29/2014 9:35	Boston	Massachusetts	PRELIM INFO FROM FAA OPS: BOSTON, MA/UAS INCIDENT/0935E/BOSTON ATCT REPORTED JAZZ 7678, CRJ2, MONTREAL, CANADA - BOSTON, SEEING A SMALL DARK UAS WHILE ON .25 FINAL TO RUNWAY 33L JUST BELOW HIM MOVING LEFT TO RIGHT AT UNKN ALTITUDE. FBI NOTIFIED AND RESPONDING TO ATCT.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
12/29/2014 11:30	Redding	California	PRELIM INFO FROM FAA OPS: REDDING, CA/UAS INCIDENT/1130P/READING ATCT REPORTED THAT CESSNA C172 REPORTED A SMALL UAS DESCRIBED AS AN RC TYPE, 500 FEET BELOW ACFT ALTITUDE. NO EVASIVE ACTION REQUIRED. TOWER OBSERVED THE UAS FOR ABOUT 10 MINS WHILE IN THE PATTERN. LOCAL LEOS NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/1/2015 0:03	Nashville	Tennessee	PRELIM INFO FROM FAA OPS: NASHVILLE, TN/UAS INCIDENT/0003C/NASHVILLE ATCT REPORTED SKYY5, NEWS HELICOPTER, AT 1,500 FEET OVER DOWNTOWN NASHVILLE SPOTTED A UAS FLYING AT APPROXIMATELY 300 FEET EAST TO WEST OVER CITY. NASHVILLE METRO POLICE NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/1/2015 0:50	Arlignton	Washington	PRELIM INFO FROM FAA OPS: ARLINGTON,WA/UAS INCIDENT/0050P MO20 REPORTED A POSSIBLE UAS FLYING OVER THE APPROACH END OF RUNWAY 34 AT ARLINGTON. LEO NOT NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/3/2015 15:14	Long Beach	California	PRELIM INFO FROM FAA OPS: LONG BEACH, CA/UAS INCIDENT/1541P/SOUTHERN CALIFORNIA TRACON ADVISED MOONEY M20P REPORTED A 2-3 FEET LONG UAS APPROX 200 FEET LATERAL AT 10,500 FEET VCNTY LGB. NO CONFLICTS REPORTED. LONG BEACH PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/6/2015 13:37	Melbourne	Florida	PRELIM INFO FROM FAA OPS: MELBOURNE, FL/UAS INCIDENT/1337E/MIA ARTCC ADVISED CIRRUS SR22, SAVANNAH ,GA - PALM BEACH, FL, REPORTED A UAS APPROX 100 FEET OFF THEIR WING AT 12,000 FEET 15 N MELBOURNE, FL. NO CONFLICTS REPORTED. NO LEO NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/7/2015 13:30	Ormond Beach	Florida	PRELIM INFO FROM FAA OPS: ORMOND BEACH, FL/UAS INCIDENT/1330E/OMN AIRPORT MANAGEMENT REPORTED RECEIVING A CALL STATING THAT A UAS WAS FLYING ABOVE 400 FEET 2 SW OMN. DAYTONA BEACH TRACON NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/11/2015 21:24	Orlando	Florida	PRELIM INFO FROM FAA OPS: ORLANDO, FL/UAS INCIDENT/2124E/MCO ATCT REPORTED CHASE 3 (P3), BELL OH58, INTERCEPTED A PHANTOM II PLUS, QUADCOPTER, WHITE WITH RED STRIPES, 2.5 N OF MCO ON FINAL AT 288 FEET, CLOSEST PROXIMITY TO CHASE 3 WAS 300 FEET. LEOS DIRECTED THE OPERATOR TO LAND THE QUADCOPTER AT THE INTERSECTION OF PERSHING AVE AND SEMORAN BLVD. LEOS INTERVIEWING UAS OPERATOR. ORANGE COUNTY SHERIFF DEPT. NO IMPACT TO AIRPORT OPERATIONS.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/13/2015 15:15	Newark	New Jersey	PRELIM INFO FROM FAA OPS: NEWARK, NJ/UAS INCIDENT/1515E/NEW YORK TRACON REPORTED THAT COMMUTAIR 4821, DE HAVILLAND DH8B, BWI - EWR, OBSERVED A RED AND BLACK UAS AT 3,300 FEET APPROX. 18 SW EWR. UAS TRAVELING IN OPPOSITE DIRECTION. SIZE NOT INDICATED. NJ STATE PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/16/2015 10:08	Burbank	California	PRELIM INFO FROM FAA OPS: BURBANK, CA/UAS/1008P/BURBANK ATCT ADVISED AN UNIDENTIFIED SKY WEST ACFT REPORTED A UAS OFF THE DEPARTURE END OF RUNWAY 15, 2-3 FEET IN DIAMETER, AT 50 FEET IN ALTITUDE .25 S BURBANK ARPT. BURBANK PD NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database

1/16/2015 15:25 Tulsa	Oklahoma	PRELIM INFO FROM FAA OPS: TULSA, OK/UAS INCIDENTS/1525C/TUL ATCT ADVISED HAWKER BEECHCRAFT BE36 REPORTED A 3 FEET BY 3 FEET BLACK UAS PASSED ABOUT .25 MILE OFF ACFT LEFT 12 NE TUL.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/16/2015 16:06 Ormond Beach	Florida	PRELIM INFO FROM FAA OPS: ORMOND BEACH, FL/UAS INCIDENT/1606E/DAB ATCT ADVISED A RESIDENT (OFF DUTY LEO) REPORTED HIS NEIGHBOR WAS FLYING A UAS AT UNKN ALTITUDE JUST WEST ORMOND BEACH ARPT. VOLUSIA CO SHERIFF RESPONDED AND INFORMED UAS OPERATOR TO CEASE AND DESIST.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/22/2015 0:13 Roanoke	Virginia	PRELIM INFO FROM FAA OPS: ROANOKE, VA/UAS INCIDENT/1213E/ROA TRACON ADVISED USAIR EXPRESS 4808, DE HAVILLAND DH8B, REPORTED A FAST MOVING UAS RESEMBLING AN AIRPLANE PASSING 1,000-1,500 FEET BELOW 17 S ROA.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/23/2015 12:38 Ormond Beach	Florida	PRELIM INFO FROM FAA OPS: ORMOND BEACH, FL/UAS INCIDENT/1238E/DAYTONA APRCH ADVISED CESSNA C172 AT 1,000 FEET ON RIGHT DOWNWIND RUNWAY 17 REPORTED UAS AT 200 FEET ABOVE HEADING S BOUND. NO CONFLICTS REPORTED. VOLUSIA COUNTY PD. MOR Alert for DAB Number: DAB-M-2015/01/23-0002 Type: Public inquiry or concern (including all pilot reported NMACs) Date/Time: Jan 23, 2015 - 1809Z A/C: C172 Summary: OMN TOWER REPORTED GA ACFT SIGHTED A UAV 200' ABOVE THE AIRCRAFT WHICH WAS AT 1000' IN OMN'S PATTERN.THE UAV WAS ON THE RIGHT DOWNWIND LEG OF RY17 AT OMN.DEN AND ROC NOTIFIED. VOULISA COUNTY SHERIFF'S OFFICE NOTIFIED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database
1/23/2015 18:30 Minneapolis	Minnesota	PRELIM INFO FROM FAA OPS: MINNEAPOLIS, MN/UAS INCIDENT/1830C/FCM ATCT ADVISED LEO REPORTED UAS OPERATING 1.5 N FCM. NO IMPACT TO OPS. UAS NOT OBSERVED FROM TOWER OR ON RADAR. EDEN PRAIRIE PD INVESTIGATING. MOR Alert for FCM Number: FCM-M-2015/01/23-0002 Type: Public inquiry or concern (including all pilot reported NMACs) Date/Time: Jan 23, 2015 - 0018Z A/C: Summary: EPPD NOTIFIED ATC OF A DRONE FLYING APPROX. 1.5 MILES NORTH OF FIELD WITH GREEN AND WHITE LIGHTS. I DID NOT SEE ANYTHING ON RADAR OR OUT THE WINDOWS. EPPD CALLED FCMT ON THE TOWER DISPATCH RADIO ADVISING THAT THEY NOW KNOW WHERE IT LANDED. DEN NOTIFIED AND ADVISED TO SEND AN OFFICER TO SPEAK WITH THE "PILOT" OF THE DRONE. NO TRAFFIC WAS AFFECTED.	Item	FocusAreas/AFS/AFS-80/Lists/UAS_Reports_Database

Legislative Task Force on Unmanned Aircraft Systems
September 3, 2015 Meeting at 813 Noble Street, Fairbanks
Westmark Hotel Fairbanks

1:00pm - 4:45pm

President Obama

Task Force Members:

- Representative Shelley Hughes, Co-Chair
- Senator Peter Micciche, Co-Chair
- Ethan Tyler, Commissioner Designee, Department of Commerce, Community Economic Devel.
- Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
- Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
- John Binder, Commissioner Designee, Department of Transportation, Public Facilities
- Ro Bailey, University of Alaska Fairbanks
- Steve Strait, Aviation Advisory Board, Governor's Office and DOT/PF
- Steve Colligan, Representative Member for the Academy of Model Aeronautics
- John Parker, Integrated Robotics Imaging Systems
- Steve Wackowski, Tulugaq II
- Bob May, Gallery Lodge, Kasilof

- Ginger Blaisdell, Staff to Rep. Hughes
- Chuck Kopp, Staff to Senator Micciche

Guest Attendee(s):

Agency COA group questions
RO - future privacy
Air Fire season
△ Chief of Police meeting Oct
· letter from Gov to AMA
△ Agency contact list POC

Privacy doc incorporate safety guideline animated
John Binder - DOT ~~safe~~ airport brief.

3-3:30 break

AGENDA

1:00pm Welcome and Introductions .....Representative Shelley Hughes

- News review and task force updates

NEW legislation –
- ongoing committee or board/task force
- creating rules for air space on private property
- safety guidelines in statute
- certification requirement for hobbyists

Task Force Responsibilities per HCR15 and Review of Resolution

The duties of the task force shall include

1. reviewing regulations and guidance from the Federal Aviation Administration regarding unmanned aircraft systems;
2. providing written recommendations, together with suggested legislation, for a comprehensive state policy for unmanned aircraft that protects privacy and allows the use of unmanned aircraft systems for public and private applications;
3. evaluating complaints and concerns expressed to the task force;
4. identifying potential privacy and public safety concerns associated with unmanned aircraft systems and determining whether legislation is necessary to address them;
5. considering recommendations for public education related to unmanned aircraft systems;
6. studying the Federal Aviation Administration's "Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System Roadmap," issued November 7, 2013 (1st ed. 2013) and its application to the development of unmanned aircraft systems in the state;
7. conducting a public hearing concerning privacy and the capture of data by unmanned aircraft systems at the University of Alaska's test site;
8. further studying the nonpublic use of unmanned aircraft systems to encourage development of the private sector unmanned aircraft system industry; and
9. further studying and making recommendations with respect to ensuring unmanned aircraft users comply with applicable laws.

AGENDA

- Public Testimony
- Josh Waite – presentation on UAS integration and safety
- UAS and Personal Privacy Guidelines document
- Discussion on final actions of the UASLTF

4:45pm Adjournment - members may join the Interest Group Meeting closing remarks from Marty Rogers followed by no host dinner on the Riverboat Discovery Dinner cruise beginning at 6:30pm

Invitation to attend:

9:30am - Friday, September 4 - Ro Bailey and ACUASI have made arrangements for demonstration flights of UAS downtown Fairbanks at the Fire Training facility for the benefit of the UAS Task Force to see working drones in action. Interest Group Meeting participants are invited to attend.

Rep. Shelley Hughes

From: Rep. Shelley Hughes
Sent: Wednesday, September 02, 2015 4:06 PM
To: 'lhschus+unmannedaircraft@akleg.gov'
Subject: Alaska UAS Legislative Task Force
Attachments: J Waite Risks of UAS Integration-final.pptx; PPUTRC Privacy Policy charts.pptx; UAS Operator Guidelines Draft 3.pdf; UAS TF 08-03-15 AGENDA.pdf

You are receiving this email because you have identified that you are interested in unmanned aircraft systems in Alaska. Please reply with "remove" if you do not want to receive any further email from the Legislative Task Force.

Meeting: Thursday, September 3, 2015
Time: 1:00pm Alaska time
Attachments:
Josh Waite presentation "Risk of UAS Integration"
UAS Operator Guidelines on Privacy – DRAFT

You may tune in by logging in to www.akl.tv and listen to the live stream.
Call—in participation can be arranged by email reply and a toll free number will be provided.

Thank you for your interest in Alaska and unmanned aircraft systems,
Representative Shelley Hughes
Representing District 11 ~ Greater Palmer
907-376-3725

agenda task force members
citizen fear or paranoia
Privacy document
- We are not afraid of commercial / govt pilots, its the hobbyists and those who don't know or intentionally don't follow the rules.
- can't legislate sensitivity of privacy but we need to teach, etiquette know your audience general

start of public testimony

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Friday, August 21, 2015 11:27 AM
To: Ana Enge - DOT committee contact; Bob May (bob@gallerylodge.com); Chuck Kopp; Com Folger; Ethan Tyler; Ginger Blaisdell; John Binder - Dep Com DOT; John Parker; Lt. Steve Adams; Micaela Fowler; Mike Lesmann; Mike O'Hare; Rep. Shelley Hughes; Ro Bailey; Sen. Peter Micciche; Steve Colligan - Model Aeronautics; Steve Strait (steve@straitmedia.us); Steve Wackowski
Subject: tentative agenda for September 3 Fairbanks

Most of you have already signed up for the Interest Group Meeting hosted by the UAF/ACUASI and will be in Fairbanks from Aug 31 – Sep 3.
If you are only attending the UAS task force meetings in the afternoon of September 3rd, there is no need to sign up for the conference.

If you are not able to attend the task force meeting or would like to call in, please let Ginger know.

Here is what we have tentatively planned:

Wednesday, September 2 is an open evening for Interest Group participants.

- I am happy to make dinner reservations at LaVelle's for 6:30pm and just need a head count (we'll probably have a few more from the conference join our reservation)

Thursday, September 3

- 12:30 – 1:00pm Rep Hughes and Sen Micciche will provide an update on the activities of the UAS Task Force and invite attendees to attend (all or part) of the Task Force meeting beginning at 1:00pm – We are intending to have the privacy document available for all attendees at this time

- 1:00pm TENTATIVE agenda
  News review and task force updates
  Public Testimony
  Josh Waite – presentation on UAS integration and safety
  UAS and Personal Privacy Guidelines document

4:45pm we will adjourn so that members may join the Interest Group Meeting closing remarks from Marty Rogers followed by no host dinner on the Riverboat Discovery Dinner cruise beginning at 6:30pm

Friday, September 4

- 9:30am Ro Bailey and ACUASI have made arrangements for demonstration flights of UAS downtown Fairbanks at the Fire Training facility for the benefit of the UAS Task Force to see working drones in action. Ro may invite commercial UAS operators to participate in the demonstration. We will need to coordinate transportation across town for the demonstration event – if you are planning to attend, do you have the ability to help transport?

I hope this provides you with a bit more detail as you make plans to attend.
Ginger
Cell 321-4197

Chief of Staff

Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 13
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

If you would like to subscribe to Representative Hughes' newsletter, please click http://www.housemajority.org/members/hughes/.

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SHELLEY HUGHES

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Trade and Tourism Committee
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Energy Committee
State Affairs Committee
Military & Veterans' Affairs Committee
University Finance Subcommittee
Fish & Game Finance Subcommittee

ALASKA STATE LEGISLATURE

Session:
State Capitol, Room 409
Juneau, Alaska 99801-1182

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Wasilla, AK 99654
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HOUSE OF REPRESENTATIVES

District 11 - Greater Palmer

To: Unmanned Aircraft Systems Legislative Task Force

From: Representative Shelley Hughes, Co-Chair

Shelley Hughes

Date: August 21, 2015

Re: Committee Schedule for September 3, 2015

The Unmanned Aircraft Systems Legislative Task Force will meet at the Westmark Fairbanks Hotel, 813 Noble St, Fairbanks, room number to be posted at hotel.

Thursday, September 3, 2015

* 1:00pm – 4:45pm
News review and task force updates
Public Testimony
Josh Waite – presentation on US integration safety
UAS and Personal Privacy Guidelines

* This meeting will be teleconferenced for anyone to call in to listen or provide public testimony. Legislative Information Office services are not available at this conference site. AKLEG.tv is not available at this conference site.

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Monday, August 10, 2015 4:29 PM
To: Rep. Shelley Hughes
Subject: DRAFT agenda UAS LTF

Categories: Drone

I'm waiting to hear back from RO on the demonstration for Friday and about housing/hotel options

1:00pm - 1:15pm Welcome and updates

- June 19 minutes
- List of department contacts for UAS
- Notes from department COA group
- National news update (very brief since most will be updated during conference)

1:15pm - 2:30pm Review privacy document
Finalize the document to put up on www.alaskadrones.org
Is the group comfortable with the "good citizen" management of privacy or should there be a bill drafted to regulate when a breach of privacy may occur?

- particularly, prohibiting a UAS from hovering over individuals or above their personal property without consent
- public places are just that - so citizenship should govern

2:30pm - 3:00pm Report from department COA group
Ro Bailey can talk about the law enforcement COA currently under development for law enforcement entities statewide
Strategy for the other departments to complete the COA application - if that's the appropriate next step

3:00pm - 4:30pm public testimony

4:30pm discussion and next meeting planning
discussion regarding any public testimony heard
should there be any legislation drafted
next meeting
final product since task force ends on June 30, 2016

5:00pm adjournment

6:30pm dinner at Lavelles Bistro (still waiting confirmation)

A good location for your dinner would be Lavelle's downtown. They have excellent food: http://www.lavellesbistro.com/. They are located at 575 First Avenue, Fairbanks, AK. The conference is at the Westmark on 10th.

To book the dinner reservation, their contact information is: (907) 450-0555. You can leave a message during the day or try them beginning at 4:30 p.m.

Friday **TENTATIVE**

UAS demonstrations beginning 9:00am in downtown location - Ro Bailey

Afternoon tour at Poker Flats (Ro said there wasn't a whole lot to see there...)

- the test site office(s) is unmarked - it's just offices because the flights occur in a variety of locations around the state
- we could look at the rocket launch facility (30 minutes) but it's not part of the ACUASI / test site

ALASKA UAS
INTEREST GROUP

2015 Annual Meeting – Workshop Agenda

Arctic Theme – Tuesday, September 1

With the U.S. assuming chairmanship of the Arctic Council from April 2015 to April 2017, an Arctic theme is featured the first day with presentations by Alaska corporations on commercialization of the industry and by the university on recent unmanned aircraft missions such as oil spill research, and sea ice, sea grass, and otter surveys. Likewise, several of the university's global partners will be speaking on this day as well.

08:30 – 09:00	**Welcome and Introduction – Overview of UAS Program: Past, Present, and Future** Pat Gamble, former President, University of Alaska Jim Johnsen, President, University of Alaska Dr. Bob McCoy, Director, Geophysical Institute, University of Alaska Fairbanks (UAF) Marty Rogers, Director, Alaska Center for UAS Integration (ACUASI)
09:00 – 09:15	**Keynote Speaker** Senator Pete Kelly, Co-Chair Senate Finance, Alaska State Legislature
09:15 – 09:45	**Arctic Slope Regional Corporation (ASRC) - Federal** Bill "Sweet" Tart, Senior Director, Unmanned Systems and Robotics Kevin "Stenny" Stenstrom, Senior Director, Business Development ASRC Federal ○ *One Alaskan Native Corporation's perspective on the UAS industry*
9:45 – 10:30	**Pogo Mine** David Larimer, Chief Geologist, Sumitomo Metal Mining Pogo LLC ○ *Unmanned Reconnaissance Systems in Underground Mine Rescue Actions* Dr. Mike Hatfield, Assistant Professor, University of Alaska Fairbanks ○ *Unmanned Vehicles for Mine Safety Rescue & Training*
10:30 – 11:00	**Morning Networking Break**
11:00 – 11:45	**University of Alaska Fairbanks and Alaska Center for UAS Integration** Jessica Garron, Senior Science Consultant at Alaska Satellite Facility, UAF Matt Westhoff, UAS Pilot, ACUASI ○ *Aerial Operations for Arctic Oil Spill Response*
11:45 – 12:15	**University of Alaska Fairbanks and Alaska Center for UAS Integration** Dyre "Oliver" Dammann, graduate student in geophysics, University of Alaska Fairbanks Eyal Saiet, Remote Sensing Specialist, ACUASI ○ *Sea Ice Survey Using Unmanned Aircraft Near Barrow, Alaska*
11:45 – 13:15	**Working Lunch** - Enjoy the buffet lunch while the meeting continues

12:15 - 12:45	**Bureau of Ocean Energy Management and Alaska Center for UAS Integration** Rick Raymond, Wildlife Biologist, BOEM Sam Vanderwaal, Systems Integration & Engineering, ACUASI ○ *Testing the use of Unmanned Aircraft Systems for Intertidal Surveys - proof of concept*
12:45 – 13:15	**U.S. Geological Survey, Alaska Science Center** Dr. Brian Battaile, Research Wildlife Biologist ○ *Testing the use of Unmanned Aircraft Systems for Walrus Surveys - proof of concept*
12:45 – 14:00	**National Oceanic Atmospheric Administration (NOAA)** John "JC" Coffey, Director, Unmanned Systems, Cherokee Nation Technologies, NOAA UAS Program Office ○ *NOAA Atmospheric, Marine and Arctic Monitoring Using UASs (including Rapid Response)*
14:00 – 14:30	**URS/AECOM Australia** Dr. Catherine Ball, Regional Unmanned Aerial Systems Lead ○ *World first UAS based environmental and engineering surveys* ○ *The antipodean appetite for UAS* ○ *The good, the bad, and the not so ugly*
14:30 – 15:00	**Afternoon Networking Break**
15:00 – 15:45	**National Oceanic Atmospheric Administration (NOAA)/National Marine Fisheries Sciences (NMFS)** Dr. Robyn Angliss, Deputy Director, NOAA/NMFS ○ *Comparing Manned and Unmanned Aircraft System Surveys for Cetacean Monitoring in the Arctic*
15:45 – 16:30	**Transport Canada & National Research Council Canada** Fernando Mojica, Project Director UAS, Transport Canada / Aircraft Services Directorate (AAF) Paul Truant, Project Manager, UAS Project, Transport Canada Iraj Mantegh, Program Leader, Civil Unmanned Aerial Systems, NRC Canada-Aerospace ○ *Unmanned Aerial Systems in Canada - Transport Canada, National Research Council Canada, and Canadian Coast Guard are Exploring Exciting New Opportunities for the Use of UAS for Civilian Government Applications*
16:30 – 17:00	**University of Hawaii** Ted Ralston, Consultant (Retired aerospace executive) Dilmurat Azimov, PhD, Assistant Professor of Mechanical Engineering ○ *Integrated Sensor Fusion, Targeting, Guidance and Control Framework and Algorithms for Autonomous Unmanned Aerial Systems*
17:00 – 17:05	**Meeting Conclusion and Announcements** Marty Rogers, Director, ACUASI
18:30 – 21:30	**Networking Reception at Fountainhead Antique Auto Museum** 212 Wedgewood Drive, Fairbanks, Alaska 99701. Phone: 907-450-2100 Business networking at its best. Enjoy an evening surrounded by a collection of over 80 vehicles, including horseless carriages, steamers, electric cars, speedsters, cyclecars, midget racers and 30s classics. Featuring rarities such as an 1898 Hay Motor Vehicle, 1906 Compound, 1920 Argonne and 1921 Heine-Velox Victoria.

Technical Theme – Wednesday, September 2

Technical presentations on emerging technologies will be provided by the military, government, industry, and private participants on a wide variety of unmanned systems on topics including UAS traffic management (UTM), environmental science, emergency response in firefighting, precision integrated programs, and image processing from UAS sensor data.

08:30 – 08:45	**Fort Wainwright, U.S. Army Garrison and U.S. Army Alaska** **COL Sean Williams, Garrison Commander** ○ *Arctic Security and Gray Eagles in Alaska*
08:45 – 09:15	**Keynote Speaker** Senator John Coghill, Majority Leader, Alaska State Legislature
09:15 – 10:00	**Lockheed Martin** Mike Glasgow, Lockheed Martin Fellow, Chief Architect for Aviation Services ○ *UAS Traffic Management (UTM): Enabling UAS Operations*
10:00 – 10:30	**Morning Networking Break**
10:30 - 11:30	**Northrop Grumman Aerospace Systems** Bill Walker, Business Development, HALE Unmanned Systems ○ *Global Hawk in Environmental Science*
11:30 – 12:00	**Bureau of Ocean Energy Management (BOEM)** Rick Raymond, Wildlife Biologist ○ *BOEM Alaska Environmental Studies Program*
11:45 – 13:15	**Working Lunch** - Enjoy the buffet lunch while the meeting continues
12:00 - 13:00	**Airware** Mark Davis, Vice President of Sales ○ *Putting Drones to Work: Meeting the Needs of Enterprises*
13:00 – 14:00	**Aerobat Aviation, Inc.** Travis Shannon, Chairman & CEO ○ *Emergency Response to Wildfires with UAS (data capture in Montana, August 2015)*
14:00 – 15:00	**PEDMAS Technologies & Innovations** John Shepley, Chief Technology Officer ○ *Improving Environmental Situational Awareness for UAV Operations*
15:00 – 15:30	**Afternoon Networking Break**
15:30 – 16:15	**Precision Aviation** Matt Parker, UAS Operations Director ○ *Diversified Operations - An Operator's Perspective*
16:15 – 16:45	**Brainlike – Smart Sensing Solutions** Dr. Robert "Bob" Jannarone, CEO, Brainlike ○ *Image Processing from UAS Sensor Data: Wildlife Survey Prospects*
16:45 – 17:00	**Meeting Conclusion and Announcements** Marty Rogers, Director, ACUASI

Policy Theme – Thursday, September 3

With the dynamic changes over the past year, lead representatives from the Federal Aviation Administration (FAA), the UAS Center of Excellence for Unmanned Aircraft Systems, the FAA's six unmanned aircraft test sites, and others will describe how the unmanned aircraft industry is being shaped. In the afternoon, technical presentations will be provided on miniature surveillance avionics, oil spill response, meeting the needs of enterprises, improving environmental situational awareness, applying complexity leadership theory to drone airspace integration, and developing payloads for climate research in Alaska. At 1:00 p.m., Alaska's Unmanned Aircraft Systems Legislative Task Force will convene a meeting adjacent to the conference that will be open to the public.

08:30 – 08:40 **University of Alaska Fairbanks**
Dr. Bob McCoy, Director, Geophysical Institute
- *Opening and Introductions*

08:40 – 09:00 **Keynote Speaker**
Representative Steve Thompson, Co-Chair House Finance, Alaska State Legislature

09:00 – 09:30 **Federal Aviation Administration (FAA)**
Unmanned Aircraft Systems (UAS) Integration Office, Washington, DC
Bill Crozier, Assistant Manager for Flight Standards
- *Major Strides Forward for Research and Commercialization in 2015*

09:30 – 10:00 **FAA's Center of Excellence on UAS**
Marty Rogers, Vice Director of ASSURE (FAA COE)
- *Universities and Corporations Collaborating for Success for Integration of UAS into the National Airspace System (NAS)*

10:00 – 10:30 **Morning Networking Break**

10:30 - 11:30 **FAA's Six Test Sites to Integrate UAS into the NAS – Technical Panel**
Elizabeth Soltys, Engineer and Manager Unmanned Aircraft Systems Test Sites
- *Discussion of achievements and pathway forward*

11:30 – 12:30 **Federal Aviation Administration**
JoAnn Ford, Manager, FAA Navigation Services Systems Engineer
- *Comparing GPS to WAAS tools that are coming from the NextGen upgrades to the overall NAS systems*

11:45 – 13:15 **Working Lunch** - Enjoy the buffet lunch while the meeting continues

12:30 - 13:00 **Alaska State Legislature**
Unmanned Aircraft Systems Legislative Task Force
Senator Peter Micciche, Co-Chair
Representative Shelley Hughes, Co-Chair,
- *Update on task force efforts from 2014 to 2015*

13:00 – 17:00 **Unmanned Aircraft Systems Legislative Task Force Meeting**
(Adjacent to main conference room directly following the lunch hour)

13:00 – 13:30 **Sagetech Corporation**
Jim Davis, Engineering Director
- *Miniature Surveillance Avionics for sUAS*

13:30 – 14:30 **Trumbull Unmanned**
Dyan Gibbens, Founder & CEO
- *UAVs for Oil Spill Response & Flying Indoors*

14:30 – 15:00 **State of Alaska Department of Transportation**
Jeff Roach, Northern Region Planning Manager, Aviation and Highways
- *UAS from an Airport Perspective*

15:00 – 15:30 **Afternoon Networking Break**

15:30 – 16:15 **University of Alaska Fairbanks, International Arctic Research Center**
Dr. Jessica Cherry
- *Developing payloads for climate research in Alaska*

16:15 – 16:45 **Department of the Interior (DOI)**
Harry Kieling, Alaska Regional Director, Office of Aviation Services (OAS)
- *The Evolution of the Unmanned Aircraft Industry: Then and Now*

16:45 – 17:00 **Meeting Conclusion and Announcements**
Marty Rogers, Director, ACUASI

18:30 – 21:30 **Alaska Riverboat Discovery – Dinner Cruise**
975 Discovery Drive, Fairbanks, Alaska 99709
(907) 479-6673

Enjoy a relaxing dinner cruising into the heart of Alaska introducing you to the culture and way of life in the "Last Frontier". The narration covers the gambit of anthropology, culture, geology, glaciology, history, with even a little hydrology and engineering thrown in for good measure!

Josh Waite
presenter

These responses are based on several years of experience flying in military airspace integrated with UAS and current participation in the UAS industry. I am a military pilot with roughly 2,000 flight hours in Iraq and Afghanistan. And I currently participate in management of an FAA-designated UAS Test Site. 9-3-2015

Effect on Safety of Air Traffic.

1. The proposed rule suggest 500 feet AGL as the limit for small UAS operations. There are two concerns with this altitude: first, the variance in barometric altimeter readings (of manned aircraft) and GPS derived altimeter readings (on most UAS), and second, the lack of sufficient buffer with potential manned aircraft operations.

The difference in altimeter readings is the result of two issues. GPS reception issues reduce the accuracy significantly, and the product is a true altitude, as opposed to the rough relative altitude of a barometric altimeter. I have personally witnessed a UAS reporting that it was below me, but was actually above – a difference of greater than 500 feet from what was reported.

Add to this uncertainty of position the fact that most of the U.S. is "uncongested" area. Therefore, manned flight over most of the National Airspace (NAS) is limited to 500 feet AGL by 14 CFR 91.119. Or, in the case of sparsely populated areas, 500 feet from the nearest person, vessel, vehicle or structure. Meaning that most of the NAS has a buffer of zero on paper, and the altimeter discrepancies have made the situation worse.

In addition, there are many Military Training Routes throughout the NAS. In most cases, this involves fast flight at low altitudes (300 feet AGL in many cases). A UAS operation in one of these areas could encounter a C-130 at 180 to 250 kts, or a much faster aircraft.

I propose a maximum altitude of 250 feet AGL, with exception for towers and other infrastructure of 50 feet above the height of the structure, in a 100 foot radius.

2. The proposed rule suggests a maximum airspeed of 100 mph (87 kts) for small UAS. The kinetic energy (KE) of a 55lb object moving at 100 mph is 18,386.1 ft/lb. KE of ~20,000 ft/lb can cause structural damage to large aircraft. This assumes the large aircraft is standing still. As a UAS strike from the rear of an aircraft is unlikely, we shall discuss only front aspect collisions. In this case, the best scenario of a UAS strike is where the UAS is crossing the path of the aircraft. KE is dependent on the velocity (V) of the aircraft then, and we will use 130 kts as approach speed. And $KE = 1/2MV^2$, so the kinetic energy of the UAS is $\frac{1}{2}*(55lbs)*(130kts)^2 = 41,149$ ft/lb. That's twice the expectation of structural damage.

14 CFR requires certain structural limits in case of bird strikes:

a. 14 CFR Part 25-631: Transport category airplanes must be capable of continued safe flight and a subsequent normal landing after the *empennage structure* has been impacted by an 8 lb bird at cruise speed at mean sea level.
b. 14 CFR Part 23.775: Normal, utility, acrobatic and commuter category airplanes are required to have limited *windshield* integrity to withstand a 2 lb bird impact at maximum approach flap speed and at least one pane with sufficient forward vision remaining to allow continued safe flight.

c. 14 CFR Part 29-631: Transport category rotorcraft are required to have a *structure* which will ensure that continued safe flight and landing is possible after impact with a bird of up to 1 kg (at the lesser of Vne and Vh at 8000 feet above mean sea level.
d. 14 CFR Part 25.571: Transport category airplanes must be capable of successfully completing a flight during which likely *structural damage* occurs as a result of impact with a 4 lb bird with a relative velocity of Vc at sea level or 0.85Vc at 8,000 feet, whichever is more critical.

Today's aircraft are built to withstand 2, 4, and 8 lb birds. Not 55 lb pieces of machinery that shatter rather than squish on impact.

Now, consider again the C-130 at 250 kts or the B-1 at 400 kts and 300 feet AGL.

I propose reducing the altitude limit to 250 feet AGL, and the airspeed limit to 50 mph (44 kts).

Please refer to Attachment 1 *Kinetic Energy of Bird Strikes & Damage to Aircraft* by Roger Nicholson, PhD and Attachment 2 *Bird Strike Airworthiness Standards*

3. The Proposed rule makes no mention of visibility-increasing measures.

I propose the requirement for a high-visibility paint scheme, such as asymmetrical international orange.

4. The proposed rule states that "pilots must have an ATC clearance to enter certain controlled airspace. In other words, the FAA requires ATC to have knowledge of aviation operations in the airspace due to the greater amount of activity in that area compared to uncontrolled airspace." However, no mention is given to proximity to uncontrolled airports. The lack of ATC facilities can make UAS operations in these areas even less safe.

I propose that small UAS operations are not permitted within 10 miles of any airport without an active NOTAM and continuing radio communication with the controlling ATC or with CTAF.

5. The proposal indicates that the only requirement for accident / incident notification is a report due within 10 days of the occurrence. While the referred 49 CFR 830.15(a) does provide for a 10-day timeframe to submit a report, 49 CFR 830.5 requires immediate notification.

I propose correcting the rule to be in accordance with 49 CFR 830.5.

Airworthiness

1. The Proposed rule eliminates the requirement for Airworthiness Certification, yet also identifies that the model aircraft standards of testing are higher and are operations are limited to 400 feet AGL (AC 91-57).

While the proposal has identified the shortcomings of applying the current manned aircraft processes to UAS, I do not believe deleting all the requirements is a viable option. A standard airworthiness certificate may be more than necessary for a small UAS, an experimental – type certificate would be more acceptable. It would ensure an airworthiness review and reduce the excessive burden on manufacturers. The FAA has only just begun the Designated Airworthiness Representative (DAR)

process with UAS. This should be more widely addressed and expanded to include Designated Engineering Representatives (DERs) as well. And as the experimental process has its limitations, I propose that experimental certification is a path to a UAS type certificate covered in a separate Part of 14 CFR to address UAS.

2. The proposal uses the comparison of potential damage from a 55lb UAS and a 6600lb manned aircraft, asserting that the UAS is safer. Given the fact that the 6600lb aircraft has been through rigorous analytical, bench and flight testing, over a period of 3-5 years, I would take exception with that assertion. "Mean Time Between Failures" are known quantities and inspections are directed. The larger, manned aircraft is proven, whereas the untested small UAS is not. Please view the many "drone crash videos" online right now, some of these are operator error, and some are system failure.

3. The proposal identifies Loss of Positive Control as one of the greatest risks, and that confining airspace to that within line-of-sight as the mitigating treatment for that risk. There is no discussion of Loss of Link and Loss of GPS occurring at the same time. The occurrence of these two failures at the same time cannot be excluded due to the fact that no testing and certification is required. There are a number of electrical issues that can easily render both receivers inoperable.

I assert that a confined area, alone, does not satisfactorily reduce risk of Loss of Positive Control and propose that flight testing is required, and that DAR / DERs are utilized for that task. I propose that requirements for Flight Termination Systems or Procedures are utilized as treatments for risk mitigation by Designees in evaluating new systems.

4. The proposal states that transponders and Traffic Collision Avoidance Systems are helpful in reducing mid-air collisions, but they are too large and heavy to be used in small UAS. With regard to transponders, this is an inaccurate statement. There are transponder / ADS-B units today that are designed for small UAS and weigh 100 grams. And regarding TCAS, the statement is disingenuous, as FAA Order 8900.1, Volume 16, *Unmanned Aircraft Systems* states that TCAS cannot be used as a method for see and avoid, and the FAA has issued COAs which prohibit the use of TCAS by UAS.

Both of these traffic sensing systems would be very useful in avoiding potential conflicts, and there use should not be discounted. I propose that ADS-B, at a minimum, is required for all operations above 100 feet AGL.

5. The proposed method of determining function and operability is for the operator to ensure the UAS is safe for flight. But there is no definition of "safe for flight." It implies that operators will instinctively know what is meant by "safe for flight," even without specific training or guidance. Also, discussions were made regarding potential annual inspection requirements, without addition to the proposed rule.

While many operators will exercise "common sense," not all will have the required level of understanding, and the FAA historically does not rely on this approach. . I propose a requirement for training in small UAS operations and maintenance prior to certification, and a requirement for annual inspections for the UAS.

Airman Certification

The proposal suggests that formal training is too great a burden for operators wishing to commercially operate small UAS in the NAS, though the requirements for operating any other vehicle for commercial purposes are much greater – commercial drivers, commercial vessel captains, and commercial pilots. It appears the position held by the FAA throughout this proposal is focused on the "burden" at the expense of safe operation.

1. The proposal suggests small UAS have operators (as opposed to pilots) in order to avoid pilot training requirements. While this shift may reduce the time and dollar burden on the operator, it comes at the cost of air sense. As the proposal states that the rule "would not require any specific form of training or studying in order to pass a knowledge test", there is no consideration to the airman's understanding of air traffic and procedures, nor soft skills such as decision making, situational awareness, checklist procedures, human factors, risk assessment and risk management. Yet the proposal requires the airman to assess risks without specific training or procedures.

I propose that a Commercial Pilots License for UAS be required for all commercial operations of a UAS, where half of the 250 hour requirement to be accomplished in a manned aircraft and the remaining 125 hours with a UAS (less expensive than the standard commercial rating). Recommend this license would have a "UAS-only" limitation for commercial operations.

2. The proposal states that there is no need for PIC designation. Most UAS have the ability to be operated in either autonomous or manual (remote control) mode. This allows for the possibility that separate operators are at each set of controls. If there is such a possibility, then an "in-charge" must be designated or this situation must be excluded by rule. However, excluding such an operation greatly reduces the ability to train a new UAS operator. I submit that a PIC must be designated for each flight as the responsible individual.

3. The FAA proposes not to provide an operator with the emergency powers available to the PIC under § 91.3(b). A designated PIC without training in the applicable regulations and operations is a liability. This is yet another reason to require training of airmen.

4. The proposal states the intent to exempt military and former military pilots based on experience from the full, initial small UAS operator test. At another point in the proposal, the same verbiage is used for allowing current or former military operators of unmanned aircraft to take a more limited test. Given the delineation the FAA has made in this proposal between pilots and operators, is the intent to exempt both?

Military experience in UAS is in *military* airspace, almost exclusively. The burden to the operator in taking the longer initial course is near zero, and not worth the short cut. As a military pilot, I propose that no one – military pilot or UAS operator – is exempt from the longer test.

5. The proposal aims to allow operators to self-certify, at the time of their airman application and attest that they do not have a medical condition that could interfere with the safe operation of a small UAS. Further, it would prohibit a person from acting as an operator or visual observer if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a

small UAS. The verbiage used is based on Sport Pilot requirements, but will be applied to commercial operations.

While there are opinions as to what such conditions might be, there is no clear listing of such. I propose a list of limiting conditions is specified within the rule. For such a list, I suggest:

- angina
- coronary heart disease that is symptomatic or clinically significant
- psychosis
- bipolar disorder
- personality disorder that is severe enough to have repeatedly manifested itself by overt acts
- substance abuse or dependence (drugs or alcohol)
- epilepsy
- disturbances of consciousness without satisfactory explanation of cause
- transient loss of control of nervous system function without satisfactory explanation of cause.

6. While this proposed rule limits small UAS operation to visual line-of-sight, it does not require vision to be corrected to 20/20.

I propose that vision is required to be corrected to 20/20 to operate a UAS.

7. The proposed rule requires an applicant to be 17 years of age, and cites regulation allowing glider and balloon pilots at 16 years. However, commercial glider and balloon pilots must be 18 years old.

I propose that the minimum age for commercial operations keep in line with all other types of flight operation – 18 years of age.

Line of Sight and VO

1. The proposed rule requires that any Visual Observer maintain visual contact with the small unmanned aircraft and the surrounding airspace and communicate to the operator the flight status of the small UAS and any hazards which may enter the area of operation so that the operator can take appropriate action. While the VO is performing a key pilot-function they would not be required to have training of any kind. Further, accurate estimation of relative motion from a third position is very difficult, and mistakes can make a bad situation worse.

I propose that VOs are required to be trained on the applicable sections of part 91, as is the current standard of governmental entities operating UAS, and also in visual observation techniques.

2. The FAA acknowledges in this proposal that visual observation "is a concentration-intensive activity," but does not address time limits for such an operation. A long period without rest in this type of activity will result in loss of concentration and may result in loss of visual contact or loss of situational awareness. Either of these situations would pose a safety risk.

I propose a maximum duration of operation as a VO to be 45 minutes followed by a break of at least 15 minutes.

Micro UAS

1. The FAA has proposed the Micro UAS class with even less restriction. While this class is smaller, it is still the same size (4.4 lbs) as the birds considered for structural engineering, and at a 100 mph limit, will still carry a significant amount of energy. Even with the proposed frangible materials, parts such as propellers, moving at high speeds can injure people.

The allowance of these UAS to fly over any person, including those not involved, is unsafe and negligent. Training and certification should be defined and required.I propose the following changes to limits in accordance with discussions above:

- Maximum altitude – 250 feet AGL, except 50 feet above a structure within a 100 foot radius of that structure
- Operator ground and flight training, written and practical test required
- Visual Observer training required
- Distance from people and structure would be the same as small UAS – operations not allowed over any person not involved in the operations (unless under a covered structure)

Insurance

This proposal does not define requirements for liability insurance. (while also allowing flight in congested areas over persons and structures). Liability insurance is required of aircraft operators in every other category of flight, in private operations and commercial. Given the risks and early technology stated of the UAS industry, liability insurance should be a requirement.

I propose the same insurance minimums currently required for private and commercial manned flight operations.

N-number

The current and proposed requirements for UAS registration include obtaining an N-number. First, the number of available N-numbers is finite and will struggle to keep up with the volume of UAS entering the market. Second, there is currently no differentiation between manned aircraft and UAS in the assigned N-number. Third, the process for obtaining a registration is antiquated and cumbersome – carbon-copy and regular mail.

I propose a new numbering system for UAS, utilizing "NU" for UAS, similar to the older method of "NX" for experimental. I also propose a web-based system for obtaining a registration, which would greatly expedite the process.

Enforcement

With no need for operations based at an airfield, no requirement for flight plan or NOTAM filing, and the small footprint of a UAS operation, how will the FAA know where to go for compliance inspections?

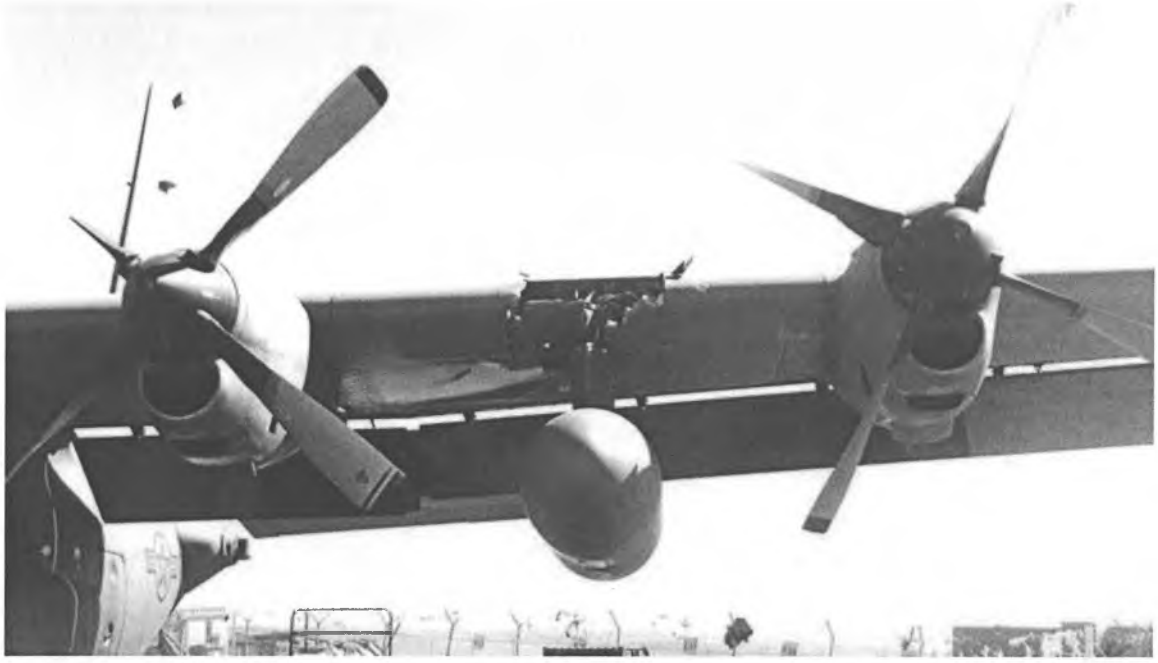
Further, what is at stake for a commercial UAS operation? A near-zero burden reduces the cost for the operator, but in doing so also reduces the incentive to operate in compliance with regulations. Cost of doing business is the incentive keeping most businesses in compliance with regulation, as loss of the ability to operate comes with a significant potential loss in capital. While commercial UAS operations will inherently be cheaper than manned flight, it should not be at the expense of safety with little to no proposed training requirements, no airworthiness inspection / certification, no insurance, and minimal regulation.

Trusting airspace limitations as the only mitigating factor is extremely risky. How are these airspace parameters of operation enforced? When a near-miss incident is reported, who do authorities go to for answers?

I propose mandatory flight plan filing for UAS operations to ensure oversight is possible, and mandatory NOTAM filing for UAS operations within 10 miles of an airfield, and other high-traffic areas.

General Thoughts

1. The proposed rule considers injury and damage to ground-based persons and property, but little for air traffic. As a military aviator with roughly 2,000 flight hours in the combat airspace shared with UAS, I have had several near-misses with unmanned aircraft. Additionally, friends of mine endured a mid-air collision between the C-130 they were flying and a 375 lb UAS. Luckily, they were on 5-mile final to the airport as the impact caused great damage and the aircraft could have become uncontrollable if not for the proximity to landing and quick corrective actions of the crew. Photos of the damage are available online, but a full report of the incident and damage sustained by this ~130,000 lb aircraft can be obtained from the USAF.



If we compare the structural damage to a combat aircraft weighing ~130,000 lbs by a 375 lb UAS to the potential damage to a 1,300 lb general aviation aircraft by a 37.5 lb UAS, the kinetic energy of the impact would be an order of magnitude greater. Without the proper regulations, training, certification and compliance in place, it's not a matter of if, it's a matter of when.

2. The FAA proposal currently rests on "limiting airspace" as a single treatment to mitigate all risks and does not thoroughly consider the potential for uncertified / untested aircraft to exceed those airspace boundaries (due to fault or failure). I understand that there is political pressure to integrate UAS into the national airspace system, but it should not be at the risk of life, limb or property. There have been a significant amount of near-miss incidents between UAS and manned aircraft in the last few years. The 26 Nov 2014 FAA report on near collisions indicated 25 incidents from 1 June 2014 until the report in which a UAS was within 10 seconds (or a few feet) of impacting a manned aircraft.

A few of my personal experiences, with experienced UAS operators in military airspace are described below:

- While flying in the traffic pattern at 1000' AGL in a small aircraft, a 375 lb UAV was launched below me without authorization. I had to maneuver to avoid the UAS and it passed within 500' vertical and less than 1/4 mile lateral. The aircraft I was flying was not equipped with TCAS, and I had to rely on the ATC Tower controllers' direction for initial avoidance maneuvering.
- Flying a medium sized aircraft on 3 mile ILS final, in marginal weather, a 40 lb UAS flew in opposite direction *just* off of centerline. I had to maneuver to avoid the UAS and it passed within 100' vertical and less than 1/2 mile lateral. The UAS was intermittently showing on TCAS, with significant gaps in display.
- In a medium sized aircraft, established at FL220, I was instructed by ATC to descend for a large UAS with lost link. Once I was established at FL210 (within 5 miles of the UAS and opposite

direction) the UAS Lost Link Flightplan commanded it to descend. I had to maneuver to avoid conflict and passed within 500' vertical and 1 mile lateral. This UAS did display on TCAS.

- In a medium sized aircraft, established at FL 200 at night, a large UAS passed less than 500 feet directly beneath me. It was not squawking and passed between my aircraft and another established at FL210. The operator was not talking to anyone on the radio. The UAS was visually acquired.
- In clear conditions, I had visually contacted a UAS above my aircraft, when the UAS showed up on my TCAS display as a traffic alert, it was reporting below my aircraft by ~200 feet. The differences in settings and use of GPS derived altimeter likely contributed to the situation.

Some of these issues were based on communications, some on GPS altimeters, o thers on procedures and understanding of airspace. The thought of UAS flight operations with extremely limited understanding of the operation, air traffic, limited training, no investment, and nothing at stake SCARES ME and should scare every pilot with skin in the game.

As a manned aviator and experienced member of the UAS industry, I am very concerned about current political and industry pressure outweighing safety concerns and risk mitigation.

4. The UAS Test Site program was initiated to assist in UAS integration; providing data and feedback to the FAA. However, due to the lack of funding, limited support, and process management gaps, very few resources have been directly and solely assigned to this program. This has resulted in little progress and the Test Sites continue to wrestle with the FAA to accomplish congressional goals. I recommend prioritization, simplification and wide research scope be established at the Test Sites if we are to expect successful data/results to come from this initiative and assist the FAA in the safe integration of UAS into the NAS.

5. On a final note, a 60 day proposal response window is a very short time period to provide meaningful, constructive responses. The potential impacts of this proposal are vast and daunting. I propose the window is reopened for another 30 days to allow for further collaboration in responses and suggested fixes. This is a matter that could have significant adverse safety impacts.

Joshua Waite

Operations Manager

Peak 3 Technical Services, Inc.

Attachment 1 – *Kinetic Energy of Bird Strikes & Damage to Aircraft* by Roger Nicholson PhD

Attachment 2 – *Bird Strike Airworthiness Standards*

Kinetic Energy of Bird Strikes & Damage to Aircraft

A Visual Analytics Approach using
Bird Species & Kinetic Energy in a Flight Envelope of Strikes
(US FAA National Wildlife Strike Database)

Roger Nicholson PhD
Associate Technical Fellow
Boeing Commercial Airplanes
Roger.Nicholson@Boeing.com
Bird Strike Committee USA Conference & Annual Meeting
August 13-16, Memphis, Tennessee

Outline

- Bird Strike Regulations
- Kinetic Energy
- Flight Envelope: Altitude vs. Speed
- Bird species, size and weight, 0-4lb, 4-8lb, 8-12lb, 12-30lb
- Fatal accidents, hull losses, and significant strikes
- Airplane component damage

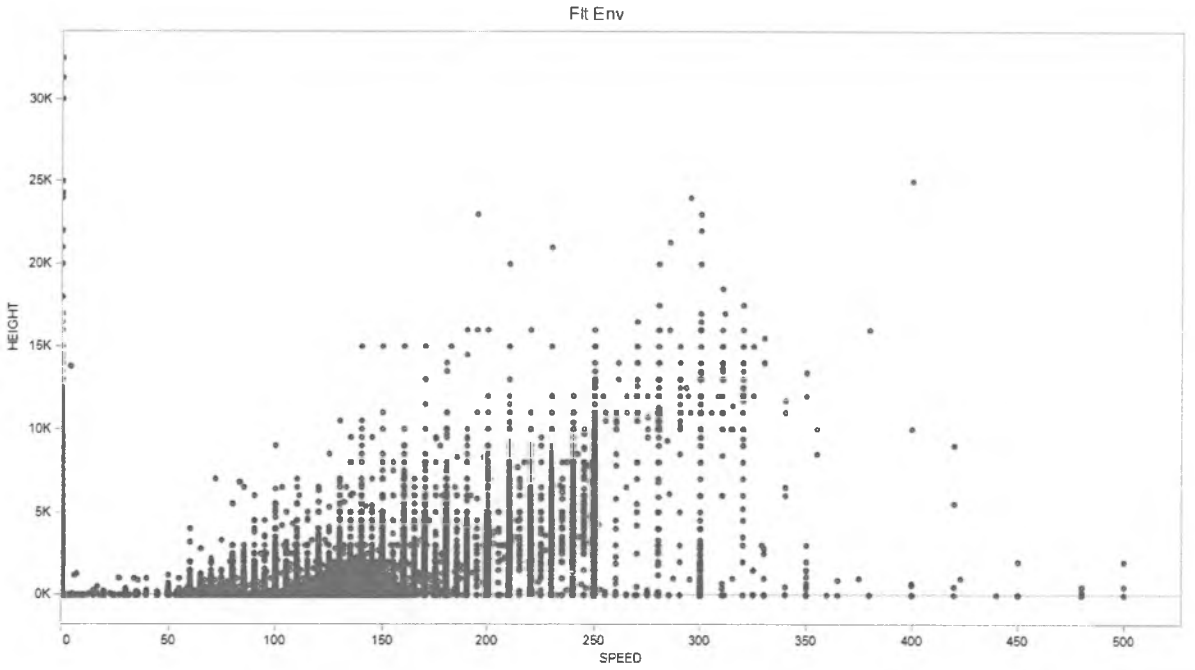
Federal Aviation Requirements (FARs) for Bird Strike, 14 CFR 25

- 25.571 (general structure): 4-lb bird at Vc, airplane cruise speed, 0.85 Vc at 8,000ft
- 25.631 (empennage): 8-lb bird at airplane cruise speed Vc
- Requirements for physical separation of airspeed sensors
- Power plant requirements, Part 33

Kinetic Energy, KE=1/2mV^2

- m, bird mass, obtained from SPECIES table, used average of mean mass of female and mean mass of male, pounds or kilograms
- V, true air speed, knots , derived from pressure altitude and calibrated airspeed, converted to feet/sec or metre/sec
- KE in units of ft-lb, or kilojoule
- Structural damage when KE => 20,000 ft-lb
- Canada goose (9.2-lb), At 250kt, 10,000ft altitude, KE ~ 33,900 ft-lb

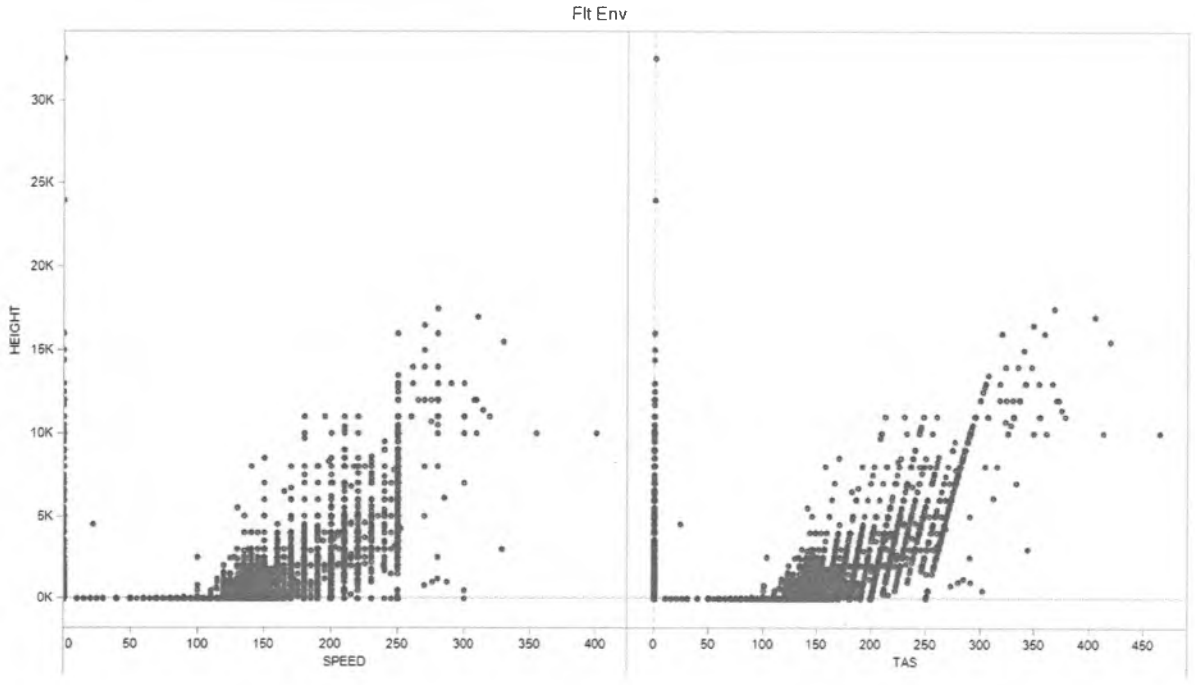
Flight Envelope: NWSDB fields of HEIGHT (above ground level, AGL, ft) & SPEED (indicated air speed, IAS, kt)



Flight Envelope:

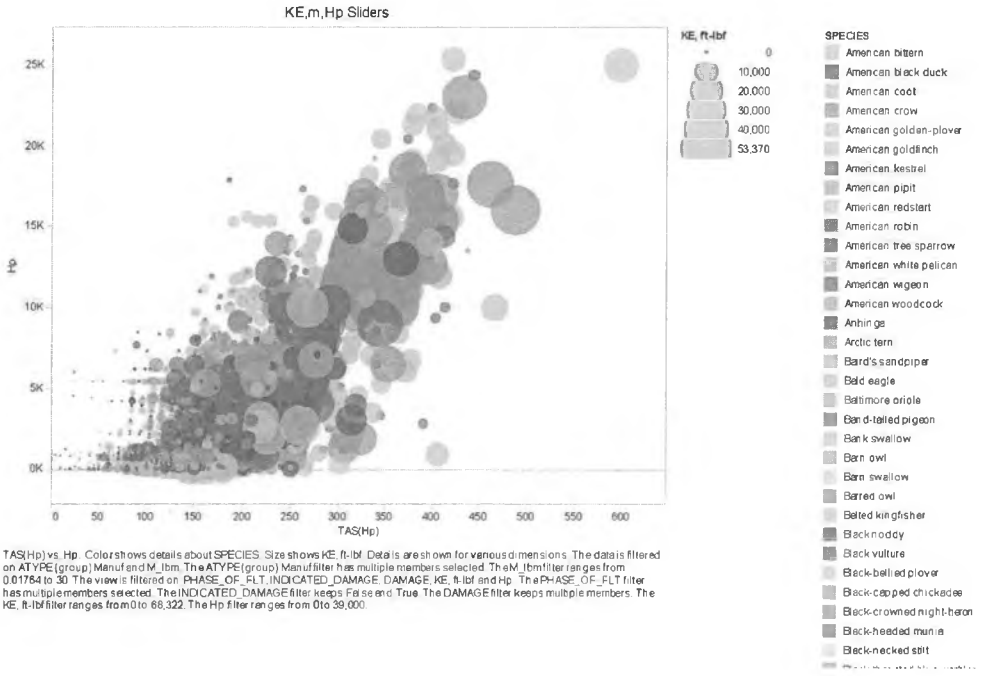
Hp (Pressure altitude) = Height (AGL) + Field Elevation

TAS (True air speed) ~ IAS + (0.02 x IAS x Altitude in 1000ft)



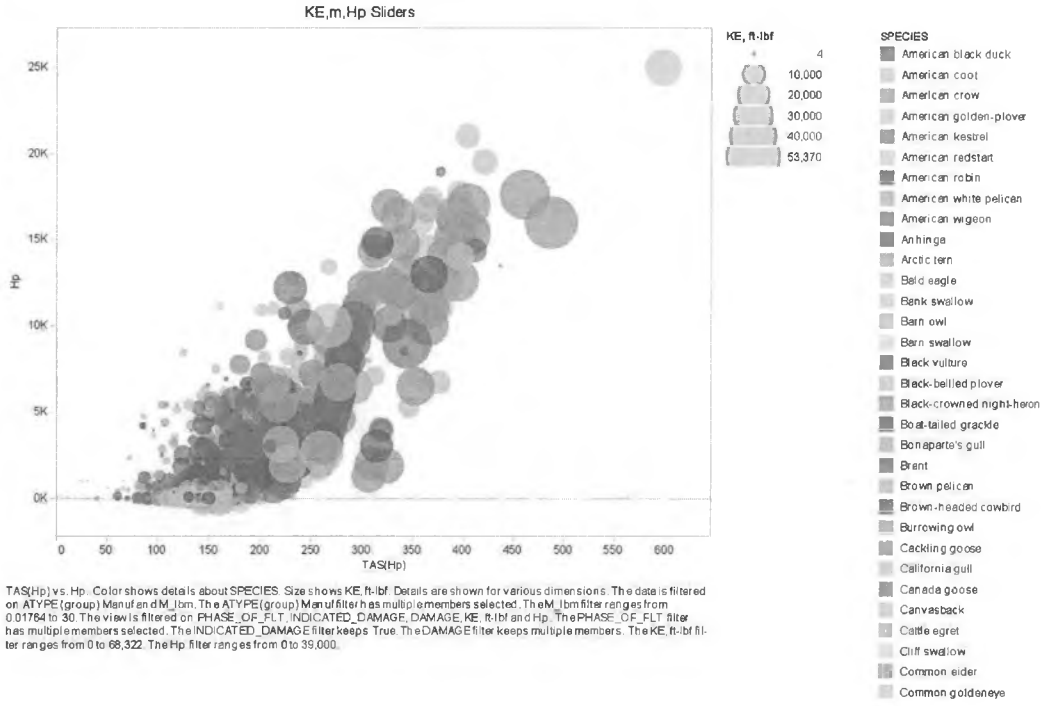
Flight Envelope: Part 121 Strikes

Color: species->mass; Size: kinetic energy



TAS(Hp) vs. Hp. Color shows details about SPECIES. Size shows KE, ft-lbf. Details are shown for various dimensions. The data is filtered on ATYPE (group) Manuf and M_lbm. The ATYPE (group) Manuf filter has multiple members selected. The M_lbm filter ranges from 0.01764 to 30. The view is filtered on PHASE_OF_FLT, INDICATED_DAMAGE, DAMAGE, KE, ft-lbf and Hp. The PHASE_OF_FLT filter has multiple members selected. The INDICATED_DAMAGE filter keeps False and True. The DAMAGE filter keeps multiple members. The KE, ft-lbf filter ranges from 0 to 68,322. The Hp filter ranges from 0 to 39,000.

Part 121 Strikes with Damage



TAS(Hp) vs. Hp. Color shows details about SPECIES. Size shows KE, ft-lbf. Details are shown for various dimensions. The data is filtered on ATYPE (group) Manuf and M_lbm. The ATYPE (group) Manuf filter has multiple members selected. The M_lbm filter ranges from 0.01764 to 30. The view is filtered on PHASE_OF_FLT, INDICATED_DAMAGE, DAMAGE, KE, ft-lbf and Hp. The PHASE_OF_FLT filter has multiple members selected. The INDICATED_DAMAGE filter keeps True. The DAMAGE filter keeps multiple members. The KE, ft-lbf filter ranges from 0 to 68,322. The Hp filter ranges from 0 to 39,000.

Small Birds, 0-2 lb

Cattle egret, 0.82#

Rock pigeon, 0.81#

Laughing gull, 0.72#

Mourning dove, 0.27#

Killdeer, 0.22#

European starling, 0.19#

House sparrow, 0.062#

Small-Medium Birds, 2-4 lb

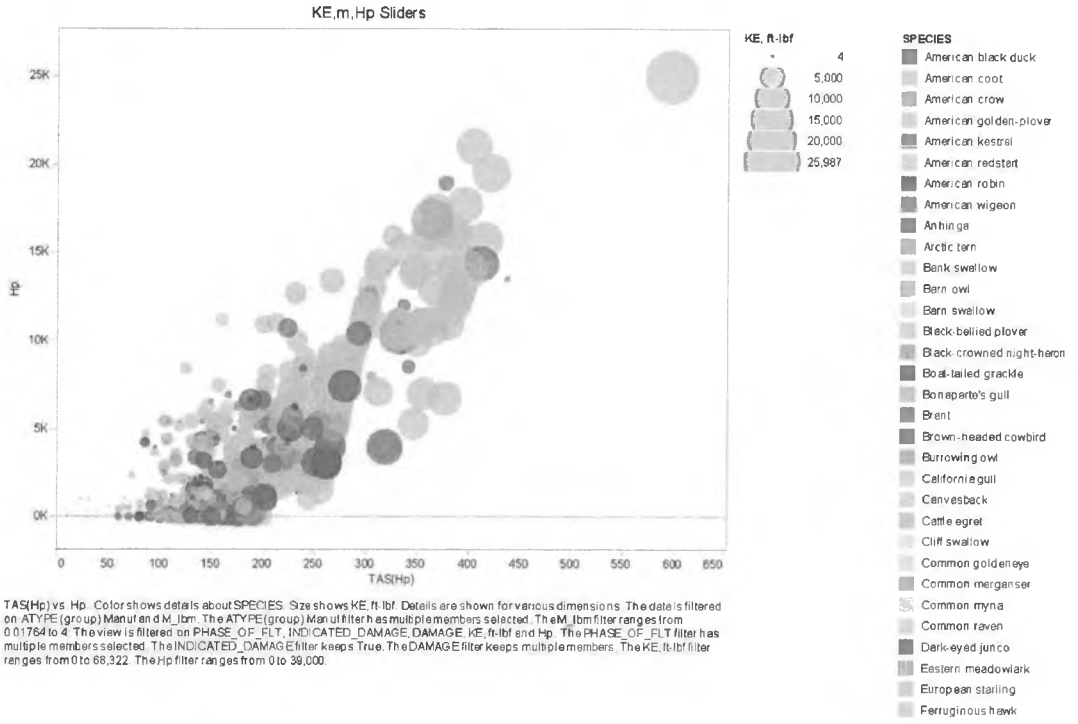
Osprey, 3.5#

Mallard, 2.8#

Red-tailed hawk, 2.7#

Herring gull, 2.5#

Part 121 Strikes with Damage 0-4lb



TAS(Hp) vs. Hp. Color shows details about SPECIES. Size shows KE, ft-lbf. Details are shown for various dimensions. The data is filtered on ATYPE (group) Manuf and M_lbm. The ATYPE (group) Manuf filter has multiple members selected. The M_lbm filter ranges from 0.01764 to 4. The view is filtered on PHASE_OF_FLT, INDICATED_DAMAGE, DAMAGE, KE, ft-lbf and Hp. The PHASE_OF_FLT filter has multiple members selected. The INDICATED_DAMAGE filter keeps True. The DAMAGE filter keeps multiple members. The KE, ft-lbf filter ranges from 0 to 68,322. The Hp filter ranges from 0 to 39,000.

Medium-Large Birds, 4-8 lb

White stork, 7.9#

Greater white-fronted goose, 6.6#

Snow goose, 6.0#

Great blue heron, 5.5#

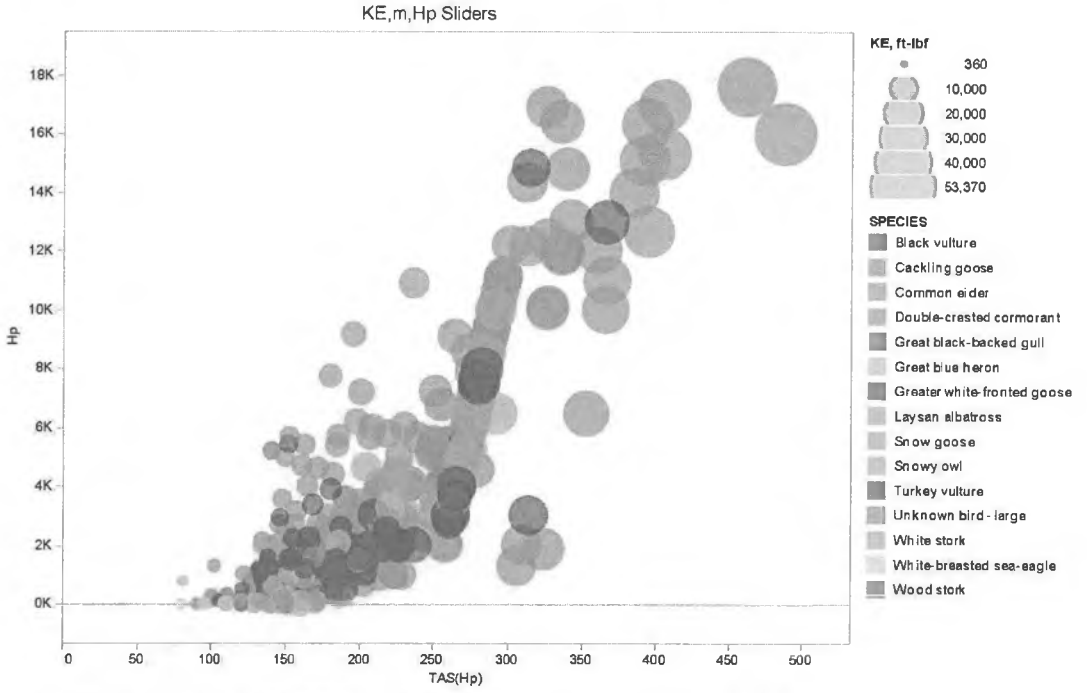
Snowy owl, 5.0#

Black vulture, 4.8#

Turkey vulture, 4.4#

Glaucous gull, 4.1#

Part 121 Strikes with Damage 4-8lb



TAS(Hp) vs. Hp. Color shows details about SPECIES. Size shows KE. ft-lbf. Details are shown for various dimensions. The data is filtered

Large Birds, 8-12 lb

Common loon, 12.0#

Bald eagle, 11.8#

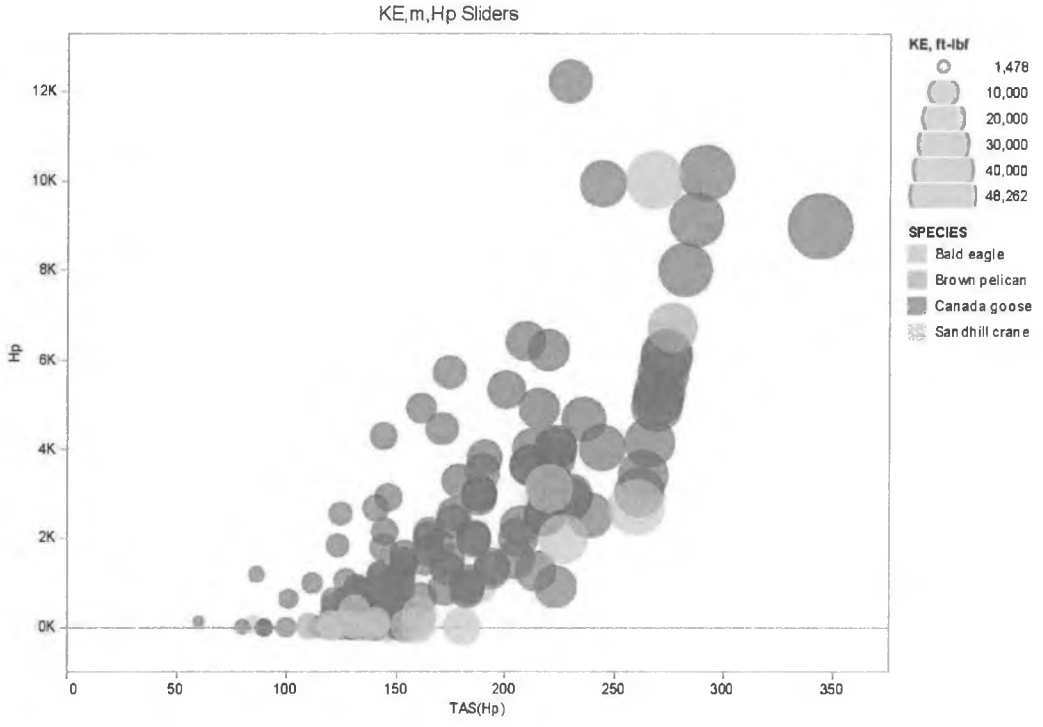
Sandhill crane, 10.6#

Golden eagle, 10.2#

Canada goose, 9.2#

Brown pelican, 8.2#

Part 121 Strikes with Damage 8-12lb



Massive Birds, 12-30 lb

Trumpeter Swan, 26.2#

Mute Swan, 26.0#

Wild Turkey, 17.2#

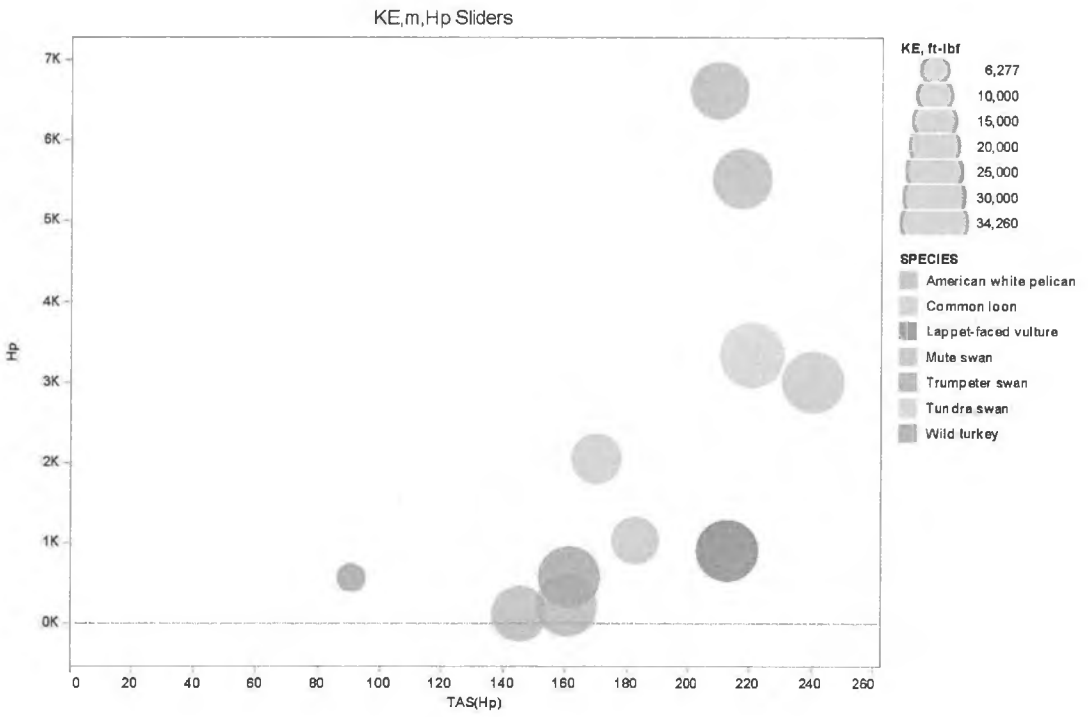
Tundra Swan, 15.9#

Lappet-faced vulture 15.4#

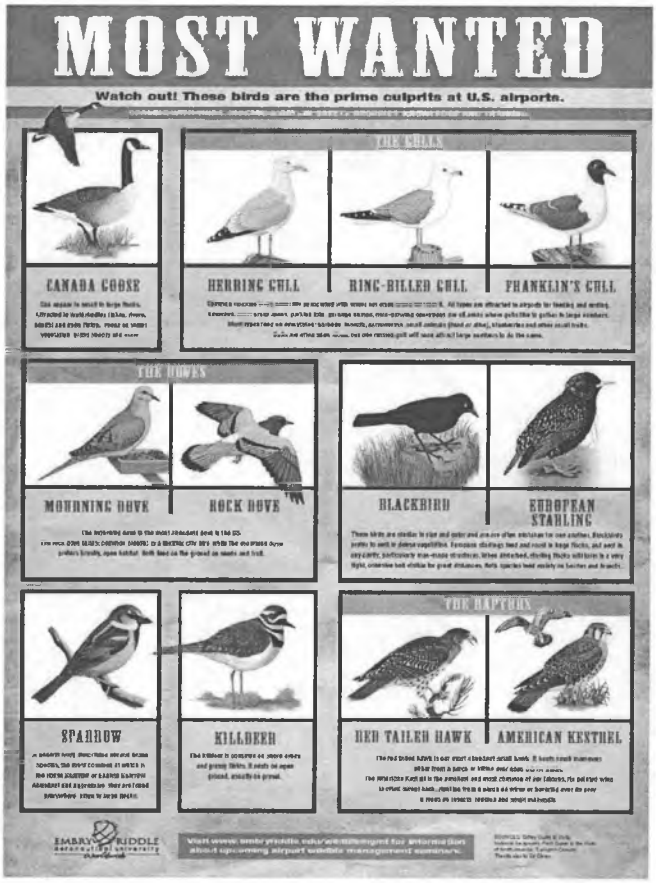
American white pelican, 14.0#

Whooping crane, 12.9#

Part 121 Strikes with Damage 12-30lb



MOST WANTED: Bird Species of Concern, US Airports



Selected Fatal Accidents

Ethiopian Airlines flight 604, 737-200 ET-AJA, 9/15/88, Baha Dar airport, Speckled pigeons, dual engine thrust loss after takeoff, 35 fatalities

September 15, 1988: The remains of a Boeing 737 that collided with a flock of speckled pigeons during take-off at Bhardar, Ethiopia. Out of 105 passengers and crew members, 35 people were killed, 21 were badly wounded and the rest were injured.

USAF AWACS E-3B, Yukla 27, 77-0354, 9/22/95, Elmendorf AFB, Alaska, Canada geese, left engines dual thrust loss after takeoff, 24 fatalities

Other Fatal Accidents

Belgian Air Force C130H, 7/15/1996, Eindhoven, starlings, missed approach, multiple engine thrust loss, 34 fatalities

United Air Lines flight 297, Vickers Viscount 745D, N7430, 11/23/1962, Ellicott City, Maryland, Mute (whistling) swans, cruise, left horizontal tail failure, 17 fatalities

Eastern Air Lines flight 375, Lockheed L-188A Electra N5533, Boston, 10/4/1960, starlings, multiple engine thrust loss on takeoff, 62 fatalities

Selected Hull Loss Accidents

KLM flight 1673, 737-400 PH-BTC, 11/28/2004, Eurasian buzzard, Amsterdam Schipol, nose gear steering failure, runway excursion on landing at Barcelona

Ryanair flight 4102 ,737-800 EI-DYG, 11/10/2008, Rome Ciampino, European starlings, missed approach, multiple engine thrust loss, hard landing

Kalitta Air flight 207, 747-200F N704CK, 5/25/2008, Eurasian kestrel, Brussels, engine ingestion RTO after V1, runway overrun

Overseas National Airways flight 032, DC-10-30 N1032F, JFK NY, 11/12/1975, gulls, RTO, overrun

Other Hull Loss Accidents

US Airways flight 1549, A320 N106US, 15 January 2009, Hudson River, Canada geese, dual engine thrust loss

NATO AWACS E-3A, 14 July 1996, LX-N90457, c/n 22852, ex-79-0457, gulls, Preveza AFB, Aktion, Greece, runway overrun

Selected Birdstrike Events

(21 transport category accidents last 20 years)

USAF B1-B
Colorado
Catastrophic loss of control (LOC),
Multi-hydraulic failure in wing root,
3 fatalities, 3 ejections,
9/1987, pelican

USAF E-3B AWACS,
707, Elmendorf AFB Alaska
Two engines failed, LOC,
24 fatalities
9/22/95, Canada geese

KLM 737-400,
Amsterdam - Barcelona,
Broke worn NGS cable,
Runway excursion,
Economic hull loss,
No fatalities
11/28/04, buzzard

US Airways, 2,750ft
A320, Hudson River,
Dual engine thrust loss,
Ditched Hudson River,
Hull Loss,
No Fatalities
1/15/09, Canada geese

Ethiopian Airlines
737-200, Ethiopia
Dual Engine Thrust loss,
off airport landing,
35 fatalities
9/15/88, Speckled pigeon

American Airlines 12,000ft
767-300, Paris, France,
Multiple strikes, flight deck penetration,
Substantial damage,
No fatalities
4/2/01, Canvasback ducks

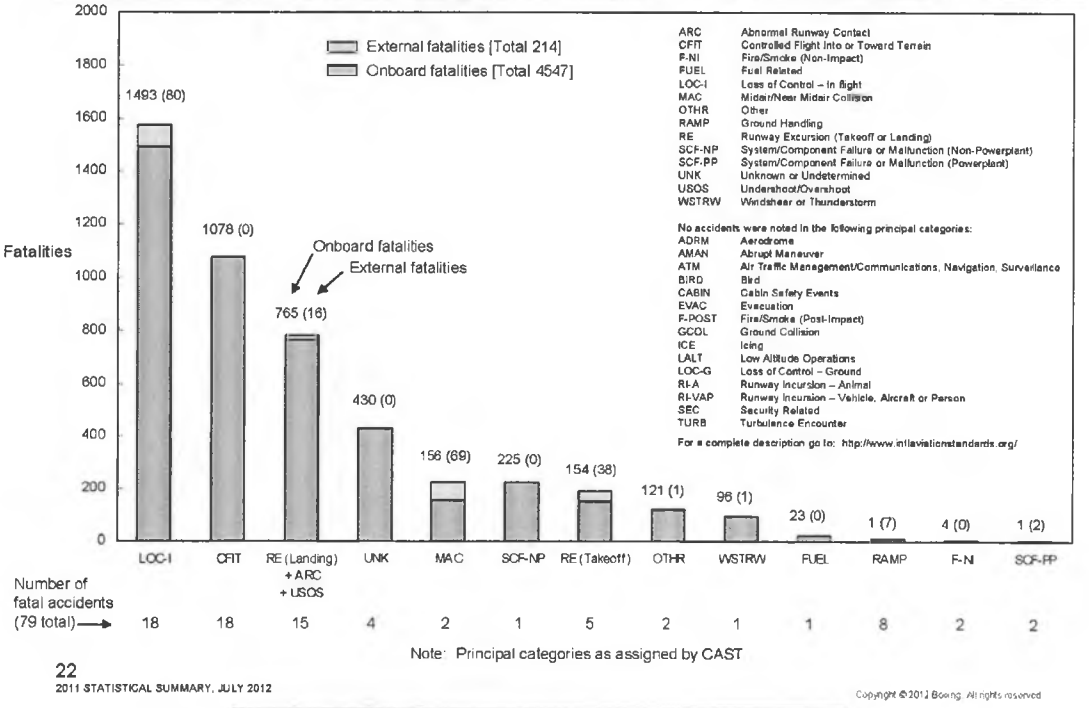
Ryan Air, 120ft
737-800, Rome, Italy,
Dual engine thrust loss,
Hard landing,
Economic hull loss,
No fatalities
11/10/08, Eur. starlings

▽ Multi-Engine
▼ Penetration
▽ Single Bird

No bird strike fatal accidents for transport category in last 20 years

Fatalities by CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories

Fatal Accidents – Worldwide Commercial Jet Fleet – 2002 Through 2011



Note: Principal categories as assigned by CAST

22
2011 STATISTICAL SUMMARY, JULY 2012

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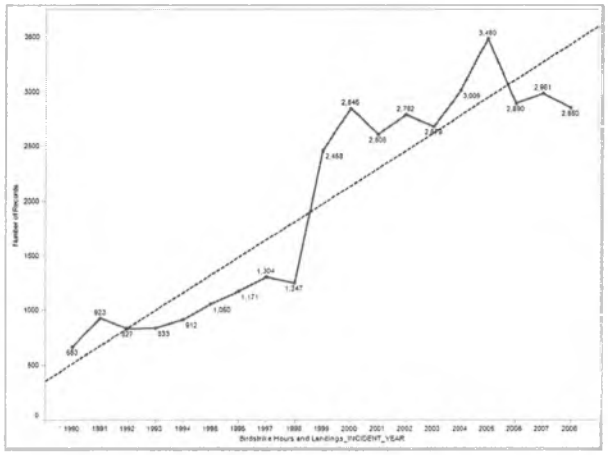
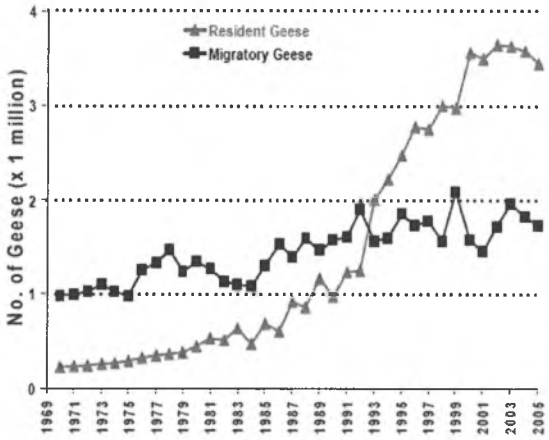
LOC, CFIT & RE have high fatality risk

The Bird Strike Hazard is Increasing



Strikes per year



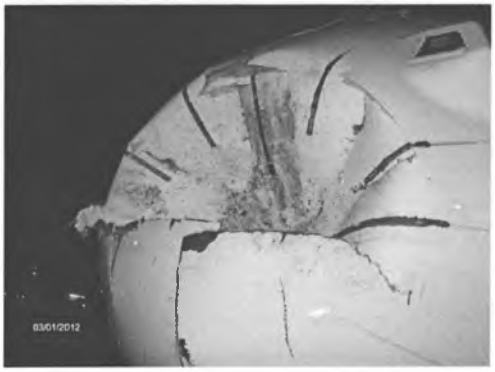
Increasing bird populations

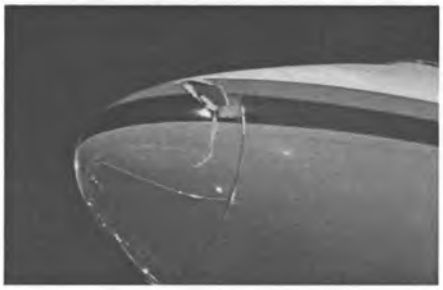
Wildlife strikes to civil aircraft in the United States, 1990–2009. U.S. Department of Transportation, Federal Aviation Administration, Serial Report No. 16 DOT/FAA/AS/00-6(AAS-310). Washington, DC, USA. 81 pages.

What are some strategies to handle the increasing threat?

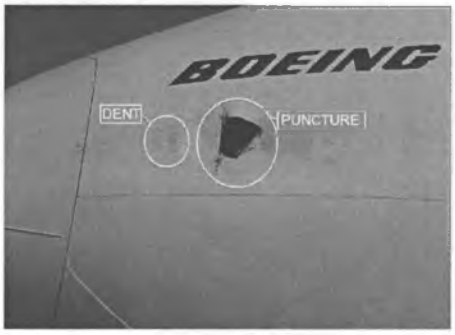
Airplane Component Damage

Radome Strikes



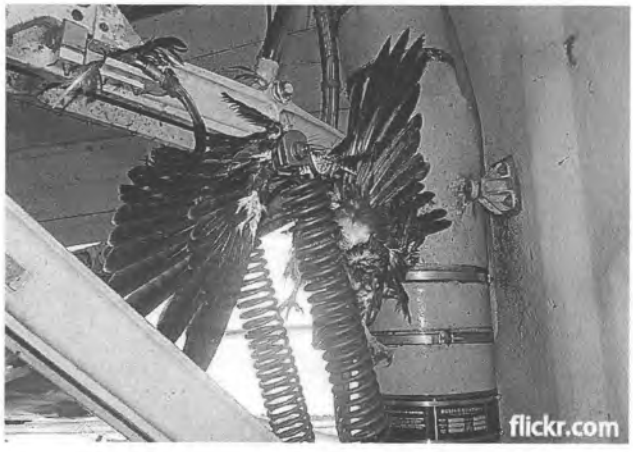


Nose Strikes



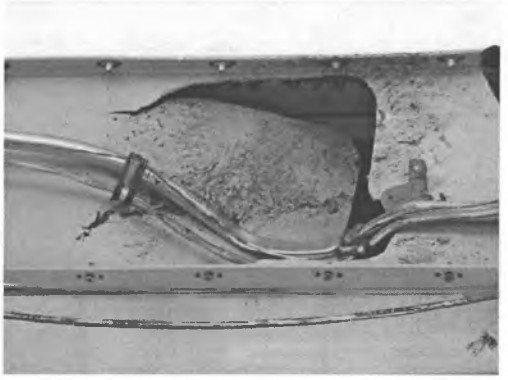
Windshield Strikes

Landing Gear & LG System Strikes

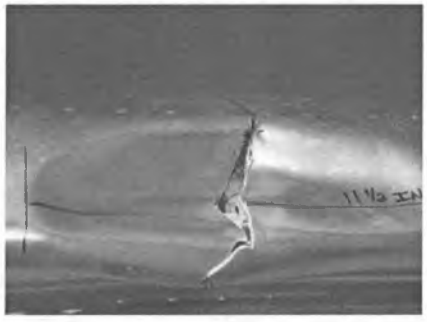


Flight Deck Penetrations

Wing Strikes



Empennage Strikes
Horizontal Tail, Vertical Stabilizer



Powerplant Strikes

Other Strikes to Airplane Systems

- Angle of attack AOA, used for stall warning
- Total Air Temperature TAT probes, used for thrust setting
- Pitot probes, used for airspeed measurement
- Antenna: glideslope and localizer for runway guidance in instrument meteorological conditions
- WXR, weather radar and windshear
- Shock: Flightdeck overhead panel, A320 engine shutdown; electrical panel, Horizon Airlines DHC-8 Medford Oregon, electrical circuit breakers popped, multiple systems lost

Airplane System Strikes: Sensors
AOA, TAT, Pitot, WXR, ILS

Flight Crew Response to Bird Strike

Boeing *AERO* Magazine 2011 Qtr 3
Strategies for Prevention of Bird-Strike Events

http://www.boeing.com/commercial/aeromagazine/articles/2011_q3/4/

The suggested strategies are based on visual analytic methods

Visual Analytics & Bird Strike

- Visual Analytics has greatly improved Boeing's understanding of the aviation wildlife hazard
- Multiple live sessions conducted with design engineers, working with online data (132,000 records), and examining strikes to radome, windshield, tail, landing gear, sensors, engines
- Promoting use of VA tools to wildlife community via US Bird Strike Committee, improve reporting, species identification, enhancement of annual wildlife strike report
- Practical wildlife hazard information for pilots

Visual Analytics Tool Applications for FOD & Bird Strike Prevention

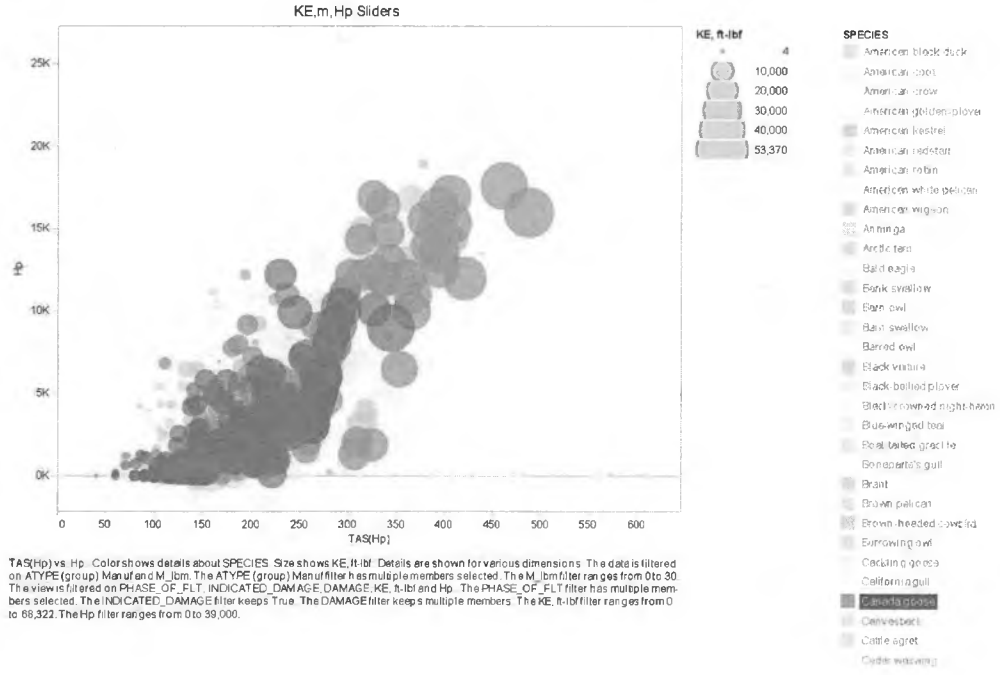
- Wildlife Strike Report Data Analysis
- Wildlife Surveys
- Vegetation Surveys
- Land Use Surveys
- FOD Report Data Analysis
- FOD Mapping

Visual Analytic tools facilitate analysis of multiple & massive sources of data

Aviation Wildlife Hazard Issues

- Voluntary Reporting of Wildlife Strikes in US
- Species Identification, particularly “Unknown Bird Large”
- Safety Requirements and Certification Requirements, Windshields, Nose Structure, Landing Gear, Tail, Lights, Sensors, Engines
- Multiple strikes, multiple engines struck

Species Identification
Canada Goose & “Unknown Bird Large”



TAS(Hp) vs. Hp. Color shows details about SPECIES. Size shows KE, ft-lbf. Details are shown for various dimensions. The data is filtered on ATYPE (group) Manuf and M_lbm. The ATYPE (group) Manuf filter has multiple members selected. The M_lbm filter ranges from 0 to 30. The view is filtered on PHASE_OF_FLT, INDICATED_DAMAGE, DAMAGE, KE, ft-lbf and Hp. The PHASE_OF_FLT filter has multiple members selected. The INDICATED_DAMAGE filter keeps True. The DAMAGE filter keeps multiple members. The KE, ft-lbf filter ranges from 0 to 68,322. The Hp filter ranges from 0 to 39,000.

Visual Analytics for Aviation Safety

- Improving aviation safety data quality: engine & airframe inconsistencies, operational data (speed, altitude & flight phase); accuracy checking of Boeing Statistical Summary of Jet Transport Accidents http://www.boeing.com/news/techissues/pdf/statsum.pdf
- Rejected takeoffs
- Unreliable airspeed
- Loss of control in flight
- Air Traffic Management applications

Visual Analytics (VA) at Boeing

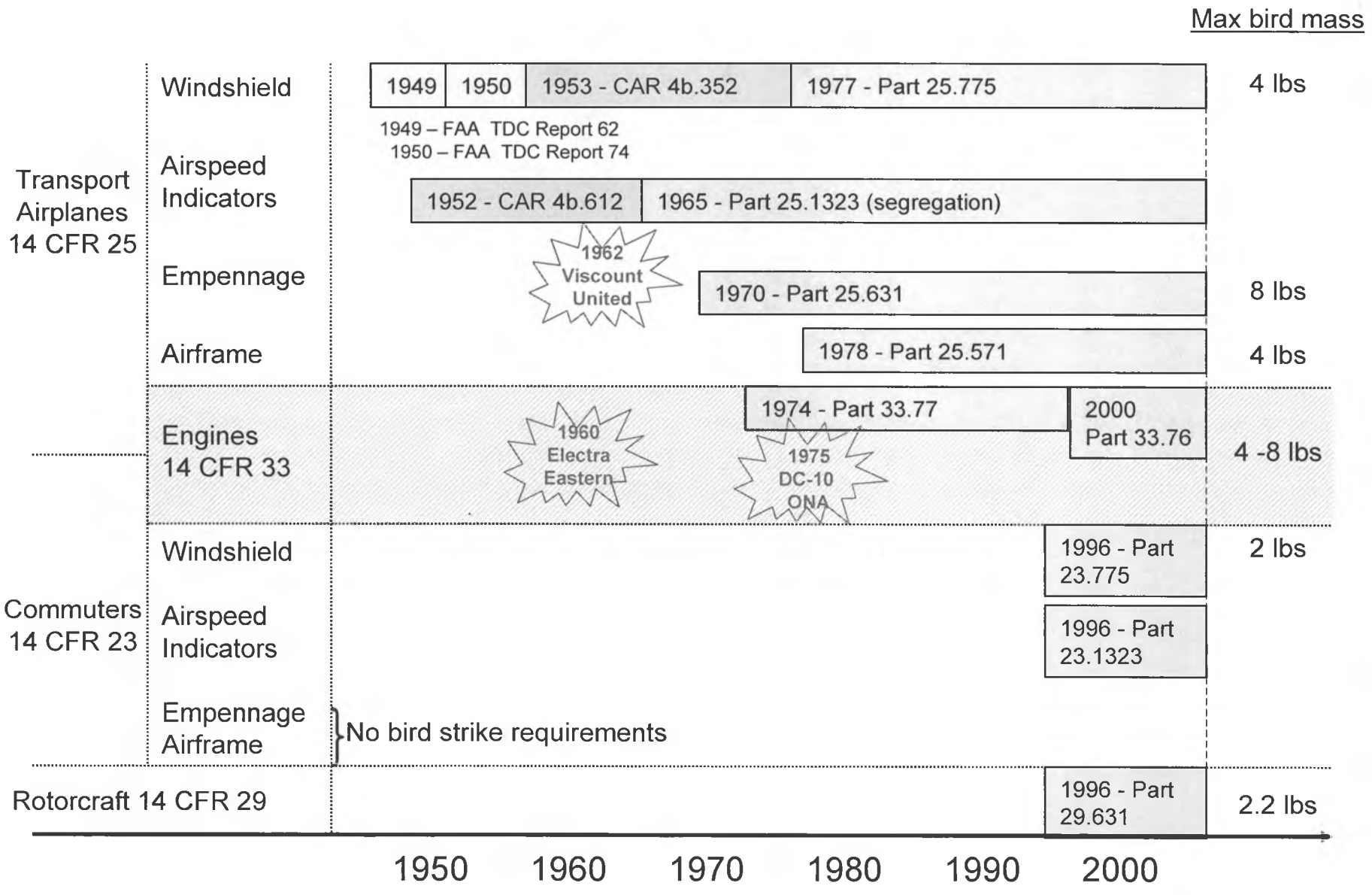
- Boeing Intern Andrew Wade (Simon Fraser University Vancouver Canada) demonstrated power of Visual Analytics for aviation safety at Boeing
- Visual Analytics is an important path forward with massive datasets of digital aviation
- Entry into service of the 787 Dreamliner is being closely monitored with VA applications

Thank You
Any Questions?

WANTED:
Wildlife position

Roger.Nicholson@Boeing.com

Bird Strike Airworthiness Standards



Ginger Blaisdell

From: AUVSI Communications <info@auvsi.org>
Sent: Tuesday, August 25, 2015 3:21 PM
To: Ginger Blaisdell
Subject: AUVSI challenges California UAS bill; Global Hawk starts storm duty

Forward to a Friend

Connect with Us:

Advocacy News

California Assembly passes SB 142, could stymie UAS industry

Brian Wynne (8/25/2015)

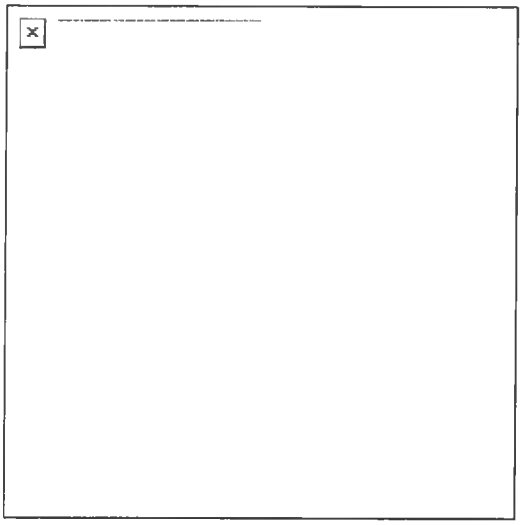
Brian Wynne, president & CEO of AUVSI, today released the following statement on the passage of SB 142 in the California Assembly. The legislation would restrict UAS from flying below 350 feet over private property.

"AUVSI is deeply disappointed with the passage of SB 142 in the California Assembly. While the industry supports the safe, non-intrusive use of UAS technology, SB 142 creates inconsistencies with federal law that has the potential to further confuse UAS users and stifle economic growth in California. The Supreme Court has ruled that property rights do not extend infinitely into the sky. Only the FAA can regulate airspace; states and municipalities can't."

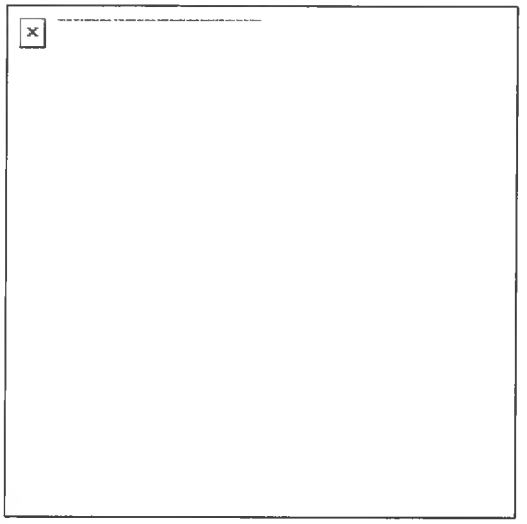
If passed, SB 142 has the potential to limit the societal and economic benefits of UAS technology in the state. From filmmaking to real estate, California industries are already successfully using UAS technology

through more than 100 commercial exemptions granted by the FAA, more than any other state. Once the U.S. airspace is fully opened to UAS, California stands to gain more than 18,100 jobs and more than $14 billion in economic impact within a decade.

Earlier this week, AUVSI President and CEO Brian Wynne penned an op-ed in the Sacramento Bee urging the California Legislature to reject SB 142. We urge you to contact your elected representatives in the California State Assembly and Senate and ask them to oppose SB 142 and allow the FAA — the appropriate authority to regulate airspace — to finalize its rules that govern UAS technology.

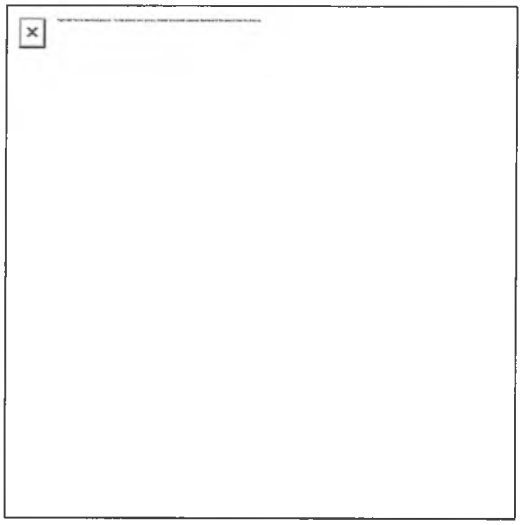


Last chance to join AUVSI on Capitol Hill
AUVIS Advocacy (8/25/15)



Today is the last day to sign up for AUVSI's Hill Day, where AUVSI members have the chance to educate lawmakers about robotics and unmanned systems technologies.

Sign up now!



Industry News

Global Hawk arrives at Wallops for SHOUT duty
AUVSI (8/24/2015)

One of NASA's Global Hawk unmanned aircraft has arrived at Wallops Island, Virginia, where it will begin a new mission to improve hurricane forecasts.

Navy orders $4 Million worth of iRobot FirstLooks
AUVSI (8/20/2015)

AMENDED IN ASSEMBLY JUNE 30, 2015

AMENDED IN ASSEMBLY JUNE 3, 2015

AMENDED IN SENATE APRIL 14, 2015

SENATE BILL No. 142

Introduced by Senator Jackson
(Principal coauthor: Assembly Member Calderon)

January 26, 2015

An act to add Section 1708.83 to the Civil Code, *and to amend Section 21012 of the Public Utilities Code,* relating to civil law.

LEGISLATIVE COUNSEL'S DIGEST

SB 142, as amended, Jackson. Civil law: unmanned aerial vehicles.

Existing federal law, the FAA Modernization and Reform Act of 2012, provides for the integration of civil unmanned aircraft systems, commonly known as drones, into the national airspace system by September 30, 2015. Existing federal law requires the Administrator of the Federal Aviation Administration to develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system by December 31, 2015.

~~Existing law imposes liability for physical invasion of privacy, if a person knowingly enters onto the land of another without permission or otherwise commits a trespass in order to capture any image or recording of the plaintiff engaging in a private activity and the invasion is offensive to a reasonable person.~~

~~This bill would define knowing entry upon the land of another also to include operation of an unmanned aerial vehicle below the navigable airspace overlaying the real property or operation of an unmanned aerial~~

~~vehicle less than 350 feet above ground level within the airspace overlaying the real property, without the consent of the landowner or without legal authority.~~

Existing law deems the detriment caused by wrongful occupation of real property to be the value of the use of the property for the time of the wrongful occupation, the reasonable cost of repair or restoration of the property, and the costs of recovering the possession.

This bill would extend liability for wrongful occupation of real property and damages to a person who operates an unmanned ~~aerial vehicle below the navigable airspace overlaying the real property or operation of an unmanned aerial vehicle~~ *aircraft or unmanned aircraft system, as defined,* less than 350 feet above ground level within the airspace overlaying the real property, without the ~~consent of the landowner~~ *express permission of the person or entity with the legal authority to grant access* or without legal authority.

Vote: majority. Appropriation: no. Fiscal committee: no. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. Section 1708.83 is added to the Civil Code, to read:

~~1708.83. (a) A person knowingly enters onto the land of another person pursuant to subdivision (a) of Section 1708.8 if, without the consent of the landowner or without legal authority, he or she does either of the following:~~

~~(1) Operates an unmanned aerial vehicle below the navigable airspace, as defined in paragraph (32) of subsection (a) of Section 40102 of Title 49 of the United States Code, overlaying the real property.~~

~~(2) Operates an unmanned aerial vehicle less than 350 feet above ground level within the airspace overlaying the real property.~~

~~(b) A person wrongfully occupies real property and is liable for damages pursuant to Section 3334 if, without the consent of the landowner or without legal authority, he or she does either of the following:~~

~~(1) Operates an unmanned aerial vehicle below the navigable airspace, as defined in paragraph (32) of subsection (a) of Section 40102 of Title 49 of the United States Code, overlaying the real property.~~

~~(2) Operates an unmanned aerial vehicle less than 350 feet above ground level within the airspace overlaying the real property.~~

1708.83. (a) A person wrongfully occupies real property and is liable for damages pursuant to Section 3334 if, without express permission of the person or entity with the legal authority to grant access or without legal authority, he or she operates an unmanned aircraft or unmanned aircraft system less than 350 feet above ground level within the airspace overlaying the real property.

(b) For purposes of this section:

(1) "Unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

(2) "Unmanned aircraft system" means an unmanned aircraft and associated elements, including communication links and the components that control the unmanned aircraft, that are required for the pilot in command to operate safely and efficiently in the national airspace system.

~~(3)~~

(c) This section shall not be construed to impair or limit any otherwise lawful activities of law enforcement personnel or employees of governmental agencies or other public or private entities that may have the right to enter land by operating an ~~unmanned aerial vehicle~~ *unmanned aircraft or unmanned aircraft system* within the airspace overlaying the real property of another, including the right to use private lands acquired pursuant to subdivision (d) of Section 1009.

(d) Nothing in this section is intended to limit the rights and defenses available at common law under a claim of liability for wrongful occupation of real property.

SEC. 2. Section 21012 of the Public Utilities Code is amended to read:

21012. "Aircraft" means any manned contrivance used or designed for navigation of, or flight in, the air requiring certification and registration as prescribed by federal statute or regulation. Notwithstanding the foregoing provisions of this section, manned lighter-than-air balloons and ultralight vehicles as defined in the regulations of the Federal Aviation Administration (14 C.F.R. Part 103), whether or not certificated by the Federal Aviation Administration, shall not be considered to be aircraft for purposes of this part. *"Aircraft" shall not include an unmanned*

aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

O

SOAPBOX AUGUST 23, 2015

Don't prematurely limit the potential of aerial drones

HIGHLIGHTS

Legislature considering bill, but it should let FAA set nationwide rules

Drone companies could expand dramatically and create jobs in California

Film industry and real estate agents already capitalizing on technology

BY BRIAN WYNNE
Special to The Bee

From Silicon Valley to Hollywood, unmanned aircraft are transforming how California industries operate and are creating several new ones as well.

But as more and more businesses receive waivers from the Federal Aviation Administration to fly drones commercially, legislators are considering Senate Bill 142, which would restrict drones from flying below 350 feet over private property.

While the industry supports the safe, nonintrusive use of drone technology, passage of SB 142 would create inconsistencies with federal law. The Supreme Court ruled that property rights do not extend infinitely into the sky. In other words, only the FAA can regulate airspace; states and municipalities can't.

Legislation like SB 142 isn't unique to California. Many states have been considering proposals that would prematurely and unnecessarily limit the tremendous societal and economic benefits that drone technology will bring. But until the FAA finalizes its long awaited rules on small unmanned aircraft systems, there is much uncertainty about where operators should and shouldn't fly and for what purpose. For the safety of our skies, we need Washington to make finalizing these rules a top priority.

There is strong evidence that a burgeoning market is waiting to be unleashed once regulations are established. Since the FAA announced in May 2014 that it would grant exemptions for certain low-risk commercial drones, more than 1,100 businesses, including dozens in California, have received permission.

The Association for Unmanned Vehicle Systems International recently examined the first 500 approved petitions and found that California led the way with 70. Unmanned aircraft are being used in many of the state's top industries, including film and television, real estate and agriculture.

For example, Carlsbad-based Aerial Mob was one of the first to receive a commercial exemption from the FAA. An innovator in cinematography and technology, Aerial Mob is also considered a pioneer in safety standards. The company performed the first ever FAA-approved film production project with a major studio on the set of the CBS show "The Mentalist." The company has since filmed Super Bowl promos for NBC, a promo for a new show on Amazon Prime and even helped Apple film a commercial.

Drones are also very popular in California's resurgent real estate industry. Real estate agents see an opportunity to capture unique aerial perspectives for their listings. The FAA has issued 15 exemptions to real estate companies in the state and more than 200 nationwide, according to the National Association of Realtors.

The large number of commercial exemptions granted in California shows that its commercial drone market is waiting to be unleashed. However, the current system of case-by-case approvals isn't a long-term solution. Once the FAA finalizes its rules, any drone operator who follows the rules can fly, opening the door to even more commercial use in California.

A study by our association estimated that in the first decade following drone integration into the national airspace system, California's economy would gain more than 18,100 jobs and more than $14 billion in economic impact. Under the right regulatory environment, there's no question these numbers could go even higher.

Drone technology is developing rapidly and the next innovative use may be just around the corner. To continue reaping the economic benefits, we need to do all we can to support the growth and development of this industry rather than restrict it. Otherwise, California risks losing its innovation edge, plus billions of dollars of economic impact.

Brian Wynne is president and CEO of the Association for Unmanned Vehicle Systems International.

reprints

MORE SOAPBOX

COMMENTS

Sign In Using The Social Network of Your Choice to Comment

To learn more about comments, please see the Comments FAQ.

GAO Reviews FAA Progress on UAS Integration

Federal aviation regulators by September expect to develop a foundation for a detailed plan to integrate drones into U.S. airspace, and then enact it in December, congressional investigators said in a new report.

The Government Accountability Office publicly released a report on Aug. 17 that reviewed the Federal Aviation Administration's progress on drone - or unmanned aerial system, or UAS - integration.

Additionally, the report covered drone challenges as well as the agency's case-by-case approval of drone operations, use of six designated sites to conduct tests, and drone regulations in other countries.

According to the report, which was actually published a month before, FAA is working with the MITRE Corp. to develop a foundation for the implementation plan that would contain several hundred activities to complete the integration process, which is needed as the government and commercial sectors are increasingly using unmanned aircraft for various purposes.

The GAO noted in a footnote that the implementation plan, however, is not expected to be made public.

A federal law enacted in 2012 required that the FAA integrate drones into the national airspace by Sept. 30, 2015, but the regulatory process in drafting and reviewing the rules has been slow.

In the meantime, the FAA issued proposed rules in February for the operations of small drones weighing less than 55 pounds and received more then 4,500 comments in late April. A final rule may not be developed until 2016 or 2017, the GAO report said, reiterating what has been previously reported.

Regarding the six test sites, which were established in 2014 to conduct research and development on drone operations and safety that the FAA reviews, more than 195 test flights have taken place as of March. The report also listed the challenges that these sites faced and their future use.

The report also compared proposed U.S. regulations to those in other countries such as Australia, Canada, France and the United Kingdom, which all have similar, but well-established rules for commercial operations.

"While the United States has not finalized UAS regulations, the provisions of FAA's proposed rules are similar to those in the countries GAO examined," the report said." However, FAA may not issue a final rule for UASs until late 2016 or early 2017, and rules in some of these countries continue to evolve."

All countries face similar challenges, too. For example, the report listed technology concerns regarding detection and avoidance of other aircrafts, lack of standards for command and control systems and the lack of a dedicated and secure spectrum.

In comments about the report, the Transportation Department said GAO addressed many of the challenges, but it did not discuss environmental concerns. The watchdog agency said that it was outside the scope of this report.

The department said that FAA is conducting research to understand the environmental impacts of drone integration, the role of such unmanned vehicles in complying with federal law and the how noise standards apply to them.

Source: FierceGovernmentIT

g+1

United States Government Accountability Office

Report to Congressional Committees

July 2015

UNMANNED AERIAL SYSTEMS

FAA Continues Progress toward Integration into the National Airspace

GAO-15-610

July 2015

UNMANNED AERIAL SYSTEMS

FAA Continues Progress toward Integration into the National Airspace

GAO Highlights

Highlights of GAO-15-610, a report to congressional committees

Why GAO Did This Study

UASs are aircraft that do not carry a pilot aboard, but instead operate on pre-programmed routes or are manually controlled by following commands from pilot-operated ground control stations. Unauthorized UAS operations have, in some instances, compromised safety. The FAA Modernization and Reform Act of 2012 directed FAA to take actions to safely integrate UASs into the national airspace. In response, FAA developed a phased approach to facilitate integration and established test sites among other things.

GAO was asked to review FAA's progress in integrating UASs. This report addresses (1) the status of FAA's progress toward safe integration of UASs into the national airspace, (2) research and development support from FAA's test sites and other resources, and (3) how other countries have progressed toward UAS integration into their airspace for commercial purposes. GAO reviewed and analyzed FAA's integration-planning documents; interviewed officials from FAA and UAS industry stakeholders; and met with the civil aviation authorities from Australia, Canada, France, and the United Kingdom. These countries were selected based on several factors including whether they have regulatory requirements for commercial UASs, operations beyond the view of the pilot, and whether non-military UAS are allowed to operate in the airspace. In comments on this report, the Department of Transportation noted that GAO did not address environmental considerations of UAS integration; such considerations were outside the scope of this report.

View GAO-15-610. For more information, contact Gerald Dillingham at (202) 512-2834 or dillinghamg@gao.gov.

What GAO Found

The Federal Aviation Administration (FAA) has progressed toward its goal of seamlessly integrating unmanned aerial system (UAS) flights into the national airspace. FAA has issued its *UAS Comprehensive Plan* and *UAS Integration Roadmap*, which provide broad plans for integration. However, according to FAA, it is working with MITRE to develop a foundation for an implementation plan; FAA then expects to enact a plan by December 2015. While FAA still approves all UAS operations on a case-by-case basis, in recent years it has increased approvals for UAS operations. Specifically, the total number of approvals for UAS operations has increased each year since 2010, and over the past year has included approvals for commercial UAS operations for the first time. In addition, FAA has issued a Notice of Proposed Rulemaking that proposes regulations for small UASs (less than 55 pounds).

The FAA's six designated test sites have become operational but have had to address various challenges during the process. The designated test sites became operational in 2014, and as of March 2015, over 195 test flights had taken place. These flights provide operations and safety data to FAA in support of UAS integration. In addition, FAA has provided all test sites with a Certificate of Waiver or Authorization allowing small UAS operations below 200 feet anywhere in the United States. However, during the first year of operations, the test sites faced some challenges. Specifically, the test sites sought additional guidance regarding the type of research they should conduct. According to FAA, it cannot direct the test sites, which receive no federal funding, to conduct specific research. However, FAA did provide a list of potential research areas to the test sites to provide some guidance on areas for research. FAA has conducted other UAS research through agreements with MITRE and some universities, and in May 2015 named the location of the UAS Center of Excellence—a partnership among academia, industry, and government conducting additional UAS research. Unlike FAA's agreements with the test sites, many of these arrangements have language specifically addressing the sharing of research and data.

Around the world, countries have been allowing UAS operations in their airspace for purposes such as agricultural applications and aerial surveying. Unlike in the United States, countries GAO examined—Australia, Canada, France, and the United Kingdom—have well-established UAS regulations. Also, Canada and France currently allow more commercial operations than the United States. While the United States has not finalized UAS regulations, the provisions of FAA's proposed rules are similar to those in the countries GAO examined. However, FAA may not issue a final rule for UASs until late 2016 or early 2017, and rules in some of these countries continue to evolve. Meanwhile, unlike under FAA's proposed rule, Canada has created exemptions for commercial use of small UASs in two categories that allow operations without a government-issued certification, and France and Australia are approving limited beyond line-of-sight operations. Similar to the United States, other countries are facing technology shortfalls, such as the ability to detect and avoid other aircraft and obstacles, as well as unresolved issues involving limited spectrum that limit the progress toward full integration of UASs into the airspace in these countries.

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Abbreviations

ASTM International	formerly known as the American Society for Testing and Materials
COA	Certificates of Waiver or Authorization
DHS	Department of Homeland Security
DOD	Department of Defense
DOT	Department of Transportation
EASA	European Aviation Safety Agency
EUROCAE	European Organization for Civil Aviation Equipment
Experimental Certificate	Special Airworthiness Certificates in the Experimental Category
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
MITRE	MITRE Corporation
MOA	memorandum of agreement
MOU	memorandum of understanding
NASA	National Aeronautics and Space Administration
NPRM	Notice of Proposed Rule Making
RTCA	formerly the Radio Technical Commission for Aeronautics (now RTCA)
the 2012 Act	FAA Modernization and Reform Act of 2012
UAS	unmanned aerial systems or unmanned aircraft systems

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GAO U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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Congressional Committees

Since the early 1990s, unmanned aerial systems (UAS) have operated on a limited basis in the national airspace system, primarily supporting public uses, such as military and border-security operations.[1] The list of potential uses is now rapidly expanding to include a broad range of UAS operations, including assisting in search and rescue operations, inspecting pipelines, photographing real estate, surveying land and crops, disaster assistance, gathering news, and filming movies. According to a 2013 report by a UAS industry group, the economic benefit of fully integrating UASs into the national airspace system will total more than $13.6 billion in the first 3 years of integration and grow to more than $82.1 billion from 2015 through 2025.

The Federal Aviation Administration's (FAA) goal is to seamlessly integrate all UAS operations into the national airspace. While FAA is developing regulations to allow routine UAS commercial operations, it currently only allows them in the national airspace after a case-by-case safety review and approval. At the same time, the safety of the national airspace is threatened on a nearly daily basis by UASs' operating without approval. For example, one UAS nearly collided with a New York Police Department helicopter over New York City, another came dangerously close to a US Airways regional jet over the Florida panhandle, and numerous UASs have been spotted flying over professional and college football stadiums full of people. The FAA has stated the number of reported incidents has increased recently, with 97 incidents reported from February through March 2015, compared to just 3 incidents reported

[1]See GAO, *Unmanned Aerial Systems: Department of Homeland Security's Review of U.S. Customs and Border Protection's Use and Compliance with Privacy and Civil Liberty Laws and Standards*, GAO-14-849R (Washington, DC: Sept. 30, 2014). UAS aircrafts do not carry a pilot onboard, but instead operate by following commands from pilot-operated ground control stations or pre-programmed routes. UASs are also referred to as "unmanned aerial vehicles," "unmanned aircraft systems," "remotely piloted aircraft," "unmanned aircraft," or "drones." The term "unmanned aerial system" is used to recognize that UASs include not only the airframe and its power source, such as a battery or combustible engine, but also associated elements such as a ground control station and communications links.

during the same period in 2014. FAA believes the increase is due to more awareness about UASs and the need to report incidents, but the extent these factors contribute to the increase is not clear.

As UAS operations in the national airspace continue to increase, members of Congress have raised questions about the safe and efficient integration of UASs into the national airspace system and asked us to examine the progress of UAS integration. This report examines (1) the status of FAA's progress toward safe integration of UASs into the national airspace, (2) research and development support from FAA's test sites and other resources, and (3) how other countries have progressed toward UAS integration into their airspace for commercial purposes.

To address all the objectives, we reviewed FAA reports and prior GAO work[2] related to integrating UASs in the national airspace system, reviewing such work as FAA's framework for UAS integration and our prior work on UAS research and development, efforts by FAA to accommodate ongoing research and commercial UAS use, and UASs' technology challenges.[3] We also reviewed provisions of the FAA Modernization and Reform Act of 2012[4] (the 2012 Act), and the Notice of Proposed Rulemaking for small UAS operations.[5] To determine FAA's progress toward safe integration of UASs into the national airspace, we reviewed and analyzed documents provided by various stakeholders and conducted semi-structured interviews with these stakeholders, including government—FAA, Department of Defense (DOD), National Aeronautics and Space Administration (NASA), and the Department of Homeland Security—academics researching UAS technology, industry trade associations, and others from the UAS industry including a manufacturer and a commercial operator. We selected the private-sector stakeholders,

[2]GAO, *Unmanned Aircraft Systems: Continued Coordination, Operational Data, and Performance Standards Needed to Guide Research and Development*, GAO-13-346T (Washington, DC: Feb. 15, 2013); *Unmanned Aircraft Systems: Measuring Progress and Addressing Potential Privacy Concerns Would Facilitate Integration into the National Airspace System*, GAO-12-981 (Washington, DC: Sept. 14, 2012); and *FAA Reauthorization Act: Progress and Challenges Implementing Various Provisions of the 2012 Act*, GAO-14-285T (Washington, DC: Feb. 5, 2014).

[3]We did not review the environmental challenges of UAS integration.

[4]Pub. L. No. 112-95, 126 Stat. 11.

[5]80 Fed. Reg. 9544 (Feb. 23, 2015).

such as RTCA and ASTM International, based on their involvement within UAS standards groups.[6] To identify research and development support from FAA's test sites and other resources, we reviewed and analyzed documents provided by officials at each of FAA's six test sites and conducted semi-structured interviews with officials from each of the six, including the applications submitted by the selected test sites and quarterly reports provided to FAA. We also interviewed FAA officials managing the test site program and those managing other research and development efforts related to UASs. To identify how other countries have progressed toward UAS integration into their airspace for commercial purposes, we obtained the UAS regulations of authorities in France, the United Kingdom, Australia, and Canada and interviewed the civil aviation authorities in them. We selected these countries based on several factors including whether they have regulatory requirements for commercial UASs, operations beyond the view of the pilot, and whether the country allows non-military UAS to operate in the airspace. We also reviewed key documents and interviewed international aviation entities including the International Civil Aviation Organization (ICAO).[7] More details on our scope and methodology can be found in appendix I.

We conducted this performance audit from January 2014 to July 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

UASs can be categorized by both size and mission, as shown in figure 1.

- For the purposes of this report, in terms of size, we use the broad categories of "small" and "large" UASs. Small UASs typically weigh less than 55 pounds and can be used for a variety of commercial purposes including photography and package delivery. According to

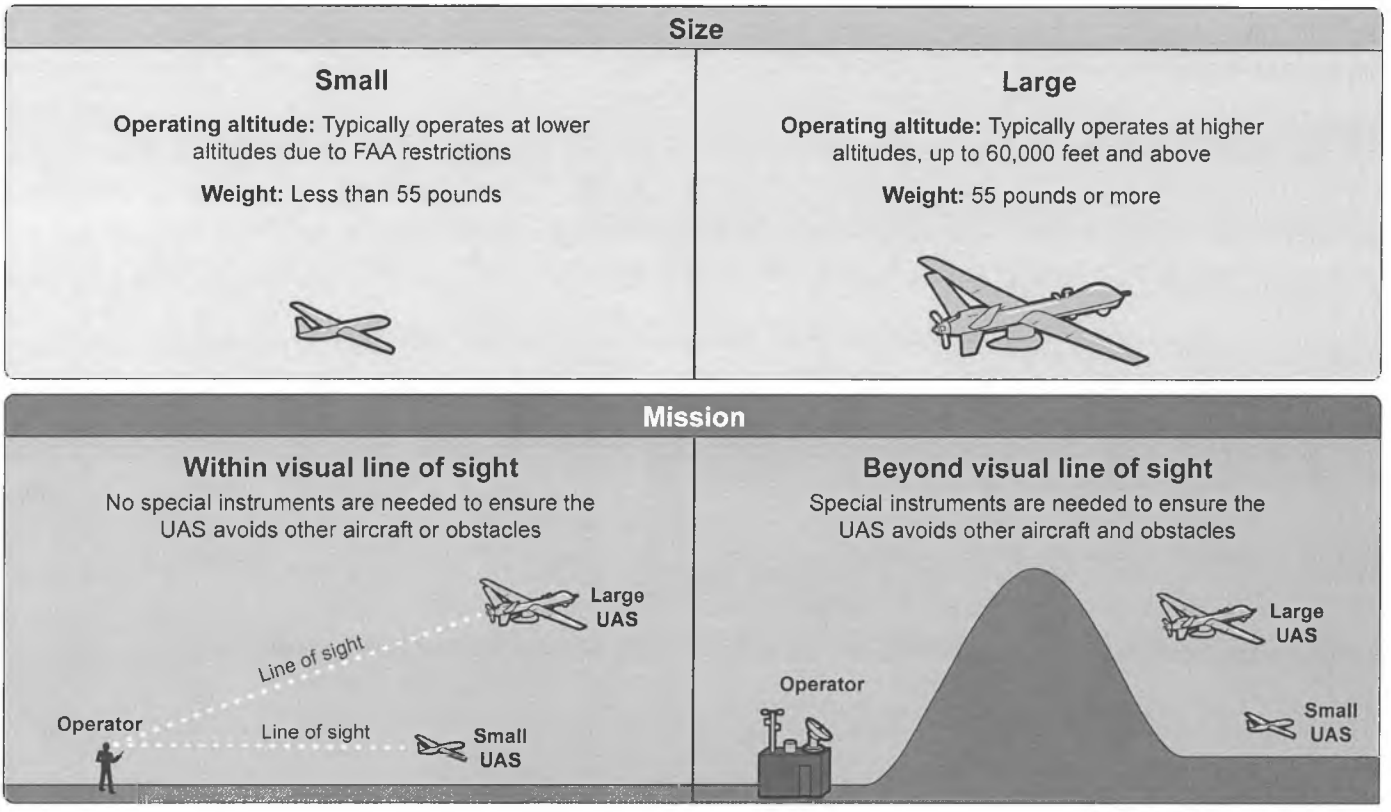
[6]RTCA was formerly known as the Radio Technical Commission for Aeronautics. ASTM International was formerly known as the American Society for Testing and Materials.

[7]ICAO is the international body that, among other things, promulgates international standards and recommended practices in an effort to harmonize global aviation standards.

an industry association, small UASs are expected to comprise the majority of UASs that will operate in the national airspace system. Large UASs, depending on their size and purpose, generally fly at higher altitudes and are used for the purposes of surveillance, data gathering, and communications relay.

- UAS operations are also categorized by how they are being used—their mission—within line of sight of the operator or beyond the line of sight of the operator. For UAS operations within the operator's line of sight—for example a real estate agent taking photographs of a house—the operator relies only on their vision to avoid colliding with other objects. On the other hand, UAS operations occurring beyond the line of sight of the operator—for example conducting rail or pipeline inspections—requires that FAA segregate the airspace or that the UAS needs instruments to sense other aircraft and obstacles and avoid those obstacles, as well as, other technologies that will keep the aircraft safely operating during its mission.

Figure 1: Unmanned Aerial Systems (UAS) Size and Mission Categories



Source: GAO. | GAO-15-610

The FAA plays two major roles in integrating UASs into the national airspace—a regulator and a service provider. As the regulator, the FAA seeks to ensure the safety of persons and property in the air and on the ground in part by requiring that UAS operators and manufactures follow specific operation and manufacturing standards. As the service provider, the FAA is responsible for providing safe and efficient air-traffic control services in the national airspace system and the other portions of global airspace. In addition to FAA, many federal and private sector entities have roles in the effort to integrate UAS into the national airspace system. See table 1 for UAS stakeholders and their responsibilities.

Table 1: Unmanned Aerial Systems (UAS) Stakeholders and Their Responsibilities

Agency	Responsibility
Federal Aviation Administration (FAA)	FAA's UAS Integration Office is responsible for ensuring that Unmanned Aerial Systems (UAS) operate safely in the national airspace system and for providing safe and efficient air traffic control.
Department of Defense (DOD)	DOD provides FAA with UAS operational and safety data, as well as research and development support.
National Aeronautics and Space Administration (NASA)	NASA provides research and development and testing on UAS integration efforts.
Department of Homeland Security (DHS)	DHS's Customs and Border Protection has provided flight demonstrations to FAA's Next Generation Air Transportation System (NextGen) Office.
UAS Executive Committee[a]	The UAS Executive Committee is composed of senior executives from federal agencies including FAA, DOD, NASA, and DHS and is responsible for identifying solutions to the range of technical, procedural, and policy concerns arising from UAS integration.
UAS Aviation Rulemaking Committee	The UAS Aviation Rulemaking Committee was chartered in 2011 to provide a mechanism for industry and academic stakeholders as well as other federal, state, and local government entities to provide recommendations and standards to FAA on issues related to UAS integration.[b]
RTCA Special Committee 228	RTCA is a private, not-for-profit organization consisting of industry experts. Special Committee 228 is responsible for developing standards for UASs to avoid objects and other aircraft, and supporting the radio controls of a UAS.
ASTM International Committee F38[c]	ASTM International Committee F38 is a committee consisting of industry experts that are responsible for developing standards and consensus based recommendations for small UAS integration into the national airspace system and worldwide.

Source: GAO. | GAO-15-610

[a]The UAS Executive Committee was formed as a result of the National Defense Authorization Act for Fiscal Year 2010 (Pub. L. No. 111-84, 123 Stat. 2190 (2009)). Section 935 of the 2010 National Defense Authorization Act states that "The Secretary of Defense and the Secretary of Transportation shall, after consultation with the Secretary of Homeland Security, jointly develop a plan for providing expanded access to the national airspace system for unmanned aircraft systems of the Department of Defense" and requires the Executive Committee members to provide Congress with, among other things, a communications plan, specific milestones for expanded access to the national airspace system, and a report on their efforts.

[b]FAA extended the Aviation Rulemaking Committee's charter through June 17, 2016, requesting the Committee continue to provide information, advice, and recommendations to the FAA for UAS integration.

[c]ASTM International, formerly known as the American Society for Testing and Materials, works to deliver the test methods, specifications, guides, and practices that support industries and governments worldwide.

FAA also partners with a range of industry, federal research entities, universities, and international organizations for research and development on UAS issues.

- Federally Funded Research and Development Centers[8] and Cooperative Research and Development Agreements typically require an agency, organization, or company to perform specific research and provide FAA with data in exchange for funding. FAA uses these types of agreements to support research and development in critical technologies needed for UAS integration including "detect and avoid" and "command and control" as well as for the dedicated radio-frequency spectrum and "human factors."[9]

- Some other partnerships use Other Transaction Agreements to establish the research and development relationship.[10] However, these take many forms and are subject to requirements that may differ from the federal laws and regulations that apply to contracts, grants, or cooperative agreements, and therefore might not include a requirement to share research results with FAA.

Currently, most UAS operations must remain within visual line of sight of the UAS operator. FAA's long-term goal is to pursue research and development that will advance technology in these critical areas, such as detect and avoid, and supporting beyond-visual-line-of-sight operations. These types of operations, according to an industry group, have the most potential for commercial purposes.

In response to the 2012 Act, FAA has been planning for UAS integration into the national airspace and has been taking steps toward increasing

[8]FAA's Federally Funded Research and Development Centers are located at MITRE, MIT's Lincoln Laboratory, and the Air Force Research Laboratory.

[9]"Detect and avoid" is needed to provide UAS with the capability to operate near other aircrafts and objects, yet avoid collisions. "Command and control" addressed the ability to maintain the integrity of radio signals to ensure that the UAS operates as expected and as intended. Dedicated radio-frequency spectrum is important because spectrum is a key security and safety vulnerability and because intentional or unintentional interruption of radio transmissions can sever the UAS's only means of control. The study of the "human factors" affecting UAS operators is important because the separation of pilot and aircraft 1) removes sensory cues needed for flight control, and 2) creates difficulties in scanning the visual environment surrounding the unmanned aircraft.

[10]Other Transaction Agreements are administrative vehicles used by a federal agency. Other Transaction Agreements generally enable the federal government and others entering into these agreements to freely negotiate provisions that are mutually agreeable. FAA's Other Transaction Agreement authority, at 49 U.S.C. § 106(l)(6) provides, in part, that the Administrator may enter into other transactions with any federal agency, among others, on such terms and conditions as the Administrator may consider appropriate.

UAS operations.[11] The 2012 Act outlined 17 date specific requirements and set deadlines for FAA to achieve safe UAS integration by September 2015. These requirements included developing two planning documents - UAS Comprehensive Plan and the UAS Roadmap. FAA has completed these two requirements in addition to naming six test sites where research and development will occur.[12] However, we found in December 2014 that several other requirements, some key ones, including the publication of a final rule on small UAS operations, had not been completed (see app. II).[13]

As part of its role in supporting UAS integration, FAA authorizes all UAS operations (access to the airspace as well as the aircraft itself) in the national airspace system—military; public (academic institutions and, federal, state, and local governments including law enforcement organizations); and civil (non-government including commercial).[14] Depending on the type of user, public or civil, the process for accessing the airspace may be different (see table 2).

Table 2: Federal Aviation Administration (FAA) Approvals Required for Unmanned Aerial Systems to Access the National Airspace

Type of operations	Airspace approval	Equipment approval
Public (academic institutions and federal, state, and local governments including law enforcement organizations)	Public Certificates of Waiver or Authorization (COA)	Public COA
Civil (non-government, including commercial)	Civil COA	Section 333 exemption, Special Airworthiness Certificates in the Experimental Category

Source: GAO presentation of FAA information | GAO-15-610

[11]Pub. L. No. 112-95, §§ 331 – 335, 126 Stat. 11.

[12]The test sites are located at the University of Alaska (includes test ranges in Hawaii, Oregon, and Iceland); State of Nevada; New York's Griffiss International Airport (includes test range locations in Massachusetts); North Dakota Department of Commerce; Texas A&M University–Corpus Christi; and Virginia Polytechnic Institute and State University (Virginia Tech) (includes test ranges in Maryland, partnered with the University of Maryland, and New Jersey, partnered with Rutgers University).

[13]GAO, *Unmanned Aerial Systems: Efforts Made toward Integration into the National Airspace Continue, but Many Actions Still Required,* GAO-15-254T (Washington, DC: Dec. 10, 2014).

[14]The integration or use of military aircraft was outside the scope of this review.

Currently, since a final rulemaking is not yet completed, FAA only approves UASs access to the national airspace on a case-by-case basis. FAA provides this approval through three different means:

- Public or Civil Certificates of Waiver or Authorization (COA): A COA is an authorization, generally for up to 2 years, issued by the FAA to an operator for a specific UAS activity. Public entities, including FAA-designated test sites (described in more detail later), and civil entities may apply for a COA to obtain authorized access to the airspace. FAA has a goal to review and approve all COAs within 60 days of being received.

- Section 333 exemptions: Since September 2014, commercial entities have applied to FAA for exemptions under section 333 of the 2012 Act, Special Rules for Certain Unmanned Aircraft Systems. This exemption requires the Secretary of Transportation to determine if certain UASs may operate safely in the national airspace system prior to the completion of UAS rulemakings.

- Special Airworthiness Certificates in the Experimental Category and the Restricted Category (Experimental Certificate): Civil entities, including commercial interests, may apply for experimental certificates, which may be used for research and development, commercial operations, training, or demonstrations by manufacturers.

While FAA has proceeded in planning for integration, foreign countries are also experiencing an increase in UAS use and planning for integration, and some have begun to allow commercial entities to fly UASs under limited circumstances. Some countries have already established regulations for flying UASs or formal processes for exemptions, while others have taken steps to completely ban all UAS operations. While some countries have worked independently to integrate UAS operations, some international groups, such as the ICAO, are working to harmonize UAS regulations and standards across borders.

FAA Has Made Progress in the First Phase of UAS Integration

Developing Planning Documents

FAA has taken a number of steps to move toward further safe integration of UAS in the national airspace in response to key requirements of the 2012 Act. FAA has developed the following planning documents:

- In November 2013, FAA issued the *UAS Comprehensive Plan*[15] identifying six high-level strategic goals for integrating UAS into the national airspace, including routine public operation and routine civil operations.[16] The *Comprehensive Plan* provides a phased-in approach for achieving these goals, which will initially focus on public UAS operations, but ultimately will provide a framework for civil UAS operations. According to the plan, each partner agency will work to achieve these national goals and may develop agency-specific plans that are aligned to the national goals and objectives. The DOD's *Unmanned Systems Integrated Roadmap* and FAA's *UAS Integration Roadmap*, described below, are examples of such plans.[17]

- In November 2013, FAA also issued the *UAS Integration Roadmap*, which identified a broad three phase approach to UAS integration—accommodation, integration, and evolution—with associated priorities for each phase.[18] These priorities provide insight into FAA's near-, mid-, and far-term goals for UAS integration, as shown in figure 2. FAA intends to use this approach to facilitate further incremental steps toward its goal of seamlessly integrating UAS flight into the national airspace. Under this approach, FAA's initial focus during the accommodation phase will be on safely allowing for the expanded operation of UASs by selectively accommodating some use and demonstrating progress by increasing operations throughout the phase. In the integration phase, FAA plans to develop new operational rules, standards, and guidance, shifting its emphasis

[15]Joint Planning and Development Office, *Unmanned Aircraft Systems (UAS) Comprehensive Plan: A Report on the Nation's UAS Path Forward* (Washington, D.C.: Sept., 2013).

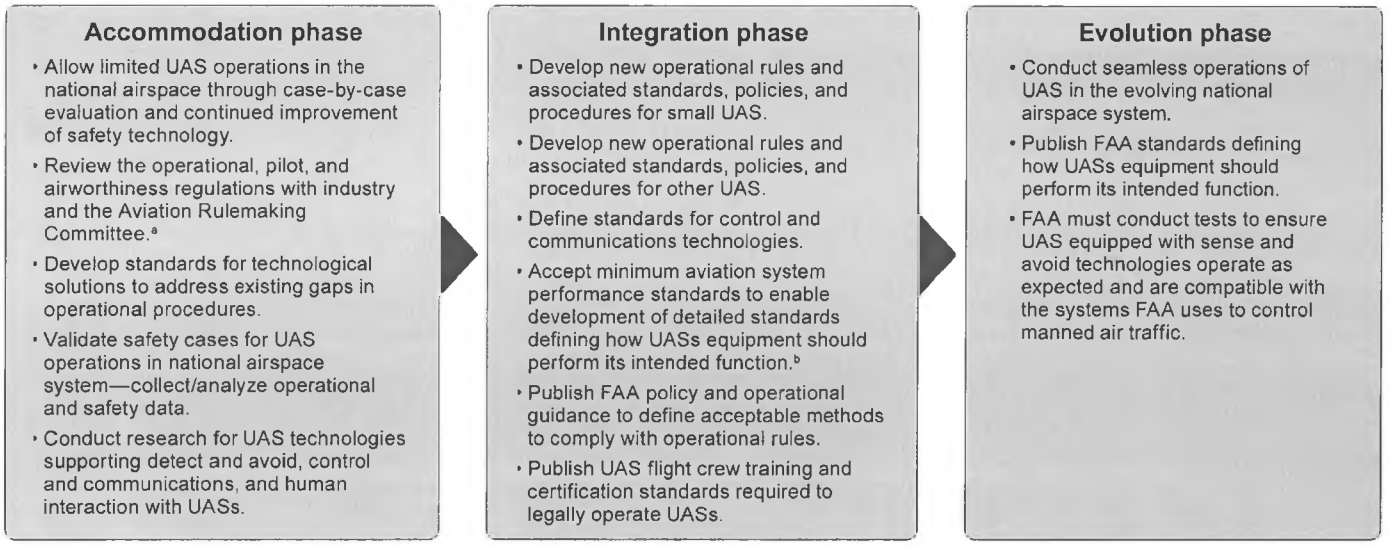
[16]The six goals address small UAS (under 55 pounds) operating within visual line-of-sight, larger UASs and operations beyond visual line-of-sight, planning and managing growing automation capabilities through research, and the opportunity for the U.S. to remain world leaders in UAS technology.

[17]DOD, *Unmanned Systems Integrated Roadmap FY2013-2038* (Washington, D.C.: 2013).

[18]FAA, *Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap: First Edition—2013* (Washington, D.C.: Nov. 2013).

toward moving beyond case-by-case approval for UAS use, once technology can support safe operations. Finally, in the evolution phase, FAA plans to focus on revising its regulations, policy, and standards based on the changing needs of the airspace. This phased approach has been supported by stakeholders across both academia and industry. The 2012 Act requires the Roadmap to be updated annually, but as of May 2015 FAA has only issued one version of the Roadmap. FAA intends to update the *Roadmap* by September 2015 and send it to the Office of Management and Budget for additional review before it is publicly released.

Figure 2: Priorities for Federal Aviation Administration's (FAA) Three Phases of Unmanned Aircraft Systems (UAS) Integration as Described in the *UAS Integration Roadmap*



Source: Federal Aviation Administration (FAA) UAS Roadmap. | GAO-15-610

[a]FAA's aviation policies and regulations focus on overall safety being addressed through three primary areas: equipment (airworthiness), personnel (pilot), and operations. Each of these areas has standards and minimum levels of safety that must be met independent of each other. Since these policies and regulations were not designed with UAS in mind, they must be reviewed and revised to safely accommodate UAS in the national airspace.

[b]Minimum aviation-system performance standards specify characteristics that are useful to designers, installers, manufacturers, service providers, and users of systems intended for operational use within a defined airspace.

While these planning documents provide a broad framework for integration, FAA is still in process of developing an implementation plan for integrating UASs. FAA's Comprehensive Plan and Roadmap provide broad plans for integration, but are not detailed implementation plans that predict with any certainty when full integration will occur and what

resources will be needed. The Department of Transportation's Inspector General issued a report in June 2014 that recommended FAA develop an implementation plan.[19]

Two reports—one from the UAS Aviation Rulemaking Committee and a second internal FAA report—have discussed the importance of an implementation plan and information to include as part of such a plan. The UAS Aviation Rulemaking Committee has emphasized that FAA needs an implementation plan that would identify the means, necessary resources, and schedule to safely and expeditiously integrate civil UAS into the national airspace. The proposed implementation plan contains several hundred tasks and other activities needed to complete the UAS integration process, including:

- identifying gaps in current UAS technologies, regulations, standards, policies, or procedures;
- developing new technologies, regulations, standards, policies, and procedures that would support safe UAS operations; and
- identifying necessary activities to advance routine UAS operations in the national airspace, including the development of guidance materials, training, and procedures for certification of aircraft.

An internal FAA report from August 2014 prepared by MITRE Corporation (MITRE) was intended to assist FAA's development of the key components of an implementation plan.[20] This report suggested that among other actions FAA's implementation plan should:

- identify the tasks necessary, responsibilities, resources, and expected time frames for incremental expansion of UAS operations;
- clarify the priorities for aligning internal resources in support of near-term and long-term integration efforts and provide consistent

[19]Department of Transportation Office of Inspector General, *FAA Faces Significant Barriers to Safely Integrate Unmanned Aircraft Systems into the National Airspace System*, Report Number AV-2014-061 (Washington, D.C.: June 2014).

[20]Deborah Kirkman, *Inputs and Recommendations for the Federal Aviation Administration UAS Integration Strategy: 2014–2019*, MITRE Corporation (August: 2014).

communication with external stakeholders on the expected progress, cost, and extent of UAS integration during these time periods;

- align resources supporting UAS integration including allocation of FAA personnel and funds used for contracts and to acquire systems and services in support of integration; and
- establish the operational, performance, and safety data needed and also the associated infrastructure for collecting, storing, disseminating, and analyzing data, actions that could be a component of an implementation plan.

According to FAA, it continues to work with MITRE developing the foundation for a detailed implementation plan. FAA expects MITRE to complete this by September 2015 and FAA to enact the plan by December 2015.[21] According to FAA, the agency used the Aviation Rulemaking Committee's report when writing the *Roadmap* and is applying the report prepared by MITRE to help develop the detailed implementation plan.

Issuing a Final Rule for Small UAS Operations

In February 2015, FAA made progress toward the 2012 Act's requirement to issue a final rule for the operations of small UASs—those weighing less than 55 pounds—by issuing a Notice of Proposed Rulemaking (NPRM) that could, once finalized, allow greater access to the national airspace.[22] To mitigate risk, the proposed rule would limit small UASs to daylight-only operations, confined areas of operation, and visual-line-of-sight operations. This proposed rule also addressed other issues pertinent to UAS operations including aircraft registration, operations in the national airspace, and operator certification. See table 3 for a summary of the rule's major provisions. FAA's release of this proposed rule for small UAS operations started the process of addressing remaining requirements of the 2012 Act.

[21]FAA told us they do intend to publicly issue the implementation plan.

[22]80 Fed. Reg. 9544 (Feb. 23, 2015).

Table 3: Selected Provisions of Proposed Rule for Small Unmanned Aircraft Systems (UAS) Operations, by Major Category

Category	Summary of proposed requirements
Operational limitations	• Must weigh less than 55 lbs. (25 kg). • Must operate within visual line of sight only. • May not operate above any persons not directly involved in the operation. • Must only operate during the day, no nighttime operations. • Maximum airspeed of 100 mph. • Maximum altitude of 500 feet above ground level. • Must not operate carelessly or recklessly. • Establishment of a micro-UAS category (4.4 lbs. or less). • Must yield right-of-way to other aircraft, manned or unmanned.
Operator certification and responsibilities	• Must pass a knowledge test initially and every 24 months. • Must be vetted by the Transportation Security Administration. • Must obtain an unmanned-aircraft operator's certificate with a small UAS rating.
Aircraft requirements	• Federal Aviation Administration (FAA) airworthiness certification not required, but operator must inspect the UAS to ensure that it is in a condition for safe operation. • Aircraft markings required; if aircraft is too small to display markings in standard size, then the aircraft simply needs to display markings in the largest practicable manner.
Model aircraft	• Would not apply to model aircraft that satisfy all of the criteria specified in section 336 of Public Law 112-95. • Would incorporate a 2012 Act provision that preserves the FAA's enforcement authority to pursue enforcement against model aircraft operators who endanger the safety of the national airspace system.

Source: Notice of Proposed Rulemaking for small UAS. | GAO-15-610

FAA's proposed rule also sought comments on a potential micro-UAS classification (4.4 pounds or less) that would apply to very small UAS being used for authorized purposes. This classification would be based on the UAS Aviation Rulemaking Committee's recommendations, as well as approaches adopted in other countries, that a separate set of regulations for micro-UASs be created. FAA is considering provisions for micro-UASs classification such as limiting operation airspeed to 30 knots, limiting flight to within visual line of sight, and having aircraft made out of materials that break on impact.

The proposed rule would not apply to model aircraft—unmanned aircraft that are flown for hobby or recreational purposes, capable of sustained flight in the atmosphere, and flown within visual line of site of the person

who is operating the aircraft—as specified in the 2012 Act.[23] Whether or not a UAS is considered a model aircraft or a small UAS depends upon its operation. For example, if the operator is flying an unmanned aircraft for recreational purposes the unmanned aircraft is considered a model aircraft. If the exact same type of unmanned aircraft is being operated for an authorized purpose such as a search and rescue mission, it is considered a small UAS.[24] The 2012 Act specifically prohibits FAA from promulgating rules regarding model aircraft that meet specific criteria, including model aircraft flown strictly for hobby or recreational use and operated in a manner that does not interfere with and gives way to any manned aircraft.[25] However, the proposed rule would incorporate the 2012 Act provisions that preserve FAA's authority to pursue enforcement against persons operating model aircraft who endanger the safety of the national airspace system.[26]

According to FAA, it may take 16 months to process the comments it receives on the NPRM and develop and issue the final rule for small UAS operations. If FAA takes 16 months, the final rule would be issued in late 2016 or early 2017, about two years beyond the requirement in the 2012

[23]See Pub. L. No. 112-95, §336(c), 126 Stat. 11, 77.

[24]FAA's *Advisory Circular 91-57* sets out model aircraft operating standards that encourage voluntary compliance with specified safety standards for model aircraft operators. In June 2014, FAA also clarified this guidance in its Notice of Interpretation of the 2012 Act's Special Rule for Model Aircraft. 79 Fed. Reg. 36172 (June 25, 2014). The Academy of Model Aeronautics has also published voluntary guidance documents for its members.

[25]More specifically, section 336(a) of the 2012 Act prohibits the FAA from promulgating rules regarding model aircraft that meet all of the following statutory criteria: The aircraft is flown strictly for hobby or recreational use; The aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization; The aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization; The aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation.

[26]Section 336(b) of the 2012 Act provides that "[n]othing in this section shall be construed to limit the authority of the Administrator to pursue enforcement action against persons operating model aircraft who endanger the safety of the national airspace system. The proposed rule provides that it is FAA's existing authority, under 49 U.S.C. §§ 40103(b) and 44701(a)(5) that provide the FAA with the power to pursue enforcement "against persons operating model aircraft who endanger the safety of the national airspace system."

Act. However, during the course of our work, FAA told us that the time needed to respond to a large number of comments could further extend the time to issue a final rule. When the comment period closed on April 24, 2015 FAA had received over 4,500 comments. FAA officials told us that it has taken a number of steps to develop a framework to efficiently process the comments it expects to receive. Specifically, they said that FAA has a team of employees assigned to lead the effort with contractor support to track and categorize the comments as soon as they are received.

Creating Test Sites

FAA has also met the requirement from the 2012 Act to create UAS test sites for research and development. Specifically, in December 2013 FAA selected six UAS test site locations, which all became operational between April 2014 and August 2014. According to FAA, these sites were chosen based on a number of factors including geography, climate, airspace use, and a proposed research portfolio that was part of the application. Under FAA policy, all UAS operations at a test site must be authorized by FAA through either the use of a COA or an experimental certificate. In addition, FAA does not provide funding to support the test sites. Thus, these sites rely upon revenue generated from entities, such as those in the UAS industry that are using the sites for UAS flights. The 2012 Act authorized the test sites to operate until February 14, 2017. FAA stated it is too early to assess the test sites' results and effectiveness and thus whether the test sites should be extended. According to FAA officials, FAA does not object to extending the test sites but may need additional resources if that happens.

Accommodating Limited UAS Operations

Although it still relies on case-by-case approvals, FAA has increased UAS operations during the accommodation phase of UAS integration. As we have previously noted, UAS operators can only gain access to the national airspace by obtaining a COA, an experimental certificate, or a section 333 exemption. From 2010 to 2014, the total number of COAs approved for public operations has increased each year, with FAA issuing 403 COAs thus far this year, as shown in table 4. Similarly, from 2011 to 2014, the total number of experimental certificates has increased each year, with FAA issuing 6 thus far this year.

Table 4: Total Number of Federal Aviation Administration-Issued Public Certificates of Waiver or Authorization (COA) and Special Airworthiness Certificates for Experimental Aircraft for Unmanned Aerial Systems

	2010	2011	2012	2013	2014	2015
Public COA	286	309	383	407	609	403[a]
Experimental certificate	15	14	18	26	39	6[b]

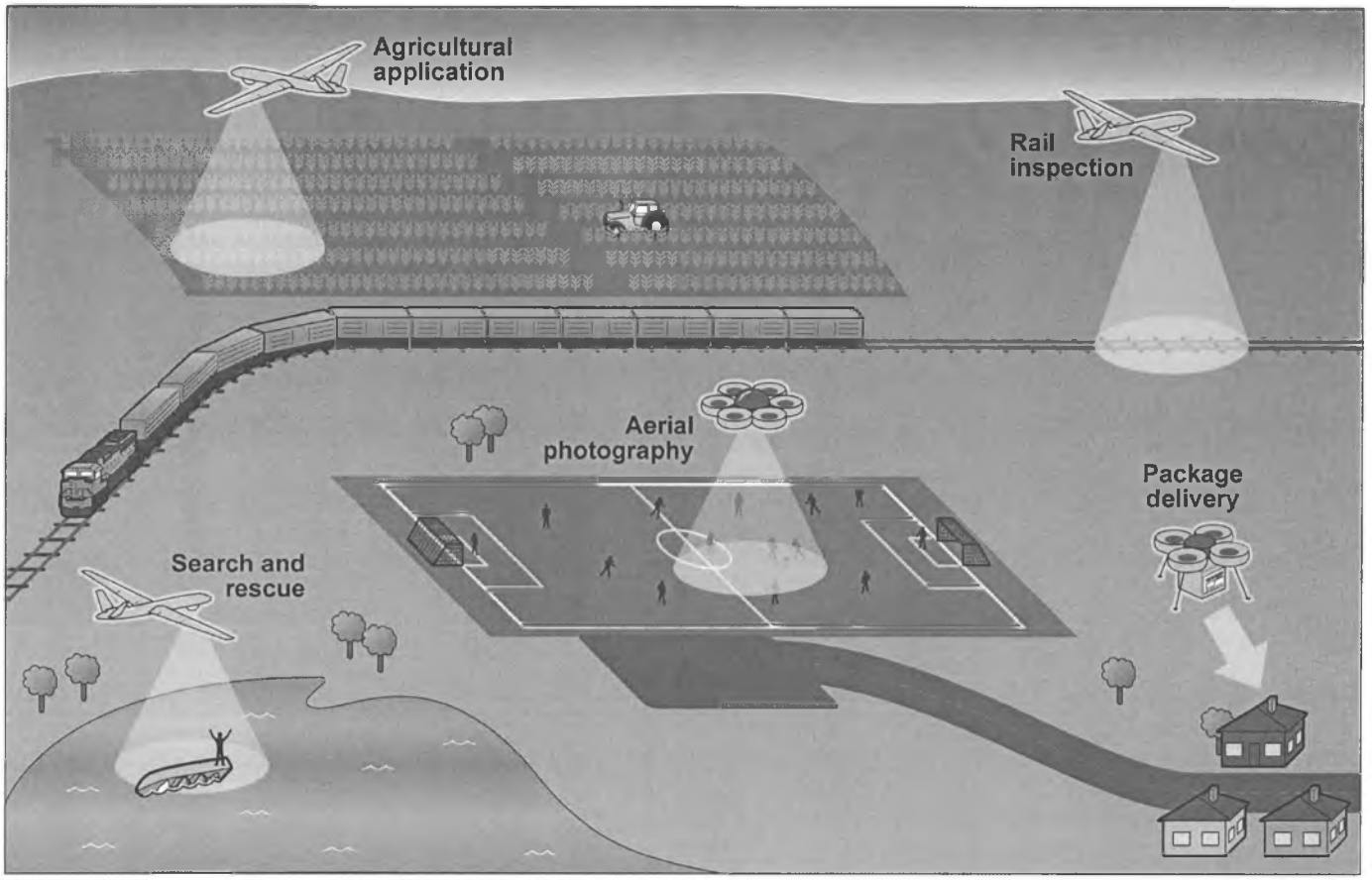
Source: FAA | GAO-15-610

[a]As of April 30, 2015.

[b]As of May 1, 2015.

In September 2014, FAA granted the first section 333 exemptions; at that time 6 total exemptions were granted for commercial UAS operations to movie and TV production companies. As of June 9, 2015, FAA had granted 548 section 333 exemptions to companies for a variety of additional commercial operations supporting the real estate, utility, and agriculture industries, among others. See figure 3 for examples of commercial uses, including some approved under section 333 exemptions.

Figure 3: Examples of Potential Commercial Unmanned Aerial Systems Operations



Source: GAO. | GAO-15-610

FAA has taken steps to make access easier for those operating UASs under a section 333 exemption. On March 23, 2015, FAA established an interim policy to speed up authorizations for certain commercial unmanned aircraft operators that request Section 333 exemptions. According to FAA, the new policy helps bridge the gap between the past "case-by-case" approval process, which evaluated every commercial UAS operation individually, and future operations after they publish a final version of the proposed small UAS rule. Under the new policy, the FAA will grant a COA for flights at or below 200 feet to any commercial UAS operator with a Section 333 exemption for aircraft that weigh less than 55 pounds, operate during the daytime, operate within visual line of sight of the pilots, and stay certain distances away from airports or heliports. According to FAA, the "blanket" 200-foot COA allows flights anywhere in

the country except restricted airspace and other areas, such as major cities, where the FAA prohibits commercial UAS operations.[27] The agency expects the new policy will allow companies and individuals who want to use UAS within these limitations to start flying much more quickly than before. A company wanting to operate above 200 feet, or outside the other rules set up by FAA, must obtain a separate COA.

FAA took additional steps in May 2015 to work with industry to safely expand UAS operations. FAA announced its Pathfinder Program that will partner FAA with companies to perform research in support of UAS integration. These companies will focus on using UAS for specific applications, such as news gathering and surveying crops. In addition, two will focus on applications for beyond the visual line of sight of the operator. One industry stakeholder stated the next step would be to develop additional mechanisms to allow UAS operations beyond the visual line of sight of the operator once technology supports greater use.

Potential Commercial Agriculture Use

The University of California-Davis has been conducting a demonstration project using a Yamaha RMAX helicopter to spray pesticides at its vineyard. The purpose of the project is to test the efficiency and safety of aerial spraying of grape crops. According to an official from Yamaha Motor Corporation, USA, initial tests have shown the RMAX can cover up to 12 times as much area in an hour compared with traditional spraying methods.

Source: Yamaha Motor Corporation, USA | GAO-15-610

While accommodating UAS access, FAA and industry have taken steps to educate UAS operators on how to safely operate. UAS industry stakeholders and FAA have begun an educational campaign that provides prospective users with information and guidance on flying safely and responsibly. Specifically, they launched an informational website for UAS operators to ease public concerns about privacy and support safer UAS operations in the national airspace.[28] In addition, in May 2015, FAA announced plans to develop the "B4UFLY" smartphone application designed to help UAS users, both model aircraft and recreational UAS operators, know where it is safe and legal to fly. The application is designed to let an operator know if it is safe and legal to fly in a specific location.

[27]Previously, an operator had to apply for and receive a COA for a particular block of airspace, a process that can take 60 days.

[28]Know Before You Fly (www.knowbeforeyoufly.org) was founded by three organizations with a stake in UAS safety: the Association for Unmanned Vehicle Systems International, the Academy of Model Aeronautics, and the Small UAV Coalition. The FAA is partnering with the founding members to spread the word about safe and responsible flying. FAA also stated that three manufacturers agreed to voluntarily include Know Before You Fly information for model aircraft operators in their packaging.

Collaborating with UAS Stakeholders

FAA has worked with federal and industry stakeholders to coordinate federal activities in support of conducting research and development and creating UAS standards to facilitate UAS integration. As with other large government-wide initiatives, achieving results for the nation increasingly requires that federal agencies and others work together. FAA has worked with the UAS Executive Committee to facilitate federal UAS activities and RTCA Special Committee 228, ASTM International Committee F38, and the UAS Aviation Rulemaking Committee to develop safety, reliability, and performance standards for UAS.

Each collaborative group has defined different long-term goals in support of UAS integration and has made progress toward the achieving these goals.

- The Executive Committee's long-term goals involve working to solve the broad range of technical, procedural, and policy issues affecting UAS integration into the national airspace. In support of this objective, the Executive Committee agencies, other public agencies, and industry have also developed processes and procedures to safely demonstrate small UAS operations in remote areas of the Arctic, including beyond-line-of-site operations. The UAS demonstration occurred in domestic and international airspace on and off the coast of Alaska.

- RTCA Special Committee 228 has set out its own goals across two phases. Currently working toward completion of the first phase, RTCA is developing minimum operational performance standards for detect and avoid and command and control technologies for UASs. RTCA has made progress toward this goal with help from the Executive Committee. Specifically, the Executive Committee's Science and Research Panel developed a definition of "well clear" to help inform RTCA Special Committee 228's work.[29]

- The UAS Aviation Rulemaking Committee has a goal to develop a report for FAA on its efforts to provide direction for UAS operational criteria, among other tasks, by April 18, 2016.

[29]The Federal Aviation Regulations generally require that pilots remain "well clear" of other aircraft when flying in the national airspace system. 14 C.F.R. §§ 91.115, 91.181. RTCA will use a definition of well clear provided by the UAS Executive Committee's Science and Research Panel as a baseline for detect and avoid standards.

- ASTM International F38's long-term goal involves developing and publishing voluntary consensus standards for small and large UASs as FAA requests them. ASTM International Committee F38 has developed standards and recommendations to support FAA's small UAS rulemaking that cover elements such as systems design, construction, and testing.

FAA has applied other interagency collaborative methods in support of UAS integration including memorandums of understanding or agreement (MOU)[30] and conferences. FAA entered into MOUs with DOD and NASA to expedite the COA process and ensure the availability of DOD's data.[31] According to FAA officials, the MOUs eased collaboration with DOD and NASA because the MOUs established roles and responsibilities for each agency as well as procedures for DOD to obtain COAs. In addition, FAA convenes meetings with test site officials and attends conferences where UAS issues are discussed. For example, FAA regularly holds conference calls and convenes technical interchange meetings with test site officials to address test site issues. According to FAA, the technical interchange meetings are opportunities for FAA to provide updates to the test sites and discuss common areas of research interest. The manager of the FAA's UAS Integration Office has presented information about its UAS efforts during industry conferences, such as the Association for Unmanned Vehicle Systems International's annual meeting. These conferences allow FAA to provide guidance and updates directly to the industry and public.

[30]A memorandum of understanding is a written agreement between more than one federal agency or department that defines the roles, responsibilities, and how each party will act for specific aspects of the relationship between the two participants.

[31]FAA also has UAS related memorandums of agreement or understanding with the U.S. Department of Justice, the U.S. Department of the Interior, the National Oceanic and Atmospheric Administration within the U.S. Department of Commerce, and the Academy of Model Aeronautics.

FAA's Designated Test Sites Have Conducted UAS Test Flights and Addressed Challenges

FAA's Designated Test Sites Are Operating and Conducting UAS Operations

Since being named in December 2013, the six designated test sites have become operational, applying for and receiving authorization from FAA to conduct test flights. Specifically, from April through August 2014, each of the six test sites became operational and signed an Other Transaction Agreement with FAA, establishing their research and development relationship. All flights at a test site must be authorized under the authority of a COA or an experimental certificate approved by FAA.[32] Since becoming operational, five of the six test sites received 48 COAs and one experimental certificate in support of UAS operations resulting in over 195 UAS flights across the five test sites. These flights provide the operations and safety data to FAA as required by the COA. While there are only a few contracts with industry thus far, according to test site operators, these will be important if the test sites are to generate sufficient revenue to remain in operation. Table 5 provides an overview of test-site activity since the sites became operational.

[32]All test sites are operated by public entities (academic institutions or federal, state, or local governments) and thus all aircraft must be public aircraft—unless they are operating under a special certificate.

Table 5: Overview of Activity at Five of Six Designated Unmanned Aerial Systems (UAS) Test Sites, as of March 2015

Type of test site activity	Overview since becoming operational in 2014
Total unmanned aerial systems (UAS) flights at FAA designated test sites	• Over 195 total UAS flights. • One test site has had over 80 UAS flights.
Number and types of certificates of waiver or authorizations (COA) received	• Five test sites hold 48 COAs. • One test site held 4 broad area COAs allowing flights over nearly the entire state by specific aircraft. • Four other test sites were seeking COAs for large flight ranges that could apply to any aircraft.
Number of special airworthiness certificates for experimental aircraft	• A certified representative reviewed and approved an aircraft to operate under an experimental certification at one test site. • Three test sites have representatives affiliated with the test site to review and approve aircraft for experimental certification.
Signed contracts with UAS companies	• Five test sites have 22 contracts with industry groups and companies to conduct UAS operations at their respective test site thus generating revenue for the test sites. • All test sites have additional negotiations with companies under way.

Source: FAA designated test sites. | GAO- 15-610

Note: Of FAA's six designated test sites, one— Texas A&M University-Corpus Christi test site—did not respond to our request for this information.

According to all test sites, FAA approval for access to the airspace can be a lengthy process taking 90 days or even longer. FAA and the test sites have found ways to allow quicker access to the test site airspace and relieve some administrative burden from FAA.

- In February 2015, FAA awarded the Northern Plains Test Site in North Dakota four broad area COAs that were aircraft specific. According to a test site official, these COAs allowed designated aircraft to fly over nearly the entire state of North Dakota and will make it easier to accommodate industry for research. Furthermore, these COAs were a positive step in allowing quicker access to the airspace at test sites. Reducing FAA's role in the process creates more certainty regarding how long it will take an operator to access airspace at the test sites. Specifically, the test site representative indicated FAA's role was reduced because there was a process that allowed aircraft to be added to these existing COAs that was simpler than applying for individual COAs.

- In May 2015, FAA approved a "blanket" COA allowing the test sites to conduct UAS operations at or below 200 feet anywhere in the national airspace, similar to the authority provided to Section 333 exemptions. In particular, these COAs will be for small UAS operations, during the

day, within line of sight of the operator, and the operations cannot occur in restricted airspace and areas close to airports. According to FAA, this will help improve UAS access allowing more operations in support of research that can further the UAS integration process. Previously, all UASs needed their own COA when operating at a test site but this action by FAA will allow any small UASs to operate at the test sites within the COA's requirements.

- The use of designated airworthiness representatives by the test sites to review and approve experimental certificates may be quicker for industry and relieve some of FAA's workload.[33] Industry benefits from not having to lease its aircraft to the test site, as all test sites are operated by public entities (academic institutions or federal, state, or local governments) and thus all aircraft must be public aircraft, unless they are operating under a special certificate.[34] In addition, any industry group working with the test site would not have to go through FAA to receive the experimental certificate. The Nevada test site has affiliated itself with a designated airworthiness representative, who has approved an aircraft to operate under an experimental certificate for the Nevada test site. According to FAA, the use of a designated airworthiness representative allows it to better leverage its resources.

FAA officials and some test site officials told us that progress has been made in part because of FAA's and test sites' efforts to work together. Test site officials meet every 2 weeks with FAA officials to discuss current issues, challenges, and progress. According to meeting minutes, these meetings have been used to discuss many issues from training for designated airworthiness representatives to processing of COAs. In addition, the six test sites have developed operational and safety processes that have been reviewed by FAA. Thus, while FAA has no funding directed to the test sites to specifically support research and development activities, FAA dedicates time and resources to supporting the test sites, and FAA staff we spoke to believe test sites are a benefit to the integration process and worth this investment.

[33]Designated airworthiness representatives are individuals acting as a representative of FAA trained to examine, inspect, test and issue aircraft certificates.

[34]For a private company to operate under a public COA at a test site, it must lease the aircraft to the public entity. A concern of some private companies has been the protection of proprietary or sensitive data when they lease the aircraft to the public operator of the test site. The experimental certificate eliminates this concern of protecting proprietary technology.

Test Sites Faced Challenges during Their First Year

Despite the progress made since they began operating, according to test site operators, they faced a number of challenges in the first year of operations:

- Guidance on research: According to FAA, because the test sites receive no federal funding, FAA can neither direct specific research to be conducted nor direct the test sites to share specific research data, other than the operations and safety data required by the COA. The Other Transaction Agreement for each test site defines the purpose of the test sites as a place to conduct research and testing under FAA safety oversight to support UAS integration into the national airspace. The Other Transaction Agreement indicates the test sites will provide FAA with UAS research and operational data to support the development of procedures, standards, and regulations. However, FAA officials told us that the Antideficiency Act may prevent the agency from directing specific test site activities without providing compensation.[35] In October 2014, FAA provided a list of potential research areas to the test sites to guide the research that each test site may conduct. According to FAA, this document was not to be construed as a directive but more as guidance for possible research areas. However, three test sites told us this document was too broad to be considered guidance for the research test sites should conduct.

- Incentives for industry to use test sites: Five test sites told us that the UAS industry gains little advantage to using the test sites for research because they must follow similar processes to access the airspace anywhere. As previously indicated, all flights at a test site must be authorized under the authority of a COA or an experimental certificate, two means the industry can use to access the airspace anywhere, not just at the test sites. All six test sites are seeking to make it easier for companies to access the airspace at a test site rather than working external of the test sites. For example, all test sites told us a COA applicable to any aircraft and covering large flight areas would be beneficial. This would be similar to the two COAs previously discussed, the COA received by the Northern Plains test site and the "blanket" 200-foot COA recently authorized by FAA. However, representatives from two test sites indicated that the "blanket" 200-foot COA meets some of their needs as it is applicable only to public

[35]The Antideficiency Act prohibits federal officers and employees from, among other things, accepting voluntary services except for emergencies involving the safety of human life or the protection of property. 31 U.S.C. § 1342.

aircraft, meaning that civil operators still have to lease the aircraft to the test site for operations. But, as one test site representative stated a broad area COA, allowing civil operations at the test site would be even more beneficial. Another test site representative indicated that they will continue to work with FAA to make access easier allowing flights at higher altitude with different aircraft.

- Maintaining operations: While all the test sites had some level of initial funding, from either private industry or state legislatures, to become operational, they must attract UAS industry to the test sites to generate enough revenue to maintain operations. However, test site operators reported that test sites have additional requirements as opposed to operating outside the test sites, including leasing the aircraft to the test site to operate under the public COA. While test sites have signed 22 contracts, there is a chance that some test sites will not survive due to the financial burden. Some companies have made a decision to go to other countries to conduct UAS testing because they believe it takes less time to be approved for test flights. For example, Amazon has reported it has testing under way in multiple countries outside the United States, including a site in Canada. In an effort to attract some industry operators, the Pan Pacific Test Site has a location in Iceland where, according to the Director, review and approval for test flights can happen much faster, in as few as 10 days, relative to over 90 days a COA may take in this country. In addition, the UAS industry is conducting tests in this country outside the test sites. For example, CNN worked with Georgia Institute of Technology.

Companies Conducting Beyond-Visual-Line-of-Sight Testing Overseas

Insitu, Inc., a Boeing subsidiary, conducted beyond-visual-line-of-sight testing in Denmark in May, 2015 with a ScanEagle UAS. The flights took place in cooperation with the Danish Transport Authority as part of an agreement signed by Boeing and the airport to develop a UAS Test Center in Denmark, which is used for training, testing, and development. The activity included members of the public and private sector, including the UAS Denmark Consortium, a group of companies, government organizations, and other entities supporting UAS industry development. The testing demonstrated capabilities for a variety of industries, including agriculture and aerial surveying, emergency and natural-disaster response, and defense and Arctic surveillance.

[An Insitu, Inc. ScanEagle UAS launch at sea.]

Source: Insitu, Inc. | GAO-15-610

FAA Supports Additional Research and Development Efforts

FAA has used cooperative research and development agreements, federally funded research and development centers, and grants to conduct other UAS research and development. These agreements for research are similar to the Other Transaction Agreement that directs the purpose and goals of the relationship between FAA and the research entities. However, unlike the Other Transaction Agreement in place for the test sites, according to FAA, many of these agreements have language specifically addressing the sharing of research and data. The following are examples of other resources FAA has devoted to UAS integration research and development:

- Cooperative research and development agreement: New Mexico State University has had a flight test center operating for several years under a cooperative research and development agreement with FAA. The center serves a similar purpose to the designated test sites but has been operating since 2007. The flight test center has conducted research in many areas including nighttime flying and more recently research into long-endurance UAS flights operating between 10,000 and 17,000 feet. According to an official, the New Mexico State University's flight test center has challenges with getting access to the airspace for customers because the process to receive a COA can be lengthy. In addition, this official told us the flight test center would like authority to approve COAs to operate at the test center because the FAA is backlogged and therefore approvals are delayed. Finally, according to the flight test center operators, FAA can get data from the research being conducted at the test site but does not direct them what to provide. While the flight test center has operated under a Cooperative Research and Development Agreement since 2007, in May 2015 the Flight Test Center switched to an Other Transaction Agreement to continue UAS testing.

- Federally funded research and development center: MITRE manages federal funded research and development centers for multiple federal agencies including FAA and DOD. MITRE has ongoing work supporting FAA's UAS integration effort by supporting UAS standards and rulemaking and supporting research planning and progress, among other efforts. MITRE brings together the federal agencies—FAA, NASA, DOD, DHS, and others—to advance UAS integration. In its role, according to MITRE officials, one of the biggest challenges is how to integrate all the UAS-related work across the federal government, academia, and private sector.

- Grants: In August 2014, FAA awarded two grants to Georgia Tech Research Corporation and the University of North Dakota to conduct literature reviews of UAS issues. Georgia Tech is collecting information on research being conducted on the effect of UAS collisions on other airborne and ground based objects. The University of North Dakota is looking at the UAS safety criteria and particularly if UASs could be deadly. According to FAA, both studies will support ongoing UAS research and help determine the applicability of past studies.

- Center of Excellence: In May 2015, FAA selected a team led by Mississippi State University as the Center of Excellence for UAS.[36] According to FAA, the goal of the Center of Excellence will be to create a cost-sharing relationship among academia, industry, and government that will focus on the primary research areas needed to support UAS integration. FAA hopes the center could provide both short- and long-term research through testing and analysis. In support of it serving this purpose, the Center of Excellence has an annual $500,000 budget for the next 10 years.

FAA also has additional resources to support the UAS integration, including facilities working on research and development and management of FAA's other research and development efforts for UAS integration. FAA's William J. Hughes Technical Center houses staff in charge of supporting and managing FAA's designated test sites.[37] While the test sites do not have specific funding, FAA has dedicated resources located at Hughes Technical Center to support the set up and ongoing operations of the test sites. For example, COA data are collected and analyzed at the Hughes Technical Center. In addition, FAA has participated in the twice-a-year technical interchange meetings with the test sites. These meetings have brought together the test sites and FAA to address issues in the set-up and operation of the test sites. Furthermore, FAA has staff supporting the test sites through review of test site operation and safety procedures and manuals to support the monthly reporting of the operational and safety data required by each COA.

[36]In addition to Mississippi State University, the other team members include: Drexel University; Embry Riddle Aeronautical University; Kansas State University; Kansas University; Montana State University; New Mexico State University; North Carolina State University; Oregon State University; University of Alabama, Huntsville; University of Alaska, Fairbanks; University of North Dakota; and Wichita State University.

[37]The William J. Hughes Technical Center is located in Atlantic City, New Jersey, and contains laboratories supporting aviation research, development, testing, and evaluation of air traffic control and aircraft safety among other aviation areas. It also serves as the primary facility supporting the Next Generation Air Traffic System.

Other Countries Have Established Regulations, and Some Allow More Commercial Operations Than the United States

Numerous Countries Allow UAS Operations

According to numerous studies and stakeholders we interviewed, many countries around the world, have been allowing commercial UAS operations in their airspace for differing purposes. We also identified a number of countries that allow commercial UAS operations and have done so for years. Specifically, Canada and Australia have regulations pertaining to UAS that have been in place since 1996 and 2002, respectively. According to a recent MITRE study, the types of commercial operations allowed vary by country and include aerial surveying, photography, and other lines of business.[38] For example, Japan has allowed UAS operations in the agriculture industry since the 1980's to help apply fertilizer and pesticide.[39]

In March 2015, the European Aviation Safety Agency (EASA) issued a proposal for UAS regulations that creates three categories of UAS operations—open, specific, and certified.[40] This proposal seeks the safe integration of UAS into national airspace, as well as support for the UAS industry in Europe. Generally, the open category would not require authorization from an aviation authority but would have basic restrictions including altitude and distance from people. The specific category would

[38]MITRE Corporation, *UAS International Harmonization: A Comparative Policy Assessment of Selected Countries*, Outcome 6, Output 4 (fiscal year 2014).

[39]According to the MITRE study, Japan's regulations also allow UAS operations for agricultural purposes with UASs weighing less than 220 pounds.

[40]EASA is the European Union Authority in aviation safety. The main activities of the organization include the strategy and safety management, the certification of aviation products and the oversight of approved organizations and EU Member States.

require a risk assessment of the proposed operation and an approval to operate under restrictions specific to the operation. The final proposed category, certified operations, would be required for those higher-risk operations, specifically when the risk rises to a level comparable to manned operations. This category goes beyond FAA's proposed rules by proposing regulations for large UAS operations and operations beyond the pilot's visual line of sight. As other countries work toward integration, standards organizations from Europe and the United States are coordinating to try and ensure harmonized standards. Specifically, RTCA and the European Organization for Civil Aviation Equipment (EUROCAE) have joint committees focused on harmonization of UAS standards.[41]

UAS Regulations in Australia, Canada, France, and the United Kingdom Are Similar to Each Other and to Proposed Regulations in This Country

We studied the UAS regulations of Australia, Canada, France, and the United Kingdom and found that these countries impose similar types of requirements and restrictions on commercial UAS operations. For example, all these countries except Canada require government-issued certification documents before UASs can operate commercially.[42] In addition, each country requires that UAS operators document how they ensure safety during flights and their UAS regulations go into significant detail on subjects such as remote pilot training and licensing requirements. For example, the United Kingdom has established "national qualified entities" that conduct assessments of operators and make recommendations to the Civil Aviation Authority as to whether to approve that operator. Similar regulations in these countries continue to evolve. In November 2014, Canada issued new rules creating exemptions for commercial use of small UASs weighing 4.4 pounds or less and from 4.4 pounds to 55 pounds. UASs in these categories can commercially operate without a government-issued certification but must still follow operational restrictions, such as a height restriction and a requirement to operate within line of sight. Transport Canada officials told us this arrangement allows them to use scarce resources to regulate situations

[41]RTCA is a private non-profit organization consisting of industry experts. RTCA provides a venue for public-private collaboration supporting consensus building on aviation modernization issues. EUROCAE is a non-profit organization dedicated to aviation standards. The organization is composed of members, who are specialized in technical fields of aeronautics.

[42]UASs lighter than 55 pounds are exempt from Canada's requirement to obtain a Special Flight Operations Certificate. Those heavier than 55 pounds or otherwise not complying with the exemption requirements must obtain a Special Flight Operations Certificate.

Firefighting with UASs In Australia

Firefighters in Western Australia have used small UASs during their firefighting operations. The UASs provide intelligence on hot spots and containment lines at night when manned aircraft are not permitted to fly.

[An unmanned Lockheed Martin/Kaman K-MAX helicopter extinguishes several fires, aided by the small unmanned Indago Quad Rotor, also from Lockheed Martin, during a demonstration.]

[The Lockheed Martin Indago Quad Rotor.]

Source: Furnished with permission of Lockheed Martin Corporation. Copyright © 2015 Lockheed Martin Corporation. All rights reserved.

of relatively high risk. Australia, in similar fashion, is considering relieving UASs lighter than 4.4 pounds from its requirement to obtain a UAS Operator's certificate. France's regulation describes 4 weight-based categories of UAS as well as 4 operational scenarios of increasing complexity. The regulations then discuss which UAS categories can operate in each scenario. FAA, by electing to focus on UASs up to 55 pounds in its Small UAS NPRM, has taken a similar risk-based approach.

The United States has not yet finalized regulations specifically addressing its small UAS operations, but if UASs were to begin flying today in the national airspace system under the provisions of FAA's proposed rules, their operating restrictions would be generally similar to regulations in these other four countries. However, there would be some differences in the details. For example, FAA proposes altitude restrictions of below 500 feet, while Australia, Canada, and the United Kingdom restrict operations to similar but slightly lower altitudes. Other proposed regulations require that FAA certify UAS pilots prior to commencing operations, while Canada and France do not require pilot certification in certain low risk scenarios. While FAA continues to finalize the small UAS rule—a process that could take until late 2016 or early 2017—other countries continue to move ahead with UAS integration. Thus, when the rule is finalized the operating restrictions in this country may be well behind what exists in other countries if the final rule reflects the proposed rule. Table 6 shows how FAA's proposed rules compare with the regulations of Australia, Canada, France, and the United Kingdom.

Table 6: Comparison of Regulatory Requirements for Commercial Unmanned Aerial Systems (UAS) Operations in Select Countries

Regulatory requirements for commercial Unmanned Aerial Systems (UAS)	United States (proposed)	Australia	Canada	France	United Kingdom
Weight classifications (in pounds)	< 55	≤ 0.2 0.2 < ≥ 331 > 331[a]	<4.4 4.4 <> 55 >55	<4.4 4.4 ≤> 55 55 ≤ > 331 ≥ 331	≤15 15 < ≥ 44 44 <> 331 ≥ 331
Government-issued documents for airspace access	Unmanned aircraft operator certificate	UAS operator certificate	None; meet specified conditions for < 55 lbs.[b]	Authorization	Permission from Civil Aviation Authority
Pilot training or certification required	Certification[c]	Certification	Training	Operator certifies pilot qualification[d]	Certification[e]
Pilot proficiency check	Biennially	Annually	Upon application	None[f]	Noneg
Airworthiness certification required	No	No, for < 331 lbs.	No, for < 55 lbs.	No < 55 lbs.	Depends upon the weight of the UAS [h]
Beyond line of sight operations allowed by regulation	No	Not specifically addressed in regulation[i]	No	No[j]	No[k]
Restrictions from congested or built-up area	May operate over congested area but not over any persons not involved with the operations.	Unless specifically authorized must fly at sufficient height where, if any of its components fail, it would be able to clear the area.	5.75 miles	Do not allow flying over these areas without special permission	Limited, based on case-by-case review
Altitude restrictions	500 ft.	Unless specifically authorized, 400 ft.	300 ft. if < 55 lbs.	492 ft.	400 ft.

Source: GAO analysis of UAS regulations in foreign countries. | GAO-15-610

Note: In certain instances, UASs may operate outside the requirements shown in this table with prior approval from the cognizant authority, e.g., the civil aviation authority or air traffic control. This table shows regulatory requirements for the UAS category used most frequently in each country.

[a]Regulations for large fixed-wing UASs (exceeding 331 pounds) apply to helicopters or rotary wing UASs heavier than 221 pounds.

[b]Operators must have certain documents available, including the exemption regulation and proof of liability insurance.

[c]Pilot must pass a test at an FAA-approved testing center.

[d]Owner of the UAS must self-certify that the UAS pilots have the required training.

[e]Pilot qualifications are determined on a case-by-case basis based a number of factors including pilot experience and aircraft weight. Permission is not required for aircraft 44 pounds or less being flown within direct unaided line of sight and away from people, property, and congested areas.

[f]Owner of the UAS must self-certify that the UAS pilots have the required training if the pilot has not flown the UAS in the preceding 12 months.

[g]Self-certification accepted using logbook entries unless the pilot changes aircraft type, or the pilot has less than 2-hours experience logged in preceding 3 months on same aircraft type.

[h]An airworthiness certification is not required for UAS weighing less than 44 pounds but is required for UAS weighing more than 44 pounds Exemptions may be available in specified circumstances.

[i]An Advisory Circular issued by Australia's Civil Aviation Safety Authority (AC 101-1(0)) provides for beyond line of sight operations under certain circumstances.

[j]UAS operations beyond line of sight are very limited and allowed only on a case-by-case basis, according to a French civil aviation official.

[k]Beyond line of sight operations are allowed with aircraft fitted with a detect-and-avoid system or, operated within a segregated airspace. The Civil Aviation Authority has noted that it is not aware of any detect-and-avoid system with adequate performance and reliability, but has several areas of segregated airspace.

While regulations in these countries generally require that UAS operations remain within the pilot's visual line of sight, some countries are moving toward allowing limited operations beyond the pilot's visual line of sight. For example, according to Australian civil aviation officials, they are developing a new UAS regulation that would allow operators to request a certificate allowing beyond-line-of-sight operations. However, use would be very limited and allowed only on a case-by-case basis. Similarly, according to a French civil aviation official, France approves on a case-by-case basis, very limited beyond-line-of-sight operations. Finally, in the United States, there have been beyond-line-of-sight operations in the Arctic, and NASA, FAA and the UAS industry have successfully demonstrated detect-and-avoid technology, which is necessary for beyond line-of-sight operations.

Like the United States, Australia, Canada, France, and the United Kingdom distinguish between recreational model aircraft and commercial UASs and have issued guidelines for safe operation.[43] For example, the United Kingdom defines model aircraft as any small unmanned aircraft, weighing less than 44 pounds, or large unmanned aircraft weighing more than 44 pounds, that is used for sporting and recreational purposes. Australia makes no practicable distinction between a small UAV and a model aircraft except that of use—model aircraft are flown only for the

[43]As discussed earlier, for the United States, the model aircraft definition is in the 2012 Act. Rules for flying model aircraft are advisory, and compliance is voluntary. However, FAA has enforcement authority over persons operating model aircraft who endanger the safety of the national airspace system.

sport of flying them. However, Australia also defines a giant model aircraft as one weighing between 55 pounds and 331 pounds.

Approvals for commercial UAS operations have increased in these four countries and some allow more commercial operations. Since 2011 the number of approvals for commercial operations in France has increased every year. According to a Civil Aviation Authority official, in 2014, there were about 3,600 commercial UAS operators. In Canada, according to a Transport Canada official, there were over 1,600 approvals for commercial and research related UAS operations in 2014. As previously mentioned, certain commercial operations in Canada do not need approval as of November 2014 and there may be even more UAS operations. The United Kingdom's Civil Aviation Authority attributes the growth to UASs in their country to the UASs' becoming less expensive and simpler to operate. In the United Kingdom, as of February 2015, there were 483 commercial UAS operators, and this number has increased every year since 2010. Similar to the United Kingdom, Australia has seen an increase in commercial UAS operators since 2010 with currently over 200 approved commercial operators. Australia's Parliament attributes the growth to improvements in UASs' piloting and control technologies, as well as reductions in UAS prices. With FAA's approvals for commercial exemptions exceeding 500 as of June 9, 2015, the United States has closed the gap with some other countries' level of commercial use.

Other Countries Face Common Challenges to UAS Integration

Other countries face challenges that are common across some countries, including the United States, trying to integrate UAS operations. Specifically, some of the challenges are:

- Technology shortfalls and unresolved spectrum issues. Technology needs and concerns about available spectrum constrain full integration of UASs into airspace with manned aircraft in the United States and in countries around the world. UASs' current inability to detect and avoid other aircraft, the lack of a standard for command and control systems, and no dedicated and secure frequency spectrum are technical challenges preventing full UAS integration into the national airspace. However, organizations around the world are looking to address these technology issues and develop standards to support safe UAS operations. At the worldwide level, the International Civil Aviation Organization is addressing how UAS integration would affect its existing standards. At the European level, the European UAS Roadmap contains a strategic research and development plan that

describes anticipated deliverables along with key milestones, timelines, and resources needed. Separate from the international organizations, researchers in individual countries are also addressing these challenges. For example, in February 2014, Australian researchers achieved what was then believed to be a world-first breakthrough for small UASs by developing an onboard system that has enabled a UAS to detect another aircraft using vision while in flight.

- Safe operations by recreational users. Countries around the world also face challenges in ensuring that UAS purchasers operate them safely. As UASs become more affordable, and increasingly available some individuals are conducting unsafe or illegal UAS operations. In July 2014, Australia's Parliament reported on testimony, from several witnesses, that UASs are being flown by operators who unknowingly break safety rules, thereby posing a safety risk to manned aircraft and persons on the ground. In response to unsafe operations, a few countries have placed outright bans on UAS operations. For example, in India, in response to the surge in interest for commercial and recreational use, the government placed an outright ban on any UAS use until its civil aviation agency issues regulations. Similar to the "Know Before You Fly" education campaign in this country, other countries have sought to educate operators. For example, the United Kingdom has developed and distributed a brochure describing safe flying practices. In Australia, UAS purchasers receive a similar document when they purchase the product. Canada has launched a national safety awareness campaign for UASs, which aims to help Canadians better understand the risks and responsibilities of flying UASs. In addition, Transport Canada has set up a web page that provides safe guidelines for flying UASs and answers frequently asked questions

While countries face some UAS integration challenges that are similar to the United States, other challenges such as airspace complexity and ease of regulatory change, can make integration in this country more difficult. Airspace complexity is one aspect in which the United States differs from other countries. According to FAA, the U.S. airspace is the busiest and most complex in the world, where UASs, after integration, would share with more than 300,000 general aviation aircraft, ranging from amateur-built aircraft, rotorcraft, and balloons, to highly sophisticated

turbojets (executive jets).[44] Introducing potentially large numbers of UAS by hobbyists, farmers, law enforcement agencies, and others would add to this complexity. In contrast, according to a study by MITRE, other countries have fewer aviation aircraft, a situation that may make integrating UAS easier. For example, the U.K. has about 20,000 registered general aviation aircraft, while Australia has around 8,400. A study conducted by MITRE for FAA indicated this factor as one that can affect the speed of change and adaptation in various aviation environments.

Agency Comments

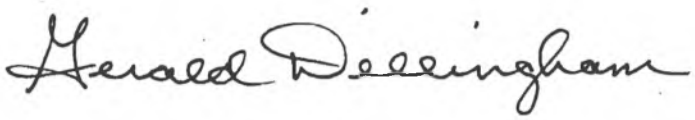
We provided a draft of this report to Department of Transportation (DOT) for review and comment. In comments, which were provided in an email, DOT stated that the report addresses many of the challenges of UAS integration but does not address any environmental concerns and that the report should state that it did not examine the environmental considerations of UAS integration. DOT further noted that FAA is conducting research to understand the environmental impacts of UAS integration, the role that UASs play in National Environmental Policy Act compliance, and the applicability of noise standards regulations to UASs.[45] We did not examine the environmental considerations of UAS integration. The discussion of challenges in the report does not mention environmental concerns because it focuses on challenges the test sites faced during their first year of operation, as reported by the test site operators. We did clarify in our scope and methodology description that we did not cover environmental considerations of UAS integration. DOT also provided technical comments on the draft that we incorporated as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the Secretary of Transportation and the appropriate congressional committees. In addition, the report will be available at no charge on the GAO website at http://www.gao.gov.

[44]General aviation includes all civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire.

[45]14 CFR Part 36.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or dillinghamg@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

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Committee on Transportation and Infrastructure
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report focuses on FAA's efforts to develop procedures to allow UAS use within the national airspace system. Specifically, we reviewed (1) the status of FAA's progress toward safe integration of UAS into the national airspace, (2) research and development support from FAA's test sites and other resources, and (3) how other countries have progressed toward UAS integration into their airspace for commercial purposes.

To address the three objectives, we reviewed and synthesized a range of published reports from GAO[1] and FAA that included general background information on a variety of related issues, such as FAA's framework for UAS integration, efforts to accommodate ongoing research and commercial UAS use, and UAS technology challenges.[2] We reviewed other relevant background literature on related issues, including results from databases, such as ProQuest® and Nexis®, trade publications, literature from industry stakeholder groups, and information from the Internet. We also reviewed provisions of the FAA Modernization and Reform Act of 2012,[3] and the Notice of Proposed Rulemaking for small UAS operations.[4] In addition, we reviewed more detailed and specific documentation related to the different objectives, as described below.

To determine FAA's progress toward safe integration of UAS into the national airspace, we:

- Reviewed documents provided by officials and conducted semi-structured interviews with officials at federal agencies, including the FAA's Unmanned Aircraft Systems Integration and Research and Development Offices, the Department of Defense (DOD), the National Aeronautics and Space Administration (NASA), and the Department

[1]GAO, *Unmanned Aircraft Systems: Continued Coordination, Operational Data, and Performance Standards Needed to Guide Research and Development*, GAO-13-346T (Washington, DC: Feb. 15, 2013); *Unmanned Aircraft Systems: Measuring Progress and Addressing Potential Privacy Concerns Would Facilitate Integration into the National Airspace System*, GAO-12-981 (Washington, DC: Sept. 14, 2012); and *FAA Reauthorization Act: Progress and Challenges Implementing Various Provisions of the 2012 Act*, GAO-14-285T (Washington, DC: Feb. 5, 2014).

[2]We did not review the environmental challenges of UAS integration.

[3]Pub. L. No. 112-95, 126 Stat. 11.

[4]80 Fed. Reg. 9544 (Feb. 23, 2015).

of Homeland Security. We reviewed FAA's Comprehensive Plan[5] and Roadmap for UAS integration.[6]

- Interviewed representatives from FAA's Joint Planning and Development Office, the UAS Aviation Rulemaking Committee, RTCA, and MITRE Corporation as well as voluntary standards development organization ASTM International. We interviewed representatives from the Association for Unmanned Vehicle Systems International, Aircraft Owners and Pilots Association, American Institute of Aeronautics and Astronautics, and the Academy of Model Aeronautics. We also obtained information on the Federal Modernization and Reform Act of 2012 Section 333 exemptions FAA granted from FAA and http://www.regulations.gov[7] from September 2014 to May 2015.

- Reviewed documents provided by and interviewed federal and industry representatives from the collaborative groups—the Executive Committee, RTCA Special Committee 228, UAS Aviation Rulemaking Committee, and ASTM International Committee F38—and industry groups that are involved in FAA's efforts to integrate UAS into the national airspace system

To identify research and development support from FAA's test sites and other resources, we:

- Reviewed and analyzed documents from each of the six test sites where FAA has recently allowed UAS operations including the applications submitted by the selected test sites and quarterly reports provided to FAA.

- Conducted semi-structured interviews with officials from the test sites, including the State of Nevada, the University of Alaska, the North Dakota Department of Commerce, Griffiss International Airport, the Virginia Polytechnic Institute & State University, and Texas A&M

[5]Joint Planning and Development Office, *Unmanned Aircraft Systems Comprehensive Plan: A Report on the Nation's UAS Path Forward* (Washington, D.C.: September 2013).

[6]FAA, *Integration of Civil Unmanned Aircraft Systems in the National Airspace System Roadmap: First Edition—2013* (Washington, D.C.: November 2013).

[7]Regulations.gov is a website that allows the pubic to access and submit comments on agencies' regulatory documents published in the Federal Register.

University Corpus Christie to determine the issues encountered in an effort to become operational, conduct research, share the research results with FAA, and receive support or guidance from FAA.

- Spoke with representatives from other universities with centers of research on UAS technology and issues, including New Mexico State University, Massachusetts Institute of Technology Lincoln Laboratory, the Humans and Autonomy Lab at Duke University, and the Georgia Institute of Technology to obtain information about the resources FAA has dedicated to conducting other UAS research and development.

To identify how the United States compares to other countries in the progress and development of UAS use for commercial purposes, we:

- Developed case studies for four countries that have made progress in integrating UASs into their national airspace—France (Direction générale de l'aviation civile); the United Kingdom (UK Civil Aviation Authority); Australia (Australia Civil Aviation Safety Authority); and Canada (Transport Canada Civil Aviation). We selected these countries based on several factors including the status of regulatory requirements for commercial UASs, beyond-line-of-site activities, and whether the country allows non-military UAS to operate in the airspace. We obtained the UAS regulations of each country and interviewed civil aviation authorities in each to obtain additional information about the issues encountered with UAS.

- Interviewed other stakeholders familiar with the UAS activities currently occurring in other countries to determine the factors that influenced their country's policies regarding UASs including the International Civil Aviation Organization (ICAO).[8]

We conducted this performance audit from January 2014 to July 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[8]ICAO is the international body that, among other things, promulgates international standards and recommended practices in an effort to harmonize global aviation standards.

Appendix II: Selected Requirements and Status for Unmanned Aerial Systems (UAS) Integration under the Federal Aviation Administration (FAA) Modernization and Reform Act of 2012, as of December 2014

Deadline	FAA Modernization and Reform Act of 2012 requirement	Status of action
05/14/2012	Enter into agreements with appropriate government agencies to simplify the process for issuing Certificates of Waiver or Authorization (COA) or waivers for public unmanned aerial systems (UAS).	In process—memorandum of agreement (MOA) with DOD signed Sept. 2013; MOA with Department of Justice signed Mar. 2013; MOA with NASA signed Mar. 2013; MOA with Department of Interior signed Jan. 2014; MOA with the Office of the Director, Operational Test and Evaluation (DOD) signed Mar. 2014; MOA with National Oceanic and Atmospheric Administration still in draft.
05/14/2012	Expedite the issuance of COAs for public safety entities	Completed
08/12/2012	Establish a program to integrate UASs into the national airspace at six test ranges. This program is to terminate 5 years after date of enactment.	Completed
08/12/2012	Develop an Arctic UAS operation plan and initiate a process to work with relevant federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes.	Completed
08/12/2012	Determine whether certain UAS can fly safely in the national airspace before the completion of the Act's requirements for a comprehensive plan and rulemaking to safely accelerate the integration of civil UASs into the national airspace or the Act's requirement for issuance of guidance regarding the operation of public UASs including operating a UAS with a COA or waiver.	Completed
11/10/2012	Develop a comprehensive plan to safely accelerate integration of civil UASs into national airspace.	Completed
11/10/2012	Issue guidance regarding operation of civil UAS to expedite COA process; provide a collaborative process with public agencies to allow an incremental expansion of access into the national airspace as technology matures and the necessary safety analysis and data become available, until standards are completed and technology issues are resolved; facilitate capability of public entities to develop and use test ranges; provide guidance on public entities' responsibility for operation.	Completed
02/12/2013	Make operational at least one project at a test range.	Completed
02/14/2013	Approve and make publically available a 5-year road map for the introduction of civil UAS into national airspace, to be updated annually.	Completed
02/14/2013	Submit to Congress a copy of the comprehensive plan.	Completed
08/14/2014	Publish in the Federal Register the Final Rule on small UAS.	In process

Deadline	FAA Modernization and Reform Act of 2012 requirement	Status of action
08/14/2014	Publish in the Federal Register a Notice of Proposed Rulemaking to implement recommendations of the comprehensive plan.	None to date
08/14/2014	Publish in the Federal Register an update to the Administration's policy statement on UAS in Docket No. FAA-2006-25714.	None to date
09/30/2015	Achieve safe integration of civil UAS into the national airspace.	In process
12/14/2015	Publish in the Federal Register a Final Rule to implement the recommendations of the comprehensive plan.	None to date
12/31/2015	Develop and implement operational and certification requirements for public UAS in national airspace.	In process
05/14/2017	Report to Congress on the test ranges	None to date

Source: GAO analysis of FAA information. | GAO-15-610

Appendix III: GAO Contacts and Staff Acknowledgments

GAO Contact

Gerald L. Dillingham, Ph.D., at (202)512-2834 or dillinghamg@gao.gov

Staff Acknowledgments

In addition to the contact named above, the following individuals made important contributions to this report: Brandon Haller, Assistant Director; Geoffrey Hamilton, Daniel Hoy, Eric Hudson, Bonnie Pignatiello Leer, Ed Menoche, Josh Ormond, Amy Rosewarne, Andrew Stavisky, and Sarah Veale.

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Congressional Relations	Katherine Siggerud, Managing Director, siggerudk@gao.gov, (202) 512-4400, U.S. Government Accountability Office, 441 G Street NW, Room 7125, Washington, DC 20548
Public Affairs	Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548

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11/15/15 Task Force Meeting

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Ginger Blaisdell

From: Ginger Blaisdell
Sent: Thursday, November 05, 2015 10:09 AM
To: Rep. Shelley Hughes
Subject: agenda with notes in red

Call in 844-586-9085
Thursday Nov 5 @ 1pm (hoping to finish by 2pm)

AGENDA
Newsworthy updates

- USDOT requiring hobbyists to register drones
- Page 3: public comments regarding UAS registration are due tomorrow Nov 6 but will likely remain open longer
- Page 10: new drone air traffic control system under 500 feet may be the answer to drone delivery issues and hobby flights
- Page 12: insurance is becoming more readily available for drones
- Page 14: judge rules OK to man shooting down drone

Subcommittee reports from:

- Mike O'Hare – State COA
- Steve Colligan – hobbyist certification/licensure and retailer rules
- Steve Wackowski – 3-D Airspace zero to 500 feet
  Dan Wayne, Legal Svcs, will be available for comments on his research (documents to be final today)

Final version of "Alaska's Drone Operator Safety and Privacy Guidelines"

- Black and white copy will be sent to list serve with reference to www.alaskadrones.org for color copy due to file size

Upcoming events and meetings Nolan Klouda UAA

- Jay Skaggs Nov 18, Economic Interest Bar-b-Queue
  - Ethan Tyler and Christie Bell are working to host a morning presentation session
  - Afternoon at Jay's house with 5pm bar-b-queue
    - 15046 East Lake Ridge Drive, Eagle River 99577
    - Encourage everyone to attend – RSVP with Ginger or Jay
- AK Chiefs of Police Leadership meeting Nov 30-Dec 1
  - UAS LTF will have 15 minute session
    - Privacy guidelines
    - FAA law enforcement rules
    - State law (HB255)
    - How to enforce inappropriate drone operators

Chief of Staff
Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 13

SITE: Offnet *COMMITTEE:JUNM* *DATE:11/5/15*	*SUBJECT OF MEETING:* *Unmanned Aircraft Systems Task Force* *Update #1*	TESTIFY KEY: Y = yes LO = Listen only ? = Available for questions

NAME	COMMUNITY	REPRESENTING/AFFILIATION	DO YOU WANT TESTIFY
Steve Wackowski		Task Force Member	
Rep Hughes			
Bob May		Task Force Member	
Ethen Tyler		Task Force Member	
John Nevadomsky		Task Force Member	
Steve Strait		Task Force Member	
John Parker		Task Force Member	
Steve Colligan		Task Force Member	
Ro Bailey		Task Force Member	

US to Require that Hobbyists Register Drones

Federal officials plan to announce on Monday that all drones will have to be registered with the U.S. Transportation Department, Fortune has learned.

U.S. Transportation Secretary Anthony Foxx and F.A.A. Administrator Michael Huerta will hold a press conference in Washington D.C. to explain the government's plans to create a new registration system that all drone buyers will be required to use, according to a source familiar with the situation.

The plan adds hobbyists to those who must register their drones with the government. Previously, only commercial drone users had to register their aircraft with the F.A.A. after getting the authorization to fly.

Drone industry leaders from trade groups and manufacturers will join government officials during the announcement. The plan calls for creating a task force that includes members of the government and the drone industry to create the registry, the source said.

The initiative to create a centralized system for collecting drone registrations has been in the works for the past few weeks. Government officials have been contacting drone makers and industry groups about it over the past few days, the source said.

The drone registration system is supposed to be debut around the Thanksgiving holiday.

The Transportation Department declined to comment on the specifics of the announcement to Fortune, but confirmed that the department will "make an important safety announcement about the use of Unmanned Aircraft Systems" on Monday.

It's unclear what penalties drone owners will face for failing to register their aircraft. Nor is it clear whether all drones must be registered or just ones that are beyond a certain size.

Michael Drobac, the executive director of the Small U.A.V. Coalition, a drone advocacy group whose members include Google, Amazon, and camera maker GoPro, told Fortune that he is concerned with the proposed regulations. Both Amazon and Google are working on drones for delivering products ordered online to customers' doorsteps.

"I have great concerns that the F.A.A. and D.O.T. won't come up with something that will help us move us forward as a country in advancing this technology on their own," Drobac said. "This has to be led by industry.

Source: Fortune

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US DoT Seeks Public Comments on UAS Registration

In a surprise move, DOT just published a document, *Clarification of the Applicability of Aircraft Registration Requirements for UAS and Request for Information Regarding Electronic Registration for UAS*, to the Federal Register. DOT is soliciting recommendations on all aspects of the UAS registration process, including which UAS should be exempt from the registration requirement.

The clarification and request for information requests that comments be received within 15 days after publication in the Federal Register, which is November 6, although the comment period reportedly will remain open for the near future. Of course, given the Secretary's expedited timeline, comments submitted after November 6 will be less likely to influence the recommendations made by the UAS registration task force. Click here to access the original document and post a comment.

In addition to clarifying applicable statutory requirements regarding UAS registration, DOT is requesting "information and recommendations regarding what information and registration platform would be appropriate for UAS registration and ways to minimize the burden to the regulated community." DOT is also requesting comments on which UAS, in terms of weight or performance

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capabilities, should remain exempt from the registration requirements because of the negligible risk they pose to the national airspace system (NAS).

To facilitate the task force's work in developing UAS registration procedures, DOT is requesting information and data from the public in areas such as:

- At what point should registration occur (e.g. point-of-sale or prior-to-operation)? How should transfers of ownership be addressed in registration?
- Consistent with past practice of discretion, should certain UAS be excluded from registration based on performance capabilities or other characteristics that could be associated with safety risk, such as weight, speed, altitude operating limitations, duration of flight? If so, please submit information or data to help support the suggestions, and whether any other criteria should be considered.
- How should a registration process be designed to minimize burdens and best protect innovation and encourage growth in the UAS industry?
- Should the registration be electronic or web-based? Are there existing tools that could support an electronic registration process?

Whether you are a UAS manufacturer, operator, or user, the comment period offers all industry stakeholders an opportunity to shape UAS regulation and policy.

Source: Hogan Lovells

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Posted in Regulatory Matters on October 26, 2015 by The Editor. 3 Comments

← MAPPS JOINS FAA REGISTRATION TASK FORCE UAV OPERATOR SUPPORTS UK AERODROME COMMUNITY →

3 COMMENTS

Angelo
October 26, 2015 at 18:35

4

FAA Administrator Opens UAS Registration Task Force Meeting

The Unmanned Aircraft Systems (UAS) Registration Task Force completed its first day of work. FAA Administrator Michael Huerta kicked off the Task Force with remarks that outlined the group's objectives and expectations. The FAA briefed participants on the current statutory requirements and international obligations for aircraft registration before the group began initial discussions on a streamlined registration process and minimum requirements for UAS that need to be registered. The Task Force will continue deliberating on Wednesday.

Here are FAA Administrator Michael Huerta's remarks as prepared:

Unmanned aircraft use has increased dramatically in recent years. With this surge in popularity has come growing concerns about their safe operation in our nation's airspace.

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In recent months, we've seen an increase in reports of UAS coming too close to manned aircraft and airports. Some have interfered with wildfire fighting in California, and one crashed into a stadium during a U.S. Open tennis match.

These incidents make it clear: we must work harder to ensure a strong culture of safety and responsibility among unmanned aircraft enthusiasts.

There's no single solution for how we do this. The integration of unmanned aircraft is multi-faceted, and our approach must be as nimble as the technology itself.

One tool we're going to use is registration - and that's why we're here today.

Unmanned aircraft have countless potential uses - from package delivery to tasks that are dangerous for people or manned aircraft to perform. No one wants to see this promising technology overshadowed by an incident or accident that could easily be avoided with proper training and awareness of the safety principles that are now second nature in manned aviation.

We invited you to assist us on this task force because each of you brings extensive knowledge about unmanned aircraft, technology, public policy and the aviation industry. You represent a wide range of viewpoints. And you are all united by a common goal: the safe integration of unmanned aircraft.

We're hopeful this task force can provide the FAA guidance on some important questions as to how we determine the best way to register aircraft under 55 pounds:

- How do we make registration as easy as possible for consumers while providing accountability?
- What products should we exclude from registration based on weight, speed, altitude and flying time?
- What information should we collect during the registration process, and what should we do with the data?
- Should every unmanned aircraft sold have its own serial number, or how to tie particular aircraft to a particular user?
- Should the process include a formal education component before an aircraft can be registered?
- Should registration be retroactive and apply to unmanned aircraft that are now in the system?
- Should there be an age requirement for registration?

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Ultimately, we want to make registration as easy as possible for consumers, to relieve them of the complexity associated with registering larger, manned aircraft.

Your recommendations will be invaluable as the FAA moves quickly to stand up this new system.

We're working on a tight timetable – Secretary Foxx set a deadline of November 20th for the task force to complete its recommendations. This reflects the urgency of the task at hand.

The holidays are weeks away, and unmanned aircraft are going to be a popular gift item. By some estimates, 700,000 new aircraft could be in the homes of consumers by the end of the year. This means unmanned aircraft could soon far outnumber manned aircraft operating in our nation's airspace.

Many of these new aircraft are bringing new users to aviation – most with little or no experience with aviation regulations.

Registration will give us an opportunity to educate new operators about airspace rules so they can use their unmanned aircraft safely. It will also help us more easily identify and take enforcement action against people who intentionally violate the rules or operate unsafely. A perfect example of this occurred last week, when a drone carrying mobile phones, drugs and hacksaw blades crashed into a prison yard in Oklahoma. Perhaps registration would have helped authorities quickly identify the owner.

We realize that most people want to use their aircraft safely for enjoyment. Registration benefits users and the government alike because it encourages education while providing a mechanism for helping the FAA fulfill its mission of keeping the nation's skies safe.

I recently announced the FAA's new Compliance Philosophy, which uses education and training to ensure we have safe operators.

At the same time, this doesn't mean we're going to go easy on enforcement.

But in cases where we find simple mistakes or a lack of understanding, we'll use tools like training and education to ensure compliance with the regulation and compliance with the standard.

This starts with giving operators the tools and knowledge they need to fly safely. Toward this end, we released the beta version of a new smartphone application called "B4UFLY," which alerts UAS operators to restrictions or requirements in effect at their current or planned flight location.

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The FAA and its government and industry partners are also conducting outreach through the Know Before You Fly and No Drone Zone campaigns, most notably during the recent visit by the pope.

But for those who don't follow the rules, we need to continue our enforcement efforts.

Last month, the FAA proposed a $1.9 million civil penalty against a company that we allege knowingly conducted dozens of unauthorized flights over Chicago and New York. This sends a clear message to others who might pose a safety risk: Operate within the law or we will take action.

As registration, education and enforcement focus on enhancing safety around recreational use, we're also working to put a commercial regulatory framework in place.

Earlier this year, we proposed a rule that would routinely allow small unmanned aircraft operations we know to be safe, and we plan to finalize it by late spring.

Meanwhile, we're approving requests for commercial operations on a case-by-by-case basis. To date, we've approved more than 2,200 authorizations that allow unmanned aircraft to be used for a wide variety of different purposes.

Under our Pathfinder program, we're working with industry to determine how to safely expand unmanned aircraft operations beyond the parameters of our proposed rule. BNSF Railway recently used an unmanned aircraft to inspect miles of its tracks in New Mexico, demonstrating beyond visual-line of sight capabilities. The flight marked the first of what we hope will be many successful Pathfinder tests and flights.

Integrating unmanned aircraft into our nation's airspace is a big job, and it's one the FAA is determined to get right. We know that we need to work closely with our partners in government and the private sector for this to succeed. This task force is a sign of our commitment to that partnership and we thank you for your work.

Please think big, and think outside the box. Take the interests of all stakeholders, of everyone who will be affected by registration, into consideration, and you need to factor that into your conversations and deliberations. And please - do not worry about achieving perfection. Your ideas will enable us to lay the groundwork for registration, but by no means is it the last word on registration.

You have a lot to accomplish in the next three days. I have no doubt this group will be able to meet the challenge, and I look forward to your recommendations. Given the urgency of this issue,

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the DOT and the FAA will move quickly to consider your suggestions as we create a registration system that works for the FAA, consumers, and the safety of our nation's airspace.

Thank you again for dedicating the time to this important undertaking.

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Posted in Regulatory Matters on November 4, 2015 by The Editor. Leave a comment

← DJI LAUNCHES EMBEDDED UBUNTU COMPUTER FOR DRONES

DRONE WORLD EXPO – EXCLUSIVE BOARD MEMBER INTERVIEWS – GRETCHEN WEST →

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DigitalGlobe Helps Create Drone Air Traffic Control

Data mined from DigitalGlobe's satellite images are at the center of a system that could change how drones operate in the U.S. and globally.

The Low Altitude Traffic and Airspace Safety, or LATAS, uses Verizon's LTE cellular network, Harris' satellite-based surveillance systems and information gleaned from Westminster-based DigitalGlobe's high-resolution Earth imagery to help unmanned aerial vehicles — or UAVs, more commonly called drones — identify and avoid obstacles and safely navigate the airspace.

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LATAS, developed by Raleigh, N.C.-based PrecisionHawk, recently completed initial testing and is under review by the Federal Aviation Administration and NASA.

Think of LATAS as air traffic control for flying robots, complete with social media integration — it has real-time tracking, a "geofencing" feature that won't allow drone flight in prohibited airspaces, and even offers live streaming.

"Anybody can fly a drone — maybe not today, but it's trending in that direction — and we need a technological solution to keep them from running into each other, people, bridges, buildings and even into aircraft," Shay Har-Noy, DigitalGlobe's senior director of Geospatial Big Data, said in an interview.

DigitalGlobe has undergone a self-described "strategy shift" in recent months to target new ways to make money from its imagery.

One of these growth areas is the Geospatial Big Data program, or GBD, which is expanding as new applications are discovered. Although Har-Noy could not specify exact numbers, he said this will definitely result in job gains in Colorado.

GBD harnesses the power of DigitalGlobe's fleet of satellites, which capture photos of about 2 million square miles per day. Each image contains topographical and other information that can be used to guide LATAS.

"Instead of just these giant images of the state of Colorado, we can tell them where the trees are, where the water is, where the mountains are," Har-Noy said. "There are all these kinds of very practical concerns you can now solve."

For now, the next step for LATAS is to continue testing until it gains FAA blessing. The team has the ambitious goal to eventually develop and implement the system globally for safe, efficient operation of UAVs.

"We don't have all the answers," Har-Noy said. "We just want to have a path."

DigitalGlobe currently employs 1,256 people — about 1,200 in Colorado — and about 380 contractors across eight locations worldwide. It recently moved into a new 482,000-square-foot Westminster headquarters.

Source: Denver Business Post

American International Group Offers Drone Insurance

American International Group, one of the nation's leading property/casualty insurance carriers, is taking on the emerging risk as more and more US retailers - including Amazon and Wal-Mart - seek and are granted FAA approval to operate drones.

In a conference Monday hosted by business software provider Oracle, AIG Chief Technology Officer Mike Brady announced that the insurer has started offering coverage for any damage caused by drones and injuries to drone operators.

"Clearly with that many drones in the airspace you run a risk, so AIG actually now offers drone insurance to our commercial customers," Brady said.

The policies are offered through AIG's excess and surplus subsidiary Lexington Insurance Company and bear many similarities to auto insurance plans, covering both "broad physical damage" and "third party liability coverage." However, as they are written especially for drones, the policies also cover drone "operators" and on-ground crew members, as well as electronic malfunctions and component failure.

The coverage excludes problems such as hijacking, unlawful seizure, hacking or "spoofing."

Drones weighing up to five pounds with a wingspan of up to three feet are covered, though pricing information is not immediately available.

The move to offer drone coverage comes just one month after a *Fortune* magazine report suggested that lack of viable insurance options could threaten the entire industry. And as it is already predicted to generate billions of dollars in economic impact over the next 10 years, it's important that market players come forward soon.

Previously, insurers have cited significantly liability and a lack of regulatory guidelines as making it difficult for underwriters to craft well-rounded products for drone manufacturers and operators.

K insurance house Lloyd's has even gone on record saying risk pricing for drones is extremely difficult in view of their emerging status and inherent issues like third-party liability for physical damage, to say nothing of a lack of meaningful data and risk metrics.

Others in the industry agree.

"Unfortunately, there are big questions and not enough answers," Tom Karol, a general counsel for the National Association of Mutual Insurance Companies, told *Fortune.*"There needs to be more clarity on how people will use these, and what will be allowed and won't be allowed is a big issue."

Those monitoring insurer appetites, however, suggest that carriers will not begin to embrace privacy concerns as part of drone liability policies until state and federal legislation becomes clearer on expectations and legality surrounding drones.

"I'm constantly following up with my standard carriers to see if their appetite for drones has changed," said Evan Garmon, a commercial insurance specialist with Harpenau Insurance in Louisville, Kentucky. "Until the regulation and laws in the United States surrounding the small unmanned aircraft systems industry stabilize, many standard insurance companies will stay out of the market.

"Once they do, I plan to be on top of the change to offer better policies for my clients."

Source: Insurance Business America

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Judge rules man had right to shoot down drone over his house

Technically Incorrect: A Kentucky judge dismisses all charges against William Merideth, saying the drone was an invasion of privacy.

by Chris Matyszczyk @ChrisMatyszczyk / October 28, 2015 11:13 AM PDT

Technically Incorrect offers a slightly twisted take on the tech that's taken over our lives.

William Merideth shot down a drone legally, a judge decides.

WDRB/TV screenshot by Chris Matyszczyk/CNET

It was a case that gripped the nation. Or at least Kentucky.

Should it have temporarily escaped your pressured memory, William Merideth in July said he saw a drone flying above his property in Hillview, Kentucky.

He believed it was spying on his 16-year-old daughter who was sunbathing in the garden. So he took out his shotgun and blasted the drone out of the sky. He was arrested for wanton endangerment and criminal mischief.

Now a Kentucky court has declared Merideth an innocent man. Bullitt County District Court Judge Rebecca Ward on Monday dismissed all charges against Merideth, reported local TV station WDRB-TV.

The drone's owner, David Boggs, had produced flight data that insisted his machine had been flying higher than Merideth had claimed.

The judge, however, seems not a fan of big data. She's a woman of the people. She declared that two human witnesses saw the drone below the tree line. This evidence was, to her, conclusive. To her, this was an invasion of Merideth's privacy.

Amateur drones hovering willy-nilly have disturbed more than just private citizens. Airline pilots' reports of drone close-calls on takeoff and landing have increased exponentially over the past year.

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This summer, amateur drones flew over California wildfires, purely to capture dramatic pictures. This grounded helicopters which were desperately trying to drop water on the flames. There's still a $75,000 reward for anyone who leads authorities to those responsible.

The FAA's recommendations include not flying above 400 feet. "Don't be careless or reckless with your unmanned aircraft -- you could be fined for endangering people or other aircraft," the agency adds.

More Technically Incorrect

Microsoft wants to make you feel good about dumping your MacBook

Twitter launches a TV ad for Moments, and it's a touch crazy

Microsoft delighting almost as much as Apple, study says

For his part, Merideth believes his case should never have gone to court.

"I don't encourage people to just go out and start blasting stuff for no reason," he told WDRB. "But three times in one day, three times over the course of a year, six times total, over one property? That's not right, that's harassment."

Boggs is reportedly considering his legal options.

Once Amazon and other retailers begin their deliveries by drone, there will surely be an almost permanent buzzing in the sky. How will people know whether the thing that's overhead is spying on them or merely delivering fresh underwear or zucchini to the nice people next door.

Every time technology thinks it's solving a problem, or at least creating new forms of entertainment, it brings with it new annoyances and potential for conflict.

This isn't necessarily a good thing in a nation where so many people own guns.

Tags: Technically Incorrect, Tech Culture, Gadgets, Drones

Discuss: Judge rules man had right to shoot down drone...

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Hobby / Retail

~ 11 pages

October 7, 2015 teleconference meeting of the UAS LTF subcommittee on Hobbyist Endorsements and Retailer Education Requirements:

Members attending meeting:

Bob May
Steve Colligan
Steve Wackowski
Ethan Tyler
Representative Hughes
John Nevadomsky
Ginger Blaisdell, task force staff

Invited Presenters:

Dave Matthewson, Executive Director AMA
Richard Hansen, AMA Government Affairs
Arthur Cunningham, AMA
Archie, AMA
Jay Skaggs, FAA Alaska

Meeting called to order by subcommittee chair, Steve Colligan at 10am via webinar presentation and teleconferencee.

Steve Colligan: Introduction and remarks

Richard Hansen:

Know Before You Fly campaign is focused on the consumer

- Manufacturers and distributors are beginning to include the flyers in packaging
- AMA is working with major retailers to provide the KBYF information to educate consumers on pilot safety

The AMA is focusing on the platform (aircraft equipment) that has the capability to go beyond visual line of sight for the next level of hobbyist education.

AMA is reviewing 2 classifications for pilots: rotary and fixed-wing. They are looking at liability insurance offerings to hobbyists, and safety awareness (knowledge and operational skills) endorsement.

Personal (hobby) use would fall under the AMA program while commercial applications are still governed by the FAA.

AMA is developing a computer-based education and endorsement on-line program. A pilot would take an on-line test to assess knowledge and includes questions to assess the individual's self-validation of operational skills. The on-line program will also allow for flight data downloads to manage flight records for hobbyists.

AMA Membership fees:

Annual cost of membership is $58 adult (being raised to $75 adult)

Annual cost of subscription for data and test/endorsement $19.95

> Recurring tests in continuing years will include law changes – frequency of testing to be determined

Model Aviation Student Clubs pay a flat fee for a set number of students – typically are universities and schools

Youth membership until age 19 is free (currently 50,000 student memberships nationwide)

Family membership is one adult at full annual fee, additional adult at $38.00 annually, children free

AMA is looking at sUAS pilot training programs around the US to encourage flight safety but will still require hobbyist to take proficiency and knowledge test through AMA to be endorsed. The United Kingdom requires an operator proficiency skills test – the AMA is looking into this.

An endorsement/ID card would be issued by AMA for qualifying hobby pilots.

AMA offers liability insurance (through an underwriter) after achieving knowledge and proficiency endorsement. Insurance underwriters have offered a discounted premium on those with the endorsement.

There is a grey area transitioning from hobby to business.

- AMA is focusing on the capabilities of the aircraft more than hobby VS business
- Beyond visual line of sight is the critical differentiator in capabilities

AMA will offer to register your aircraft through the membership website.

Is the registration data public information?

- It might be provided to the FAA upon request but not to general public
- Public could go through AMA to identify specific aircraft if requested
- Many platforms require the owner to register with the manufacturer in order to download the firmware – this would require personal ID of the aircraft owner
- How would the manufacturer data become available to law enforcement?

Field examiners offering proficiency tests:

- Are they volunteers or will there be additional costs?
- AMA is not convinced that this level of oversight is necessary for hobby pilots – they are leaning toward self-validation of competency.

Is there a pilot training center in Alaska?

- Steve Colligan is working on this as part of his business.

- UAF trains pilots and certifies them depending on what kind of platform they are operating.

Timeline for AMA endorsement is early January 2016 with the mapping and flight logging coming later in the year.

The primary difference between the Know Before You Fly and the AMA membership with endorsement is that KBYF is a "first blush" on safety and the endorsement is more advanced.

Meeting adjourned 11:07am

A followup meeting will be scheduled.

Academy of Model Aeronautics

October 7, 2015

AMA
ACADEMY OF
MODEL AERONAUTICS

sUAS Program For FPV and Semi-Automated Flight For Personal and Purposeful Use

Individual Elements

Legitimacy
Education
Training
Safety
Registration/Endorsement
Classification
Insurance
Program Support/Advocacy
Media
Marketing

Legitimacy

- Current FAA policy precludes the operation of sUAS for anything other than recreational purposes without specific authorization.
- The purposeful use of sUAS is becoming prevalent in the US and growing at an astounding rate.
- AMA believes the safety considerations for the use of sUAS are the same no matter if operated for recreational or purposeful use.
  - Similar to the Academy's existing MA safety program, AMA's sUAS community-based program will provide a safety structure that will allow the purposeful use of sUAS to occur in a safe and responsible manner.
  - AMA will petition the FAA to recognize AMA community-based program as an effective and accepted means of allowing the purposeful use of sUAS in the national airspace.

Education

- Public access to all safety guidelines.
- Computer based learning management system.
  - Member's Only access to the testing and endorsement system.
- Individual module topics would include.
  - Learning the NAS.
  - Current relevant regulations.
  - Safety.
  - Fly friendly (Ethical, noise, nuisance, privacy, surveillance).
  - Best practices for common applications (i.e. photography).
  - Community involvement (search & rescue, emergency Response, disaster relief, etc.)
  - Other non-regulatory or safety issues.

Education (continued)

- Online training syllabus for those that choose not to take an authorized training facility course.
  - Flight proficiency.
  - Flight test (fixed wing, single-rotor, multi-rotor).
- Develop University MASC program (UMASC) for universities & colleges.
- Educate clubs and members.

Training

- Create a nationwide network of AMA Affiliated Training Centers.
  - AMA would put the center on a list of recommended facilities.
  - AMA would review and endorse programs.
  - Center would have to teach to AMA minimum standards. Both written and practical (flying).
  - All participants in Training Center programs must be AMA members.
  - Program completion would be validated through AMA's online system.
  - Members would gain sUAS endorsements by participating in the program.

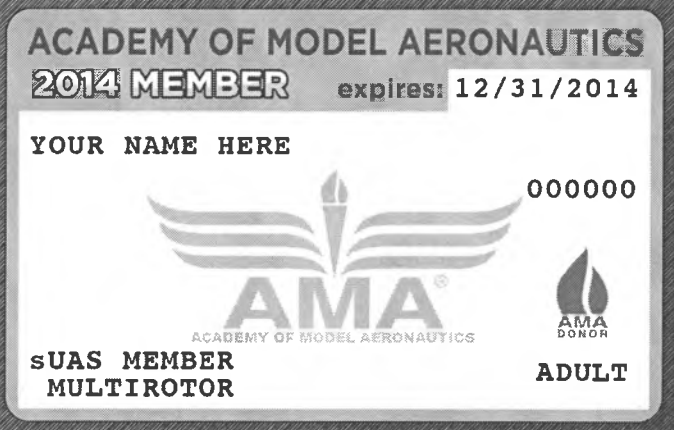
Safety Program

- Foundation will be AMA's existing safety guidelines.
- Stand alone (discipline specific) safety program for sUAS.
- Customized for specific use.
  - Personal use (filming family, recreational activities, special events, general photography).
  - Purposeful use (community service, search & rescue, public safety support, survey of personal property, casual journalism, amateur photography).

Endorsements

- Successful completion of online education program.
- Completion of affiliated training program.
- Review of AMA Safety Program content.
- Participatory based online testing.
- Cost aggregation with tuition at affiliated center.
- Individual endorsements for fixed wing, heli, and multi-rotor.
- Field validation (appointed field examiners).
- Self attestation.

sUAS Endorsements



Special sUAS Membership Classification

- Participatory based, annual renewal.
- Supplemental to AMA membership (Adult, Senior, Junior).
- Availability of sUAS endorsements.
- Access to affinity benefits (Insurance).
- Additional sUAS program benefits

Insurance

- Personal liability coverage for sUAS and MA operations.
  - $2.5 million coverage for recreational use.
- Individually customized policyholder coverage (liability/comprehensive) for sUAS business use through AMA's affinity partner.
  - AMA rate would be more favorable than might otherwise be achieved.
  - Additional discounts with endorsements and/or endorsements from an affiliated training center.

Program Support/Advocacy

- Increase advocacy reach to include this community.
- Dedicated staff to manage community.
- Increased involvement in conventions and seminars.
- Partner with AUVSI and other relevant organizations.

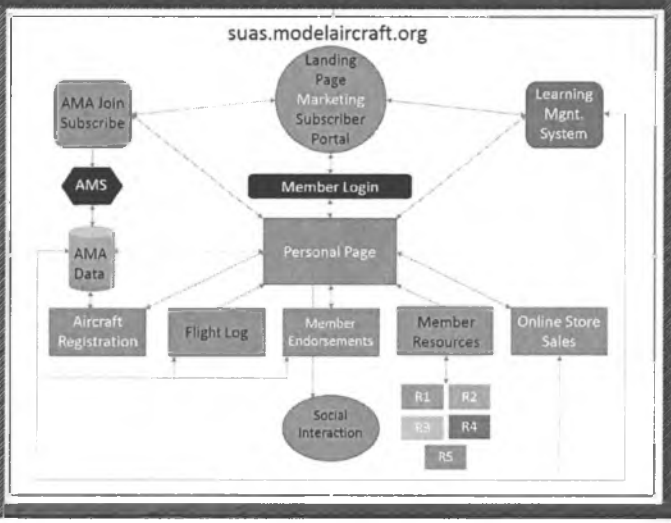
Media

- AMA Today style monthly E-Zine.
  - Auto-populated.
- Continued content in *Model Aviation* magazine.
- Continued content in *Park Pilot* magazine.
- Webinars/Podcasts on relevant topics.
- Instructional videos (potential topics could be terms, definitions, describe platforms, etc.)
- Blogs, videos and other member exclusive content available in the subscriber area.
- Social media / subscriber interaction within the subscriber area.

Marketing

- Join/Renew Landing Page.
- Join/Renew dedicated page (precursor to a microsite).
- Dedicated sUAS Microsite (suas.modelaircraft.org)
- Wherever you fly; Whatever you fly campaign to the community.
- Engagement of manufacturers.
- Outreach through drone user sites/media.
- Marketing in industry related but non MA publications.
- Possible agreements with AUVSI.
- AMA info in boxes pointing to AMA.
- Establish sUAS events, activities, and competitions.

sUAS Website



3-D Airspace

~7 pages

Members in attendance 3-D airspace subcommittee, October 12, 2015

Steve Wackowski, chair
Steve Colligan
Steve Strait
Representative Hughes
John Parker
Dan Wayne, Legislative Legal Svcs
Ginger Blaisdell, staff
Absent: Bob May, John Binder, Senator Micciche

At the last meeting of the UAS Task Force in Fairbanks, there was concern expressed by a member of the public who experienced low flying manned aircraft and was concerned about UAS flying over his private property.

Slide #2

Cuius est solum, eius est usque ad caelum et ad inferos

("*For whoever owns the soil, it is theirs up to Heaven and down to Hell.*")

- Until the early 1900's, this legal clause established precedence for managing airspace for landowners.
- Times have changed so airspace management has changed during the industrial era.

Slide #3

Is the US code that gives the FAA the mandate to manage the airspace

- Declares that a citizen, but not his property, can navigate the airspace.

Slide #4

The court held that all of the navigable airspace in this country is within the sole domain of federal regulation.

- "The United States government has exclusive sovereignty of airspace of the United States."
- Recommends clicking on the link provided and reading about the court case of US vs. Causby
    - Causby was a farmer with farmland next to a WWII training ground where aircraft were interfering with his farming activities (his chickens)

Slide #5

Shows an image of flight zones by altitude – this airspace chart was proposed by Amazon (similar to Google X)

- The X axis (bottom of the image) shows the model flying, rural, suburban, urban and airport airspace
- This concept is still in its infancy and will need more vetting and is predicated on sense and avoid technology

Slide #6

Generally, from the industry, "everyone stressed that one set of standards is preferred – even if state laws may be more favorable to industry.

- Big industry have and will likely lobby against any state that tries to introduce its own airspace standards/rights that differ from the FAA/national rules.
- E.g. lobbied for the Governor of California to veto latest drone bill

Maybe Leg Legal could research what Alaska could do to gain sovereignty over airspace?

Shelley Hughes – can we explore an 'opt in' clause

- 'down to the ground' isn't substantiated in slide #4 because it states "The act defines navigable airspace as airspace above the minimum altitudes of flight...including airspace needed to ensure the safety in the takeoff and landing of aircraft."
- Dan Wayne – statute says the US govt has exclusive sovereignty of airspace of the United States but that the citizen has right of transit through the navigable airspace – so it seems that the govt has authority over all airspace and citizens can transit above 500 feet (in some places it would be 1,000 feet)
- John Parker – the FAA claims domain to all airspace to the ground but they are relinquishing the non-navigable airspace (400' and below) through the 333 exemptions – we may need to talk with the FAA (RTCA) to better understand their intent over this airspace
- Steve Wackowski – assumes that the FAA would not be willing to give up their powers over safety in the airspace but understands that one concern is privacy rights of citizens. There may be the ability to beef up other laws, such as harassment and stalking, to incorporate UAVs.
- Shelley Hughes – there may not be consistency for industry if individual citizens choose to allow UAS traffic above their private property
- Steve Colligan – my fear is another level of bureaucracy over rights of way and public projects. We need to look at loitering and reasonable expectation of privacy, not to make industry projects more expensive.

Steve Wackowski – discussion on range space that allows industry to fly. Maybe ACUASI could elaborate more on the workings of the test range.

Shelley Hughes – met with law enforcement officials last week and loitering can occur in public and private areas and establishes different tolerances for loitering. Within the parameters of the FAA will there be loitering addressed?

- Can a property owner allow hovering, filming, recording over their private property? Excusing a UAS pilot from a loitering law? Maybe lease airspace to the industry?
- John Parker – wouldn't work because the cameras will extend beyond the boundaries of the property and it could extend into multiple properties and airspace leases.
- Steve Colligan – swath of data requires a 75% overlap so could extend into other property boundaries.

- Steve Colligan – would like a better clarification of laws regarding audio recording and video recording and loitering infringements whether in public or on private property compared to traveling across the property. Need legal clarification.
- Dan Wayne – one party conversation doesn't violate the law. Eavesdropping could constitute breaking a law. Videoing could be a greater concern.
- Doesn't matter if it's using a cell phone, recorder, camera or drone.

Steve Strait

1. Slide #5 does not provide an allowance for flight over water where there is no minimum altitude consideration
2. If a state were to take the lead it would be a cause for concern but we should be working with our congressional delegation to be active in the FAA regulations
3. Privacy, loitering; every incident seems to be unique and we may need to let the courts figure it out.

- John Parker said that he's been working with FAA and looking for ways to agree on airspace rulings

Shelley Hughes

- Private property has laws that have to be followed even on your private property.
- Can the private property owner own any of the space above his property but still follow the rules of the FAA?

Steve Wackowski – how were the federal highway system laws established (driver's licensing and road laws). This might be similar to the path of UAS in the NAS.

Request for Dan Wayne:

Is the ground up considered navigable airspace, court precedence vs statute?

- Causby case
- Does the flight interfere with use and enjoyment of your land? Altitude considerations?
- This is different than the question of privacy. A drone operator could meet the elements of an offense if there was a determination of harassment or stalking (explicit images, etc.).

Does the one party consent rule in Alaska include video as well as audio?

Shelley Hughes

We could introduce a resolution that promotes industry/economic development that declares that certain lands (airspace above lands) are open for UAS testing.

- Economic development driver over state lands.
- Bring in Fish and Game regarding animal harassment.
- Steve Colligan is currently leasing airspace over state lands – includes a COA approval – leasing land space contingent with COA approval for the airspace above that property
- Statements for inclusion in a resolution should be provided to Ginger sooner rather than later for bill drafting completed prior to session start in January 2016.

3-D Airspace Subcommittee Discussion Points

12 Oct 2015

State of Alaska UAS Task Force

Agenda

- Federal Statute
- Thoughts from Industry
- Others?
- Way forward

Cuius est solum, eius est usque ad caelum et ad inferos

("*For whoever owns the soil, it is theirs up to Heaven and down to Hell.*")

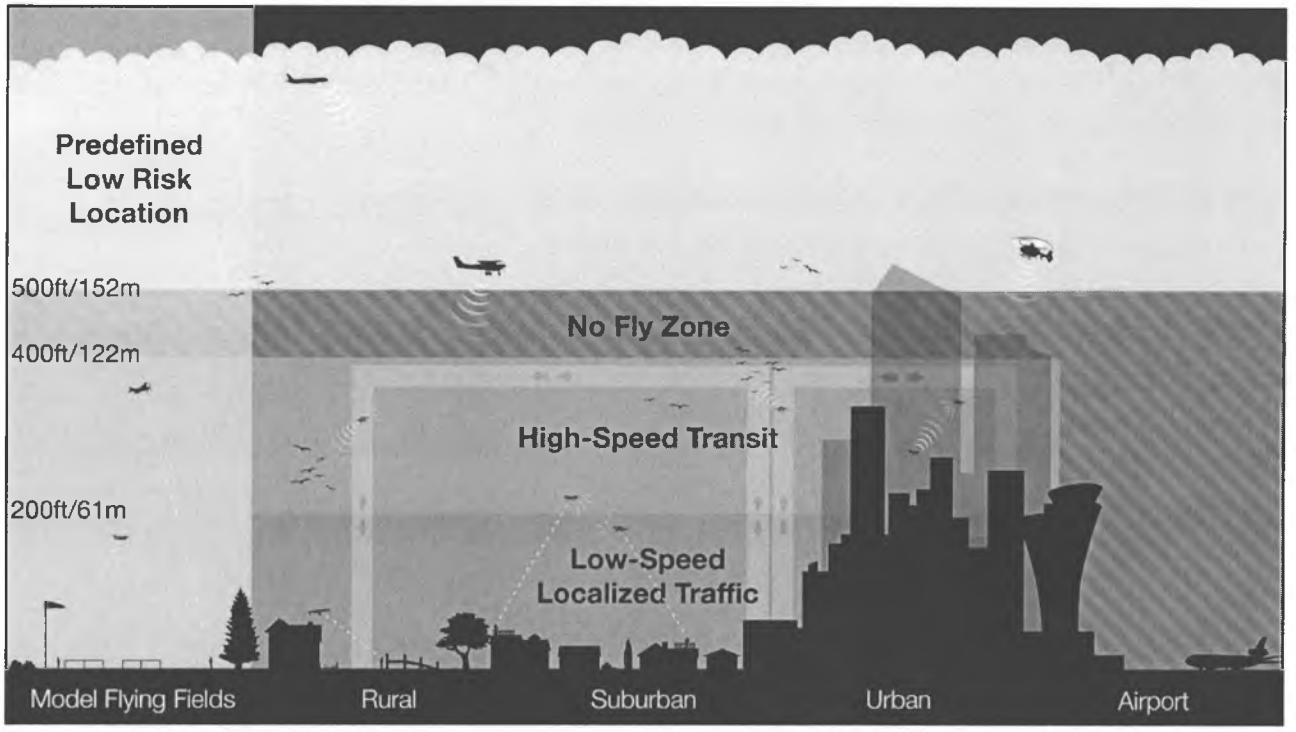
49 U.S. Code § 40103 - Sovereignty and use of airspace

(a) Sovereignty and Public Right of Transit.—
(1) The United States Government has exclusive sovereignty of airspace of the United States.
(2) A citizen of the United States has a public right of transit through the navigable airspace. To further that right, the Secretary of Transportation shall consult with the Architectural and Transportation Barriers Compliance Board established under section 502 of the Rehabilitation Act of 1973 (29 U.S.C. 792) before prescribing a regulation or issuing an order or procedure that will have a significant impact on the accessibility of commercial airports or commercial air transportation for handicapped individuals.
(b) Use of Airspace.—
(1) The Administrator of the Federal Aviation Administration shall develop plans and policy for the use of the navigable airspace and assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace. The Administrator may modify or revoke an assignment when required in the public interest.
(2) The Administrator shall prescribe air traffic regulations on the flight of aircraft (including regulations on safe altitudes) for—
(A) navigating, protecting, and identifying aircraft;
(B) protecting individuals and property on the ground;
(C) using the navigable airspace efficiently; and
(D) preventing collision between aircraft, between aircraft and land or water vehicles, and between aircraft and airborne objects.
(3) To establish security provisions that will encourage and allow maximum use of the navigable airspace by civil aircraft consistent with national security, the Administrator, in consultation with the Secretary of Defense, shall—
(A) establish areas in the airspace the Administrator decides are necessary in the interest of national defense; and
(B) by regulation or order, restrict or prohibit flight of civil aircraft that the Administrator cannot identify, locate, and control with available facilities in those areas.
(4) Notwithstanding the military exception in section 553 (a)(1) of title 5, subchapter II of chapter 5 of title 5 applies to a regulation prescribed under this subsection.
(c) Foreign Aircraft.— A foreign aircraft, not part of the armed forces of a foreign country, may be navigated in the United States as provided in section 41703 of this title.
(d) Aircraft of Armed Forces of Foreign Countries.— Aircraft of the armed forces of a foreign country may be navigated in the United States only when authorized by the Secretary of State.
(e) No Exclusive Rights at Certain Facilities.— A person does not have an exclusive right to use an air navigation facility on which Government money has been expended. However, providing services at an airport by only one fixed-based operator is not an exclusive right if—
(1) it is unreasonably costly, burdensome, or impractical for more than one fixed-based operator to provide the services; and
(2) allowing more than one fixed-based operator to provide the services requires a reduction in space leased under an agreement existing on September 3, 1982, between the operator and the airport.

AOPA: "Small Airports and the Law"

The court held that all of the navigable airspace in this country is within the sole domain of federal regulation. It quoted the Federal Aviation Act that provides: "The United States Government has exclusive sovereignty of airspace of the United States." The act defines navigable airspace as "airspace above the minimum altitudes of flight…including airspace needed to ensure the safety in the takeoff and landing of aircraft."

**http://www.aopa.org/News-and-Video/All-News/2000/November/1/Pilot-Counsel-(11)*



Thoughts from Industry

- Spoke with Google, Amazon, AVUSI and others
  - *Everyone stressed that one set of standards is preferred – even if state laws may be more favorable to industry*

Other Input/Way Forward?

State COA

Ginger Blaisdell

From: Ro Bailey <rbailey11@alaska.edu>
Sent: Friday, October 23, 2015 2:36 PM
To: Ginger Blaisdell; O'Hare, Michael F (MVA); John Binder - Dep Com DOT; Steven Adams; John 'Nevada' Nevadomsky
Subject: Fwd: Anchorage Meetings

Hi, all,

Here's the question I sent to Tom Burgess of DHS. For future reference, his contact info is at the end of his initiating email of this string.

Ro

Ro Bailey, Director
Pan-Pacific UAS Test Range Complex (an FAA Test Site), and
Associate Director
Alaska Center for Unmanned Aircraft Systems Integration - RDT&E
Geophysical Institute
University of Alaska Fairbanks
PO Box 757320
Fairbanks AK 99775
907-322-2255

---------- Forwarded message ----------
From: **Ro Bailey** <rbailey11@alaska.edu>
Date: Fri, Oct 23, 2015 at 2:32 PM
Subject: Re: Anchorage Meetings
To: "Burgess, Thomas" [redacted]

Hi, Tom,

Our Alaska Legislative UAS Task Force has just started a subcommittee to examine how best to set up the various involved state agencies with a UAS program for response to disasters. We had our first meeting (telecon) this afternoon, to start working on requirements, mission sets, who might do what, and funding. I told them about the Resilience work you were doing, and the expected resulting ability to use FEMA funding, but didn't have many details. Could I get a copy of the report? and regarding the FEMA funding, is that reimbursement only, or would it also potentially support costs of establishing the capability?

I will be in Anchorage next Mon-Wed for some appointments with a fair amount of free time. If you are in town and have some time, I'd love to meet you, bring you up to speed on what we are doing, and see what else I might learn about the resilience program.

All the best,

Alaska's Drone Operator Safety and Privacy Guidelines

Prepared by the UAS Legislative Task Force
29th Alaska State Legislature
November 5, 2015

Incident Reporting: FAA Aviation Safety Hotline 907-271-2000 or contact your local law enforcement agency

Incident Reporting: FAA Aviation Safety Hotline 907-271-2000 or contact your local law enforcement agency

Unmanned Aircraft Systems (UAS) Legislative Task Force

Task Force Members

Representative Shelley Hughes, Co-Chair
Senator Peter Micciche, Co-Chair
Ethan Tyler, Commissioner Designee, Department of Commerce, Community Economic Development
Mike O'Hare, Commissioner Designee, Department of Military and Veterans' Affairs
Lieutenant Steve Adams, Commissioner Designee, Department of Public Safety
John Binder, Commissioner Designee, Department of Transportation and Public Facilities
Ro Bailey / John "Nevada" Nevadomsky, University of Alaska Fairbanks, ACUASI and PPUTRC
Steve Strait, Aviation Advisory Board, organization representative
Steve Colligan, Academy of Model Aeronautics, organization representative
John Parker, Integrated Robotics Imaging Systems, industry representative
Steve Wackowski, Tulugaq II, industry representative
Bob May, Gallery Lodge, Kasilof, public representative

Many thanks to those who have contributed:
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Alaska's Drone Operator Safety and Privacy Guidelines

Incident Reporting: FAA Aviation Safety Hotline 907-271-2000 or contact your local law enforcement agency

SAFETY: FAA AND THE ROLE OF LAW ENFORCEMENT

The FAA promotes voluntary compliance by educating individual UAS operators about how they can operate safely under current regulations and laws. The FAA also has a number of enforcement tools available including warning notices, letters of correction, and civil penalties. The FAA may take enforcement action against anyone who conducts an unauthorized UAS operation or operates a UAS in a way that endangers the safety of the national airspace system. This authority is designed to protect users of the airspace as well as people and property on the ground.

However, State and local Law Enforcement Agencies (LEA) are often in the best position to deter, detect, immediately investigate, and, as appropriate, pursue enforcement actions to stop unauthorized UAS operations. Although the FAA retains the responsibility for enforcing FAA's regulations, FAA aviation safety inspectors, who are the agency's principal field elements responsible for following up on these unauthorized and/or unsafe activities, will often be unable to immediately travel to the location of an incident.

While the FAA must exercise caution not to mix criminal law enforcement with the FAA's administrative safety enforcement function, the public interest is best served by coordination and fostering mutual understanding and cooperation between governmental entities with law enforcement responsibilities. Although there are Federal criminal statutes that may be implicated by some UAS operations (see 49 U.S.C. § 44711), most violations of the FAA's regulations may be addressed through administrative enforcement measures. As with any other civil or criminal adjudication, successful enforcement will depend on development of a complete and accurate factual report contemporaneous with the event.

Although not an exhaustive list, law enforcement officials, first responders and others can provide invaluable assistance to the FAA by taking the following actions:

1. Witness identification and interviews
2. Identification of the drone operator
3. Viewing and recording the location of the event
4. Identifying sensitive locations, events, or activities
5. Notification to FAA Regional Operation Center
6. Evidence collection

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ALASKA'S KNOW-BEFORE-YOU-FLY DRONE SAFETY GUIDELINES

What is recreational use of a sUAS (Drones)? Recreational use is the operation of a sUAS for personal interests and enjoyment, and not for compensation or hire. For example, using a sUAS to take photographs for your own personal use would be considered recreational; using the same device to take photographs or videos for compensation or sale to another individual would be considered commercial. You should check with the FAA for further determination as to what constitutes commercial sUAS operation.

SAFETY GUIDELINES FOR RECREATIONAL USERS OF sUAS (DRONES)

- Users should follow community-based safety guidelines, as developed by organizations such as the Academy of Model Aeronautics (AMA)
- Users should fly no higher than 400 feet and remain below surrounding obstacles when possible
- Users must be able to see their sUAS at all times, and use an observer to assist them if needed
- Users should remain well clear and must not interfere with manned aircraft operations, must see and avoid other aircraft and obstacles at all times, must avoid any activity that would cause a manned aircraft pilot to divert from planned operations, and must give way to all other aircraft at all times.
- Users must not intentionally fly over unprotected persons or moving vehicles, and should remain at least 25 feet away from individuals and vulnerable property
- Users must contact the airport or control tower before flying within five miles of an airport
- Users should be aware that in addition to public airports, Alaska has many private airstrips as well as bodies of waters used for take-off and landing by float planes and should not fly a UAS in the vicinity of these locations
- Users should not fly a UAS weighing more than 55 lbs unless it's certified by an aeromodelling community-based organization.
- Users should not fly in adverse weather conditions such as in high winds or reduced visibility
- Users must not fly under the influence of alcohol or drugs
- Users should ensure the operating environment is safe and that the operator is competent and proficient in the operation of the sUAS
- Users should not operate on or fly over private property without first obtaining permission from the property owner and/or tenant
- Users should not fly near or over sensitive infrastructure or property such as power stations, water treatment facilities, correctional facilities, heavily traveled roadways, government facilities, etc.
- Users should not conduct surveillance or photograph persons in areas where there is an expectation of privacy without the individual's permission (See AMA's privacy policy at http://www.modelaircraft.org/privacy.aspx).

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Frequently Asked Questions: Privacy

FAQ 1 WHEN DOES A FLYING DRONE BREACH PRIVACY?

All Alaskans have a reasonable expectation of privacy to live without fear of unwarranted personal invasion. With equal importance, Alaskans enjoy the right to be left alone. The definition for **Reasonable Expectation of Privacy** directly relates to law enforcement requirements to obtain a warrant before actions of search and seizure.

The **United States Constitution Fourth Amendment** forbids the government from performing warrantless and unreasonable searches of any area in which a person maintains a reasonable expectation of privacy. **Alaska's Constitution** guarantees Alaskans the right to privacy. Article 1, Section 22 states, "The right of the people to privacy is recognized and shall not be infringed. The legislature shall implement this section." The legislature has a long-standing history of protecting Alaskans' privacy by instituting **statutes** regarding stalking, harassment, indecent viewing, sending explicit images, and misusing confidential information. The UAS Legislative Task Force (UASLTF) continues to review these protections particularly as they relate to unmanned aircraft systems.

The UASLTF has prepared this document to address privacy guidelines with respect to drones and to educate UAS operators and citizens. We will look at privacy as it pertains to the specific act of intrusion into another's privacy, the prevention of intrusion into one's own privacy, and/or the act of exposing elements of one's privacy against an individual's will. This concept is recognized as "**the right to be left alone.**"

Private Citizen: Please recognize that individuals experience different levels of sensitivity to interruption of privacy. Was the drone flight intentionally directed at you or just passing through? Do you believe the operator of the drone was flying in an inappropriate way? Be as specific as possible so that you can report the incident to local law enforcement.

Drone Operator: Will you be perceived as intruding on someone's privacy? Would you act in-person as you do with your drone? Be courteous and respectful to others.

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FAQ 2 MY NEIGHBOR IS SUNBATHING ON HER DECK AND MY SON IS FLYING HIS DRONE...

Although the FAA governs the airspace from the ground up, help your son understand courteous flying so he doesn't disturb the neighbors or fly somewhere he shouldn't. He should never hover over your neighbor's yard.

Know Before You Fly provides recreational flying rules for hobby pilots: the complete rules can be found at www.alaskadrones.org.

Private Citizen: The FAA governs the airspace from the ground up regardless of whether the property owner is private, public, corporate, or government. While we enjoy a sense of privacy on our property, we may not control what occurs above our heads.

Drone Operator: Fly with respect. Don't fly your drone where people typically expect privacy. Don't use your drone to harass people. in public areas, don't invade people's personal space and their solitude.

Example: Someone is flying their drone and interrupting my relaxing evening barbequing in my backyard. They won't stop even when I "shoo" it away...

What Can I Do? Try to identify where the drone operator is located. Provide as much information as possible to local law enforcement. This might be a situation of harassment.

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FAQ 3 CAN I SHOOT IT DOWN IF IT'S FLYING OVER MY HOUSE?

Remember that a drone is someone else's personal property. It's best to know:

- Why is a drone flying over your property?
- Is it violating the law?
- Who and where is the drone operator?

If you shoot it down or damage it, you may be liable for:

- Destruction of property
- Discharging a weapon in a restricted area

If you think a drone operator is in violation of the law, immediately contact your local law enforcement agency, and provide as much detail as you can about the encounter.

Private Citizen: The value associated with a recreational drone could be $25 to much more than $1,000. The FAA is rapidly authorizing commercial use, so that a small drone could be carrying specialized equipment and cost more than $100,000. Both the hobby drone and the commercial drone may look very similar as you view it from the ground.

Drone Operator: Before you fly over private property, consider the impact of your flight on someone's privacy. Obtain the owner's permission if you plan to hover and take photos or video. If you do not have permission, data you capture should not exceed what a smart phone could capture from a public viewpoint or area nearby. Avoid flying over populated areas.

What Does Federal Law Say?

18 U.S.C. § 32: Federal law governing the National Air Space states that it is a Federal Offense to discharge a firearm at or in the direction of an aircraft. In effect, anyone purposefully shooting at a UAS, is breaking Federal Law, not just State Law or Local Ordinance. 18 USC 32 states that a person shooting down a government or commercial drone would constitute a violation of 18 U.S.C. § 32, that anyone who damages or destroys any aircraft in flight in the United States has committed a crime punishable by up to twenty years in prison or a fine of up to $250,000.

Federal law states in part: "Whoever willfully…sets fire to, damages, destroys, disables, or wrecks any aircraft in the special aircraft jurisdiction of the United States or any civil aircraft used, operated, or employed in interstate, overseas, or foreign air commerce…shall be fined under this title or imprisoned not more than twenty years or both."

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FAQ 4 WHAT IF A DRONE IS PHOTOGRAPHING THROUGH MY WINDOW OR HOVERING AROUND MY HOUSE?

If you feel threatened or concerned, contact local law enforcement. Alaska has laws that address stalking and "peeping Tom" activities.

Private Citizen: A camera mounted on a drone may be treated in the same way as another camera. If an individual is flying a drone in such a way that you feel violated, local law enforcement should be contacted.

Drone Operator: Enjoy your drone with your family and friends who welcome its presence. When you don't have permission, don't hover and capture images that you couldn't capture on your smart phone while walking down the street, or from a nearby building, or from a manned aircraft overhead.

Welcomed Drone: The family drone hovering and taking a portrait when grandma comes to visit.

Unwelcomed Drone: It wasn't a bad dream and the buzzing sound was not your alarm clock. The drone was spying through the bedroom window. Who knows where the pilot is and how those pictures might be used?

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FAQ 5 THE NEIGHBOR IS CHASING MY DOG WITH HIS DRONE!

Although the pet's owner may have introduced his dog to a flying toy, the noise and unfamiliarity of the neighbor's drone buzzing around could frighten Fido and could be considered harassment. If the dog swats the drone out of the sky and chews it up, would it be considered damaging another's personal property or self-defense by the dog? Who is harassing who? Did in incident occur on the dog owner's property or in a public place? There are many factors to consider.

Private Citizen: Know and follow your local animal control laws. If you are in a public area such as a local park, keep your pet away from people flying model aircraft.

Drone Operator: Harassing an animal may come with criminal penalties. Be smart and protect your expensive piece of technology from animals that might view your drone as a threat and attack it.

FAQ 6 WHAT CAN I DO IF THE DRONE'S "BUZZING" IS ANNOYING ME?

A drone typically makes less noise than a standard lawn mower, so fortunately you probably won't find the noise overbearing. But if the noise is annoying, likely the drone is too "near ears" and should be redirected away from people. If the drone is flown during locally recognized waking hours, a drone is probably not in violation of a noise ordinance. If the drone operator is flying too close to people he should be reported to the FAA or local law enforcement for unsafe operations or a situation of harassment.

Private Citizen: Many annoying noises are allowable in both public and private areas. The decibel limit separating acceptable noise level is generally compared to the noise of a standard lawn mower or small engine.

Drone Operator: The drone's buzzing may not be the only problem. The proximity of the aircraft to another person and the length of time in that proximity may be the real issue. **This could be a situation of harassment.**Be courteous to others, don't hover your UAS "near ears," and stay away unless invited.

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FAQ 7 I UNDERSTAND WHY IT'S NOT SAFE TO FLY A DRONE NEAR HEAVY TRAFFIC BUT WHAT ABOUT PRIVACY?

A drone flying near traffic could distract drivers and create unsafe driving conditions including accidents. Drivers should keep their eyes on the road, and drone operators should keep their UAS away from traffic.

Private Citizen: If you see one, keep your eyes on the road. Pull over to report it to local law enforcement if you think it's creating unsafe conditions or collecting data inappropriately.

Drone Operator: Flying over roads can cause distraction and potential automobile accidents on a road system. Not only are drones dangerous over busy traffic but most drivers don't want to be GPS tracked and photographed. Don't fly your drone near high traffic roadways.

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FAQ 8 WHAT PRIVACY CONCERNS CAN THERE BE WHEN YOU'RE IN A CROWD?

Sometimes photographing a crowd could result in the capture of inadvertent images. If the drone photographs Captain Blowhole with a catch beyond his limit, that image could be provided to the authorities for legal review.

Private Citizen: Typically, if you're in a crowd, privacy is limited. Although the safety concerns are paramount when a drone is flying above a crowd, the photography could identify something that a citizen would not want shared, such as the map to Clyde's secret fishing hole.

Drone Operator: During the fishing season, don't photograph Clyde's map to his secret fishing hole! Even if something is visible in a public area, realize a person might not want a camera zooming in on him. Clyde would like his fishing hole to remain a secret.

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FAQ 9 WHAT SAFETY CONCERNS ARE MOST PREVALENT AROUND CROWDS?

"No Drone Zone" announcements have been made at public events to insure the safety of participants and the public. Drone operators have been asked to leave their drones at home during many major events such as: the Super Bowl, forest fires, Olympic qualifying meets, and many other crowd-gathering events.

If you want to find restrictions that may have been posted, check with the nearest FAA airport tower or look at https://pilotweb.nas.faa.gov/PilotWeb/ for notices to airmen (NOTAMs) for information regarding manned and unmanned flight events occurring in a designated area.

Private Citizen: Safety concerns are paramount when a drone is flying above a crowd. Many unforeseen circumstances can occur that might result in injury. If you see a drone, stay at least 25 feet away from it.

Drone Operator: If the drone was to fall out of the sky it could injure a bystander. The drone could also compromise the safety of the crowd by interfering with the activity or distracting people, thus rendering them unaware of happenings nearby. Keep your drone a minimum of 25 feet from a person. If a crowd is in the general vicinity of your flight, make sure your drone is far enough away that if the battery dies or you lose control of your UAS that it won't fall on anyone. Never fly your drone over or near a crowd intentionally.

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FAQ 10 How will the photos or video be stored or used?

Inappropriate use of images or data captured by technological devices understandably concern Alaskans. If you believe someone has obtained images or data illegally or plans to use them illegally, contact local law enforcement. Be able to answer the following questions: Is the drone operator taking inappropriate images? Are images being used in an inappropriate way? Are the images being used for personal gain? Was personal information stolen?

Examples of inappropriate image gathering could include:

- A drone records your PIN over your shoulder while you are at the ATM.
- A drone records images through your office window of a newly signed contract.
- A drone peers through the window while your child is napping.

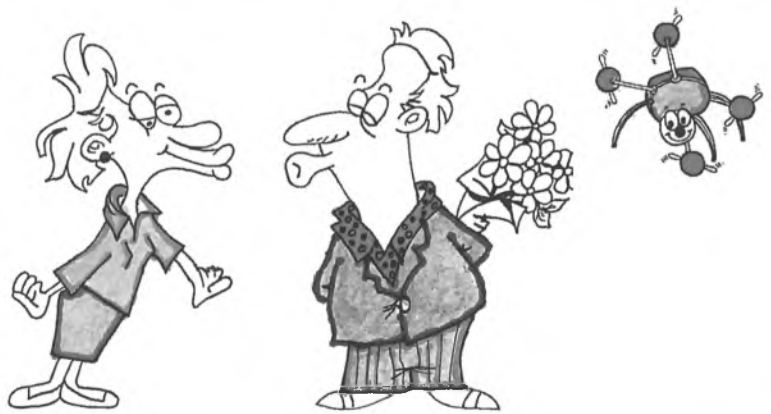
Private Citizen: Many recreational drone operators have posted video and pictures on social media sites. Enjoy this new interesting form of photography. If you come across footage that you believe may be a violation of privacy, contact local law enforcement.

Drone Operator: If you are photographing something with your drone in a place where you would not be welcomed if you were taking pictures in-person, your drone should not be there. Make sure you don't save or post footage that breaches someone's privacy.

FAQ 11 What happens if a drone captures inadvertent images?

Private Citizen: What happens if a drone captures inadvertent images and those images are posted on social media or reveal something questionable? Photographing in a public area could result in capturing an image that may not have been planned. The image of a person not wanting to be photographed may not be a breach of privacy since it occurred in public.

Drone Operator: Be aware of and be sensitive to what you are photographing. Are you capturing proprietary information? If you capture an image of someone appearing to break the law, you may want to surrender images to local authorities. Some people may not want to be photographed and their expectation of privacy could result in an angry situation. Again, if you are photographing something in a place where you would not be welcomed in-person, redirect your drone elsewhere.



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CAN I USE A DRONE FOR MY BUSINESS?

Aircraft continue to advance technologically and many people are waiting for the opportunity to use drones as part of business. Today, the FAA prohibits commercial use of Unmanned Aircraft Systems (UAS) unless the business has been granted a waiver to use the aircraft for specific purposes in the business. Businesses are beginning to receive authorization to use UAS for commercial use.

You must obtain authorization from the FAA if you want to use your drone for commercial purposes. The time will come when safety concerns have been well-vetted and business use will become commonplace, but at this time, you must have prior FAA approval.

Thank you for reviewing these guidelines!
Know your rights and your responsibilities.

Now go enjoy life in a world
where UAS technology is changing daily
and where the UASLTF continues to look out for you!

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CONTACT INFORMATION AND ALASKA STATUTES

Please visit the following web sites for additional information:
Federal Aviation Administration, www.faa/gov/uas
Academy of Model Aeronautics, www.modelaircraft.org
Alaska State Legislature, www.alaskadrones.org
University of Alaska Fairbanks, www.acuasi.alaska.edu
FAA UAS Test Range, www.acuasi.alaska.edu/pputrc

To report suspicious behavior of a drone and its operator, please contact your local law enforcement authority.

Alaska statutes that could be applied to inappropriate drone use:

AS 11.61.116 Sending an explicit image of a minor
AS 11.61.120(a)(6) Harassment, publishing or distributing certain images
AS 11.61.123 Indecent viewing or photography
AS 11.41.270 Stalking, nonconsensual conduct prohibits monitoring by technical means
AS 45 Personal Information Protection Act
AS 11.76.113 and AS 11.76.115 Misconduct involving confidential information in the first and second degree

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Alaskans guard their personal privacy very seriously. How do we define privacy when it comes to Unmanned Aircraft Systems (UAS) commonly known as drones? Because of the rapid development of UAS technology, this question is being contemplated worldwide, and new boundaries must be identified. A threat to safety can be pinpointed more easily because a person can see the aircraft, operator and its effects; on the other hand, a threat to privacy is not so easily pinpointed because it involves thought, sentiment, emotion and perception. It is important operators and citizens understand drone guidelines. This publication was created by the State of Alaska Unmanned Aircraft Systems Legislative Task Force for this purpose.

Read. Share. Enjoy your drone!

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LEGAL SERVICES

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MEMORANDUM November 4, 2015

SUBJECT: Airspace and video recording restrictions on unmanned aircraft systems (Work Order No. 29-LS1146)

TO: Representative Shelley Hughes
Attn: Ginger Blaisdell

FROM: Daniel C. Wayne
Legislative Counsel

You have asked two questions.

1. Does the federal government have jurisdiction over private airspace, including the airspace above private dwellings? The answer is yes. Under 49 U.S.C. 40103(a), "[T]he United States Government has exclusive sovereignty of airspace of the United States." In addition, 49 U.S.C. 40103(b)(2) reads, in part:

> **(2)** The Administrator shall prescribe air traffic regulations on the flight of aircraft (including regulations on safe altitudes) for--
>
> . . .
>
> **(B)** protecting individuals and property on the ground;
>
> . . .

Although it is sometimes argued that model aircraft are not "aircraft" for purposes of 49 U.S.C. 40103, the National Traffic Safety Board recently clarified otherwise, as follows:

> Title 49 U.S.C. § 40102(a)(6) defines "aircraft" as "any contrivance invented, used, or designed to navigate, or fly in, the air." Similarly, 14 C.F.R. § 1.1 defines "aircraft" for purposes of the FARs, including § 91.13, as "a device that is used or intended to be used for flight in the air." The definitions are clear on their face. Even if we were to accept the law judge's characterization of respondent's aircraft, allegedly used at altitudes up to 1,500 feet AGL for commercial purposes, as a "model aircraft," the definitions on their face do not exclude even a "model aircraft" from the meaning of "aircraft." Furthermore, the definitions draw no distinction between whether a device is manned or unmanned. An aircraft is "any"

> "device" that is "used for flight." We acknowledge the definitions are as broad as they are clear, but they are clear nonetheless.[1]

Although the federal government has jurisdiction to regulate airspace from the surface on up, private land owners retain certain rights in connection with airspace that is above their property. In *United States v. Causby*, the U.S. Military had begun flying as low as 83 feet above a chicken coop in the Causby family's yard, distressing the chickens so much that some of them died, prompting the family to allege an unconstitutional taking of their property. The U.S. Supreme Court held that a long established common-law rule—that private land owners owned the airspace above their land from the surface to a point extending indefinitely upward—had no place in the modern world.[2] However, the Court said that the military flights were "so low and so frequent as to be a direct and immediate interference with the enjoyment and use of the land."[3] The Court said:

> We have said that the airspace is a public highway. Yet it is obvious that if the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere. Otherwise buildings could not be erected, trees could not be planted, and even fences could not be run. The principle is recognized when the law gives a remedy in case overhanging structures are erected on adjoining land.[4]

Gregory S. McNeal, author of *Drones and Aerial Surveillance: Considerations for Legislators* wrote recently of the decision:

> The *Causby* opinion thus created two types of airspace, the public navigable airspace, a "public highway" in which the landowner could not exclude aircraft from flying, and the airspace below that which extends downward to the surface, in which landowners held some right to exclude aircraft. This discussion brings into focus the possibility that a landowner may exclude others from entering the low altitude airspace above their property, and as such may exclude drones (whether government or civilian operated) from entering that airspace. But, if such rights in fact exist, at what altitude are such property rights triggered? Unfortunately there is very little clarity on this point. The Supreme Court referred to this airspace

PINKER

[1] *Huerta v. Pinker*, Docket CP-217, NTSB Order No. EA-5730 (November 17, 2014).

[2] *United States v. Causby*, 328 U.S. 256 (1946).

[3] *Id.*, 328 U.S. 256, 266 (1946).

[4] *Id.*, 264 (1946).

> as the "immediate reaches" above the land, into which intrusions would "subtract from the owner's full enjoyment of the property."[5]

There may be other legal or constitutional protections from unmanned air systems. The U.S. Supreme Court has recognized that an expectation of privacy protecting persons from searches by the government extend to certain areas near a dwelling, including the adjacent "curtilage."[6] The Court described curtilage as follows:

> "At common law, the curtilage is the area to which extends the intimate activity associated with the 'sanctity of a man's home and the privacies of life.'" The protection afforded the curtilage is essentially a protection of families and personal privacy in an area intimately linked to the home, both physically and psychologically, where privacy expectations are most heightened.[7]

In that case, the Court upheld an aerial search by the government from a height of 1000 feet over Ciraulo's private property, however, based on a finding that 1000 feet is within "publically navigable airspace." The Court concluded:

> Any member of the public flying in this airspace who glanced down could have seen everything that these officers observed. On this record, we readily conclude that respondent's expectation that his garden was protected from such observation is unreasonable and is not an expectation that society is prepared to honor.[8]

A year later the U.S. Supreme Court explained that, with regard to curtilage questions, certain factors have bearing on the "centrally relevant consideration—whether the area in question is so intimately tied to the home itself that it should be placed under the home's 'umbrella' of Fourth Amendment protection." The Court said those factors include: (1) "the proximity of the area claimed to be curtilage to the home," (2) "whether the area is included within an enclosure surrounding the home," (3) "the nature of the uses to which the area is put," and (4) "the steps taken by the resident to protect the area from observation by people passing by."[9]

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[5] Pages 8 - 9 (November 11, 2014). Brookings Institution: The Robots Are Coming: The Project on Civilian Robotics, November 2014; Pepperdine University Legal Studies Research Paper No. 2015/3.

[6] *California v. Ciraolo*, 476 U.S. 207 (1986).

[7] *Id.*, 212 - 213 (citations omitted).

[8] *Id.*, 213 - 214.

[9] *United States v. Dunn*, 480 U.S. 294, 301 (1987).

In 1986, during the same term as *Ciraulo*, (cited above) the Supreme Court in *Dow Chemical Co. v. United States* confronted the question of whether aerial photography by the government from above an industrial site was a search, and whether the search was subject to the warrant requirement under the Fourth Amendment of the U.S. Constitution.[10] The Court held that "the taking of aerial photographs of an industrial plant complex from navigable airspace is not a search prohibited by the Fourth Amendment."[11] The Court distinguished the facts in *Dow* from hypothetical future cases—where technology might be used to penetrate walls or windows to obtain information that an unaided human eye is not able to obtain—as follows:

> Here, EPA was not employing some unique sensory device that, for example, could penetrate the walls of buildings and record conversations in Dow's plants, offices, or laboratories, but rather a conventional, albeit precise, commercial camera commonly used in mapmaking. The Government asserts it has not yet enlarged the photographs to any significant degree, but Dow points out that simple magnification permits identification of objects such as wires as small as 1/2-inch in diameter.
>
> It may well be, as the Government concedes, that surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant. But the photographs here are not so revealing of intimate details as to raise constitutional concerns. Although they undoubtedly give EPA more detailed information than naked-eye views, they remain limited to an outline of the facility's buildings and equipment. The mere fact that human vision is enhanced somewhat, at least to the degree here, does not give rise to constitutional problems. An electronic device to penetrate walls or windows so as to hear and record confidential discussions of chemical formulae or other trade secrets would raise very different and far more serious questions; other protections such as trade secret laws are available to protect commercial activities from private surveillance by competitors.

In some search and seizure cases where "naked-eye" observation was enhanced by technology, courts have found the search to be unreasonable and violative of the Fourth

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[10] 476 U.S. 227 (1986).

[11] *Dow Chemical Co. v. United States*, 476 U.S. 227, 238 (1986). Note, however, that at least one court has declined to apply *Dow*, as well as *Ciraulo*, (cited above) to search and seizure cases involving an expectation of privacy within a residence, on the basis that a state constitution may provide greater protection of privacy than the protection provided by federal law. *People v. Mayoff*, 42 Cal. 3d 1302, 1310-14, 729 P.2d 166, 170-73 (1986).

Amendment to the U.S. Constitution. For example, as noted in the following excerpt from *Kyllo v. United States,* the Court found that the use of sense-enhancing technology (thermal imaging) to gather information regarding the interior of a home was a search—analogous to a physical intrusion into a home without a warrant—and therefore the evidence obtained should be suppressed. The Court said:

> The present case involves officers on a public street engaged in more than naked-eye surveillance of a home. We have previously reserved judgment as to how much technological enhancement of ordinary perception from such a vantage point, if any, is too much. While we upheld enhanced aerial photography of an industrial complex in *Dow Chemical,* we noted that we found "it important that this is *not* an area immediately adjacent to a private home, where privacy expectations are most heightened."
>
> It would be foolish to contend that the degree of privacy secured to citizens by the Fourth Amendment has been entirely unaffected by the advance of technology. For example, as the cases discussed above make clear, the technology enabling human flight has exposed to public view (and hence, we have said, to official observation) uncovered portions of the house and its curtilage that once were private. The question we confront today is what limits there are upon this power of technology to shrink the realm of guaranteed privacy.
>
> * * *
>
> Where, as here, the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a "search" and is presumptively unreasonable without a warrant.[12]

Interestingly, after *Dow* the Court held (in *Florida v. Jardines)* that even when law enforcement's observation of a dwelling is enhanced by a police dog sniffing for evidence after being dispatched to a location within the curtilage surrounding the dwelling, the observation is a search subject to the warrant requirement. The Court said:

> The Fourth Amendment "indicates with some precision the places and things encompassed by its protections": persons, houses, papers, and effects. The Fourth Amendment does not, therefore, prevent all investigations conducted on private property; for example, an officer may (subject to *Katz*) gather information in what we have called "open fields"—even if those fields are privately owned—because such fields are not enumerated in the Amendment's text.

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[12] *Kyllo v. United States*, 533 U.S. 27, 33 - 41 (2001) (emphasis in original, internal citations omitted).

> But when it comes to the Fourth Amendment, the home is first among equals. At the Amendment's "very core" stands "the right of a man to retreat into his own home and there be free from unreasonable governmental intrusion." This right would be of little practical value if the State's agents could stand in a home's porch or side garden and trawl for evidence with impunity; the right to retreat would be significantly diminished if the police could enter a man's property to observe his repose from just outside the front window.
>
> We therefore regard the area "immediately surrounding and associated with the home"—what our cases call the curtilage—as "part of the home itself for Fourth Amendment purposes."[13]

In that case, the Court acknowledged that private individuals and law enforcement officers alike are free to approach the front door of a dwelling in many instances, without express permission or invitation, but explained limits on that freedom as follows:

> "A license may be implied from the habits of the country," notwithstanding the "strict rule of the English common law as to entry upon a close." We have accordingly recognized that "the knocker on the front door is treated as an invitation or license to attempt an entry, justifying ingress to the home by solicitors, hawkers and peddlers of all kinds." This implicit license typically permits the visitor to approach the home by the front path, knock promptly, wait briefly to be received, and then (absent invitation to linger longer) leave. Complying with the terms of that traditional invitation does not require fine-grained legal knowledge; it is generally managed without incident by the Nation's Girl Scouts and trick-or-treaters. Thus, a police officer not armed with a warrant may approach a home and knock, precisely because that is "no more than any private citizen might do."
>
> But introducing a trained police dog to explore the area around the home in hopes of discovering incriminating evidence is something else. There is no customary invitation to do *that*. An invitation to engage in canine forensic investigation assuredly does not inhere in the very act of hanging a knocker.[3] To find a visitor knocking on the door is routine (even if sometimes unwelcome); to spot that same visitor exploring the front path with a metal detector, or marching his bloodhound into the garden before saying hello and asking permission, would inspire most of us to—well, call the police. The scope of a license—express or implied—is limited not only to a particular area but also to a specific purpose. Consent at a traffic stop to an officer's checking out an anonymous tip that there is a body in

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[13] *Florida v. Jardines,* 133 S. Ct. 1409, 1414 (2013) (internal citations omitted).

> the trunk does not permit the officer to rummage through the trunk for narcotics. Here, the background social norms that invite a visitor to the front door do not invite him there to conduct a search.[14]

A court may extend an analysis similar to the ones in *Kyllo* and *Florida v. Jardines* to the use of UAS to enhance naked-eye observation of a dwelling. If so, it may determine that an uninvited UAS has very limited legal license to enter the curtilage surrounding a dwelling or from there to observe or record images or sounds that are inside the dwelling.

In *Florida v. Riley*, the U.S. Supreme Court upheld the search of a greenhouse in someone's private yard, conducted from a helicopter flying 400 feet above the yard, partly because the helicopter was flying in what the Court determined was navigable airspace, and since any member of the public would be free to fly over the property and observe from that height, it was not unconstitutional for the government to do so as well.[15] In a concurring opinion, Justice Sandra Day O'Connor said:

> Because there is reason to believe that there is considerable public use of airspace at altitudes of 400 feet and above, and because Riley introduced no evidence to the contrary before the Florida courts, I conclude that Riley's expectation that his curtilage was protected from naked-eye aerial observation from that altitude was not a reasonable one. However, public use of altitudes lower than that—particularly public observations from helicopters circling over the curtilage of a home—may be sufficiently rare that police surveillance from such altitudes would violate reasonable expectations of privacy, despite compliance with FAA air safety regulations.[16]

Very recently, in a case in New Mexico involving an aerial search by the government with a manned aircraft, the New Mexico Supreme Court discussed *Riley* and said:

> First, unobtrusive aerial observations of space open to the public are generally permitted under the Fourth Amendment. Even a minor degree of annoyance or irritation on the ground will not change that result.
>
> . . .
>
> Our second conclusion, however, is that when low-flying aerial activity leads to more than just observation and actually causes an unreasonable intrusion on the ground—most commonly from an unreasonable amount of wind, dust, broken objects, noise, and sheer panic—then at some point

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[14] *Id.*, 1415 -1416 (emphasis in the original) (internal citations and original footnotes omitted).

[15] *Florida v. Riley*, 488 U.S. 445 (1989).

[16] *Id.*, 455.

> courts are compelled to step in and require a warrant before law enforcement engages in such activity.
>
> . . . as the U.S. Supreme Court said in *Riley,* an observation will not always be lawful under the Fourth Amendment simply because the plane is operating within navigable airspace. *Riley,* 488 U.S. at 451, 109 S.Ct. 693.
>
> . . .
>
> we conclude that the official conduct in this case went beyond a brief flyover to gather information. The prolonged hovering close enough to the ground to cause interference with Davis' property transformed this surveillance from a lawful observation of an area left open to public view to an unconstitutional intrusion into Davis' expectation of privacy. We think what happened in this case to Davis and other persons on the ground is precisely what *did not* occur in either *Ciraolo* or *Riley* and what *did* occur in both *Oglialoro* and *Pollock.* Accordingly, we hold that the aerial surveillance over Davis' property was an unwarranted search in violation of the Fourth Amendment.[17]

The New Mexico Supreme Court further noted in *Davis*, that New Mexico's state constitution explicitly creates a constitutional right of privacy in that state, and implied that consideration of privacy interests under that provision might require a different kind of analysis than one based on intrusiveness, in a case involving UAS. But the court declined to speculate further about UAS because the case before the Court involved surveillance by manned helicopters.[18] Under art. I, sec. 22, Constitution of the State of Alaska, the "right of the people to privacy is recognized and shall not be infringed," and under art. I, sec. 14, Constitution of the State of Alaska, "unreasonable searches and seizures" are prohibited.[19] The Alaska Supreme Court has held that the right to privacy

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[17] *State v. Davis*, No. S-1-SC-34548, 2015 WL 6125580, at pages 10 - 13 (N.M. Oct. 19, 2015).

[18] *Id.*

[19] Generally, a warrant is required in order for the state to search private property in Alaska. Alaska courts have recognized exceptions, however, including a search of abandoned property, a search in pursuit of a fleeing felon, a search to avoid destruction of a known sizable item, a pre-incarceration "inventory" search, a search where voluntary consent has been granted, a search in rendering emergency aid, a "stop and frisk" search, and a search incident to arrest. Harrison, *Alaska's Constitution: A Citizen's Guide*, 5th Ed., at 32.

under the Alaska Constitution is broader in scope than that under the federal constitution.[20]

In my opinion, a court in Alaska would consider law enforcement use of a UAS to conduct surveillance inside a dwelling, from a location outside of the dwelling, is a search. Searching a person's home implicates the right to privacy and protection against unreasonable search and seizure under the United States Constitution and the Constitution of the State of Alaska. In *Ravin v. State*, the Alaska Supreme Court found the right to privacy in the home to be a right of the highest importance and most deserving of constitutional protection. In *Ravin*, the Court wrote "[T]he home, then, carries with it associations and meanings which make it particularly important as the situs of privacy. Privacy in the home is a fundamental right, under both the federal and Alaska constitutions."[21]

As noted by the US Supreme Court in *Florida v. Jardines*, cited above, there is a common law right for a member of the public, including a police officer, to approach a residence via the normal methods of ingress and egress. This right can apply even when "No Trespassing" signs have not been posted, according to the Alaska Court of Appeals, in *Michel v. State.*[22] The Court held that "the law presumes that a homeowner generally consents to 'allow visitors to take reasonable steps to make contact with the occupant,'" and this presumption "can be overcome only when a homeowner manifests a clear intent to prohibit all visitors from even approaching the house."[23] In *Michel*, a state trooper approached a residence that was not visible from the highway via a 300-yard-long driveway that had four "no trespassing" signs posted, knocked on the door, and eventually gained a search warrant based on observations made while talking to the homeowner. The court agreed with other state courts that found that "No Trespassing" signs do not, by themselves, manifest a homeowner's intent to keep away all visitors. Under the circumstances of *Michel*—a long driveway in rural Alaska—the court found that a visitor would reasonably conclude that the "No Trespassing" signs were aimed at people who might be tempted to use the driveway as an access route for their own purposes such as hunting, camping, or hiking, and were not directed at prohibiting entry by people visiting for social or commercial purposes.[24]

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[20] *Woods & Rohde, Inc. v. State, Dep't of Labor*, 565 P.2d 138, 150 (Alaska 1977).

[21] *Ravin v. State*, 537 P.2d 494, 504 (Alaska 1975).

[22] *Michel v. State*, 961 P.2d 436 (Alaska Ct. App. 1998).

[23] *Id.*, 438.

[24] *Id.*

2. Does the one party consent exception to the legal prohibition on secretly recording a conversation apply to videos? The answer is yes, probably. Generally, the undisclosed recording by one party to a conversation is lawful in the State of Alaska.[25] However, it is difficult to see how this would be applicable to a recording made by a UAS since neither the UAS nor the person operating it is likely to be identifiable as a party to the recorded conversation. Furthermore, the rule applies only to conversations, not to private and nonverbal communication or activities.

According to one recent report:

> UAS, commonly referred to as "drones," can range from the size of an insect—sometimes called nano or micro drones—to the size of a traditional jet. Drones can be outfitted with an array of sensors, including high-powered cameras, thermal imaging devices, license plate readers, and laser radar (LADAR). In the near future, drones might be outfitted with facial recognition or soft biometric recognition, which can recognize and track individuals based on attributes such as height, age, gender, and skin color. In addition to their sophisticated sensors, the technical capability of drones is rapidly advancing.[26]

The evolving surveillance capabilities of drones, and the growth in their affordability and availability, raises a number of issues related to privacy, as it becomes possible for a person to be surveilled in their home by law enforcement and other persons, government and non-government, in a manner and to a degree that has not been possible until recently.

Margot E. Kaminski writes, in *Drone Federalism: Civilian Drones and the Things They Carry*:

> One intuition that frequently arises in privacy cases, both under tort law and under the Fourth Amendment, is that the location of the recording matters. A First Amendment right to record is most likely to outweigh privacy concerns in a public space, where one person's privacy collides with other peoples' experience and memory.[27]

Her prediction that a court may determine that a private individual has a first amendment right under the U.S. Constitution, to make an audio or video recording, is not without

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[25] *State v. Murtagh*, 169 P.2d 200, 208 (Alaska Ct. App. 1997).

[26] *Congressional Research Report: "Domestic Drones and Privacy: A Primer*," page 3, by Richard M. Thompson II, Legislative Attorney (March 30, 2015).

[27] 4 California Law Review 57, 62 - 63 (2013).

support in case law. One federal court has said:

> "The act of making an audio or audiovisual recording is necessarily included within the First Amendment's guarantee of speech and press rights as a corollary of the right to disseminate the resulting recording. The right to publish or broadcast an audio or audiovisual recording would be insecure, or largely ineffective, if the antecedent act of making the recording is wholly unprotected."[28]

However, when it comes to recordings made by law enforcement, courts in Alaska have focused on the right to personal privacy, under art. I, sec. 22, Constitution of the State of Alaska, and the prohibition, under art. I, sec. 14, Constitution of the State of Alaska, on "unreasonable searches and seizures." In *State v. Glass*, a police informant took part in a private conversation with a suspected drug dealer, while wearing an electronic transmitter so the police could secretly record the conversation.[29] The Alaska Supreme Court upheld a warrant requirement, and holding that "one who engages in a private conversation is . . . entitled to assume that his words will not be broadcast or recorded absent his consent or a warrant."[30] The Court found that at the time of a conversation a party to it knows his or her words might be repeated later by another party who is present, but does foresee that his or her voice will be recorded or broadcast secretly.[31]

In *State v. Page*, the police secretly recorded a drug transaction between a police informant and a suspect, intentionally with only video, no audio, by hiding a camera in the informant's apartment ahead of time.[32] The Court held that a party in a private conversation has a right to visual privacy under the Constitution of the State of Alaska, and the police should have obtained a warrant even though the sound on the video camera was turned off.[33]

In a later case, involving the use of a hidden video camera in a workplace, the Alaska Supreme Court described a two part test for determining whether surveillance assisted by

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[28] *ACLU v. Alvarez*, 679 F.3d 583, 595 (7th Cir. 2012) cert. denied, 133 S. Ct. 651 (2012).

[29] *State v. Glass*, 583 P.2d 872, 874 (Alaska 1978).

[30] *Id.*, 875

[31] *Id.*, 877.

[32] *State v. Page*, 911 P.2d 513, 515 (Alaska App. 1996).

[33] *Id.*

technology is a search. The Court said:

> The United States and Alaska Constitutions prohibit not only unreasonable physical searches, but also unreasonable technological searches. Thus placing a hidden video camera in a house in order to record activities there without a warrant is prohibited just as is a warrantless entry to search for evidence. But not all technological monitoring of places or individuals is regarded as a search for constitutional purposes. Photographing a person as she walks in a public park does not raise constitutional concerns. But photographing a person in an enclosed public restroom stall is a search.[34]
>
> The general test used to determine whether particular technological monitoring is a search is the expectation of privacy test. Under this test courts ask: "(1) did the person harbor an actual (subjective) expectation of privacy, and, if so, (2) is that expectation one that society is prepared to recognize as reasonable?"[35]

The Court said that answering the question posed in the second part of this test requires, in each case, considering the facts, including the police conduct involved, and "assessing the nature of a particular practice and the likely extent of its impact on the individual's sense of security balanced against the utility of the conduct as a technique of law enforcement." The Court determined that the public nature of the location in *Cowles* tipped the balance in favor of the government in that case, noting the following:

> Cowles's desk could be seen by members of the public through the ticket window and the open door, and by her fellow employees who were walking around the office almost continuously during the videotaping. Activities that are open to public observation are not generally protected by the Fourth Amendment. "What a person knowingly exposes to the public, even in his own home or office, is not a subject of fourth amendment protection."[36]

The Court also discussed the difference between private locations and public locations, and said:

> . . . a person engaging in illicit conduct in a doorless restroom stall may have a reasonable expectation that she will not be observed from a hidden vantage point above her, even though it would have been unreasonable for

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[34] *Cowles v. State*, 23 P.3d 1168, 1170 (Alaska 2001) (internal citations omitted).

[35] *Id.*, (internal citations omitted).

[36] *Id.*, 1171 (internal citations omitted).

> her to expect that she would not be seen through the doorless opening. Where incriminating conduct occurs in a public area, however, participants in that conduct already risk observation, and so have "no constitutional right . . . to demand that such observation be made only by some person of whose presence they [are] aware."[37]

This suggests that in at least some circumstances a person in Alaska may have a right, regardless of the one-party consent exception, against an audio or video recording of their private conduct being made by a person of whose presence they are not aware. This may be further supported by the holding by the Alaska Court of Appeals, in *State v. Boceski*, that when a police officer eavesdrops using only the officer's natural senses, "the prevailing rule is that such uses of the senses 'made from a place where a police officer has a right to be do not amount to a search in the constitutional sense.'"[38] Under the federal wiretap statute, it is unlawful for anyone to intentionally intercept an "oral communication"[39] by a person "exhibiting an expectation that such communication is not subject to interception under circumstances justifying such expectation . . . . "[40] There are various exceptions to the prohibition, including exceptions for one party consent and law enforcement in some circumstances. Alaska has similar prohibitions under AS 42.20.300 - 42.20.390, and a similar exception for one party consent.[41] Nothing suggests that these

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[37] *Id.*, 1172 (internal citations omitted).

[38] *State v. Boceski*, 53 P.3d 622, 625 (Alaska Ct. App. 2002) (internal citations omitted).

[39] 18 U.S.C. 2511(1)(a).

[40] 18 U.S.C. 2510(2).

[41] AS 42.20.320(a) reads

> (a) Except for a party to a private conversation, a person who receives or assists in receiving, or who transmits or assists in transmitting, a private communication may not divulge or publish the existence, contents, substance, purport, effect, or meaning of the communication, except through authorized channels of transmission or reception
>
> (1) to the addressee or the agent or attorney of the addressee;
>
> (2) to a person employed or authorized to forward a communication to its destination;
>
> (3) to proper accounting or distributing officers of the various communicating centers over which the communication may be passed;
>
> (4) to the master of a ship under whom the person is serving;
>
> (5) to another on demand of lawful authority; or
>
> (6) in response to a subpoena issued or order entered by a court of competent jurisdiction.

prohibitions and (for recording conversations) the one party consent exception do not apply to UAS.

Under AS 12.37 law enforcement is granted authority to secretly intercept private communications and record them electronically, after obtaining a warrant, subject to certain limitations on the use and retention of the recorded information. The electronic recording can be audio or video. The Alaska Supreme Court has said that the legislative history of AS 12.37 was enacted to parallel the federal law under 18 U.S.C. §§ 2510 - 21, which provides for exceptions to the general prohibition against the interception of communications unless at least one party consents.[42] 18 U.S.C. 2511(2)(d) reads:

> (d) It shall not be unlawful under this chapter for a person not acting under color of law to intercept a wire, oral, or electronic communication where such person is a party to the communication or where one of the parties to the communication has given prior consent to such interception unless such communication is intercepted for the purpose of committing any criminal or tortious act in violation of the Constitution or laws of the United States or of any State.

AS 42.20.310 (Eavesdropping) reads:

> (a) A person may not
> (1) use an eavesdropping device to hear or record all or any part of an oral conversation without the consent of a party to the conversation;
> (2) use or divulge any information which the person knows or reasonably should know was obtained through the illegal use of an eavesdropping device for personal benefit or another's benefit;
> (3) publish the existence, contents, substance, purport, effect, or meaning of any conversation the person has heard through the illegal use of an eavesdropping device;
> (4) divulge, or publish the existence, contents, substance, purport, effect, or meaning of any conversation the person has become acquainted with after the person knows or reasonably should know that the conversation and the information contained in the conversation was obtained through the illegal use of an eavesdropping device.
> (b) In this section "eavesdropping device" means any device capable of being used to hear or record oral conversation whether the conversation is conducted in person, by telephone, or by any other means; provided that this definition does not include devices used for the restoration of the deaf or hard-of-hearing to normal or partial hearing.

[42] *Bachlet v. State*, 941 P.2d 200, 208 (Alaska Ct. App. 1997).

Although a one party consent exception under federal or state law may apply in particular circumstances, keep in mind, that, as with any recording made without the consent of all parties, the one-party consent exceptions do not allow unrestricted use of a recording, whether audio or video. And, keep in mind that the warrant requirements under state and federal constitutions, as discussed in *Glass*, *State v. Page*, *Cowles* and the other authorities cited above may further limit the use of a one party consent exception by law enforcement. Finally, notwithstanding the one-party consent, a person may be held liable, criminally or civilly, depending on the facts, for the misuse of recorded audio or video material; the one-party consent exception does not legalize stalking, harassment, or trespass when it would otherwise be a crime.[43]

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[43] The potential private criminal use of UAS is discussed more fully in a previous memorandum to you from this office, authored by Legislative Counsel Hilary Martin, dated June 8, 2015, entitled "Unmanned Aircraft Systems."

Drones on the Horizon: SciTech Lawyer (2015)

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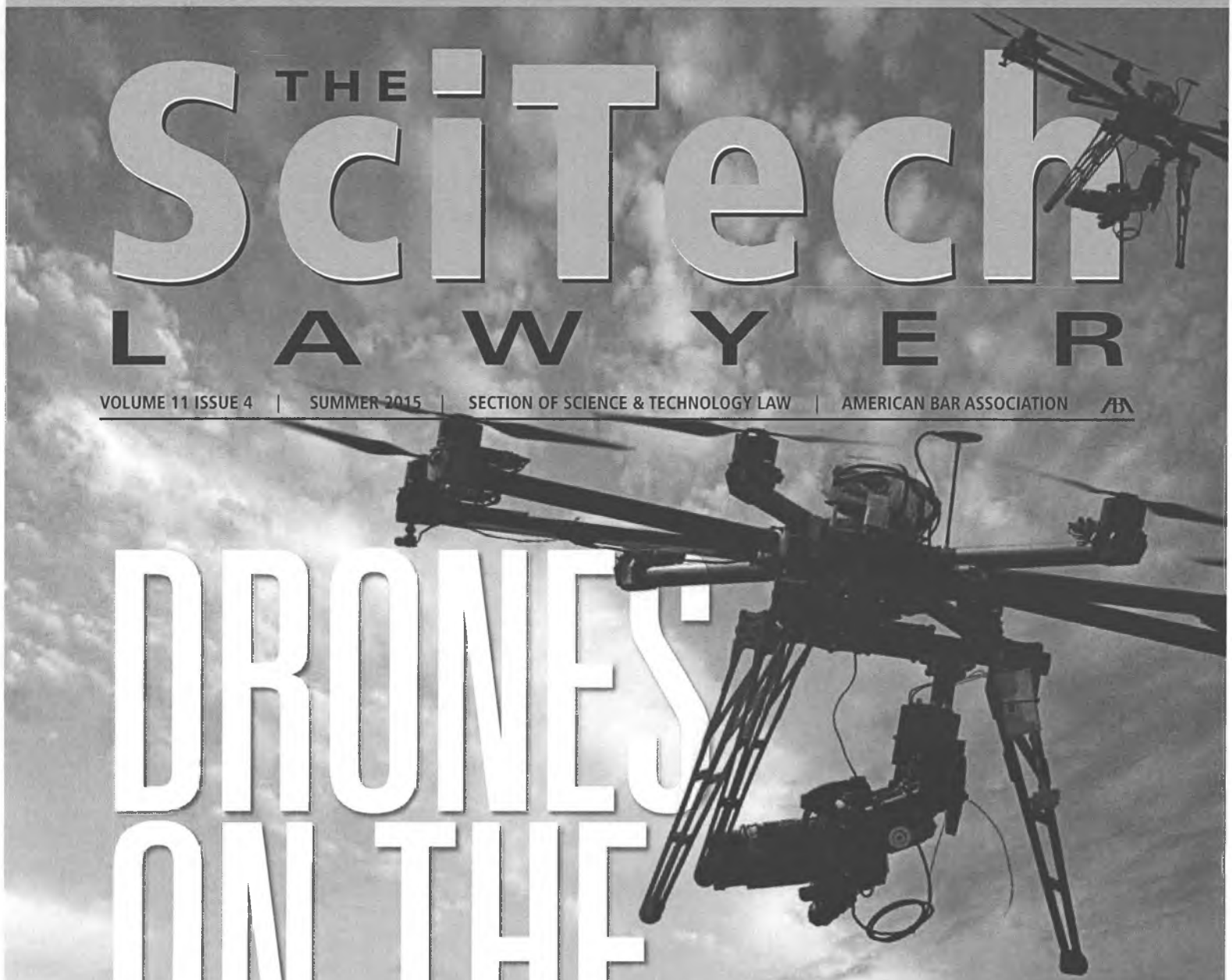

DRONES ON THE HORIZON!

GET READY FOR UNMANNED AERIAL VEHICLES

MATTHEW HENSHON AND GILBERT F. WHITTEMORE, ISSUE EDITORS

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MESSAGE FROM THE CHAIR

Michael Hawes

Legislators tend to take out the pen quickly when presented with technology bugaboos. Whether we refer to them as drones, unmanned aircraft, or human-free aerial vehicles (I am going to call them HFAVs, though it is far too late at this stage to coin a new term), the ever-shrinking creations of this flourishing industry face potential new laws and regulations aimed at safety, privacy, and other concerns.

Although HFAVs are not bringing about Orwell's dystopian *1984*, their military origins don't do much to quell concern. Casey Civiello gives us a starting point for understanding why the industry faces significant regulatory pressures in an excellent review of a book that details how HFAVs were developed. Of course, naming an example of a new technology "Predator" will have predictable consequences in the court of public opinion.

Knowing that history, our SciTech members then move to the upcoming challenges at this new intersection of science, technology, and law. Lois Mermelstein guides us through the FAA's proposal for new rules in this area. Before we buy a tiny quadcopter with a gyroscopically stabilized camera to film a family water skiing event, or advise a client who wants to do so, it pays to know the regulations that will soon apply to such toys. Matthew Henshon and Gil Whittemore also step in to help identify how to safely comply with new regulations.

Not sure that the quadcopter really has the capacity to do such filming? Donna Dulo helps us understand the technical capabilities of HFAVs. And, assuming it can, Richard Balough steps us through a possible encounter with a client who wants to be on the cutting-edge of assisted aerial photography. Clients who like to push forward at the technological edge are always in need of SciTech lawyers who keep them from falling. Our section, through *The SciTech Lawyer*, books, webinars, and live conferences, gives our members the tools to serve those clients.

After the clients who want to play come the clients who are concerned about the consequences—and the concern that is the current priority is privacy. Hillary Farber, Janna Lewis, and Lauren Caplan work together to present the different privacy issues resulting not only from an HFAV that can't get above a couple hundred feet in altitude, but also from aerial data collection platforms ranging as high as satellites that collect observation data of unprecedented accuracy. At SciTech, we want to make sure our members have access to the information needed to look at all sides of an issue, and this issue of *The SciTech Lawyer* certainly gives you that. ◆

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BY MATTHEW HENSHON
AND GIL WHITTEMORE

DRONES ON THE HORIZON!

GETTING READY FOR UNMANNED AERIAL VEHICLES (UAVs)

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It is now likely that some of you will be advising clients within 12 months on how to safely and legally comply with new regulations governing unmanned aerial vehicles (UAVs, or more colloquially, "drones").

The UAV story begins back in the early part of the 20th century, but it has really accelerated in the past few years. In the last few months, UAVs have burst into the national consciousness. From General Atomics' Predators circling high above the tribal areas in Pakistan, to last summer's private operator flying his quadcopter through exploding July 4th fireworks,[1] new flying systems were seen everywhere. And from Amazon's proposed package delivery systems to a private operator crash-landing his DJI Phantom on the White House grounds, drones were also over the front-pages and home pages of America's news outlets.

Thanks to a 2012 bill, the Federal Aviation Administration (FAA) is in the process of accelerating the speed of introducing drones into the national airspace. As of press time, more than 489 one-off permits have already been granted. Also, in February the FAA unveiled proposed regulations for light (less than 55 pound) UAVs.

This issue of *The SciTech Lawyer* is designed to familiarize you quickly with drone issues, and to give you a sense of where the industry—and the legal landscape—is headed. We have compiled a diverse and qualified collection of authors to help you understand—from all 360 degrees—where drones are going:

- Privacy issues are often raised in connection with UAVs, and Professor Hillary Farber's "Eyes in the Sky and Privacy Concerns on the Ground" will provide a good primer, as well as touch on what states are doing to protect privacy.
- UAVs are not the only flying objects that can raise privacy issues, however. "Drones to Satellites: Should Commercial Aerial Data Collection Regulations Differ by Altitude?" by Janna Lewis and Lauren Caplan explores the differences—and the similarities—in regulating UAVs and satellites.
- In February, the Federal Aviation Administration published draft regulations for certain (less than 55 pound) UAVs. Lois Mermelstein's "FAA's New Draft Drone Rules" walks you through the proposed rules.
- Related to the draft regulations, the question of defining a UAV is surprisingly complex. Donna Dulo lays out the various classifications of UAVs (and unmanned aircraft systems (UASs) in her "Unmanned Aircraft Classifications: The Foundation for UAS Regulations in the National Airspace."
- Bringing all of these articles back to a real world scenario is the subject of Richard Balough's article, "'So, You Want to Legally Fly a Drone?' How to Counsel a Client."
- And to provide a sense of the history of UAV technology, Casey Civiello reviews the new book, *Predator: The Secret Origins of the Drone Revolution* (Henry Holt and Company, 2014).
- Surely, 2015 is the "Year of the Drone." In addition to this issue, the Artificial Intelligence and Robotics Committee (ST-AIRC) and the SciTech Section will be providing many more opportunities for continued education over the next few months:
  - Many of the authors featured in this issue of *The SciTech Lawyer* will be featured at the ABA Annual Meeting in a Showcase Program entitled "Drones Incoming! Are You Ready for Unmanned Aerial Vehicles (UAVs)?" The program will take place on **Saturday, August 1, 2015, from 8:00–9:30 a.m.**
  - Some of the same issues will be previewed in a CLE teleconference to be held June 22 from 1:00 p.m. to 2:30 p.m. EST. Visit the SciTech website[2] to register.
  - And finally, two[3] of the articles in this issue are in fact excerpted chapters from the forthcoming book from the ABA: *Unmanned Aircraft in the National Airspace: Critical Issues, Technology, and the Law.*[4]

All in all, it's an exciting time to be a lawyer working with technology. We hope that you enjoy this special issue of *The SciTech Lawyer*, and hope you will continue to stay involved in this fast-moving area.◆

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Endnotes

1. Set to music at https://youtu.be/zlXGU20F-ME.
2. http://www.americanbar.org/groups/science_technology.html.
3. Those written by Hillary Farber and Donna Dulo.
4. Available by visiting http://shop.americanbar.org/ebus/store.aspx.

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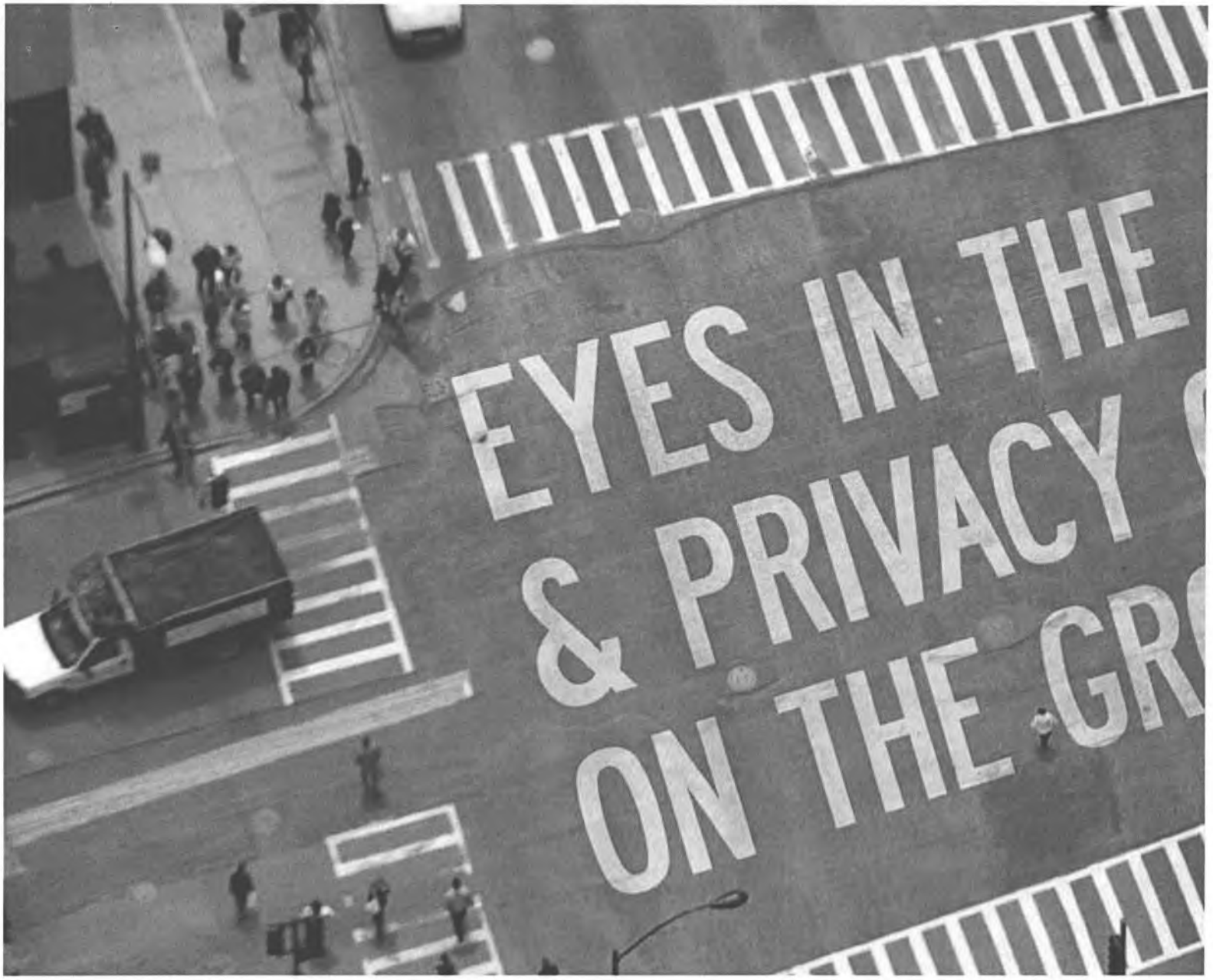

Unmanned aerial systems (UASs), as compared to planes and helicopters, can pose unique threats to society's expectation of privacy. The very essence of pervasive unmanned aerial surveillance enables users to track the movements of large numbers of people simultaneously, zeroing in on people and places on the streets, in their backyards, and even through the open blinds in their homes. The visual imagery gathered can be stored indefinitely, just like other digital data. In contrast to surveillance by manned aircraft, unmanned aerial vehicles (UAVs) are readily portable and have the ability to hover, fly at various altitudes, and stay aloft for hours or even days at a time. UAVs can be small enough that people on the ground are unaware that they are being watched. Moreover, the breadth and scope of the data a UAV can capture is far greater than the capability of traditional surveillance tools. These capabilities set these devices apart from planes and helicopters, or even closed circuit television (CCTV) and satellite surveillance. The aerospace and robotics industries are developing the technology faster than lawmakers and courts can regulate it. Without legislative action limiting aerial monitoring by unmanned aircraft, the privacy Americans have enjoyed in their movements and activities is threatened.

In 2012, Congress passed the Federal Aviation Administration Modernization and Reform Act, which required the Federal Aviation Administration (FAA) to promulgate regulations for the integration of UAVs into the national airspace.[1] In addition, the law directs the agency to create a five-year road map. In 2013, it was estimated that by 2020, there could be as many as 30,000 UASs occupying national airspace.[2] A significant portion of these remotely piloted vehicles will be owned and operated by law enforcement.

Because of the enhanced aerial perspective an unmanned system provides, law enforcement can amass large amounts of data concerning a target, as well as information on people and places about whom the police have no particularized suspicion. Moreover, the expense of operating and maintaining UAVs is estimated at one-fifth that of operating and maintaining manned aircraft.

Interest in using unmanned aircraft in the civil and commercial arenas is growing exponentially. Last year, Amazon,

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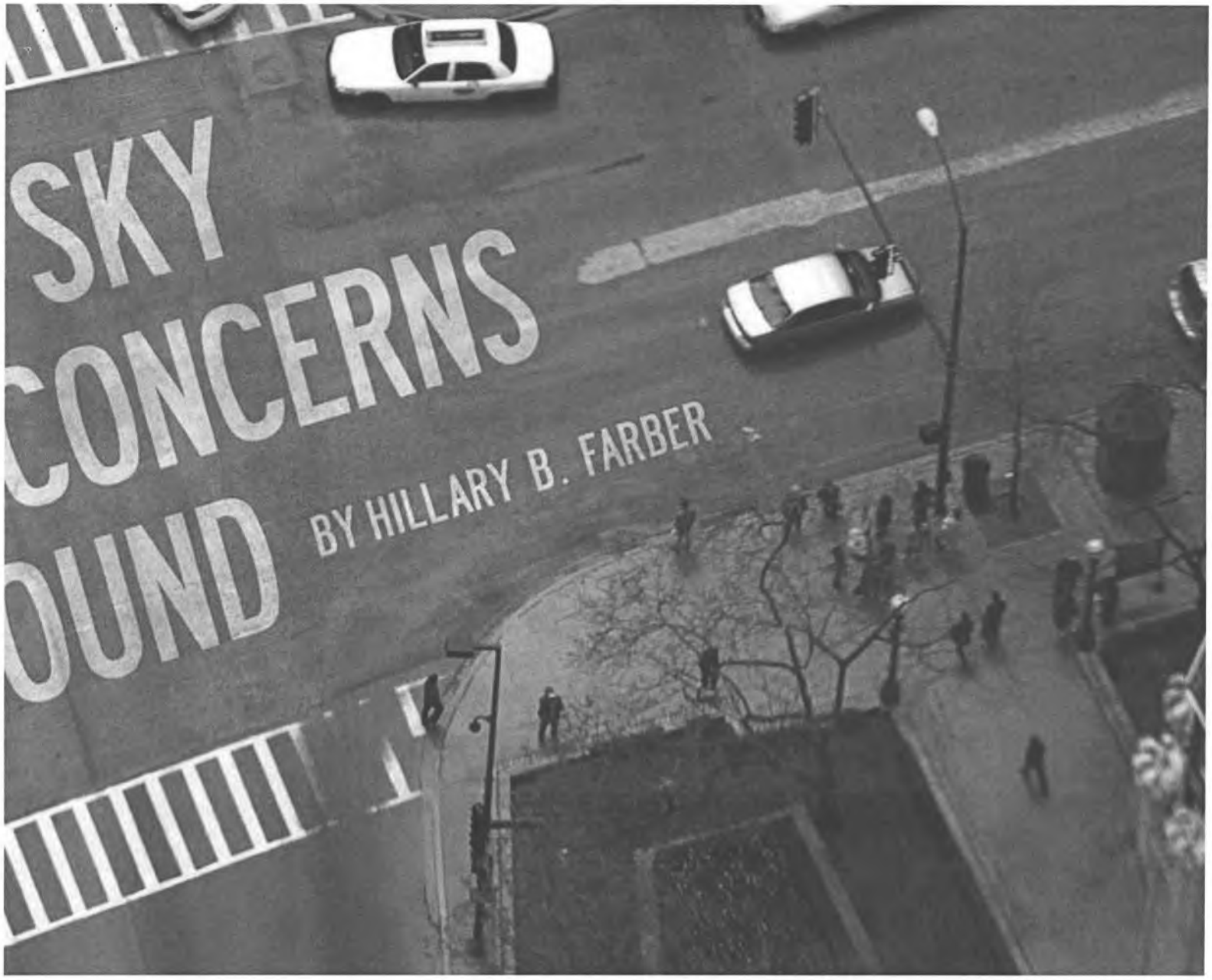

one of the largest retail companies in the United States, revealed its intention to use unmanned aircraft to deliver packages as soon as the regulations permit. Film production companies, real estate agencies, farmers, and videographers are keenly interested in conducting aerial photography with unmanned systems. The Association for Unmanned Vehicle Systems International (AUVSI) has estimated that integrating UAVs into US airspace would have an economic effect worth more than $13.6 billion, and create more than 70,000 jobs in the first three years.[3]

The FAA has slowly responded to the chorus of manufacturers and owners of unmanned aircraft systems seeking an expansion of certificates for civil and commercial use. In June 2014, the FAA approved the first commercial use of an unmanned aircraft system for surveying the oil fields in and around the Alaskan pipeline.[4] Similarly, in September 2014 the FAA announced that it would permit six media aerial photo and visual production organizations to use unmanned aircraft.[5] Most notably, on February 15, 2015, the FAA set forth a framework of regulations for small UASs (less than 55 pounds) conducting nonrecreational operations.[6] This is discussed in detail by Lois Mermelstein in her article in this issue, found on page 14.

Federal and State Legislative Activity

While the FAA proceeds with its proposed regulations, there is also activity on the legislative front. Constraints on the use of these powerful aerial observers have been initiated by the White House and lawmakers. On the federal level there is bipartisan concern over the potential for unmanned aircraft to erode personal privacy and civil liberties.[7] Despite a number of Congressional hearings, at present there is no federal legislation regulating the use of unmanned aircraft systems. Perhaps the most comprehensive legislation pending before Congress is the Drone Aircraft Privacy and Transparency Act (DAPTA). DAPTA proscribes limits on the gathering, retention, and sharing of data collected by UAS. It would require that certain disclosures be made as part of the flight approval process, including the identity of the UAV operator; the flight path, the type of data to be collected, and

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how the data will be used. Law enforcement agencies would be required to file a "data minimization statement," which would explain how the agency will minimize the collection and retention of data unrelated to the criminal investigation. All this information would be available in a publicly searchable database, including the times and location of all UAV flights, along with disclosures of any data security breaches suffered by a licensee. Moreover, DAPTA would place restrictions on how long the data will be in the possession of the agency that collected it and whether the information can be sold, leased, or otherwise provided to third parties. These measures would add a layer of transparency and accountability to the deployment of unmanned aircraft.

States have responded more quickly than the federal government, all inclined toward restricting the scope and use of unmanned aircraft. At this writing, 18 states have enacted laws ranging from moratoriums on UAS to prohibiting any government official from using an unmanned aerial vehicle without first obtaining a warrant.[8] To date, all but two states have initiated bills and resolutions to regulate the use of unmanned aircraft systems. Efforts to create an enforceable privacy interest are evinced in the titles of the proposed bills: "Freedom From Unwanted Surveillance Act" (Florida),[9] "An Act Relating to Privacy Protection" (Vermont),[10] and "Freedom from Drone Surveillance Act" (Illinois).[11] Almost all of these proposed state laws would require a warrant for government surveillance, with some states allowing for exceptions, such as a high risk of a terrorist attack, search-and-rescue missions, preventing the escape of a suspect, imminent danger to life, or serious damage to property. Other provisions in the proposed laws would include barring the use of unlawfully obtained evidence from criminal prosecution, enforcing civil penalties for noncompliance, and limiting the time that data can be retained by law enforcement agencies.

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More recently, lawmakers have sought to restrict use of unmanned aircraft by private users. Among the 18 states that have passed laws regulating unmanned aircraft, 10 states include restrictions on private deployment of unmanned aircraft.[12] More than half the UAS legislation introduced in 2014 proposed restrictions on private use of UAVs.

When federal regulation on unmanned aircraft systems is enacted, some of the state laws may be preempted by the federal government's intent to "occupy the field."[13] Because use of unmanned aircraft will exist largely in federal airspace, Congress has the authority to set policy over how UASs are operated. This will undoubtedly cause disruption in terms of the enforceability of particular state statutes.

Use of Aerial Surveillance by Law Enforcement and Current Fourth Amendment Jurisprudence

In addition to regulatory and statutory responses, there is also the Fourth Amendment and its application to unmanned aerial surveillance. The Fourth Amendment guarantees "the right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures."[14] If the police unreasonably intrude upon an individual's reasonable expectation of privacy without a warrant or probable cause, the evidence derived from the illegal search will be inadmissible. Conversely, if there has been no "search," then the Fourth Amendment is not implicated. In 1967 the Supreme Court in *Katz v. United States* declared that the Fourth Amendment protects "people not places," a major departure from the pre-existing property rights-based analysis.[15] The Court's decision transformed the way courts assess whether police conduct constitutes a search under Fourth Amendment principles. Justice Harlan's famous concurrence set forth the two-pronged "reasonable expectation of privacy" test. This doctrinal formulation makes investigatory searches by police constitutionally significant if (1) there is an actual expectation of privacy and (2) the expectation is deemed one that society is willing to recognize as reasonable.[16]

Some years following *Katz*, the Court applied its reasonable expectation analysis to observation from the sky. The Supreme Court decided three important aerial surveillance cases involving police-manned aircraft flying at altitudes of 400 and 1,000 feet, taking pictures of private property concealed from ground observation.[17] In all three cases, the Supreme Court found no reasonable expectation of privacy because the observations were made from public, navigable airspace. The Court reasoned that navigable airspace is the equivalent of a public thoroughfare, open to anyone who abides by the regulations governing air travel.[18]

In 2001, the Supreme Court addressed the constitutional relevance of sense-enhancing technology in *Kyllo v. United States*.[19] The case involved police use of a thermal imaging device. Federal agents suspecting the defendant of using high-intensity heat lamps to grow marijuana plants inside his home used a thermal imaging device to detect the heat levels from discrete areas inside his home. Coupled with other information, the police obtained a search warrant for the house and found marijuana plants growing inside. In this very close case the Court determined that the technology used to obtain information regarding the interior of the home was not in "general public use" and therefore constituted a search.

Unmanned aircraft systems and many of the technologies with which they can be equipped, by contrast, are in general public use. Although the regulations for UAS are still being developed, many people own and operate them.[20] One of the more basic platforms is the AR Parrot drone, which retails for under $300 and is available at many commercial outlets. As the price increases, the onboard instruments get more sophisticated, but the Parrot drone itself is equipped with live-streaming video capability and a 720-megapixel camera. The global proliferation of UASs may well dilute the protections enunciated in *Kyllo*, leaving Americans vulnerable to intrusions in and around their homes by government and neighbors alike.

It is plausible that the increased power that technology affords police could prove to be a significant factor in the Court's willingness to extend the reach

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of the Fourth Amendment.[21] In *United States v. Jones*, the Supreme Court considered whether the use of a GPS device to monitor Jones' movements constituted a search within the framework of the Fourth Amendment.[22] Five justices expressed a willingness to reassess the legal framework for evaluating long-term electronic monitoring of a person in public.[23] In two notable concurrences, the justices recognized the "quantum of intimate information about a person" that can be obtained from a GPS device with relative ease and little expense.[24]

Moreover, the qualitative and quantitative differences between digital data and physical objects may influence where the Court draws the line between personal privacy and the public domain. In an even more recent case, *Riley v. California*,[25] Chief Justice Roberts emphasized the pervasiveness of cell phones and their capacity to retain and transport the privacies of life. With such significant privacy interests at stake, the Court unanimously voted to require the police to obtain a warrant before searching a cell phone incident to arrest.

It will likely be some time before courts take on the novel legal issues posed by unmanned aircraft. In the meantime, unmanned aircraft systems are becoming a ubiquitous presence in our airspace. Because of the extraordinary capabilities of UAS, they may need their own set of specific legal controls to ensure privacy, avoid infringing upon First Amendment activities, and prevent discriminatory targeting. Striking the right balance is crucial so that society can enjoy the benefits of this technology without sacrificing the privacy and liberties Americans have relied upon for centuries. ◆

Note

This article is excerpted from the full-length article, "Sensing and Surveillance: Issues of Privacy in Unmanned Aircraft," which appears in the forthcoming book *Unmanned Aircraft in the National Airspace: Critical Issues, Technology, and the Law*, Donna A. Dulo, editor.

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13. See Federal Aviation Administration Modernization and Reform Act, Pub. L. No. 112-095 (2012).

14. U.S. Const. Amend. IV.

15. Katz v. United States, 389 U.S. 347 (1967).

16. *Katz*, 389 U.S. at 361.

17. *See* Dow Chem. Co. v. United States, 476 U.S. 227 (1986); California v. Ciraolo, 476 U.S. 207 (1986); Florida v. Riley, 488 U.S. 445 (1989).

18. *Ciraolo*, 476 U.S. at 213. ("The Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares.")

19. Kyllo v. United States, 533 U.S. 27 (2001).

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23. *See Jones*, 132 S. Ct. at 954 (Sotomayor, J., concurring); *id.* at 957 (Alito, J., concurring).

24. *Id.* at 955 (Sotomayor, J., concurring) ("With increasing regularity, the Government will be capable of duplicating the monitoring undertaken in this case by enlisting factory- or owner-installed vehicle tracking devices or GPS-enabled smartphones.").

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DRONES TO SATELLITES

SHOULD COMMERCIAL AERIAL DATA COLLECTION REGULATIONS DIFFER BY ALTITUDE?

BY JANNA J. LEWIS & LAUREN R. CAPLAN

The news and social media commentary of late reveals considerable discomfort with the idea that "drones," or unmanned aircraft systems (UASs), could be used to collect images and data for commercial purposes. The idea that a flying machine—say, a six-inch quadcopter equipped with tiny cameras—might track people or record images and data about their movements and habits strikes many as invasive.[1]

Yet, for all the recent attention on commercial drones, commercial aerial data collection is hardly a new concept. Private companies have been capturing and commercializing images of the Earth and its inhabitants for decades[2]—never mind that hobbyists have been flying cameras on model airplanes long before the term "drone" entered the public lexicon, or that governments have been peering at the planet from space since Sputnik first beeped across the skies.[3]

Indeed, a growing number of commercial operators are using satellites orbiting hundreds of miles above the Earth to gather data and images,[4] a feat generally referred to as "remote sensing." These operators process and sell the information to companies, research institutes, and even government agencies for various commercial and noncommercial uses.[5] Many of the uses are undeniably beneficial, such as weather forecasting and monitoring disaster zones. Other uses, such as monitoring farmland, livestock movements, and energy and mining resources, give businesses an operational edge, while still other uses of satellite data, such as location-based services and detection of traffic patterns for smartphone apps, are now a daily part of life for countless people.

Few would argue that satellites are as easily accessible or potentially intrusive as drones—satellites are much more expensive to develop, operate, and launch, and not nearly as agile as drones. However, with their increasingly sophisticated optics, sensors, and processing technologies, satellites can record places, events, and people with a degree of precision and pervasiveness that is worrisome for data privacy advocates. From the perspective of commercial satellite and drone operators, issues of data privacy and consumer consent to collection of personal data present significant business challenges.

Existing regulations and proposed rules do little to quell these concerns. Different government agencies

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promulgate a patchwork of regulatory schemes and guidelines for operation of commercial drones and satellites, which do not consistently address personal data privacy protections.[6] This makes it difficult for private citizens and commercial operators, alike, to know their rights and duties with respect to collection, storage, and dissemination of personal data and images via commercial aerial platforms.

Yet, even as some federal agencies are considering privacy issues in relation to commercial drone use, questions arise as to whether enactment of privacy regulations for aerial data collection should even be a federal initiative.[16] Still, consistent and interoperable privacy protections cannot be achieved at any level if current initiatives do not contemplate all aerial data collection platforms.

To briefly explain, different regulations apply according to the type of aerial platform (such as satellite, aircraft, balloon, or UAS); the altitude at which it flies; the way it got there (such as self-propelled take-off or rocket launch); whether the platform is operated by a private individual, a commercial entity, or a public sector agency (such as the US military or local law enforcement); and the manner of use and distribution of the imagery and data collected. The Federal Aviation Administration (FAA) regulates commercial drones,[7] and an increasing number of states have proposed legislation to govern commercial drone use within state borders.[8] The federal agencies that regulate aspects of commercial satellite use include the National Oceanic and Atmospheric Administration (NOAA)[9] and Federal Communications Commission (FCC).[10]

Existing commercial satellite and drone regulations approach the issue of aerial data collection in various ways, emphasizing different security issues and priorities. However, none expressly contemplates the growing overlap of aerial data collection capabilities by different commercial aerial platforms. This overlap raises questions about whether privacy and data protections should differ according to the altitude at which a data collection platform flies.

Arguably, increased altitude does not mitigate privacy concerns. The 500-foot ceiling recently proposed by the FAA in its Notice of Proposed Rulemaking[11] (NOPR) for commercial operation of small UASs is not the upper limit of aerial data-capture capabilities.[12] Indeed, many commercial drones are capable of operating at altitudes above 500 feet, or even at suborbital altitudes,[13] well above the reach of data privacy regulations that might stem from the FAA's small UAS rules. At the same time, the resolution and quality of imagery and data captured by commercial satellites is steadily improving and increasingly in demand,[14] yet existing data security regulations do not expressly account for technological improvements that implicate personal privacy. It is not far-fetched to imagine that, soon, a single company could operate both satellites and drones for aerial data collection. Under the current regulatory trajectory, that company could be subject to different degrees of data privacy requirements, despite the feasible similarity in images and other data collected by its satellites and drones.[15]

Of course, it's a complicated issue, and there are no easy answers, but there are opportunities to start the discussion now. Privacy initiatives for protecting data collected by commercial drones are in formative stages and are receptive to input from all stakeholders, and there appear to be options for implementing privacy protections for data and imagery collected via commercial satellite without a complete overhaul of the regulations that currently govern commercial satellite systems.

At the request of President Obama,[17] the US Commerce Department's National Telecommunications and Information Administration (NTIA) recently issued a Request for Public Comment (RPC) on formulation of best practices for privacy, transparency, and accountability in the handling and collection of data by commercial and private drones.[18] Managing this effort will be no small task, and it may take years for a final policy to materialize. However, although the RPC is directed to commercial UAS data collection, NTIA provided a framework that could be used to prompt thoughtful discourse on implementing alighned safeguards for aerial data collection, retention, and dissemination, regardless of platform or altitude.

Likewise, although the existing regulations for commercial satellites heavily emphasize national security protections,[19] there might be ways to address privacy concerns about commercial satellite data collection and implement balanced protections through the existing regulatory process.

For example, NOAA, the agency charged with licensing and regulating US private remote sensing space systems,[20] can require specific and enforceable limitations on operational performance of commercial satellites, which can include limitations on data collection and dissemination.[21] Private satellite operators must submit a Data Protection Plan (DPP) as part of their license application to NOAA.[22] In a DPP, a commercial satellite operator must describe its process for protecting data and information through all stages of collection, storage, and dissemination. The DPP must meet certain minimum requirements, but the DPP can be adjusted to accommodate agency needs

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and advancements in technology.[23] Just as NOAA requires private satellite operators to describe and adhere to their data security plans, NOAA could require operators to include privacy protections in their DPPs, or similar plans, for imagery and data collected by commercial satellites.[24]

The looming question, then, is what should overarching privacy principles for aerial data collection look like? Who should structure them, and under what mandate? Should commercial drone and satellite operators be required to obtain consent from every person detected by an aerial lens or sensor? If so, when and by what means that will minimize the burden on commercial operators? To avoid regulatory inconsistencies, they would need to be flexible enough to apply to data collected by drones, satellites, aircraft, and even gliders and balloons, and take into account the diverse views, roles, and interests of all stakeholders, public and private alike. They would need to be interoperable with, and deferential to, federal, state, and local regulations and constitutional principles, and should not restrict innovation or inappropriately restrain companies from pursuing commercial opportunities.[25]

There are numerous other important considerations that need attention and analysis, such as whether and under what circumstances compliance should be voluntary, the costs of implementation and management, issues of accountability and enforcement, as well as alignment with international treaties. Components of the existing regulatory framework can be used to address some of these issues, but the discussions need to go beyond commercial UAS operations to include other commercial aerial data collection capabilities.

To be sure, commercial drones and satellites hold tremendous economic potential, and already are spurring growth of vibrant and exciting industries. But the privacy concerns are real. All stakeholders will need to participate in proactive development of balanced rules and policies to address those concerns—ideally, ones that can be implemented consistently across all aerial data collection platforms, current and future, and regardless of altitude.

Endnotes

1. *See, e.g.*, UAS Privacy Considerations, The Aerospace States Association, *available at* http://aerostates.org/wp-content/uploads/2013/08/UAS-State-Privacy-Considerations-Final2.pdf.

2. Launched in 1999, the IKONOS satellite is the first commercial satellite to collect images from space. *See* Dr. Christopher Lavers, The Origins of High Resolution Civilian Satellite Imaging-Part 2: Civilian Imagery Programs and Providers, Directionsmag.com, 2013, http://www.directionsmag.com/entry/the-origins-of-high-resolution-civilian-satellite-imaging-part-2-civil/307714.

3. NASA, Sputnik and the Dawn of the Space Age, http://history.nasa.gov/sputnik/.

4. Catalog of Earth Satellite Orbits, *available at* http://earthobservatory.nasa.gov/Features/OrbitsCatalog/.

5. *See, e.g.*, DigitalGlobe Industry Solutions, https://www.digitalglobe.com/industries.

6. For example, the Federal Trade Commission has established a privacy protection regime that includes regulation and enforcement of privacy and data security laws; *see* Statutes Enforced or Administered by the Commission, *available at* https://www.ftc.gov/enforcement/statutes; *see also* Susan Landau, *Control Use of Data to Protect Privacy*, 347 Science 504–06 (2015). In principle, people have the right to control the collection, use, and disclosure of their personal data. In the context of online data collection, for example, notice and consent are considered integral elements of personal data protections. But it is not clear that notice and consent would be workable for aerial collection of personal data and imagery. For example, at what stage, and in what manner, should a commercial drone or satellite operator notify consumers that they will collect data, and how would those consumers manifest consent? What, realistically, should a commercial operator do if a consumer declines consent?

7. *See*, FAA Unmanned Aircraft System (UAS) Regulations and Policies, *available at* https://www.faa.gov/uas/regulations_policies/. The FAA also regulates the commercial space transport industry, including commercial satellite launches and reentry, *see, e.g.*, Commercial Space Launch Act, 51 U.S.C. Ch. 509, §§ 50901-23 (2011) and FAA Office of Commercial Space Transportation, Licenses, Permits & Approvals, *available at* http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/. However, the FAA does not monitor payloads (such as commercial satellites) that are subject to regulation by the FCC or NOAA. Generally speaking, the FAA's jurisdiction ends where space begins.

8. Proposed rules and regulations at the state and local levels are popping up around the country. *See, e.g.* Idaho Code Ann. § 21-213 (Idaho); N.C. Gen. Stat. Ann. § 15A-300.1 (North Carolina); Or. Rev. Stat. Ann. § 837.380 (Oregon); Tenn. Code Ann. § 39-13-903 (Tennessee); Tex. Gov't Code Ann. § 423.003 (Texas); Wis. Stat. Ann. § 942.10 (Wisconsin); *see also* Resolution Supporting Usage of Unmanned Aircraft Systems, the Council of State Governments, *available at* http://knowledgecenter.csg.org/kc/system/files/csg_resolution_supporting_audited_usage_of_unmanned_aircraft_systems_-_approved_9-22-2013.pdf, and the ACLU's Status of 2014 Domestic Drone Legislation in the State, *available at* https://www.aclu.org/blog/technology-and-liberty/status-2014-domestic-drone-legislation-states.

9. Most of the US and international codes, policies, and rules applicable to commercial satellites focus on licensing, data storage, processing, access, and preservation of national security and compliance with foreign policy and international obligations of the United States—and not necessarily on individual privacy. *See, e.g.*, General Conditions for Private Remote Sensing Space System Licenses, *available at* http://www.nesdis.noaa.gov/CRSRA/files/General%20Conditions.pdf; *see also* NOAA Commercial Remote Sensing Regulatory Affairs Office, Overview of NOAA's Commercial Remote Sensing Regulatory Affairs Office (Mar. 31, 2009), *available at* http://calval.cr.usgs.gov/JACIE_files/JACIE09/TuesdayAM/D'AguannoNOAAGovt.pdf).

10. *See, e.g.*, 47 C.F.R. Chapter I (Federal Communications Commission regulations); 15 C.F.R. § 960.11 (Department of Commerce Regulations).

11. Operation and Certification of Small

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Unmanned Aircraft Systems, 80 Fed. Reg. 9544 (Feb. 23, 2015), *available at* http://www.gpo.gov/fdsys/pkg/FR-2015-02-23/pdf/2015-03544.pdf.

12. *Id.* at 9552 (The NOPR acknowledges potential implications of commercial small UAS operations on privacy, civil rights, and civil liberties, but notes that privacy issues are beyond the scope of the NOPR).

13. As drones gain altitude and the ability to operate at suborbital heights, the line between drone and satellite fades. *See, e.g.*, *Almost Orbital, Solar-Powered Drone Offered As "Atmospheric Satellite," available at* http://arstechnica.com/information-technology/2013/08/almost-orbital-solar-powered-drone-offered-as-atmospheric-satellite/; *see also*, *Tiny NASA Helicopter Drone Could Explore Mars One Day, available at* http://www.space.com/28360-nasa-mars-helicopter-drone.html.

14. Resolution of satellite imagery has evolved from the grainy, 40-foot resolution of photos taken by the first CORONA satellite, to 15- to 60-meter resolution of images taken by, for example, the Landsat 7 satellite, to the high-resolution, digital images now available via satellite constellations circling the globe today. The clarity of the image processed for dissemination is set by the US Department of Commerce, which limits the resolution of commercial satellite images to 25 cm or about 10 inches). This means that objects smaller than 25 cm should not be easy to discern in the image. *See, e.g.*, Andrea Shalal, *DigitalGlobe Gains U.S. Govt License to Sell Sharper Satellite Imagery*, REUTERS, June 11, 2014, http://www.reuters.com/article/2014/06/11/digitalglobe-imagery-idUSL2N0OR2UX20140611.

15. See, e.g., Martyn Williams, *Google's Solar-Drone Internet Tests About to Go Airborne*, Computerworld.com (May 13, 2015), http://www.computerworld.com/article/2896581/googles-solar-drone-internet-tests-about-to-go-airborne.html; Ellen Huet, *Google Buys Skybox Imaging – Not Just For Its Satellites*, Forbes.com (June 10, 2014), http://www.forbes.com/sites/ellenhuet/2014/06/10/google-buys-skybox-imaging-not-just-for-its-satellites.

16. See, e.g., Wells C. Bennett, *Civilian Drones, Privacy, and the Federal-State Balance*, Brookings.edu (September 2014), http://www.brookings.edu/research/reports2/2014/09/civilian-drones-and-privacy.

17. Presidential Memorandum: Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems (Feb. 15, 2015), https://www.whitehouse.gov/the-press-office/2015/02/15/presidential-memorandum-promoting-economic-competitiveness-while-safegua.

18. Request for Comments on Privacy Transparency, and Accountability Regarding Commercial and Private Use of Unmanned Aircraft Systems, 80 Fed. Reg. 11978 (Mar. 5, 2015), *available at* http://www.gpo.gov/fdsys/pkg/FR-2015-03-05/pdf/2015-05020.pdf.

19. *See, e.g.*, the National and Commercial Space Programs Act of 2010, 51 U.S.C. §60101, et seq., formerly the 1992 Land Remote Sensing Policy Act of 1992, 15 U.S.C. 5601 et seq.; Licensing of Private Remote-Sensing Systems, 15 C.F.R. Part 960; National Space Policy of the United States of America (June 28, 2010), *available at* http://www.nesdis.noaa.gov/CRSRA/files/national_space_policy_6-28-10.pdf; U.S. Commercial Remote Sensing Policy (Apr. 25, 2003), *available at* http://www.nesdis.noaa.gov/CRSRA/files/Commercial%20Remote%20Sensing%20Policy%202003.pdf; United Nations General Assembly, Principles on Remote Sensing (Dec. 3, 1986), *available at* http://www.un.org/documents/ga/res/41/a41r065.htm; General Conditions for Private Remote Sensing Space System Licenses, *available at* http://www.nesdis.noaa.gov/CRSRA/files/General%20Conditions.pdf.

20. NOAA, About Commercial Remote Sensing Regulatory Affairs, http://www.nesdis.noaa.gov/CRSRA/.

21. 15 CFR Part 960(b)(1) ("Specific limitations on operational performance, including, but not limited to, limitations on data collection and dissemination, as appropriate, will be specified in each license.").

22. 15 C.F.R. § 960.11(b)(13); 79 Fed. Reg. 24474 (Apr. 25, 2006).

23. *Id.* ("As NOAA licenses more advanced systems, greater emphasis has been placed on protection of the data.")

24. Some commentary has suggested a need to revise commercial satellite regulations to address the CubeSat phenomenon (i.e., the upswing in launch and operation of tiny satellites by people, educational organizations, and other entities who don't realize that, technically, they need a license from NOAA for those activities). If changes are made to address CubeSats, NOAA could also use that opportunity to address privacy concerns relating to data collection by commercial satellites.

25. *See, e.g.*, 80 Fed. Reg. at 11980. NTIA addressed the issue succinctly by asking, "What specific best practices would promote accountable commercial and private UAS operation while supporting innovation?"

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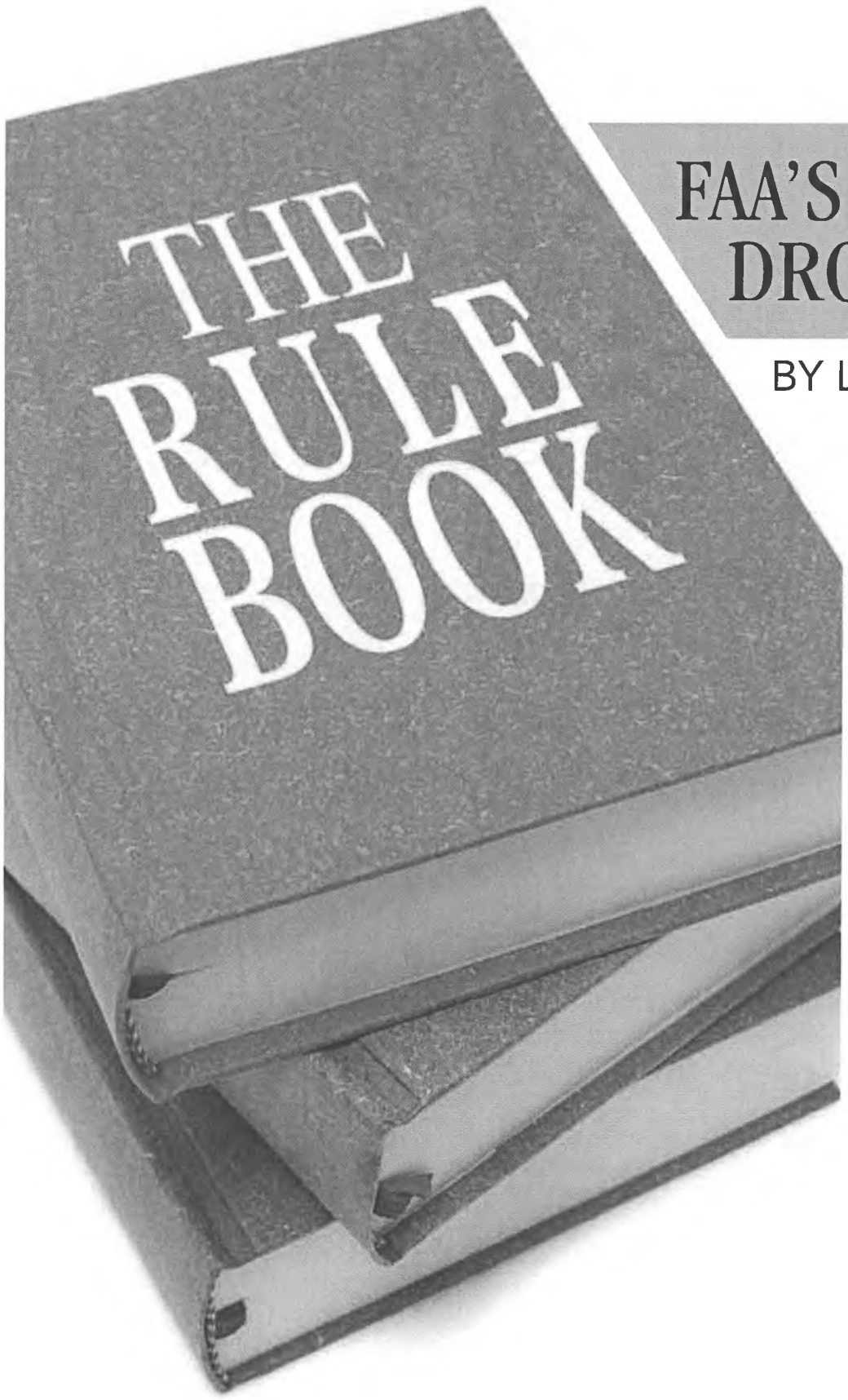

FAA'S NEW DRAFT DRONE RULES

BY LOIS MERMELSTEIN

In February 2015, the Federal Aviation Administration (FAA) released its long-awaited draft rules for the operation of small unmanned aircraft systems (UASs), popularly known as "drones." Although it seems these systems are already being used everywhere, commercial uses are currently allowed only with individually granted waivers and other exemptions. Commercial uses, in FAA regulations, are generally those involving aircraft operations for compensation or hire (14 CFR 1.1). For drones, these commercial uses could include newsgathering; crop and wildlife monitoring; inspections of power lines, pipelines, bridges, and antennas; aerial photography; and other research and educational activities. The new proposed rules would apply to all of these activities.

The FAA already regulates manned aircraft through Code of Federal Regulations Title 14. Airplanes, helicopters, balloons, and other aircraft are all covered, as well as the pilots, mechanics, airlines, and others who interact with those aircraft. The FAA had also previously (in 1981) issued an Advisory Circular (AC 91-57) that covered recreational model aircraft. But neither type of regulation was appropriate for unmanned aircraft being used commercially. These new requirements would be added as a new part 107 to the existing rules.

For starters, the new rules set a weight limit—under 55 pounds or

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25 kilograms, for the aircraft itself and everything on board. Just as for larger aircraft, the responsibility for and ability to see and avoid other traffic is critical. For drones, this means the operator would be required to always keep the drone "in sight." And this means unaided sight—cameras on the drone, binoculars, and other aids (except glasses or contact lenses for the operator) do not count. The FAA clearly has concerns about drones getting too far from the operator and losing the control signal, does not yet trust cameras on the drone to be sufficient for see-and-avoid, and considers current electronic collision avoidance systems to be too heavy for drone applications. Drones would operate only in daylight and would have to avoid any other aircraft.

Conventional airplanes in uncontrolled airspace—away from airports and close to the ground—need only operate with one mile of visibility and clear of any clouds. But drones in the same airspace would have the stricter requirements—three miles visibility, at least 500 feet under and 2,000 feet horizontally from clouds—that are required of other aircraft only in controlled airspace. This is intended to give the drone operator more time to avoid a manned aircraft. For the same reasons, an operator would only be allowed to handle one drone at a time, and not from a moving vehicle or aircraft (although moving boats would be acceptable, because there are far fewer people, and there is less property, over water).

It's also important that drones not interfere with other aircraft operations. To that end, the rules propose they currently be limited to a maximum altitude of 500 feet, staying below where other (manned) aircraft are allowed to be. Drones could operate in controlled airspace (near most airports) only with air traffic controllers' permission, and no faster than 100 mph (or 87 knots). Drones would also have to stay out of restricted or prohibited airspace without permission, just as for larger aircraft.

All aircraft operators have a duty not to endanger the life or property of others by their operations. So, as is required for larger aircraft, no careless or reckless operations would be allowed; operators would have to do a preflight inspection before flight; and drones could not fly if the operator, aircraft, or environment was in a condition that would interfere with safe operation. One difference from larger aircraft is that drones could not operate over people uninvolved in their operation unless the people below were sufficiently protected from potentially falling drones. And while the prohibition against careless or reckless operations for larger aircraft has been in place long enough to accumulate a substantial body of regulatory and court precedent, what it will mean for drones has yet to be tested.

Drone pilots would now be called *operators*, and would be subject to their own rules. Like pilots of larger aircraft, they would have to pass an initial written test, be vetted by the Transportation Security Administration, and obtain an operator certificate. The test would cover regulations, airspace, obstacle clearance, weather, performance calculations for safe flight, aeronautical decision-making, airport operations, and drugs and alcohol—similar to other pilots' requirements, but adapted for drone operations. Just as other pilots are required to undergo periodic flight reviews, drone operators would have to take a written test every two years. Operators would have to be at least 17, like most other pilots, and have to comply with the same alcohol and drug rules as other pilots. All of this is intended to ensure that drone operators remain under the FAA's authority and operrate as other pilots, hopefully ensuring that everyone using the same airspace stays on the same page.

Drones would not need the types of airworthiness certification and maintenance that larger aircraft have. They would require registration and marking like their bigger cousins, though.

Some types of proposed drone operations would specifically not be allowed under the proposed rules. For example, package delivery via drone, such as Amazon has proposed, would be considered an "air carrier" operation that would not be allowed (even if otherwise under the 55-pound limit). However, the FAA is seeking comment on whether such operations could work within its other proposed constraints, such as line-of-sight operation and the ban on flights over uninvolved persons. External-load and towing operations would not be allowed either, but might be in the future. And any operation might still be possible if the FAA grants an individual waiver for it—as it already has in several instances.

Now that the rules are drafted, and more than 3,000 comments have been received, domestic drone operations are poised to expand rapidly. Even non-aviation lawyers should keep up with developments.

The complete proposed rules with FAA explanatory notes are available at https://www.faa.gov/regulations_policies/rulemaking/recently_published/media/2120-AJ60_NPRM_2-15-2015_joint_signature.pdf. ◆

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UNMANNED AIRCRAFT CLASSIFICATIONS

The Foundation for UAS Regulations in the National Airspace

BY DONNA A. DULO

The unmanned aerial system (UAS) encompasses a wide range of technologies and aeronautical platforms from the highly sophisticated to the most basic models. The functions, cost, and ability for operators to acquire a UAS vary based on the level of sophistication for each system.

The potential use of UAS technology has grown exponentially over the past few years in the civilian sector. Incorporating lighter composites, advanced embedded electronics, and efficient computational algorithms, the UAS is becoming the platform of choice for increased aerial mobility and functionality for a wide range of operators including police departments monitoring crime to science departments mapping archaeological sites.

The key to UAS use is expanded operations in three-dimensional space. Current UAS technology allows operators to transverse three-dimensional space in a more rapid and customized manner that transcends the current military-based use of the UAS for operations that are too "dull, dirty, or dangerous" for a manned aircraft. Rather, new and innovative uses of unmanned aircraft technologies are facilitated due to the compact and relatively inexpensive nature of unmanned aircraft compared to their manned counterparts. This new-found aeronautical ability for operators enhances real-time situational awareness allowing information to be gathered and disseminated in an exponentially greater manner compared to the past.

The increased information intake allows for significant reductions in decision cycles that results in faster situational resolutions and reduced information product turnarounds. In

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essence, new civilian UAS technology has the potential to transform the manner in which agencies and operators do business through enhanced information gathering from a three-dimensional vantage point.

The FAA Modernization and Reform Act of 2012[1] mandates that a plan to integrate UAS technology into US national airspace be developed by the Secretary of Transportation in consultation with the aviation industry and applicable federal agencies. The types of UAS technology are not specified, but rather, the legislation states that agencies will be allowed access to the national airspace as "standards are completed and technology issues are resolved." This plan leaves the technological door open for a wide range of UAS platforms, payloads, and airframe uses in the national airspace. This plan allows for a wide range of flexibility for the FAA to implement the mandates.

FIGURE 1 A Fixed-Wing Unmanned Aircraft[2]

The most basic principle to understand is that a UAS is an aircraft that obeys the same aerodynamic principles as a manned aircraft. In fact, all aircraft theoretically can be remotely operated, ranging from large aircraft such as airliners to high-speed jets. However, unmanned aircraft are distinguished due to their technological design that does not center on a cockpit but rather on their potential mission functionality. Indeed, essentially all unmanned aircraft are designed around their payloads.

Without their payloads, unmanned aircraft would be classified as model aircraft or experimental units. Thus, unmanned aircraft tend to be crafted for specific missions that are evident from the design to implementation, yet their basic technological foundations mirror those of their manned counterparts. The following definitions demonstrate this principle.

The Federal Aviation Administration (FAA) defines an aircraft in the Federal Aviation Regulations (FAR) section 1.1 as, "A device that is used or intended to be used for flight in the air." This definition, which derives its authority from 49 U.S.C. 106(g), 40113, 44701, applies to both manned and unmanned aircraft. The definition of airplane, which emerges from the same authority, is "An engine-driven fixed-wing aircraft heavier than air, that is supported in flight by the dynamic reaction of the air against its wings." This definition rightly applies to both manned and unmanned systems. Exploring this concept a step further under the same authority, the definition of a rotorcraft is "A heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors."

Because a UAS can be composed of either fixed-wing or rotorcraft form, all of the above definitions apply perfectly to an unmanned aircraft, because the unmanned aircraft obeys the same three-dimensional aerodynamic principles as its manned counterpart and requires the same basic components to operate in the air. So where is the definitional variance? The definition of unmanned aircraft can be found in The FAA Modernization and Reform Act of 2012, Subtitle B §331:

> An aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

Thus, it is clear that the sole distinguishing factor of manned and unmanned aircraft from a legal definitional standpoint is the absence of a human pilot onboard the physical aircraft. This is a major legal point as well as a technological reality. Without the human on or inside of the aircraft, its legal role in the national airspace is vastly different than its manned counterpart although they both are aerodynamically and technologically similar.

Types of Unmanned Aerial Systems

There are several ways to classify an unmanned aircraft. Methods of classification vary between the military services, between the military and civilian sectors, and between different countries. In general, it is useful to classify an unmanned aircraft according to three specific criteria:

1. FAA Operational Categories
2. General Airframe Technologies
3. Functional Size Categories.

Each UAS will have a specification within each of the three criteria, allowing for a specific type of identification of the aircraft. This facilitates a general understanding of the performance, range, and maneuverability of the aircraft at an initial glance.

UAS Operational Categories

To begin the discussion of UAS technologies, the three types of civilian operational categories of the UAS as defined by the FAA are as follows:

- Experimental Unmanned Aircraft
- Model Unmanned Aircraft
- Public Unmanned Aircraft

These are the general categories of UAS that currently exist in the rapidly evolving realm of regulatory definitions. While each are considered unmanned aircraft, they have unique characteristics that warrant their own special category.

Experimental Aircraft

Experimental aircraft are unmanned aircraft that serve various experimental purposes such as airframe testing, payload testing, research and development, pilot and aircrew training, academic and educational training,

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and systems demonstration aside from air shows and air racing events. Their technologies range from fixed-wing to rotorcraft, to a combination of the two with a plethora of propulsion and payload technologies. The FAA issues special UAS experimental category airworthiness certificates under FAR section 21.191 for operations of experimental aircraft. These aircraft must be operated with full FAA approval. In many cases these aircraft encompass the cutting-edge elements of aeronautical design and development.

Model Aircraft
Model aircraft are recreational unmanned aircraft, with technologies ranging from fixed-wing, to rotorcraft to lighter-than-air models, that are regulated by Advisory Circular AC 91-57 and more currently by the FAA Modernization and Reform Act of 2012 section 336 (Special Rule for Model Aircraft). Section 336 defines a model unmanned aircraft as:

1. capable of sustained flight in the atmosphere
2. flown within visual sight of the person operating the aircraft; and
3. flown for hobby or recreational purposes.

The guidelines for model aircraft in section 336 state that model aircraft are flown strictly for hobby or recreational use, are not more than 55 pounds unless otherwise certified, are operated in a manner that does not interfere with and gives way to manned aircraft, and, when flown within five miles of an airport, the airport operator and air traffic control tower are notified, and mutual arrangements are made. Model aircraft are flown within community-based sets of safety regulations that are based upon national community-based model aircraft organizations. These organizations design, develop, and implement their own safety programs for use in the model aircraft community.

Public Aircraft
Public unmanned aircraft are discussed in section 334 (Public Unmanned Aircraft Systems.) This section provides the provisions for the establishment of unmanned aircraft in the national airspace. While the ultimate size and limits of the aeronautical technologies of public unmanned aircraft are not defined in section 334, the section does permit government public safety agencies to operate small unmanned systems while the issues of the national airspace are being worked out legislatively. Section 334 allows for an agency to operate an unmanned aircraft weighing 4.4 pounds or less if operated:

1. within sight of the operator
2. less than 400 feet above the ground
3. during daylight hours
4. within class G airspace; and
5. outside of five statute miles from any airport, heliport, seaplane base, spaceport, or other location with aviation activities

The above operational categories are general classifications of UAS. These categories can encompass a wide variety of aeronautical designs and capabilities. These designs and capabilities revolve around the choice of airframe as well as the size the of aircraft being used for a particular mission.

UAS Airframe Technologies

When looking at an unmanned system, the airframe is the key determinant to the degree of maneuverability that the aircraft will have in three-dimensional airspace. The speed, range, and maneuverability requirements of a UAS will be key factors in determining the choice of technology used to achieve the required mobility for fulfilling the mission of the aircraft. The size and weight of the payload, too, will determine the choice of a UAS airframe technology, as well as time in air or "persistence" requirements. There are four basic types of UAS airframe technologies, as well as hybrid models, that agencies and organizations will be choosing from to achieve their maneuverability, speed, range, and payload requirements:

1. **Fixed-Wing UAS:** a rigid body aircraft with fixed wings, a fuselage, and empennage that uses forward motion to generate lift and move the UAS through the air.
2. **Rotorcraft UAS:** an aircraft that generates lift through rotating rotor blades that revolve around a mast. A rotorcraft can be in the standard single rotor "helicopter" frame, or the popular quad rotor (or more) airframe, where four or more masts and blade systems propel the aircraft.
3. **Tilt-Rotor UAS:** an airframe that uses a pair of powered rotors mounted on rotating shafts that are located at the end of a fixed aircraft wing. The wing of this aircraft is fixed, but the rotors and pylons on which they are mounted tilt in the order of a 90 degree or better range, allowing for various combinations of horizontal or vertical flight.
4. **Lighter-Than-Air UAS:** an aircraft that uses buoyancy to float through the use of one or more large gas bags or canopies.

The choice of UAS airframes, in addition to the payload requirements, will depend on a careful analysis of long-term mission requirements, cost, and pilot capabilities as well as ground station availability and location.

continued on page 23

Donna A. Dulo has been with the Department of Defense for more than 27 years and is the president and founder of the Unmanned Aircraft Safety and Security Society, Inc. She is the editor and lead author of the American Bar Association's book Unmanned Aircraft in the National Airspace: Critical Issues, Technology, and the Law *due out in early summer of 2015.*

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2015 ABA SECTION OF SCIENCE & TECHNOLOGY LAW

ANNUAL MEETING

JULY 30–AUGUST 1
CHICAGO / OMNI HOTEL

ABA SECTION OF
SCIENCE & TECHNOLOGY LAW

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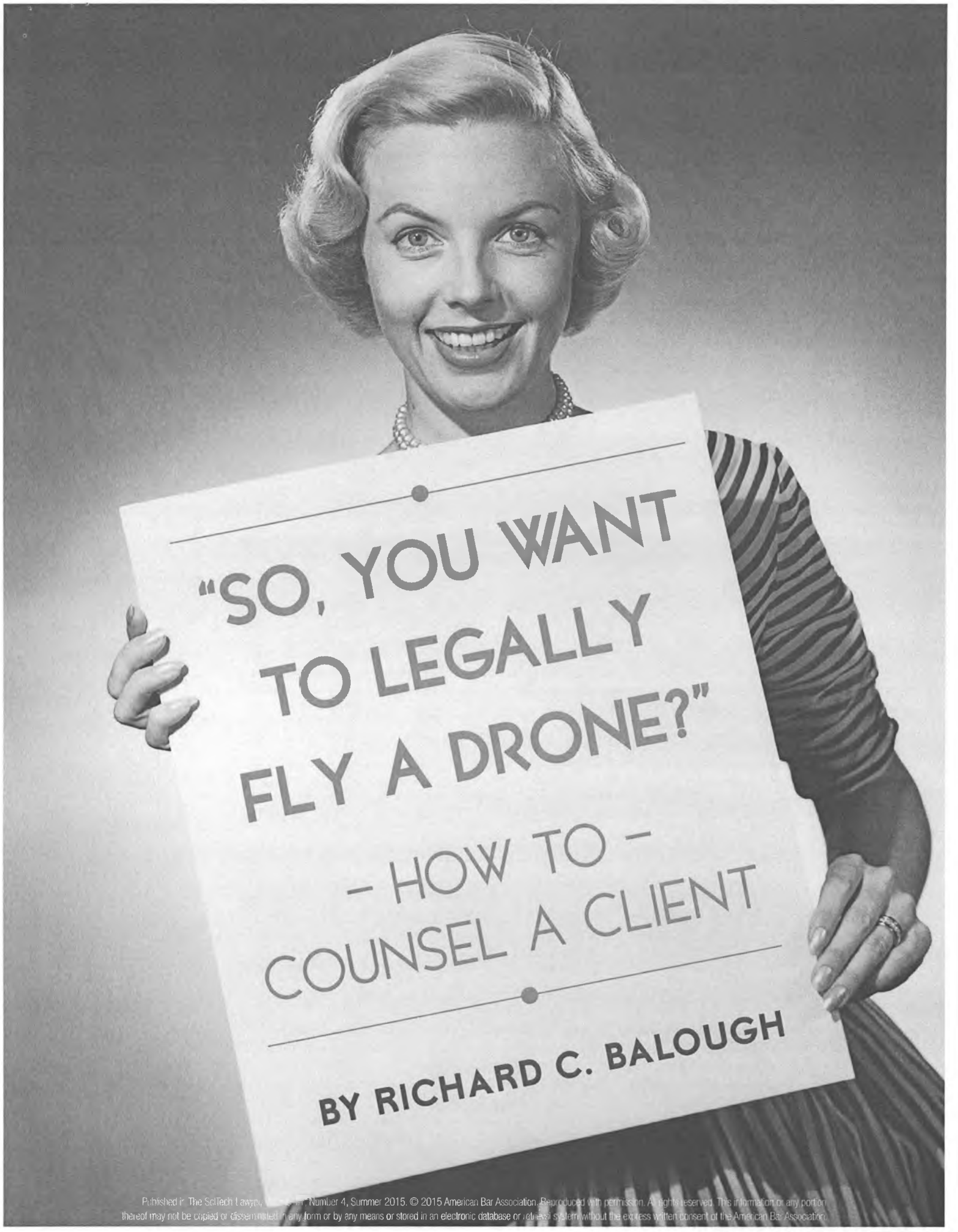

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A good client calls you to ask if they should worry about the legal aspects of using a drone for photography. What do you say?

First, appreciate your client's perspective. Drones can take dramatic videos and digital images that could be used for selling real estate, inspecting construction sites, filmmaking, and finding missing persons.

However, unless the business has obtained special permission from the Federal Aviation Administration (FAA), all of these commercial uses currently are illegal in the United States.

The FAA currently prohibits using drones for any commercial purpose without a special permit, and only a few purposes have been approved. As described in more detail in the article by Lois Mermelstein on page 14 in this issue, the restrictions will continue for the remainder of 2015 as the FAA reviews comments on proposed rules to permit limited commercial use of drones. These proposed rules apply only to drones weighing less than 55 pounds. FAA rules for larger drones still are being developed.

Despite the legal obstacles, the desire to use drones will only increase. The cost of drones, technically unmanned aircraft systems (UASs), has decreased dramatically, and the quality of the onboard cameras continues to increase. Drones range from the very small (less than several ounces) to the size of a small airplane. Most personal drones weigh well under 55 pounds. They can fly several thousand feet in the air and out-of-sight of the operator.

Business Insider reports that over the next decade 12 percent of an estimated $98 billion in global spending on drones will be for commercial purposes.[1] Another report, from the Association for Unmanned Vehicle Systems International, claims that the industry will create more than 100,000 jobs in the United States in the next 10 years.[2]

With a camera attached, a small drone costing $1,000 or less provides a wide range of commercial functions. As functionality increases (such as more sophisticated cameras, infrared devices and the like), the price increases as well. Actual and announced uses for drones include:

- Photographing bridges to detect faults or areas where maintenance is required. Drones can do a more thorough job than an on-the-ground crew.
- Surveying and assessing damage caused by tornados or hurricanes by insurance carriers. Drones give the insurance adjusters access to the damage almost immediately without interfering with search, recovery, and clean-up operations.
- Inspecting oil and gas pipelines, electric transmission lines, and solar panels by flying closer to the pipelines, transmission lines, and solar panels at lower speeds.
- Providing journalists with overhead images of fires, disasters, and other news events.
- Managing crops. Not only can drones take photographs of crops to monitor crop health and development, but drones also may apply fertilizers, insecticides, and other treatments, reducing the need for large, manned crop duster planes.
- Searching for missing persons, especially where the terrain makes it difficult to cover on foot. A drone can cover far more territory in a shorter time.
- Mapping archaeological sites that are not easily surveyed by airplane.
- Photographing homes for real estate agents.
- Delivering packages, as has been announced by Amazon.com.

However, the increased amount and variety of uses raise both safety and legal issues. Although drones are small and lightweight, a collision with an aircraft might cause extensive damage to the aircraft. If a drone is sucked into a jet engine, it could cause engine failure. A drone flying into a helicopter tail rotor could cause the helicopter to go out of control and crash. As one pilot told the FAA, "If one of those things hits us, we're coming down."[3]

Incidents involving drones are increasing. Early this year, a wayward drone made headlines when it crashed on the White House lawn. In a response to a Freedom of Information Act request by the *Washington Post*, the FAA reported that in a five-month period, pilots and air traffic controllers reported 25 instances where drones came within a few seconds or feet of crashing into much larger aircraft, with many of the near misses occurring near large airports.[4]

Recently, the FAA sent cease-and-desist letters to:

- a commercial photographer who used a drone to take aerial photographs of a house for a real estate company.[5]
- a photographer who posted and offered to sell aerial shots taken with a drone of a concert in Chicago's Grant Park.[6]
- a search and rescue organization that used drones to help find missing persons when ground and horseback searches were not successful or the terrain was too difficult for other methods.[7] The FAA argued that, because the organization took donations, it was involved in a commercial operation.
- two journalism schools that were using drones to take pictures for class stories.

According to the FAA, each of the above uses is a *commercial* use subject to FAA regulation. However, if the commercial aspect of the transaction could be eliminated, these actions would be unregulated by the FAA,

Richard C. Balough is the Co-Chair of the Global and Connected Devices Subcommittee of the ABA Cyberspace Law Committee. He is a founding member of Balough Law Offices, LLC, in Chicago, Illinois. He has written extensively on technology and privacy issues, and can be reached at rbalough@balough.com.

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although the potential hazard might remain the same. The regulatory category of *commercial* may no longer work.

The ban against commercial drones dates back to a 2007 FAA order, which allows the commercial use of drones only if the operator obtains special FAA permission. In 2012 Congress passed the FAA Modernization and Reform Act, requiring the FAA to integrate drones into the National Airspace System (NAS). The Act directed the FAA to develop a five-year road map for introducing drones into the NAS, to initiate a rulemaking on small unmanned aircraft, and to establish pilot projects.

Some proponents of commercial drones argue that the small craft should be given the same treatment as model aircraft, which are covered by FAA Advisory Circular 91-57, issued in 1981. This circular generally limits operations for hobby and recreational use to below 400 feet, away from airports and air traffic, and within sight of the operator. Some argue that the 2012 Modernization Act confirms drones are model aircraft exempt from regulation if they are flown strictly for hobby or recreational use, weigh less than 55 pounds, are operated in a manner that does not interfere with any manned aircraft, and are flown within visual line of sight of the person operating the aircraft.[8] The distinction between hobby and commercial drones was recognized by the FAA in its initial proposed rules for drones published in February 2015. However, the FAA maintains the right to take enforcement action against model aircraft to protect people and property on the ground. The FAA argues that the model aircraft rules do not apply to commercial uses of drones, regardless of how low they are flying. In other words, *hobby/recreational* and *commercial* may now be overlapping regulatory categories, creating confusion.

In the proposed rules,[9] the FAA attempts to allow the commercial use of drones under 55 pounds while protecting the public and aircraft. The proposed rules limit small UAS to daytime flights, require visual-line-of-sight operations, and restrict altitude to lower than 500 feet.

Because on one hand the FAA does not assert any jurisdiction over the noncommercial use of drones, but on the other hand asserts total jurisdiction over commercial drones, it raises the interesting dichotomy where, if an individual flies a drone to take pictures of her house, her action is not regulated. At the same time, if the same photographs were taken by a commercial photographer for use by a real estate agent selling the house, the activity would be regulated, and—under today's FAA regulations—it would be illegal unless an FAA permit had been obtained. Yet the hazards would be the same.

Until the formal rules on commercial use are finally adopted, businesses may apply to the FAA for special use exemptions, which are subject to public notice and public comment. The FAA has granted authority to several aerial photo and video production companies in the film and television industry to use drones, which weigh about 50 pounds, for their filming. The certificates require that the operators hold private pilot certificates, keep the drones within line of sight at all times, restrict the flights to the "sterile area" on the set, conduct an inspection of the aircraft before each flight, and prohibit operations at night. There are scores of other requests pending.

The ban on commercial drones also grounds drones for news gathering. This has drawn the ire of the media, which argue that the ban violates the First Amendment because news gathering is not a "commercial" use. Rather, the media argue, use of drones benefits the public because the lower-cost aerial photography would help newsrooms bring more accurate and useful information to the public.

Journalists also are concerned about some state laws on drones. For example, Utah criminalizes interference with agriculture operations, which includes "knowingly or intentionally" recording an image of an agriculture operation.[10] This could prevent investigative journalists from photographing a farm as part of an investigative story on agribusiness. Texas prohibits taking photographs of private property "with the intent to conduct surveillance," which might prohibit investigative journalists from using drones over private property.[11]

Several states have enacted legislation regarding the private use of drones. In an interesting twist, Illinois has made it a crime to use a drone "that interferes with another person's lawful taking of wildlife or aquatic life."[12] (For other examples of state regulation of UAVs, see Hillary Farber's article on page 6.) When the FAA does allow commercial use for drones, the use will be subject to laws governing right of privacy, intrusion upon seclusion, and right of publicity for images captured by the drones.

What, then, should a lawyer tell a client who wants to use drones for a commercial use?

The client should be told that the FAA currently bans commercial use of drones in the United States. The client may apply to the FAA for an exception by obtaining a special airworthiness certificate or for a certificate of waiver and authorization. Either process requires a detailed filing, public input, and time. If client does not want to file for a waiver, it could develop the commercial use outside the United States in countries that allow commercial use of drones. Or the client could wait until the FAA's rules on commercial drones are adopted and hope that no one develops and pre-empts the client's use in the interim. ◆

Endnotes

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7. *Gene Robinson Drone*, https://www.youtube.com/watch?v=UTcWo4OAwtA.

8. FAA Modernization and Reform Act of 2012, §§ 336 and 337.

9. 80 Fed Reg. 9544 (Feb. 23, 2015).

10. Utah Code Tit. 76, Ch. 6 § 112(2)(a).

11. Tex. Rev. Civ. Stat. 423.001. Titled the Texas Privacy Act, the act deals with use of unmanned aircraft. It allows many uses for drones including research, agriculture, gas and electric inspections, which currently are not allowed by the FCC.

12. 720 ILCS 5/48-3(b)(10).

Unmanned Aircraft Classifications

continued from page 18

UAS Size Categorizations

A final category of UAS is the functional-size categorization. This category is particularly important in the legal arena as future airspace operations regulations are likely to revolve around UAS size as well as operational category and airframe. The functional size of a UAS not only determines its robustness in terms of aeronautical capabilities and payload abilities, but also its visibility in the air and its maneuverability. Both of these factors contribute to the safe operation of the aircraft.

FIGURE 2 A Medium-Sized Fixed-Wing UAS[3]

The functional-size categories in the civilian world are arbitrary, except for the small category, which is specifically defined in the FAA Modernization and Reform Act of 2012. The categories are as follows:

- Large UAS
- Medium UAS
- Small UAS
- Micro/Mini UAS
- Nano UAS

These categories cover all airframe types. Additionally, lighter-than-air unmanned aircraft tend to be larger by nature and as such are usually categorized by their specific volume as well as size.

Conclusion

The classification and categorization of the UAS are vital in understanding the operational capabilities of the aircraft. They are also important for understanding the capability, maneuverability, range, and endurance specifications of unmanned aircraft models and airframes. By understanding the operational and size categories, as well as the airframe technologies of UASs, a defined picture of system capabilities can be drawn in order to understand specific applications of unmanned aircraft.

Understanding the technical capabilities of a UAS also aids the legal practitioner in understanding the legal ramifications of the use and implementation of the specific UAS technology. Each airframe as well as airframe-size classification poses specific legal challenges and issues. By understanding these technological specifications, a clearer picture of emerging legal challenges can be gained. ◆

Note

This article is excerpted from the forthcoming book, *Unmanned Aircraft in the National Airspace: Critical Issues, Technology, and the Law*, Donna A. Dulo, editor.

Endnotes

1. The FAA proposed a framework of regulations in February 2015 that is discussed more fully in the article in this issue by Lois Mermelstein on page 14. *See* http://www.faa.gov/regulations_policies/rulemaking/media/021515_sUAS_Summary.pdf.

2. Photograph by Donna A. Dulo, 2014.

3. Photograph by Donna A. Dulo, 2014.

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Privacy, Security, and the Internet of Things: The Looming Crisis

— WEBINAR SUMMARY —

REPORTED BY JARED CHANEY

Trying to determine the market size of the Internet of Things is like trying to calculate the market for plastics, circa 1940.
—Michael Nelson, Bloomberg Government & Georgetown University

To address this hot area, the ABA Section of Science & Technology Law presented a webinar, "Privacy, Security, and the Internet of Things: The Looming Crisis," on Tuesday, March 10, 2015.

Jeff Greene moderated the panel. He is senior policy counsel and covers issues including cybersecurity, identity management, and privacy, and works extensively with industry and the government. Jeff currently serves as Vice-Chair of the Homeland Security Committee of the American Bar Association's Section of Science & Technology Law and Co-Chair of the Supply Chain Working Group on the Information Technology Sector Coordinating Council. The panel included the following faculty members.

- Martha Chemas is an attorney, Internet presenter, and blogger. She has worked with Sullivan & Cromwell LLP, Shearman & Sterling LLP, and Covington & Burling LLP in New York and has taught law with Lawline. She is the Co-Chair of the Information Security Committee of the American Bar Association.
- Cheryl A. Falvey is a Washington, DC-based partner and Co-Chair of Crowell & Moring's Advertising & Product Risk Management Group. An experienced trial lawyer, she provides litigation and counseling services, with a focus on brand and consumer protection matters, including product safety, privacy, anticounterfeiting, sweepstakes, promotions, and advertising.
- Kristen Anderson is a staff attorney at the Federal Trade Commission, in the Bureau of Consumer Protection's Division of Privacy and Identity Protection. Her practice focuses on consumer privacy and data security. She has investigated and pursued cases against advertising companies, financial services companies, and others for violations of the FTC Act, Fair Credit Reporting Act, and Gramm-Leach-Bliley Act.

The panel addressed how so many systems on the Internet of Things (IOT) are venerable to infiltration—not only when there are defects that make them susceptible to hacking, but also when the security features are not utilized. Often infiltrations occur when default credentials are used after the initial setup, or when simple passwords, such as 1234, are used. It is often very hard to get people to change or even set up passwords. The number of essential systems that are vulnerable is staggering, from water treatment plants to a range of medical devices. There are very basic things that are not being done to secure the infrastructure of essential systems.

As new devices and systems are being built, they need to be designed with integral security systems. There are several groups and agencies that are looking into how to encourage data security in the next generation of systems. The potential areas of law that will depend on this type of security range from products liability to patents.

In order to prevent, or at least limit, catastrophe, the next generation will need to bring a new understanding to product design. Companies should not only design precautionary safety measures into products, but also include features to detect security breaches. Furthermore, when a manufacturer designs a new product, it must also determine the effective life of the product and exactly how long it is willing to provide support and upgrades. The risk profile for these issue and concerns does not only affect litigation for product issues and regulation enforcement, but also can cause damage to a client's brand.

When examining these issues, it will be important to understand how the government will control its oversight. The FTC is looking at security vulnerabilities for the IOT. The FTC is focused on the rights and security of the consumers' data. They are trying to make sure that no company is violating or failing to safeguard consumers' data security. Because the FTC's goal is not punishment but compliance, after they settle a case they also monitor the company's compliance with the orders.

Overall, security developments in the Internet of Things will have far-reaching ramifications. As new products are developed, privacy and security will have to be built into those products and services at the outset. Transparency and duty to consumers will have to be considered as data security for the IOT with every new development. With more than 100 billion devices expected to be connected to the Internet in the near future, the benefit to consumers will be immense, but data security and privacy legislation will have to develop along with it.

A full recording of the presentation, along with the CLE materials, can be purchased from the ABA at www.americanbar.org/groups/science_technology/events_cle.html. ◆

Jared Chaney is a Material Science Engineer, a law student at St. Thomas School of Law, and a law clerk with Kinney & Lange P.A. He also serves the SciTech Section as Student Liaison. He can be reached at chan7393@stthomas.edu.

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ABA SECTION OF SCIENCE & TECHNOLOGY LAW NOMINEES FOR 2015–2016 SECTION OFFICER AND COUNCIL POSITIONS

The Nominating Committee, chaired by Cynthia Cwik, is pleased to announce the following slate of nominees for 2015–2016 Officer and Council positions in the Section of Science & Technology Law.

The Section membership will vote on the slate of candidates during the Section's Annual Business Meeting, which immediately follows the Council Meeting on Friday, July 31, 2015, during the ABA Annual Meeting in Chicago, IL.

Cynthia Cwik will automatically succeed to the position of Section Chair at the completion of the ABA Annual Meeting in Chicago.

CHAIR-ELECT	VICE-CHAIR	SECRETARY	BUDGET OFFICER	DELEGATE	COUNCIL	COUNCIL	COUNCIL
Eileen Smith Ewing	David Z. Bodenheimer	William B. Baker	Garth B. Jacobson	Bonnie Fought	Katherine E. Lewis	Lisa R. Lifshiftz	Joe Pennell

Incoming Section Chair

Cynthia Cwik is a partner with the San Diego office of Jones Day. She has extensive experience in complex litigation and class actions, including mass tort and product liability cases, consumer class actions, and environmental cases. She has particular expertise with cases involving health and science issues, and she has had significant victories in high-profile matters. In one case, Cynthia won motions to exclude the testimony of five of the plaintiffs' experts and had the claims of all of the trial plaintiffs dismissed. A journalist described Cynthia as "formidable" and "the mastermind behind the team's savvy attack." She has been selected seven times as a California "Top Female Litigator" by *The Los Angeles/San Francisco Daily Journal*, and she has been included in *Best Lawyers of America*.

Cynthia is currently Chair-Elect of the ABA Section of Science & Technology Law, Vice-Chair of the Long Range Planning Committee and a member of the Section Council. She has served the Section in various leadership roles, including as Life & Physical Sciences Division Co-Chair and coeditor of the ABA SciTech Section book *Scientific Evidence Review: Monograph No. 9*, published in 2013.

She has been active in other bar and community organizations, including serving as Chair of the Executive Committee of the Yale Law School Association and President of the San Diego Chapter of the Federal Bar Association. Cynthia has made presentations to many organizations, including the Association of General Counsel and the National Judicial College.

Cynthia graduated from Yale College in 1983 (summa cum laude) and from Yale Law School in 1987. She served as a judicial clerk to the Honorable Thomas Meskill on the Court of Appeals for the Second Circuit.

Section Chair-Elect

Eileen Smith Ewing practices law in Boston, where she counsels her life sciences clients on a variety of business transactions, ranging from traditional mergers, acquisitions, and capital financing to complex, cutting-edge product development collaborations and other strategic alliances.

Eileen publishes and lectures frequently on legal issues of interest to the biopharmaceutical and medical device sectors. She is the author of more than 50 publications. Eileen served as coeditor-in-chief and a chapter author of the ABA SciTech Section book *Biotechnology and the Law: A Primer*. She also contributed chapters to two books in the Aspatore Press *Inside the Minds* series: *Life Sciences Mergers and Acquisitions* and *Winning Legal Strategies for Life Sciences Settlements and Negotiations*. Legal Media Group/Euromoney has named Eileen a 2012 and 2013 "Life Sciences Star" in the Financial & Transactional category.

Eileen currently serves as Vice-Chair of the ABA Section of Science & Technology Law, Chair of the Administration Division, Vice-Chair of the Long Range Planning Committee, a member of the Section Council, and a member of the Finance Committee. Past ABA positions include Chair and Co-Chair of the Section's Life and Physical Sciences Division, Chair of the Section's Biotechnology Committee, and member of the ABA Special Committee on Bioethics and the Law. Eileen is an American Bar Foundation Fellow and serves as Co-Chair of the Board of the National Conference of Lawyers and Scientists (American Academy for the Advancement of Sciences).

Eileen received her A.B. in East Asian Studies, summa cum laude, from Harvard University and her J.D. from Columbia University School of Law.

Section Vice-Chair

David Z. Bodenheimer is a Government Contracts partner and litigator in Crowell & Moring LLP's Washington, DC, office, where he heads the Homeland Security practice.

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Representing all sizes of technology clients for 32 years, David litigates, counsels, and resolves the full range of issues confronting clients selling to the government. *See, e.g., US v. UTC* (6th Cir. 2015) ($657 million False Claims Act litigation); *BAE Systems*, 2013 CPD § 278 (NextGen airborne jammer protest litigation); *Supreme Foodservice GmbH v. United States*, 109 Fed. Cl. 369 (2013) (injunctive action on $8 billion acquisition); *Health Net Federal Services*, 2009 CPD § 220 ($16 billion protest litigation); *Wynne v. UTC*, 463 F.3d 1261 (Fed. Cir. 2006) ($299 million defective pricing trial/appeal). He authored the *Defective Pricing Handbook* (Thomson West, 2014–15 ed.) and regularly lectures on government contracting, pricing, and fraud matters.

Nationally recognized by Chambers USA in Government Contracts as "a leading lawyer within the cybersecurity space," he advises and trains Fortune 500 companies on cyberlaw and security (NIST standards, cloud, FedRAMP, APT breaches, network audits, and cyber disputes), handles protest litigation on cyber issues, testifies before Congress on cybersecurity, teaches cybercontracting for Federal Publications, and publishes extensively. He currently serves as ABA SciTech Section Secretary; Co-Chair of the Security, Privacy, and Information Law Division; Co-Chair of the Homeland Security Committee; and a member of the Section Council. He also serves as a Public Contract Law Section Committee Co-Chair (Cybersecurity, Privacy, and Data Protection) and as a member of the ABA President's Cybersecurity Legal Task Force.

Section Secretary

William B. Baker is a partner in the Potomac Law Group, PLLC, a Washington, DC-based law firm. He has practiced for more than 30 years in the areas of communications, technology, and postal law, with particular interest in privacy, information law, and marketing communications. He is a frequent author and lecturer on privacy and postal matters. He previously practiced for more than 30 years in the Washington, DC, law firm Wiley Rein LLP.

Bill has served as Budget Officer of the Section of Science & Technology Law since 2012 and as Assistant Budget Officer prior to that. He has served on the Section's Council since 2008. He has chaired or co-chaired several Section committees, including the committee on Telecommunications and Information Services from 1998–2002, the ePrivacy Law Committee from 2003–2008, and the Data Property Rights Committee since 2013. He is a Fellow of the American Bar Foundation.

He has written numerous articles on privacy and technology issues, contributed to several Section publications, and served as a moderator or panelist on a number of Section programs. Bill chaired the Government Affairs Committee of the Northern Virginia Technology Council from 2001–2005 and served on Advisory Committees to the Virginia General Assembly's Joint Commission on Technology and Science from 1997–2005.

Bill holds a bachelor of arts degree in economics, and a juris doctor degree, both from the University of Virginia. He lives in Arlington, Virginia.

Section Budget Officer

Garth B. Jacobson serves as a Senior Government Relations Attorney for CT Corporation. Previous positions include working as an attorney at Preston Gates and Ellis LLP and chief legal counsel to the Montana Secretary of State. As chief legal counsel, he successfully litigated election law cases before the state trial and appellant courts and federal courts. During that tenure, he also served on the state bar committees that drafted business entity legislation including profit and nonprofit corporate acts, revisions to the partnership laws, and the limited liability company act. Additionally, he developed and administered alternative dispute resolution of business name infringements. He served on the Montana Ethics Advisory Commission, on the Board of Trustees of the State Bar of Montana, and as president of the First Judicial District Bar Association.

Garth served as an observer/advisor to various Uniform Laws Commission business entity drafting committees. Currently he participates as an "observer" on the Series LLC drafting committee and the ABA advisor on the Wage Garnishment Committee. He is a member of the ABA Business Law and the Science & Technology Law sections where he serves as co-chair on both ULC Committee and E-filing Committee and LLC Committee subcommittee chair. Garth also serves as SciTech's Assistant Budget Officer. He coauthored an article, "Electronic Service of Process," published in the Spring 2008 *SciTech Lawyer*.

Garth has many years' experience with legal education as a presenter, organizer, or moderator of numerous continuing legal education (CLE) programs. He conducted programs on a variety of topics, including tax law, corporations, LLCs, UCC, service of process, and legal ethics. He also taught business law classes at Carroll College as an adjunct professor, in Helena, Montana.

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Garth enjoys rock, alpine, and ice climbing. His climbing resume includes summits of Mt. Rainier, Mt. Hood, Mt. Adams, Mt. Baker, Castleton Tower, and the Snake Dike route on Half Dome, Yosemite. He is a member of the Seattle Mountaineers' climbing program. Additionally, he often creates pottery at Pottery Northwest, where he completed a 10-year term on its board of directors.

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Section Delegate to the ABA House of Delegates

Bonnie Fought was a founder and member of the executive team of Connectix Corporation for more than 15 years and served as its chief financial officer, general counsel, and later chief operating officer. Connectix designed, manufactured, and marketed an array of computer software and hardware products. After licensing and selling various technologies, Connectix's primary technology was sold to Microsoft Corporation in 2003.

For the past six years, Bonnie has served as the Section Delegate in the House of Delegates for the Section of Science & Technology Law. In addition, Bonnie is a Past Chair of the ABA Section of Science & Technology Law. She served as the Chair of its Book Publishing Board for three years and as the Section's Budget Officer for three years. Bonnie also served as a member of the ABA's Standing Committee on Technology and Information Systems from 1999–2002, the Standing Committee on Publishing Oversight from 2011–2014 and currently serves on Standing Committee on Continuing Legal Education. Bonnie also serves as the Co-Chair of the SOC Decennial Governance Review Committee.

Bonnie has a J.D from the University of California at Berkeley (Boalt Hall) and was admitted to the California State Bar in 1990.

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Joe Pennell is a senior associate in the Business & Technology Sourcing practice in Mayer Brown's Chicago office. Joe focuses his practice on information technology and managed services transactions, including cloud computing, software licensing and development, and the outsourcing of finance and accounting services, IT infrastructure services and support, managed network services, and application development and maintenance. He is a Co-Chair of the ABA Section of Science & Technology Law's Cloud Computing Committee. Joe was recently recognized as a Rising Star in the Winter 2015 edition of *The SciTech Lawyer*. He graduated from Harvard Law School in 2008 and earned his undergraduate degree in electrical engineering (with high honors) from Michigan State University.

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BOOK REVIEW

PREDATOR: THE SECRET ORIGINS OF THE DRONE REVOLUTION

BY RICHARD WHITTLE

Reviewed by Casey Civiello

The date is September 4, 2001, less than a year after the suicide attack on the *USS Cole* in the Yemeni port of Aden. President George W. Bush is holding his first National Security Council Principals Committee meeting since his election. Just prior, the top counterterrorism official at the time, Richard Clarke, directs a note to then-National Security Advisor Condoleezza Rice pleading to extend drone usage beyond mere intelligence gathering by arming the aircraft. Clarke alludes to a feared (and, as we now know, actual) imminent al-Qaeda attack on American lives, warning: "What would those decision makers wish that they had done earlier? That future day could happen at any time" (page 226).

On multiple occasions in the preceding year, Predator unmanned aerial systems, (UASs, or more colloquially, "drones") had silently stalked and captured footage of Osama bin Laden, who was on the verge of becoming an infamous household name. In the months prior the 9/11 attacks, members of "Big Safari," a quasi-secret United States Air Force group of engineers, had scrambled to weaponize the drone with laser-guided Hellfire missiles, and Clarke was determined to cut through bureaucracy and gain authority and guidelines for use of these missiles to kill terrorist threats. The technology remained an afterthought by hardened military officials, viewed as more gimmick than as a functional tool. Pilots directed to Indian Springs, Nevada, to remotely fly the early Predator view the assignment as punishment, sarcastically referring to it as "life at One G." But after 9/11, a new attitude emerged.

In *Predator*, Richard Whittle invites the reader behind the curtain of secrecy surrounding the drone warfare program. He traces the documents and influential players in the struggle to capture funding and implement drone technology, juxtaposed against the rise of al-Qaeda in the Middle East. The account of events humanizes the creation of a silent stalker; balancing a sequential story with technical jargon among a colorful cast of engineers, government officials, and political fixers who together transformed the Predator from a military afterthought to perhaps the world's most valuable intelligence gathering and fear-inducing active weapon, capable of silently stalking and destroying targets anywhere on earth.

As with any good story, the truth lies not only in the composite materials and feats of engineering but in the characters who bring the technology to life. Whittle takes the reader to 1973, the end of the Yom Kippur War between Israel and an Arab coalition led by Egypt and Syria. Abe Karem, an Israeli engineer who had risen to be chief designer with the government-owned Israel Aircraft Industries, was issued a challenge to rapidly create a decoy that could be released from a fighter jet to fool the Arabs' Soviet-built surface-to-air missile radar systems, which had served as a formidable counter to the powerful Israeli Air Force.

Though undistinguished in its military application, the decoy created was functional within two weeks and inspired Karem to recognize the future of unmanned flight. This occurrence pushed him to start Leading Systems, Inc. in his garage some years later, after relocating to California. The lightweight, broad-wing aircraft dubbed the "Amber" would later evolve to become the physical platform for General Atomics to create the present-day Predator.

Whittle observes that "Necessity is the mother of invention, and war [is] the mother of necessity" (page 293). Demand for development of the Predator increased during the conflict in the former Yugoslavia, where frustration reigned over lack of intelligence about movement of Serbian artillery targeting civilians in Bosnia. Early versions of the Predator flew over the region in 1995 with mixed success. One Predator was shot down by the Serbian military, while another crashed as a result of engine failure. The real-time information gathered amazed military commanders. But, due to lack of clearly defined leadership and disputes between the Navy, Army, Air Force, and CIA, targeted development of the Predator project was effectively handcuffed until the Air Force assumed full control of the program in October 1997.

Thereafter, advancements sped along, largely due to Big Safari, headquartered at Wright-Patterson Air Force Base in Dayton, Ohio. Development was guided by philosophies such as "modify, don't develop" and "provide the necessary, not the nice

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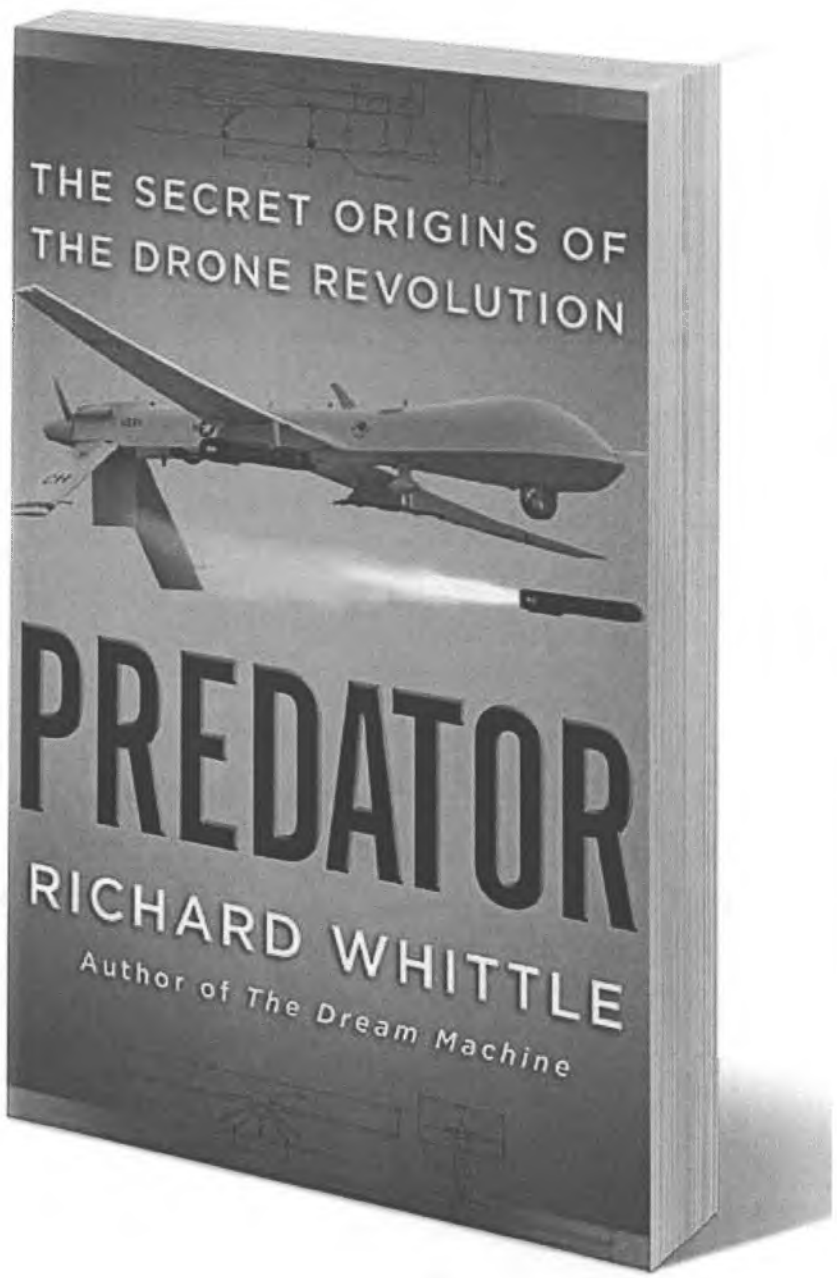
to have." The Big Safari team and their supporting advocates inside the government are painted by Whittle as a group of gunslingers who efficiently carry the Predator project from successful experiment into modern-day prevalence, applying innovative ideas (streaming video, multiple-point flight control) to existing military hardware. The culmination of Big Safari innovation efforts resulted in a joint CIA-Air Force team tracking down and killing al-Qaeda military chief Muhammed Atef near Kabul, Afghanistan, in the weeks following 9/11.

Although it is possible to get lost at times in the alphabet soup of government programs, call-names, and plane designations, Whittle gives the reader confident insight into how the innovators were able to cut through red tape, draw resources, and complete a secret project under intense pressure and timelines. In truth, the sometimes confusing roster of players tied to the creation of the Predator may play as a parallel to the complexity of government contracting and development itself. Perhaps the hesitance displayed through bureaucracy is a necessary check on technological development that seems to be outpacing the balancing moral review.

Predator successfully lifts the veil of secrecy shrouding perhaps the most influential military innovation of a generation, but Whittle passes on the opportunity to analyze the ethical questions surrounding the Predator. References in the book to collateral damage are sterile, though likely an accurate representation of the feelings of those individuals affiliated with creating and operating the Predator. The book's excitement-inducing narrative tempts the reader to accept impolitic portrayals of casualties of war, such as referring to human bodies blown from a Hellfire blast as "flippers," or to those crawling from the scene as "squirters." Instead, the invitation (to the reader) could be for a more thorough reflection on the long-term impacts of remote-controlled warfare. What are the moral hazards of dehumanizing casualties? What role do anonymous strikes and collateral damage play in advancing the radicalization of Islam? What are the legal and foreign policy implications of this "video game" warfare?

Whittle perhaps recognizes the limitations of his book when near the end he posits, "When automobiles replaced horses, traffic laws and stoplights were needed" (page 305). The military development of unmanned aerial vehicles has quickly skipped to the consumer market and sparked huge popularity of drones for personal and commercial applications. This expansion further stretches the need for timely thought and action with respect to the role that innovators and lawmakers alike will have in shaping the future of drone usage. ◆



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Make Connections That Matter at the ABA Annual Meeting: Sweet Home Chicago

By Ruth Hill Bro

In a 24/7 world humming on mobile technology, it's easy to forget that coming together face-to-face, in person, is the best way to make the connections that matter most. Although *distance* learning, *remote* connections, and *virtual* meetings are essential, they seem so far away and never quite as good as the real thing. In fact, one definition of "virtual" is that it is "*almost* or *nearly* as described, *but not completely*."

That's why most leading businesses recognize a key concept backed up by mounting data from biologists, computer scientists, and psychologists: no matter how well we communicate electronically, it's vital to come together in person. Two *Forbes* articles by Susan Adams, called "Being There" and "Why We Need to Meet in Person," discussed such data and noted, "Meeting face to face does three things better than virtual meetings. It captures trust, it inspires positive emotions, and it builds relationships."

If you doubt it, consider the many things you do more effectively in person: (1) going home for the holidays, relaxing with friends, and celebrating milestones; and (2) building relationships with clients and prospects, conducting job interviews, meeting potential employers and future colleagues, and expanding your network of peers and mentors. The list is endless. No matter what our personal life is like or our job setting is, *we're all in the people business.*

However much you get from your SciTech membership, you could be getting even more of that *SciTech Edge* if you visit your home Section at the ABA Annual Meeting. From July 30th through August 4, 2015, the American Bar Association will meet in Chicago, home to ABA headquarters, renowned architecture, high-profile professional sports teams, Lollapalooza and other top music venues, beautiful Lake Michigan, the Cloud Gate sculpture and Millennium Park, and the Art Institute (site of the 2015 ABA President's Reception) and other internationally acclaimed museums.

Join SciTech at the Annual Meeting to make the connections that matter most: at the SciTech Luncheon (with a top-notch speaker), the SciTech Reception (this year focused on diversity and inclusion and cohosted by the ABA Intellectual Property Law Section), SciTech and ABA CLE programs (meet the speakers), SciTech committee meetings on hot topics (explore ways to contribute and raise your profile), the ABA General Assembly (featuring a keynote address from a US Supreme Court Justice or other prominent legal figure), the ABA Expo (with a Grisham-esque authors panel on "The Law as a Platform for Writing"), etc. You'll also find:

- Meaningful ways to interact with other forward-thinking practitioners (find the answers you need now and colleagues and mentors for years to come).
- Indispensable resources and perspectives that make your work life easier.
- Opportunities to get involved, share insights, and shape law and policy on issues that are not only important, but also important to get right.
- So much more. Register and explore your options at ambar.org/scitech and ambar.org/annual. (Law students: for only $50, you can access 150+ CLE programs, dozens of committee/governance meetings, the General Assembly, and Expo.)

We hope you'll join us every year for the Annual Meeting, but especially this year in Chicago, whether you know it as Sweet Home Chicago (a la the Blues Brothers), my kind of town (a la Frank Sinatra), the Windy City (politics, and literally the wind), or the City of the Big Shoulders (a la poet Carl Sandburg). By standing on those shoulders, you'll see farther and make more of the connections that matter to you. ◆

Ruth Hill Bro, privacy attorney, speaker, and author (Chicago), chairs the Membership and Diversity (MAD) Committee of the ABA Section of Science & Technology Law and served as the 2008–09 Section Chair. She can be reached at ruth.hill.bro@gmail.com.
"It's a MAD World: Membership and Diversity, with a SciTech Edge," is a column designed to spotlight membership and diversity-related topics, resources, and opportunities for SciTech members.

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ABOVE: Pepper has the SciTech Edge. Wouldn't you like to be a Pepper, too?

ABOVE: 2015 ABA Midyear Meeting (Houston); All of these SciTech leaders want to see you in Chicago.

ABOVE: Ruth Hill Bro introducing SciTech Luncheon speaker Chris Kelly, then Facebook Chief Privacy Officer, General Counsel, and Head of Global Public Policy, 2007 ABA Annual Meeting (San Francisco).

LEFT: SciTech CLE panel, "Need-to-Know Information from the Women of Cybersecurity," selected to be part of the Commission on Women in the Legal Profession's Day of the Woman, 2013 ABA Annual Meeting (San Francisco).

LEFT: Speakers with SciTech mobile devices after their panel on "The Mobile Transformation: The Extraordinary Legal Implications of Billions of Mobile Devices," SciTech CLE program, 2013 ABA Annual Meeting (San Francisco).

ABOVE: Section Chairs celebrating SciTech's 35th anniversary, 2009 ABA Annual Meeting (Chicago), SciTech Reception.

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CLE Webinar

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August 25, 2015
Understand How to Overcome Implicit Bias and Other Cognitive Bias to Be Better Lawyer
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September 9, 2015
Lawyer Interrupted: Ethics and Workplace Distractions
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September 22, 2015
Privacy, Probate, and What Happens to Your Digital Data After You Die
CLE Webinar

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Economic Impact of a Pan-Pacific Unmanned Aircraft Systems Test Site - McDowell Group (2013)

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Economic Impact of a

Pan-Pacific Unmanned Aircraft Systems Test Site

May 2013

PREPARED FOR

Alaska Center for Unmanned
Aircraft Systems Integration
University of Alaska Fairbanks

PREPARED BY

McDowell
GROUP

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Executive Summary

Purpose and Scope

In March 2013, the University of Alaska Fairbanks Center for Unmanned Aircraft Systems contracted with McDowell Group to analyze the economic conditions for unmanned aircraft systems (UASs) in Alaska and measure the projected economic impact of developing a Federal Aviation Administration (FAA) test site for UAS in Alaska. The economic impact assessment (EIA) in this report provides annual projections of the direct, indirect, and induced impacts to employment and wages as well as projections of output and value added related to the test site, called the Pan-Pacific UAS Test Range Complex (PPUTRC) – with test ranges located in Alaska, Hawaii, and Oregon. The EIA focuses on the additional economic activity that is expected in response to the PPUTRC test site selection. Additional information is provided in this report on the economic impact of the commercialization of UAS specifically in Alaska once UAS flights are allowed in the National Airspace System (NAS).

Summary

- UAS represent a new industry that is set to quickly grow once new government regulations increase access to designated test sites and then to the National Airspace System (NAS), the system of air traffic control that enables safe and efficient flight activity in the U.S.
- UAS applications are far reaching for civilian and military purposes; ranging from environmental monitoring to search and rescue to pipeline or powerline inspections.
- The FAA has limited the authorized use of UASs in the U.S. to efforts focused on the public interest. There are currently two ways to operate a UAS with the approval of the FAA (both of these options require that the flight takes place outside of densely-populated areas):
    - Certificate of Waiver or Authorization (COA) for public UAS
    - Special airworthiness certificate for private sector (civil) UAS
- However, the FAA is scheduled to designate six UAS test sites in the U.S., as required under the FAA Modernization and Reform Act of 2012. The sites will operate from January of 2014 to February 13, 2017 to provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UASs in the NAS.
- According to the Association of Unmanned Vehicle Systems International (AUVSI), integration of UASs into the NAS will generate some $82 billion in activity in the U.S. between 2015 and 2025; employment impacts are estimated at just over 100,000 jobs by 2025.

- In an effort to bring additional UAS activity and related economic benefits to Alaska, UAF is leading the PPUTRC Test Site application process for 13 ranges in Alaska, Hawaii, and Oregon.
- Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide-open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts).
- In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from $57 million in 2014 to about $76 million in 2017.
- Output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017.
- Value added would climb from $109 million to $134 million over the same period.
- Designation of the PPUTRC will provide a four-year total of $20 million of income tax revenue to Hawaii and Oregon.

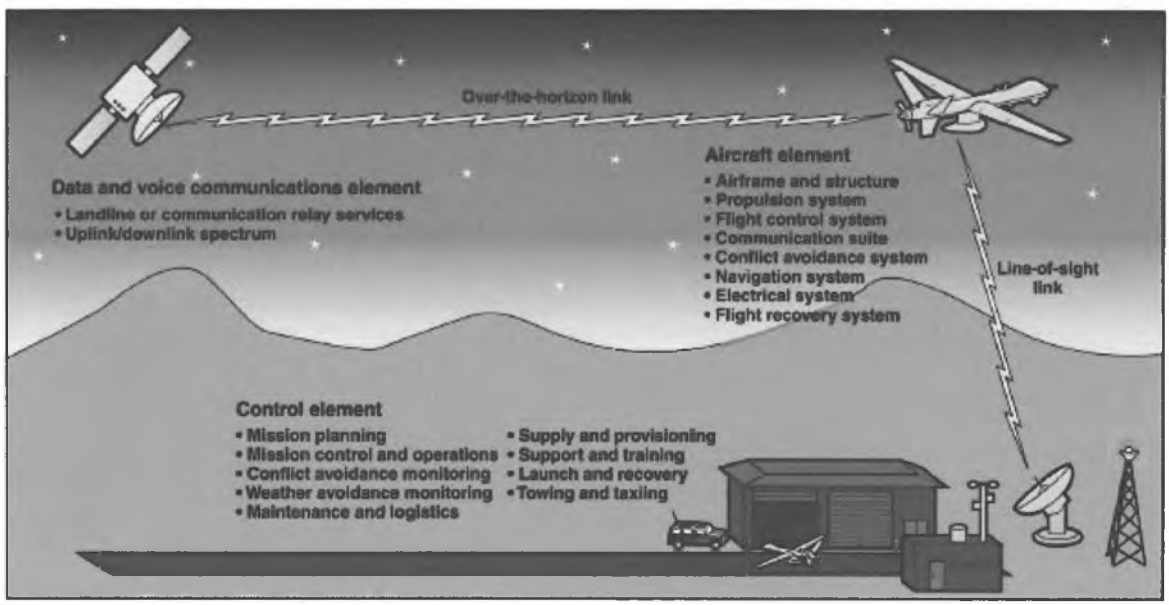
Chapter 1. Unmanned Aircraft Systems in the United States and the NAS

Background

Unmanned aerial vehicles (UAVs) were first described in the late-19th century. Early attempts to develop these UAVs, mostly for combat purposes, soon followed. These remotely piloted vehicles first entered U.S. combat in the mid-20th century to support missions focused on reconnaissance and surveillance, and sometimes they were also used as decoys. Throughout most of the 20th century UAVs lacked real-time data capability and instead focused on collecting images and video for surveillances purposes. Widespread adoption of the technology for U.S. military purposes did not begin until the 1990s and, to a much greater extent, the 2000s during the Afghanistan and Iraq conflicts. It was at this point that technological innovations related to onboard sensors, communication links, and data collection began drastically increasing the potential domestic uses of unmanned aircraft systems.

The increase in complexity for the UAVs required a systems approach to appropriately understand the interactions - and design each component from the start as an integratedsystem - among the on-the-ground control elements, the aircraft, and the communication links. This broader operational perspective is termed "unmanned aircraft system" (UAS). The image below provides a conceptual rendering of the interactions among key elements of a UAS flight.

Figure 1: Conceptual Rendering of an Unmanned Aircraft System



Source: GAO, 2013

UAS Applications

Unmanned aircraft often provide advantages in comparison to manned aircraft. For instance, flights that are dangerous or covert represent potential opportunities where an unmanned vehicle might be preferred over a manned vehicle. Similarly, dull tasks such as extended surveillance missions may be better suited for ground-based operators that can be relieved at the end of their shift. UAVs are often more fuel efficient, quieter, and less disruptive to their surroundings (in comparison to manned aircrafts) and, thus, can allow for fewer environmental disturbances as well as more accurate research results. Finally, initial costs, operating costs (e.g. maintenance costs, fuel costs, storage costs, etc.), and labor costs (e.g. wages, insurances, etc.) are all generally lower for UAVs (Source: Austin, 2010). UASs have already been shown to lead to arrests as well as saving lives during search and rescue missions (Source: The Verge, 2013).

The existing and potential applications for UASs are wide ranging for both civilian uses as well as for military purposes. The lists below provide an abbreviated look at how important this relatively new field may become to sectors throughout Alaska's economy (Source: Austin, 2010):

Civilian

- Aerial Photography - Film, video, stills, etc.
- Agriculture - Crop monitoring and spraying; herd monitoring and driving
- Coastguard – Search and rescue, coastline, and sea-lane monitoring
- Conservation – Pollution and land monitoring
- Customs and Excise – Surveillance for illegal imports
- Electricity Companies – Powerline inspection
- Fire Services and Forestry – Fire detection, incident control
- Fisheries – Fisheries protection
- Gas and Oil Supply Companies – Land survey and pipeline security
- Information Services – News information and pictures, feature pictures (e.g. wildlife)
- Lifeboat Institutions – Incident investigation, guidance, and control
- Local Authorities – Survey, disaster control
- Meteorological Services – Sampling and analysis of atmosphere for forecasting, etc.
- Oil Companies – Pipeline security
- Ordinance Survey – Aerial photography for mapping
- Police Authorities – Search for missing persons, security and incident surveillance
- Rivers Authorities –Water course and level monitoring, flood and pollution control
- Survey Organizations – Geographical, geological, and archaeological survey
- Traffic Agencies – Monitoring and control of road traffic
- Water Boards – Reservoir and pipeline monitoring

Military

- Navy
    - Shadowing enemy fleets

    - Decoying missiles by the emission of artificial signatures
    - Electron intelligence
    - Relaying radio signals
    - Protection of ports from offshore attack
    - Placement and monitoring of sonar buoys and possibly other forms of anti-submarine warfare
- Army
    - Reconnaissance
    - Surveillance of enemy activity
    - Monitoring of nuclear, biological, or chemical (NBC) contamination
    - Electronic intelligence
    - Target designation and monitoring
    - Location and destruction of land mines
- Air Force
    - Long-range, high-altitude surveillance
    - Radar system jamming and destruction
    - Electronic intelligence
    - Airfield base security
    - Airfield damage assessment
    - Elimination of unexploded bombs

UAS Categories

UASs are typically categorized based on the size or capability of the UAV. The five categories below provide a common categorization of UAS that helps simplify requirement assessments and costing estimates (Source: Teal Group, 2008):

- Micro or Mini – A small UAV that ranges in size from something that can be held in the palm of the hand to a UAV that can be carried on your back and launched by hand.
- Naval – A tactical UAV is generally operated with simpler systems over a radius between 100 and 300 km.
- Tactical – A reconnaissance UAV used by the Army for endurance missions ranging several hours over an operating radius up to 200 km.
- MALE – Medium Altitude Long Endurance reconnaissance UAVs fly between 5,000 and 15,000 meters in altitude for approximately 24 hours.
- HALE – High Altitude Long Endurance reconnaissance and surveillance UAVs are usually operated by Air Forces at altitudes over 15,000 meters for periods longer than 24 hours.

National Airspace System

The NAS was developed to allow for safe and efficient commercial aviation. However, commercial UAS flights are currently not allowed in the NAS due to concerns over (1) "the inability to detect, sense, and avoid other aircraft and airborne objects in a manner similar to 'see and avoid' by a pilot in a manned aircraft, (2) vulnerabilities in the command and control of UAS operations, (3) the lack of technological and operational standards needed to guide the safe and consistent performance of UAS, and (4) the lack of final regulations to accelerate the safe integration of UAS into the national airspace" (Source: U.S. GAO, 2012 and Waggoner, 2013).

The first authorized use of UASs in the NAS in the U.S. was permitted by FAA in 1990. Over the past 23 years, the FAA has limited the authorized use of UAS in the U.S. to efforts focused on the public interest. These missions have included border patrol, military training, disaster relief, firefighting, search and rescue, law enforcement, and testing and evaluation. According to the FAA, the Department of Homeland Security currently utilize UASs for border and port surveillance; NASA and NOAA utilize UAS to help with scientific research and environmental monitoring; law enforcement agencies utilize UASs to support public safety; and state universities use UASs to conduct research (Source: FAA Fact Sheet 2013). These efforts are limited to areas outside of major urban areas at elevations less than 50,000 feet. The aircraft range in size from a hummingbird to a wingspan as large as a Boeing 737; although many are the size of a remote-control plane or helicopter. Recreational use of airspace is allowed away from airports and air traffic and below 400 feet above ground level – informal flights for business purposes are specifically excluded (Source: FAA Advisory Circular 91-57).

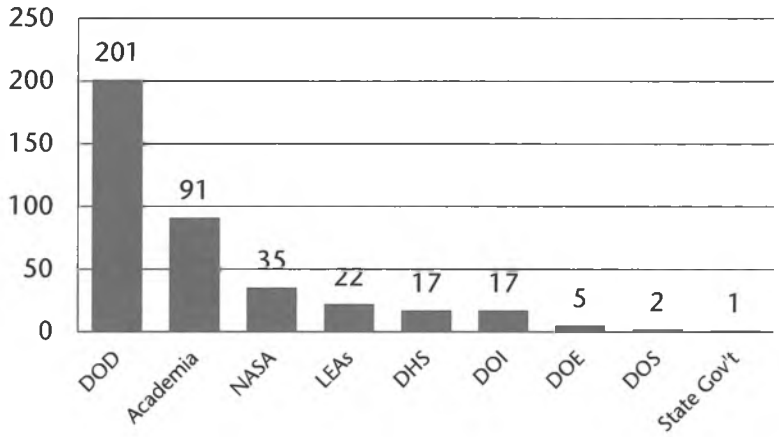
As of 2013, there are currently two ways to operate a UAS with the approval of the FAA: (1) Certificate of Waiver or Authorization (COA) for public UAS's and (2) special airworthiness certificate for private sector (civil) UAS's – both of these options require that the flight takes place outside of densely-populated areas.

Certificate of Waiver or Authorization (COA)

COAs allow public entities to fly UASs in a defined block of civil airspace. The FAA issued the first COAs in January 2007. With COAs, the UAV must remain in view, either of the ground crew or via a chase plane, since UAS technology cannot currently comply with 'See and Avoid' rules. COAs usually require between six and 24 months for approval and cost $40,000 to $60,000 (Source: Economic Development of Central Oregon, 2011). Most of the cost is for specialists in the testing protocols, documentation, and in managing the process through the FAA. Common applications by COA holders include firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions (Source: FAA 2013b). The number of COAs issued has increased since 2009, with 146 in 2009, 298 in 2010, and 313 in 2011 (Source: FAA 2013b). In 2012, the FAA issued 391 COAs to 121 federal, state, and local government entities in the U.S. A total of 1,428 COAs have been issued since January of 2007 (Source: GAO 2013). As of February 15, 2013, there were 327 active COAs (Source: FAA 2013b).

The graph below aggregates the 391 COAs issued in 2012 to nine types of entities: U.S. Department of Defense, academia, NASA, local law enforcement agencies, U.S. Department of Homeland Security, U.S. Department of the Interior, U.S. Department of Energy, U.S. Department of State, and state government.

Figure 2: Number of Approved COAs, 2012



Source: GAO, 2013

Special Airworthiness Certificate

Special airworthiness certificates are the only way for civil operators to fly UASs in the NAS at present. However, these certificates cannot be utilized to carry people or property for compensation or hire – they can only be issued for research and development, crew training, or market surveys (Source: FAA 2011).

Allowing UAS in the NAS

In recent years the FAA has made a concerted effort to integrate UAS regulations into the NAS. In 2009, the FAA, NASA, DoD, and the Department of Homeland Security began addressing pathways to integrating UAS regulations into the NAS through their UAS Executive Committee. Additionally, the FAA chartered a UAS Aviation Rulemaking Committee in 2011 to create operational procedures, regulatory standards, and policies related to UAS flights in the NAS. In 2012, the FAA Modernization and Reform Act of 2012 (FMRA of 2012) was passed by Congress to approve six test sites where UAS integration could be tested prior to a 2015 integration of UAS regulations in the NAS (Source: FAA 2012). Delays within the FAA due to technical, logistical, and public outreach concerns may contribute to a UAS integration date later than 2015. However, six test sites are still scheduled to run from January 1, 2014 to February 13, 2017.

Six UAS Test Sites

There is considerable competition over where test sites will be designated, since designation will provide immediate employment in the selected region and support a strong foundation for UAS activity prior to integration of UAS regulation in the NAS. As of March 5, 2013, 50 applicants from 37 states were granted access to the FAA test site application web portal (Source: FAA 2013b). The FAA will consider

five key items when deciding the location of the six test sites: (1) geographic and climatic diversity, (2) location of ground infrastructure and research needs, (3) consultation with NASA and DOD, (4) population density and air traffic density of the surrounding area of any proposed location as well as the potential impact areas in the event of incidents, such as "Fly away" given potential safety mitigations; and (5) identification of specific goals and objectives to be accomplished. Additionally, the test sites are expected to provide an environment and opportunity to test conventional takeoff and landing capability, high speed flight (greater than 250 knots indicated air speed), maritime (launch/maneuver/recovery) capability, operations at extremely high altitudes (Class A airspace and above), and evaluation of dissimilar aircraft (including a mix of manned and unmanned aircraft) in multiple altitude structures (Source: FAA 2013a).

The six test sites that are selected will support the following operations and programs:

- Safe designation of airspace for integrated manned and unmanned flight operations in the national airspace system;
- Development of certification standards and air traffic requirements for unmanned flight operations;
- Coordinating with and leveraging the resources of NASA and the Department of Defense;
- Addressing both civil and public unmanned aircraft systems;
- Ensuring that the program is coordinated with the Next Generation Air Transportation System; and
- Ensuring the safety of unmanned aircraft systems and related navigation procedures before they are integrated into the national airspace system (Source: FAA, 2013b).

The test site operators will provide opportunities for government agencies, industry, and researchers to access this airspace to aid in the integration of UAS regulations in the NAS. Additionally, data collection will support development and operations research and professional development opportunities will be available for inspectors, airspace managers, air traffic controllers, and others. The specific goals described by the PPUTRC applicants include (Source: PPUTRC, 2013):

- Develop a set of standards for select unmanned aircraft categories, for aircraft state monitoring, and navigation. PPUTRC goals and objectives work will augment ongoing standards work with research on categories of UAS not yet addressed, and evaluations needed to refine emerging standards under consideration;
- Validate FAA acceptable risk thresholds or safety management system standards for UAS operations;

- Identify safety factors in UAS design; validate certification standards, including protocols for air traffic control interaction. Define and qualify underlying assumptions and a minimum set of air vehicle characteristics critical to safety, reliability, etc.;
- Develop effective, compliant 'sense and avoid' systems to satisfy regulatory guidance;
- Identify gaps in federal and state statutory and case law protections for privacy and recommend policies or legislation to remedy;
- Directly support the federal mandate for "Expanding Use of UAS in the Arctic" (in Sec 332(d) of Public Law 112-95);
- Design experiments and provide data to support American Society for Testing and Materials (ASTM) F38 and Radio Technical Commission for Aeronautics Special Committee (RTCA SC) 203 to evaluate minimum training and operator qualification standards for crew licensing.

Economic Impact of UAS in the U.S.

The economic implications of integrating UAS regulations into the NAS are substantial. According to a study conducted for the Association for Unmanned Vehicle Systems International (AUVSI), integration will generate $82 billion in activity between 2015 and 2025. Employment impacts are estimated at just over 100,000 jobs by 2025.

The direct economic impact of UAS development in the U.S. is expected to climb from $1.1 billion in 2015 to over $5 billion annually by 2025, measured in terms of output. Including indirect and induced effects, the annual economic impact is expected to rise from $2.3 billion in 2015 to $10 billion in 2025 (Source: AUVSI, 2013).

Areas selected as UAS test sites will have an advantage in capturing these economic benefits; thus the fierce competition among the 50 applicants.

Chapter 2. Pan-Pacific Test Range Complex

In 2012, the Alaska Center for UAS Integration (ACUASI) at the University of Alaska Fairbanks Geophysical Institute began collaborating with Oregon State University and the University of Hawaii to propose a Pan-Pacific Test Range Complex (PPUTRC) as one of the six FAA test sites. This proposed PPUTRC contains 13 test ranges located in Alaska, Hawaii, and Oregon. Of the 13 ranges, six ranges are in Alaska (Denali, Kodiak, North Slope, Oliktok, Poker Flat, and Wainwright), three ranges are in Hawaii (Humuula-R-3103, Makua-R-3109, and Maku-R-3110), and four ranges are in Oregon (Juniper MOA, Pendleton, Tillamook Coastal, and Warm Spring).

Existing UAS activity in Alaska, Hawaii, and Oregon benefits from unique assets and opportunities, including government facilities (e.g. numerous military bases, universities, and maritime assets), wide open airspace in largely unpopulated areas, and geographic diversity (e.g. tropical to arctic climates, oceanic or mountainous landscapes, and up/down weather fronts). The diverse testing environments for the PPUTRC are included in the Table 1 below:

Table 1: Diversity of Potential Testing Environments for the PPUTRC

360 degree oceanic airspace access	Arctic landscape	Extreme low temperatures
Oceanic and sea-ice access	High arctic winds	High sea-salt corrosion effect
Able to fully matrix UAS into NextGen and air traffic operating both VFR and IFR; high and low altitude	Operations in all classes and categories of military SUA	Operations in Classes A through F international airspace in the oceanic environment
Class C, D, & E airspace within 5-nautical miles of airports	High and low-land vegetation tundra	Numerous inland waterways and lakes
High density airports integration studies and testing	Class C, D, & E airspace airport approaches/departures	High-humidity high and low-altitude
Hot and cold high-desert testing	Littoral coastal region mountainous area	Class E (high) airspace
Jungle conditions	Class A airspace	Mountainous terrain
Volcanic	Glacier	Ship traffic including open ocean and ports

UAS Activity in Alaska, Hawaii, and Oregon

There are currently 15 active COAs in the PPUTRC area as well as eight in-process COAs and 20 expired COAs.

Alaska

ACUASI at the University of Alaska Fairbanks (UAF) is the lead organization for the proposed PPUTRC. The formal PPUTRC team includes over 80 businesses, universities, tribes, and economic development organizations in Alaska. UAF has actively managed UAS operations since 2004.

ACUASI was formed in 2012 to enhance UAS research in Alaska. ACUASI and the UAF Geophysical Institute have developed and flown a variety of in-situ and remote sensing instruments on various UASs in Alaska and throughout the world. Scientific and research campaigns undertaken in Alaska over the past decade include using UASs to support observation and monitoring of sea lions in the Aleutian Islands, weather forecasting, volcanic plume monitoring, atmospheric sampling during wildfires, monitoring of sea ice build ups, and oil spill mapping. Commercial applications trialed in Alaska include whale monitoring, cadastral mapping, maritime navigation support, industrial plant monitoring, and environmental clean-up. This experience, coupled with the FAA's UAS test site status, would leverage a variety of new economic activities in Alaska.

The following table, which summarizes ACUASI activity in 2012, illustrates the variety of UAS activity supported by the organization. The table also provides revenue and staffing data for each UAS campaign.

Table 2: UAS Campaigns Supported by the University of Alaska Fairbanks in 2012

Client	Flight Locations	Type of UAS	Purpose of Flights	Revenue for Site Operator	Site Operator Staff	Flight Operator Staff
Aleutians	Aleutian Islands, AK	Aeryon Scout and Puma	Seal observation	$314,200	2 pilots	1 observer
Idaho	Lewiston, ID	Aeryon Scout	Salmon nest observation	$115,000	1 pilot	1 observer
Eglin Air Force Base	Fort Walton Beach, FL	ScanEagle and Aeryon Scout	Controlled burn experiment	$413,000	4 pilots	3 observers
Prudhoe Bay	Prudhoe Bay, AK	Aeryon Scout	British Petroleum flare stack monitoring	$190,000	1 pilot	1 observer
Nome	Nome, AK	Aeryon Scout	Harbor Ice monitoring for USCG	$30,000	1 pilot	1 observer
Ugak Island	Ugak Island, AK	Aeryon Scout	Seal population monitor	$6,500	1 Pilot	1 observer
Fort Greely	Fort Greely, AK	ScanEagle and Aeryon Scout	Flight test	$25,000	2 pilots	2 observers
Chile	Santiago, Chile	Aeryon Scout	Glacier Ice monitor	$9,000	1 pilot	1 observer
Belgium	Belgium	Gatewing	Flight training	$16,000	2 pilots	1 observer
Anchorage	Fort Richardson, AK	Aeryon Scout	Flight test and demonstration	$1,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	ScanEagle	Payload test	$347,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Aeryon Scout	Payload test and demonstration	$30,000	2 pilots	1 observer
Fairbanks	Poker Flat Research Range	Raven	Flight test for avionics	$5,000	2 pilots	2 observers
Hawaii	Offshore Hawaiian Islands	Puma	Tsunami debris tracking	$95,000	1 pilot	1 observer

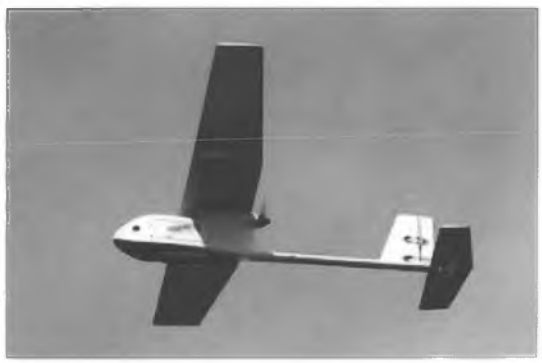
Sources: ACUASI, 2013

Figure 3: Types of UAS Flown in Alaska in 2012

Aeryon Scout

Boeing Insitu ScanEagle

AeroVironment Raven



Gatewing

AeroVironment Puma

Hawaii

Hawaii offers many unique qualities that make UAS operations appealing. These include: (1) expansive over-water areas unencumbered by other aviation uses, (2) proximity to U.S. Pacific Command – a significant user of future UAS systems, (3) opportunities for joint operations with the Pacific Missile Range Facility – a major test range on Kauai, and (4) opportunities for long-range point-to-point tests with partner ranges in Alaska and Oregon. The Hawaii ranges have proven an important focus for the development of scientific applications of UAS, with significant milestones including test flights of the Aerovironment Pathfinder; Pathfinder Plus; and Helios solar-hybrid propulsion high altitude, long endurance UAS, between 1997 and 2001. Scientific applications led by U.S. federal agencies have recently seen Hawaii emerge as a focal point for NOAA's exploration of UAS as a tool for marine park surveillance. NOAA has utilized UAS to monitor Papahanaumokuakea Marine National Monument since 2007 and performed initial trials using small hand launched systems in mid-2012.

Oregon

The Oregon-based PPUTRC team members include 16 businesses, universities, tribes, and economic development organizations. Additionally, six committed team partners will convert to formal team members upon FAA test site designation award to PPUTRC. Engagements are also planned with a wide ranging network in Oregon – including the 111 AUVSI members and numerous startup companies, primarily in sensor, robotics, and other supporting technologies. In comparison to Alaska and Hawaii, Oregon has historically been more engaged in design, development, and manufacture of UAV systems and subsystems.

The two largest Oregon UAS firms are Insitu (design, development, and manufacture of UAS systems) and FLIR Systems (remote sensors). The main Oregon firm involved in UAS applications has been Near Space Corporation (NSC). NSC uses very high altitude unmanned balloons and gliders to perform scientific and commercial test activities, ranging from data gathering on behalf of government agencies to near-space testing of hardware and sensors for commercial firms. NSC is opening a new $6 million flight test and operations facility at the Tillamook Airport on the Oregon coast. Existing UAS activity also includes the Oregon Army National Guard operations in Pendleton. Oregon's UAS efforts are synergistic with a separately funded ground vehicle innovation initiative, Drive Oregon, which requires systems that can be spun out of UAS: quiet, efficient motors, lightweight composite designs, and navigation systems. The potential economic benefits of the test sites, as well as NAS integration, are particularly strong for Oregon's already significant aircraft manufacturing sector.

Recent UAS Funding in Alaska, Hawaii, and Oregon

Since 2004, nine Alaska contractors have received direct U.S. federal agency contracts for UAS goods and services. The largest federal contract in Alaska is a 5-year standing services award, worth $47 million, from the U.S. Navy to the University of Alaska in 2010 for UAS payload integration and flight test services. The second major award made since 2004 to an Alaska firm consists of a series of pacts totaling $17 million from the U.S. State Department to Anchorage-headquartered Kuk Construction (subsidiary of Olgoonik Development, an Alaskan Native Corporation) for the provision of UAS-based security surveillance services in Iraq in partnership with KBR, Inc. UAF has collaborated with commercial entities, such as Idaho Power Company, and manufacturers including AeroVironment to conduct surveys and observe environmental impacts. Additionally, UAF has collaborated with BP for oil spill response and flare stack monitoring, as well as projects focused on detecting and locating gas and oil pipeline leaks and developing new sensors and processes to identify leaks.

Hawaii's large military presence has resulted in defense spending as the primary source of federal funding to UAS vendors in the state. Direct defense contracts accounted for 94 percent of all awards in terms of obligated amounts from 2004-2012, rising to 97 percent when including awards placed by the General Services Administration on behalf of the U.S. Air Force. The remaining awards were placed with Honolulu-based Referentia Systems by NOAA as part of the Papahanaumokuakea Marine National Monument monitoring project. Hawaii supports a dedicated UAS development and manufacturing company, Williams Aerospace, a small firm currently developing new platforms in the fixed-wing, hand launched micro and medium altitude endurance classes. The state is also working to create two commercial UAS services arms, addressing the defense, homeland security, and precision agriculture markets.

In Oregon, a consortium of industry, academia, and public entities has created a 7-year strategic plan to double the size of the UAS industry in the state, with the help of a $2.5 million State of Oregon grant scheduled for the 2013-14 biennium and additional investments of at least $1.15 million from other sources for a total of $3.65 million. The plan specifically creates UAS solutions for commercial applications, and safely integrating those UAS solutions into the NAS. Projects include emergency response; weather; firefighting; search and rescue; wildlife and habitat management; law enforcement; physical and resource surveys (land and water); management of agriculture, livestock, and public lands; and management of public and private infrastructure. Oregon State University (OSU) has already begun UAS flights based on these research objectives.

Leveraging Current Research Institutes, Community Colleges, and Training Centers

ACUASI is collaborating with the UAF College of Engineering and Mines (CEM) and the Community and Technical College (CTC) to integrate UAS engineering, science, and technology into UAF's teaching, research, and service activities. Additionally, ACUASI is working with the CEM to fill a full-time tenure track engineering faculty position with a professor focused on UAS engineering, science, and technology. ACUASI and CTC also intend to include UAS technology courses in CTC's aviation curricula to train UAS developers, technicians, and pilots as well as to improve outreach to remote Alaskan villages that could benefit from UAS technologies. Cooperation with the CTC at UAA will add air traffic controller participation, offer training for UAS operators, and ultimately build a maintenance program similar to the Aircraft and Powerplant program currently offered.

The University of Hawaii is testing UASs in several of its research programs, evaluating the utility and impact of UAS through analysis of coastal resource management, terrestrial and aquatic environmental monitoring, natural source management and inventory, and human impact studies. University of Hawaii is also developing programs to train students and research professionals on UASs, and plans to integrate this capacity into accredited degree programs.

The new OSU industry-university UAS consortium will depend on test site facilities for collaborative research and development in all phases of operations and applications. Through the Colleges of Engineering, Science, Agriculture, Forestry and Earth, Ocean and Atmospheric Sciences, OSU has expertise and supports ongoing research on control theory and robotics, flexible airframes and flight, sensors, and signal processing, and numerous applications in natural and environmental sciences and environmental monitoring, measuring, and management. OSU-Cascades, located in Central Oregon near the Warm Springs and Juniper test ranges, offers programs in energy engineering, computer science, natural resources, and business, and plans to add programs designed in conjunction with the UAS industry. OSU-Cascades can also provide on-site facilities for OSU-Corvallis researchers leading projects in the region. Central Oregon Community College (COCC) has one of the largest aviation flight training programs on the West Coast – both fixed wing and rotary. COCC offers certifications for UAS flight training and plans to develop a program for data analysis of sensors, building on the school's strong geographic information systems program. Additionally, Blue Mountain Community College (BMCC) in Pendleton, Oregon is developing a UAS curriculum for instructional delivery and course certification. Oregon Institute of Technology (OIT) offers a variety of degrees in engineering and engineering technology, composite engineering, computer and software systems engineering, and electrical engineering, including a master's degree in manufacturing engineering. It offers degrees in professional land surveying and geographic information systems. OIT is collaborating with Rockwell Collins, the aviation electronics company, on real-world projects at a joint campus outside Portland and offers similar hands-on collaborations with other aerospace firms in the northwestern U.S.

Expansion of Existing Businesses and Attracting New Business Investment

The University of Alaska has spun off at least two companies who intend to test their products on the Pan-Pacific test range. These companies were created by University graduate students who were expanding their research in sensors for testing in UASs. UA recently received $5 million from the State of Alaska to support the development of a sustainable high-tech industry in Alaska. Already two companies have established satellite offices in Alaska to improve collaboration with the ACUASI.

Placement of a UAS test site in Hawaii will promote growth within Hawaii and reduce development cycles for manufacturers and researchers. Additionally, it would reduce or eliminate costs to ship sensors, and send knowledgeable staff, to mainland test sites to operate and demonstrate systems. Close proximity to a test site in Hawaii will greatly benefit firms such as BAE Systems, Williams Aerospace, and others – including many military and government contractors working with the Honolulu Fire Department, Honolulu Police Department, U.S. Civil Air Patrol, U.S. Coast Guard, U.S. Department of Defense, U.S. Department of Homeland Security, U.S. National Guard, and others.

In Oregon, more than a dozen companies have said that they will begin testing their sensor packages, propulsion systems, and airframes in Oregon if the Pan-Pacific UAS Test Area is designated as a national test site. Additionally, two companies have informally pledged to open satellite offices at a state test range. The PPUTRC will benefit UAS businesses in the Columbia River Gorge. Over the past seven years, the Gorge's UAS industry grew from a small core of 30 people to an employment base of more than 1,400 employees. Many of these new jobs were created by the UAS companies' suppliers. The two largest Oregon UAS manufacturers are Insitu, manufacturer of UAS platforms and subsystems, and FLIR Surveillance Systems, a manufacturer of electro-optic and infrared imaging systems. Insitu is a major global supplier of high endurance, runway-independent UAS. FLIR Surveillance provides more ER and IR imaging systems for unmanned aircraft, unmanned ground, and unmanned maritime platforms than any other company. Activity in the Gorge from firms such as Insitu, FLIR Surveillance Systems, Cloud Cap Technology, and UTC Aerospace has spun off more than 20 local companies. Central Oregon's general aviation aircraft manufacturing industry had a similar growth pattern over a 15-year period, expanding from a core company of about 30 employees (Lancair) to a cluster of 25 companies that now employs nearly 1,200 people. It is anticipated the PPUTRC will help expand these existing businesses in the Gorge and Central Oregon.

Infrastructure

Alaska expects to invest $1.5 million to construct a test site center at its Poker Flat Research Range, as well as develop and acquire mobile test infrastructure such as fixtures, data collection devices, and monitoring systems similar to its internet-Portable Aerial Surveillance System (iPASS), a web-based application that merges track information from radar, GPS, and a transponder interrogator/receiver. Additionally, large data collection requirements are expected to drive development of a data center for processing and storage.

Hawaii's test ranges link to military/restricted areas used for current UAS operations. These sites include the Pohakuloa training area on the Island of Hawaii, Bradshaw and Wheeler Army Airfields on Oahu, and the Pacific Missile Range Facility on Kauai. Other areas under consideration include Upolu and Dillingham Airfields (on the Big Island and Oahu, respectively). Test points within the ranges would be utilized to support both shore and ship-based development, testing and certification of new UASs, training and crew certification of operational UASs, and development of expanded and joint capabilities involving existing communications systems and operations tactics using UAS.

The budget for the $2.5 million Oregon innovation grant envisions spending at least $1.2 million at test ranges for new equipment and/or infrastructure, with the grant providing $300,000, private enterprise providing $750,000, and public entities providing $150,000. Possible infrastructure development proposed with this funding includes: portable ground radar units; an automatic dependent surveillance-broadcast ground station or a similar 'sense and avoid' technology system; one or more operations management buildings housing computers, calibration components, baseline sensors with a range of capabilities, data analysis equipment, supporting software, maintenance facilities and machine shops; and ground control stations, an observation tower, and ITAR facilities as needed. Additionally, as noted earlier, Near Space Corporation is preparing to open a new $6 million flight test and operations facility at the Tillamook airport.

Chapter 3. Potential Economic Impacts of the PPUTRC

Designation as one of the nation's six UAS test sites promises to have significant economic impacts in the areas where flight activity occurs and support services are provided. Private and public sector UAS activity that has been constrained by restricted access and a restrictive federal authorizing process will have much greater opportunity to conduct UAV flight operations. In this chapter the potential economic impacts in Alaska, Hawaii, and Oregon related to serving as a test site are quantified.

The following economic impact projections were developed by McDowell Group, Inc. utilizing flight activity, flight cost, and flight-related staffing data provided by PPUTRC team members. Direct economic activity was measured by approximating preflight administrative costs, site fees per day, operating costs per day, and total flight days from historical data provided by the applicant. Sector-level information was obtained from the applicant concerning the number of UAS-related firms and jobs per firm. Direct employment estimates were then coupled with multipliers obtained from the IMPLAN economic impact model to estimate total direct, indirect, and induced economic effects. Annual projections from 2014 to 2017 were calculated for each of the 13 ranges utilizing growth rates based on funding forecasts from the Teal Group UAS market profile and forecast report, historical flight activity, and projected growth in flight activity, research, and UAS-related manufacturing as provided by the applicant.

In total, designation of PPUTRC as a UAS test site would be expected to generate 1,065 direct, indirect, and induced jobs in 2014, increasing to over 1,400 jobs by 2017. Total labor income would climb from$57 million in 2014 to about $76 million in 2017.

Table 3: Summary Impacts of PPUTRC Test Site Designation, 2012-2017
Combined Impacts in Alaska, Hawaii and Oregon

Impact of Test Site Designation				
	2014	2015	2016	2017
Total Employment	**1,065**	**1,260**	**1,335**	**1,429**
Direct Employment	490	571	602	642
Indirect Employment	198	243	259	279
Induced Employment	377	447	474	508
Total Labor Income ($ million)	**$56.9**	**$66.9**	**$70.8**	**$75.6**
Direct Labor Income ($ million)	$26.4	$30.5	$32.2	$34.2
Indirect Labor Income ($ million)	$10.4	$12.5	$13.3	$14.4
Induced Labor Income ($ million)	$20.1	$23.8	$25.3	$27.1
Output ($ million)	**$265.0**	**$301.8**	**$315.9**	**$333.5**
Total Value Added ($ million)	**$109.3**	**$121.9**	**$127.1**	**$133.5**
State Income Taxes ($ million)	$4.3	$5.0	$5.3	$5.6

Employment Resulting from UAS and Test Site Operations

In 2014, with designation of PPURTC as a test site, UAS activity in Alaska, Hawaii, and Oregon is expected to account for 581 direct jobs and a total of 1,254 jobs - including direct, indirect, and induced jobs. Approximately 85 percent of that total employment (1,065 jobs) is attributable to test site designation. The remaining 15 percent (189 jobs) is expected to occur in the absence of PPUTRC test site designation. By 2017, employment will rise to an estimated 904 direct jobs and 1,991 total jobs - with 72 percent of that total employment (1,429) attributable to test site designation. A significant number of these direct jobs are expected in smaller communities that tend to have higher unemployment – thus test site designation for the PPUTRC will help improve opportunities where they will provide the most benefits.

Table 4: Direct Employment, 2012-2017

Direct Employment						
	2012	2013	2014	2015	2016	2017
Total Direct Employment						
PPUTRC	**74**	**82**	**581**	**712**	**801**	**904**
Alaska Ranges	43	47	129	142	157	173
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	31	35	452	498	549	605
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**490**	**571**	**602**	**642**
Alaska Ranges	-	-	77	82	86	91
Hawaii Ranges	-	-	-	72	95	126
Oregon Ranges	-	-	414	417	421	424

Oregon's relatively high direct employment numbers are due to the existing, well-developed aircraft manufacturing sector in Oregon. Oregon is well placed to supply the growing demand for UAS aircraft that will be triggered by UAS integration. Most of the new jobs created in Oregon due to PPUTRC designation include manufacturing jobs (many of which may be created due to designation of test sites anywhere in the U.S.). These numbers for Oregon are based on an analysis provided to McDowell Group by Economic Development for Central Oregon (EDCO).

In addition to direct jobs created from UAS firms, significant indirect and induced jobs will also be created. Indirect jobs represent jobs created throughout the supply chain to support the UAS industry and induced jobs represent jobs created due to changes in household consumption as a result of the UAS industry.

Table 5: Indirect Employment, 2012-2017

Indirect Employment						
	2012	2013	2014	2015	2016	2017
Total Indirect Employment						
PPUTRC	**21**	**24**	**224**	**290**	**328**	**374**
Alaska Ranges	7	8	22	24	27	30
Hawaii Ranges	-	-	-	42	56	74
Oregon Ranges	14	16	202	223	246	271
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**198**	**243**	**259**	**279**
Alaska Ranges	-	-	-	42	56	74
Hawaii Ranges	-	-	185	187	188	190
Oregon Ranges	-	-	13	14	15	16

Table 6: Induced Employment, 2012-2017

Induced Employment						
	2012	2013	2014	2015	2016	2017
Total Induced Employment						
PPUTRC	**59**	**65**	**448**	**558**	**629**	**712**
Alaska Ranges	35	39	106	117	129	142
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	24	26	342	377	416	459
Impact of Test Site Designation						
PPUTRC	**-**	**-**	**377**	**447**	**474**	**508**
Alaska Ranges	-	-	63	67	71	75
Hawaii Ranges	-	-	-	64	84	111
Oregon Ranges	-	-	313	316	319	321

Note: Summation of columns may not match the total due to rounding

Labor Income Resulting from UAS and Test Site Operations

In 2014, UAS activity in Alaska, Hawaii, and Oregon is expected to account for $31 million in direct labor income and $67 million in total labor income - including direct, indirect, and induced - assuming the PPUTRC is awarded test site designation. Approximately 84 percent of that total labor income ($57 million) is attributable to test site designation, while the remaining 16 percent ($10 million) is expected to occur even if the proposed PPUTRC does not become a test site. By 2017, labor income is expected to include $106 million in total direct, indirect, and induced labor income - with 71 percent of that total labor income ($76 million) attributable to test site designation.

Table 7: Direct Income, 2012-2017 ($ million)

	Direct Income					
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$4.0**	**$4.4**	**$31.3**	**$38.2**	**$42.9**	**$48.3**
Alaska Ranges	$2.3	$2.6	$7.0	$7.7	$8.5	$9.4
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	$1.7	$1.9	$24.2	$26.7	$29.5	$32.5
Impact of Test Site Designation						
PPUTRC	-	-	**$26.4**	**$30.5**	**$32.2**	**$34.2**
Alaska Ranges	-	-	$4.2	$4.4	$4.7	$5.0
Hawaii Ranges	-	-	-	$3.7	$4.9	$6.4
Oregon Ranges	-	-	$22.2	$22.4	$22.6	$22.8

Table 8: Indirect Income, 2012-2017 ($ million)

Indirect Income						
	2012	2013	2014	2015	2016	2017
Total Direct Income						
PPUTRC	**$1.1**	**$1.3**	**$11.7**	**$15.0**	**$17.0**	**$19.3**
Alaska Ranges	$0.4	$0.4	$1.2	$1.3	$1.5	$1.6
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	$0.7	$0.8	$10.5	$11.6	$12.8	$14.1
Impact of Test Site Designation						
PPUTRC			**$10.4**	**$12.5**	**$13.3**	**$14.4**
Alaska Ranges	-	-	$0.7	$0.8	$0.8	$0.9
Hawaii Ranges	-	-	-	$2.1	$2.7	$3.6
Oregon Ranges	-	-	$9.6	$9.7	$9.8	$9.9

Table 9: Induced Income, 2012-2017 ($ million)

Induced Income						
	2012	2013	2014	2015	2016	2017
Total Induced Income						
PPUTRC	**$3.5**	**$3.8**	**$24.4**	**$30.1**	**$34.0**	**$38.4**
Alaska Ranges	$2.2	$2.5	$6.7	$7.4	$8.2	$9.0
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	$1.2	$1.4	$17.6	$19.4	$21.4	$23.6
Impact of Test Site Designation						
PPUTRC	-	-	**$20.1**	**$23.8**	**$25.3**	**$27.1**
Alaska Ranges	-	-	$4.0	$4.3	$4.5	$4.8
Hawaii Ranges	-	-	-	$3.3	$4.3	$5.7
Oregon Ranges	-	-	$16.1	$16.3	$16.4	$16.6

Output, Value Added, & State Income Taxes Resulting from UAS and Test Site Operations

'Output' represents the value of industry production, and 'total value added' is the difference between an industry's total output and the cost of their intermediate inputs. Economic modeling conducted for the purposes of this study indicates output in the PPUTRC states attributable to test site designation would climb from $265 million in 2014 to $333 million in 2017. Value added would climb from $109 million to $134 million over the same period.

Table 10: Output, 2012-2017 ($ million)

	Output					
	2012	2013	2014	2015	2016	2017
Total Output						
PPUTRC	**$18.3**	**$20.2**	**$302.4**	**$366.8**	**$411.7**	**$463.6**
Alaska Ranges	$8.6	$9.5	$34.3	$37.8	$41.7	$46.0
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	$9.7	$10.7	$268.1	$295.6	$325.9	$359.3
Impact of Test Site Designation						
PPUTRC	-	-	**$280.1**	**$315.5**	**$328.4**	**$344.7**
Alaska Ranges	-	-	$23.8	$24.8	$25.8	$26.8
Hawaii Ranges	-	-	-	$33.3	$44.1	$58.3
Oregon Ranges	-	-	$256.3	$257.4	$258.5	$259.6

Table 11: Total Value Added, 2012-2017 ($ million)

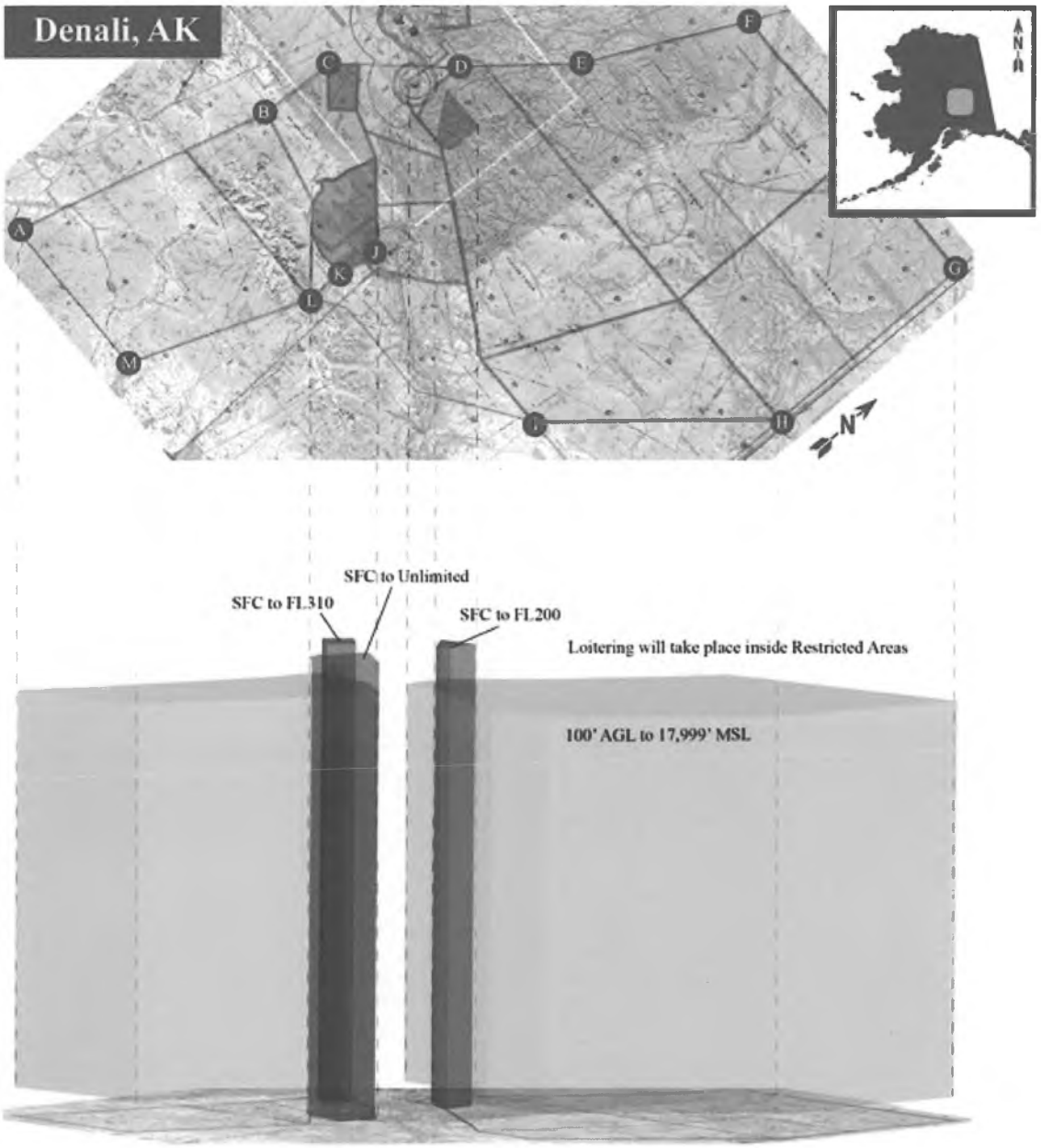
	Value Added					
	2012	2013	2014	2015	2016	2017
Total Value Added						
PPUTRC	**$9.5**	**$10.5**	**$127.7**	**$151.8**	**$169.7**	**$190.3**
Alaska Ranges	$5.7	$6.3	$22.7	$25.0	$27.6	$30.4
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	$3.8	$4.2	$105.1	$115.8	$127.7	$140.8
Impact of Test Site Designation						
PPUTRC	-	-	**$116.2**	**$128.2**	**$132.8**	**$138.5**
Alaska Ranges	-	-	$15.8	$16.4	$17.1	$17.7
Hawaii Ranges	-	-	-	$10.9	$14.5	$19.1
Oregon Ranges	-	-	$100.4	$100.9	$101.3	$101.7

Designation of the PPUTRC will provide a combined four-year total of $20 million in income tax revenue to Hawaii and Oregon. The effective income tax rate for these calculations was approximated as 7.5 percent for Hawaii, and 9 percent for Oregon (Alaska has no income tax).

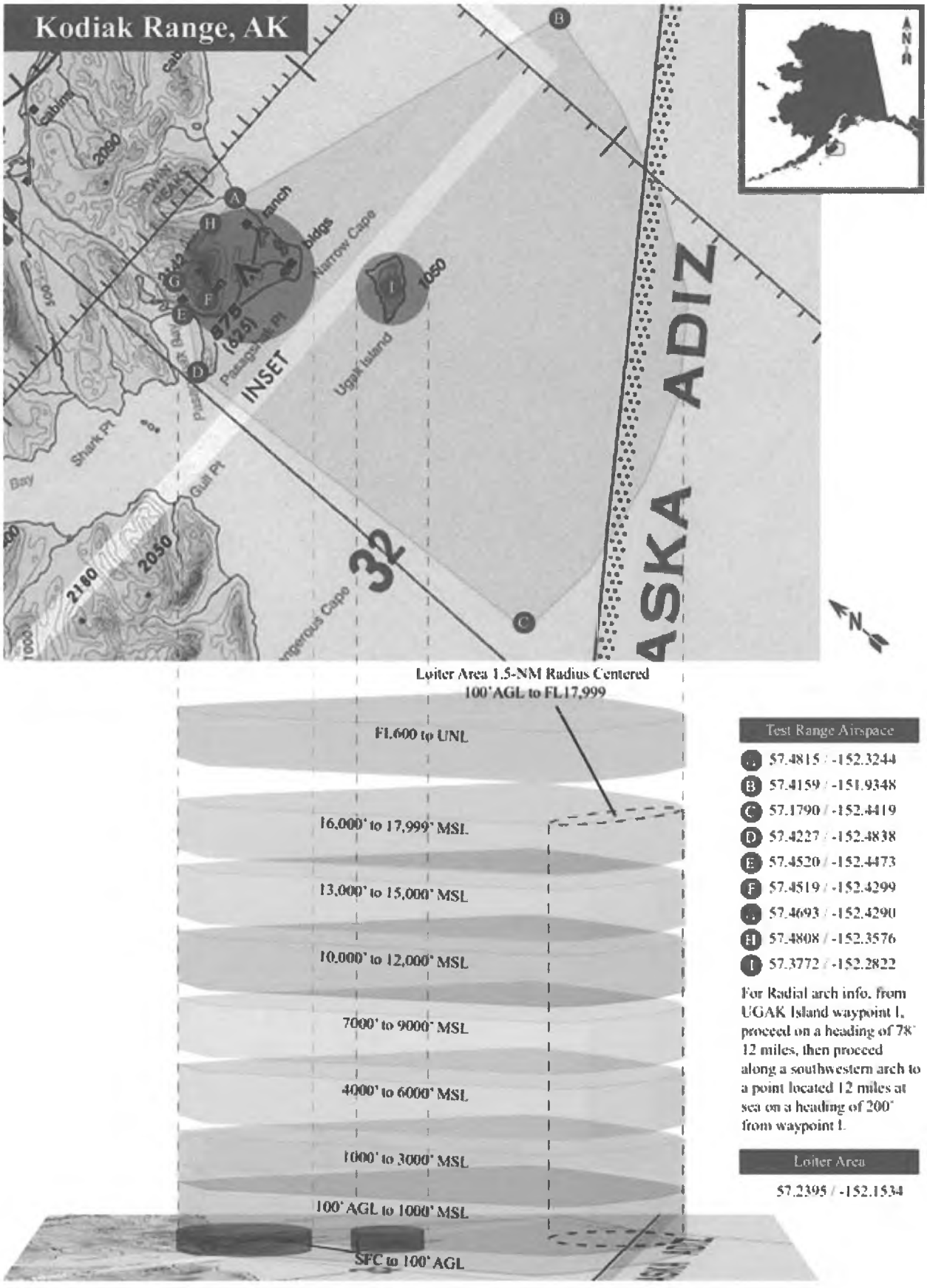
Table 12: State Income Taxes, 2012-2017 ($ million)

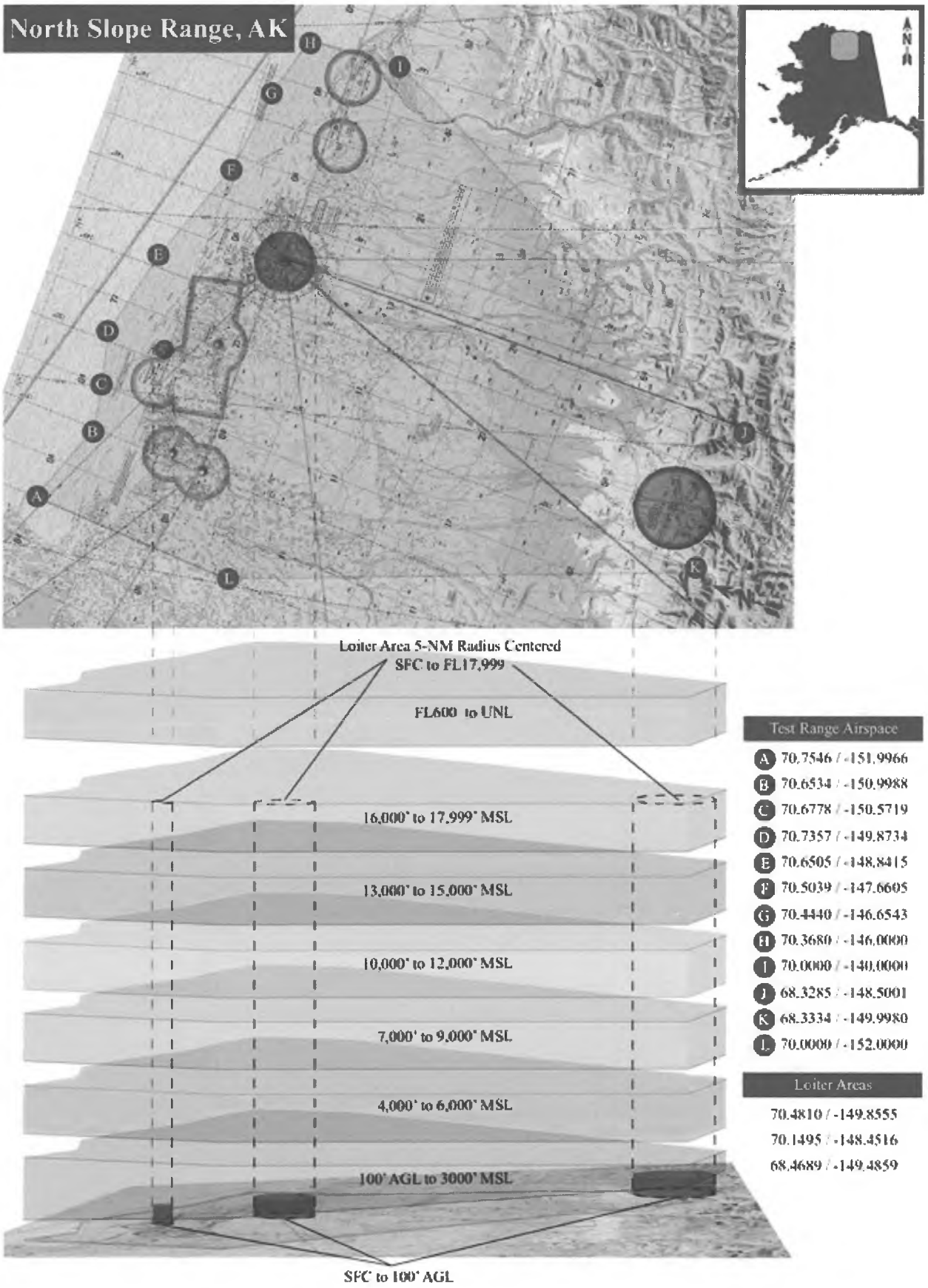
State Income Taxes						
	2012	2013	2014	2015	2016	2017
Total State Income Taxes						
PPUTRC	**$0.2**	**$0.2**	**$4.7**	**$5.9**	**$6.6**	**$7.5**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	$0.2	$0.2	$4.7	$5.2	$5.7	$6.3
Impact of Test Site Designation						
PPUTRC	-	-	**$4.5**	**$5.2**	**$5.5**	**$5.8**
Alaska Ranges	-	-	-	-	-	-
Hawaii Ranges	-	-	-	$0.7	$0.9	$1.2
Oregon Ranges	-	-	$4.5	$4.5	$4.6	$4.6

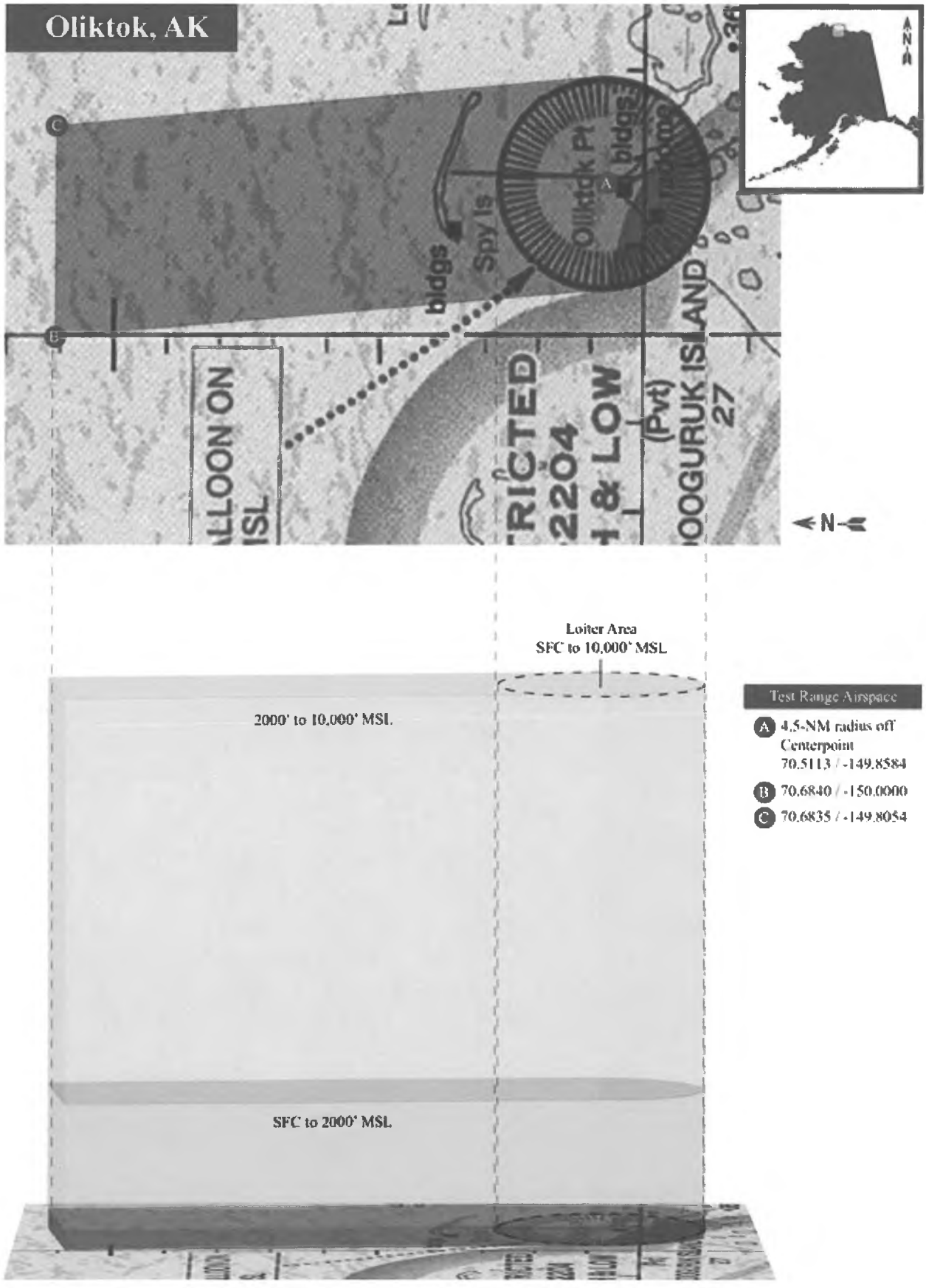
Appendix. Proposed Pan-Pacific Test Ranges

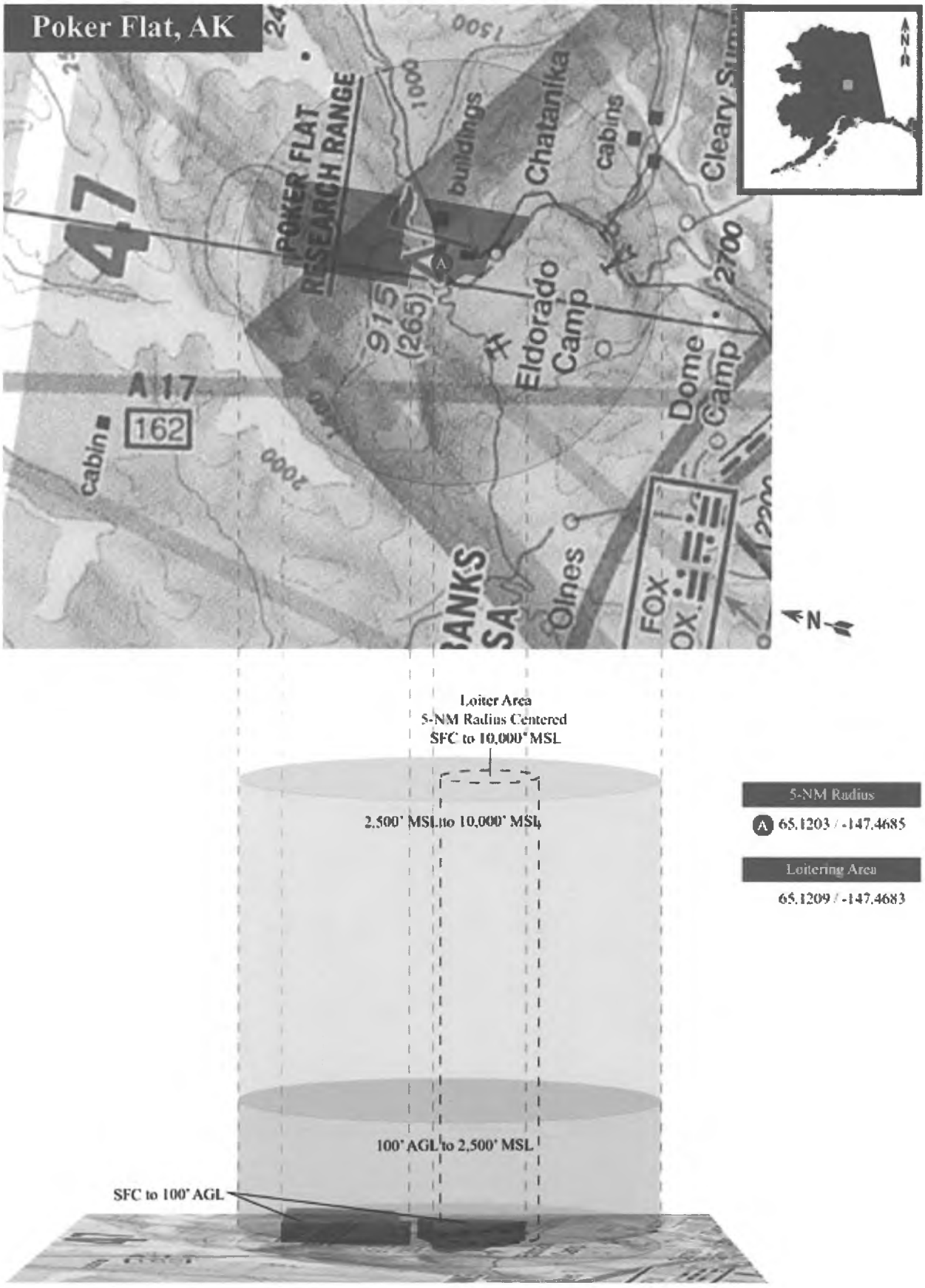


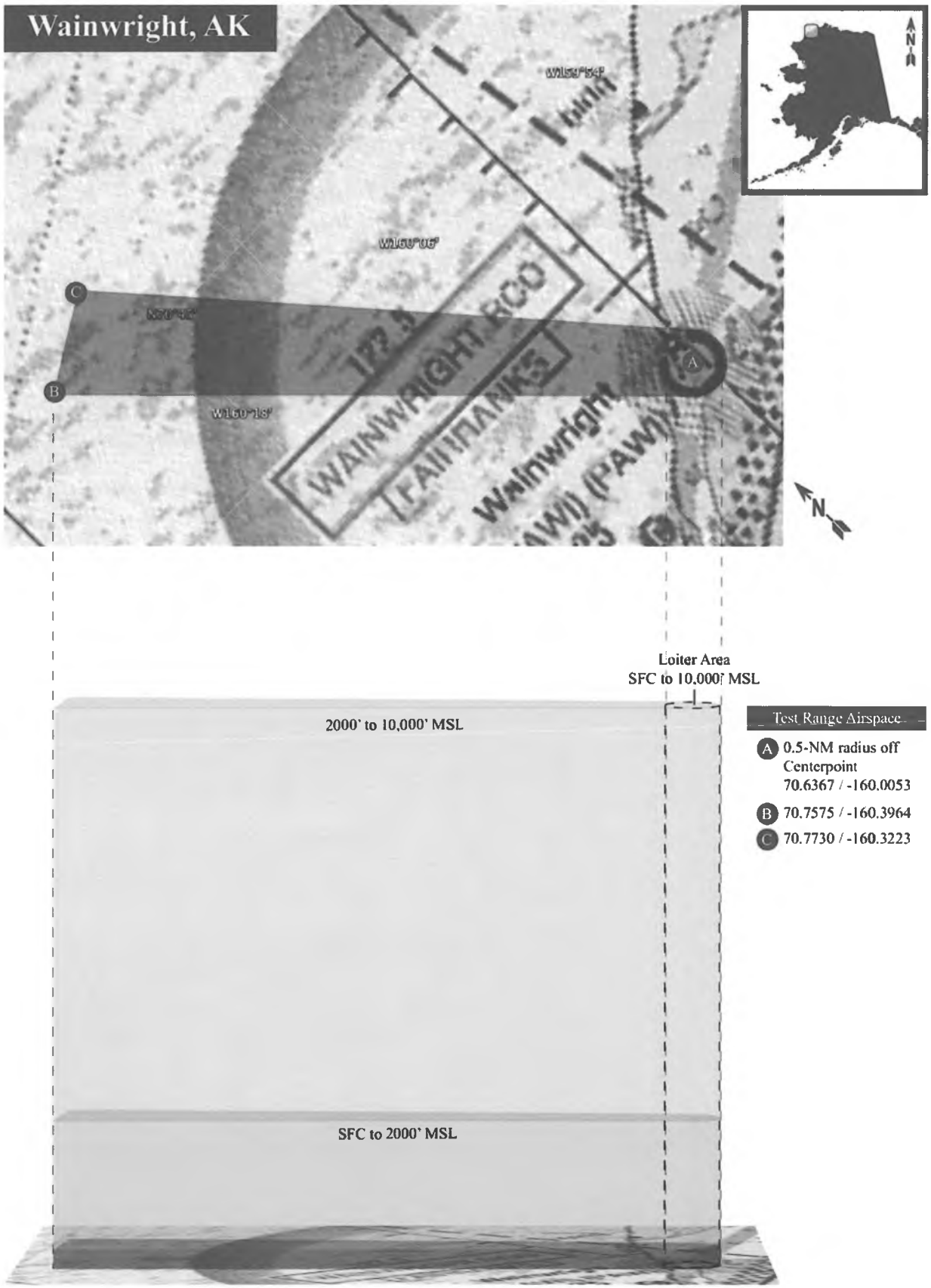
Test Range Airspace		
A 62.5000 / -148.8500	F 66.1668 / -145.0934	J 63.9364 / -145.8266
B 63.9653 / -148.0089	G 66.1692 / -141.0817	K 63.7156 / -145.9051
C 64.3756 / -147.9803	H 65.0000 / -141.0821	L 63.4974 / -145.9046
D 64.9000 / -146.9134	I 64.0000 / -143.0159	M 62.5000 / -146.7279
E 65.3505 / -146.0719		

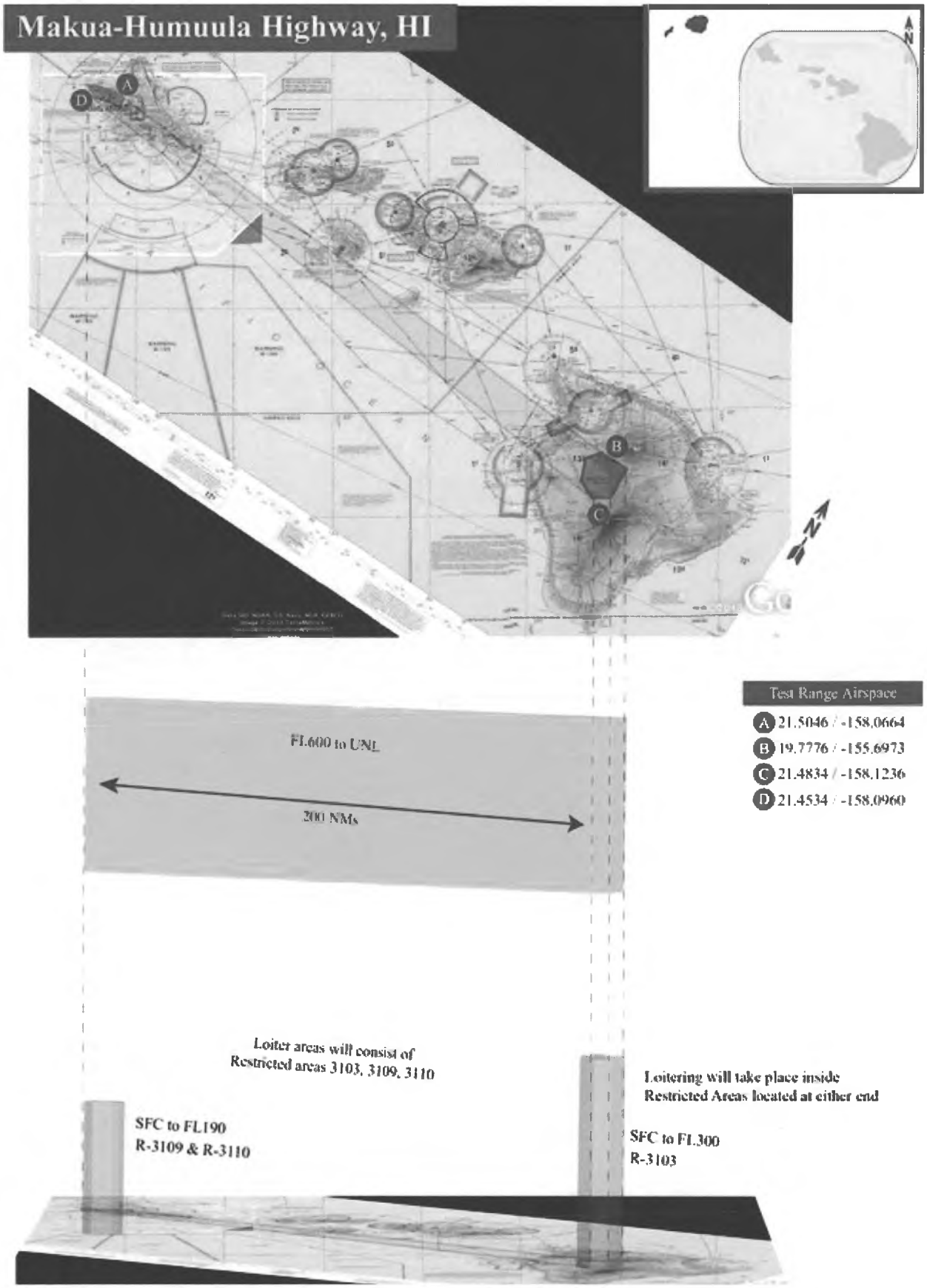

Kodiak Range, AK
INSET
Ugak Island
Narrow Cape
Shark Pt
Gull Pt
Bay
Loiter Area 1.5-NM Radius Centered
100' AGL to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7000' to 9000' MSL
4000' to 6000' MSL
1000' to 3000' MSL
100' AGL to 1000' MSL
SFC to 100' AGL
Test Range Airspace
A 57.4815 / -152.3244
B 57.4159 / -151.9348
C 57.1790 / -152.4419
D 57.4227 / -152.4838
E 57.4520 / -152.4473
F 57.4519 / -152.4299
G 57.4693 / -152.4290
H 57.4808 / -152.3576
I 57.3772 / -152.2822
For Radial arch info. from UGAK Island waypoint I, proceed on a heading of 78° 12 miles, then proceed along a southwestern arch to a point located 12 miles at sea on a heading of 200° from waypoint I.
Loiter Area
57.2395 / -152.1534
N

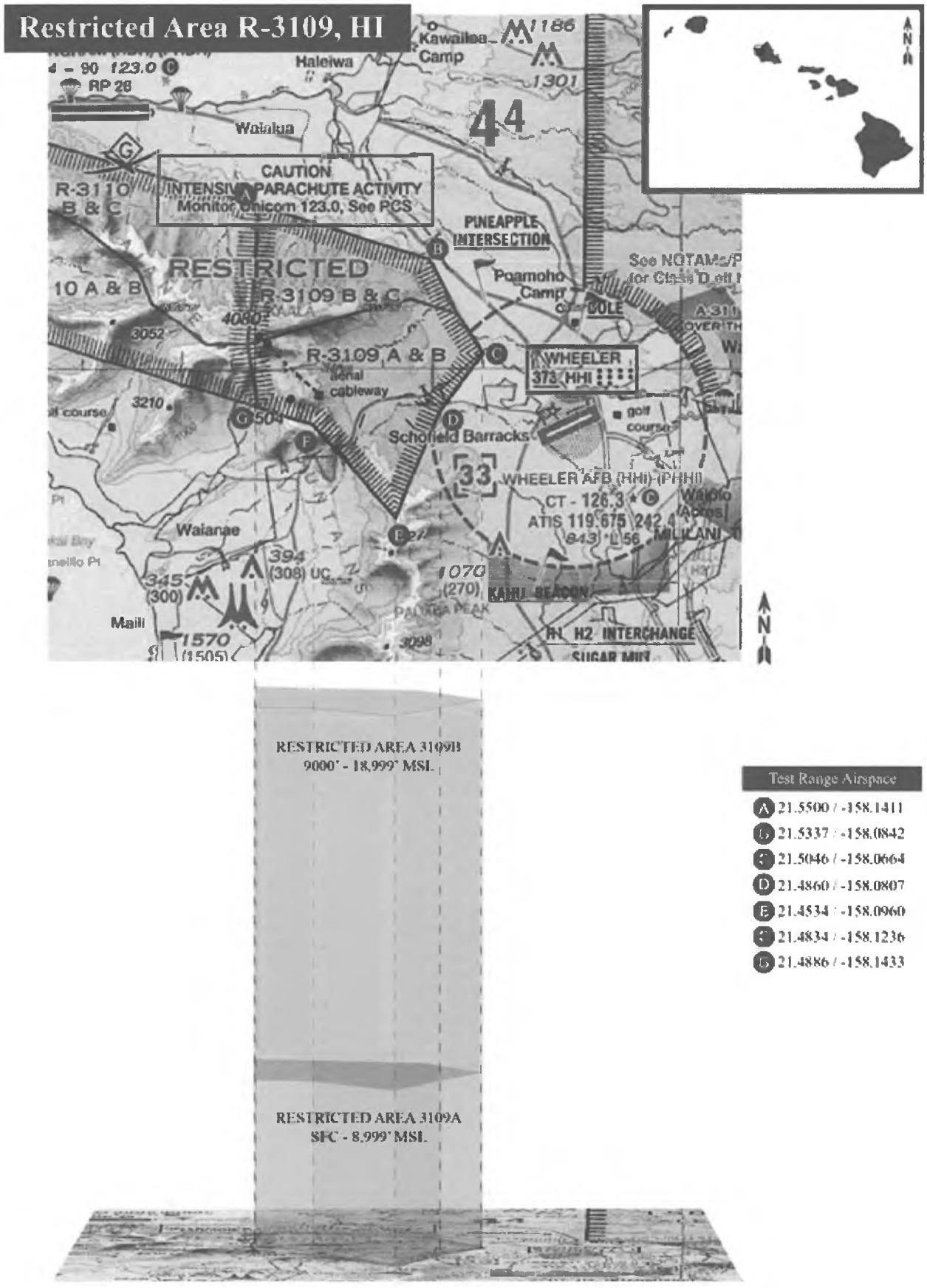

North Slope Range, AK
A
B
C
D
E
F
G
H
I
J
K
L
Loiter Area 5-NM Radius Centered
SFC to FL17,999
FL600 to UNL
16,000' to 17,999' MSL
13,000' to 15,000' MSL
10,000' to 12,000' MSL
7,000' to 9,000' MSL
4,000' to 6,000' MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 70.7546 / -151.9966
B 70.6534 / -150.9988
C 70.6778 / -150.5719
D 70.7357 / -149.8734
E 70.6505 / -148.8415
F 70.5039 / -147.6605
G 70.4440 / -146.6543
H 70.3680 / -146.0000
I 70.0000 / -140.0000
J 68.3285 / -148.5001
K 68.3334 / -149.9980
L 70.0000 / -152.0000
Loiter Areas
70.4810 / -149.8555
70.1495 / -148.4516
68.4689 / -149.4859

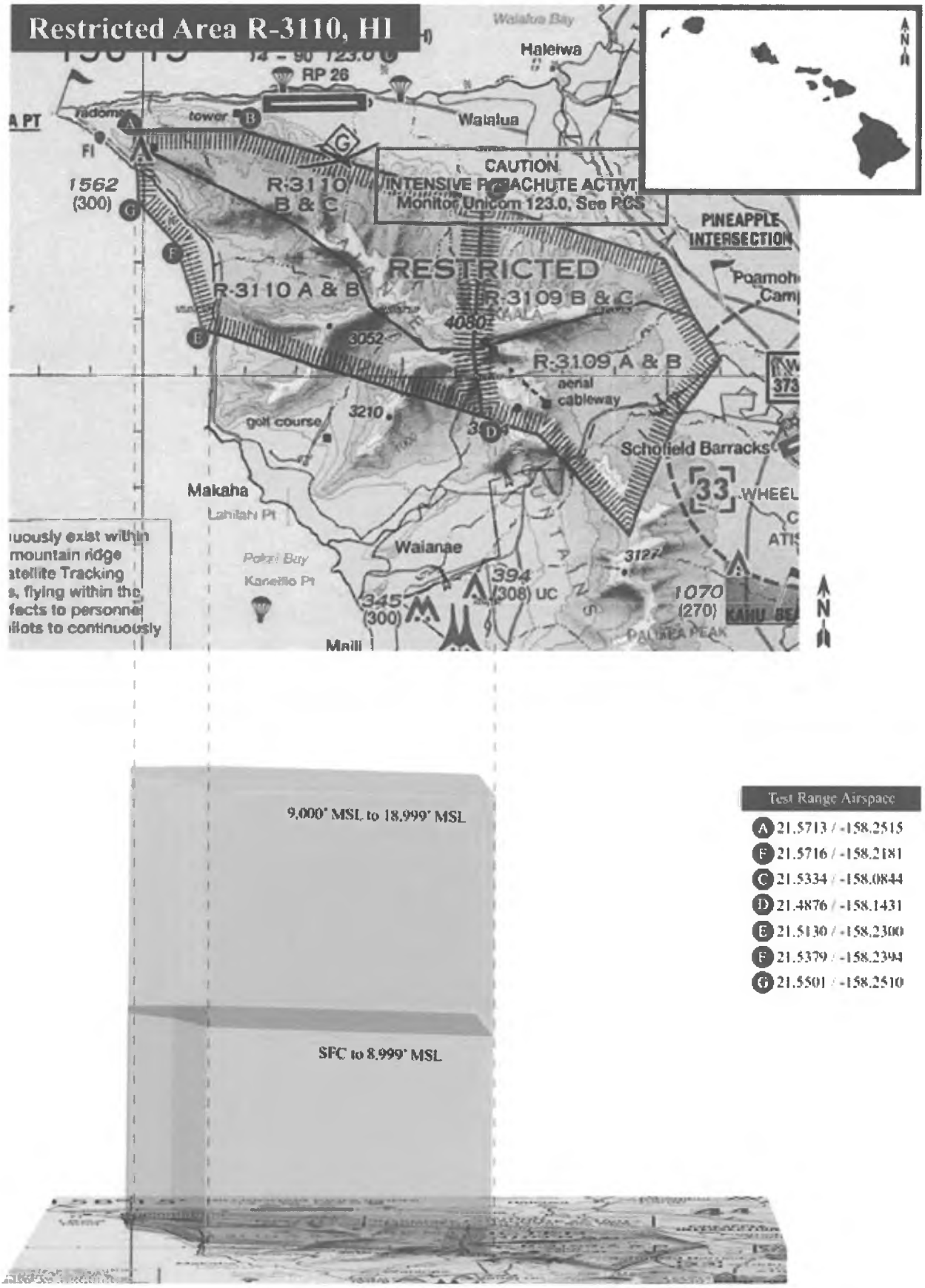

Oliktok, AK
Oliktok Pt
bldgs
Spy Is
bldgs
(Pvt)
27
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL.
SFC to 2000' MSL.
Test Range Airspace
A 4.5-NM radius off Centerpoint 70.5113 / -149.8584
B 70.6840 / -150.0000
C 70.6835 / -149.8054


Poker Flat, AK
POKER FLAT RESEARCH RANGE
Chatanika
cabins
buildings
Cleary Summit
Eldorado Camp
Dome Camp
2700
915
(265)
A17
162
Cabin
Olnes
FOX
N
Loiter Area
5-NM Radius Centered
SFC to 10,000' MSL
2,500' MSL to 10,000' MSL
100' AGL to 2,500' MSL
SFC to 100' AGL
5-NM Radius
A 65.1203 / -147.4685
Loitering Area
65.1209 / -147.4683

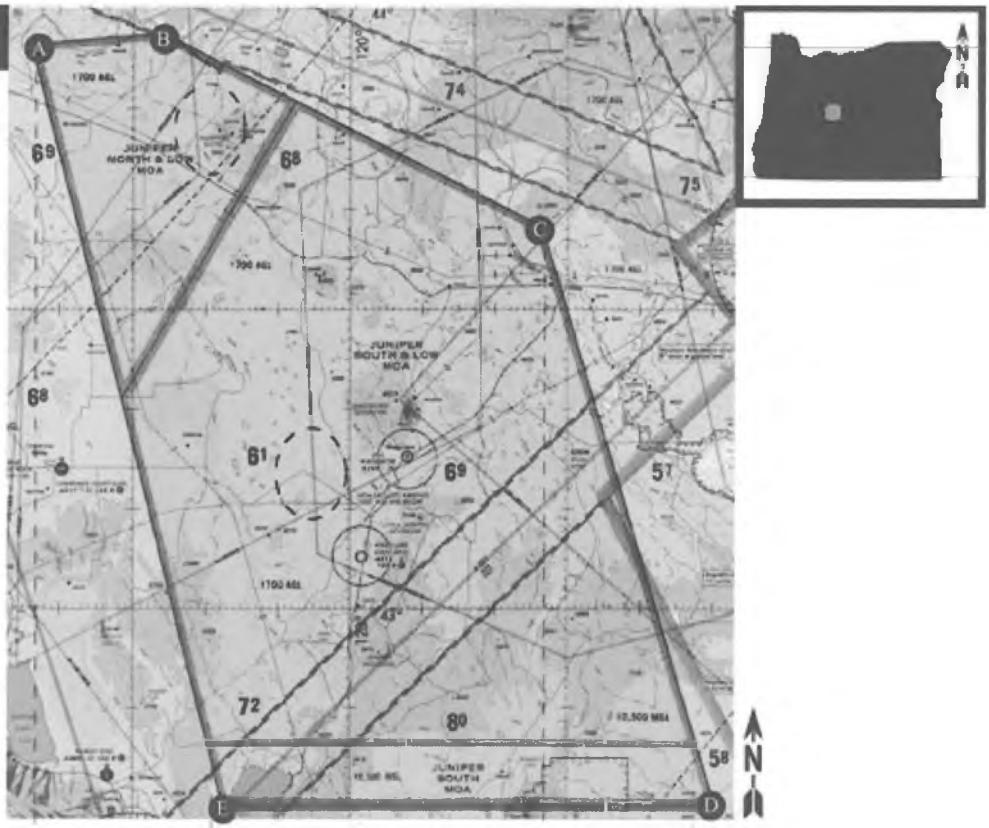

Wainwright, AK
W159°54'
W160°06'
W160°18'
C
B
A
WAINWRIGHT RCO
FAIRBANKS
Wainwright
AWI) (PAW)
N
Loiter Area
SFC to 10,000' MSL
2000' to 10,000' MSL
SFC to 2000' MSL
Test Range Airspace
A 0.5-NM radius off Centerpoint 70.6367 / -160.0053
B 70.7575 / -160.3964
C 70.7730 / -160.3223

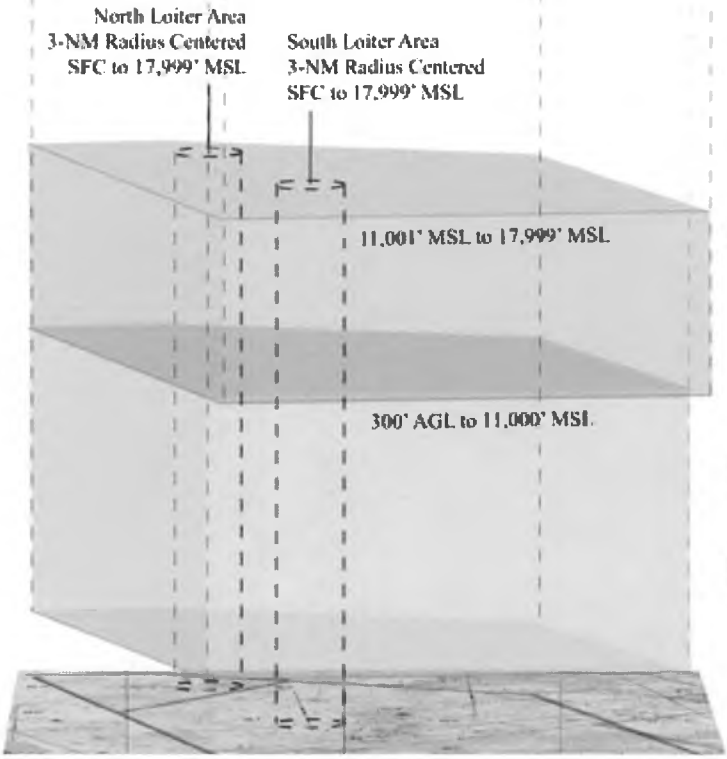

Makua-Humuula Highway, HI
A
B
C
D
Test Range Airspace
A 21.5046 / -158.0664
B 19.7776 / -155.6973
C 21.4834 / -158.1236
D 21.4534 / -158.0960
FL600 to UNL
200 NMs
Loiter areas will consist of
Restricted areas 3103, 3109, 3110
Loitering will take place inside
Restricted Areas located at either end
SFC to FL190
R-3109 & R-3110
SFC to FL300
R-3103


Restricted Area R-3109, HI
Haleiwa
Kawailoa Camp
Waialua
CAUTION
INTENSIVE PARACHUTE ACTIVITY
Monitor Unicom 123.0, See PCS
R-3110
B & C
PINEAPPLE
INTERSECTION
RESTRICTED
R-3109 B & C
10 A & B
Poamoho Camp
DOLE
R-3109 A & B
aerial cableway
WHEELER
373 HHI
golf course
Schofield Barracks
WHEELER AFB (HHI) (PHHI)
CT - 126.3
ATIS 119.675 242.4
MILILANI
Waipio
Waianae
KAHU BEACON
H1 H2 INTERCHANGE
Mauli
RESTRICTED AREA 3109B
9000' - 18,999' MSL
RESTRICTED AREA 3109A
SFC - 8,999' MSL
Test Range Airspace
A 21.5500 / -158.1411
B 21.5337 / -158.0842
C 21.5046 / -158.0664
D 21.4860 / -158.0807
E 21.4534 / -158.0960
F 21.4834 / -158.1236
G 21.4886 / -158.1433


Restricted Area R-3110, HI
Haleiwa
RP 26
Waialua
CAUTION
INTENSIVE PARACHUTE ACTIVT
Monitor Unicom 123.0, See PCS
R-3110
B & C
RESTRICTED
R-3110 A & B
R-3109 B & C
R-3109 A & B
PINEAPPLE
INTERSECTION
1562
(300)
4080
3052
3210
aerial
cableway
golf course
Schofield Barracks
33
Makaha
Lahilahi Pt
Waianae
Kaneilio Pt
394
(308) UC
345
(300)
1070
(270)
Maili
PALIKEA PEAK
9,000' MSL to 18,999' MSL
SFC to 8,999' MSL
Test Range Airspace
A 21.5713 / -158.2515
B 21.5716 / -158.2181
C 21.5334 / -158.0844
D 21.4876 / -158.1431
E 21.5130 / -158.2300
F 21.5379 / -158.2394
G 21.5501 / -158.2510

Juniper, OR





Test Range Airspace

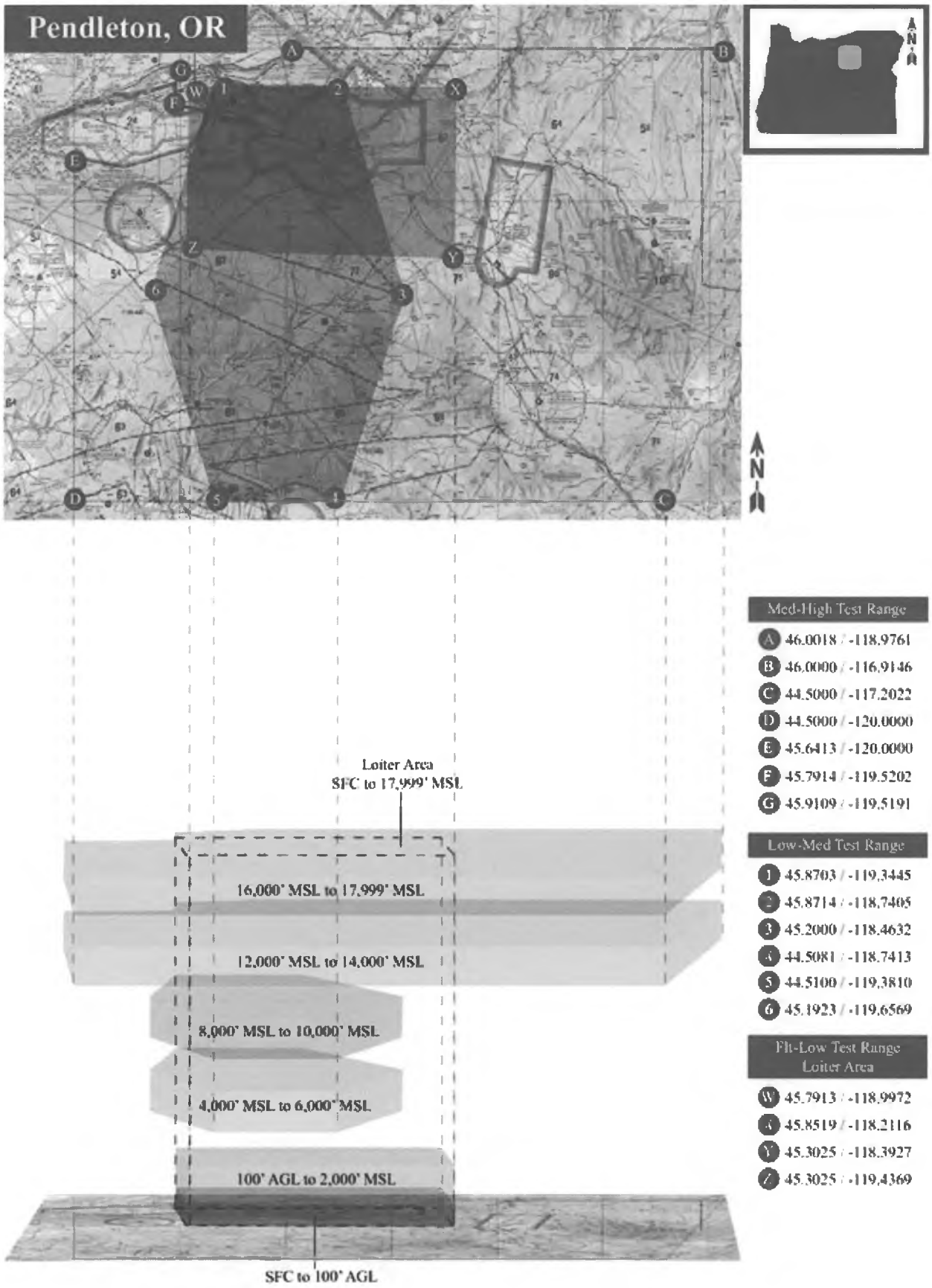
- A 43.9392 / -120.7296
- B 43.9575 / -120.4327
- C 43.6381 / -119.5600
- D 42.6700 / -119.1592
- E 42.6709 / -120.2951

North Loitering Area

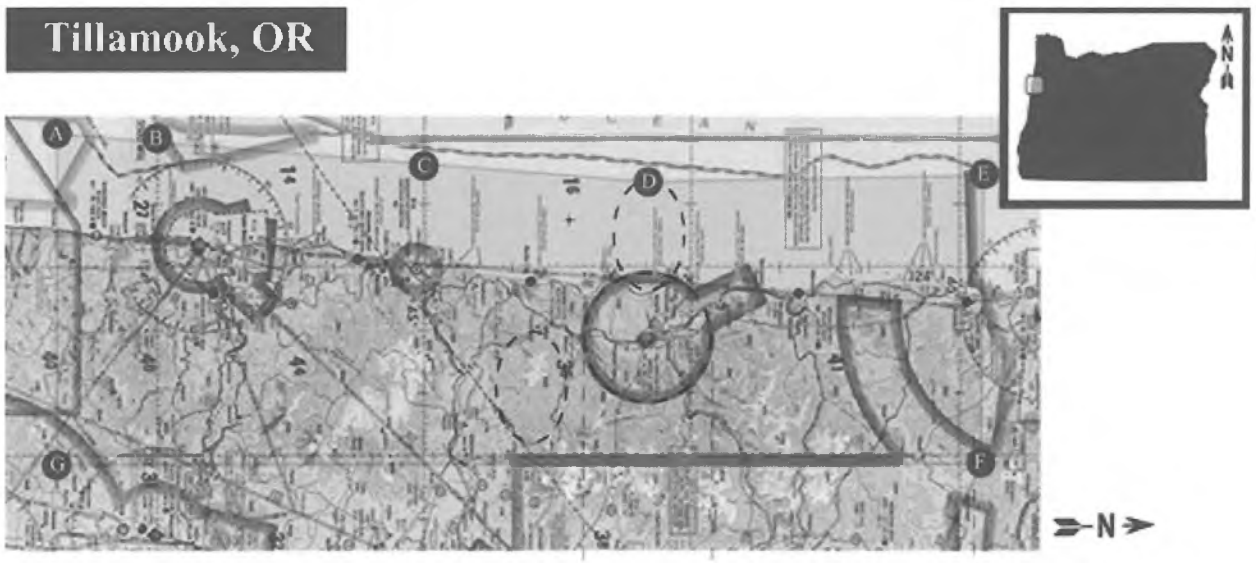
43.8126 / -120.3354

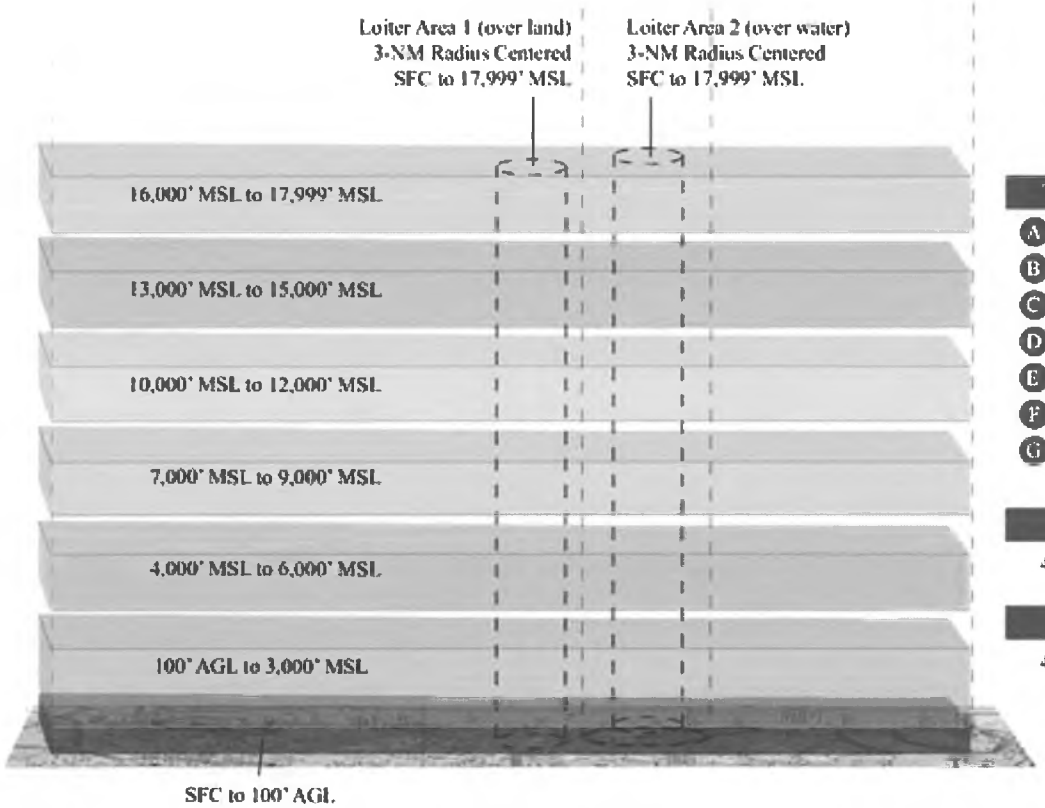
South Loitering Area

43.2300 / -120.1053


Pendleton, OR
A
B
C
D
E
F
G
W
X
Y
Z
1
2
3
4
5
6
N
Loiter Area
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
12,000' MSL to 14,000' MSL
8,000' MSL to 10,000' MSL
4,000' MSL to 6,000' MSL
100' AGL to 2,000' MSL
SFC to 100' AGL
Med-High Test Range
A 46.0018 / -118.9761
B 46.0000 / -116.9146
C 44.5000 / -117.2022
D 44.5000 / -120.0000
E 45.6413 / -120.0000
F 45.7914 / -119.5202
G 45.9109 / -119.5191
Low-Med Test Range
1 45.8703 / -119.3445
2 45.8714 / -118.7405
3 45.2000 / -118.4632
4 44.5081 / -118.7413
5 44.5100 / -119.3810
6 45.1923 / -119.6569
Flt-Low Test Range
Loiter Area
W 45.7913 / -118.9972
X 45.8519 / -118.2116
Y 45.3025 / -118.3927
Z 45.3025 / -119.4369

Tillamook, OR





Test Range Airspace

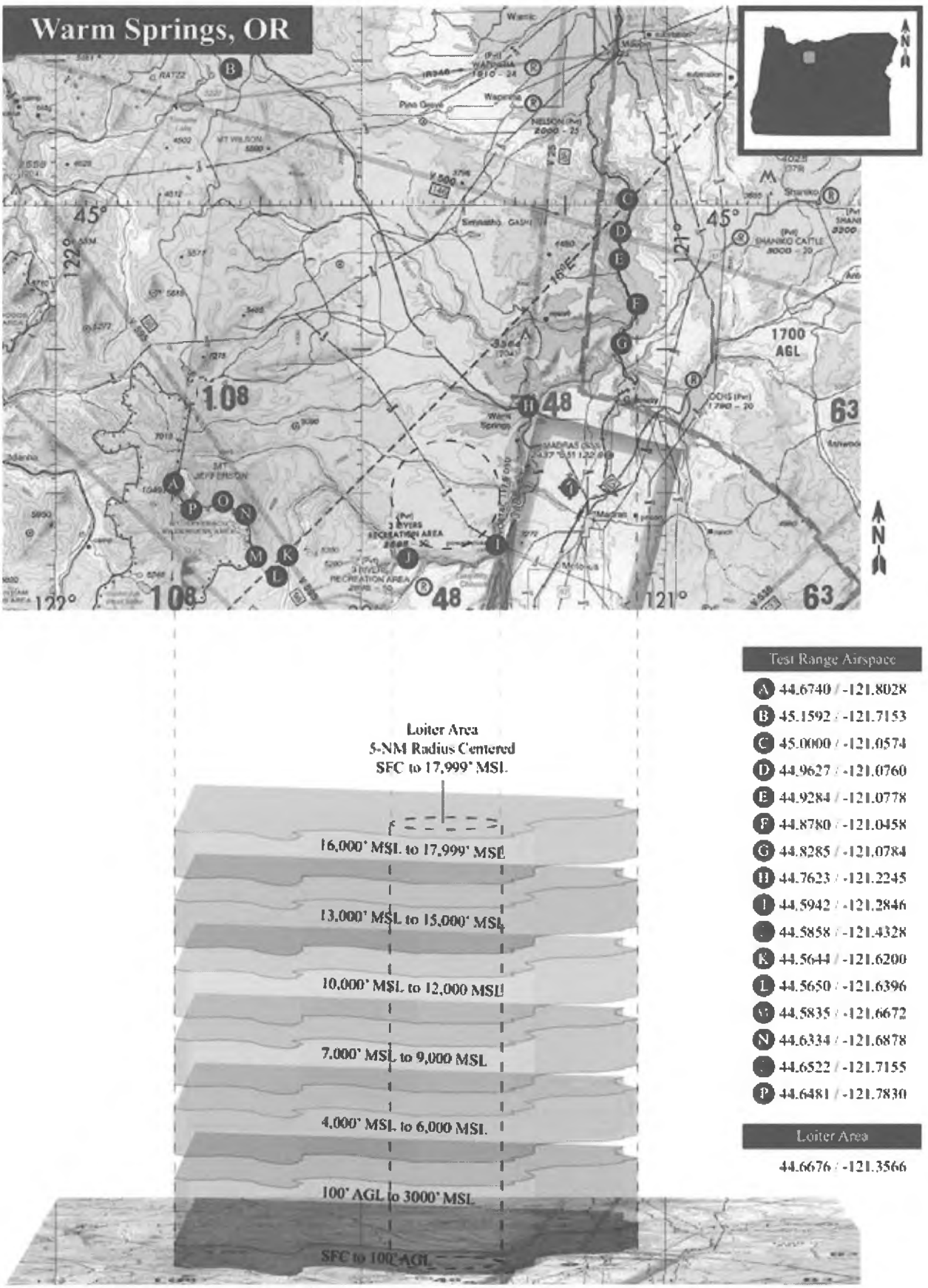
- A 46.0000 / -124.2336
- B 45.5000 / -124.2164
- C 45.0000 / -124.2507
- D 44.5000 / -124.3158
- E 44.3493 / -124.3302
- F 44.3492 / -123.5000
- G 46.0000 / -123.5000

Loitering Area 1

45.2697 / -123.6051

Loitering Area 2

45.4239 / -124.0814


Warm Springs, OR
1700 AGL
Loiter Area
5-NM Radius Centered
SFC to 17,999' MSL
16,000' MSL to 17,999' MSL
13,000' MSL to 15,000' MSL
10,000' MSL to 12,000 MSL
7,000' MSL to 9,000 MSL
4,000' MSL to 6,000 MSL
100' AGL to 3000' MSL
SFC to 100' AGL
Test Range Airspace
A 44.6740 / -121.8028
B 45.1592 / -121.7153
C 45.0000 / -121.0574
D 44.9627 / -121.0760
E 44.9284 / -121.0778
F 44.8780 / -121.0458
G 44.8285 / -121.0784
H 44.7623 / -121.2245
I 44.5942 / -121.2846
J 44.5858 / -121.4328
K 44.5644 / -121.6200
L 44.5650 / -121.6396
M 44.5835 / -121.6672
N 44.6334 / -121.6878
O 44.6522 / -121.7155
P 44.6481 / -121.7830
Loiter Area
44.6676 / -121.3566

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Excerpts from FAA, Gao, and Other Federal Documents Governing UAS Use

<TARGET><BILL></BILL><SUBJECT>Excerpts from FAA, Gao, and Other Federal Documents Governing UAS Use</SUBJECT><COMM>JUNM28</COMM></TARGET>

DEFINITIONS

Certificate of Waiver or Authorization (COA)—The terms "certificate of waiver" and "certificate of authorization" mean a Federal Aviation Administration grant of approval for a specific flight operation. Applications for a COA are only accepted from public entities. An application may be referred to the FAA Office of the Chief Counsel (AGC), for determination of the status of an applicant, i.e., public or civil. COAs are typically issued for a period of up to one year, but may be issued for a lesser duration if requested or deemed appropriate.

Civil Applicants – Approvals for civil applications using the special airworthiness process receive their airworthiness certification as part of the review process with the FAA.

Civil UAS – Obtaining an experimental airworthiness certificate for a particular UAS is currently the only way civil operators of unmanned aircraft are accessing the NAS. Experimental certificate regulations preclude carrying people or property for compensation or hire, but do allow operations for research and development, flight and sales demonstrations and crew training. The FAA is working with civilian operators to collect technical and operational data that will help refine the UAS airworthiness certification process. The agency is currently developing a future path for safe integration of civil UAS into the NAS as part of NextGen implementation.

Model Aircraft – Recreational use of airspace by model aircraft is covered by FAA Advisory Circular 91-57, which generally limits operations to below 400 feet above ground level and away from airports and air traffic. In 2007, the FAA clarified that AC 91-57 only applies to modelers, and specifically excludes individuals or companies flying model aircraft for business purposes.

Pilot in Command (PIC): The person who has final authority and responsibility for the operation and safety of flight, has been designated as pilot in command before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the pilot in command as described by 14 CFR 91.3, *Responsibility and Authority of the Pilot in Command*, apply to the unmanned aircraft PIC. The pilot in command position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.

Public Aircraft – An aircraft operated by a public user which is intrinsically governmental in nature (i.e. federal, state, and local agencies). Examples of public entities are Department of Defense (DoD) and its military branches; other local, state, and federal government agencies; and state universities. Refer to 14 CFR 1.1, *General Definitions*, for a complete definition of a public aircraft.

Public UAS – COAs are available to public entities that want to fly a UAS in civil airspace. Common uses today include law enforcement, firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions.

Unmanned Aircraft—The term "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

Unmanned Aircraft System—The term "unmanned aircraft system" means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.

UAS Test Sites
In the FAA Modernization and Reform Act of 2012, Congress directed the FAA to establish a program to integrate UAS into the national airspace system at six test ranges.

Department of Transportation Advisory Circular 91-57

- Simply stated, an unmanned aircraft is a device that is used, or is intended to be used, for flight in the air with no onboard pilot.
- These devices may be as simple as a remotely controlled model aircraft used for recreational purposes or as complex as surveillance aircraft flying over hostile areas in warfare.
- They may be controlled either manually or through an autopilot using a data link to connect the pilot to their aircraft.
- They may perform a variety of public services: surveillance, collection of air samples to determine levels of pollution, or rescue and recovery missions in crisis situations.
- They range in size from wingspans of four inches to 246 feet (like a Boeing 737); and can weigh from approximately four ounces to over 25,600 pounds.

The one thing they have in common is that their numbers and uses are growing dramatically. In the United States alone, approximately 50 companies, universities, and government organizations are developing and producing some 155 unmanned aircraft designs. Regulatory standards need to be developed to enable current technology for unmanned aircraft to comply with Title 14 Code of Federal Regulations (CFR).

FAA Fact Sheet: The FAA first authorized use of unmanned aircraft in the NAS in 1990. Since then, the agency has authorized limited use of UAS for important missions in the public interest, such as firefighting, disaster relief, search and rescue, law enforcement, border patrol, military training and testing and evaluation.

Unmanned aircraft are flying now in the national airspace system under very controlled conditions. Operations potentially range from ground level to above 50,000 feet, depending on the specific type of aircraft. However, UAS operations are currently not authorized in Class B airspace, which exists over major urban areas and contains the highest density of manned aircraft in the National Airspace System.

There are currently two ways to get FAA approval to operate a UAS. The first is to obtain an experimental airworthiness certificate for private sector (civil) aircraft to do research and development, training and flight demonstrations. The second is to obtain a Certificate of Waiver or Authorization (COA) for public aircraft. Routine operation of UAS over densely-populated areas is prohibited.

A New Office for New Technology

In 2012, the FAA established the Unmanned Aircraft Systems Integration Office to provide a one-stop portal for civil and public use UAS in U.S. airspace. This office is developing a comprehensive plan to integrate and establish operational and certification requirements for UAS. It will also oversee and coordinate UAS research and development.

Public Law 112-95 Feb 14, 2012
SEC. 332. Integration of Civil Unmanned Aircraft Systems into National Airspace System
(a) REQUIRED PLANNING FOR INTEGRATION.—
(1) COMPREHENSIVE PLAN.
(3) DEADLINE.—The plan required under paragraph (1) shall provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015.
(b) STANDARDS FOR OPERATION AND CERTIFICATION.—Not later than December 31, 2015, the Administrator shall develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system.

FAA Interim Operational Approval Guidance 08-01; Unmanned Aircraft Systems Operations in the US National Airspace System

The proliferation of UAS into the NAS has resulted in an increased demand for the FAA to process a large number of applications to review for operational approvals. These approvals are required due to the fact that unmanned aircraft (UA) are not compliant with various sections of Title 14 of the Code of Federal Regulations (14 CFR) and therefore, require an alternate means of compliance. Most notably, the lack of an on-board pilot requires an alternate method of the "see-and-avoid" provisions of 14 CFR 91.113. **Restrictions/Requirements:**

8.2.5 Flight Over Populated Areas Routine UAS operations shall not be conducted over urban or populated areas. UAS operations may be approved in emergency or relief situations if the proposed mitigation strategies are found to be acceptable.

8.2.6 Flight Over Heavily Trafficked Roads or Open-air Assembly of People UAS operations shall avoid these areas.

8.2.7 Day/Nighttime Operations All UAS operations outside of Class A airspace must be conducted during daylight hours.

8.2.9 Autonomous Operations It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the NAS outside of Restricted, Prohibited, or Warning areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorized in the national airspace system.

9.1 UAS Pilot Qualifications

The FAA is focused on insuring that UAS pilots have a common level of understanding of federal aviation regulations applicable to the airspace where the UA will operate. Pilots are responsible for a thorough preflight inspection of the UAS. They are accountable for controlling their aircraft to the same responsible standards as the pilot of a manned aircraft. Pilot qualifications for UAS operations conducted under IFR are addressed in this section. The following items apply to the pilots of all UAS:
• One pilot in command (PIC) must be designated at all times.
• The PIC of an aircraft is directly responsible, and is the final authority of, the operation of that aircraft.
• Pilots must not perform crew duties for more than one UAS at a time.
• Pilots are not allowed to perform concurrent duties both as pilot and observer.

GAO: Unmanned Aircraft Systems:

Why GAO Did This Study

UAS do not carry a pilot on board, but instead operate on pre-programmed routes and by following commands from pilot-operated ground stations. UAS can be small, generally 55 pounds or less, or large. Current domestic uses include law enforcement, forest fire monitoring, border security, weather research, and scientific data collection. However, current uses are limited. FAA authorizes UAS operations on a case-by-case basis after conducting a safety review.

Currently, FAA authorizes all domestic military; public (academic institutions, federal, state, and local governments including law enforcement organizations); and civil (private sector entities) UAS operations on a limited basis after conducting a case-by-case safety review. Federal, state, and local government agencies must apply for Certificates of Waiver or Authorization (COA), while civil operators must apply for special airworthiness certificates in the experimental category. Because special airworthiness certificates do not allow commercial operations, there is currently no means for FAA to authorize commercial UAS operations.

Since FAA started issuing COAs in January 2007, 1,428 COAs have been issued. At present, under COA or special airworthiness certification, UAS operations are permitted for specific time frames (generally 12 to 24 months); locations; and operations. So, one agency can be issued multiple COAs to operate one UAS for the same purpose. In 2012, FAA issued 391 COAs to 121 federal, state, and local government entities across the United States, including law enforcement entities as well as academic institutions

GAO earlier reported that unmanned aircraft systems (UAS) could not meet the aviation safety requirements developed for manned aircraft and posed several obstacles to operating safely and routinely in the national airspace system. These include 1) the inability for UAS to detect, sense, and avoid other aircraft and airborne objects in a manner similar to "see and avoid" by a pilot in a manned aircraft; 2) vulnerabilities in the command and control of UAS operations; 3) the lack of technological and operational standards needed to guide the safe and consistent performance of UAS; and 4) the lack of final regulations to accelerate the safe integration of UAS into the national airspace.

UAS aircraft do not carry a human operator on board, but instead operate on pre-programmed routes or by following commands from pilot-operated ground stations. These aircraft are also referred to as "unmanned aerial vehicles," "remotely piloted aircraft," "unmanned aircraft," or "drones." The term "unmanned aircraft system" is used to recognize that a UAS includes not only the airframe, but also associated elements such as a ground station and the communications links.

GAO July 2012: Current domestic uses of UAS are limited and include law enforcement, monitoring or fighting forest fires, border security, weather research, and scientific data collection. UAS have a wide-range of potential uses, including commercial uses such as pipeline, utility, and farm fence inspections; vehicular traffic monitoring; real estate and construction site photography; relaying telecommunication signals; and crop dusting. FAA's long-range goal is to permit, to the greatest extent possible, routine UAS operations in the national airspace system while ensuring safety. Using UAS for commercial purposes is not currently allowed in the national airspace. As the list of potential uses for UAS grows, so do the concerns about how they will affect existing military and non-military aviation as well as concerns about how they might be used.

Table 1: Key Federal UAS Stakeholders and Their Roles Integrating UAS into the National Airspace Key stakeholders	UAS integration role
Federal Aviation Administration (FAA)	FAA's UAS Integration Office is responsible for ensuring that UAS operate safely in the national airspace.
Department of Defense (DOD)	DOD provides FAA with UAS operational and safety data, as well as research and development support.
National Aeronautics and Space Administration (NASA)	NASA provides research and development and testing on UAS integration efforts.
Department of Homeland Security (DHS)	DHS's Customs and Border Patrol has provided flight demonstrations to FAA's Next Generation Air Transportation System (NextGen) Office.
General Services Administration (GSA)	The General Services Administration (GSA) is responsible for tracking the federal government's UAS inventory. Federal agencies that own or lease UAS report their UAS inventory, cost and utilization data to GSA.
Department of Justice (DOJ)	DOJ's National Institute of Justice is responsible, in part, for assisting the technology needs—including UAS—of local, state, and tribal law enforcement agencies.

Meeting the 2012 Act's Requirements Will Continue to Challenge FAA

January 31, 2013 Deadline	FAA Modernization and Reform Act of 2012 requirement	Status of action
05/14/2012	Enter into agreements with appropriate government agencies to simplify the process for issuing COAs or waivers for public UAS.	In process
05/14/2012	Expedite the issuance of a COA for public safety entities.	Completed
08/12/2012	Establish a program to integrate UAS into the national airspace at 6 test ranges. This program is to terminate 5 years after date of enactment.	In process
08/12/2012	Develop an Arctic UAS operation plan and initiate a process to work with relevant federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes.	Completed
08/12/2012	Determine whether certain UAS can fly safely in the national airspace before the completion of the Act's requirements for a comprehensive plan and rulemaking to safely accelerate the integration of civil UAS into the national airspace or the Act's requirement for issuance of guidance regarding the operation of public UAS including operating a UAS with a COA or waiver.	In process
11/10/2012	Develop a comprehensive plan to safely accelerate integration of civil UAS into national airspace.	In process
11/10/2012	Issue guidance regarding operation of civil UAS to expedite COA process; provide a collaborative process with public agencies to allow an incremental expansion of access into the national airspace as technology matures and the necessary safety analysis and data become available and until standards are completed and technology issues are resolved; facilitate capability of public entities to develop and use test ranges; provide guidance on public entities' responsibility for operation.	In process

GAO July 2012: Obstacles to Safe and Routine Integration of UAS:

Sense and avoid technologies. To date, no suitable technology has been identified that would provide UAS with the capability to meet the detect, sense, and avoid requirements of the national airspace system.

Command and control communications. Similar to what we previously reported, ensuring uninterrupted command and control for UAS remains a key obstacle for safe and routine integration into the national airspace.

Standards. A rigorous certification process with established performance thresholds is needed to ensure that UAS and pilots meet safety, reliability, and performance standards. Minimum aviation system standards are needed in three areas: performance; command and control communications; and sense and avoid.

Regulations. FAA regulations govern the routine operation of most aircraft in the national airspace system. However, these regulations do not contain provisions to address issues relating to unmanned aircraft.

Security requirements have yet to be developed for UAS ground control stations—the UAS equivalent of the cockpit

Privacy concerns over collection and use of surveillance data. Following the enactment of the UAS provisions of the 2012 FAA reauthorization act, members of Congress, a civil liberties organization, and others have expressed concern that the increased use of UAS for surveillance and other purposes in the national airspace has potential privacy implications.

Proposed legislation in the 112th session of Congress, seeks to limit or serve as a check on uses of UAS by, for example, limiting the ability of the federal government to use UAS to gather information pertaining to criminal conduct without a warrant.

Currently, no federal agency has specific statutory responsibility to regulate privacy matters relating to UAS.

Representatives from one civil liberties organization told us that since FAA has responsibility to regulate the national airspace, it could be positioned to handle responsibility for incorporating rules that govern UAS use and data collection. Some stakeholders have suggested that the FAA has the opportunity and responsibility to incorporate such privacy issues into the small UAS rule that is currently underway and in future rulemaking procedures. However, FAA officials have said that regulating these sensors is outside the FAA's mission, which is primarily focused on aviation safety,

Model Aircraft flyers:

Owners of model aircraft do not require a COA to operate their aircraft

Furthermore, as part of its 2012 reauthorization act, FAA is prohibited from developing any rule or regulation for model aircraft under a specified set of conditions. The Academy of Model Aeronautics, which promotes the development of model aviation as a recognized sport and represents a membership of over 150,000, published several documents to guide model aircraft users on safety, model aircraft size and speed, and use.

Public Law 112-95 Feb 14, 2012

SEC. 336. Special Rule for Model Aircraft.

(a) IN GENERAL.—Notwithstanding any other provision of law relating to the incorporation of unmanned aircraft systems into Federal Aviation Administration plans and policies, including this subtitle, the Administrator of the Federal Aviation Administration may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft, if—

This document and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating systems for sport and recreation. Those individuals should seek guidance under Advisory Circular (AC) 91-57, Model Aircraft Operating Standards, which is currently under revision.

Federal Aviation Administration

Fact Sheet – Unmanned Aircraft Systems (UAS)

For Immediate Release

February 19, 2013
Contact: Les Dorr or Alison Duquette
Phone: (202) 267-3883

Unmanned Aircraft Systems (UAS) come in a variety of shapes and sizes and serve diverse purposes. They may have a wingspan as large as a Boeing 737 or smaller than a radio-controlled model airplane. Regardless of size, the responsibility to fly safely applies equally to manned and unmanned aircraft operations.

Because they are inherently different from manned aircraft, introducing UAS into the nation's airspace is challenging for both the FAA and aviation community. UAS must be integrated into a National Airspace System (NAS) that is evolving from ground-based navigation aids to a GPS-based system in NextGen. Safe integration of UAS involves gaining a better understanding of operational issues, such as training requirements, operational specifications and technology considerations.

The FAA's Role: Safety

Safety is the FAA's top mission, and the agency maintains the world's safest aviation system. As a provider of air traffic control services, the FAA also must ensure the safety and efficiency of the nation's entire airspace.

The FAA first authorized use of unmanned aircraft in the NAS in 1990. Since then, the agency has authorized limited use of UAS for important missions in the public interest, such as firefighting, disaster relief, search and rescue, law enforcement, border patrol, military training and testing and evaluation. Today, UAS perform border and port surveillance by the Department of Homeland Security, help with scientific research and environmental monitoring by NASA and NOAA, support public safety by law enforcement agencies, help state universities conduct research, and support various other missions for public (government) entities.

Unmanned aircraft are flying now in the national airspace system under very controlled conditions. Operations potentially range from ground level to above 50,000 feet, depending on the specific type of aircraft. However, UAS operations are currently not authorized in Class B airspace, which exists over major urban areas and contains the highest density of manned aircraft in the National Airspace System.

There are currently two ways to get FAA approval to operate a UAS. The first is to obtain an experimental airworthiness certificate for private sector (civil) aircraft to do research and development, training and flight demonstrations. The second is to obtain a Certificate of Waiver or Authorization (COA) for public aircraft. Routine operation of UAS over densely-populated areas is prohibited.

Civil UAS

Obtaining an experimental airworthiness certificate for a particular UAS is currently the only way civil operators of unmanned aircraft are accessing the NAS. Experimental certificate regulations preclude carrying people or property for compensation or hire, but do allow operations for research and development, flight and sales demonstrations and crew training. The FAA is working with civilian operators to collect technical and operational data that will help refine the UAS airworthiness certification process. The agency is currently developing a future path for safe integration of civil UAS into the NAS as part of NextGen implementation.

Public UAS

COAs are available to public entities that want to fly a UAS in civil airspace. Common uses today include law enforcement, firefighting, border patrol, disaster relief, search and rescue, military training, and other government operational missions.

Applicants make their request through an online process and the FAA evaluates the proposed operation to see if it can be conducted safely.

The COA allows an operator to use a defined block of airspace and includes special provisions unique to the proposed operation. For instance, a COA may require flying only under Visual Flight Rules (VFR) and/or only during daylight hours. COAs usually are issued for a specific period—up to two years in many cases.

Most COAs require coordination with an appropriate air traffic control facility and may require a transponder on the UAS to operate in certain types of airspace.

Because UAS technology cannot currently comply with "see and avoid" rules that apply to all aircraft, a visual observer or an accompanying "chase plane" must maintain visual contact with the UAS and serve as its "eyes" when operating outside airspace restricted from other users.

COAs Issued:

2009	146
2010	298
2011	313
2012	257

There were 327 COAs active as of February 15, 2013.

Streamlining the Process

The FAA has been working with its government partners to streamline COA procedures. In 2009, the FAA, NASA and the Departments of Defense and Homeland Security formed a UAS Executive Committee, or "ExCom" to address UAS integration issues. The ExCom established a working group that developed suggestions to expedite the COA process and increase transparency.

For new applications from public users, the FAA has an on-line process that ensures paperwork is complete and ready to be assessed. Today, the average time to issue an authorization for non-emergency operations is less than 60 days, and the renewal period is two years. The agency has expedited procedures in place to grant one-time COAs for time-sensitive emergency missions, such as disaster relief and humanitarian efforts.

Model Aircraft

Recreational use of airspace by model aircraft is covered by FAA Advisory Circular 91-57, which generally limits operations to below 400 feet above ground level and away from airports and air traffic. In

2007, the FAA clarified that AC 91-57 only applies to modelers, and specifically excludes individuals or companies flying model aircraft for business purposes.

The FAA guidance is available at: http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf

Operation and Certification Standards

Integrating UAS into the nation's airspace presents both opportunities and challenges. However, everything the FAA does is focused on ensuring the safety of the nation's aviation system. New policies, procedures and approval processes will address the increasing desire by civilian operators to fly UAS in the NAS. Developing and implementing new UAS standards and guidance is a long-term effort.

The FAA chartered a UAS Aviation Rulemaking Committee in 2011 to develop inputs and recommendations on appropriate operational procedures, regulatory standards and policies before allowing routine UAS access to the nation's airspace.
The FAA has asked RTCA – organized in 1935 as the Radio Technical Commission for Aeronautics, a group that facilitates expert advice to the agency on technical issues – to work with industry to assist in the development of UAS standards. RTCA's technical group will address how UAS will handle communication, command and control and how they will "sense and avoid" other aircraft.
The FAA continues to work closely with its international aviation counterparts to harmonize standards, policies, procedures and regulatory requirements.

UAS Test Sites

In the FAA Modernization and Reform Act of 2012, Congress directed the FAA to establish a program to integrate UAS into the national airspace system at six test ranges. The designation and operation of test sites will be a tool for testing all aspects of UAS integration. Some facets of test site selection and operation include:

Safe designation of airspace for integrated manned and unmanned flight operations in the national airspace system
Development of certification standards and air traffic requirements for unmanned flight operations
Coordinating with and leveraging the resources of NASA and the Department of Defense
Addressing both civil and public unmanned aircraft systems
Ensuring that the program is coordinated with the Next Generation Air Transportation System
Ensuring the safety of unmanned aircraft systems and related navigation procedures before they are integrated into the national airspace system

The FAA issued a Screening Information Request on February 14, 2013 for proposals to manage these sites. You can read the press release here: (http://www.faa.gov/news/press_releases/news_story.cfm?newsId=14313)
http://www.faa.gov/news/press_releases/news_story.cfm?newsId=14313
(http://www.faa.gov/news/press_releases/news_story.cfm?newsId=14313)

Small Unmanned Aircraft

Small unmanned aircraft (sUAS) are likely to grow most quickly in civil and commercial operations because of their versatility and relatively low initial cost and operating expenses. The FAA is working on a proposed rule governing the use of a wide range of small civil unmanned aircraft systems.

The 2012 reauthorization bill also directed the FAA to "allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less" under certain restrictions. The bill specified these UAS must be flown within the line of sight of the operator, less than 400 feet above the ground, during daylight conditions, inside Class G (uncontrolled) airspace and more than five miles from any airport or other location with aviation activities.

Prior to the congressional action, the FAA and the Justice Department had been working on an agreement to streamline the COA process for law enforcement – an agreement that also meets the mandate. Initially, law enforcement organizations will receive a COA for training and performance evaluation. When the organization has shown proficiency in flying its UAS, it will receive an operational COA. The agreement expands the allowable UAS weight up to 25 pounds.

A New Office for New Technology

In 2012, the FAA established the Unmanned Aircraft Systems Integration Office to provide a one-stop portal for civil and public use UAS in U.S. airspace. This office is developing a comprehensive plan to integrate and establish operational and certification requirements for UAS. It will also oversee and coordinate UAS research and development.

Over more than 50 years, the FAA has a proven track record of introducing new technology and aircraft safely into the NAS. The agency will successfully meet the challenges posed by UAS technology in a thoughtful, careful manner that ensures safety and addresses privacy issues while promoting economic growth.

For more information: http://www.faa.gov/about/initiatives/uas/ (http://www.faa.gov/about/initiatives/uas/)

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This page can be viewed online at: http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=14153

(e) USE OF DESIGNEES.—The Administrator may use designees to carry out subsection (a) to the extent practicable in order to minimize the burdens on pilots.

(f) REPORT TO CONGRESS.—

(1) IN GENERAL.—Not later than 1 year after the date of enactment of this Act, and annually thereafter, the Administrator shall submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report on the issuance of improved pilot licenses under this section.

(2) EXPIRATION.—The Administrator shall not be required to submit annual reports under this subsection after the date on which the Administrator has issued improved pilot licenses under this section to all pilots.

Subtitle B—Unmanned Aircraft Systems

49 USC 40101 note. Applicability.

SEC. 331. DEFINITIONS.

In this subtitle, the following definitions apply:

(1) ARCTIC.—The term "Arctic" means the United States zone of the Chukchi Sea, Beaufort Sea, and Bering Sea north of the Aleutian chain.

(2) CERTIFICATE OF WAIVER; CERTIFICATE OF AUTHORIZATION.—The terms "certificate of waiver" and "certificate of authorization" mean a Federal Aviation Administration grant of approval for a specific flight operation.

(3) PERMANENT AREAS.—The term "permanent areas" means areas on land or water that provide for launch, recovery, and operation of small unmanned aircraft.

(4) PUBLIC UNMANNED AIRCRAFT SYSTEM.—The term "public unmanned aircraft system" means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft (as defined in section 40102 of title 49, United States Code).

(5) SENSE AND AVOID CAPABILITY.—The term "sense and avoid capability" means the capability of an unmanned aircraft to remain a safe distance from and to avoid collisions with other airborne aircraft.

(6) SMALL UNMANNED AIRCRAFT.—The term "small unmanned aircraft" means an unmanned aircraft weighing less than 55 pounds.

(7) TEST RANGE.—The term "test range" means a defined geographic area where research and development are conducted.

(8) UNMANNED AIRCRAFT.—The term "unmanned aircraft" means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

(9) UNMANNED AIRCRAFT SYSTEM.—The term "unmanned aircraft system" means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.

SEC. 332. INTEGRATION OF CIVIL UNMANNED AIRCRAFT SYSTEMS INTO NATIONAL AIRSPACE SYSTEM.

49 USC 40101 note.

(a) REQUIRED PLANNING FOR INTEGRATION.—

(1) COMPREHENSIVE PLAN.—Not later than 270 days after the date of enactment of this Act, the Secretary of Transportation, in consultation with representatives of the aviation industry, Federal agencies that employ unmanned aircraft systems technology in the national airspace system, and the unmanned aircraft systems industry, shall develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system.

Deadline.

(2) CONTENTS OF PLAN.—The plan required under paragraph (1) shall contain, at a minimum, recommendations or projections on—

(A) the rulemaking to be conducted under subsection (b), with specific recommendations on how the rulemaking will—

(i) define the acceptable standards for operation and certification of civil unmanned aircraft systems;

(ii) ensure that any civil unmanned aircraft system includes a sense and avoid capability; and

(iii) establish standards and requirements for the operator and pilot of a civil unmanned aircraft system, including standards and requirements for registration and licensing;

(B) the best methods to enhance the technologies and subsystems necessary to achieve the safe and routine operation of civil unmanned aircraft systems in the national airspace system;

(C) a phased-in approach to the integration of civil unmanned aircraft systems into the national airspace system;

(D) a timeline for the phased-in approach described under subparagraph (C);

(E) creation of a safe

(F) airspace designation for cooperative manned and unmanned flight operations in the national airspace system;

(G) establishment of a process to develop certification, flight standards, and air traffic requirements for civil unmanned aircraft systems at test ranges where such systems are subject to testing;

(H) the best methods to ensure the safe operation of civil unmanned aircraft systems and public unmanned aircraft systems simultaneously in the national airspace system; and

(I) incorporation of the plan into the annual NextGen Implementation Plan document (or any successor document) of the Federal Aviation Administration.

(3) DEADLINE.—The plan required under paragraph (1) shall provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015.

(4) REPORT TO CONGRESS.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to Congress a copy of the plan required under paragraph (1).

Deadlines.
Publication.
Web posting.

(5) ROADMAP.—Not later than 1 year after the date of enactment of this Act, the Secretary shall approve and make available in print and on the Administration's Internet Web site a 5-year roadmap for the introduction of civil unmanned aircraft systems into the national airspace system, as coordinated by the Unmanned Aircraft Program Office of the Administration. The Secretary shall update the roadmap annually.

Deadline.
Federal Register, publication.

(b) RULEMAKING.—Not later than 18 months after the date on which the plan required under subsection (a)(1) is submitted to Congress under subsection (a)(4), the Secretary shall publish in the Federal Register—

(1) a final rule on small unmanned aircraft systems that will allow for civil operation of such systems in the national airspace system, to the extent the systems do not meet the requirements for expedited operational authorization under section 333 of this Act;

(2) a notice of proposed rulemaking to implement the recommendations of the plan required under subsection (a)(1), with the final rule to be published not later than 16 months after the date of publication of the notice; and

(3) an update to the Administration's most recent policy statement on unmanned aircraft systems, contained in Docket No. FAA–2006–25714.

(c) PILOT PROJECTS.—

Deadline.

(1) ESTABLISHMENT.—Not later than 180 days after the date of enactment of this Act, the Administrator shall establish a program to integrate unmanned aircraft systems into the national airspace system at 6 test ranges. The program shall terminate 5 years after the date of enactment of this Act.

Termination date.

(2) PROGRAM REQUIREMENTS.—In establishing the program under paragraph (1), the Administrator shall—

(A) safely designate airspace for integrated manned and unmanned flight operations in the national airspace system;

Standards.

(B) develop certification standards and air traffic requirements for unmanned flight operations at test ranges;

(C) coordinate with and leverage the resources of the National Aeronautics and Space Administration and the Department of Defense;

(D) address both civil and public unmanned aircraft systems;

(E) ensure that the program is coordinated with the Next Generation Air Transportation System; and

(F) provide for verification of the safety of unmanned aircraft systems and related navigation procedures before integration into the national airspace system.

(3) TEST RANGE LOCATIONS.—In determining the location of the 6 test ranges of the program under paragraph (1), the Administrator shall—

(A) take into consideration geographic and climatic diversity;

(B) take into consideration the location of ground infrastructure and research needs; and

Consultation.

(C) consult with the National Aeronautics and Space Administration and the Department of Defense.

(4) TEST RANGE OPERATION.—A project at a test range shall be operational not later than 180 days after the date on which the project is established. Deadline.

(5) REPORT TO CONGRESS.—

(A) IN GENERAL.—Not later than 90 days after the date of the termination of the program under paragraph (1), the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure and the Committee on Science, Space, and Technology of the House of Representatives a report setting forth the Administrator's findings and conclusions concerning the projects.

(B) ADDITIONAL CONTENTS.—The report under subparagraph (A) shall include a description and assessment of the progress being made in establishing special use airspace to fill the immediate need of the Department of Defense—

(i) to develop detection techniques for small unmanned aircraft systems; and

(ii) to validate the sense and avoid capability and operation of unmanned aircraft systems.

(d) EXPANDING USE OF UNMANNED AIRCRAFT SYSTEMS IN ARCTIC.—

(1) IN GENERAL.—Not later than 180 days after the date of enactment of this Act, the Secretary shall develop a plan and initiate a process to work with relevant Federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes. The plan for operations in these permanent areas shall include the development of processes to facilitate the safe operation of unmanned aircraft beyond line of sight. Such areas shall enable over-water flights from the surface to at least 2,000 feet in altitude, with ingress and egress routes from selected coastal launch sites. Deadline. Plans.

(2) AGREEMENTS.—To implement the plan under paragraph (1), the Secretary may enter into an agreement with relevant national and international communities.

(3) AIRCRAFT APPROVAL.—Not later than 1 year after the entry into force of an agreement necessary to effectuate the purposes of this subsection, the Secretary shall work with relevant national and international communities to establish and implement a process, or may apply an applicable process already established, for approving the use of unmanned aircraft in the designated permanent areas in the Arctic without regard to whether an unmanned aircraft is used as a public aircraft, a civil aircraft, or a model aircraft. Deadline.

SEC. 333. SPECIAL RULES FOR CERTAIN UNMANNED AIRCRAFT SYSTEMS. 49 USC 40101 note.

(a) IN GENERAL.—Notwithstanding any other requirement of this subtitle, and not later than 180 days after the date of enactment of this Act, the Secretary of Transportation shall determine if certain unmanned aircraft systems may operate safely in the national airspace system before completion of the plan and rulemaking required by section 332 of this Act or the guidance required by section 334 of this Act. Deadline. Determination.

Determination.

(b) ASSESSMENT OF UNMANNED AIRCRAFT SYSTEMS.—In making the determination under subsection (a), the Secretary shall determine, at a minimum—

(1) which types of unmanned aircraft systems, if any, as a result of their size, weight, speed, operational capability, proximity to airports and populated areas, and operation within visual line of sight do not create a hazard to users of the national airspace system or the public or pose a threat to national security; and

(2) whether a certificate of waiver, certificate of authorization, or airworthiness certification under section 44704 of title 49, United States Code, is required for the operation of unmanned aircraft systems identified under paragraph (1).

(c) REQUIREMENTS FOR SAFE OPERATION.—If the Secretary determines under this section that certain unmanned aircraft systems may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft systems in the national airspace system.

49 USC 40101 note.

SEC. 334. PUBLIC UNMANNED AIRCRAFT SYSTEMS.

Deadline.

(a) GUIDANCE.—Not later than 270 days after the date of enactment of this Act, the Secretary of Transportation shall issue guidance regarding the operation of public unmanned aircraft systems to—

(1) expedite the issuance of a certificate of authorization process;

(2) provide for a collaborative process with public agencies to allow for an incremental expansion of access to the national airspace system as technology matures and the necessary safety analysis and data become available, and until standards are completed and technology issues are resolved;

(3) facilitate the capability of public agencies to develop and use test ranges, subject to operating restrictions required by the Federal Aviation Administration, to test and operate unmanned aircraft systems; and

(4) provide guidance on a public entity's responsibility when operating an unmanned aircraft without a civil airworthiness certificate issued by the Administration.

Deadline.

(b) STANDARDS FOR OPERATION AND CERTIFICATION.—Not later than December 31, 2015, the Administrator shall develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system.

(c) AGREEMENTS WITH GOVERNMENT AGENCIES.—

Deadline.

(1) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Secretary shall enter into agreements with appropriate government agencies to simplify the process for issuing certificates of waiver or authorization with respect to applications seeking authorization to operate public unmanned aircraft systems in the national airspace system.

(2) CONTENTS.—The agreements shall—

(A) with respect to an application described in paragraph (1)—

(i) provide for an expedited review of the application;

(ii) require a decision by the Administrator on approval or disapproval within 60 business days of the date of submission of the application; and Deadline.

(iii) allow for an expedited appeal if the application is disapproved;

(B) allow for a one-time approval of similar operations carried out during a fixed period of time; and

(C) allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less, if operated—

(i) within the line of sight of the operator;

(ii) less than 400 feet above the ground;

(iii) during daylight conditions;

(iv) within Class G airspace; and

(v) outside of 5 statute miles from any airport, heliport, seaplane base, spaceport, or other location with aviation activities.

SEC. 335. SAFETY STUDIES. 49 USC 40101 note.

The Administrator of the Federal Aviation Administration shall carry out all safety studies necessary to support the integration of unmanned aircraft systems into the national airspace system.

SEC. 336. SPECIAL RULE FOR MODEL AIRCRAFT. 49 USC 40101 note.

(a) IN GENERAL.—Notwithstanding any other provision of law relating to the incorporation of unmanned aircraft systems into Federal Aviation Administration plans and policies, including this subtitle, the Administrator of the Federal Aviation Administration may not promulgate any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft, if—

(1) the aircraft is flown strictly for hobby or recreational use;

(2) the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;

(3) the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;

(4) the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and

(5) when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with prior notice of the operation (model aircraft operators flying from a permanent location within 5 miles of an airport should establish a mutually-agreed upon operating procedure with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport)).

(b) STATUTORY CONSTRUCTION.—Nothing in this section shall be construed to limit the authority of the Administrator to pursue enforcement action against persons operating model aircraft who endanger the safety of the national airspace system.

(c) MODEL AIRCRAFT DEFINED.—In this section, the term "model aircraft" means an unmanned aircraft that is—

(1) capable of sustained flight in the atmosphere;

(2) flown within visual line of sight of the person operating the aircraft; and

(3) flown for hobby or recreational purposes.

Subtitle C—Safety and Protections

SEC. 341. AVIATION SAFETY WHISTLEBLOWER INVESTIGATION OFFICE.

Section 106 (as amended by this Act) is further amended by adding at the end the following:

"(t) AVIATION SAFETY WHISTLEBLOWER INVESTIGATION OFFICE.—

"(1) ESTABLISHMENT.—There is established in the Federal Aviation Administration (in this subsection referred to as the 'Agency') an Aviation Safety Whistleblower Investigation Office (in this subsection referred to as the 'Office').

"(2) DIRECTOR.—

"(A) APPOINTMENT.—The head of the Office shall be the Director, who shall be appointed by the Secretary of Transportation.

"(B) QUALIFICATIONS.—The Director shall have a demonstrated ability in investigations and knowledge of or experience in aviation.

"(C) TERM.—The Director shall be appointed for a term of 5 years.

"(D) VACANCIES.—Any individual appointed to fill a vacancy in the position of the Director occurring before the expiration of the term for which the individual's predecessor was appointed shall be appointed for the remainder of that term.

"(3) COMPLAINTS AND INVESTIGATIONS.—

"(A) AUTHORITY OF DIRECTOR.—The Director shall—

"(i) receive complaints and information submitted by employees of persons holding certificates issued under title 14, Code of Federal Regulations (if the certificate holder does not have a similar in-house whistleblower or safety and regulatory noncompliance reporting process) and employees of the Agency concerning the possible existence of an activity relating to a violation of an order, a regulation, or any other provision of Federal law relating to aviation safety;

"(ii) assess complaints and information submitted under clause (i) and determine whether a substantial likelihood exists that a violation of an order, a regulation, or any other provision of Federal law relating to aviation safety has occurred; and

Recommendations.

"(iii) based on findings of the assessment conducted under clause (ii), make recommendations to the Administrator of the Agency, in writing, regarding further investigation or corrective actions.

"(B) DISCLOSURE OF IDENTITIES.—The Director shall not disclose the identity of an individual who submits a complaint or information under subparagraph (A)(i) unless—

"(i) the individual consents to the disclosure in writing; or

AVIATION SAFETY
UNMANNED AIRCRAFT PROGRAM OFFICE
AIR-160

Interim Operational Approval Guidance 08-01

Unmanned Aircraft Systems Operations in the U. S. National Airspace System

March 13, 2008

Purpose

Aviation Safety Unmanned Aircraft Program Office (UAPO) Interim Operational Approval Guidance, *Unmanned Aircraft Systems Operations in the U. S. National Airspace System,* provides guidance to be used to determine if unmanned aircraft systems (UAS) may be allowed to conduct flight operations in the U. S. national airspace system (NAS). UAPO and Air Traffic Organization (ATO) personnel will use this policy guidance when evaluating each application for a Certificate of Waiver or Authorization (COA) and special airworthiness certificates (normally issued in an experimental category). UAPO Interim Operational Approval Guidance provides additional information on a number of items in the COA processor application developed by the Air Traffic Organization. Used in conjunction with the COA online application system, this guidance will simplify the COA evaluation process.

1.0 Introduction

The proliferation of UAS into the NAS has resulted in an increased demand for the FAA to process a large number of applications to review for operational approvals. These approvals are required due to the fact that unmanned aircraft (UA) are not compliant with various sections of Title 14 of the Code of Federal Regulations (14 CFR) and therefore, require an alternate means of compliance. Most notably, the lack of an on-board pilot requires an alternate method of the "see-and-avoid" provisions of 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*.

This document is intended to provide guidance and information to Aviation Safety (AVS) and ATO personnel who are charged with the processing, reviewing, and approving of UAS operations. The interim guidance presented in this document represents the culmination of best practices and procedures used in prior UAS approvals, as well as input from other government agencies, industry and user stakeholders. It should be noted that the material presented in this document is a recommended approach to approving typical UAS operations, however, each application needs to be assessed on its own technical merits and may require unique authorizations which are based on the specific needs or capabilities of the UAS in question.

It should be further noted that due to the rapid evolution of UAS technology, this guidance material will be subject to continuous review and may be updated when appropriate.

Note: In general, and as a minimum, applicants must observe all applicable regulations of 14 CFR parts 61 and 91. This document is intended to identify alternate methods of compliance with the regulations when evaluating proposed UAS operations.

For a complete listing of regulations, refer to the following website:
http://www.faa.gov/regulations_policies/faa_regulations/

2.0 Background

UAS operations have increased dramatically during the past several years in both the public and private sectors. In response to this increasing activity, it has become necessary to develop guidance for Federal Aviation Administration to use when evaluating applications for certificate(s) of waiver or authorization and special airworthiness certificates. This guidance is

not meant as a substitute for any regulatory process. This guidance was jointly developed by, and reflects the consensus opinion of:

- The Unmanned Aircraft Program Office (UAPO), FAA Aircraft Certification Service (AIR-160)
- The Production and Airworthiness Division, FAA Aircraft Certification Service (AIR-200)
- The Flight Technologies and Procedures Division, FAA Flight Standards Service (AFS-400)
- The FAA Air Traffic Organization's Office of System Operations and Safety, (AJR-3).

3.0 Definitions

The following definitions apply to terms used in this document.

- **Airworthiness:** For the UAS to be considered airworthy, both the aircraft and all of the other associated support equipment of the UAS must be in a condition for safe operation. If any element of the systems is not in condition for safe operation, then the UA would not be considered airworthy.
- **Chase aircraft:** A manned aircraft flying in close proximity to an unmanned aircraft that carries, in addition to the pilot in command (PIC) of the aircraft, a qualified visual observer.
- **Cooperative aircraft:** Aircraft that have an electronic means of identification (i.e., a transponder) aboard and operating.
- **Inspection:** The routine performance of inspection tasks at prescribed intervals. The inspection must ensure the airworthiness of an aircraft up to and including its overhaul or life limits.
- **Non-Cooperative aircraft:** Aircraft that do not have an electronic means of identification (i.e., a transponder) aboard or not operating such equipment due to malfunction or deliberate action.
- **Off-Airport:** Any location used to launch or recover an unmanned aircraft that is not considered an airport (i.e., an open field).
- **Pilot in Command (PIC):** The person who has final authority and responsibility for the operation and safety of flight, has been designated as pilot in command before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the pilot in command as described by 14 CFR 91.3, *Responsibility and Authority of the Pilot in Command*, apply to the unmanned aircraft PIC. The pilot in command position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.
- **Public aircraft:** An aircraft operated by a public user which is intrinsically governmental in nature (i.e. federal, state, and local agencies). Examples of public entities are Department of Defense (DoD) and its military branches; other local, state, and federal government agencies; and state universities. Refer to 14 CFR 1.1, *General Definitions*, for a complete definition of a public aircraft.

- **Scheduled Maintenance (Routine):** The performance of maintenance tasks at prescribed intervals.
- **Supplemental Pilot:** Supplemental pilots are those pilots assigned unmanned aircraft flight duties to augment the pilot in command. It is common for applicants to have both an "internal" and an "external" unmanned aircraft pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the pilot in command if they meet the qualifications.
- **Unmanned Aircraft:** A device used or intended to be used for flight in the air that has no onboard pilot. This includes all classes of airplanes, helicopters, airships, and translational lift aircraft that have no onboard pilot. Unmanned aircraft are understood to include only those aircraft controllable in three axes and therefore, exclude traditional balloons
- **Unscheduled Maintenance (Non-Routine):** The performance of maintenance tasks when mechanical irregularities occur. These irregularities are categorized as to whether or not they occur during flight time.
- **Visual Line-of-Sight:** A method of control and collision avoidance that refers to the pilot or observer directly viewing the unmanned aircraft with human eyesight. Corrective lenses (spectacles or contact lenses) may be used by the pilot or visual observer. Aids to vision, such as binoculars, field glasses, or telephoto television may be employed as long as their field of view does not adversely affect the surveillance task.
- **Visual Observer:** A trained person who assists the unmanned aircraft pilot in the duties associated with collision avoidance. This includes, but is not limited to, avoidance of other traffic, clouds, obstructions and terrain.

4.0 Methods of Authorization and Applicability

Guidance in this document of an operational nature always applies to both civil and public operators. In the areas of pilot certification, crew certification, pilot currency, medical certificates, and airworthiness, it is assumed that all public aircraft comply with processes and policies established by the public entity, in a manner similar to publicly operated manned aircraft. If no established policies exist regarding pilot certification, crew certification, pilot currency, medical certificates, and airworthiness, it is highly recommended that the public agency/department apply the guidance outlined in this document.

The procedures contained in this document are applicable for operations in the contiguous United States, Alaska, Hawaii, and the Flight Information Regions delegated to the United States and areas where the FAA is the Air Traffic Service Provider.

In general, specific authorization to conduct unmanned aircraft operations in the NAS outside of active Restricted, Prohibited, or Warning Area airspace must be requested by the applicant. Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated. The two methods of approval are either a certificate of waiver or authorization (COA) or the issuance of a special airworthiness certificate.

The guidance information presented in this document applies to approvals for both COA and special airworthiness certificates. Unless otherwise stated, recommended procedures and guidance that appear in this document apply to both.

The applicability and process to be used in a UAS operational approval is dependent on whether the applicant is a civil user or a public user. A public user is one that is intrinsically governmental in nature (i.e., federal, state, and local agencies). Public applicants should utilize the COA application process. Civil applicants must apply for an airworthiness certificate.

Regardless of authorization method, all UAS applications are ultimately processed through ATO, UAPO, Flight Standards, and Aircraft Certification staff at the headquarters level for final approval and disposition.

Notes:

- ***This document and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating systems for sport and recreation. Those individuals should seek guidance under Advisory Circular (AC) 91-57, Model Aircraft Operating Standards, which is currently under revision.***
- ***Civil UAS operations require a special airworthiness certificate and should follow the process as specified in this document.***
- ***AC 91-57 shall not be used as a basis of approval for UAS operations and is applicable to recreational and hobbyists use only.***

4.1 Certificate of Waiver or Authorization (COA)

Applications for a COA are only accepted from public entities. An application may be referred to the FAA Office of the Chief Counsel (AGC), for determination of the status of an applicant, i.e., public or civil. COAs are typically issued for a period of up to one year, but may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for operations conducted wholly within an active Restricted, Prohibited or Warning Area airspace when operating with permission from the appropriate authority or using agency of that airspace.

4.1.1 General Process Air Traffic Operations (ATO) is responsible for the COA process. Applications can be made on the internet or can be made on FAA Form 7711-2, *Application for Certificate of Waiver or Authorization.* If the application is made on FAA Form 7711-2 it will be sent to Headquarters ATO, through the local Air Traffic Service Area. ATO has developed a guidance checklist covering the application and approval process. This form and guidance material can be found on the internet at www.faa.gov/uas via the Air Traffic Airspace (ATA), Unmanned Aircraft Systems (UAS) Group link.

Prior to issuance of a COA, ATO normally requests a review of the COA application by the UAPO. Specifically, the AFS-400 members of the UAPO evaluates each application to determine if risks associated with the operation have been acceptably mitigated. Formal recommendations are forwarded to ATO from the UAPO at the conclusion of the review process.

4.1.2 National Security Considerations When the Department of Defense or the Department of Homeland Security declares a UAS operation is a matter of "national security," the FAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this guidance document. In this case, national security itself may override risk mitigation requirements and the applicant must declare in the COA application acceptance of all risks associated with the UAS operations. In general, such requests should be directed to the Administrator, Federal Aviation Administration, from an equivalent level individual of the applicant's organization.

4.2 Special Airworthiness Certificate

Civil applicants are required to apply for a special airworthiness certificate, typically, an experimental certificate. The applicant is required to submit the requisite data to support a determination that the aircraft and its systems, including the control station(s) is designed, built, and maintained in a safe and airworthy condition. Experimental certificates are typically issued for a period of up to one year. Experimental certificates are typically issued to industry and manufacturers wishing to accomplish UAS research and development, testing, crew training, and market survey in accordance with 14 CFR Part 21.191. In cases where an applicant has been issued a special airworthiness certificate, and concurrently operates a corresponding UAS on a COA in support of a public activity, the applicant must elect, prior to each flight, what authority is to be used to conduct the flight. The use of both a special airworthiness certificate and a COA authorization on a single flight is not permitted.

4.2.1 General Process For civil UAS operations, the Aircraft Certification Service, Production and Airworthiness Division, AIR-200, at FAA headquarters is responsible for the issuance of special airworthiness certificates. The issuance of an experimental certificate is coordinated with the UAPO as well as AVS and ATO personnel at the headquarters and regional levels. A thorough review is conducted by this team to evaluate the system's airworthiness and operational specifics and to determine mitigations required to meet acceptable standards of safety.

5.0 Alternate Methods of Compliance

All limitations and procedures presented in this guidance document are to be considered as general guidelines only. Each application is evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems. As such, deviations and alternate methods of compliance may be approved and may differ from the information presented in this document. Therefore, if the applicant makes a safety case and presents sufficient data for an alternate means of compliance, then this data should be taken into consideration and evaluated for possible approval.

6.0 UAS Airworthiness

All UAS must be shown to be airworthy to conduct flight operations in the NAS. UAS should be maintained and conform to the same airworthiness standards as defined for the 14 CFR parts

under which UAS are intended to be operated. The FAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined. In the future, UAS Maintenance Technician certification will parallel existing standards for manned aviation. As with airworthiness standards, Maintenance Technicians Requirements will be reviewed as part of the data collection process.

6.1 Public Applicants

The applicant must provide an airworthiness statement specifying compliance with the proponent's applicable airworthiness policy or criteria. Examples of acceptable policy/criteria include, but are not limited to:

- DoD: MIL-HDBK 516B, *Airworthiness Certification*
- Air Force: AFPD 62-6, *USAF Aircraft Airworthiness Certification*
- Army: AR 70-62, *Airworthiness Qualification Of US Army Aircraft Systems (Level 1)*
- Navy and Marine Corps: NAVAIRINST 13034.1C, *Flight Clearance Policy for Air Vehicles and Aircraft Systems.*

Note: As an example, an airworthiness statement could include words to this effect: This COA application for (name of UAS) has been reviewed on behalf of the (name of applicant or agency) in accordance with (MIL-HDBK-516 or specified alternative method) and has been determined to be airworthy to operate as specified in this application subject to the following restrictions (specify the conditions). The statement should be on letterhead paper and both dated and signed by the responsible reviewing authority.

6.2 Civil Applicants

Approvals for civil applications using the special airworthiness process receive their airworthiness certification as part of the review process with the FAA.

7.0 Continued Airworthiness

Applicants for UAS operational approvals must address continued airworthiness procedures as part of their application. It is highly recommended that all applicants provide the following information: a Continuing Airworthiness Program, a Maintenance Training Program, any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation and a process to report any applicable data relating to the operation and maintenance of the UAS. All information that is received from UAS operators will aid the FAA in tracking the various existing UAS types and operations. This data will help expedite the regulatory process for UAS and allow the FAA to have a historical data base from which to base current and future UAS regulatory guidance. Accurate recordkeeping is essential in assuring positive operational and quality airworthiness control.

8.0 Flight Operations

8.1 General

The guidance presented in this document applies only to those UAS operations affecting areas of the NAS other than active Restricted, Prohibited, or Warning Areas. The FAA is particularly concerned that UAS operate safely among all users of the NAS, including non-cooperative aircraft and other airborne operations not reliably identifiable by radar (i.e., balloons, gliders, parachutists, etc).

Unless specifically authorized, UAS operations in other than active Restricted, Prohibited, or Warning Areas, or Class A airspace shall require visual observers, either airborne or ground-based.

While considerable work is ongoing to develop a certifiable "detect, sense, and avoid" system, no current solution exists. Compliance with the "see and avoid" aspect of 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*, becomes one of the primary issues in UAS operational approvals. As a result, alternate methods of compliance are required to accomplish the "see and avoid" function. See and avoid risk mitigation strategies are normally based on the use of visual observers or other methods of segregation. Risk mitigations may also include other methods or systems that an applicant may propose for consideration. An applicant may propose any reasonable type of mitigation or system, however, the FAA approves UAS flight activities that can demonstrate that the proposed operations can be conducted at an acceptable level of safety.

Applicants proposing "see and avoid" strategies in lieu of visual observers, need to support proposed mitigations with system safety studies which indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an "extremely improbable" determination.

It is the applicant's responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable. UA with performance characteristics that impede normal air traffic operations may be restricted in their operations.

8.1.1 System Considerations

- **Onboard Cameras/Sensors:** Although onboard cameras and sensors that are positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of deconfliction is still quite limited. Therefore, these types of systems may not be considered as a sole mitigation in the see and avoid risk assessment. In general, current designs are not mature and have shown to be insufficient to provide the sole mitigation in the see and avoid risk assessment. Although these systems are currently immature, applicants may be allowed to propose any system solution that provides a mitigation strategy and should be evaluated as a potential solution.
- **Radar and Other Sensors:** If special types of radar or other sensors are utilized to mitigate risk, the applicant must provide supporting data which demonstrates that:

- both cooperative and non-cooperative aircraft, including targets with low radar reflectivity, such as gliders and balloons, can be consistently identified at all operational altitudes and ranges, and,
- the proposed system can effectively deconflict a potential collision.

- **Lost Link Procedures:** In all cases, the UAS must be provided with a means of automatic recovery in the event of a lost link. There are many acceptable approaches to satisfy the requirement. The intent is to ensure airborne operations are predictable in the event of lost link.
- **Flight Termination System (FTS)**: It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a UAS is found to be lacking in system redundancies, an independent flight termination system that can be activated manually by the UAS PIC, may be required to safeguard the public.

8.2 Operational Requirements

Unless operating in an active Restricted, Prohibited, or Warning Area, UAS operations must adhere to the following requirements.

8.2.1 Observer Requirement VFR UAS operations may be authorized utilizing either ground-based or airborne visual observers onboard a dedicated chase aircraft. A visual observer is required to perform the see and avoid function as alternative compliance to 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations.*

The task of the observer is to provide the pilot of the UAS with instructions to steer the UA clear of any potential collision with other traffic. Visual observer duties require the ability to maintain visual contact with the UA at all times while scanning the immediate environment for potential conflicting traffic. At no time will the visual observer permit the UA to operate outside their line-of-sight. This ensures that any required maneuvering information can be reliably provided to the PIC.

The visual limitation will specify both a lateral and vertical distance and shall be regarded as a maximum distance from the observer where a determination of a conflict with another aircraft can be made. When an application is approved by the FAA, the visual limitation distance becomes a directive upon the observer.

Generally, observers are to be positioned no greater than one nautical mile laterally and 3000 feet vertically from the UA. The use of nautical miles is based on the fact that the UA is being positioned by the pilot via control stations that typically use moving map displays that are referenced in nautical miles.

This distance is predicated on the observer's normal unaided vision. Corrective lenses, spectacles, and contact lenses may be used.

When using other aids to vision, such as binoculars, field glasses, or telephoto television, visual observers must use caution to ensure that the UA remains within the approved visual limitation distance of the observer. Due to field of view and distortion issues, the

use of such aids can be used to augment the observer's visual capability but cannot be used as the primary means of visual contact.

Although this guidance specifies an observer distance, the small size of some UA may not allow for adequate observation at the one mile limit. It should be understood that this limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, until an on site validation of observer distance is conducted by the FAA, it will remain the responsibility of the applicant to ensure the safety of flight and adequate visual range coverage to mitigate any potential collisions. Conversely, larger UA may accommodate an observer distance greater than the one mile limit. The applicant may establish a distance greater than one mile based on a variety of factors. Increased observer distances may be proposed by the applicant and will be subject to review by the FAA either by on site demonstration or other means.

If UAS applications are approved for nighttime operations with flight operations that will depart or arrive between sunset and sunrise, the ground observer(s) must be in place one hour prior to that operation to ensure acclimation to the twilight/nighttime environment.

8.2.2 ATC Communications Requirements The UAS pilot must have immediate radio communication with appropriate ATC facilities anytime:

- the UA is being operated in Class A, D or sometimes E airspace (See 9.2.14 for operations in Class B or C Airspace)
- the UA is being operated under instrument flight rules (IFR)
- it is stipulated under the provisions of any issued COA or a special airworthiness certificate.

It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay; this is required for IFR flight.

8.2.3 Inter-Communications Requirements Any visual observer, sensor operator, or other person charged with providing collision avoidance for the UA must have immediate communication with the UAS pilot. If a chase aircraft is being utilized, immediate communication between the chase aircraft and the UAS pilot shall be required at all times. If the UAS pilot is talking to air traffic control, monitoring of the air traffic control frequency by all UAS crew members (UAS pilots, observers, and chase pilots) is recommended for shared situational awareness. However, unless it is necessary, the UAS PIC or the supplemental pilots are the only crewmembers that will talk to Air Traffic Control.

8.2.4 Dropping Objects/Hazardous Materials If the UA's intended operation includes the dropping or spraying of aircraft stores outside of active Restricted, Prohibited, or Warning Areas, the application must specifically address the hazard and make a clear case that injury to persons on the ground is extremely remote and operational risks have been sufficiently mitigated. A similar case must be made for hazardous materials carried aboard the UA.

8.2.5 Flight Over Populated Areas Routine UAS operations shall not be conducted over urban or populated areas. UAS operations may be approved in emergency or relief situations if the proposed mitigation strategies are found to be acceptable.

8.2.6 Flight Over Heavily Trafficked Roads or Open-air Assembly of People UAS operations shall avoid these areas. If flight in these areas is required, the applicant will be required to support proposed mitigations with system safety studies that indicate the operations can be conducted safely. Acceptable system safety studies must include a hazard analysis, risk assessment, and other appropriate documentation that support an "extremely improbable" determination. Additionally, it is the applicant's responsibility to demonstrate that injury to persons or property along the flight path is extremely improbable. UAS with performance characteristics that impede normal air traffic operations may be restricted in their operations.

8.2.7 Day/Nighttime Operations All UAS operations outside of Class A airspace must be conducted during daylight hours. Nighttime operations may be considered in other airspace if the applicant provides a safety case and sufficient mitigation to avoid collision hazards at night. Examples of such may be transit operations in Class D airspace over a non-joint use military airfield adjacent to restricted airspace.

8.2.8 Flights Below Class A Airspace All UAS operations (IFR or VFR) outside of active Restricted, Prohibited or Warning Areas and below flight level (FL) 180 shall be conducted in visual meteorological conditions (VMC) and in accordance with 14 CFR 91.155, *Basic VFR Weather Minimums*, however, a minimum flight visibility of not less than three statue miles (SM) shall be maintained at all times. Cloud clearance requirements shall remain as specified in 14 CFR 91.155, *Basic VFR Weather Minimums*. Special VFR requirements per 14 CFR 91.157, *Special VFR Weather Minimums*, do not apply to UAS operations and cannot be exercised.

8.2.9 Autonomous Operations It is generally understood that most UAS have some level of autonomy associated with its operation. Although it is possible to have a completely manual UAS, which requires a pilot-in-the-loop, the majority of UAS are autonomous to a certain degree. Only those UAS that have the capability of pilot intervention, or pilot-on-the-loop, shall be allowed in the NAS outside of Restricted, Prohibited, or Warning areas. UAS that are designed to be completely autonomous, with no capability of pilot intervention, are not authorized in the national airspace system. Although the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.

8.2.10 Operations from Off-Airport Locations In most cases, an off-airport location should be situated no closer than five nautical miles (NM) from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions and reasonable efforts should be made to keep operations away from structures and heavily trafficked roads. Due to the unique attributes of off-airport locations, approval requests need to be evaluated on a case-by-case basis.

8.2.11 Other Mitigations in lieu of Observers See Alternate Methods of Compliance section.

8.2.12 Operating Under Instrument Flight Rules (IFR) While operating on an instrument flight plan, the following must exist, be completed, or be complied with:

- The pilot in command must hold a current instrument rating in a manned aircraft.
- The aircraft's airworthiness statement includes IFR flight and all equipment is certified and working (including pitot static and transponder checks).
- Aviation database and charts are current and available to the UAS pilot.
- An IFR flight plan is filed.
- An ATC clearance has been obtained and all clearances followed.
- Direct two-way radio communication between the UAS pilot and ATC is available. Communication relay through the UA is required.
- Pre-coordination with ATC has been accomplished.
- The UA is equipped with a certified operating mode C (mode S preferred) transponder.
- Visual observers are utilized in accordance with this guidance document.
- ATC radar monitoring is available throughout the portion of the flight in Class A airspace.
- All operations outside of Class A airspace and active Restricted, Prohibited, or Warning Areas shall be conducted in VMC conditions only.

8.2.13 Chase Aircraft Operations The chase aircraft must remain at a safe distance from the UA to ensure collision avoidance should a UAS malfunction occur, but remain close enough to provide visual detection of conflicting aircraft in the path of the UA in a timely manner to advise the UAS PIC of the situation. Should the UAS pilot operate the UA from the chase aircraft, the chase aircraft must remain within radio control range of the UA to maintain appropriate signal coverage for flight control or activation of the flight termination system. Chase aircraft may be required to have communication with appropriate ATC facilities based on the applicant's application or mission profile.

- Chase aircraft are not required in Class A, active Restricted, Prohibited, or Warning Area airspace.
- Chase operations shall be conducted during daylight hours only.
- Flight visibility for all UAS chase operations shall be three statute miles or greater.
- Chase aircraft pilots must not concurrently perform either observer or UA pilot duties along with chase pilot duties.
- Chase aircraft operating as a formation flight will immediately notify ATC if they are using a non-standard formation.

Note: A standard formation is one in which a proximity of no more than 1 mile laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman.

Note: Nonstandard formations are those operating under any of the following conditions:

- ***When the flight leader has requested and ATC has approved other than standard formation dimensions.***
- ***When operating within an authorized altitude reservation (ALTRV) or under the provisions of a letter of agreement.***
- ***When the operations are conducted in airspace specifically designed for a special activity.***

8.2.14 Airspace Considerations by Airspace Designation:

Note: UA operating in airspace designated as reduced vertical separation minimum (RVSM) airspace must comply with 14 CFR 91.180, Operations within Airspace Designated as Reduced Vertical Separation Minimum Airspace.

- **Class A:** Observers are not required in Class A. All UAS must be operating on an instrument flight plan. UAS operations approved for Class A must comply with 14 CFR 91.135, *Operations in Class A Airspace.*
- **Class B:** UAS operations are currently not authorized. Class B airspace contains terminal areas highest density of manned aircraft in the National Airspace System. As with all applications, the FAA will consider exceptional circumstances.
- **Class C and airspace within 30 nautical miles of an airport listed in 14 CFR 91.215:** Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class C must comply with 14 CFR 91.130, *Operations in Class C Airspace*, and 14 CFR 91.215, *ATC Transponder and Altitude Reporting Equipment and Use*. The transponder requirement will not be waived.
- **Class D:** Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class D must comply with 14 CFR 91.129, *Operations in Class D Airspace.*
- **Class E:** If there is an operating Air Traffic Control Tower Class D rules may apply. UAS operations approved for Class E must comply with 14 CFR 91.127, *Operating on or in the Vicinity of an Airport in Class E Airspace.*
- **Class G:** UA operations approved for Class G must comply with 14 CFR 91.126, *Operating on or in the Vicinity of an Airport in Class G Airspace.*

8.3 Oceanic Operations

8.3.1 UAS operations wholly contained within Warning areas are handled in the same manner as those operations conducted in active Restricted and Prohibited areas, that is, no specific approval is required and observers or chase aircraft are not required.

8.3.2 Flight Information Region Operations. FAA rules and policies apply in the flight information regions (FIRs) where the FAA is the air traffic service provider. As such, the guidelines specified in this document apply to UAS operations conducted in these FIRs.

9.0 Personnel Qualifications

This section addresses the qualifications of UAS pilots, observers, maintainers, and other personnel as appropriate. All references to a pilot certificate refer to an FAA issued private pilot certificate or higher.

9.1 UAS Pilot Qualifications

The FAA is focused on insuring that UAS pilots have a common level of understanding of federal aviation regulations applicable to the airspace where the UA will operate. Pilots are responsible for a thorough preflight inspection of the UAS. They are accountable for controlling their aircraft to the same responsible standards as the pilot of a manned aircraft. Pilot qualifications for UAS operations conducted under IFR are addressed in this section.

The following items apply to the pilots of all UAS:

- One pilot in command (PIC) must be designated at all times.
- The PIC of an aircraft is directly responsible, and is the final authority of, the operation of that aircraft.
- Pilots must not perform crew duties for more than one UAS at a time.
- Pilots are not allowed to perform concurrent duties both as pilot and observer.

9.1.1 Pilot in Command (PIC) The designated PIC is the pilot responsible for the UAS flight operation. The PIC may be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the UA. It is common for applicants to have both an "internal" and an "external" UAS pilot. The PIC can assume any of these positions. The PIC duty may be rotated as necessary to fulfill operational requirements.

9.1.1.1 Ratings Rating requirements for the UAS PIC depend on the type of operation conducted and fall into two categories:

- Operations that require a pilot certificate
- Operations that do not require a pilot certificate.

The requirement for the PIC to hold a pilot certificate is based on various factors including the location of the planned operations, mission profile, size of the UA, and whether or not the operation is conducted within or beyond visual line of sight. Operations without a pilot certificate may be allowed, permitting smaller UA to operate below certain altitudes while controlled strictly by visual line of sight. The cutoff point at which the smaller UA criteria will be utilized is yet to be defined; therefore, each application will be carefully reviewed to assess the feasibility of allowing that type of operation.

Operations requiring a pilot certificate: The PIC shall hold, at a minimum, an FAA pilot certificate under the following circumstances:

- All operations approved for conduct in Class A, C, D, and E airspace.
- All operations conducted under IFR (FAA instrument rating required).
- All operations approved for nighttime operations.
- All operations conducted at joint use or public airfields.
- All operations conducted beyond line of sight.
- At any time the FAA has determined the need based on the UAS' characteristics, mission profile, or other operational parameters.

***Note:** The FAA may require specific aircraft category and class ratings in manned aircraft depending on the UAS seeking approval and the characteristics of its flight controls interface.*

Operations not requiring a pilot certificate: The PIC *may not* be required to hold a pilot certificate for operations approved and conducted solely within visual line of sight in Class G airspace. For the PIC to be exempt from the pilot certificate requirement the following conditions must exist and the alternate compliance method described below must be followed:

Pilot certificate

- The operation is conducted in a sparsely populated location, and,
- The operation is conducted from a privately owned airfield, military installation, or off-airport location.
- Visual line of sight operations conducted no further than 1 NM laterally from the UAS pilot and at an altitude of no more than 400 feet above ground level (AGL) at all times.
- Operations shall be conducted during daylight hours only.
- Operations shall be conducted no closer than 5 NM from any airport or heliport.
- **Alternate Compliance Method**: In lieu of a pilot certificate, the PIC must have successfully completed, at a minimum, FAA private pilot ground instruction, and have passed the written examination.

***Note:** The FAA may require an instrument rating in a specific aircraft category in manned aircraft depending on the UAS seeking approval and the characteristics of its flight controls interface.*

9.1.1.2 **Currency** The applicant shall provide a process that ensures that the pilots receive an appropriate level of currency in the UAS being operated. At a minimum, the PIC must demonstrate three takeoffs (launch) and landings (recovery) in the specific UAS in the previous 90 days.

For those operations approved for night operations, the PIC must demonstrate three takeoffs (launch) and landings (recovery) in the specific UAS at night to a full stop in the previous 90 days.

For those operations that require a certificated pilot per section 9.1.1.1 above, the PIC, in order to exercise the privileges of his certificate, shall have flight reviews and maintain currency in manned aircraft per 14 CFR 61.56, *Flight Review* and 61.57, *Recent Flight Experience: Pilot in Command.*

For operations approved for night or IFR, the PIC shall maintain currency per 14 CFR 61.57, *Recent Flight Experience: Pilot in Command*, as applicable.

9.1.1.3 **Medical** The PIC shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR part 67, and have it in their possession.

9.1.1.4 **Training** In addition to the aforementioned training required for a pilot certificate, UAS pilots will have additional training in all specific details of the UAS being operated including normal, abnormal, and emergency procedures. This must include manufacturer specific training (or military equivalent), demonstrated proficiency, and testing in the UAS being operated.

9.1.2 **Supplemental Pilots** Supplemental pilots are those pilots assigned UA flight duty to augment the PIC. It is common for applicants to have both an "internal" and an "external" UA pilot. The supplemental pilot can assume any of these positions.

9.1.2.1 **Ratings** No specific rating is required for supplemental pilots unless they are assuming the role of pilot in command. However, at a minimum, they must have successfully completed private pilot ground school and have passed the written test.

9.1.2.2 **Currency** The applicant shall provide a process that ensures that the pilots maintain an appropriate level of currency in the UAS being operated.

9.1.2.3 **Medical** Supplemental pilots shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR part 67, and have it in their possession. Any supplemental pilot acting as a dedicated visual observer or flying the UA on a visual basis shall also maintain a valid FAA Class 2 medical certificate.

9.1.2.4 **Training** In addition to all training required for receiving and maintaining a pilot certificate, the UAS pilot shall be additionally trained in all specific details of the UAS being operated including normal, abnormal, and emergency procedures.

9.2 Observer Qualifications

All observers must have an understanding of federal aviation regulations applicable to the airspace where the UA will operate. Observers are considered a crewmember of the UAS. Observers must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as pilot and observer.

9.2.1 **Medical** All observers shall maintain, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR 67, and have it in their possession. 14 CFR 91.17, *Alcohol or Drugs*, applies to all UAS crewmembers, including observers.

9.2.2 Training Observers must have completed sufficient training to communicate to the pilot any instructions required to remain clear of conflicting traffic. This training, at a minimum, shall include knowledge of the rules and responsibilities described in 14 CFR 91.111, *Operating Near Other Aircraft;* 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations;* and 14 CFR 91.155, *Basic VFR Weather Minimums;* knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology; and knowledge of appropriate sections of the *Aeronautical Information Manual.*

9.3 Other Personnel Qualifications

Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the subject systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, they must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel on an inter-communication system.

9.4 Maintenance Personnel Qualifications

9.4.1 Ratings Will be established as more data is collected and a regulatory guideline is developed.

9.4.2 Currency It is suggested that applicants follow applicable guidelines of 14 CFR 65.83 as appropriate until final UAS regulatory guidelines are available.

9.4.3 Medical No medical requirements have been defined at this time.

9.4.4 Training It is highly recommended that a Maintainer/Operator of a UAS submit a training program. This requirement will be further defined as more data is collected and the regulatory process better defines these guidelines.

Revision History

Date	Action
6-01-2005	Initial release as AFS-400 Policy Memo 05-01, *Unmanned Aircraft Systems Operations in the U.S. National Airspace System – Interim Operational Approval Guidance.*
3-13-2008	Cancelled AFS-400 Policy Memo 05-01 and Reissued Updated Document as *Interim Operational Approval Guidance 08-01, Unmanned Aircraft Systems Operations in the U. S. National Airspace System.*

Signed

March 13, 2008

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United States Government Accountability Office

GAO

Testimony

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UNMANNED AIRCRAFT SYSTEMS

Use in the National Airspace System and the Role of the Department of Homeland Security

Statement of Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

G A O

Accountability * Integrity * Reliability

GAO-12-889T

July 19, 2012

UNMANNED AIRCRAFT SYSTEMS

Use in the National Airspace and the Role of the Department of Homeland Security

GAO
Accountability * Integrity * Reliability
Highlights

Highlights of GAO-12-889T, a testimony before the Subcommittee on Oversight, Investigations, and Management, Committee on Homeland Security, House of Representatives.

Why GAO Did This Study

UAS aircraft do not carry a human operator on board, but instead operate on pre-programmed routes or by following commands from pilot-operated ground stations. An aircraft is considered to be a small UAS if it is 55 pounds or less, while a large UAS is anything greater. Current domestic uses of UAS are limited and include law enforcement, monitoring or fighting forest fires, border security, weather research, and scientific data collection by the federal government. FAA authorizes military and non-military UAS operations on a limited basis after conducting a case-by-case safety review. Several other federal agencies also have a role or interest in UAS, including DHS. In 2008, GAO reported that safe and routine access to the national airspace system poses several obstacles.

This testimony discusses 1) obstacles identified in GAO's previous report on the safe and routine integration of UAS into the national airspace, 2) DHS's role in the domestic use of these systems, and 3) preliminary observations on emerging issues from GAO's ongoing work.

This testimony is based on a 2008 GAO report and ongoing work, and is focused on issues related to non-military UAS. In ongoing work, GAO analyzed FAA's efforts to integrate UAS into the national airspace, the role of other federal agencies in achieving safe and routine integration, and other emerging issues; reviewed FAA and other federal agency efforts and documents; and conducted selected interviews with officials from FAA and other federal, industry, and academic stakeholders.

View GAO-12-889T. For more information, contact Gerald Dillingham at (202) 512-2834 or dillinghamg@gao.gov.

What GAO Found

GAO earlier reported that unmanned aircraft systems (UAS) could not meet the aviation safety requirements developed for manned aircraft and posed several obstacles to operating safely and routinely in the national airspace system. These include 1) the inability for UAS to detect, sense, and avoid other aircraft and airborne objects in a manner similar to "see and avoid" by a pilot in a manned aircraft; 2) vulnerabilities in the command and control of UAS operations; 3) the lack of technological and operational standards needed to guide the safe and consistent performance of UAS; and 4) the lack of final regulations to accelerate the safe integration of UAS into the national airspace. GAO stated in 2008 that Congress should consider creating an overarching body within the Federal Aviation Administration (FAA) to address obstacles for routine access. FAA's Joint Planning and Development Office (JPDO) has taken on a similar role. FAA has implemented GAO's two recommendations related to its planning and data analysis efforts to facilitate integration.

The Department of Homeland Security (DHS) is one of several partner agencies of JPDO working to safely integrate UAS into the national airspace. Since 2005, FAA has granted DHS authority to operate UAS to support its national security mission in areas such as the U.S. northern and southern land borders. DHS's Transportation Security Administration (TSA) has the authority to regulate security of all modes of transportation, including non-military UAS, and according to TSA officials, its aviation security efforts include monitoring reports on potential security threats regarding the use of UAS. Security considerations could be exacerbated with routine UAS access. TSA has not taken any actions to implement GAO's 2008 recommendation that it examine the security implications of future, non-military UAS.

GAO's ongoing work has identified several UAS issues that, although not new, are emerging as areas of further consideration in light of greater access to the national airspace. These include concerns about privacy relating to the collection and use of surveillance data. Currently, no federal agency has specific statutory responsibility to regulate privacy matters relating to UAS. Another emerging issue is the use of model aircraft (aircraft flown for hobby or recreation) in the national airspace. FAA is generally prohibited from developing any rule or regulation for model aircraft. The Federal Bureau of Investigation report of a plot to use a model aircraft filled with plastic explosives to attack the Pentagon and U.S. Capitol in September 2011has highlighted the potential for model aircraft to be used for unintended purposes. An additional emerging issue is interruption of the command and control of UAS operations through the jamming and spoofing of the Global Positioning System between the UAS and ground control station. GAO plans to report more fully this fall on these issues, including the status of efforts to address obstacles to the safe and routine integration of UAS into the national airspace.

Figure 1: Example of a Small UAS (SkySeer) and a Large UAS (Predator)

Sources: Octatron, Inc. and DHS.

Chairman McCaul, Ranking Member Keating, and Members of the Subcommittee:

I appreciate the opportunity to testify before you today on obstacles to unmanned aircraft systems (UAS) safe and routine operations in the national airspace, the role that the Department of Homeland Security (DHS) has in UAS operations, and emerging UAS issues. Many stakeholders have exhibited increased interest in UAS for border security and disaster assistance, among other uses. Additionally, as combat operations in Afghanistan decrease, all of the United States military services expect to conduct more UAS training flights across the contiguous United States.[1]

UAS aircraft do not carry a human operator on board, but instead operate on pre-programmed routes or by following commands from pilot-operated ground stations. These aircraft are also referred to as "unmanned aerial vehicles," "remotely piloted aircraft," "unmanned aircraft," or "drones." The term "unmanned aircraft system" is used to recognize that a UAS includes not only the airframe, but also associated elements such as a ground station and the communications links. UAS are typically described in terms of weight, endurance, purpose of use, and altitude of operation. Most UAS are considered small, weighing less than 55 pounds; some of which fly less than 400 feet above the ground. According to an industry association, small UAS are expected to comprise the majority of UAS that will operate in the national airspace.

The Federal Aviation Administration (FAA) authorizes military and non-military (academic institutions; federal, state, and local governments including law enforcement entities; and private sector entities) UAS operations on a limited basis after conducting a case-by-case safety review. Only federal, state, and local government agencies can apply for a Certificate of Waiver or Authorization (COA); private sector entities must apply for special airworthiness certificates in the experimental category. [2]

[1]House Permanent Select Committee on Intelligence, *Performance Audit of the Department of Defense Intelligence, Surveillance, and Reconnaissance* (Washington, DC: Apr. 2012).

[2]COAs and special airworthiness certifications in the experimental category represent exceptions to the usual certification process. FAA examines the facts and circumstances of a proposed UAS to ensure that the prospective operator has acceptably mitigated safety risks.

Between January 1, 2012 and July 17, 2012, FAA had issued 201 COAs to 106 federal, state, and local government entities across the United States, including law enforcement entities as well as academic institutions. Additionally, FAA had issued 8 special airworthiness certifications for experimental use to four UAS manufacturers. Presently, under COA or special airworthiness certification, UAS operations are permitted for specific times, locations, and operations. Thus it is not uncommon for an entity to receive multiple COAs for various missions. Over the years, concerns have been expressed by the Congress and other stakeholders that sufficient progress has not been made to integrate UAS into the national airspace system. In 2008, GAO reported that safe and routine access to the national airspace system poses several obstacles. We also stated that Congress should consider creating an overarching body within FAA to coordinate federal, academic, and private-sector efforts in meeting the safety challenges of allowing routine access to the national airspace system. Additionally, we made two recommendations to FAA related to its planning and data analysis efforts to facilitate the process of allowing UAS routine access to the national airspace. We also recommended that DHS assess the security implications of routine access. FAA is working toward implementing the requirements set forth by its February 2012 reauthorization to accelerate UAS integration.[3]

Several other federal agencies also have a role or interest in UAS, including the Department of Homeland Security (DHS), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA).[4] DHS's Transportation Security Administration (TSA) has authority to regulate the security of all transportation modes, including non-military UAS, to ensure that appropriate safeguards are in place. According to TSA, its aviation security efforts include addressing risks, threats, and vulnerabilities related to non-military UAS. In addition, According to DHS officials, Customs and Border Protection (CBP) owns ten UAS that it operates for its own missions as well as for missions in conjunction with other agencies. DOD has successfully used UAS for

[3]FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, §§ 332 – 334, 126 Stat. 11 (2012).

[4]Senior executives from these four federal agencies represent the UAS ExCom, whose mission is to enable increased and ultimately routine access of federal UAS engaged in non-military aircraft operations into the national airspace to support these agencies' operational, training, development, and research requirements.

intelligence, surveillance, reconnaissance, and combat missions.[5] While many of DOD's UAS operations currently take place outside of the United States, the military services require access to the national airspace to conduct UAS training. DOD has also assisted DHS in border security missions, including two missions since 2006 where the National Guard provided support in four southwestern border states. NASA uses UAS primarily for research purposes, such as the Predator B for wildfire mapping and investigations as well as an expected arctic mission next year on surface sea ice.

My statement today discusses 1) obstacles we identified in our previous report to the safe and routine integration of UAS into the national airspace, 2) DHS's role in the domestic use of these systems, and 3) preliminary observations on emerging issues from our ongoing work examining UAS. This statement is based on our 2008 UAS report[6] and ongoing work for this subcommittee, the House Committee on Transportation and Infrastructure and its subcommittee on Aviation, and the Senate Committee on Science, Commerce and Transportation. Our ongoing work is focused on issues related to non-military UAS and is based on our analysis of FAA's efforts to integrate UAS into the national airspace, the role of other federal agencies in achieving safe and routine integration, and other emerging issues. Our preliminary observations are based on our review of various FAA and other federal agency efforts and documents; and selected interviews with officials from FAA and other federal, industry, and academic stakeholders. Our 2008 report contains detailed explanations of the methods used to conduct that work. We have discussed the information in this testimony with officials from FAA and DHS, and incorporated their comments as appropriate. The work on which this statement is based was performed in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained

[5]GAO, *Unmanned Aircraft Systems: Comprehensive Planning and a Results-Oriented Training Strategy Are Needed to Support Growing Inventories*, GAO-10-331 (Washington, DC: Mar. 26, 2010).

[6]GAO, *Unmanned Aircraft Systems: Federal Actions Needed to Ensure Safety and Expand Their Potential Uses within the National Airspace System,* GAO-08-511 (Washington, D.C.: May 15, 2008).

provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Current domestic uses of UAS are limited and include law enforcement, monitoring or fighting forest fires, border security, weather research, and scientific data collection. UAS have a wide-range of potential uses, including commercial uses such as pipeline, utility, and farm fence inspections; vehicular traffic monitoring; real estate and construction site photography; relaying telecommunication signals; and crop dusting. FAA's long-range goal is to permit, to the greatest extent possible, routine UAS operations in the national airspace system while ensuring safety. Using UAS for commercial purposes is not currently allowed in the national airspace. As the list of potential uses for UAS grows, so do the concerns about how they will affect existing military and non-military aviation as well as concerns about how they might be used.

Domestically, state and local law enforcement entities represent the greatest potential use of small UAS in the near term because small UAS can offer a simple and cost effective solution for airborne law enforcement activities for agencies that cannot afford a helicopter or other larger aircraft.[7] For example, federal officials and one airborne law enforcement official said that a small UAS costing between $30,000 and $50,000 is more likely to be purchased by state and local law enforcement entities because the cost is nearly equivalent to that of a patrol car. According to recent FAA data, 12 state and local law enforcement entities have a Certificate of Waiver or Authorization (COA) while an official at the Department of Justice said that approximately 100 law enforcement entities have expressed interest in using a UAS for some of their missions. According to law enforcement officials with whom we spoke, small UAS are ideal for certain types of law enforcement activities. Officials anticipate that small UAS could provide support for tactical teams, post-event crime scene analysis and critical infrastructure photography. Officials said that they do not anticipate using small UAS for

[7]FAA generally considers UAS in the two broad categories of "small" and "large," and has used these categories to split its efforts to develop rules that would allow government and commercial UAS access to the national airspace. FAA has been developing rules for small UAS for several years. Although there is no widely accepted common classification system for UAS, an aircraft is considered to be a small UAS if it is 55 pounds or less, while a large UAS is anything greater.

routine patrols or missions that would require flights over extended distances or time periods.

FAA has been working with the Department of Justice's National Institute of Justice to develop a COA process through a memorandum of understanding to better meet the operational requirements of law enforcement entities. While the memorandum of understanding establishing this COA process has not been finalized, there are two law enforcement entities that are using small UAS on a consistent basis for their missions and operations. The proposed process would allow law enforcement entities to receive a COA for training and performance evaluation. When the entity has shown proficiency in operating its UAS, it would then receive an operational COA allowing it to operate small UAS for a range of missions. In May 2012, FAA stated that it met its first requirement to expedite the COA process for public safety entities. FAA's reauthorization also required the agency to enter into agreements with appropriate government agencies to simplify the COA process and allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less if flown within the line of sight of the operator, less than 400 feet above the ground, and during daylight conditions, among others stipulations.

Obstacles to Safe and Routine Integration of UAS

In 2008, we reported that UAS could not meet the aviation safety requirements developed for manned aircraft and posed several obstacles to operating safely and routinely in the national airspace system.

- *Sense and avoid technologies*. To date, no suitable technology has been identified that would provide UAS with the capability to meet the detect, sense, and avoid requirements of the national airspace system. Our ongoing work indicates that research has been carried out to mitigate this, but the inability for UAS to sense and avoid other aircraft or objects remains an obstacle. With no pilot to scan the sky, UAS do not have an on-board capability to directly "see" other aircraft. Consequently, the UAS must possess the capability to sense and avoid an object using on-board equipment, or with the assistance of a human on the ground or in a chase aircraft,[8] or by other means, such

[8]Chase pilots are in constant radio contact with research pilots and serve as an "extra set of eyes" to help maintain total flight safety during specific tests and maneuvers. Chase pilots monitor certain events for the research pilot and are an important safety feature on all research missions.

as radar. Many UAS, particularly smaller models, will likely operate at altitudes below 18,000 feet, sharing airspace with other vehicles or objects. Sensing and avoiding other vehicles or objects represents a particular challenge for UAS, because other vehicles or objects at this altitude often do not transmit an electronic signal to identify themselves and, even if they did, many small UAS, do not have equipment to detect such signals if they are used and may be too small to carry such equipment.

- *Command and control communications.* Similar to what we previously reported, ensuring uninterrupted command and control for UAS remains a key obstacle for safe and routine integration into the national airspace. Without such control, the UAS could collide with another aircraft or crash, causing injury or property damage. The lack of dedicated radiofrequency spectrum for UAS operations heightens the possibility that an operator could lose command and control of the UAS. Unlike manned aircraft that use dedicated radio frequencies, non-military UAS currently use undedicated frequencies and remain vulnerable to unintentional or intentional interference. To address the potential interruption of command and control, UAS generally have pre-programmed maneuvers to follow if the command and control link becomes interrupted (called a "lost-link scenario"). However, these procedures are not standardized across all types of UAS and, therefore, remain unpredictable to air traffic controllers who have responsibility for ensuring safe separation of aircraft in their airspace.

- *Standards.* A rigorous certification process with established performance thresholds is needed to ensure that UAS and pilots meet safety, reliability, and performance standards. Minimum aviation system standards are needed in three areas: performance; command and control communications; and sense and avoid. In 2004, RTCA, a standards-making body sponsored by FAA, established a federal advisory committee called the Special Committee 203 (or SC 203), to establish minimum performance standards for FAA to use in developing UAS regulations.[9] Individuals from academia and the private sector serve on the committee, along with FAA, NASA, and

[9]RTCA, formerly the Radio Technical Commission for Aeronautics, is a private, not-for-profit corporation that develops consensus-based performance standards regarding communications, navigation, surveillance, and air traffic management system issues. RTCA serves as a federal advisory committee, and its recommendations are the basis for a number of FAA's policy, program, and regulatory decisions.

DOD officials. ASTM International Committee F38 on UAS, an international voluntary consensus standards-making body, is working with FAA to develop standards to support the integration of small UAS into the national airspace.[10]

- *Regulations*. FAA regulations govern the routine operation of most aircraft in the national airspace system.[11] However, these regulations do not contain provisions to address issues relating to unmanned aircraft. As we highlighted in our previous report, existing regulations may need to be modified to address the unique characteristics of UAS. Today, UAS continue to operate as exceptions to the regulatory framework rather than being governed by it. This has limited the number of UAS operations in the national airspace, and that limitation has, in turn, contributed to the lack of operational data on UAS in domestic operations previously discussed. One industry forecast noted that growth in the non-military UAS market is unlikely until regulations allow for the routine operation of UAS. Without specific and permanent regulations for safe operation of UAS, federal stakeholders, including DOD, continue to face challenges. The lack of final regulations could hinder the acceleration of safe and routine integration of UAS into the national airspace.

Given the remaining obstacles to UAS integration, we stated in 2008 that Congress should consider creating an overarching body within FAA to coordinate federal, academic, and private-sector efforts in meeting the safety challenges of allowing routine access to the national airspace system. While it has not created this overarching body, FAA's Joint Planning and Development Office has taken on a similar role. In addition, Congress set forth requirements for FAA in its February 2012 reauthorization to facilitate UAS integration. Additionally, we made two recommendations to FAA related to its planning and data analysis efforts to facilitate the process of allowing UAS routine access to the national airspace, which FAA has implemented.

[10]ASTM International, formerly known as the American Society for Testing and Materials (ASTM), is a globally recognized leader in the development and delivery of international voluntary consensus standards. ASTM members deliver the test methods, specifications, guides and practices that support industries and governments worldwide.

[11]Title 14, Code of Federal Regulations (14 CFR).

Role of the Department of Homeland Security in Domestic UAS Use

DHS is one of several partner agencies of FAA's Joint Planning and Development Office (JPDO) working to safely integrate UAS into the national airspace. TSA has the authority to regulate the security of all transportation modes, including non-military UAS, and according to TSA officials, its aviation security efforts include monitoring reports on potential security threats regarding the use of UAS. While UAS operations in the national airspace are limited and take place under closely controlled conditions, this could change if UAS have routine access to the national airspace system. Further, DHS owns and uses UAS.

Security is a significant issue that could be exacerbated with an increase in the number of UAS, and could impede UAS use even after all other obstacles have been addressed. In 2004, TSA issued an advisory in which it stated that there was no credible evidence to suggest that terrorist organizations plan to use remote controlled aircraft or UAS in the United States. However, the TSA advisory also provided that the federal government remains concerned that UAS could be modified and used to attack key assets and infrastructure in the United States. TSA advised individuals to report any suspicious activities to local law enforcement and the TSA General Aviation Hotline.[12] Security requirements have yet to be developed for UAS ground control stations—the UAS equivalent of the cockpit.[13] Legislation introduced in the 112th Congress would prohibit the use of UAS as weapons while operating in the national airspace.[14]

In our 2008 report, we recommended that the Secretary of Homeland Security direct the Administrator of TSA to examine the security implications of future, non-military UAS operations in the national airspace and take any actions deemed appropriate. TSA agreed that consideration and examination of new aviation technologies and operations is critical to ensuring the continued security of the national airspace. According to TSA officials, TSA continues to work with the FAA and other federal agencies concerning airspace security by implementing security procedures in an attempt to protect the National Airspace

[12]Department of Homeland Security, *TSA Advisory: Security Information Regarding Remote Controlled Aircraft and Unmanned Aerial Vehicles* (Washington, DC: Nov. 22, 2004).

[13]Additionally, in response to the events of September 11, 2001, entry doors to passenger airplane cockpits were hardened to prevent unauthorized entry.

[14]No Armed Drones Act of 2012, H. R. 5950, 112th Cong. (2012).

System. Examples of this collaboration include the coordinated efforts to allow access to temporary flight restricted airspace such as those put in place for Presidential travel and DHS Security Events. However, to date, neither DHS nor TSA has taken any actions to implement our 2008 recommendation. According to TSA officials, TSA believes its current practices are sufficient and no additional actions have been needed since we issued our recommendation.

DHS is also an owner and user of UAS. Since 2005, CBP has flown UAS for border security missions. FAA granted DHS authority to operate UAS to support its national security mission along the United States northern and southern land borders, among other areas. Recently, DHS officials told us that DHS has also flown UAS over the Caribbean to search for narcotics-carrying submarines and speedboats. According to DHS officials, CBP owns ten UAS that it operates in conjunction with other agencies for various missions. As of May 2012, CBP has flown missions to support six federal and state agencies along with several DHS agencies. These missions have included providing the National Oceanic and Atmospheric Administration with videos of damaged dams and bridges where flooding occurred or was threatened, and providing surveillance for DHS's Immigration and Customs Enforcement over a suspected smuggler's tunnel. DHS, DOD, and NASA, are working with FAA to identify and evaluate options to increase UAS access in the national airspace. DHS officials reported that if funding was available, they plan to expand their fleet to 24 total UAS that would be operational by fiscal year 2016, including 11 on the southwest border.

The DHS Inspector General reviewed CBP's actions to establish its UAS program, the purpose of which is to provide reconnaissance, surveillance, targeting, and acquisition capabilities across all CBP areas of responsibility. The Inspector General assessed whether CBP has established an adequate operation plan to define, prioritize, and execute its unmanned aircraft mission. The Inspector General's May 2012 report found that CBP had not achieved its scheduled or desired level of flight hours for its UAS. It estimated that CBP used its UAS less than 40 percent of the time it would have expected.[15]

[15]The report made four recommendations intended to improve CBP's planning of its UAS program to address its level of operation, program funding, and resource requirements, along with stakeholder needs.

Preliminary Observations on Emerging UAS Issues

Our ongoing work has identified several UAS issues that, although not new, are emerging as areas of further consideration in light of the efforts towards safe and routine access to the national airspace. These include concerns about 1) privacy as it relates to the collection and use of surveillance data, 2) the use of model aircraft, which are aircraft flown for hobby or recreation, and 3) the jamming and spoofing of the Global Positioning System (GPS).

- *Privacy concerns over collection and use of surveillance data.* Following the enactment of the UAS provisions of the 2012 FAA reauthorization act, members of Congress, a civil liberties organization, and others have expressed concern that the increased use of UAS for surveillance and other purposes in the national airspace has potential privacy implications. Concerns include the potential for increased amounts of government surveillance using technologies placed on UAS as well as the collection and use of such data. Surveillance by federal agencies using UAS must take into account associated constitutional Fourth Amendment protections against unreasonable searches and seizures. In addition, at the individual agency level, there are multiple federal laws designed to provide protections for personal information used by federal agencies. While the 2012 FAA reauthorization act contains provisions designed to accelerate the safe integration of UAS into the national airspace, proposed legislation in the 112th session of Congress, seeks to limit or serve as a check on uses of UAS by, for example, limiting the ability of the federal government to use UAS to gather information pertaining to criminal conduct without a warrant.[16]

  Currently, no federal agency has specific statutory responsibility to regulate privacy matters relating to UAS. UAS stakeholders disagreed as to whether the regulation of UAS privacy related issues should be centralized within one federal agency, or if centralized, which agency would be best positioned to handle such a responsibility. Some stakeholders have suggested that FAA or another federal agency should develop regulations for the types of allowable uses of UAS to specifically protect the privacy of individuals as well as rules for the conditions and types of data that small UAS can collect. Furthermore,

[16]Preserving Freedom from Unwarranted Surveillance Act of 2012, S. 3287, 112th Cong. (2012) and Farmer's Privacy Act of 2012, H.R. 5961, 112th Cong. (2012).

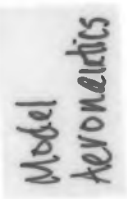
stakeholders with whom we spoke said that developing guidelines for technology use on UAS ahead of widespread adoption by law enforcement entities may preclude abuses of the technology and a negative public perception of UAS. Representatives from one civil liberties organization told us that since FAA has responsibility to regulate the national airspace, it could be positioned to handle responsibility for incorporating rules that govern UAS use and data collection. Some stakeholders have suggested that the FAA has the opportunity and responsibility to incorporate such privacy issues into the small UAS rule that is currently underway and in future rulemaking procedures. However, FAA officials have said that regulating these sensors is outside the FAA's mission, which is primarily focused on aviation safety, and has proposed language in its small UAS Notice of Proposed Rulemaking to clarify this.

- *Model aircraft*. According to an FAA official with whom we spoke and other stakeholders, another concern related to UAS is the oversight of the operation of model aircraft—aircraft flown for hobby or recreation—capable of sustained flight in the atmosphere and a number of other characteristics.[17] Owners of model aircraft do not require a COA to operate their aircraft.[18] Furthermore, as part of its 2012 reauthorization act, FAA is prohibited from developing any rule or regulation for model aircraft under a specified set of conditions.[19] However, the 2012 reauthorization act also specifies that nothing in the act's model aircraft provisions shall be construed to limit FAA's authority to take enforcement action against the operator of a model

[17]The 2012 reauthorization act defines the term "model aircraft" to mean an unmanned aircraft that is: (1) capable of sustained flight in the atmosphere, (2) flown within visual line of sight of the person operating the aircraft, and (3) flown for hobby or recreational purposes.

[18]FAA's Advisory Circular 91-57 sets out model aircraft operating standards that encourage voluntary compliance with specified safety standards for model aircraft operators.

[19]This prohibition on FAA model aircraft rules or regulations only applies where the aircraft is: (1) flown strictly for hobby or recreational use, (2) operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization, (3) limited to not more than 55 pounds (unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization), (4) operated in a manner that does not interfere with and gives way to any manned aircraft, and (5) when flown within 5 miles of an airport, prior notice of the operation is given to the airport operator and the air traffic control tower.



aircraft who endangers the safety of the national airspace system.[20] The Federal Bureau of Investigation report of the arrest and criminal prosecution of a man plotting to use a large remote-controlled model aircraft filled with plastic explosives to attack the Pentagon and U.S. Capitol in September 2011 has highlighted the potential for model aircraft to be used for non-approved or unintended purposes.

The Academy of Model Aeronautics, which promotes the development of model aviation as a recognized sport and represents a membership of over 150,000, published several documents to guide model aircraft users on safety, model aircraft size and speed, and use. For example, the Academy's National Model Aircraft Safety Code specifies that model aircraft will not be flown in a careless or reckless manner and will not carry pyrotechnic devices that explode or burn, or any device that propels a projectile or drops any object that creates a hazard to persons or property (with some exceptions).[21] The Academy of Model Aeronautics also provides guidance on "sense and avoid" to its members, such as a ceiling of 400 feet above ground of aircraft weighing 55 pounds or less. However, apart from FAA's voluntary safety standards for model aircraft operators, FAA has no regulations relating to model aircraft. Currently, FAA does not require a license for any model aircraft operators, but according to FAA, the small UAS Notice of Proposed Rule Making, under development and expected to be published late 2012, may contain a provision that requires certain model aircraft to be registered.

- *GPS jamming and spoofing.*[22] The jamming and spoofing of the communication signal between the UAS and ground control station could also interrupt the command and control of UAS operations. In a GPS jamming scenario, the UAS could potentially lose its ability to determine where it is located and in what direction it is traveling. Low

[20]Pub. L. No. 112-95, § 336, 126 Stat. 11 . 77 (2012).

[21]The Academy of Model Aeronautics National Model Aircraft Safety Code allows members to fly devices that burn producing smoke and are securely attached to the model aircraft and use rocket motors if they remain attached to the model during flight. Model rockets may be flown but not launched from a model aircraft.

[22]GPS spoofing is when counterfeit GPS signals are generated for the purpose of manipulating a target receiver's reported position and time. Todd E. Humphreys, *Detection Strategy for Cryptographic GNSS Anti-Spoofing*, IEEE Transactions on Aerospace and Electronics Systems (August 2011).

cost devices that jam GPS signals are prevalent. According to one industry expert, GPS jamming would become a larger problem if GPS is the only method for navigating a UAS. This problem can be mitigated by having a second or redundant navigation system onboard the UAS that is not reliant on GPS. In addition, a number of federal UAS stakeholders we interviewed stated that GPS jamming is not an issue for the larger, military-type UAS, as they have an encrypted communications link on the aircraft. A stakeholder noted that GPS jamming can be mitigated for small UAS by encrypting its communications, but the costs associated with encryption may make it infeasible. Recently, researchers at the University of Texas demonstrated that the GPS signal controlling a small UAS could be spoofed using a portable software radio. The research team found that it was straightforward to mount an intermediate-level spoofing attack but difficult and expensive to mount a more sophisticated attack.[23]

The emerging issues we identified not only may exist as part of efforts to safely and routinely integrate UAS into the national airspace, but may also persist once integration has occurred. Thus, these issues may warrant further examination both presently and in the future.

Chairman McCaul, Ranking Member Keating, and Members of the Subcommittee, this concludes my prepared statement. We plan to report more fully this fall on these same issues, including the status of efforts to address obstacles to the safe and routine integration of UAS into the national airspace. I would be pleased to answer any questions at this time.

[23]The presentation "Assessing the Civil GPS Spoofing Threat" by Todd Humphreys, Jahshan Bhatti, Brent Ledvina, Mark Psiaki, Brady O'Hanlon, Paul Kintner, and Paul Montgomery sought to assess the spoofing threat of a small civil UAS. The team built a civilian GPS spoofer and tested some countermeasures. They concluded that GPS spoofing is a threat to communications security and civil spoofing has not been the focus of research in open literature.

GAO Contact and Staff Acknowledgements

For further information on this testimony, please contact Gerald L. Dillingham, Ph.D., at (202) 512-2834 or dillinghamg@gao.gov. In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals making key contributions to this testimony include Maria Edelstein, Assistant Director; Amy Abramowitz; Erin Cohen; John de Ferrari; Colin Fallon; Rebecca Gambler; Geoffrey Hamilton; David Hooper; Daniel Hoy; Joe Kirschbaum; Brian Lepore; SaraAnn Moessbauer; Faye Morrison; Sharon Pickup; Tina Won Sherman; and Matthew Ullengren.

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Academy of Model Aeronautics National Model Aircraft Safety Code

Effective January 1, 2011

A. **GENERAL**: A model aircraft is a non-human-carrying aircraft capable of sustained flight in the atmosphere. It may not exceed limitations of this code and is intended exclusively for sport, recreation and/or competition. All model flights must be conducted in accordance with this safety code and any additional rules specific to the flying site.

1. Model aircraft will not be flown:
   (a) In a careless or reckless manner.
   (b) At a location where model aircraft activities are prohibited.
2. Model aircraft pilots will:
   (a) Yield the right of way to all man carrying aircraft.
   (b) See and avoid all aircraft and a spotter must be used when appropriate. (AMA Document #540-D-See and Avoid Guidance.)
   (c) Not fly higher than approximately 400 feet above ground level within three (3) miles of an airport, without notifying the airport operator.
   (d) Not interfere with operations and traffic patterns at any airport, heliport or seaplane base except where there is a mixed use agreement.
   (e) Not exceed a takeoff weight, including fuel, of 55 pounds unless in compliance with the AMA Large Model Aircraft program. (AMA Document 520-A)
   (f) Ensure the aircraft is identified with the name and address or AMA number of the owner on the inside or affixed to the outside of the model aircraft. (This does not apply to model aircraft flown indoors).
   (g) Not operate aircraft with metal-blade propellers or with gaseous boosts except for helicopters operated under the provisions of AMA Document #555.
   (h) Not operate model aircraft while under the influence of alcohol or while using any drug which could adversely affect the pilot's ability to safely control the model.
   (i) Not operate model aircraft carrying pyrotechnic devices which explode or burn, or any device which propels a projectile or drops any object that creates a hazard to persons or property.
   Exceptions:
   - Free Flight fuses or devices that burn producing smoke and are securely attached to the model aircraft during flight.
   - Rocket motors (using solid propellant) up to a G-series size may be used provided they remain attached to the model during flight. Model rockets may be flown in accordance with the National Model Rocketry Safety Code but may not be launched from model aircraft.
   - Officially designated AMA Air Show Teams (AST) are authorized to use devices and practices as defined within the Team AMA Program Document (AMA Document #718).

   (j) Not operate a turbine-powered aircraft, unless in compliance with the AMA turbine regulations. (AMA Document #510-A).
3. Model aircraft will not be flown in AMA sanctioned events, air shows or model demonstrations unless:
   (a) The aircraft, control system and pilot skills have successfully demonstrated all maneuvers intended or anticipated prior to the specific event.
   (b) An inexperienced pilot is assisted by an experienced pilot.
4. When and where required by rule, helmets must be properly worn and fastened. They must be OSHA, DOT, ANSI, SNELL or NOCSAE approved or comply with comparable standards.

B. ***RADIO CONTROL (RC)***

1. All pilots shall avoid flying directly over unprotected people, vessels, vehicles or structures and shall avoid endangerment of life and property of others.
2. A successful radio equipment ground-range check in accordance with manufacturer's recommendations will be completed before the first flight of a new or repaired model aircraft.
3. At all flying sites a safety line(s) must be established in front of which all flying takes place (AMA Document #706-Recommended Field Layout):
   (a) Only personnel associated with flying the model aircraft are allowed at or in front of the safety line.
   (b) At air shows or demonstrations, a straight safety line must be established.
   (c) An area away from the safety line must be maintained for spectators.
   (d) Intentional flying behind the safety line is prohibited.
4. RC model aircraft must use the radio-control frequencies currently allowed by the Federal Communications Commission (FCC). Only individuals properly licensed by the FCC are authorized to operate equipment on Amateur Band frequencies.
5. RC model aircraft will not operate within three (3) miles of any pre-existing flying site without a frequency-management agreement (AMA Documents #922-Testing for RF Interference; #923- Frequency Management Agreement)
6. With the exception of events flown under official AMA Competition Regulations, excluding takeoff and landing, no powered model may be flown outdoors closer than 25 feet to any individual, except for the pilot and the pilot's helper(s) located at the flight line.
7. Under no circumstances may a pilot or other person touch a model aircraft in flight while it is still under power, except to divert it from striking an individual. This does not apply to model aircraft flown indoors.
8. RC night flying requires a lighting system providing the pilot with a clear view of the model's attitude and orientation at all times.
9. The pilot of a RC model aircraft shall:
   (a) Maintain control during the entire flight, maintaining visual contact without enhancement other than by corrective lenses prescribed for the pilot.
   (b) Fly using the assistance of a camera or First-Person View (FPV) only in accordance with the procedures outlined in AMA Document #550.

C. **FREE FLIGHT**

1. Must be at least 100 feet downwind of spectators and automobile parking when the model aircraft is launched.
2. Launch area must be clear of all individuals except mechanics, officials, and other fliers.
3. An effective device will be used to extinguish any fuse on the model aircraft after the fuse has completed its function.

D. **CONTROL LINE**

1. The complete control system (including the safety thong where applicable) must have an inspection and pull test prior to flying.
2. The pull test will be in accordance with the current Competition Regulations for the applicable model aircraft category.
3. Model aircraft not fitting a specific category shall use those pull-test requirements as indicated for Control Line Precision Aerobatics.
4. The flying area must be clear of all utility wires or poles and a model aircraft will not be flown closer than 50 feet to any above-ground electric utility lines.
5. The flying area must be clear of all nonessential participants and spectators before the engine is started.

AC 91-57

DATE June 9, 1981

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: MODEL AIRCRAFT OPERATING STANDARDS

1. PURPOSE. This advisory circular outlines, and encourages voluntary compliance with, safety standards for model aircraft operators.

2. BACKGROUND. Modelers, generally, are concerned about safety and do exercise good judgement when flying model aircraft. However, model aircraft can at times pose a hazard to full-scale aircraft in flight and to persons and property on the surface. Compliance with the following standards will help reduce the potential for that hazard and create a good neighbor environment with affected communities and airspace users.

3. OPERATING STANDARDS.

a. Select an operating site that is of sufficient distance from populated areas. The selected site should be away from noise sensitive areas such as parks, schools, hospitals, churches, etc.

b. Do not operate model aircraft in the presence of spectators until the aircraft is successfully flight tested and proven airworthy.

c. Do not fly model aircraft higher than 400 feet above the surface. When flying aircraft within 3 miles of an airport, notify the airport operator, or when an air traffic facility is located at the airport, notify the control tower, or flight service station.

d. Give right of way to, and avoid flying in the proximity of, full-scale aircraft. Use observers to help if possible.

e. Do not hesitate to ask for assistance from any airport traffic control tower or flight service station concerning compliance with these standards.

R. J. VAN VUREN
Director, Air Traffic Service

Initiated by: AAT-220

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

Docket No. FAA-2006-25714

Unmanned Aircraft Operations in the National Airspace System

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of policy; opportunity for feedback.

SUMMARY: This notice clarifies the FAA's current policy concerning operations of unmanned aircraft in the National Airspace System.

FOR FURTHER INFORMATION CONTACT: Kenneth D. Davis, Manager, Unmanned Aircraft Program Office, Aircraft Certification Service, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, (202) 385-4636, email: *kenneth.d.davis@faa.gov.*

Background

Simply stated, an unmanned aircraft is a device that is used, or is intended to be used, for flight in the air with no onboard pilot. These devices may be as simple as a remotely controlled model aircraft used for recreational purposes or as complex as surveillance aircraft flying over hostile areas in warfare. They may be controlled either manually or through an autopilot using a data link to connect the pilot to their aircraft. They may perform a variety of public services: surveillance, collection of air samples to determine levels of pollution, or rescue and recovery missions in crisis situations. They range in size from wingspans of six inches to 246 feet; and can weigh from approximately four ounces to

over 25,600 pounds. The one thing they have in common is that their numbers and uses are growing dramatically. In the United States alone, approximately 50 companies, universities, and government organizations are developing and producing some 155 unmanned aircraft designs. Regulatory standards need to be developed to enable current technology for unmanned aircraft to comply with Title 14 Code of Federal Regulations (CFR).

The Federal Aviation Administration's current policy is based on whether the unmanned aircraft is used as a public aircraft, civil aircraft or as a model aircraft.

Unmanned Aircraft Systems Operating as Public Aircraft

The most common public use of unmanned aircraft today in the United States is by the Department of Defense. U.S. operations in Iraq, Afghanistan and elsewhere have fueled a huge increase in unmanned aircraft demand. In Iraq alone, more than 700 unmanned aircraft are in use for surveillance and weapons delivery.

Other agencies have also found public uses for unmanned aircraft. For example, the Customs and Border Protection uses them to patrol along the US/Mexican border. In the future, unmanned aircraft could be used to provide first responder reports of damage due to weather or other catastrophic causes.

In response to this growing demand for public use unmanned aircraft operations, the FAA developed guidance in a Memorandum titled "Unmanned Aircraft Systems Operations in the U.S. National Airspace System – Interim Operational Approval Guidance" (UAS Policy 05-01). In this document, the FAA set out guidance for public use of unmanned aircraft by defining a process for evaluating applications for Certificate(s) of Waiver or Authorization (COA's) for unmanned aircraft to operate in the National Airspace System. The concern was not only that unmanned aircraft operations might interfere with

commercial and general aviation aircraft operations, but that they could also pose a safety problem for other airborne vehicles, and persons or property on the ground. The FAA guidance supports unmanned aircraft flight activity that can be conducted at an acceptable level of safety. In order to ensure this level of safety, the operator is required to establish the Unmanned Aircraft System's (UAS) airworthiness either from FAA certification, a DOD airworthiness statement, or by other approved means. Applicants also have to demonstrate that a collision with another aircraft or other airspace user is extremely improbable as well as complying with appropriate cloud and terrain clearances as required. Key to the concept are the roles of pilot-in-command (PIC) and observer. The PIC concept is essential to the safe operation of manned aircraft. The FAA's UAS guidance applies this PIC concept to unmanned aircraft and includes minimum qualifications and currency requirements. The PIC is simply the person in control of, and responsible for, the UAS. The role of the observer is to observe the activity of the unmanned aircraft and surrounding airspace, either through line-of-sight on the ground or in the air by means of a chase aircraft. In general, this means the pilot or observer must be, in most cases, within 1 mile laterally and 3,000 feet vertically of the unmanned aircraft. Direct communication between the PIC and the observer must be maintained at all times. Unmanned aircraft flight above 18,000 feet must be conducted under Instrument Flight Rules, on an IFR flight plan, must obtain ATC clearance, be equipped with at least a Mode C transponder (preferably Mode S), operating navigation lights and / or collision avoidance lights and maintain communication between the PIC and Air Traffic Control (ATC). Unmanned aircraft flights below 18,000 feet have similar requirements, except that if operators choose to operate on other than an IFR flight plan, they may be required to pre-coordinate with ATC.

The FAA has issued more than 50 COA's over the past 2 years and anticipates issuing a record number of COA's this year.

For more information, Memorandum on UAS Policy (05-01) and other policy guidance is available at the FAA Website: *http://www.faa.gov/uas.*

Unmanned Aircraft Systems Operating as Civil Aircraft

Just as unmanned aircraft have a variety of uses in the public sector, their application in commercial or civil use is equally diverse. This is a quickly growing and important industry. Under FAA policy, operators who wish to fly an unmanned aircraft for civil use must obtain an FAA airworthiness certificate the same as any other type aircraft. The FAA is currently only issuing special airworthiness certificates in the experimental category. Experimental certificates are issued with accompanying operational limitations (14 CFR § 91.319) that are appropriate to the applicant's operation. The FAA has issued five experimental certificates for unmanned aircraft systems for the purposes of research and development, marketing surveys, or crew training. UAS issued experimental certificates may not be used for compensation or hire.

The applicable regulations for an experimental certificate are found in 14 CFR §§21.191, 21.193, and 21.195. In general, the applicant must state the intended use for the UAS and provide sufficient information to satisfy the FAA that the aircraft can be operated safely. The time or number of flights must be specified along with a description of the areas over which the aircraft would operate. The application must also include drawings or detailed photographs of the aircraft. An on-site review of the system and demonstration of the area of operation may be required. Additional information on how to apply for an

experimental airworthiness certificate is available from Richard Posey, AIR-200, (202) 267-9538; email: *richard.posey@faa.gov.*

Recreational/Sport Use of Model Airplanes

In 1981, in recognition of the safety issues raised by the operation of model aircraft, the FAA published Advisory Circular (AC) 91-57, Model Aircraft Operating Standards for the purpose of providing guidance to persons interested in flying model aircraft as a hobby or for recreational use. This guidance encourages good judgment on the part of operators so that persons on the ground or other aircraft in flight will not be endangered. The AC contains among other things, guidance for site selection. Users are advised to avoid noise sensitive areas such as parks, schools, hospitals, and churches. Hobbyists are advised not to fly in the vicinity of spectators until they are confident that the model aircraft has been flight tested and proven airworthy. Model aircraft should be flown below 400 feet above the surface to avoid other aircraft in flight. The FAA expects that hobbyists will operate these recreational model aircraft within visual line-of-sight. While the AC 91-57 was developed for model aircraft, some operators have used the AC as the basis for commercial flight operations.

Policy Statement

The current FAA policy for UAS operations is that no person may operate a UAS in the National Airspace System without specific authority. For UAS operating as public aircraft the authority is the COA, for UAS operating as civil aircraft the authority is special airworthiness certificates, and for model aircraft the authority is AC 91-57.

The FAA recognizes that people and companies other than modelers might be flying UAS with the mistaken understanding that they are legally operating under the authority of

AC 91-57. AC 91-57 only applies to modelers, and thus specifically excludes its use by persons or companies for business purposes.

The FAA has undertaken a safety review that will examine the feasibility of creating a different category of unmanned "vehicles" that may be defined by the operator's visual line of sight and are also small and slow enough to adequately mitigate hazards to other aircraft and persons on the ground. The end product of this analysis may be a new flight authorization instrument similar to AC 91-57, but focused on operations which do not qualify as sport and recreation, but also may not require a certificate of airworthiness. They will, however, require compliance with applicable FAA regulations and guidance developed for this category.

Feedback regarding current FAA policy for Unmanned Aircraft Systems can be submitted at www.faa.gov/uas. (Scroll down to the bottom of the page and find Contact UAPO. Click into this link.)

Issued in Washington, DC on February 6, 2007

/s/ Nick Sabatini

Nicholas Sabatini
Associate Administrator for Aviation Safety

NOTICE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8900.207

National Policy

Effective Date:
1/22/13

Cancellation Date:
1/22/14

SUBJ: Unmanned Aircraft Systems (UAS) Operational Approval

1. Purpose of this Notice. This notice provides policies necessary for reviewing and evaluating the safety and interoperability of proposed Unmanned Aircraft Systems (UAS) flight operations conducted within the United States (U.S.) National Airspace System (NAS) for the Aviation Safety (AVS) Flight Standards Service (AFS), UAS Integration Office (AFS-80), when assessing applications for a Certificate of Waiver or Authorization (COA) or special airworthiness certificate.

2. Audience. This notice applies to AFS divisions at the Federal Aviation Administration (FAA) Washington headquarters (HQ) and regional field offices.

3. Where You Can Find This Notice. You can find this notice on the MyFAA Web site at https://employees.faa.gov/tools_resources/orders_notices/. Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at http://fsims.avs.faa.gov. Air carriers and operators can find this notice on the FAA's Web site at: http://fsims.faa.gov. This notice is available to proponents and the public at http://www.faa.gov/regulations_policies/orders_notices.

4. Background.

a. UAS Operations. UAS operations have increased dramatically in both the public and private sectors. This proliferation has introduced greater exposure and elevated risk to the safety of operations within the NAS. This growth in UAS operations has increased the number of applications for operational approvals and increased demand on the FAA to process them. For these activities, the development of a notice is required for the FAA to use when evaluating applications for COAs and special airworthiness certificates.

b. Policy. Policy identifies Unmanned Aircraft (UA) as "aircraft" flown by a "pilot" regardless of where the pilot is located. Aircraft and pilots must demonstrate compliance with applicable sections of Title 14 of the Code of Federal Regulations (14 CFR) to operate in the NAS. However, UA are not compliant with certain sections of 14 CFR. For instance, the absence of an onboard pilot means that the "see-and-avoid" provisions of 14 CFR part 91, § 91.113, cannot be satisfied. Without an onboard pilot, there is a significant reliance on the command and control link, and a greater emphasis on the loss of functionality associated with lost link. Furthermore, for air traffic control (ATC) operations requiring visual means of maintaining

in-flight separation, the lack of an onboard pilot does not permit ATC to issue all of the standard clearances or instructions available under the current edition of FAA Order 7110.65, Air Traffic Control. Consequently, to ensure an equivalent level of safety, UAS flight operations require an alternative method of compliance (AMOC) or risk control to address their "see-and-avoid" impediments to safety of flight, and any problems they may generate for ATC. In the future, permanent and consistent methods of compliance will be needed for UAS operations in the NAS without the need for waivers or exemptions.

5. Consensus Opinion. This notice is subject to continuous review, will be updated when appropriate, is not meant as a substitute for any regulatory process, and was jointly developed by and reflects the consensus opinion of:

- Flight Technologies and Procedures Division (AFS-400);
- UAS Integration Office (AFS-80) and the ATO component of AFS-80; and
- Aircraft Certification Service, Production & Airworthiness Branch (AIR-240).

Note: In general, and as a minimum, proponents must observe all applicable regulations of 14 CFR parts 61 and 91. This notice identifies acceptable AMOC with the regulations when evaluating requests for approval of proposed UAS operations. Refer to the following Web site for a listing of regulations: http://www.faa.gov/regulations_policies/faa_regulations/.

6. Discussion. This notice represents the culmination of input from government agencies, industry, and user stakeholders along with best practices and procedures that have been used by FAA in prior approvals for UAS applications for COAs or special airworthiness certificates. The material presented in this notice represents the process and procedures necessary for approving applications for UAS flight operations. However, because of the uniqueness of various UAS flight operations, each application must be evaluated on its own technical merits, including operational risk management (RM) planning. Each application may require unique authorizations or limitations directly related to the specific needs or capabilities of the UAS and/or the proposed specific mission and operating location.

7. Applicability and Approval Process Criteria. The applicability and process to be used in UAS operational approval are dependent on whether the proposed UAS operation within the territorial airspace of the United States (the airspace above the contiguous United States, Alaska, Hawaii, U.S. territories, and U.S. territorial waters) is defined as public or civil (see 14 CFR part 1, § 1.1 and Public Law 110-181, "The National Defense Authorization Act of 2008"). UAS operations outside the territorial airspace of the U.S. will be classified as either state or civil operations in accordance with international law. A public operation is one that is intrinsically governmental in nature (i.e., Federal, State, and local agencies). Proponents requesting approval of public aircraft operations by UAS will use the COA application process. In contrast, proponents for civil operations approval will use the special airworthiness certificate process. Part 91, § 91.319(a)(2) specifically prohibits operation of an aircraft that has an experimental certificate from "carrying persons or property for compensation or hire."

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a. Coordination and Approval. Regardless of the process for the authorization approval, COA applications for UAS flight operation approvals will be coordinated through the ATO component of AFS-80 and AVS. Special airworthiness certificates will be coordinated through the Aircraft Certification (AIR-240) staff as well as the ATO and AFS component of AFS-80 for final approval and disposition.

b. Applicability and Methods of Authorization. Operational policy in this notice applies to both public and civil operations and certain state aircraft operations.

(1) Applicability. These procedures are applicable for all operations in the contiguous United States, Alaska, Hawaii, U.S. territories, and international airspace in the Flight Information Regions (FIR) delegated to the United States where the FAA is the Air Traffic Service (ATS) provider. These procedures do not apply to the territorial airspace of another sovereign country that lies within FIRs delegated to the United States where the FAA is the ATS provider, except by agreement with that country, or airspace in FIRs delegated to other countries. All UAS proponents, operators, and pilots must observe all applicable regulations of 14 CFR.

(a) In general, specific authorization to conduct UAS operations in the NAS outside of active Restricted and Warning Areas designated for aviation use, or approved Prohibited Areas, must be requested by the proponent. Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated. (Refer to the current edition of Order JO 7400.8, Air Traffic Organization Policy.)

(b) This notice and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating unmanned systems for sport and recreation. Those individuals should seek policy under the current edition of Advisory Circular (AC) 91-57, Model Aircraft Operating Standards. AC 91-57 is not to be used as a basis of approval for operation of any other aircraft, including by Federal, State, and local governments, commercial entities, or law enforcement.

(c) This notice and the processes prescribed also do not apply to UAS operations in FAA-controlled international airspace by an agency of, or a contractor to, the Federal government when those operations are appropriately designated as State aircraft operations and are operated under "due regard" rules and procedures established by the Federal agency responsible for the operation. The designation of flight operations as State aircraft operations normally are made in coordination with the U.S. Department of State. This notice and the processes prescribed do, however, apply where the responsible Federal agency either has not established a formal set of rules and procedures for "due regard" operations, or is not operating the UAS under "due regard" rules and procedures in FAA-controlled international airspace. This notice and the processes prescribed also apply to all UAS operations by an agency of, or a contractor to, the Federal government that transit through U.S. territorial airspace en route to or from international airspace. See Appendix F, UAS COA Requirement. The "due regard" option is not available for state aircraft operations transiting through U.S. territorial airspace en route to or from international airspace.

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(d) Oceanic Operations Within Warning Areas. UAS operations contained within Warning Areas are handled in the same manner as those operations conducted in active Restricted and approved Prohibited areas; that is, neither specific FAA approval nor observers or chase aircraft are required by the FAA.

(e) The only public aircraft that can fly under "due regard" are U.S. government aircraft designated as State aircraft.

(2) Methods. The two methods of approval are the issuance of either a COA for public aircraft operations or a special airworthiness certificate for civil operations. In the case of public aircraft operations, the operating entity applying to conduct the UAS operation must comply with its own processes, policies, and standards in the following areas, in addition to complying with all applicable safety provisions in all other parts of 14 CFR:

- Pilot certification,
- Crew certification,
- Recent pilot experience (or, currency),
- Medical certificates, and
- Airworthiness of public UAS.

Note: If no established public entity processes, policies, or standards exist, it is highly recommended that the public agency/department apply the specifics outlined in this notice and comply with the provisions of 14 CFR applicable to civil UAS operations.

8. COA for Public Operations.

a. Applications. Applications for a COA are only accepted from entities that intend to conduct public aircraft operations. An application may be referred to the FAA Office of the Chief Counsel (AGC-200) for determination of the status of a proponent as a government entity under the public aircraft statute. The duration of COAs complies with the time limitations specified under the current edition of FAA Order 7210.3, Facility Operation and Administration. COAs may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for operations conducted within active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited Areas with permission from the appropriate authority or using agency of that airspace. (Refer to the current edition of Order JO 7400.8, Special Use Airspace.)

b. Approving and Reviewing Authority. AFS-80 is responsible for determining whether the proponents' proposed UAS operations can be conducted safely and responsibly in the NAS, and that they comply with all COA limitations and provisions.

(1) In accordance with FAA Order 7210.3, "As a general rule, a waiver or authorization should be canceled when it is no longer required or there is an abuse of its provisions or unforeseen safety factors develop. Failure to comply with the waiver or authorization is cause for cancellation."

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(2) The FAA has the authority to suspend or cancel the COA, or to delay any activities if there is a violation of the terms in the COA, or if the safety of persons or property on the ground or in the air is determined to be in jeopardy. That may include, but is not limited to:

- Incidents or accidents occurring during UAS operations in the NAS;
- Habitual noncompliance with administrative requirements, such as failure to provide the FAA with monthly reports on the number of flights, pilot duty time, or unusual equipment malfunctions (e.g., a malfunction or failure of ground control station (GCS) flight control hardware or software (other than loss of control link); a power plant failure or malfunction; a deviation from any provision contained in the COA);
- Deviations from ATC instructions, operational, or coordination issues; and
- Events of intermittent or persistent lost-link as described in the COA or events determined to pose as a risk to the safety of the NAS.

(3) COA suspensions and cancellations are not automatic. Whenever possible, a documented conversation, between the FAA and the proponent, will happen before the suspension/cancellation is issued. Timely and transparent responses to accidents, deviations, and similar safety-related events are expected.

c. Accident and Incident Notification and Investigation. The current edition of FAA Order 8020.11C, Aircraft Accident and Incident Notification, Investigation, and Reporting, and Title 49 of the Code of Federal Regulations (49 CFR) part 830, outlines reporting procedures for accidents and incidents involving civil aircraft and certain public aircraft. All accidents and incidents involving fatalities, injuries, property damage, and fly-away by civil aircraft and those public aircraft subject to part 830 require FAA notification within 24 hours. No additional flights by those aircraft under this COA are allowed before notification. An immediate investigation is required, and when requested to do so, UAS proponents are expected to provide copies of written aircraft accident/incident reports to AFS-80 for review. In accordance with 49 CFR part 1520, § 1520.5, reports will not be released outside of government channels without originator permission.

d. General COA Process. The ATO component of AFS-80 is responsible for the COA process. Applications can be made two ways:

(1) On the Internet using the UAS COA Online System at https://ioeaaa.faa.gov. The UAS COA Online System requires a user name and password; a support desk phone number and e-mail address is provided to assist with obtaining an account.

(2) Using FAA Form 7711-2, Application for Certificate of Waiver or Authorization, available online at http://www.faa.gov/documentLibrary/media/form/faa7711-2.pdf. The completed form can be mailed to: FAA Headquarters, Unmanned Aircraft Systems Integration Office, 490 L'Enfant Plaza SW, Suite 3200, Washington, DC 20024. Mail submittal may encounter significant delay due to current U.S. Postal Service security screening procedures in place.

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e. Operational Review. Prior to issuance of a COA, air traffic specialist components of AFS-80 conduct an operational validation that addresses ATC processes. Next, an aviation safety inspector (ASI) evaluates each application to determine if risks to the NAS associated with the operation have been acceptably mitigated. Both the ASI and ATC requirements are merged into the final COA.

f. Safety Risk Management (SRM) Process. ASIs and other FAA personnel use SRM principles outlined in the current edition of AC 120-92, Safety Management Systems for Aviation Service Providers, to maintain or improve the safety of the NAS by identifying safety risks, hazards, and mitigations associated with proposed UAS operations. When deemed appropriate, Safety Risk Management Documents (SRMD) are created through SRM reviews of specific operations or of risks associated with UAS operations in various classes of airspace. SRM reviews may result in the incorporation of additional mitigations or controls into all or some COAs.

g. National Security Considerations. When appropriate levels of Department of Defense (DOD) or Department of Homeland Security (DHS) declare a UAS operation to be a matter of national security, the FAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this notice. In this case, national security may override risk mitigation requirements. Such requests to the FAA Administrator will originate from an equivalent level of authority from the proponent's parent organization.

h. Special COA.

(1) National Disaster COA. Due to the unpredictability of national disasters, a National Disaster COA is issued in two parts. In part 1 of the COA, AFS-80 completes an evaluation, excluding the location of the disaster. All known information is inserted into a template and signed by appropriate FAA authority. Once the specific location is identified, this information, along with the specific operation, is inserted into part 2 of the COA in the form of an attachment. Part 2 of the COA must then be signed by appropriate FAA authority, which completes and establishes a valid COA.

(2) Emergency COA. An emergency UAS COA may be considered when all of the following conditions apply:

(a) A situation exists that is defined as a condition of distress or urgency, where there is, or that has, the extreme possibility of loss of life, and

(b) The proponent has determined that manned flight operations cannot be conducted efficiently, and

(c) The proposed UAS is operating under a current approved COA for a different purpose or location.

Note: Requests for UAS COAs that fall outside of these parameters will be processed through the normal online COA application process. Emergency UAS COAs will not be considered for:

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- Demonstration flights,
- Flights to test capabilities,
- Training,
- Flights in Class B Airspace, or
- Flights over populated areas, unless a suitable mitigation strategy is proposed and found to be acceptable.

9. Special Airworthiness Certificate for Civil UAS Applicants.

a. Airworthiness Determination. Civil applicants may apply for a special airworthiness certificate from the FAA. The proponent is required to submit the requisite data to support a determination that the aircraft and its systems, including the control station (CS), are designed, built, and maintained in a safe and airworthy condition.

b. Special Airworthiness Certificate Issuance. Special airworthiness certificates are typically issued to proponents wishing to conduct UAS research and development (R&D), crew training, and market surveys under 14 CFR part 21, § 21.191. Special airworthiness certificates are issued in accordance with FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, current edition. Refer to Order 8130.34 for in-depth information on special airworthiness certificates.

c. Proponents with both a COA and Special Airworthiness Certification. In cases where a proponent has been issued a special airworthiness certificate, and is concurrently eligible to operate a corresponding UAS on a COA as a public aircraft operation, the proponent must elect, prior to each flight, which authority is to be used to conduct the flight. The use of both a special airworthiness certificate and a COA on a single flight is not permitted.

d. General Process for Civil UAS Operations. For civil UAS operations, the Aircraft Certification Service, Production and Airworthiness Division (AIR-200) at FAA HQ, is responsible for the issuance of special airworthiness certificates according to FAA Order 8130.34. The issuance of a special airworthiness certificate is coordinated with AIR-200, AFS-80 and the ATO component of AFS-80, and AVS at the HQ and regional levels. A thorough review is conducted by the FAA to evaluate the system's airworthiness and operational specifications. In addition, the FAA reviews and accepts mitigations developed by the proponent to meet acceptable standards of safety.

10. UAS Airworthiness. All UAS must be in an airworthy condition to conduct flight operations in the NAS. An "airworthy condition for UAS subject to a COA" means that the UAS meets the applicable standards and requirements of its operating agency and is capable of operating in compliance with the applicable requirements in 14 CFR part 91. The FAA recognizes that some of the requirements can differ from those for manned aircraft and appropriate changes can be defined. As with airworthiness standards, maintenance technician requirements will be addressed as part of the review process.

a. Public Aircraft Proponents. The proponent must provide an airworthiness statement specifying compliance with the proponent's applicable airworthiness criteria. Airworthiness statements must be provided on agency letterhead and include:

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- The date the statement is effective,
- A signature of the responsible certifying authority within the agency,
- A point of contact (POC), and
- Any warnings/limitations.

(1) Airworthiness statements are generally written for one UAS. If more than one UAS model is included on a single airworthiness statement, each UAS will be listed and specific information for each UAS will be included in the statement. Airworthiness statements with an expiration date must remain current for the duration of the COA including extensions. If a new airworthiness statement is issued during the period the COA is active, a copy of the airworthiness certificate must be provided to AFS-80.

(2) Examples of acceptable policy/criteria include, but are not limited to:

- Department of Defense (DOD) Handbook, MIL-HDBK 516B, Airworthiness Certification Criteria;
- Air Force Policy Directive (AFPD) 62-6, USAF Aircraft Airworthiness Certification;
- Army Regulations (AR) 70-62, Airworthiness Qualification of Aircraft Systems; or
- Naval Air Systems Command Instruction, NAVAIRINST 13034.1 series, Flight Clearance Policy for Air Vehicles and Aircraft Systems.

b. Civil Aircraft Proponents. Approvals for civil applications using the special airworthiness certificate process receive their airworthiness certification from the FAA.

c. Continued Airworthiness.

(1) Public Aircraft. Proponents for UAS used in public aircraft operations should follow their own agency's procedures and guidelines to maintain continued airworthiness at a level which ensures they continue to operate the aircraft safely.

(2) Civil Aircraft. Proponents for civil UAS operational approvals must address continued airworthiness procedures as part of their application. Civil UAS should be maintained and must conform to the same airworthiness standards defined in 14 CFR parts under which UAS are intended to be operated. It is highly recommended that all proponents provide the following information:

- A Continuing Airworthiness Program,
- A maintenance training program,
- Any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation, and
- A process to report any applicable data relating to the operation and maintenance of the UAS.

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d. Database and Recordkeeping. All information received from UAS proponents aids the FAA in establishing a database for the existing UAS types and operations. This data is critical to our development of future certification criteria for both systems and pilots. It expedites the regulatory process for UAS and allows the FAA to have historical data from which to base current and future UAS policy. Accurate recordkeeping is essential in assuring positive operational and quality airworthiness control. In accordance with 49 CFR § 1520.5, reports will not be released outside of government channels without originator permission.

11. Flight Operations of a UAS.

a. Applicability and Requirements. This notice applies to UAS operations conducted in the NAS other than in active Restricted and Warning Areas designated for aviation use or approved Prohibited Areas. The FAA requires aircraft to operate safely among all users of the NAS, including non-cooperative aircraft (e.g., aircraft operated without a transponder), and other airborne operations not reliably identifiable by ATC radar (e.g., balloons, gliders, parachutists). Unless otherwise specifically authorized, UAS operators must use observers, either airborne or ground-based, to comply with 14 CFR part 91 requirements.

b. Risk Mitigation. While considerable work is ongoing to develop a certifiable detect, sense, and avoid system as an AMOC with the see-and-avoid aspect of §§ 91.113 and 91.115, no current solution exists. As a result, compliance with the see-and-avoid requirement and navigational awareness are primary concerns in UAS operational approvals leading to imposition of AMOC. Risk mitigation for these two issues is normally based on the use of observers or other methods of maintaining flight separation and collision avoidance or 'segregation'; however, they may also include other concepts or systems that a proponent may propose for FAA review. The FAA only approves UAS flight operations that can be conducted at an acceptable level of safety. Refer to the current editions of AC 120-92 and FAA Order 8000.369, Safety Management System Guidance.

> **Note:** Risk mitigations that depend on the establishment of new types and categories of airspace are extremely difficult and time-consuming. The NAS is established and configured through a rigorous regulatory process. Risk mitigations that result in the prohibition of the public's right to transit airspace will require a very long lead time with no guarantee that they will be approved.

(1) Proponents proposing see-and-avoid strategies in lieu of visual observers (VOs) are required to support proposed mitigations with system safety cases which indicate the operations can be conducted safely. Acceptable system safety cases must include a hazard analysis, risk assessment, and other appropriate documentation that identifies the level of risk.

(2) It is the proponent's responsibility to demonstrate that the risk of injury to persons or property along the flightpath is appropriately mitigated. Aircraft with performance characteristics that impede, delay, or divert other normal air traffic operations may be restricted in their operations.

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12. System Considerations for UAS.

a. Traffic Alert and Collision Avoidance Systems (TCAS). The use of TCAS by UAS has not been validated as an acceptable alternative for see-and-avoid requirements, and is not an approved means of mitigation for UAS see-and-avoid requirements or strategies.

b. Onboard Cameras/Sensors. Although onboard cameras and sensors positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of segregation is still quite limited. To date, these types of systems have not been approved as a sole mitigation in the see-and-avoid risk assessment.

c. Use of Equipment in Lieu of VOs.

(1) Any equipment proposed for use on UAS to accomplish the function of see-and-avoid in lieu of VOs must:

- Be certified as an aircraft system and equipment using standards, requirements, and processes commensurate with installation of equipment in aircraft by a recognized airworthiness authority, and
- Meet the requirements of 14 CFR part 25, § 25.1309, or equivalent process, for any UAS installation, regardless of its size, performance, or maximum takeoff weight.

Note: For other equipment that is not proposed for use in meeting see-and-avoid requirements, § 23.1309, or equivalent process, should be used.

(2) It is the responsibility of the proponent to show that the contemplated standards, requirements, and processes meet an equivalent level of safety.

d. Radar and Other Sensors. If special types of radar systems or other sensors are utilized to mitigate risk, the proponent must provide supporting data which demonstrates the following can be accomplished safely:

- Both cooperative and non-cooperative traffic can be detected and tracked to ensure appropriate separation and collision avoidance,
- The proposed system can effectively mitigate a potential collision,
- Operators are suitably trained and equipped to use them effectively, and
- Procedures are in place for the pilot in command (PIC) to effectively use the data.

e. Lost Link Procedures. There are many acceptable approaches to satisfy lost link requirements. The intent of any lost link procedure is to ensure airborne operations remain predictable. Proponents will comply with the UAS lost link procedures as specified in the COA.

Note: Lost link is not considered fly-away. Refer to definitions in Appendix A.

(1) Unless otherwise authorized, lost link solutions must comply with the last ATC clearance (if ATC clearance is required), for a period of time sufficient for ATC to ensure conflict resolution without loss of required separation.

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(2) Lost link procedures are pre-coordinated by AFS-80 with the appropriate ATC facility and included in the COA. They include, at a minimum, lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points (FTP) or other contingency planning measures in the event recovery of the UAS is not feasible.

(3) If lost link occurs within a Restricted Area, Warning Area, or Class A airspace, or lost link procedure takes aircraft into one of these areas, the aircraft will not exit that airspace, unless otherwise authorized, until link is re-established. All exceptions will be submitted as part of the COA application to AFS-80 for review.

(4) Unless otherwise authorized, lost link procedures will conform to the Contingency Planning Limitations in Appendix E and in general, include the following:

- Limiting of UAS operations to operations over water or sparsely populated areas over the ground to transit to another Restricted Area, Warning Area, or to a pre-planned lost link orbit point within visual line-of-sight to re-establish link. (The UAS lost link procedure will not transit over fixed structures on the water.)
- Lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.
- Lost link orbit points will not be contained within any published holding area, airway, Jet route, T route, or other area navigation (RNAV) published route.

(5) If the link is not re-established within a pre-determined time as defined by the FAA-approved COA, the aircraft may:

- Autoland; however, the aircraft will not exit the Restricted Area or Warning Area in accordance with subparagraph 12.e.(3) above,
- Proceed to another lost link point (LLP) in an attempt to regain communication link, or
- Proceed to an FTP or the location specified in other contingency planning measures for flight termination.

Note: LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is re-established or fuel exhaustion occurs.

- UAS without auto-land capability will proceed to a pre-planned FTP or other acceptable contingency planning option prior to fuel exhaustion.

(6) Refer to Appendix E for more Contingency Planning Limitations.

f. Flight Termination System (FTS). It is highly desirable that all UAS have system redundancies and independent functionality to ensure the overall safety and predictability of the system. UAS that lack system redundancies may be required to have an independent FTS that can be activated manually by the UAS PIC to safeguard the public.

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g. Spectrum Authorization.

(1) Every UAS proponent must have the appropriate National Telecommunications and Information Administration (NTIA) or Federal Communications Commission (FCC) authorization/approval to transmit on the radio frequencies (RF) used for UAS uplink and downlink of control, telemetry, and payload information.

(2) Non-Federal public agencies, such as universities and State/local law enforcement, and all civil UAS proponents generally require a license from the FCC as authorization to transmit on frequencies other than those in the unlicensed bands (900 megahertz (MHz), 2.4 gigahertz (GHz), and 5.8 GHz). This generally will be in the form of an Experimental Radio License or a Special Temporary Authority (STA) issued by the FCC. Non-Federal public agencies and civil UAS proponents that operate systems using frequencies assigned to the Federal government (e.g., the DOD) must demonstrate they have the proper authorization through FCC-issued documentation.

(3) DOD agencies will typically demonstrate UAS spectrum authorization through an STA issued by NTIA or a frequency assignment in the NTIA-administered Government Master File (GMF). Authorizations issued under Title 47 of the Code of Federal Regulations (47 CFR) part 300, in the NTIA Manual, Chapter 7, paragraph 7.11, Use of Frequencies by Certain Experimental Stations, are not appropriate for UAS operations.

(4) Federal public agencies other than DOD, such as National Aeronautics and Space Administration (NASA), U.S. Coast Guard (USCG), and U.S. Customs and Border Protection (USCBP), also need an STA issued by NTIA or a frequency assignment in the NTIA-administered GMF. This is especially important for systems designed to operate on frequencies assigned to DOD.

13. Operational Requirements for UAS. Unless operating in an active Restricted or Warning Area designated for aviation use, or approved Prohibited Areas, UAS operations must adhere to the following requirements.

a. Observer Requirement. Visual flight rules (VFR) UAS operations may be authorized utilizing either ground-based or airborne VOs onboard a dedicated chase aircraft. A VO must be positioned to assist the PIC, to exercise the see-and-avoid responsibilities required by §§ 91.111, 91.113, and 91.115 by scanning the area around the aircraft for potentially conflicting traffic and assisting the PIC with navigational awareness.

(1) VOs:

(a) Must assist the PIC in not allowing the aircraft to operate beyond the visual line-of-sight limit, and

(b) Must be able to see the aircraft and the surrounding airspace sufficiently to assist the PIC with:

- Determining the UA's proximity to all aviation activities and other hazards (e.g., terrain, weather, structures), and

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- Exercising effective control of the UA, and
- Complying with §§ 91.111, 91.113, and 91.115, and
- Preventing the UA from creating a collision hazard, and

(c) Must inform the PIC before losing sufficient visual contact with the UA or previously sighted collision hazard. This distance is predicated on the observer's normal vision. Corrective lenses, spectacles, and contact lenses are permitted.

(2) Because of field of view and distortion issues with aids to vision such as binoculars, field glasses, night vision devices, or telephoto lenses, these are allowed only for augmentation of the observer's visual capability; they cannot be used as the primary means of visual contact. When using other aids to vision, VOs must use caution to ensure the aircraft remains within normal visual line-of-sight of the observer. These aids to vision are not to be confused with corrective lenses or contact lenses, which do not alter the field of view or distort vision.

(3) The responsibility of ensuring the safety of flight and adequate visual range coverage to avoid any potential collisions remains with the PIC. The PIC for each UAS operation must identify a location from which the observer will perform his/her duties. This location will be selected to afford the best available view of the entire area within which the operation is to be conducted.

(4) Daisy-chaining of observers to increase operational distance is not normally approved; however, a proponent may provide a safety case for daisy-chaining in accordance with paragraph 16 by demonstrating an acceptable level of risk to the NAS.

(5) Observer(s) must be in place 30 minutes prior to night operations to ensure dark adaptation. Refer to subparagraph 13.i.(2)(b) for night operations information.

b. ATC Communications Requirements.

(1) The UAS pilot must establish and maintain direct two-way radio communication with appropriate ATC facilities anytime:

- The aircraft is being operated in Class A or D airspace (under §§ 91.135 or 91.129) or, when required, in Class E and G airspace (under §§ 91.127 or 91.126). See subparagraph 13.q.(2) and (3) for operations in Class B or C airspace; or
- The aircraft is being operated under instrument flight rules (IFR); or
- It is stipulated under the provisions of any issued COA or Special Airworthiness Certificate.

(2) It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay, however, for IFR flight this method of transmission is required.

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c. Inter-Communications Requirements. Any VO, sensor operator, or other person charged with providing see-and-avoid assistance must have immediate communication with the UAS pilot. If a chase aircraft is being utilized, immediate communication between the chase aircraft and the UAS pilot is required at all times. If the UAS pilot is in communication with ATC, monitoring of the ATC frequency by all UAS crew members (pilots, observers, and chase pilots) is recommended for shared situational and navigational awareness. However, unless it is approved for others to do so, the UAS PIC or the supplemental pilots are the only crewmembers that will communicate with ATC.

d. Electronic Devices. The use of electronic devices (including cell phones) other than for UAS flight- and mission-required usage is governed by § 91.21, which ensures these devices do not interfere with the UAS systems. The use of electronic devices (including cell phones) is not authorized for primary communication with ATC unless authorized under the Special Provisions of the COA.

e. Dropping Objects/Expendable Stores or Hazardous Materials. If the intended UAS operation includes the carriage, dropping, or spraying of aircraft stores outside of active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited Areas, the proponent must ensure that specific approval is listed in the special provisions, the operational risks have been sufficiently mitigated as required by 14 CFR § 91.15, and that the hazardous material requirements in 49 CFR have been met. Acceptable procedures for hung stores and loss of control link while carrying stores must be provided to the FAA. A similar case must be made for hazardous materials carried aboard the aircraft and, if approved, will be listed in the special provision section of the COA.

f. Flight Over Populated Areas. Routine UAS operations are prohibited over urban or populated areas, except where the level of airworthiness allows. UAS operations may be approved in emergency or national disaster relief situations if the proposed mitigation strategies are found to be acceptable. See Appendix A for definition of populated or urban area.

g. Air Shows. A proponent is required to provide a safety case in accordance with paragraph 16 that demonstrates an acceptable level of risk and must receive a separate Air Show Waiver in accordance with FAA Order 8900.1, Flight Standards Information Management System (FSIMS).

h. Flight Over Heavily Trafficked Roads or Open-Air Assembly of People. UAS operations must avoid these areas, except where level of airworthiness allows. If flight in these areas is required, the proponent is required to support proposed mitigations with system safety cases that indicate the operations can be conducted safely. Acceptable system safety cases must include information located in paragraph 16. Additionally, it is the proponent's responsibility to demonstrate that risk of injury to persons or property along the flightpath has been mitigated. UAS with performance characteristics that impede, delay, or divert other air traffic operations may be restricted in their operations. Refer to AC 120-92 and FAA Order 8000.369, current editions.

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i. Day/Night Operations.

(1) Day Operations. UAS operations outside of Class A airspace, active Restricted or Warning Areas designated for aviation use, or approved Prohibited Areas will be conducted during daylight hours unless otherwise authorized.

(2) Night Operations.

(a) Night operations may be considered if the proponent provides a safety case and sufficient mitigation to avoid collision hazards at night.

(b) UAS night operations are those operations that occur between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time. (Note: this is equal to approximately 30 minutes after sunset until 30 minutes before sunrise, except in Alaska.) External pilots and observers must be in place 30 minutes prior to night operations to ensure dark adaptation.

j. Flights Below Class A Airspace. All UAS operations outside of active Restricted/ Warning/Sensitive Security Information (SSI) airspace designated for aviation use, or approved Prohibited Areas must be conducted in visual meteorological conditions (VMC) if using ground or airborne VOs. In addition, the following weather requirements apply:

- If on IFR flight, remain clear of clouds. This requirement does not relieve the PIC from following the ATC clearance. According to § 91.3, the PIC retains responsibility for, and is the final authority as to the operation of that aircraft.
- If on VFR flight, maintain § 91.155 VFR cloud clearances, except in Class G airspace, where Class E airspace visibility requirements must be applied, but not less than 3 statute miles (SM) in-flight visibility.
- Special VFR is not permitted.
- For chase aircraft, 5 SM in-flight visibility.

k. Autonomous Operations. Although it is possible to have a completely manual (direct pilot intervention) UAS, the majority of UAS are autonomous to a certain degree. Only those UAS which have the capability of direct pilot intervention will be allowed in the NAS outside of active Restricted or Warning Areas designated for aviation use, or approved Prohibited Areas. Because the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.

l. Operations from Off-Airport Locations. In most cases, an off-airport location should be situated no closer than 5 nautical miles (NM) from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions; reasonable efforts should be made to keep operations away from structures.

m. Crew Resource Management (CRM). Proponents must train all UAS crewmembers in CRM. The current edition of FAA AC 120-51, Crew Resource Management Training, or an FAA-recognized equivalent applies to UAS operations. Proponents must implement the recommended training and procedures included in AC 120-51, or in an FAA-recognized

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equivalent. The PIC of a UAS must ensure no activities other than those duties required for safe flight operation are performed. No UAS crewmember may engage in any activities unrelated to those required for safe operation of the UAS during critical phases of flight such as launch/takeoff and landing/recovery.

n. Sterile Cockpit. Proponents must comply with the current edition of AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers, or the FAA-recognized equivalent, for ensuring the PIC implements sterile cockpit procedures. During critical phases of flight, including all ground operations involving taxi (movement of an airplane under its own power on the surface of an airport), takeoff and landing, and all other flight operations in which safety or mission accomplishment might be compromised by distractions, no crewmember may perform any duties not required for the safe operation of the aircraft. No crewmember may engage in, nor may any PIC permit, any activity during a critical phase of flight which could distract any crewmember from the performance of his/her duties or interfere in any way with the proper conduct of those duties.

o. Operating Under IFR. While operating on an instrument flight plan, the following must exist, be completed, or be complied with:

(1) The PIC must hold a current instrument rating or an FAA-recognized equivalent.

(2) The aircraft's airworthiness signature statement for flight release (not airworthiness document) must include IFR flight and indicate that all equipment required for IFR operations is certified and working (including pitot-static and transponder checks).

(3) Applicable navigation database and charts are current and available to the UAS pilot.

(4) An IFR flight plan is filed.

(5) An ATC clearance has been obtained and all clearances must be followed.

(6) Direct two-way radio communication between the UAS pilot and ATC is established and maintained. (A communication relay through the aircraft may be required.)

(7) Alternate communication capabilities with ATC for the purpose of lost link and/or lost communication are designated and operational during all phases of flight.

(8) The UAS is equipped with a certified operating mode C (mode S preferred) transponder.

(9) ATC radar services are obtained throughout the portion of the flight in Class A airspace whenever possible (overwater non-radar operations may be allowed in the special provisions section).

(10) All operations outside of Class A airspace and active Restricted, Prohibited, Warning Areas, or SSI airspace designated for aviation use, must remain clear of clouds. If operating under IFR, to comply with this provision, the PIC must have an ATC clearance to deviate.

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According to § 91.3, the PIC retains responsibility for, and is the final authority as to, the operation of that aircraft.

(11) VOs are not required in Class A airspace unless stipulated in the COA.

p. Chase Aircraft Operations. The chase aircraft:

(1) Must remain at a safe distance from UA to ensure collision avoidance if a malfunction occurs, and

(2) Must remain close enough to the UA to provide visual detection of any conflicting aircraft and advise the PIC of the situation.

(3) Must remain within radio control range of the UA, in the case of pilot operation from the chase aircraft, to maintain appropriate signal coverage for flight control or activation of the FTS.

(4) May be required to have communication with appropriate ATC facilities based on the proponent's application or mission profile.

(5) Is not required by FAA in active Restricted or Warning Area airspace designated for aviation use, or approved Prohibited airspace.

(6) Is not required for Optionally Piloted Aircraft (OPA) if a qualified VO is on board.

(7) Is not required in Class A airspace unless stipulated in the COA.

(8) Operations must be conducted in accordance with the Special Provisions listed in the approved COA.

(9) Must maintain 5 SM in-flight visibility restrictions.

(10) Pilot/observer:

- Will not concurrently perform either observer or UAS pilot duties along with chase pilot duties unless otherwise authorized.
- Must maintain direct voice communication with the UAS pilot.

(11) Pilots operating as a formation flight will immediately notify ATC if they are using a non-standard formation. Non-standard formations must be pre-approved by ATC. Proponents adhere to the current edition of Order JO 7610.4, Special Operations, as applicable. Refer to Appendix A for definitions of standard and non-standard formations.

(12) Operations will not be conducted in IMC.

(13) Operations will be thoroughly planned and briefed.

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(14) Pilot, during a lost link situation, must be notified immediately along with ATC. The chase pilot will report to ATC that the UA is performing lost link procedures as planned or if deviations are occurring.

(15) Pilot will ensure safe separation with the UA, and immediately notify ATC and the UA PIC during loss of visual contact with the UA by both the chase pilot and observer, when such contact cannot be promptly re-established. The UA PIC will either execute lost link procedures to facilitate a rejoin, recover the UA, or terminate the flight as appropriate.

q. Airspace Considerations by Airspace Designation.

Note: UAS operating in airspace designated as reduced vertical separation minimum (RVSM) airspace must comply with § 91.180.

(1) Class A. Observers are not normally required in Class A. All UAS must be operating under IFR and on an instrument flight plan. UAS operations approved for Class A must comply with § 91.135.

(2) Class B. UAS operations are currently not authorized. Class B airspace contains terminal areas with the highest density of manned aircraft in the NAS. On a case-by-case basis, the FAA may consider exceptional circumstances. For public aircraft, a Letter of Agreement (LOA) between the affected ATC facility and the proponent describing UAS segregation procedures is required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class B operations.

(3) Class C (and airspace within 30 NM of an airport listed in Appendix D, section 1, § 91.215). UAS operations approved for Class C must comply with §§ 91.130 and 91.215. Requests for operations without this equipment will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class C operations.

(4) Class D. Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class D must comply with § 91.129. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class D operations.

(5) Class E. If there is an operating ATC tower, Class D rules may apply. UAS operations approved for Class E must comply with § 91.127. For public aircraft, an LOA between the affected ATC facility and the proponent describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class E operations.

(6) Class G. UAS operations approved for Class G must comply with § 91.126.

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r. ATC Visual Approach Clearances. The UAS PIC must not accept a visual approach clearance, an instruction to follow another aircraft by visual means, or a clearance to maintain visual separation from another aircraft.

s. In-Flight Emergencies.

- The PIC will notify ATC of any in-flight emergency or aircraft accident as soon as practical.
- The PIC will notify ATC of any loss of control link as soon as practical. Loss of control link scenarios may be handled by ATC as an emergency.

14. Contingency Planning Limitations. See Appendix E.

15. Personnel Qualifications. This paragraph addresses the qualifications of all UAS flightcrew members, observers, maintainers, and other personnel as appropriate. All references to a pilot certificate or FAA written examination refer to an FAA-issued private pilot certificate, higher certification, or an FAA-recognized equivalent.

a. UAS Pilot Qualifications. The FAA is focused on ensuring that UAS pilots have an appropriate level of understanding of 14 CFR applicable to the airspace where UAS operate. UAS pilots are responsible for controlling their aircraft to the same standards as the pilot of a manned aircraft. Civil UAS pilots may be required to have instruction by an FAA-certificated flight instructor.

b. UAS General Operational Requirements. The following operational restrictions apply to all UAS pilots:

- One PIC must be designated at all times.
- The PIC of an aircraft is directly responsible for, and is the final authority of the operation of that aircraft.
- Pilots must not perform crew duties for more than one UAS at a time.
- Pilots are not allowed to perform concurrent duties both as the pilot and the VO. In the case of OPA, the airborne pilot may assume the role of PIC at all times, but will only be the observer when the OPA is operated by the CS pilot.
- Unless undergoing initial qualification training, pilots must be qualified on the aircraft being flown.
- Only one PIC per aircraft is authorized, and the PIC must be in a position to assume control of the aircraft.

c. PIC.

(1) The designated PIC:

- Has been designated as PIC before or during the flight.
- Is responsible for the UAS flight operation as described under § 91.3, or FAA-recognized equivalent.
- Is responsible for determining whether the UAS is in condition for safe flight.

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- Must land as soon as safely practical when any condition occurs that causes operations to be unsafe.
- May be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the aircraft.
- Has the ability to assume the duties of an internal or an external UAS pilot at any point during the flight.
- May rotate duties as necessary to fulfill operational requirements.
- Operating under a public agency, must have a thorough knowledge of the COA issued to the organization and must retain a copy to reference during flight.
- Must be trained and qualified on the specific UAS for the conduct of the flight.
- May assume the duties of VO or PIC, if piloting an OPA when the OPA is being utilized as a UAS and being flown by the CS pilot.

(2) PIC Rating Requirements. Rating requirements for the UAS PIC depend on the type of operation conducted; they fall into two categories:

- Operations that require at least a private pilot certificate or FAA-recognized equivalent, or
- Operations that do not require at least a private pilot certificate or FAA-recognized equivalent.

(a) The requirement for the PIC to hold a pilot certificate or FAA-recognized equivalent is based on various factors including:

- The location of the planned operations,
- The mission profile,
- The size of the aircraft, and
- Whether or not the operation is conducted within or beyond visual line-of-sight.

(b) The PIC must hold, at a minimum, an FAA private pilot certificate or FAA-recognized equivalent for all operations listed below:

- Flight in Class A, B, C, D, E, and G (400 feet above ground level (AGL)) airspace.
- IFR (must have instrument rating) operations.
- Night operations.
- At joint use or public airfields.
- Requiring a chase aircraft.
- At any time the FAA has determined the need, based on the UAS characteristics, mission profile, or other operational parameters.

(c) Operations without a pilot certificate may be allowed when all of the following conditions are met:

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- The PIC has successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA-recognized equivalents. (Airman Test Reports are valid for the 24 calendar-month period preceding the month the exam was completed, at which time the instruction and written examination must be repeated.)
- Operations are during daylight hours.
- The operation is conducted in a sparsely populated location.
- Operations are approved and conducted solely within visual line-of-sight in Class G airspace.
- Visual line-of-sight operations are conducted no further than ½ NM laterally from the UAS pilot and at an altitude of no more than 400 feet AGL at all times. Refer to Appendix A for the visual line-of-sight definition.
- Operations are conducted no closer than 5 NM from any FAA-designated airport or heliport other than the airport from which the aircraft is operating.
- The operation is conducted from a privately owned airfield, military installation, or off-airport location.

(3) PIC Recent Flight Experience (Currency). The proponent must provide documentation showing the pilots maintain an appropriate level of recent pilot experience in the UAS being operated, or in an FAA-certified simulator. At a minimum, the PIC must conduct three takeoffs (launch) and three landings (recovery) in the specific UAS within the previous 90 days (excluding pilots who do not conduct launch/recovery during normal/emergency operations); or as prescribed by the proponent's accepted recurrent training and currency program.

(a) For those operations that require a certificated pilot, the PIC, to exercise the privileges of his certificate, must have flight reviews and maintain recent pilot experience in manned aircraft per 14 CFR part 61, as appropriate; or FAA-accepted equivalent.

(b) For flights approved for night operations, the PIC must conduct three takeoffs (launch) and three landings (recovery) each, in the specific UAS at night, to a full stop in the previous 90 days (excluding pilots who do not conduct launch/recovery during normal/emergency operations).

(c) For operations approved for night or IFR, the PIC must maintain recent pilot experience per § 61.57 or FAA-accepted equivalent as applicable.

(4) PIC Medical. The PIC must maintain, at a minimum, a valid FAA second-class medical certificate issued under 14 CFR part 67 or the FAA-recognized equivalent. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate listed in § 61.23.

(5) Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(6) PIC Training.

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(a) In addition to the training required for a pilot certificate, UAS PICs must have the following additional training (or FAA-recognized equivalent):

- Including normal, abnormal, and emergency procedures in all specific details of the UAS being operated,
- Manufacturer-specific training,
- Demonstrated proficiency, and
- Testing in the UAS being operated.

(b) Proponents must maintain individual training records of all UAS personnel. All training and testing will be documented in the individual's training record by the instructor and initialed by the trainee.

d. Supplemental Pilots. Supplemental pilots are those pilots assigned UAS flight duty to augment the PIC. It is common for proponents to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions.

(1) Ratings. Supplemental pilots must have, at a minimum, successfully completed private pilot ground school and passed the written test or FAA-recognized equivalents. The ground school written test results are valid for two years from the date of completion, at which time the instruction and written examination must be repeated. If a supplemental pilot assumes the role of PIC, he/she must comply with the PIC rating, currency, medical, and training requirements listed above in subparagraph 15c.

(2) Recent Pilot Experience. The proponent must provide a process that ensures that pilots maintain an appropriate level of recent pilot experience for the position they are assigned in the UAS being operated.

(3) Medical. Supplemental pilots must maintain, at a minimum, a valid FAA second-class medical certificate issued under part 67 or the FAA-recognized equivalent. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate, according to § 61.23. Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(4) Training.

(a) UAS supplemental pilots must have:

- Training in all specific details of the UAS being operated, including normal, abnormal, and emergency procedures;
- Manufacturer-specific training (or FAA-recognized equivalent);
- Demonstrated proficiency and successful testing in the UAS being operated.

(b) Proponents must maintain individual training records for all UAS personnel. All training must be documented by the instructor and initialed by the trainee.

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e. UAS Observer Qualifications. All observers must have an understanding of Federal aviation regulations applicable to the airspace where the UAS will operate. Observers are considered crewmembers. Observers must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as UAS pilot and observer.

(1) Medical. All observers must have a valid FAA second-class medical certificate issued under part 67; an FAA-recognized equivalent is an acceptable means of demonstrating compliance with this requirement. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate. Section 91.17 or FAA-recognized equivalent applies to all UAS crewmembers.

(2) Training. Observers must complete sufficient training to communicate to the pilot any information required to remain clear of conflicting traffic, terrain, and obstructions, maintain proper cloud clearances, and provide navigational awareness. This training, at a minimum, must include knowledge of:

(a) Their responsibility to assist pilots in complying with the requirements of 14 CFR:

- § 91.111, Operating Near Other Aircraft;
- § 91.113, Right-of-Way Rules: Except Water Operations;
- § 91.115, Right-of-Way Rules: Water Operations; and
- § 91.155, Basic VFR Weather Minimums;

(b) Air traffic and radio communications, including the use of approved ATC/pilot phraseology; and

(c) Appropriate sections of the Aeronautical Information Manual (AIM).

f. UAS Maintenance Personnel Qualifications.

(1) Maintenance Ratings. Will be established as more data is collected and a regulatory guideline is developed.

(2) Recent Maintenance Experience. It is suggested that proponents follow applicable guidelines of 14 CFR part 65, § 65.83, as appropriate, until final UAS regulatory guidelines are available.

(3) Maintenance Medical Requirements. At a minimum, the requirements of § 91.17 or FAA-recognized equivalent must be met. No additional medical requirements have been defined at this time.

(4) Maintenance Training. It is highly recommended that a proponent of a UAS submit a training program. This requirement will be further defined as more data is collected and the regulatory process affects these guidelines.

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g. Other UAS Personnel Qualifications. Ancillary personnel such as systems operators or mission specialists must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, personnel must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel.

16. AMOC. This notice defines certain limitations and procedures to conduct UAS operations, but each application is evaluated on its own technical merit based on its own set of operational parameters and proposed operational profiles, mitigations, and systems. When a proponent desires to deviate from these limitations and procedures, an AMOC that includes a safety case (recommended format provided in Appendix D), must be submitted for approval. For a proponent to make an acceptable safety case, information must be provided that outlines all hazards and risks associated with the requested AMOC. In addition, the proponent must provide a description of the methods and procedures or equipment for mitigating each hazard and risk. As such, deviations and AMOC may differ from the information presented in this notice. Therefore, if the proponent provides an acceptable safety case with sufficient data that supports the proposal, the AMOC will be considered and evaluated for approval.

a. Safety Case Information. The proponent should include at a minimum:

(1) A thorough description of the environment in which the aircraft will operate;

(2) Criteria for categorizing hazards (e.g., severity and likelihood);

(3) A detailed airworthiness description of the affected items associated with the proposed AMOC, which includes, as a minimum:

- Certification status of components and systems, or statement of airworthiness for public aircraft,
- Reliability data,
- Redundant systems,
- Failure modes and effects, including system response to loss of control link, and
- An airworthiness determination (for COA proponents only);

(4) Capabilities of the aircraft;

(5) Flight data;

(6) Accident data;

(7) Emergency procedures; and

(8) Pilot/crew roles and responsibilities.

b. Sample Safety Case. Appendix D represents the FAA's approach to documenting the process used for hazard identification and risk mitigation. It is provided as an example for proponents to use when developing and documenting a safety case. In addition to these

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guidelines, other government and industry methods similar to the FAA's approach to developing a safety case also provide acceptable hazard analysis tools. These include Preliminary Hazard Analysis, Operational Safety Assessment, Comparative Safety Assessment, and Fault Hazard Analysis. See Appendix D for a complete list.

17. Disposition. We will incorporate the information in this notice into FAA Order 8900.1 before this notice expires. Direct questions concerning the information in this notice to the Unmanned Aircraft Systems Integration Office, AFS-80, at 202-385-4835.

for John M. Allen
John M. Allen
Director, Flight Standards Service

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APPENDIX A. DEFINITIONS

1. Aircraft. A device used or intended to be used for flight in the air, including unmanned aircraft (UA).

2. Airworthiness [UAS]. A condition in which the unmanned aircraft system (UAS) (including the aircraft, airframe, engine, propeller, accessories, appliances, and control station (CS)) conforms to its type certificate, if applicable, and is in condition for safe operation.

3. Airworthiness Certification. Process and aircraft qualification for civil UAS proponents to obtain a special airworthiness certificate.

4. Airworthiness Statement. Document required from public UAS proponents during a Certificate of Waiver or Authorization (COA) application process which confirms aircraft airworthiness.

5. Certificate of Waiver or Authorization (COA). An FAA grant of approval for a specific operation. The authorization to operate a UAS in the National Airspace System (NAS) as a public aircraft outside of Restricted, Warning, or Prohibited areas approved for aviation activities.

6. Chase Aircraft. A manned aircraft that carries its own pilot-in-command (PIC) and a separate qualified VO flying in proximity to a UA.

7. Civil Aircraft. Aircraft other than public aircraft.

8. Cooperative Aircraft. Aircraft that have an electronic means of identification (i.e., a transponder or ADS-B transceiver) aboard in operation.

9. Crewmember [UAS]. In addition to the crewmembers identified in 14 CFR part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and VOs, but may include other persons as appropriate or required to ensure safe operation of the aircraft.

10. Crew Resource Management (CRM). The effective use of all available resources including human, hardware, and information resources.

11. Daisy-Chaining. Aviation jargon for the use of multiple, successive observers to extend the flight of a UA beyond the direct visual line-of-sight of any other PIC or VO.

12. Experimental Certificate. A type of special airworthiness certificate issued for the purposes of research and development (R&D), crew training, exhibition, and market survey as defined in 14 CFR part 21, § 21.191(a), (c), and (f). Note: According to § 91.319(a)(2), experimental aircraft may not be used for carrying persons or property for compensation or hire.

a. R&D Aircraft. Aircraft testing new design concepts, equipment, installations, operating techniques, or uses for aircraft. Any unmanned aircraft system (UAS), including an Optionally Piloted Aircraft (OPA) is eligible for an experimental certificate under this purpose. Operations

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may be conducted by the proponent only as a matter of research or to determine whether an idea warrants further development.

b. Crew Training. Crew training is limited to the number of flight crews required by the proponent to conduct experimental aircraft operations.

c. Market Survey. Aircraft may be used for the purposes of conducting market surveys, sales demonstrations, and customer crew training of the manufacturer's customers as provided in part 21, § 21.195.

13. External Pilot. A UAS pilot who flies from outside a CS shelter with direct visual contact with the aircraft.

14. FAA-Recognized Equivalent. An FAA recognition that a public agency may exercise its own internal processes regarding airworthiness and pilot, aircrew, and maintenance personnel certification and training; furthermore, the agency has determined that its UAS is capable of safe operation in the National Airspace System (NAS) when conducting public aircraft operations under Title 49 of the United States Code (49 U.S.C.) §§ 40102(a)(41) and 40125.

15. Fly-Away. An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA is not operating in a predicable or planned manner.

16. Formation.

a. Non-standard formation. A formation operating under any of the following conditions:

- When the flight leader has requested and ATC has approved other than standard formation dimensions;
- When operating within an authorized block altitude or under the provisions of a letter of agreement (LOA);
- When the operations are conducted in airspace specifically designed for a special activity.

b. Standard formation. A formation in which proximity of no more than 1 NM laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman or UA.

17. Inspection. The routine performance of inspection tasks at prescribed intervals. The inspection must ensure the airworthiness of an aircraft up to and including its overhaul or life limits.

18. Internal Pilot. A UAS pilot who flies from inside a CS shelter without direct visual contact with the aircraft.

19. Lost Link. An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA will perform a predictable or planned maneuver. Loss of command and control link between CS and aircraft. There are two types of links:

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- An uplink which transmits command instructions to the aircraft, and
- A downlink which transmits the status of the aircraft and provides situational awareness to the pilot.

20. Missile. A non-recoverable, powered, guided munition that travels through the air or space.

- Ballistic missiles follow a ballistic trajectory.
- Cruise missiles generate lift.
- Guided missiles are launched from a ship or aircraft and serve as a self-contained precision bomb.

21. Non-Cooperative Aircraft. Aircraft that do not have an electronic means of identification (e.g., a transponder) aboard or that have inoperative equipment because of malfunction or deliberate action.

22. Non-Standard Formation. See Formation.

23. Observer. A trained person who assists a UAS pilot in the duties associated with collision avoidance and navigational awareness through electronic or visual means. (Collision avoidance includes, but is not limited to, avoidance of other traffic, clouds, obstructions, terrain and navigational awareness.) A visual observer (VO) is a trained person who assists the UAS pilot by visual means in the duties associated with collision avoidance. A VO includes the OPA pilot when the OPA is being operated as a UAS.

24. Off-Airport. Any location used to launch or recover aircraft that is not considered an airport (e.g., an open field).

25. Optionally Piloted Aircraft (OPA). An aircraft that can conduct operations as a traditional aircraft with a pilot aboard the aircraft, and can also operate as a UAS when the aircraft is operated and controlled by the CS pilot, allowing the pilot aboard the aircraft to become a qualified observer and remain a PIC. OPA operating as a UAS must meet UAS guidance requirements.

26. Pilot Duty Period. The period beginning when a flightcrew member is required to report for duty, with the intention of conducting a flight, and ending when the aircraft is parked after the last flight. It includes the period of time before a flight or between flights that a pilot is working without an intervening rest period.

27. Pilot-in-Command (PIC)-[UAS]. The person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the PIC as described by 14 CFR part 91, § 91.3 apply to the UA PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight. Note: The PIC can only be the PIC for one aircraft at a time. For OPA, PIC must meet UAS guidance requirements for training, pilot licensing, and medical requirements when operating OPA as a UAS.

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28. Populated or Urban Areas. Areas depicted in yellow on a Visual Flight Rules (VFR) sectional chart or as determined from other sources.

29. Proponent. A person or agency making an application for a Certificate of Waiver or Authorization (COA).

30. Public Aircraft. An aircraft operated by a governmental entity (including Federal, State, or local governments, and the U.S. Department of Defense (DOD) and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. See 14 CFR part 1, § 1.1 for a complete definition of a public aircraft.

31. Public Operator. An operator that is classified as government and/or otherwise qualifies for public aircraft operation under 49 U.S.C. §§ 40102(a)(41) and 40125. Not all flights by a public aircraft operator qualify as a public aircraft operation under the statute. Public aircraft operation status is not automatic for flights conducted by a government entity or a contractor to a government entity.

32. Rocket. A powered, unguided munitions (DOD); or an aircraft propelled by ejected expanding gases generated in the engine from self-contained propellants and not dependent on the intake of outside substances. It includes any part which becomes separated during the operation (14 CFR).

33. Safety Risk Management (SRM). A formalized, proactive approach to system safety. SRM is a methodology that ensures hazards are identified, risks are analyzed, assessed, and prioritized; and results are documented for FAA decision-makers to transfer, eliminate, accept, or mitigate risk.

34. Scheduled Maintenance (Routine). The performance of maintenance tasks at prescribed intervals.

35. Segregation. Setting apart from other air traffic operations in the NAS. Segregation is not synonymous with required air traffic separation standards. Therefore, segregation does not prescribe or mandate criteria such as vertical, lateral, or longitudinal distances.

36. Shells. Munitions that are fired from a gun whether guided or not.

37. Smart Bomb. Precision-guided munitions.

38. Standard formation. See formation.

39. Supplemental Pilot. Pilots assigned UAS flight duties to augment the PIC. It is common for proponents to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the PIC if the specified qualifications are met.

40. Torpedoes. Powered munitions that travel through water.

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41. Unmanned Aircraft (UA). A device used or intended to be used for flight in the air that has no onboard pilot. This devise excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UA do not include traditional balloons (see 14 CFR part 101), rockets, tethered aircraft and un-powered gliders.

42. Unmanned Aircraft System (UAS). A UA and its associated elements related to safe operations, which may include CSs (ground, ship, or air-based), control links, support equipment, payloads, flight termination systems (FTS), and launch/recovery equipment.

43. Unscheduled Maintenance (Non-Routine). The performance of maintenance tasks when mechanical irregularities occur.

44. Visual Line-of-Sight. Unaided (corrective lenses and/or sunglasses exempted) visual contact between a PIC or a VO and a UAS sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.

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APPENDIX B. ACRONYMS

AC	Advisory Circular
AFPD	Air Force Policy Directive
AFS	Flight Standards Service
AGC	Chief Counsel
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AMOC	Alternative Means of Compliance
AR	Army Regulations
ASI	Aviation Safety Inspector
ATCAA	Air Traffic Control Assigned Airspace
ATCSCC	Air Traffic Control System Command Center
ATO	Air Traffic Organization
ATS	Air Traffic Service
AVS	Aviation Safety
CFIT	Controlled Flight Into Terrain
CFR	Code of Federal Regulations
COA	Certificate of Waiver or Authorization
CRM	Crew Resource Management
CS	Control Station
DCP	Divert/Contingency Points
DHS	Department of Homeland Security
DOD	Department of Defense
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FIR	Flight Information Regions
FL	Flight Level
FSIMS	Flight Standards Information Management System
FTP	Flight Termination Point
FTS	Flight Termination System
GCS	Ground Control Station
GHz	Gigahertz
GMF	Government Master File
HQ	Washington Headquarters
IFR	Instrument Flight Rules
LLP	Lost Link Points
LOA	Letter of Agreement
MHz	Megahertz
MSL	Mean Sea Level
NAS	National Airspace System
NASA	National Aeronautics And Space Administration
NAVAIRINST	Naval Air Systems Command Instruction
NM	Nautical Mile
NTIA	National Telecommunications And Information Administration

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OPA	Optionally Piloted Aircraft
PIC	Pilot in Command
POC	Point of Contact
R&D	Research and Development
RF	Radio Frequency
RM	Risk Management
RNAV	Area Navigation
RTB	Return to Base
RVSM	Reduced Vertical Separation Minimum
SM	Statute Mile
SRM	Safety Risk Management
SRMD	Safety Risk Management Document
SSI	Sensitive Security Information
STA	Special Temporary Authority
TAS	Traffic Advisory Systems
TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance Systems
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
U.S.	United States
USC	United States Code
USCBP	U.S. Customs and Border Protection
USCG	U.S. Coast Guard
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VO	Visual Observer

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APPENDIX C. RELATED REGULATIONS AND PUBLICATIONS

1. Title 14 of the Code of Federal Regulations (CFR).

a. Part 1, Definitions and Abbreviations.

b. Part 21, Certification Procedures for Products and Parts.

- Section 21.191, Experimental certificates.
- Section 21.193, Experimental certificates: general.
- Section 21.195, Experimental certificates: Aircraft to be used for market surveys, sales demonstrations, and customer crew training.
- Section 21.197, Special flight permits.
- Section 21.199, Issue of special flight permits.

c. Part 23, § 23.1309, Equipment, Systems, and Installations.

d. Part 25, § 25.1309, Equipment, Systems, and Installations.

e. Part 61, Certification: Pilots, Flight Instructors, and Ground Instructors.

- Section 61.23, Medical Certificates: Requirement and Duration.
- Section 61.56, Flight Review.
- Section 61.57, Recent Flight Experience: Pilot in Command.
- Section 61.58, Pilot-in-Command Proficiency Check: Operation of an Aircraft that Requires more than one Pilot Flight Crewmember or is Turbojet-Powered.

f. Part 65, § 65.83, Recent Experience Requirements.

g. Part 67, Medical Standards and Certification.

h. Part 91, General Operating and Flight Rules.

- Section 91.3, Responsibility and Authority of the Pilot in Command.
- Section 91.13, Careless or Reckless Operation.
- Section 91.15, Dropping Objects.
- Section 91.17, Alcohol or Drugs.
- Section 91.21, Portable Electronic Devices.
- Section 91.111, Operating Near Other Aircraft.
- Section 91.113, Right-of-Way Rules: Except Water Operations.
- Section 91.115, Right-of-Way Rules: Water Operations.
- Section 91.126, Operating on or in the Vicinity of an Airport in Class G Airspace.
- Section 91.127, Operating on or in the Vicinity of an Airport in Class E Airspace.
- Section 91.129, Operations in Class D Airspace.
- Section 91.130, Operations in Class C Airspace.
- Section 91.135, Operations in Class A Airspace.
- Section 91.155, Basic VFR Weather Minimums.

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- Section 91.157, Special VFR Weather Minimums.
- Section 91.180, Operations within Airspace Designated as Reduced Vertical Separation Minimum Airspace.
- Section 91.203, Civil Aircraft: Certifications Required.
- Section 91.215, ATC Transponder and Altitude Reporting Equipment and Use.
- Section 91.319, Aircraft having Experimental Certificates: Operating Limitations.

2. Title 49 of the Code of Federal Regulations (CFR).

a. Chapter I, Subchapter C, Hazardous Materials Regulations.

b. Chapter VIII, Part 830, Notification and Reporting of Aircraft Accidents or Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records.

c. Chapter XII, Part 1520, § 1520.5, Sensitive Security Information.

3. Related Publications (current editions).

4. Advisory Circulars (AC).

- AC 00-1.1, Government Aircraft Operations.
- AC 91-57, Model Aircraft Operating Standards.
- AC 120-51, Crew Resource Management Training.
- AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers.
- AC 120-92, Introduction to Safety Management Systems for Air Operators.

5. FAA Notices. N JO 7210.766, Unmanned Aircraft Operations in the National Airspace System (NAS).

6. FAA Orders.

- JO 1000.37, Air Traffic Organization Safety Management System.
- JO 7110.65, Air Traffic Control.
- JO 7210.3, Facility Operation and Administration.
- JO 7400.8, Special Use Airspace.
- JO 7610.4, Special Operations.
- 8000.369, Safety Management System Guidance.
- 8020.11C, Aircraft Accident and Incident Notification, Investigation, and Reporting.
- 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft.
- 8900.1, Flight Standards Information Management System.

7. Other Documents.

- Title 47 CFR Part 300, National Telecommunications and Information Administration (NTIA) Manual, Chapter 7.11, Use of Frequencies by Certain Experimental Stations.
- Title 49 United States Code (49 U.S.C.) §§ 40102(a)(41), Definitions.

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- FAA Air Traffic Organization (ATO) Safety Management System Manual.
- Memorandum of Agreement Concerning the Operation of Department of Defense Unmanned Aircraft Systems in the National Airspace System (DOD-FAA MoA, September 24, 2007).
- Convention on International Civil Aviation ("Chicago Convention"). 7 December 1944, 61 Stat. 1180, 15 U.N.T.S. 295.

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APPENDIX D. SAFETY CASE FORMAT

1. **Signature Page.** Include the following information on the signature page:

   - Title: A clear and concise description of the proposed method for AMOC;
   - Originator Information: Originator's name, organization, contact information, etc.;
   - Safety Risk Management Document (SRMD) Information: Safety Case submission date, revision number, etc.

2. **Executive Summary.** The summary should give a general description of the proposed AMOC, including a list of the hazards with associated risk level (high, medium, low) and their corresponding initial and predicted residual risk. Include a high level system description, a summary of how the Safety Case was developed, and what process/method was used to move through the risk assessment process.

3. **Introduction.** Provide a brief reasoning/rationale for the initiative. The scope of the proposed AMOC, whether it is more complex or far-reaching, will determine the need for increased scope and detail of the analysis to be performed.

4. **Section 1.** Current System/System Baseline. Provide a description of the current system or existing procedures as well as the corresponding (operational) system states. If the proposal entails a procedural change, describe the current procedure and its operational environment. If the current system or procedure is unique and has challenges associated with its unique situation, be sure to delineate.

5. **Section 2.** Proposed Change. Provide a description of the proposed change/procedure, identifying which safety parameters are involved.

6. **Section 3.** Safety Risk Management (SRM) Planning and Impacted Organizations. Prior to initiation of the safety analysis, SRM planning is necessary. It is essential to select the appropriate SRM participants, identify the SRM Panel, schedule milestones, and assign tasks and responsibilities. With regard to the organizations that are impacted by the change, describe the method used for collaboration between those organizations during the identification, mitigation, tracking, and monitoring of hazards associated with the change.

7. **Section 4.** Assumptions. If in the process of developing a procedure to validate an AMOC, any assumptions are made to make the evaluation of the change more manageable, clearly define and document them in this section.

8. **Section 5.** Phase 1: System Description. The description of the system/procedure, its operational environment, the people involved/affected by the change/procedure, and the equipment required to accommodate the proposal must be provided.

9. **Section 6.** Phase 2: Identified Hazards. The SRM Panel identifies hazards as a collaborative effort. The tool(s) and technique(s) used to identify hazards should be specified and discussed. The identified hazards are documented as well as their corresponding causes, the corresponding system states considered and the consequent potential outcome. It is important to realize that while identification of the worst credible outcome and the system state in which the worst

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credible outcome occurs is required, system states with less severe outcomes should not be ignored.

10. Section 7. Phase 3 & 4: Risk Analysis & Risks Assessed. Describe the process used to analyze the risks associated with the identified hazards. Specify what type of data was used to determine the likelihood of risk occurrence (e.g., quantitative or qualitative) as well as the sources of the data. A risk matrix should provide an illustration of the predicted initial/current risk(s) associated with the identified hazards.

11. Section 8. Phase 5: Treatment of Risks/Mitigation of Hazards. If the existing controls and mitigations do not acceptably mitigate the hazards, then additional recommended safety requirements should be identified. An explanation of how the recommended safety requirements are expected to reduce the initial/current risk to an acceptable predicted residual risk level should be included. Low-risk hazards may still warrant recommended safety requirements.

12. Section 9. Tracking and Monitoring of Hazards. Once the proposal has been approved and implemented, tracking of hazards and verification of the effectiveness of mitigation controls throughout the lifecycle of the system or change are required. Also, the methodology for this tracking and monitoring should be outlined.

13. Appendices.

a. Documents Related to the SRMD. Include a list of documents (orders, directives, regulations, handbooks, and manuals) that pertain to the proposed change, which have been consulted in the development of the proposed change and the corresponding safety analysis.

b. Hazard Identification Tools. Provide information on the different tool(s), method(s), and technique(s) used during the safety analysis. (See Figure D-1, for a chart listing acceptable hazard analysis tools and techniques.)

c. Hazard Analysis and Risk Matrix. Depending on the analyses necessary, there might be one or more appendices with analyses. A risk matrix reflecting the initial and predicted residual risks should also be included.

d. Glossary. Include any acronyms and definitions for any terms you listed in the Safety Case.

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Figure D-1. Acceptable Hazard Analysis Tools and Techniques

This chart from the ATO Safety Management System Manual, available on the Internet, displays acceptable hazard analysis tools for developing safety cases.

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Table 3.1: Selection of Hazard Identification and Analysis Tools and Techniques

Tool or Technique	Summary Description	Page in Appendix G
Preliminary Hazard Analysis (PHA)	The PHA provides an initial overview of the hazards present in the overall flow of the operation. It provides a hazard assessment that is broad, but usually not deep.	G-1
Operational Safety Assessment (OSA)	The OSA is a development tool based on the assessment of hazard severity. It establishes how safety requirements are to be allocated between air and ground components and how performance and interoperability requirements might be influenced.	G-3
Comparative Safety Assessment (CSA)	The CSA provides management with a listing of all of the hazards associated with a change, along with a risk assessment for each alternative hazard combination that is considered. It is used to rank the options for decision-making purposes. The CSA's broad scope is an excellent way to identify issues that may require more detailed hazard identification tools.	G-5
Fault Hazard Analysis (FHA)	The FHA is a deductive method of analysis that personnel can use exclusively as a qualitative analysis or, if desired, can expand to a quantitative one. The FHA requires a detailed investigation of the subsystems to determine component hazard modes, causes of these hazards, and resultant effects on the subsystem and its operation.	G-8
Failure Mode and Effect Analysis (FMEA)	The FMEA determines the results or effects of sub-element failures on a system operation and classifies each potential failure according to its severity.	G-9
Failure Modes, Effects, and Criticality Analysis (FMECA)	The FMECA is an essential function in design from concept through development. To be effective, the FMECA is iterative to correspond with the nature of the design process itself. The FMECA identifies component and sub-system failure modes, including the impact of human error; evaluates the results of the failure modes; determines rates and probability; and demonstrates compliance with safety requirements.	G-9
What-If Analysis	The What-If Analysis methodology identifies hazards, hazardous situations, or specific accident events that could produce an undesirable consequence. One can use the What-If Analysis as a brainstorming method.	G-10
Scenario Analysis	The Scenario Analysis identifies and corrects potentially hazardous situations by postulating accident scenarios in cases where it is credible and physically logical.	G-12
Change Analysis	The Change Analysis analyzes the hazard implications of either planned or incremental changes (e.g., operation, equipment, or procedure).	G-13
Cause-Consequence Analysis	The Cause-Consequence Analysis combines the bottom-up and top-down analysis techniques of Event Trees and Fault Trees. The result is the development of potential complex accident scenarios.	G-15

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Figure D-1. Acceptable Hazard Analysis Tools and Techniques, continued

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Tool or Technique	Summary Description	Page in Appendix G
Hazard and Operability Tool (HAZOP)	A group uses the HAZOP to analyze hazards of completely new operations and to review the significance of all of the ways that a process element can malfunction or be incorrectly operated. The technique is essentially a structured brainstorming using specific guide words.	G-17
Interface Analysis	One uses the Interface Analysis to discover the hazardous linkages between interfacing systems.	G-18
Accident/Incident Analysis	The Accident/Incident Analysis uses data on recorded hazardous events. One groups these events in various ways according to a pre-established criterion, usually a common cause or outcome. One then identifies the groupings as hazards.	G-19
Job Safety Analysis (JSA)	One uses this technique to assess in detail the safety considerations in a single job or task..	G-20
Energy Trace and Barrier Analysis (ETBA)	The ETBA is highly structured. It documents all energy sources in system. One identifies the energy sources as hazards. One identifies the barrier between the energy sources and the operators, maintainers, and other systems as mitigations.	G-21
Fault Tree Analysis (FTA)	An FTA is a graphical design technique that can provide an alternative to block diagrams. It is a top-down, deductive approach structured in terms of events. One models faults in terms of failures, anomalies, malfunctions, and human errors.	G-22
Management Oversight and Risk Tree (MORT)	One uses the MORT technique to systematically analyze hazards to examine and determine detailed information about the process and accident contributors.	G-24
Human Error Analysis (HEA)	HEA, in a system context, involves assessing each human-machine interface point, decision, or action for the potential for human error to adversely impact system performance or safety of the system and its users. There are a variety of methodologies for conducting these analyses.	G-26
Job Task Analyses (JTA)	The foundation of the performance of HEA is a task analysis, which describes each human task/sub-task within a system in terms of the perceptual (information intake), cognitive (information processing and decision making), and manual (motor) behaviors required of an operator, maintainer, or support person. It should also identify the skills and information required to complete the tasks; equipment requirements; the task setting; time and accuracy requirements; and the probable human errors and consequences of these errors. There are several tools and techniques for performing task analyses, depending on the level of analysis needed.	G-28

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APPENDIX E. CONTINGENCY PLANNING LIMITATIONS

1. Point Identification. The proponent must submit contingency plans that address emergency recovery or flight termination of the unmanned aircraft (UA) in the event of unrecoverable system failure. These procedures will normally include Lost Link Points (LLP), Divert/Contingency Points (DCP) and Flight Termination Points (FTP) for each operation. LLPs and DCPs must be submitted in latitude/longitude (Lat/Long) format along with a graphic representation plotted on an aviation sectional chart (or similar format). FTPs or other accepted contingency planning measures must also be submitted in Lat/Long format along with a graphic representation plotted on an aviation sectional chart, or other graphic representation acceptable to the FAA. The FAA accepts the LLPs, DCPs, FTPs, and other contingency planning measures submitted by the proponent, but does not approve them. When conditions preclude the use of FTPs, the proponent must submit other contingency planning options for consideration and acceptance. At least one LLP, DCP, and FTP (or an acceptable alternative contingency planning measure) is required for each operation. The proponent must furnish this data with the initial Certification of Waiver or Authorization (COA) application. Any subsequent changes or modifications to this data must be provided to the Unmanned Aircraft Systems (UAS) Integration Office (AFS-80) for review and consideration no later than 30 days prior to proposed flight operations.

2. Risk Mitigation Plans. For all operations, the proponent must develop detailed plans to mitigate the risk of collision with other aircraft and the risk posed to persons and property on the ground in the event the UAS experiences a lost link, needs to divert, or the flight needs to be terminated. The proponent must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, Navigational Aids (NAVAIDS), and congested areas. In the event of a contingency divert or flight termination, the use of a chase aircraft is preferred when the UAS is operated outside of Restricted or Warning Areas. If time permits, the proponent should make every attempt to utilize a chase aircraft to monitor the aircraft to a DCP or to the FTP. In the event of a contingency divert or flight termination, the proponent will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

a. LLP Procedures.

(1) LLPs are defined as a point, or sequence of points, where the aircraft will proceed and hold at a specified altitude, for a specified period of time, in the event the command and control link to the aircraft is lost. The aircraft will autonomously hold, or loiter, at the LLP until the communication link with the aircraft is restored or the specified time elapses. If the time period elapses, the aircraft may autoland, proceed to another LLP in an attempt to regain the communication link, or proceed to an FTP for flight termination. LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is re-established or fuel exhaustion occurs.

(2) For areas where multiple or concurrent UAS operations are authorized in the same operational area, a segregation plan must be in place in the event of a simultaneous lost link scenario. The deconfliction plan may include altitude offsets and horizontal separation by using independent LLPs whenever possible.

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b. DCP Procedures.

(1) A DCP is defined as an alternate landing/recovery site to be used in the event of an abnormal condition that requires a precautionary landing. Each DCP must incorporate the means of communication with air traffic control (ATC) throughout the descent and landing (unless otherwise specified in the Special Provisions) as well as a plan for ground operations and securing/parking the aircraft on the ground. This includes the availability of control stations (CS) capable of launch/recovery, communication equipment, and an adequate power source to operate all required equipment.

(2) For local operations, the DCP specified will normally be the airport/facility used for launch and recovery; however, the proponent may specify additional DCPs as alternates.

(3) For transit and/or mission operations that are being conducted in Class A airspace or Class E airspace above flight level (FL) 600, DCPs will be identified during the flight to be no further than one hour of flight time at any given time, taking into consideration altitude, winds, fuel consumption, and other factors. If it is not possible to define DCPs along the entire flight plan route, the proponent must identify qualified FTPs along the entire route and be prepared to execute flight termination at one of the specified FTPs if a return to base (RTB) is not possible.

(4) It is preferred that specified DCPs are non-joint use military airfields, other government-owned airfields, or private-use airfields. However, the proponent may designate any suitable airfield for review and consideration.

c. Flight Termination Procedures.

(1) Flight termination is the intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination must be executed in the event that all contingencies have been exhausted and further flight of the aircraft cannot be safely achieved or other potential hazards exist that require immediate discontinuation of flight. FTPs or alternative contingency planning measures must be located within power-off glide distance of the aircraft during all phases of flight and must be submitted for review and acceptance. The proponent must ensure sufficient FTPs or other contingency plan measures are defined to accommodate flight termination at any given point along the route of flight. The location of these points is based on the assumption of an unrecoverable system failure and must take into consideration altitude, winds, and other factors.

(2) Unless otherwise authorized, FTPs must be located in sparsely populated areas. Except for on- or near-airport operations, FTPs will be located no closer than five nautical miles (NM) from any airport, heliport, airfield, NAVAID, airway, populated area, major roadway, oil rig, power plant, or any other infrastructure. For offshore locations, the proponent must refer to appropriate United States Coast Guard (USCG) charts and other publications to avoid maritime obstructions, shipping lanes, and other hazards. Populated areas are defined as those areas depicted in yellow on a Visual Flight Rules (VFR) sectional chart or as determined from other sources.

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(a) It is preferred that flight termination occurs in Restricted or Warning Areas, government-owned land, or offshore locations that are restricted from routine civil use. However, the proponent may designate any suitable location for review and consideration.

(b) The proponent is required to survey all designated areas prior to their use as an FTP. All FTPs will be reviewed for suitability on a routine and periodic basis, not to exceed six months. The proponent assumes full risk and all liability associated with the selection and use of any designated FTP.

(c) It is desirable that the proponent receive prior permission from the land owner or using agency prior to designation of this area as an FTP. The proponent should clearly communicate the purpose and intent of the FTP.

(d) For each FTP, plans must incorporate the means of communication with ATC throughout the descent as well as a plan for retrieval/recovery of the aircraft.

(e) Contingency planning must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes, NAVAIDS, and congested areas to the maximum extent possible.

(f) In the event of a contingency divert or flight termination, if time permits, the use of a chase aircraft is preferred when the UA is operated outside of Restricted or Warning Areas.

(g) In the event of a contingency divert or flight termination or other approved contingency measures, the proponent will operate in Class A airspace and Special Use airspace to the maximum extent possible to reduce the risk of collision with non-participating air traffic.

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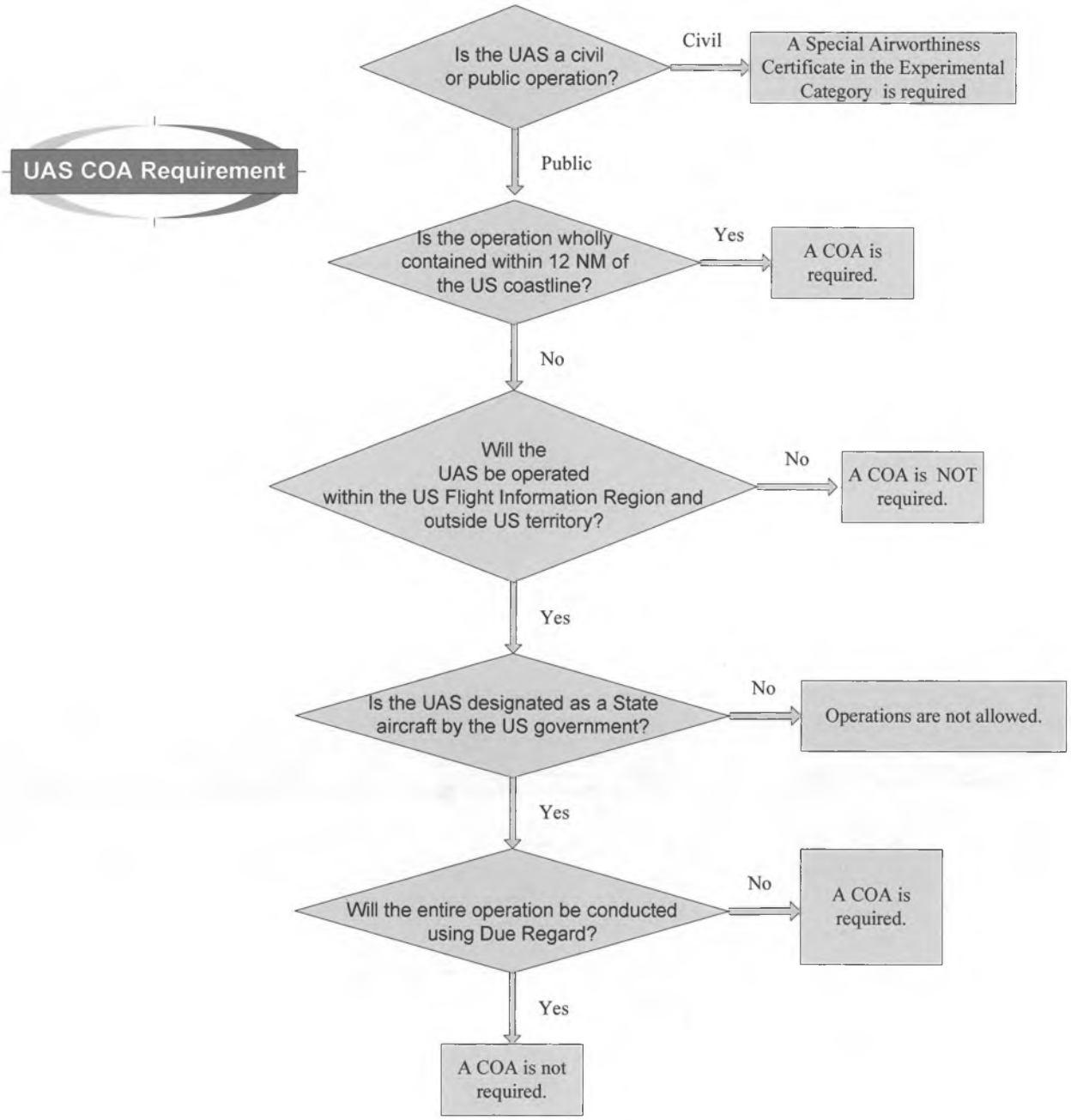
APPENDIX F. UAS COA REQUIREMENT FLOWCHART



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NOTICE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Air Traffic Organization Policy

N JO 7210.766

Effective Date:
March 28, 2011

Cancellation Date:
March 27, 2012

SUBJ: Unmanned Aircraft Operations in the National Airspace System (NAS)

1. Purpose of This Notice. This notice provides information and interim guidance on air traffic policies and prescribes procedures for the planning, coordination, and services involving the operation of unmanned aircraft systems (UAS) in the NAS. These policies and procedures reflect current written directives and regulations and do not reflect any major changes. The intent of this notice is to consolidate all current directives and regulations into one document to assist with understanding UAS operations in the NAS.

2. Audience. This notice applies to the following Air Traffic Organization (ATO) service units: En Route and Oceanic, Terminal, Mission Support, and System Operations; the David J. Hurley Air Traffic Control System Command Center (ATCSCC); and the Flight Standards Service's divisions at Federal Aviation Administration (FAA) Washington headquarters and international field offices.

3. Where Can I Find This Notice? This notice is available on the MyFAA employee Web site at https://employees.faa.gov/tools_resources/orders_notices/ and on the air traffic publications Web site at http://www.faa.gov/air_traffic/publications.

4. Explanation of Changes. This notice is a continuation of N JO 7110.512, Unmanned Aircraft Operations in the National Airspace System, effective December 16, 2009, which was cancelled on December 15, 2010. Administrative changes (for example, website change and Air Force address) were made, and word meanings were clarified (for example, safety alerts were clarified to meet FAA Order JO 7110.65 standards). NOTAM requirements in the different classes of airspace, lost link requirements, guidance for the use of ATC visual clearances, and the requirement for the proponent to be responsible for strict compliance with the incident/accident and normal reporting provisions were added. This is to conform with the requirements in the certificate of waiver or authorization (COA) process. Also added is a clarification on the mixing of, or concurrent manned and unmanned aircraft operations in terminal airspace.

5. Action. Unmanned aircraft (UA) activities must be provided services following the policy, criteria, and procedures in this notice and other air traffic publications. When a conflict arises, supervisors must request a clarification from their respective service unit. Procedures/minima, applied jointly or otherwise, require the cooperation or concurrence of more than one facility/organization and must be documented in a letter of agreement (LOA). LOAs only supplement this notice. Any minima they specify must not be less than that specified in this notice unless appropriate military authority has authorized application of reduced separation between military aircraft. Additionally, the separation minima must not be less than authorized in the certificate of waiver or authorization (COA).

6. Certificate of Waiver or Authorization (COA). This section prescribes the policies, guidance, and procedures about COA applications for UAS operations.

a. Application Process. The ATO issues a COA to a public operator for a specific UA's activity. After a complete application is submitted, the FAA conducts a comprehensive operational and technical review. If necessary, provisions or limitations may be imposed as part of the approval to ensure the UA operates safely with other users.

b. Application Submission. Electronic applications should be submitted following the provisions provided on the following Web site:

http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/.

c. Application Information. The FAA must obtain enough information to assess the proposed operations following current standards and procedures. Because of the dynamic changes in the development of UA technologies, the applicant is responsible for adequately describing the proposed operations so an appropriate safety assessment can be conducted by the FAA. For this purpose, the following information may be required in a COA application.

(1) Organizational and operational points of contact.

(2) Operational description (for example, method of navigation, see-and-avoid).

(3) Systems description (for example, airframe, control station, communications).

(4) Airframe performance characteristics.

(5) Airworthiness.

(6) Contingency procedures (for example, lost command/control link, lost communications, and emergency).

(7) Avionics equipment.

(8) Lighting.

(9) Frequency spectrum analysis.

(10) Method of air traffic control (ATC) communications.

(11) Surveillance capability (for example, electronic and visual).

(12) System monitoring/recording capability.

(13) Flightcrew qualifications.

(14) Flight operations description (flight plan).

(15) Special circumstances.

(16) Reports of past incidents or accidents (for those applicants who have previously held a COA).

d. Emergency and Urgent Applications. The FAA must ensure procedures are available to accommodate real-time applications that will directly support emergency and law enforcement-type operations. UA operations that reduce safety must not be approved in any case.

(1) An emergency UAS COA may be considered when all of the following conditions apply:

(a) There is a situation of such distress or urgency that the possibility of loss of life is great.

(b) Manned flight is not possible or practicable due to a hazard or the operation cannot be conducted safely with manned flight, or manned assets are not available.

(c) The proposed proponent and UAS are operating under a current approved COA.

NOTE-
Requests for UAS COAs that fall outside of these perimeters must be processed through the normal online COA application process.

(2) Emergency UAS COAs will not be considered for:

(a) Demonstration flights.

(b) Flights to test capabilities.

(c) Training.

(d) Flights in Class B airspace.

(e) Flights over populated areas.

7. Operations.

a. Types and Authority. Current FAA policy for UAS operations is that no person may operate a UAS in the NAS without specific authority.

(1) Public.

(a) FAA policy restricts COAs to public operations as defined in title 14, Code of Federal Regulations (CFR), Part 1, Definitions & Abbreviations.

(b) For UAS operating as public aircraft, the authority is the COA.

(2) Civil.

(a) Civil applicants must apply for a Special Airworthiness Certificate–Experimental Category.

(b) For UAS operating as civil aircraft, the authority is special airworthiness certificates.

(3) Hobbyist.

(a) Hobbyists should follow the guidance contained in Advisory Circular (AC) 91-57.

(b) For model aircraft, the authority is AC 91-57.

NOTE-
The FAA recognizes that people and companies other than modelers might be flying UAS with the mistaken understanding they are legally operating under the authority of AC 91–57. AC 91–57 only applies to modelers and specifically excludes its use by persons or companies for business purposes.

b. Operations. UAS operations should normally be conducted in the following areas:

(1) Within active restricted areas.

(2) Within active warning areas.

(3) Within active prohibited areas, when authorized.

NOTE-

1. *Procedures for nonjoint-use DOD airfield operations will be specified by the DOD and listed in the COA.*

2. *For those operations that cannot be conducted for private recreational use or cannot be contained wholly within active restricted areas or warning areas, the UAS operations must be conducted following procedures outlined in the issued COA or Special Airworthiness Certificate-Experimental Category.*

c. General Procedures. UAS operating outside of restricted areas and warning areas must comply with the following:

(1) At least 60 business days before the proposed start of UAS operations, the proponent must submit an application for a COA, using the online application system at:

http://oeusers.faa.gov/oeaaa/Welcome.jsp.

NOTE-

1. *Approvals for UAS operations require the proponent to provide the UAS with a method that provides an equivalent level of safety comparable to see-and-avoid requirements for manned aircraft. Methods to consider include, but are not limited to, radar observations, forward- or side-looking cameras, electronic detection systems, visual observation from one or more ground sites, monitoring by patrol or chase aircraft, or a combination thereof.*

2. *Risk mitigations that would depend on the establishment of new types and categories of airspace are not considered acceptable. The NAS is established and configured through a rigorous regulatory process. Risk mitigations that result in the prohibition of the public's right to transit airspace will not be considered.*

(2) COAs must have a termination date not more than 1 year from the effective date unless renewed or revalidated. The COA expires on the stated termination date unless sooner surrendered by the proponent or revoked by the issuing agency.

(3) UAs may be equipped with standard aircraft anticollision or navigation lights following criteria in 14 CFR, section 23.1401. If installed, these lights must be operating during all phases of flight to enhance flight safety.

(4) UAs required to be equipped with an altitude encoding transponder must meet the specifications of 14 CFR, section 91.215. If equipped, the transponder must be set to operate on a code assigned by ATC. Unless the use of a specific, special-use code is authorized, the UAS pilot-in-command must have the capability to reset the transponder code while the UA is airborne. If the transponder becomes inoperative, the mission may be canceled and/or recalled at the discretion of the affected service area or air traffic facility.

(5) The proponent and/or its representatives must be responsible at all times for collision avoidance maneuvers with nonparticipating aviation activities and the safety of persons or property on the surface.

(6) The proponent and/or its representatives are responsible for strict compliance with the Incident/Accident and Normal Reporting Provisions contained in the Special Provisions section of each COA. Further guidance can be found in FAA Order JO 7210.3, Facility Management, Chapter 18, Waivers, Authorizations, and Exemptions. The Certificate of Waiver or Authorization, FAA Form 7711-1, provides additional clarity regarding the strict observance of the terms and conditions set forth in the COA.

8. Procedures. UAS operations may occur within Class A, C, D, E, and/or G airspace. Current FAA policy does not allow UAS operations in Class B airspace; however, the FAA will consider exceptional circumstances. Nighttime operations, for all classes of terminal airspace, may be authorized if the proponent requests approval and a safety analysis for such operation is approved by the FAA.

a. Terminal.

(1) Class C airspace is to be used on a case-by-case basis only. When operating in Class C airspace, UA operators must comply with the following FAA requirements:

(a) Strict compliance with the provisions of the COA is required.

(b) Lost link procedures must be clearly defined. Lost link procedures will be pre-coordinated with the appropriate ATC facility and included in the COA. At a minimum, they will include: lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points in the event recovery of the UAS is not feasible.

(c) In the event of lost link, the UA must squawk code 7600.

(d) Direct two-way radio communications with ATC and the UA pilot is required at all times.

(e) Compliance with ATC instructions for arrivals, departures, operations within, and through flight is required.

(f) Pilots/observers must have an appropriate FAA medical certificate or military/agency equivalent.

NOTE-
Pilots may not perform concurrent observer duties.

(g) Pilots must not conduct concurrent or simultaneous UAS operations in the presence of manned aircraft unless approved segregation procedures are written in a letter of agreement with the affected ATC facility and included in the COA.

(h) Use of visual separation by the UA pilot is not authorized.

(i) UA pilots and observers must be responsible for only one UA at a time.

(j) UA operations must not impede, delay, or divert manned operations (for example, excessive departure/arrival delays).

(k) UA operations must not be conducted over populated areas.

(l) All UA operations must be conducted during daylight hours unless authorized in the COA.

(m) Safety alerts will be issued in accordance with FAA Order JO 7110.65, paragraph 2-1-6.

(n) All operations must be conducted under visual meteorological conditions (VMC).

(o) Special VFR procedures are not authorized.

(p) A certified operating mode C/S transponder must be used.

(q) Compliance with mitigations identified in the FAA-approved safety analysis.

(r) A NOTAM issued by the proponent.

(2) UA operators using Class D airspace or operating with a control tower in Class E or G airspace must comply with the following FAA requirements:

NOTE-
All categories of Department of Defense (DOD) UAS operations that have a DOD Memorandum of Agreement (MOA) Class D COA will be conducted wholly within Class D airspace that has an associated DOD-controlled, non-joint-use airfield and must follow uniform air traffic control procedures at all locations. These procedures were developed in coordination with the FAA before implementation and a COA issued to the appropriate DOD air traffic facility.

(a) Strict compliance with the provisions of the COA is required.

(b) Lost link procedures must be clearly defined. Lost link procedures will be pre-coordinated with the appropriate ATC facility and included in the COA. At a minimum, they will include: lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points in the event recovery of the UAS is not feasible.

(c) In the event of lost link, the UA must squawk code 7600, if transponder equipped.

(d) Direct two-way radio communications with ATC and the UA pilot is required at all times.

(e) Compliance with all ATC instructions is required.

(f) Dedicated ground/chase aircraft observers are required for all UA flights.

NOTE-
Pilot may not perform concurrent observer duties.

(g) Pilots/observers must have an appropriate FAA medical certificate or military/agency equivalent.

(h) Pilots must not conduct concurrent or simultaneous UAS operations in the presence of manned aircraft unless approved segregation procedures are written in a Letter of Agreement with the affected ATC facility and included in the COA.

(i) Use of visual separation by the UA pilot is not authorized.

(j) UA pilots and observers must be responsible for only one UA at a time.

(k) UA operations must not impede, delay, or divert manned operations (for example, excessive departure/arrival delays).

(l) UA operations must not be conducted over populated areas.

(m) All UA operations must be conducted during daylight hours unless authorized in the COA.

(n) All UA operations must be conducted under VMC.

(o) Special VFR procedures are not authorized.

(p) A NOTAM issued by the proponent.

(3) UA operators using Class E and G airspace must comply with the following FAA requirements:

NOTE-
DOD UAS that have been authorized by the Class G section of the DOD/FAA MOA must remain within clear visual range of the pilot or a certified observer in ready contact with the pilot to ensure separation from other aircraft.

(a) Strict compliance with the provisions of the COA or DOD MOA is required.

(b) Lost link procedures must be clearly defined. Lost link procedures will be pre-coordinated with the appropriate ATC facility and included in the COA. At a minimum, they will include: lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points in the event recovery of the UAS is not feasible.

(c) In the event of lost link, the UA must squawk code 7600, if transponder equipped.

(d) Maintain direct two-way radio communication with ATC, when required in the COA.

(e) Compliance with all ATC instructions, if issued, is required.

(f) Dedicated ground/chase aircraft observers are required for all UA flights.

NOTE-
Pilot may not perform concurrent observer duties.

(g) Pilots/observers must have an appropriate FAA medical certificate or military/agency equivalent.

(h) Pilots must not conduct concurrent or simultaneous UAS operations in the presence of manned aircraft unless approved segregation procedures are written in a Letter of Agreement with the affected ATC facility and included in the COA.

(i) In the airport traffic pattern, the UA pilot is not authorized to use visual separation.

(j) UA pilots and observers must be responsible for only one UA at a time.

(k) UA operations must not have an adverse impact on manned operations (for example, excessive departure/arrival delays).

(l) UA operations must not be conducted over populated areas.

(m) All UA operations must be conducted during daylight hours unless authorized in the COA.

(n) Safety alerts will be issued in accordance with FAA Order JO 7110.65, paragraph 2-1-6.

(o) Additional services will be provided as workload and other conditions permit.

(p) All operations must be conducted in VMC.

(q) A NOTAM issued by the proponent.

b. En Route/Terminal Radar Approach Control (TRACON). UA flights in en route and TRACON airspace must be divided into two segments:

(1) Flight below flight level (FL) 180, including Class E and G airspace without a control tower, must comply with the following FAA regulations:

(a) Strict compliance with the provisions of the COA is required.

(b) Lost link procedures must be clearly defined.

(c) In the event of lost link, the UA must squawk code 7600, if transponder equipped.

(d) Direct two-way communications with the UA pilot is required at all times, unless not required in the COA.

(e) Compliance with all ATC instructions is required.

(f) Observers are required. Depending on the altitude of the UA operation, ground observers may be used.

(g) Chase aircraft acting as observers may be required.

(h) A dedicated chase pilot is required when specified.

(i) A dedicated observer is required when specified.

NOTE-
Pilot may not perform concurrent observer duties.

(j) Pilots/observers must have an appropriate FAA medical certificate or military/agency equivalent.

(k) In the airport traffic pattern, the UA pilot is not authorized to use visual separation, accept a clearance for a visual approach, or accept clearance to follow another aircraft.

(l) UA operations must not be conducted over populated areas.

(m) If installed, lights must be operational; night operations must have operational lights including anticollision and navigation lights, at a minimum.

(n) Safety alerts will be issued in accordance with FAA Order JO 7110.65, paragraph 2-1-6.

(o) All operations must be conducted in VMC.

(p) Operations may be conducted on an IFR flight plan or VFR.

(q) If operating IFR, a flight plan must be filed and followed once clearance is received.

(r) An operating mode C/S transponder must be used unless exempted by the COA.

(s) The COA may limit the number of UAs operating in a specific area.

(t) Operations in military operating areas and restricted areas require approval from the using agency.

(u) A NOTAM issued by the proponent.

(2) Flight above 18,000 feet MSL to FL 600, Class A airspace:

(a) The UA pilot must have direct two-way communications with each air traffic controller working the aircraft.

(b) Pilots/observers must have an appropriate FAA medical certificate or military/agency equivalent.

(c) Standard IFR separation will be applied unless noted in the COA.

(d) UA operations must not impede, delay, or divert manned operations.

(e) UA operations must not be conducted over populated areas.

(f) Safety alerts will be issued in accordance with FAA Order JO 7110.65, paragraph 2-1-6.

(g) All operations will be conducted on an IFR flight plan.

(h) An operating mode C/S transponder must be used.

(i) The UA should operate below or above reduced vertical separation minimum (RVSM) altitudes unless it is RVSM-certified. Requests for military non-RVSM-equipped UA in RVSM airspace remains at the discretion of each air traffic controller.

(j) Descent below 18,000 feet MSL in Class D, E, and/or G airspace without visual observers is not authorized.

(k) The pilot must be qualified for manned IFR flight.

(l) Whenever possible, the UA must enter Class A airspace from active restricted airspace. If restricted airspace is not available, a chase aircraft with a dedicated observer must be used until the UA has reached Class A airspace.

(m) Lost link procedures must be clearly defined. Lost link procedures will be pre-coordinated with the appropriate ATC facility and included in the COA. At a minimum, they will include: lost link route of flight, transponder use, lost link orbit points, communications procedures, and pre-planned flight termination points in the event recovery of the UAS is not feasible.

NOTE-
In all classes of airspace, a COA is required for UA flights outside of active restricted or warning areas. The COA will contain additional requirements and compliance is mandatory.

c. Military Operations Interface Offices.

If military operations or facilities are involved, prior coordination by the following appropriate headquarters is required for subsequent interface with FAA. (See FAA Order JO 7110.65, TBL 1-1-3.)

Military Operations Interface Offices

Branch	Address
U.S. Navy / U.S. Marine Corps	Department of the Navy Chief of Naval Operations N8853 2000 Navy Pentagon Washington, DC 20350-2000
U.S. Air Force	HQ AFFSA/A3A Bldg 4 Room 240 6500 S. MacArthur Blvd Oklahoma City, OK 73169 Email: hqaffsa.a3a@tinker.af.mil
U.S. Army	Headquarters USAASA 9325 Gunston Road, Suite N319 Fort Belvoir, VA 22060-5582

9. Distribution. This notice is distributed to the following ATO service units: En Route and Oceanic, Terminal, Mission Support, and System Operations; the ATO Office of Safety; the David J. Hurley ATCSCC; and the Flight Standards Service's divisions at FAA Washington headquarters and international field offices.

10. Background. During the past few years, UA technology has been developing rapidly, driving a profound increase in requested operations in the NAS. Traditionally, UA operations have been conducted by the DOD or other Government agencies within restricted and warning areas. In recent years, the combined increase in requests by Government agencies has tripled, and forecasts suggest the increase will continue for the next 4 years. This notice incorporates information from other publications and serves as a compilation of air traffic topics relating to unmanned aircraft. In many cases, the information contained in this notice is complemented by guidance and directives from the Unmanned Aircraft Program Office under Aviation Safety and other regulations.

11. Authority to Change this Notice. The contents of this notice will be periodically reviewed and updated as required. Exceptional or unusual requirements may dictate procedural deviations or supplementary procedures to this notice. If there are suggestions for revision or any procedural deviation that alters the level, quality, or degree of service, obtain approval from the Vice President, Mission Support Services, Attention: Airspace Services.

12. Definitions.

a. Airworthiness – the condition in which the UAS conforms to its type certification (or military equivalent) and is in condition for safe operation.

b. Altitude –

(1) Mean sea level, unless otherwise specified.

(2) Flight level when followed by "FL."

(3) Above ground level when followed by "AGL."

c. ATC Communications – the voice or data relay of instructions or information between the UAS pilot and the air traffic controller and other NAS users, normally conducted by radio.

d. Autonomous – not controlled by others or by outside forces; independent judgment.

e. Autonomy – the quality of being autonomous; self-determination.

f. Catastrophic – the loss of the UA, other aircraft and/or loss of life.

g. Certificate of Waiver or Authorization (COA) – an FAA grant for a specific UA operation.

h. Civil Aircraft – means aircraft other than public aircraft.

i. Command/Control Link – the systems supporting the exchange of information between the ground control station and the airframe of the flight control systems.

j. Communication Link – the systems supporting the communication between the pilot and ATC, other aircraft, observers, or NAS users.

k. Direct Visual Control – the means by which the UA is controlled and the pilot/observer exercises see-and-avoid responsibilities.

l. Equivalent Level of Safety – an evaluation of a system and/or operation to determine the acceptable risk to people and property.

m. Ground Control Station – the location and equipment used by a pilot.

n. Hobby – model aircraft used for sport and recreation only.

o. Latency – the time incurred between two particular interfaces (for example, data link/communications).

p. Lost Link – loss of command and control link between control station and aircraft. There are two types of link.

(1) Up link – transmits command instructions to the aircraft, and

(2) Down link – transmits the status of the aircraft and provides situational awareness to the pilot.

q. Observer – ground-based personnel or observers within a chase aircraft.

r. Proponent – the person or organization responsible for the COA and operation of the UA.

s. Public Aircraft – aircraft operations that are inherently governmental as defined in 14 CFR, Part 1, Definitions and Abbreviations, Section 1.1, General definitions.

t. Segregation – setting apart from other activities. Segregation is not synonymous with required ATC separation standards. Therefore, segregation does not prescribe or mandate criteria such as vertical, lateral, or longitudinal distances.

u. Unmanned Aircraft (UA) – an aircraft operated without the possibility of direct human intervention from within or on the aircraft.

v. Unmanned Aircraft System (UAS) – airframe, ground control station, command and control links, and crewmembers.

13. Word usage.

a. *May* (need not be followed by a verb) means a procedure is optional.

b. *Must* (followed by a verb or the use of an appropriate action verb in the imperative sense) means a procedure is mandatory.

c. *Should* (followed by a verb) means a procedure is recommended.

d. *Will* (followed by a verb) indicates futurity; not a requirement for application of a procedure.

e. Singular words include the plural and plural words include the singular.

14. Related Publications.

a. Title 14, Code of Federal Regulations, part 91

b. FAA Order JO 7110.65, Air Traffic Control

c. FAA Order JO 7210.3, Facility Operation and Administration

d. FAA Order JO 7610.4, Special Operations

e. Obstruction/Evaluation/Airport/Airspace/Analysis (OEAAA), COA online

f. RTCA Special Committee SC-203 documents

g. Unmanned Aircraft Program Office Interim Operational Approval Guidance 08-01

h. Safety Management System Manual

i. FAA Order 1100.161, Air Traffic Safety Oversight

Elizabeth L. Ray
Vice President, Mission Support Services
Air Traffic Organization

2/18/11
Date Signed

Unmanned Aircraft System Operations
Industry "Code of Conduct"

The emergence of unmanned aircraft systems (UAS) as a resource for a wide variety of public and private applications quite possibly represents one of the most significant advancements to aviation, the scientific community, and public service since the beginning of flight. Rapid advancements in the technology have presented unique challenges and opportunities to the growing UAS industry and to those who support it. The nature of UAS and the environments which they operate, when not managed properly, can and will create issues that need to be addressed. The future of UAS will be linked to the responsible and safe use of these systems. Our industry has an obligation to conduct our operations in a safe manner that minimizes risk and instills confidence in our systems.

For this reason, the Association for Unmanned Vehicle Systems International (AUVSI), offers this Code of Conduct on behalf of the UAS industry for UAS operation. This code is intended to provide our members, and those who design, test, and operate UAS for public and civil use, a set of guidelines and recommendations for safe, non-intrusive operations. Acceptance and adherence to this code will contribute to safety and professionalism and will accelerate public confidence in these systems.

The code is built on three specific themes: Safety, Professionalism, and Respect. Each theme and its associated recommendations represent a "common sense" approach to UAS operations and address many of the concerns expressed by the public and regulators. This code is meant to provide UAS industry manufacturers and users a convenient checklist for operations and a means to demonstrate their obligation to supporting the growth of our industry in a safe and responsible manner. By adopting this Code, UAS industry manufacturers and users commit to the following:

Safety

- We will not operate UAS in a manner that presents undue risk to persons or property on the surface or in the air.
- We will ensure UAS will be piloted by individuals who are properly trained and competent to operate the vehicle or its systems.
- We will ensure UAS flights will be conducted only after a thorough assessment of risks associated with the activity. This risks assessment will include, but is not limited to:
- Weather conditions relative to the performance capability of the system
- Identification of normally anticipated failure modes (lost link, power plant failures, loss of control, etc) and consequences of the failures
- Crew fitness for flight operations
- Overlying airspace, compliance with aviation regulations as appropriate to the operation, and off-nominal procedures
- Communication, command, control, and payload frequency spectrum requirements
- Reliability, performance, and airworthiness to established standards

Professionalism

- We will comply with all federal, state, and local laws, ordinances, covenants, and restrictions as they relate to UAS operations.
- We will operate our systems as responsible members of the aviation community.
- We will be responsive to the needs of the public.
- We will cooperate fully with federal, state, and local authorities in response to emergency deployments, mishap investigations, and media relations.
- We will establish contingency plans for all anticipated off-nominal events and share them openly with all appropriate authorities.

Respect

- We will respect the rights of other users of the airspace.
- We will respect the privacy of individuals.
- We will respect the concerns of the public as they relate to unmanned aircraft operations.
- We will support improving public awareness and education on the operation of UAS.

As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in

adopting this industry Code of Conduct.

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Recommended Guidelines for the use of Unmanned Aircraft

BACKGROUND:

Rapid advances in technology have led to the development and increased use of unmanned aircraft. That technology is now making its way into the hands of law enforcement officers nationwide.

We also live in a culture that is extremely sensitive to the idea of preventing unnecessary government intrusion into any facet of our lives. Personal rights are cherished and legally protected by the Constitution. Despite their proven effectiveness, concerns about privacy threaten to overshadow the benefits this technology promises to bring to public safety. From enhanced officer safety by exposing unseen dangers, to finding those most vulnerable who may have wandered away from their caregivers, the potential benefits are irrefutable. However, privacy concerns are an issue that must be dealt with effectively if a law enforcement agency expects the public to support the use of UA by their police.

The Aviation Committee has been involved in the development of unmanned aircraft policy and regulations for several years. The Committee recommends the following guidelines for use by any law enforcement agency contemplating the use of unmanned aircraft.

DEFINITIONS:

1. **Model Aircraft** - A remote controlled aircraft used by hobbyists, which is manufactured and operated for the purposes of sport, recreation and/or competition.
2. **Unmanned Aircraft (UA)** – An aircraft that is intended to navigate in the air without an on-board pilot. Also called Remote Piloted Aircraft and "drones."
3. **UA Flight Crewmember** - A pilot, visual observer, payload operator or other person assigned duties for a UA for the purpose of flight.
4. **Unmanned Aircraft Pilot** - A person exercising control over an unmanned aircraft during flight.

COMMUNITY ENGAGEMENT:

1. Law enforcement agencies desiring to use UA should first determine how they will use this technology, including the costs and benefits to be gained.
2. The agency should then engage their community early in the planning process, including their governing body and civil liberties advocates.
3. The agency should assure the community that it values the protections provided citizens by the U.S. Constitution. Further, that the agency will operate the aircraft in full compliance with the mandates of the Constitution, federal, state and local law governing search and seizure.
4. The community should be provided an opportunity to review and comment on agency procedures as they are being drafted. Where appropriate, recommendations should be considered for adoption in the policy.
5. As with the community, the news media should be brought into the process early in its development.

SYSTEM REQUIREMENTS:

1. The UA should have the ability to capture flight time by individual flight and cumulative over a period of time. The ability to reset the flight time counter should be restricted to a supervisor or administrator.
2. The aircraft itself should be painted in a high visibility paint scheme. This will facilitate line of sight control by the aircraft pilot and allow persons on the ground to monitor the location of the aircraft. This recommendation recognizes that in some cases where officer safety is a concern, such as high risk warrant service, high visibility may not be optimal. However, most situations of this type are conducted covertly and at night. Further, given the ability to observe a large area from an aerial vantage point, it may not be necessary to fly the aircraft directly over the target location.
3. Equipping the aircraft with weapons of any type is strongly discouraged. Given the current state of the technology, the ability to effectively deploy weapons from a small UA is doubtful. Further, public acceptance of airborne use of force is likewise doubtful and could result in unnecessary community resistance to the program.
4. The use of model aircraft, modified with cameras, or other sensors, is discouraged due to concerns over reliability and safety.

OPERATIONAL PROCEDURES:

1. UA operations require a Certificate of Authorization (COA) from the Federal Aviation Administration (FAA). A law enforcement agency contemplating the use of UA should contact the FAA early in the planning process to determine the requirements for obtaining a COA.
2. UA will only be operated by personnel, both pilots and crew members, who have been trained and certified in the operation of the system. All agency personnel with UA responsibilities, including command officers, will be provided training in the policies and procedures governing their use.
3. All flights will be approved by a supervisor and must be for a legitimate public safety mission, training, or demonstration purposes.
4. All flights will be documented on a form designed for that purpose and all flight time shall be accounted for on the form. The reason for the flight and name of the supervisor approving will also be documented.
5. An authorized supervisor/administrator will audit flight documentation at regular intervals. The results of the audit will be documented. Any changes to the flight time counter will be documented.
6. Unauthorized use of a UA will result in strict accountability.
7. Except for those instances where officer safety could be jeopardized, the agency should consider using a "Reverse 911" telephone system to alert those living and working in the vicinity of aircraft operations (if such a system is available). If such a system is not available, the use of patrol car public address systems should be considered. This will not only provide a level of safety should the aircraft make an uncontrolled landing, but citizens may also be able to assist with the incident.
8. Where there are specific and articulable grounds to believe that the UA will collect evidence of criminal wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.

IMAGE RETENTION:

1. Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UA should not be retained by the agency.
2. Unless exempt by law, retained images should be open for public inspection.

Association News

AUVSI Study Finds Unmanned Aircraft Industry Poised to Create 70,000 New Jobs in the U.S. in Three Years
New Study Finds Enormous Job Creation Potential Following Integration of Unmanned Aircraft into the National Airspace
12 March 2013

Today, AUVSI unveiled a new study, which finds that the unmanned aircraft industry is poised to create more than 70,000 new American jobs in the first three years following the integration of unmanned aircraft systems (UAS) into U.S. national airspace system (NAS). Integration is scheduled to take place in 2015. Beyond the first three years, the study projects that more than 100,000 new jobs will be created by 2025.

"This is an incredibly exciting time for an industry developing technology that will benefit society, as well as the economy," said Michael Toscano, president & CEO of AUVSI. "In recent years, unmanned aircraft technology has grown remarkably and is already proving useful in a range of domestic applications. Integrating UAS into the national airspace will lead to new and expanded uses, which means the creation of quality, high-paying American jobs."

Specifically, the study finds:

• In the first three years following integration into the NAS, more than 70,000 new jobs will be created.

• In the first three years following integration, the total economic impact stemming from the integration is projected to surpass $13.6 billion and will grow sustainably for the foreseeable future, cumulating in more than $82.1 billion in impact between 2015 and 2025. Economic impact includes the monies that flow to manufacturers and suppliers from the sale of new products as well as the taxes and monies that flow into communities and support the local businesses.

• The study projects integration will lead to 103,776 new jobs nationally by 2025. Many of these jobs are portable and will gravitate toward states with favorable regulatory structures and infrastructure. Future events – such as the establishment of FAA Test Sites – will ultimately determine where many of these new jobs will flow.

• Additional economic benefit will be seen through tax revenue to the states, which will total more than $482 million in the first decade following the integration.

• Every year that integration is delayed, the United States loses more than $10 billion in potential economic impact. This translates to a loss of $27.6 million per day that UAS are not integrated into the NAS.

The complete study, including state-by-state breakdowns of economic impact projections, is available at http://www.auvsi.org/econreport.

"While we project more than 100,000 new jobs by 2025, states that create favorable regulatory and business environments for the industry and the technology will likely siphon jobs away from states that do not," wrote the report's author, Darryl Jenkins, a past professor at George Washington University and Embry Riddle Aeronautical University.

Nationally, the precision agriculture industry is expected to be the largest market for UAS technology, the AUVSI study finds. UAS will help farmers monitor crops and distribute pesticides, which could not only help improve efficiency, but also reduce the total amount of pesticides sprayed, saving money and reducing environmental impact. The public safety sector is another area that will benefit from the tremendous potential for UAS technology. UAS have the capability to help police and firefighters— who put themselves into harm's way every day to protect the communities they serve — do their job safely and efficiently.

The report was commissioned by AUVSI and developed by Jenkins, an aviation industry economist with more than 30 years of experience. Mr. Jenkins is the author of the Handbook of Airline Economics and previously served as the director of the Aviation Institute at George Washington University in Washington, D.C.

AUVSI Joins New Coalition to Promote Innovation, Jobs and Safety
Virginia Poised to Attract FAA Test Site
4 March 2013

The Virginia Technology Alliance for Public Safety (VATAPS) announced its official launch as a grassroots coalition promoting the economic development and public safety benefits of new technology in the field of Unmanned Aircraft Systems (UAS). The organization will highlight new jobs and investments associated with encouraging responsible research, development and testing of UAS in the Commonwealth.

"This is an opportunity to bring jobs, innovation and more technology to Virginia at a time when the federal government is cutting other programs," says Michael Toscano, AUVSI president & CEO and member of the alliance. "These are good paying jobs that will save lives, save money as well as spawn research programs at Virginia's colleges and universities." A soon to be released study conducted by AUVSI indicates Virginia could see 2,380 new jobs and $460 million in economic investment if the state embraces programs to research, develop and test UAS. The study indicates many of those jobs would pay starting salaries in the $55,000 range.

The Federal Aviation Administration (FAA) has announced plans to designate six test sites for development of UAS. Virginia is currently pursuing an FAA designation as part of a coalition lead by Virginia Tech.

The formation of VATAPS follows the passage of legislation by the Virginia General Assembly in the form of House Bill 2012 (HB2012) and Senate Bill 1331 (SB 1331), which place a two year-moratorium on the use of UAS. The legislation allows an exception for search and rescue operations, but fails to recognize other public safety applications and embrace the economic benefits of promoting responsible UAS- related research and development in the state.

"The advantages and uses of unmanned aircraft systems for public safety are greatly misunderstood and often falsely associated with military drones," says

Robert Fitzgerald, president of Bosh Global Services in Newport News and member of the alliance. "We are developing small, lightweight UAS that can aid in assessing natural disasters, fires, hazardous spills and other dangerous situations remotely without putting additional lives at risk."

"The safety of public officers in Virginia and across the country is of paramount importance. There are examples where officers have been endangered but could have been protected by the use of UAVs," says John Jones, executive director of the Virginia Sheriffs Association and member of the alliance. "Any Virginia law on UAVs needs to address existing emergency situations and other non-emergency applications. It is imperative that Governor Bob McDonnell take a very close look at this issue and its implications before he agrees to sign the bill into law."

Toscano adds, "The six FAA test sites for unmanned aircraft are expected to be an economic windfall for the states that are selected. But states that are advancing overly-restrictive legislation to limit the use of this technology are hurting their chances of attracting high-quality jobs. There is no reason we cannot responsibly advance this technology while simultaneously ensuring Americans' rights are protected. We would encourage officials in all states, and especially those seeking test sites, to work collaboratively to ensure that legislation doesn't undermine the job creation potential of unmanned aircraft or their state's ability to compete for a test site."

Charter members of VATAPS include aeronautics technology companies along with public safety and law enforcement agencies. VATAPS plans to launch an educational awareness and public information campaign as it recruits additional members.

AUVSI Statement on FAA's Request for Proposals to Receive an FAA UAS Test Site
14 February 2013

Today, AUVSI President & CEO Michael Toscano released the following statement on the Federal Aviation Administration's (FAA) request for proposals to develop and test unmanned aircraft systems (UAS) at six sites around the country:

"Today's announcement by the FAA is an important milestone on the path toward unlocking the potential of unmanned aircraft, and creating thousands of American jobs. Whether it is helping search and rescue teams, assisting in disaster response, or aiding scientific research, unmanned aircraft extend the human reach and allow us to accomplish dangerous and difficult tasks safely and efficiently.

"States across the country have been eager to receive this FAA designation because they recognize the incredible economic and job creation potential it would bring with it. While we would prefer the FAA not limit the number of test sites, we applaud the agency for finally taking this important step, which will help create jobs and ensure the U.S. remains a global leader in aviation innovation."

The FAA's announcement, which can be found here announcement, is part of the process to integrate UAS into the National Airspace System by 2015 as required by the FAA Modernization and Reform Act, which was signed into law on 14 Feb. 2012. AUVSI does not endorse any individual test site proposal.

With the demand for UAS on the rise, the industry recently released a Code of Conduct for UAS manufacturers and operators to ensure the safe, professional and respectful use of unmanned aircraft. The International Association of Chiefs of Police also released a set of guidelines last year for the use of unmanned aircraft, which addressed issues such as search warrants and image retention, and encouraged community engagement.

AUVSI Chairman Cautions Va. Governor on Pending UAS Moratorium Legislation
8 February 2013

AUVSI Chairman Peter Bale wrote a letter to Virginia Gov. Bob McDonnell regarding pending legislation that would impose a moratorium on the use of unmanned aerial vehicles by public agencies in Virginia. In the letter, Bale writes how the proposed moratorium will not only deny public safety officers the use of potentially life-saving technology, but also hurt Virginia's economy and potentially impede scientific endeavors at Virginia universities. Read the text of the letter is below.

Dear Governor McDonnell,

I would like to express serious concern with two pieces of pending legislation, Virginia House Bill 2012 and Virginia Senate Bill 1331, which would impose a two-year moratorium on the use of unmanned aerial systems (UAS) by police and government agencies in Virginia. As Chairman of the Association for Unmanned Vehicle Systems International (AUVSI), the world's largest non-profit organization devoted exclusively to advancing unmanned systems, I believe this proposed moratorium will not only hinder the ability of UAS to assist police, firefighters and other first responders in keeping Virginia communities safe, but also jeopardize current and future manufacturing jobs in the Commonwealth in the rapidly growing unmanned systems sector.

As you are well aware, public safety agencies see tremendous benefits in using UAS. They have the capability to help police and firefighters, who put themselves into harm's way every day in order to protect the communities they serve, do their job safely and efficiently. A UAS flying over a structure fire can provide firefighters with critical situational awareness, while reducing the danger to which they are exposed. A UAS flying over a wooded area can help police searching for a missing child quickly, when time is of the essence. And in times of tight budgets, UAS can provide the same capability of a manned helicopter at a fraction of the operational cost, saving taxpayer dollars.

However, the proposed moratorium would hinder these public safety agencies from using UAS.

I am also greatly concerned about the impact of this legislation on Virginia's economy. A forthcoming study commissioned by my organization projects that in the first three years following the integration of UAS into the national airspace, Virginia stands to gain 2380 new jobs and more than $460 million in economic impact.

Additionally, as you know, Virginia is interested in joining Maryland and New Jersey in putting forth a joint-bid for one of six test sites designated by the Federal Aviation Administration for the development of UAS. These test sites would most certainly be job creators and bring economic activity to the Commonwealth. However, if the moratorium were to become law, the plan for a test site, and the economic benefit that would come with it, will most certainly be in jeopardy.

Not only would future job prospects dim, but current businesses and those they employ would be at risk. More than 50 companies that manufacture UAS have a footprint in Virginia. A moratorium would create an unfriendly environment for these companies, which as a result might look to take their business, as well as jobs, elsewhere.

If the moratorium passes, scientific research could join public safety as a casualty. Right now, students at Virginia Tech are using UAS to research the spread of disease among plants and animals. Students at the University of Virginia are using 3D-printing to create an inexpensive UAS that could be quickly produced and deployed to respond to emergencies. These and other research pursuits by public institutions could be curbed by a moratorium.

As Governor, you have been an outstanding advocate for the potential of UAS. We greatly appreciate your support for the advancement of UAS technology as a tool to save time, save money and even save lives. We ask that you do everything you can to oppose this moratorium, which will hinder a remarkable technology and everyone who might one day be helped by it.

Sincerely,
Peter Bale
Chairman
Association for Unmanned Vehicle Systems International

AUVSI Congratulates Michael Huerta on his FAA Administrator Confirmation
3 January 2013

AUVSI President & CEO Michael Toscano today congratulated Michael Huerta on his confirmation as the administrator of the Federal Aviation Administration (FAA).

"For more than a year, Michael Huerta has led the FAA admirably as acting administrator, and we are pleased to see Congress make his appointment official," Toscano said. "These next several years are important ones for the FAA, as the agency moves forward with the integration of unmanned aerial systems (UAS) into the National Airspace System (NAS) and continues to develop the NextGen air traffic control system."

Toscano said, "This is a critical time for the FAA and the aerospace industry, and it is important that the FAA have a permanent leader to advance these priorities, especially the integration of UAS. This technology holds tremendous potential to save money, save time and, most importantly, save lives. Strong

and clear leadership is needed to make sure that the process stays on track, and Huerta's confirmation is a step in the right direction."

"We look forward to working with Administrator Huerta in the coming months and years to advance these innovations in a safe manner, in keeping with the FAA's primary mission. We are confident that under Administrator Huerta's leadership, the FAA will continue to ensure that the United States aerospace industry stays at the forefront of aviation safety and technological advances," Toscano said.

AUVSI to FAA: Focus on your Mission, Proceed with UAS Integration
28 November 2011

Selection of six UAS test sites more than three months delayed...and counting

AUVSI Chairman of the Board Peter Bale and President & CEO Michael Toscano today requested the Federal Aviation Administration (FAA) focus on its commitment to innovative partnerships and proceed with the integration of unmanned aerial systems (UAS) into the National Airspace System (NAS). The selection of six UAS test sites has been delayed by more than three months so far, despite a congressionally mandated timetable for the site selection process and overall integration.
Recently, the FAA has begun citing privacy issues as a reason for delaying UAS integration. However, the primary mission of the FAA is safety. The establishment of UAS test sites will help the FAA establish safety criteria for UAS, which is a completely separate issue from privacy concerns. Yet, in a letter to Rep. Howard McKeon (R-Calif.) earlier this month, Acting FAA Admistrator Michael Huerta wrote that the FAA must fulfill its obligations in a manner that, among other goals, "addresses privacy issues."

AUVSI Chairman of the Board Peter Bale and President & CEO Michael Toscano today released the following statement:

"Unmanned Aerial Systems (UAS) hold tremendous potential to keep the public safe, create lasting jobs, boost local economies and further advance the U.S. as a leader in technology and innovation. That's why, in February of this year, Congress required the FAA to safely integrate UAS into the U.S. airspace by September 2015.

"Congress had the foresight to lay out a multi-year timetable for the integration of UAS, so all stakeholders would have time to work collaboratively to advance this technology in a safe and responsible manner. The FAA should adhere to the will of Congress as well as focus on the agency's stated mission of providing 'the safest, most efficient aerospace system in the world.'

"AUVSI and its members are committed to working with all stakeholders to ensure privacy concerns are addressed while advancing this beneficial technology, and work is ongoing in this area. To date, AUVSI has met with a nearly a dozen privacy and civil liberties organizations, in addition to over 100 congressional offices, and AUVSI recently adopted an industry code of conduct that addresses privacy.

"There is also already a growing consensus among law enforcement agencies about the proper use of UAS. The International Association of Chiefs of Police (IACP) adopted UAS guidelines that have won praise from the ACLU. Three other law enforcement associations subsequently endorsed the IACP guidelines.

"As an industry, we support a continued, civil dialogue on privacy, but any such conversations should take place concurrent with the integration. The selection process for the six test sites are a separate issue and should be treated as such. Meanwhile, the FAA should adhere to its mission and do what it does best – focus on the safety of the U.S. airspace – while other, more appropriate institutions consider privacy issues.

"We request the FAA to immediately announce its UAS test site selection process to move UAS integration forward without further delay."

- Link to the Congressional Unmanned Systems Caucus Letter
- Link to AUVSI's previous letter to the FAA on the site selection delay

AUVSI Launches New Industry Career Center
19 November 2012

AUVSI launched a new industry Career Center today. AUVSI's Career Center is the leading employment resource for job-seekers and employers in the unmanned systems industry. Browse job listings or post a position today!

AUVSI Corporate Members can post unlimited jobs in the new career center for free!

AUVSI Launches Public Education Website to Highlight Benefits of Unmanned Systems
2 November 2012

Today AUVSI launched a public education website, www.increasinghumanpotential.org, to highlight the valuable and endless benefits of all unmanned systems and robotics.

The website shows how the unmanned systems and robotics industry literally increases human potential by working for the human in dull, dirty, dangerous and difficult tasks.

The site promotes the use of unmanned systems and robotics in the following categories:

By Land, Air and Sea
Jobs and Economy
Enhancing Public Safety
Mitigating and Monitoring Disasters
Helping the Environment
Fostering Education and Learning
Increasing Efficiency in Agriculture
FAA Flight Restrictions

Visit www.increasinghumanpotential.org today to learn more about the endless applications of unmanned systems and robotics.

AUVSI's Executive Vice President Gretchen West Testifies at Rep. Poe's Field Hearing on Privacy, Spoofing
25 October 2012

AUVSI's Executive Vice President Gretchen West testified at Rep. Ted Poe's (R-Texas) field hearing at Rice University on UAS privacy issues and spoofing.

Read West's opening statement:

Congressman Poe, I want to thank you, and the rest of the members for the opportunity to participate in today's forum on unmanned aircraft systems (UAS). I also want to thank Rice University for hosting this event, and congratulate President Leebron for his school's prowess in last year's NASA design showcase. In this prestigious event, Rice students won top awards for designing and building unmanned aircraft systems; this is one example of significant contributions American universities are making to the dynamic global aerospace industry.

There is a lot I would like to say about the tremendous potential of this technology, but before I do, let me first say a few words about the Association for Unmanned Vehicle Systems International – or AUVSI.

AUVSI is the world's largest non-profit organization devoted exclusively to advancing the unmanned systems and robotics community. We have more than 6,300 members in the United States, including 225 here in Texas, such as BAE Systems, Lockheed Martin, L-3 Communications, Raytheon and Rockwell Collins. Many other members are small businesses that support and supply this high-tech industry.

For years, AUVSI has been a leading advocate for the safe integration of unmanned aircraft into the United States National Airspace System. That's why we were delighted earlier this year when Congress recognized what those of us in the industry have known for a long time – that unmanned aircraft bring a host of positive benefits for our society and hold the remarkable potential to create jobs.

Whether it is helping search and rescue teams find a lost child, providing agricultural benefits or helping to fight wildfires, the applications of unmanned aircraft in the United States are virtually limitless. The benefits of UAS aren't just theoretical, however; the technology is already demonstrating its value in the United States, and its value to Texas. Let me provide just a few examples:

• U.S. Customs and Border Protection (CBP) currently uses unmanned aircraft to monitor the U.S. border, including the 1,241 mile border that Texas shares with Mexico. According to the CBP, unmanned aircraft in 2011 assisted with the seizure of thousands of pounds of narcotics and the apprehension of dozens of individuals taking part in illegal activities along the border.

• Texas is home to some of the world's largest energy companies, and several – including Shell, BP and ConocoPhillips – want to use UAS to more cost-effectively monitor critical energy infrastructure.

• Around June of each year, Texas and the Gulf Coast brace for hurricane season. Now, researchers at NASA are flying unmanned aircraft into and above hurricanes, something which is often too dangerous or difficult for manned aviation, to study how these storms form and develop to better predict hurricane tracks and make earlier evacuation decisions. As a result of UAS, Texas residents along the Gulf Coast will be much safer in the years to come.

These are just a few examples of the real-world applications of UAS. And there are many, many more.

In addition to the societal benefits of unmanned aircraft, the expansion of this technology will help drive economic growth in Texas and around the country. A 2010 study by our organization found that the integration of UAS into national airspace could add at least 23,000 new jobs by 2025, translating into roughly $107 million in wages each year.

The state of Texas, with an already thriving aerospace industry, is well positioned to reap these economic benefits. Texas has the human capital, with more than 200,000 aerospace and aviation industry workers currently employed at 1,665 companies. Meanwhile, the state is already hard at work attracting new aerospace jobs and investment including jobs in unmanned systems. The Texas Enterprise Fund, spearheaded by Gov. Rick Perry, has infused more than $44 million into aerospace-related projects since the fund was established in 2003.

As this technology advances, we are also mindful that unmanned aircraft must be operated in a safe and responsible manner. Safety has always been a top priority for our industry. In fact, safety is also one of three main pillars of the industry's new Code of Conduct, which was published this summer. We are in regular contact with the Federal Aviation Administration (FAA) and we have met with, and continue to maintain an open dialogue with, representatives from the pilot community, air traffic controllers and others with an interest in aviation safety.

We also steadfastly support Americans' right to privacy. And just like other new technologies such as cell phones, GPS and even social networking websites like "Facebook," a reasonable conversation about the implications of a new technology is entirely appropriate. That is why AUVSI has fostered a dialogue with privacy advocates and civil liberties organizations to discuss how we can ensure Americans' rights are protected as the use of this technology advances. In July, AUVSI endorsed federal privacy legislation that reaffirms citizens' Fourth Amendment rights with regard to the use of UAS. Our Code of Conduct also articulates our commitment to respecting individuals' privacy.

As we embark on this discussion of law enforcement's use of unmanned aircraft, it is important to emphasize that law enforcement already uses existing and developing technologies on manned aircraft. Unmanned aircraft simply offer a new platform for these technologies. I would also like to take a minute to recognize and applaud the proactive steps law enforcement officials have taken to ensure the safe and responsible use of UAS. Notably, the International Association of Chiefs of Police (IACP) last summer released its own detailed guidelines for UAS operations, which were quickly adopted by several other law enforcement organizations. The guidelines – which address privacy, the use of warrants and data retention – were not only praised by our industry, but the ACLU as well.

Law enforcement entities are already demonstrating a commitment to safety and privacy. Here again, Texas is leading the way.

Less than 300 miles from where we sit today, the Arlington Texas Police Department is developing what could one day be the model for law enforcement UAS programs across the country. The department has created a comprehensive framework for UAS operations that includes pre-flight checklists, flight and maintenance logs, training protocols and standard operating procedures for all UAS flights. Arlington plans to use UAS to survey multi-car crashes on interstate highways, to reduce the time officers spend roadside, cut down on pollution and clear congestion more quickly.

Clearly, we are just beginning to realize and unlock the tremendous potential of this technology. Unmanned aircraft extend our human potential and allow us to execute dangerous or difficult tasks safely and efficiently, saving time, saving money and, most importantly, saving lives.

As an industry, we believe all stakeholders can work together to advance this technology in a thoughtful way that recognizes the benefits and creates jobs while protecting Americans' safety, as well as their individual rights to privacy.

Thank you, and I look forward to your questions.

AUVSI Welcomes Formation of Senate Unmanned Aerial Systems Caucus
28 September 2012

Sens. Inhofe, Manchin Form Bipartisan Caucus to Educate Senators about the Potential Applications of Unmanned Systems

AUVSI welcomed the announcement from Capitol Hill that Sens. Jim Inhofe (R-Okla.) and Joe Manchin (D-W.Va.) formed the Senate Unmanned Aerial Systems Caucus. The mission of the bipartisan caucus will be to educate senators and staffers on the capabilities of unmanned systems and work closely together to best shape the unmanned systems policymaking process.

"I would like to commend Senators Inhofe and Manchin for their leadership and commitment in establishing the caucus, which will enable AUVSI to work with the Senate and stakeholders on the important issues that face the unmanned systems community as the expanded use of the technology transitions to the civil and commercial markets," said AUVSI President & CEO Michael Toscano. "It is our hope to establish the same open dialogue with the Senate caucus as we have for the past three years with the House Unmanned Systems Caucus."

Unmanned systems extend human potential, allowing us to execute dangerous or difficult tasks safely and efficiently. Whether bolstering search and rescue efforts; studying and aiding in natural and man-made disasters; or supporting security missions and protecting the environment, unmanned systems are capable of saving time, saving money and, more importantly, saving lives.

"I am enthusiastic about the announcement that Senator Manchin (D-W.V.) and I were able to introduce and will co-chair the Senate Unmanned Aerial Systems Caucus," said Sen. Inhofe. "The caucus will help educate senators and staff on the importance of all unmanned systems, including air, land and sea-based platforms. Federal policies and legislation relating to unmanned systems are still in its infancy and concerns of the platforms need to be addressed. This caucus will help develop and direct responsible policy to best serve the interests of U.S. national defense and emergency response, and work to address any concerns from senators, staff and their constituents. I hope that all of our colleagues in the Senate will join and participate in this bipartisan caucus."

Over the next decade, there will be an exponential growth in unmanned systems technology and operations. Congress will play a critical role in writing and passing laws that will set policy, direct oversight and provide direction for unmanned systems integration, development and utilization. The Senate Unmanned Aerial Systems Caucus will serve as a venue to discuss issues.

"The increased use of unmanned aerial systems carries great potential – and great risk," Sen. Manchin said. "It's important for all of us to understand how we can use this advancing technology to strengthen our national security and improve our ability to respond in case of natural or man-made disasters, while at the same time ensuring the privacy of all of our law-abiding American citizens. I am so appreciative of Senator Inhofe's work on this issue, and I look forward to working together in a bipartisan way to keep our colleagues updated on the emerging policy issues involving this technology."

AUVSI Holds Largest Gathering of Unmanned Systems, Robotics Technology in the World
20 August 2012

The Association for Unmanned Vehicle Systems International turned the Mandalay Bay Convention Center into a robotics playground 6-9 August, when it brought together the largest display of unmanned systems and robotics technology in the world.

With more than 550 exhibitors and 7,400 attendees, AUVSI's Unmanned Systems North America 2012 highlighted the future of unmanned systems in military, civilian and commercial applications.

Highlights from the conference include affirmation for unmanned systems in life saving applications in the military; a commitment to integrate unmanned systems into the U.S. National Airspace System; and a pledge from the industry to work with government, civil liberties groups and others to ensure integration is done safely with respect to privacy.

Day one of the convention opened with Federal Aviation Administration (FAA) Acting Administrator Michael Huerta highlighting the progress his agency has made in working to integrate unmanned air vehicles into the national airspace.

Part of the framework to integrate UAS is moving ahead, he said, with the FAA due to soon ask for proposals to manage the upcoming six test sites still currently under selection.

"We need to make sure we use these sites to obtain the very best data that we possibly can," he said.

The agency has also streamlined its certificate of authorization process, with the average non-emergency COA approval down to 60 days, and the FAA now provides two-year authorizations instead of one. This expedited process has been possible due to an internal reorganization that moved all the FAA's unmanned work into its new Unmanned Aviation Systems Integration Office.

Though the agency has come a long way, Huerta said it still has more to go.

"We need to change the way we do business as well," he said.

Huerta highlighted three core areas the FAA needs to work on: make the airspace system smarter and safer, bring technology benefits to the users, and task employees to think creatively and innovatively in a tight budget.

"There's a lot of work that needs to be done to move integration for all UAS forward, but I'm very, very optimistic that we will get there."

Day two kicked off with an affirmation of the life saving capabilities of unmanned systems when Navy Seal Lt. Cmdr Rorke Denver addressed attendees.

Denver has seen action in the Middle East, Africa and Latin America, and has made use of unmanned aircraft and unmanned underwater vehicles.

"The fact of the matter is ... I have been a benefactor from the technologies and the things that have been developed" by the people in the room, he said.

He has thrown a Raven into the air, similar to a scene in the movie, and "I've had ScanEagle, Tiger Shark, all kinds of Predators above my head helping leverage those technologies in a way that protected my guys, it made us win on the battlefield when we might not have otherwise."

He said he also made use of an unmanned underwater vehicle off the coast of Monrovia.

"We're in there with these lead lines and slates doing this classical SEAL UDT mission and this EMD guy comes walking up" with a vehicle that looks like a torpedo.

It was an unmanned underwater vehicle, "somebody probably made it in here," he said. "You throw this thing in the water and it's got side-scan radar ... an hour later it pops onto the surface, we plug it into a laptop and up pops a map" and the team was able to plot its path.

"Just remarkable technology," he said.

Chairman's Address

Finally, AUVSI Chairman of the Board Peter Bale promised attendees that the industry will, in time, figure out how to make these advances and respect all values.

"I don't want to look back on the process of figuring this out and have regrets that we learned lessons with blood or scandal that could have been avoided," Bale said. "The technology has arrived and is ready. That means it is time to figure out the public safety and civil rights issues."

Bale went on to say, "The FAA test ranges and the window until September of 2015 represent our chance to get this right on the front end. None of us, in or out of government, are quite sure how this process will unfold but I am pledging this organization's support and asking for your personal and professional assistance in answering these questions.

"Parallel with the FAA test range process that figures out the flight safety procedures and standards, I want to ask the law enforcement, criminal justice and civil rights communities to use these three years to help sort out the civil rights issues. I am pledging myself and this organization to engage in a serious dialogue with any and all concerned.

"Politics does not have to be zero sum. This is not a choice between embracing technology or respecting deeply cherished values — we can do both. I look forward to the process and let's get it right. There is too much at stake not to."

SAVE THE DATE: AUVSI's Unmanned Systems 2013 will be held in Washington, DC at the Walter E. Washington Convention Center, 12-15 August 2013.

AUVSI Applauds Police Chiefs for Adopting Guidelines for the Safe and Responsible Use of Unmanned Aircraft
16 August 2012

Today, AUVSI applauded the International Association of Chiefs of Police (IACP) for adopting guidelines for the use of unmanned aircraft systems (UAS). The guidelines provide law enforcement agencies an outline of how to use UAS safely and responsibly, and with respect to individuals' privacy. The adoption of the IACP guidelines follows the recent adoption of AUVSI's "Code of Conduct" for those who design, test and operate UAS.

"We applaud the IACP for putting forward these guidelines as part of law enforcement's simultaneous commitment to protect communities, as well as the rights of the members of those communities," said Michael Toscano, president and CEO of AUVSI. "Unmanned aircraft could help law enforcement agencies with missions such as search and rescue or crime scene photography, often at a lower cost than manned aircraft. The more the law enforcement community, privacy advocates, government and other stakeholders work together to address issues such as privacy, the faster we can unlock the incredible potential of unmanned aircraft to help save time, save money and most importantly, save lives."

The IACP guidelines, which can be found here, cover community engagement, system requirements, operational procedures and image retention. They direct law enforcement agencies to engage with the community, specifically their governing body and civil liberties advocates, about how UAS will be used and protections put in place to uphold citizens' rights. The guidelines also encourage notifying those living and working in the vicinity of aircraft operations, when possible. The guidelines call for a transparent implementation process for agencies desiring UAS, including a period of public comment.

The guidelines include specific steps law enforcement should take to respect the privacy of individuals:
• Where there are specific and articulable grounds to believe that the (unmanned aircraft) will collect evidence of criminal wrongdoing and if the (unmanned aircraft) will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight.
• Unless required as evidence of a crime, as part of an on-going investigation, for training, or required by law, images captured by a UAS should not be retained by the agency.
• Unless exempt by law, retained images should be open for public inspection.

A poll conducted earlier this year by Monmouth University found strong public support for law enforcement's use of UAS in search and rescue missions, tracking runaway criminals, protecting U.S. borders and controlling illegal immigration. Currently, however, fewer than 3% of law enforcement units have aviation assets because of the high operating costs of manned aircraft. UAS provide a cost-effective alternative. The Sheriff's Office in Mesa County, Colo., operates an unmanned aircraft at the cost of $3.36 per hour, compared to $250 to $600 per hour for a manned aircraft. The purchase price of a UAS is also significantly less than a manned aircraft, costing about the price of a patrol car with standard police gear. The vast majority of UAS currently flying in the U.S. are small models that weigh less than 25 lbs and can fit in the trunk of a car.

Read more about how law enforcement agencies around the country are using UAS:
• The New Eye in the Sky over Mesa County – 9News, Denver
• Arlington PD Testing Unmanned Aircraft – KXAS, Dallas
• Drones tested as tools for police and firefighters – *Los Angeles Times*

AUVSI Announces Newly Elected Board of Directors
31 July 2012

AUVSI announces its newly elected leaders on its Board of Directors.

Officers elected for the 2012-2013 term are Peter Bale, chairman; John Lademan, executive vice chairman; Ralph Alderson, first vice chairman and Joe Brannan, treasurer. Additionally, John Lambert continues as immediate past chairman for this term.

Newly elected to the AUVSI Board of Directors:
Jason Grabinsky
Heather Griffith
Steve Pennington
Chad Partridge
Dave Seagle
Michelle Kalphat

Continuing AUVSI Board of Directors:
Virginia Young
Grant Begley
Matt England
Gene Fraser
Stephen Newton
David Place
Peter Smith
Tim Heely
Neil Hunter
Rick Lynch
Mark Patterson

"These officers and directors represent a wide range of companies and institutions in the global unmanned systems and robotics community, bringing expertise in technology, applications and markets related to this rapidly emerging industry," said AUVSI Chairman of Board of Directors Peter Bale. "We congratulate those elected and look forward to their service on the board."

The new term of office for the board of directors starts at AUVSI's Unmanned Systems North America 2012 in Las Vegas, 6-9 August, where more than 8,000 attendees from 40 countries will see 550+ exhibits and participate in 100+ educational sessions, showcasing the present and future capabilities of unmanned systems and robotics technology.

Unmanned Aircraft Industry Backs Privacy Legislation
By Melanie Hinton
19 July 2012

Today, the Association for Unmanned Vehicle Systems International (AUVSI) announced support for legislation to reaffirm individuals' Constitutional protections against unreasonable searches. An amendment included in the Department of Defense Appropriations bill, introduced by Rep. Frank LoBiondo, R-N.J., only allows funding for the operation of UAS "in accordance" with the Fourth Amendment.

"The unmanned aircraft systems industry strongly supports Rep. LoBiondo's amendment included in the Defense Appropriations bill, which reaffirms Americans' Constitutional rights. Unmanned aircraft can help our police, fire fighters and first responders save time, save money and most importantly, save lives, while fully respecting Americans' rights to privacy. This amendment is right inline with our commitment to the safe and responsible integration of unmanned aircraft into our skies," said Michael Toscano, president & CEO of AUVSI.

Earlier this year, Congress passed, and the president signed into law, legislation requiring the Federal Aviation Administration to plan for the integration of unmanned aircraft into the National Airspace System by 2015. Since then, AUVSI has met with a variety of stakeholders, including nearly a dozen privacy advocates and civil rights groups, to listen to their concerns and begin working toward solutions.

The industry's backing of the privacy legislation is just the latest example of its commitment to the safe and responsible integration of UAS into the National Airspace System. The industry recently released a Code of Conduct for UAS manufacturers and operators to ensure the safe, professional and respectful use of unmanned aircraft. The Code of Conduct set forth guidelines to provide AUVSI members - and those who design, test and operate UAS for public and civil use - with recommendations for their safe, non-intrusive operation, including respect for the privacy of individuals.

"Like with any merging technology, it is important that a commitment to safety, professionalism and respect is part of the foundation of its use. The Code of Conduct reflects how the rights of individuals and the safety of all users of civil airspace are our top priority as we work to unlock the incredible potential this technology holds," Toscano said.

AUVSI Submits Testimony for Congressional Subcommittee Hearing on Using UAS in the Homeland
18 July 2012
On 18 July, AUVSI released prepared testimony from Michael Toscano for the House Homeland Security – Subcommittee on Oversight, Investigations and Management hearing, "Using Unmanned Aerial Systems Within the Homeland: Security Game Changer? " scheduled for Thursday, 19 July at 9:30 a.m.

In the testimony, Mr. Toscano discusses the many potential uses for unmanned aircraft systems (UAS), and the industry's efforts to ensure a safe and responsible integration of UAS into the national airspace. The testimony lays out the UAS industry's commitment to safety, highlighted by the industry's recently released "Code of Conduct," as well as the technological advancements to help ensure their safe operation.

AUVSI Releases "Code of Conduct" for Unmanned Aircraft Systems Operations
Promotes Safe, Responsible Use as Integration into Airspace Proceeds
02 July 2012
AUVSI published the "Unmanned Aircraft System Operations Industry Code of Conduct" www.auvsi.org/conduct, a set of guidelines to provide AUVSI members – and those who design, test and operate UAS for public and civil use – with recommendations for their safe, non-intrusive operation.

Central to the "Code of Conduct" is the need for "safety, professionalism and respect" in all uses of UAS. This code is meant to provide UAS industry manufacturers and users a convenient checklist for operations and a means to demonstrate their obligation to supporting the growth of the industry in a safe and responsible manner.

"The emergence of unmanned aircraft systems represents one of the most significant advancements to aviation, the scientific community, and public service since the beginning of flight," said Michael Toscano, President and CEO of AUVSI. "With a commitment to safety, professionalism and respect, we can ensure unmanned aircraft are integrated responsibly into civil airspace."

The guidelines recommend when and by whom UAS should be flown, to minimize risk. They commit to complying with all federal, state and local laws and cooperating with authorities at all levels. The guidelines also commit to respecting other users of the airspace, the privacy of individuals, the concerns of the public and improving public awareness of UAS.

"By proactively adhering to these guidelines, we want to demonstrate how the rights of individuals and the safety of all users of civil airspace are our top priority, as we work to unlock the incredible potential this technology holds," Toscano said.

The FAA Modernization and Reform Act signed into law on February 14, 2012, included a provision requiring the FAA to safely integrate UAS into the national airspace. The law created a number of deadlines for the FAA to meet on its way to the safe integration of UAS by September 2015.

Unmanned aircraft systems extend human potential, allowing individuals to execute dangerous and often difficult tasks safely and efficiently. Whether it is aiding search and rescue efforts, navigating through airspace too hazardous for manned vehicles, or furthering scientific research, UAS are capable of saving time, saving money and most importantly, saving lives.

To view the Code of Conduct, visit www.auvsi.org/conduct.

AUVSI Rejects Calls for Unlawful Destruction of Unmanned Aerial Systems
18 May 2012
Today, the Association for Unmanned Vehicle Systems International (AUVSI) released the following statement from President and CEO Michael Toscano in response to recent depictions in the media that put the unlawful destruction of unmanned aerial systems in a positive light:

"To advocate for people to shoot down any object from U.S. airspace is irresponsible, dangerous and unlawful. Unmanned aerial systems are being designed to serve the public good, such as helping search and rescue officers find missing children, monitor weather and wildlife, provide disaster relief and respond to emergencies, as they did in the Fukushima nuclear crisis in Japan last year. The myriad of important uses will be imperiled if they become targets. Meanwhile, the suggestion that Americans take up arms against unmanned aircraft also endangers citizens on the ground.

"AUVSI welcomes civil discussions about privacy and the proper uses of unmanned aircraft, but it cannot and does not condone violence against technology intended to keep citizens safe while saving taxpayer dollars."

Syndicated columnist Charles Krauthammer recently stated that unmanned aircraft should be banned entirely in the United States, and said that "I would predict — I'm not encouraging, but I would predict, the first guy who uses a Second Amendment weapon to bring down a drone that's hovering over his house is gonna be a folk hero in this country."

The NBC television show "Harry's Law" also recently portrayed its main character shooting down a "drone" in just such a situation.

Under New Leadership, FAA's Unmanned Aircraft Systems Integration Office Meets Its Deadline
by Timothy Adelman, Aviation Attorney
14 May 2012

The FAA's Unmanned Aircraft Systems Integration Office (formally the UAPO) and the Department of Justice's National Institute of Justice's Aviation Technology Program (NIJ) have worked diligently over the past 18 months to identify the hurdles to public safety unmanned aircraft operations in the National Airspace System (NAS) and to provide solutions to those hurdles. With the help of the Congressional Unmanned Systems Caucus, chaired by Reps. Buck McKeon (R-Calif.) and Henry Cuellar (D-Texas), the FAA's Reauthorization Bill provided language for a roadmap to lessen the hurdles associated with the deployment of small unmanned aircraft systems (sUAS) by public safety.

When the FAA's Reauthorization Bill was signed into law by President Obama on 14 February 2012, the FAA was faced with a deadline to enter into agreements with appropriate government agencies to simplify the process for issuing Certificates of Waiver or Authorization (COAs) to operate sUAS public aircraft. While the UAS Integration Office had already been working on a solution in advance of the Bill, the 90-day deadline turned up the heat to get the solution completed. Under its new leadership by James Williams, head of the FAA's Unmanned Aircraft Systems Integration Office and in direct coordination with NIJ, the FAA has developed a streamlined COA process for public safety.

With more than 18,000 domestic law enforcement agencies in the United States and many more public safety agencies, including fire service and emergency response teams, the potential demand for aviation assets is high. Through various studies over the years, there are less than 400 law enforcement aviation units. In other words, less than 3% of all law enforcement organizations have aviation assets to support their daily operations. Why so few? Largely because of the cost and complexity of operating manned aircraft.

In 2007 the Bureau of Justice Statistics published a report that examined the use of aviation assets in large law enforcement organizations (100 officers or more). They identified 201 aviation units operating in 46 states. Those units spend more than $300 million in one year on aircraft purchases, leasing, financing, maintenance and fuel, an average of $1.5 million per aviation unit. While almost all law enforcement agencies would benefit from aviation units, not many can afford them.

Unmanned Aircraft Systems (UAS) provide an affordable solution to those agencies that need "eyes in the sky" but don't have the budget or for those agencies that need to supplement their current aviation units with more cost effective aircraft for specific missions. In December 2009, NIJ hosted a conference for all public safety agencies interested or currently using UAS. During that conference, the agencies identified the anticipated scenarios for which UAS could provide vital support: tactical teams, forensics, fire safety, high-risk warrants, marijuana eradication, photographing critical infrastructure, corrections, traffic for ingress/egress under special conditions, payload detection of HazMat, aid in evacuation after natural disasters, critical incidents, and post-event forensics.

Most domestic public safety agencies are looking for small UAS (sUAS) to provide immediate eyes in the sky in response to a defined incident. The anticipated use of sUAS does not include routine patrol, which would require flight for extended distances over an extended time period. Operations would occur within "defined incident perimeter" in close proximity to the individual controlling the aircraft on the ground and most operations would be for a relatively short duration, i.e. less than an hour. Therefore, the FAA's UAS Integration Office in collaboration with NIJ designed a solution that would permit the operation of sUAS in a less restrictive manner than current FAA policy.

While the COA process will continue, many of its barriers will be reduced. COAs will be available for operations within a defined incident perimeter throughout an agency's jurisdiction. There will be no need to obtain an emergency COA for a specific mission. As long as the agency operates within its COA, it can fly when it wants and where it wants. COAs will require line of sight operations under 400' AGL during VFR conditions. The COA will permit certain operations within Class C, D, E and G airspace. In addition, and with certain restrictions, agencies can get a COA that would involve operations within 5nm of an airport.

The FAA's UAS Integration Office and NIJ will develop a knowledge base exam for those operators that do not have an FAA issued airman certificate. This exam will help agencies demonstrate an adequate level of airman knowledge to ensure the safe operation of UAS, a tremendous asset for individual agencies risk management programs. The COA process will also provide a sample Safety Risk Analysis Plan ("SRAP") to help the agency identify its areas of risk and ensure safe operating procedures.

The FAA is working to streamline the current online application to lessen the burden on agencies applying for COAs and to help expedite review. The COA process currently requires a lot of technical detail on the aircraft and equipment. The FAA, through its work with NIJ, will develop a master list of sUAS that an agency can use to simply select the aircraft with appropriate equipment. Manufacturers will be able to have their aircraft included in this master list through an independent assessment process.

With model standard operating procedures, SRAP, operating limitations and training curriculum, agencies will have an easier time applying for COAs. The streamlined process will eliminate the need to recreate the wheel and simply provide agencies with best practices for sUAS operations.

The news for public safety agencies and manufacturers is good. The FAA was once considered a major hurdle for public safety operations. While I still hear agencies and manufacturers claim that the barrier to sUAS operations is the FAA, that is no longer an accurate statement. The FAA has already issued operational COAs for specific jurisdictions to a number of agencies. Building upon that experience and through discussions with NIJ and public safety officers, the FAA created the new COA process to help reduce the administrative burden for agencies while at the same time ensure adequate safety.

While the new "Common Strategy" which streamlines the COA process has been agreed upon, there remains an ongoing implementation process. A few of these implementation steps include:

- Creating an online knowledge exam for operators.
- Creating a sample SRAP for agencies to use when applying for a COA.
- Revising the on-line COA application website to incorporate the streamlined process.
- Educating manufacturers and end-users on the new process.

The FAA, DOJ and DHS Science and Technology Directorate are working together to host a multiday sUAS focused conference that will include both educational seminars and live sUAS demonstrations by active law enforcement sUAS units. This conference will mark the kickoff for the new "Common Strategy" and it's streamlined COA process. Attendees will have an opportunity to hear from the FAA, DHS S&T and DOJ regarding sUAS operations. Seminars will include information about the new streamlined process, best practices for operating sUAS in a public safety mission, examples of how to develop your own SRAP, and much more. The conference is anticipated to occur in the middle of September. Stayed tuned for more information about dates and locations.

Having had a chance to participate in many of the discussions with the FAA and NIJ about the new streamlined COA process and having had the chance to discuss operations with many public safety entities, I am confident that the "Common Strategy" will be a significant step forward in the employment of sUAS by public safety agencies. There appears to be a fundamental shift in the FAA's perception of public safety operations. Initially, the FAA feared operations by public safety agencies that did not have adequate aviation knowledge, thereby creating a risk in the National Airspace System. Now, the FAA is focused on providing the tools necessary to help those public safety agencies conduct safe operations in the National Airspace System. Many of the new requirements in the streamlined COA process will help agencies identify the risk of operations and implement proper mitigating steps to limit those risks which seems to be in

alignment with the FAA's desire to introduce Safety Management Systems concepts. In the end, the goal is to increase our public safety agencies' effectiveness through technology without unnecessarily increasing the risk to persons or property.

The Case for Driverless Cars
10 May 2012

AUVSI recently released a new white paper: The Case for Driverless Cars.

Driverless cars have been a dream for drivers around the world since the invention of the automobile more than 100 years ago, but have yet to be realized on a mass scale. Recent demonstrations and competitions, utilizing corporate and government investments, have shown that driverless car technology is maturing to the point where such vehicles may be commercially viable within a decade.

A variety of non-technical issues remain in order to field driverless cars. Legal, liability, regulatory, culture, and privacy concerns all need to be addressed for consumers to be able to use, and desire to use, driverless cars.

The paper goes into detail in these issues, the potential American consumer market, and technical aspects of driverless cars. The paper is written for people without a strong background in driverless cars looking for more information and is a good background for people interested in the Driverless Car Summit.

AUVSI Presses DOT to Release Small UAS Proposed Rule
4 May 2012

On 4 May, AUVSI President & CEO Michael Toscano sent a letter to U.S. Secretary of Transportation Ray LaHood asking him to expedite the publication of the small unmanned aircraft system (UAS) notice of proposed rulemaking.

The Federal Aviation Administration (FAA) has been examining the issue of allowing small UAS to fly in the airspace since 2008, when it formed an aviation rulemaking committee (ARC) to examine the issue. Although the ARC issued recommendations in 2009, the FAA has not yet released a proposed rule for public comment on how it will safely allow small UAS to fly in the civil airspace.

Congress, in the FAA Modernization and Reform Act of 2012 - which was passed into law on 14 February - requires the secretary of Transportation to publish a final rule on allowing small UAS to fly in the airspace by mid-2014, with the safe integration of all civil UAS by 30 Sept. 2015.

"The UAS industry believes the pending rule is urgently needed and will provide meaningful guidance to manufacturers and end users for design, construction and operation of small UAS to safely operate and deliver crucial services to law enforcement, agriculture and other sectors of the American economy." said Toscano in a letter to Secretary LaHood. "UAS will be the next big revolution in aviation; however, before this industry can really take off, we need rules from the FAA on how to safely operate alongside manned aircraft."

AUVSI continues to actively engage with members of Congress, federal regulators, aviation stakeholders, potential users, and privacy groups to help educate about the importance of unmanned systems.

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THE ECONOMIC IMPACT

OF UNMANNED AIRCRAFT SYSTEMS INTEGRATION IN THE UNITED STATES

MARCH 2013

AUVSI
ASSOCIATION FOR UNMANNED VEHICLE SYSTEMS INTERNATIONAL

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Darryl Jenkins, author of "The Handbook of Airline Economics," is an airline analyst with more than 30 years of experience in the aviation industry. Jenkins also served as director of the Aviation Institute at George Washington University for more than 15 years. As an independent aviation consultant, Jenkins has worked for the majority of the world's top 50 airlines. In addition, he has consulted for the FAA, DOT, NTSB and other U.S. government agencies as well as many foreign countries. Jenkins also is the author of several aviation books and is a regular commentator for major media including ABC, CBS, NBC, MSNBC, CNN, FOX and major print publications. Jenkins was a member of the Executive Committee of the White House Conference on Aviation Safety and Security.

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Executive Summary

The purpose of this research is to document the economic benefits to the United States (U.S.) once Unmanned Aircraft Systems (UAS) are integrated into in the National Airspace System (NAS).

In 2012, the federal government tasked the Federal Aviation Administration (FAA) to determine how to integrate UAS into the NAS. In this research, we estimate the economic impact of this integration. In the event that these regulations are delayed or not enacted, this study also estimates the jobs and financial opportunity lost to the economy because of this inaction.

While there are multiple uses for UAS in the NAS, this research concludes that **precision agriculture** and **public safety** are the most promising commercial and civil markets. These two markets are thought to comprise **approximately 90%** of the known potential markets for UAS.

We conclude the following:

1. The economic impact of the integration of UAS into the NAS will total more than $13.6 billion (Table 19) in the first three years of integration and will grow sustainably for the foreseeable future, cumulating to more than $82.1 billion between 2015 and 2025 (Table 1);
2. Integration into the NAS will create more than 34,000 manufacturing jobs (Table 18) and more than 70,000 new jobs in the first three years (Table 19);
3. By 2025, total job creation is estimated at 103,776 (Table 1);
4. The manufacturing jobs created will be high paying ($40,000) and require technical baccalaureate degrees;
5. Tax revenue to the states will total more than $482 million in the first 11 years following integration (2015-2025); and
6. Every year that integration is delayed, the United States loses more than **$10 billion** in potential economic impact. This translates to a loss of **$27.6 million per day that UAS are not integrated into the NAS.**

Utility of UAS

The main inhibitor of U.S. commercial and civil development of the UAS is the lack of a regulatory structure. Because of current airspace restrictions, non-defense use of UAS has been extremely limited. However, the combination of greater flexibility, lower capital and lower operating costs could allow UAS to be a transformative technology in fields as diverse as urban infrastructure management, farming, and oil and gas exploration to name a few.

Present-day UAS have longer operational duration and require less maintenance than earlier models. In addition, they can be operated remotely using more fuel efficient technologies. These aircraft can be deployed in a number of different terrains and may be less dependent on prepared runways. Some argue the use of UAS in the future will be a more responsible approach to certain airspace operations from an environmental, ecological and human risk perspective.

UAS are already being used in a variety of applications, and many more areas will benefit by their use, such as[1]:

- **Wildfire mapping[2];**
- **Agricultural monitoring;**
- **Disaster management;**
- **Thermal infrared power line surveys;**
- **Law enforcement;**
- **Telecommunication;**
- **Weather monitoring;**
- **Aerial imaging/mapping;**
- **Television news coverage, sporting events, moviemaking[3];**
- **Environmental monitoring;**
- **Oil and gas exploration; and**
- **Freight transport.**

Applicable Markets

There are a number of different markets in which UAS can be used. This research is concentrated on the two markets, commercial and civil, with the largest potential. A third category (Other) summarizes all other markets:

1. Precision agriculture;
2. Public safety; and
3. Other.

> While we project more than 100,000 new jobs by 2025, states that create favorable regulatory and business environments for the industry and the technology will likely siphon jobs away from states that do not.

Public safety officials include police officers and professional firefighters in the U.S., as well as a variety of professional and volunteer emergency medical service providers who protect the public from events that pose significant danger, including natural disasters, man-made disasters and crimes.

Precision agriculture refers to two segments of the farm market: remote sensing and precision application. A variety of remote sensors are being used to scan plants for health problems, record growth rates and hydration, and locate disease outbreaks. Such sensors can be attached to ground vehicles, aerial vehicles and even aerospace satellites. Precision application, a practice especially useful for crop farmers and horticulturists, utilizes effective and efficient spray techniques to more selectively cover plants and fields. This allows farmers to provide only the needed pesticide or nutrient to each plant, reducing the total amount sprayed, and thus saving money and reducing environmental impacts.

As listed above, a large number of other markets will also use UAS once the airspace is integrated. We believe the impact of these other markets will be at least the size of the impact from public safety use.

[1]Market Intel Group (MiG), November, 2010
[2]Predators improve wildfire mapping: Tests under way to use unmanned aircraft for civilian purposes, Tribune Business News, August 26, 2007
[3]Honeywell International Inc 2004-2012

With sensible regulations in place, we foresee few limitations to rapid growth in these industries. These products use off-the-shelf technology and thus impose few problems to rapidly ramping up production. The inputs (i.e., parts) to the UAS can be purchased from more than 100 different suppliers; therefore, prices will be stable and competitive. The inputs to the UAS can all be purchased within the U.S., although these products can be imported from any number of foreign countries without the need of an import license. UAS have a durable life span of approximately 11 years and are relatively easy to maintain. The manufacture of these products requires technical skills equivalent to a baccalaureate degree. Therefore, there will always be a plentiful market of job applicants willing to enter this market. In summary, there are no production problems on the horizon that will impact the manufacturing and output of this product. Most of the barriers of potential usage are governmental and regulatory. For this study, we assume necessary airspace integration in 2015, on par with current legislation.

Covering and justifying the cost of UAS is straightforward. In the precision agriculture market, the average price of the UAS is a fraction of the cost of a manned aircraft, such as a helicopter or crop duster, without any of the safety hazards. For public safety, the price of the product is approximately the price of a police squad car equipped with standard gear. It is also operated at a fraction of the cost of a manned aircraft, such as a helicopter, reducing the strain on agency budgets as well as the risk of bodily harm to the users in many difficult and dangerous situations. Therefore, the cost-benefit ratios of using UAS can be easily understood.

Economic Benefit

The economic benefits to the country are enormous and were estimated as follows. First, we forecast the number of sales in the three market categories. Next, we forecast the supplies needed to manufacture these products. Using estimated costs for labor, we forecast the number of direct jobs created. Using these factors, we forecast the tax revenue to the states.

In addition to direct jobs created by the manufacturing process, there is an additional economic benefit. The new jobs created and the income generated will be spread to local communities. As new jobs are created, additional money is spent at the local level, creating additional demand for local services which, in turn, creates even more jobs (i.e., grocery clerks, barbers, school teachers, home builders, etc.). These indirect and induced jobs are forecast and included in the total jobs created.

The economic benefits to individual states will not be evenly distributed. The following 10 states are predicted to see the most gains in terms of job creation and additional revenue as production of UAS increase, totaling more than $82 billion in economic impact from 2015-2025 (Table 1).

In rank order they are:

1) California
2) Washington
3) Texas
4) Florida
5) Arizona
6) Connecticut
7) Kansas
8) Virginia
9) New York
10) Pennsylvania

It is important to note that the projections contained in this report are based on the current airspace activity and infrastructure in a given state. As a result, states with an already thriving aerospace industry are projected to reap the most economic gains. However, a variety of factors—state laws, tax incentives, regulations, the establishment of test sites and the adoption of UAS technology by end users—will ultimately determine where jobs flow.

By 2025, we estimate more than 100,000 new jobs will be created nationally. For the purposes of this report, we base the 2025 state economic projections on the current aerospace employment in the states. We also presume that none of the states have enacted restrictive legislation or regulations that would limit the expansion of the technology. These landscapes will likely shift, however, as states work to attract UAS jobs in the years following integration. Future state laws and regulations could also cause some states to lose jobs while others stand to gain jobs. In conclusion, while we project more than 100,000 new jobs by 2025, states that create favorable regulatory and business environments for the industry and the technology will likely siphon jobs away from states that do not.

The trend in total spending, total economic impact and total employment impact was investigated for 2015 through 2025. The total spending in UAS development and total economic and employment impacts are expected to increase significantly in the next five years. This study demonstrates the significant contribution of UAS development and integration in the nation's airspace to the economic growth and job creation in the aerospace industry and to the social and economic progress of the citizens in the U.S. See Table 1 for the results of the total impact of UAS integration in the United States.

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Table 1: Total Economic Impact of UAS Integration in the United States						
	2015 - 2017			2015-2025		
State	Economic Impact $(M)	Taxes ($M)	Jobs Created	Economic Impact ($M)	Taxes ($M)	Jobs Created
Alabama	$294	$2.43	1,510	$1,765	$14.60	2,231
Alaska	$19	$0.00	95	$112	$0.00	141
Arizona	$561	$2.59	2,883	$3,371	$15.55	4,260
Arkansas	$80	$0.94	411	$481	$5.63	608
California	$2,390	$13.64	12,292	$14,372	$82.03	18,161
Colorado	$232	$1.79	1,191	$1,392	$10.76	1,760
Connecticut	$538	$4.32	2,764	$3,232	$25.97	4,084
Delaware	$17	$0.16	88	$103	$0.97	131
Florida	$632	$0.00	3,251	$3,801	$0.00	4,803
Georgia	$379	$3.72	1,949	$2,279	$22.34	2,880
Hawaii	$32	$0.39	166	$194	$2.35	245
Idaho	$29	$0.36	149	$174	$2.16	220
Illinois	$204	$1.71	1,049	$1,226	$10.30	1,549
Indiana	$208	$1.18	1,067	$1,248	$7.12	1,577
Iowa	$159	$0.92	817	$956	$5.53	1,208
Kansas	$489	$4.84	2,515	$2,941	$29.13	3,716
Kentucky	$89	$0.90	459	$537	$5.41	678
Louisiana	$213	$1.44	1,097	$1,282	$8.67	1,620
Maine	$107	$1.26	548	$641	$7.56	810
Maryland	$335	$2.64	1,725	$2,017	$15.85	2,549
Massachusetts	$386	$3.36	1,985	$2,321	$20.22	2,933
Michigan	$188	$1.37	965	$1,128	$8.26	1,426
Minnesota	$142	$1.68	730	$853	$10.08	1,078
Mississippi	$162	$1.10	832	$973	$6.60	1,230
Missouri	$260	$1.73	1,338	$1,565	$10.37	1,978
Montana	$14	$0.15	74	$86	$0.91	109
Nebraska	$25	$0.22	128	$149	$1.30	189
Nevada	$38	$0.00	196	$229	$0.00	290
New Hampshire	$85	$0.00	439	$514	$0.00	649
New Jersey	$263	$3.24	1,353	$1,582	$19.50	1,999
New Mexico	$101	$0.73	518	$606	$4.41	765
New York	$443	$4.66	2,276	$2,661	$28.05	3,363
North Carolina	$153	$1.79	785	$918	$10.75	1,160
North Dakota	$14	$0.07	71	$83	$0.40	105
Ohio	$359	$2.43	1,844	$2,156	$14.60	2,725
Oklahoma	$106	$0.93	545	$637	$5.61	805
Oregon	$81	$0.41	416	$486	$2.47	614
Pennsylvania	$393	$2.02	2,021	$2,363	$12.12	2,986
Rhode Island	$42	$0.38	217	$253	$2.28	320
South Carolina	$99	$1.16	507	$593	$6.99	749
South Dakota	$9	$0.00	48	$56	$0.00	71
Tennessee	$112	$0.00	578	$675	$0.00	853
Texas	$1,087	$0.00	5,588	$6,533	$0.00	8,256
Utah	$143	$1.21	735	$859	$7.26	1,085
Vermont	$36	$0.47	184	$215	$2.81	271
Virginia	$463	$4.47	2,380	$2,783	$26.86	3,517
Washington	$1,312	$0.00	6,746	$7,888	$0.00	9,967
West Virginia	$47	$0.47	240	$280	$2.83	354
Wisconsin	$88	$0.96	450	$527	$5.76	665
Wyoming	$5	$0.00	24	$28	$0.00	36
Total	$13,657	$80.22	70,240	$82,124	$482.39	103,776

Forecast

In this chapter, we describe the methodology for the forecasts we used as inputs to the economic benefits section. In accomplishing this task, we were fortunate to obtain and use comparable product sales from other countries. In making the forecasts, we relied on four different methods:

1) Comparable sales from other countries;
2) Survey results;
3) Land ratios; and
4) A literature search on rates of adoption of new technology.

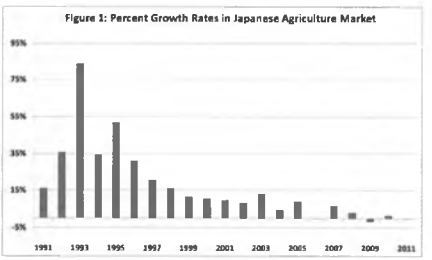
The four different methodologies yielded similar results and provide confidence in our final results.

Throughout this study, we use the following terms. When we use the term output, we are referring to the UAS. The inputs to the UAS are the parts and labor that go into making these products. In turn, the parts that go into the inputs we refer to as derived demand.

As part of this section, we provide a detailed discussion of the factors that may make our forecasts inaccurate and their potential impact. Our forecasts are for an 11-year period. That unit of measurement was chosen as that is the expected life of a UAS. We did not include maintenance, training or other revenue streams, which makes our overall estimates conservative. In addition, there are multiple options on sales including leasing the equipment and having third-party providers as an outsourced service, all of which add to our conservative estimates.

Sales in Foreign Countries

Other countries have already adopted UAS technology from a zero base (i.e., first year of adoption). By now, these technologies have been operational for more than two decades. The growth curve is found to be logistic with a rapid beginning and then a leveling off of the market (Figure 1). The issue is not whether these products will be adopted once the airspace is integrated, but at what rate(s). The experience in Japan started out at rates of growth in excess of 20% annually. This was from no unmanned vehicles in 1990 (i.e., the zero base), where neither the companies nor the consumers had previous experience with this technology (see Appendix A for detailed data).



As is readily apparent, the growth rates in the early years in Japan were very high. The question of interest is: How fast will growth occur in the U.S.? We chose a short time period for growth in the U.S. (doubling the first year, 50% growth the next year and thereafter a 5% growth rate). Our justification is as follows. First, there is considerable experience with these products. American farmers are not starting out from a zero-knowledge base as did Japan. Second, UAS are not sold in the U.S. domestic market only because FAA regulations prohibit them in the nation's airspace. It is noted that the dampening of the Japanese growth curve happened within six years. The literature review found higher initial rates of product acceptance than the previous Japanese experience and lower leveling off of rates.

Adoption Rates of New Technology

There are many factors that influence the rate at which new technologies are adopted and diffused into a society. We found considerable literature on this topic. The conclusion from the brief search we conducted is that new technologies are either accepted or rejected quickly. There is already a trade association that is doing outreach to the primary targets and showing products in their trade show(s). Because there is previous experience in this field, we reject the notion that these products will not be adopted. However, it is suggested that a follow up to this study be conducted on adoption of new technology. There is considerable literature on this topic, which needs to be investigated, and will help develop further adoption strategies.

Methodology

We performed three separate forecasts for this study:

1) The estimated number of sales by state;
2) The estimated sales by state for the inputs to the final product; and
3) The estimated sales by state for the derived demand for the final products.

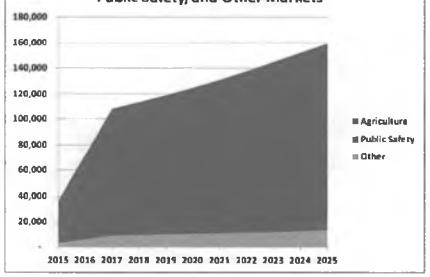
To complete these forecasts, we developed a telephone survey and pilot-tested it on five participants to refine our survey questions. We next conducted 30 telephone interviews with industry experts. An industry expert was defined as a person with more than three years of practical and relevant experience. Each interview lasted about 30 minutes. The participants were guaranteed confidentiality so we cannot divulge the individual results. However, we were able to obtain a reasonable estimate on what the group as a whole felt was the size of the market and the cost structure. Because there was considerable variance in these estimates, we ignored the outliers and calculated the average cost structure. We estimate that approximately 60% of the overall cost of a UAS is parts with an average annual labor cost of $37,000. In this report, we use $40,000 and hold it at a constant cost, as we do with the parts numbers. Thus the results can be interpreted as constant dollars over the entire term, as we are not forecasting the inflation rate. As for profitability, we consider this a competitive industry with a normal rate of return.

We found that almost all respondents considered agriculture to be far and above the largest market given that the public safety market is limited by the number of first-response teams. We next looked at some simple ratios between UAS sales in Japan and the amount of arable farmland and imputed these ratios to the United States. The survey results indicated an agricultural market of approximately 150,000 unit sales per year at maturity (i.e., 2020), and the Japanese land ratio indicated a market size of 165,000 unit sales per year. For the purposes of this forecast, we used 100,000 unit sales per year as a conservative benchmark. See Figure 2 for total expected sales for 2015-2025. Actual sales could be a multiple of this estimate.

As to the public safety market, the consensus was that the agriculture market will be at least 10 times the public safety market. Our follow-up task to the questionnaire was to find the number of first-response domestic teams and survey a small number of this group. We found their purchase issues to be minimal. They simply have a budget given to them by the local governmental unit that oversees them, and they work within it. Purchases of this size are not uncommon and public safety officials have all of the appearances of being early adopters, especially when safety is involved.

During the survey interviews, we discovered that there were unlimited uses of UAS. For example, many respondents discussed the potential uses of UAS for real estate purposes or for examining oil pipelines. In the case of oil pipelines, the consensus of the experts was that the total annual sale was approximately 1,000 units. For real estate personnel, there was not a consensus. From the surveys and follow-up calls with other professionals, we estimate that the aggregate size for other sales was approximately 10% of the total. In reality, this figure is a lower boundary and should be interpreted as at least 10% of the total. Depending on the promotions to this segment, the final price and, most importantly, the federal regulations, this segment could be significantly larger. We estimate the lower boundary at 10% to be conservative.

Figure 2: Annual UAS Sales for Agriculture, Public Safety, and Other Markets



In making the first round of forecasts, we tried several different methods but ultimately used a ratio of the number of direct aerospace and defense (A&D) industry employees in each state[4] to the total number of direct A&D industry employees in the U.S. For example, Alabama has an estimated 23,090 direct A&D industry employees out of a total of 1,040,796 direct A&D employees in the U.S., or 2.22% of the total. So we took the total forecast of agriculture sales and multiplied by 2.22% for Alabama. See Table 2 for a complete list of states and their estimated manufacturing distribution.

For the inputs, we find no constraints. There are plenty of manufacturers of these parts; they are off-the-shelf and require little lead time. If one supply line goes down, there are multiple sources as backups. For the input forecast, we relied on the size of the aerospace labor force in each state as the metric. These numbers were obtained from a Deloitte report, commissioned by the Aerospace Industries Association, titled "The Aerospace and Defense Industry in the U.S.: A Financial and Economic Impact Study"[5]. In this forecast, we also looked at employment and taxes. Using the estimated labor dollar amount, we simply divided by 40,000 to find the number of jobs. Subtracting adjacent years yields the number of new jobs created. We used marginal state tax rates for the $40,000 income range, the assumption being that states will hold this rate constant over time.

Table 2: Estimated Manufacturing Distribution

State	Manufacturing Distribution	State	Manufacturing Distribution
Alabama	2.22%	Montana	0.11%
Alaska	0.15%	Nebraska	0.19%
Arizona	4.10%	Nevada	0.30%
Arkansas	0.61%	New Hampshire	0.67%
California	15.58%	New Jersey	1.99%
Colorado	1.77%	New Mexico	0.78%
Connecticut	3.95%	New York	3.30%
Delaware	0.13%	North Carolina	1.17%
Florida	4.74%	North Dakota	0.11%
Georgia	2.83%	Ohio	2.71%
Hawaii	0.25%	Oklahoma	0.81%
Idaho	0.22%	Oregon	0.63%
Illinois	1.56%	Pennsylvania	3.00%
Indiana	1.59%	Rhode Island	0.32%
Iowa	1.24%	South Carolina	0.76%
Kansas	3.54%	South Dakota	0.07%
Kentucky	0.69%	Tennessee	0.81%
Louisiana	1.65%	Texas	8.43%
Maine	0.82%	Utah	1.10%
Maryland	2.53%	Vermont	0.27%
Massachusetts	2.90%	Virginia	3.55%
Michigan	1.44%	Washington	9.02%
Minnesota	1.09%	West Virginia	0.36%
Mississippi	1.25%	Wisconsin	0.67%
Missouri	1.97%	Wyoming	0.04%

4Deloitte, The Aerospace and Defense Industry in the U.S., A financial and economic impact study, March, 2012
5http://www.deloitte.com/view/en_US/us/Industries/Aerospace-Defense-Manufacturing/b4c8ae98118f5310VgnVCM3000001c56f00aRCRD.htm

Necessary Conditions for the Forecasts

We now turn our attention to the conditions that must happen to validate this forecast:

1) The FAA must develop new regulations integrating UAS into the nation's airspace;
2) Job growth distribution will mimic current aerospace manufacturing employment;
3) Creative destruction of existing jobs will have a net-zero impact;
4) There must be sufficient capital available to smaller manufacturing companies;
5) There must be financing available to UAS purchasers;
6) There must be insurance to cover liabilities;
7) Gross Domestic Product (GDP) needs to grow at least 3% annually over the designated time period;
8) The adoption rate(s) of this product in the U.S. will mimic Japan; and
9) Other unforeseen factors.

The FAA Must Develop New Regulations Integrating UAS into the Nation's Airspace

Perhaps the single most important aspect of this forecast is that the FAA develops new guidelines allowing the integration of UAS in the nation's airspace. In the absence of these guidelines, this report is simply the opportunity cost to the economy (new jobs, tax revenue, etc.) of a good idea that was hindered due to government interference or inaction. The FAA regulatory process, like all government entities, is slow and unpredictable.

Job Growth Distribution Will Mimic Current Aerospace Manufacturing Employment

The employment growth described in this report is all new employment, that is, jobs that do not currently exist. To project the statewide distribution of this employment, we used current aerospace manufacturing employment. However, there are many external factors that will affect this distribution that are impossible to predict in this report. These include, among other things, tax incentives, test sites and where new product development will actually occur.

Creative Destruction of Existing Jobs Will Have a Net Zero Impact

As UAS are introduced, some uses will replace existing capabilities, because there are efficiencies to be gained by using a UAS versus a traditional capability. As such, there is likely to be some job destruction from UAS. However, UAS will still need many similar capabilities to manned systems including training, maintenance and pilots. Any jobs that will be made immaterial by UAS will be transitioned to regular UAS operations. Because of the efficient use of UAS, there will be job creation in other areas. For instance, a farmer that saves money because he or she can use less pesticide since UAS can provide precision application will spend less money on pesticides and less on taxes due to pesticide use. That money back into the farmer's pocket will provide economic impact to the U.S. that is not calculated in this report. To simplify, we generalize that there will be a net-zero impact of job creation in the application of these systems. A detailed analysis of this potential job creation is recommended for further research.

There Must be Sufficient Capital Available to Smaller Manufacturing Companies

One of the biggest problems with growing companies is their access to capital. As companies grow, their need for capital to buy new equipment, hire additional personnel, rent extra space and all of the other requirements are seldom met from working capital. The need for short-term working capital to accommodate growth can stymie any otherwise well thought out business plan.

There Must be Financing Available to UAS Purchasers

While the costs of these purchases are not the same as other farm equipment, they are seldom made as a cash purchase. Farm implements, such as tractors, are usually bought with company financing as they do not have serial numbers like cars. Banks may finance a tractor, but usually at a higher interest rate with the credit worthiness of the person as the collateral. This means that the industry or consortia of companies will need to be created for these purchases. There is probably less of a need for these arrangements for public safety, but they are only a shadow market compared to the agriculture market. It is clear that offering financing from a small company standpoint, outside of normal banking realms, is impossible and impractical at this time. This may be one of the most important factors outside of regulation reform to move this industry forward.

Insurance to Cover Liabilities Must be Supplied

One of the many great unknowns about the infant commercial UAS industry is its product liability exposure. Suppose a UAS used by a public safety agency malfunctions and crashes into a building. The assumption is that this event is covered by the local government's umbrella insurance policy. What if this happens elsewhere? Perhaps the thrust of this argument is that the industry as a whole needs to start collecting relevant data in this realm. A Google search on this topic turned up little information, as governments use UAS mainly for wartime purposes. However, anything mechanical can malfunction, and a UAS is no exception. There will be issues of proper maintenance and liability, as there always are with aircraft of any type, in addition to workmen's compensation and other potential problems. The long-term issue is the need for industry-wide data collection.

GDP Needs to Grow at Least 3% Annually Over the Designated Time Period

All studies of this nature require GDP assumptions. The typical scenario is that over a longer time period, the economy will grow at 3% per year. This is our assumption as well. Our forecast is that with new and improved products, they will grow at a slightly higher rate.

There may be several problems with this assumption. First, the current economic stagnation may persist. If so, this may favor sunken capital over new capital. Thus, we may see growth, but at a much later date, and significantly slower growth thereafter. If this happens, it has the potential to make our forecast inaccurate.

The Adoption Rate(s) of this Product in the U.S. Will Mimic Japan

Consumers in different countries or even different segments of the same country can react differently to the same product offering. Our assumption is that consumers in both countries will react similarly.

Other Unforeseen Factors

Any researcher knows that economic analysis and forecasts may not include hundreds of unforeseen events that impact economic estimates that were not taken into account. Any of these may materially affect our forecast.

Discussion of Forecast Results

In this section, we will discuss the forecast results for the year 2015, which is the first forecast year. Table 3 shows the rank ordering of UAS manufacturing by state for agriculture uses in 2015, and Table 4 shows it for public safety. Other markets besides agriculture and public safety are estimated to have the same total economic impact as the public safety market, so in the following we only show the agriculture and public safety markets. Final economic impact calculations include agriculture, public safety and other markets (i.e., the public safety total economic impact multiplied by two to account for "other markets").

Table 3: 2015 Total UAS Agriculture Sales Inputs

State	Labor	Parts	Taxes	Employment
California	$65,438,414	$ 98,157,622	$2,094,029	1,636
Washington	$37,902,240	$ 56,853,360	$ -	948
Texas	$35,422,907	$ 53,134,361	$ -	886
Florida	$19,927,882	$ 29,891,823	$ -	498
Arizona	$17,225,796	$ 25,838,695	$ 396,882	431
Connecticut	$16,575,698	$ 24,863,547	$ 663,028	414
Virginia	$14,907,071	$ 22,360,607	$ 685,725	373
Kansas	$14,873,981	$ 22,310,972	$ 743,699	372
New York	$13,878,051	$ 20,817,077	$ 716,107	347
Pennsylvania	$12,598,434	$ 18,897,651	$ 309,418	315
Massachusetts	$12,175,124	$ 18,262,685	$ 516,225	304
Georgia	$11,882,156	$ 17,823,233	$ 570,343	297
Ohio	$11,362,400	$ 17,043,599	$ 372,687	284
Maryland	$10,645,314	$ 15,967,971	$ 404,522	266
Alabama	$ 9,317,676	$ 13,976,514	$ 372,707	233
New Jersey	$ 8,353,625	$ 12,530,438	$ 497,876	209
Missouri	$ 8,276,550	$ 12,414,825	$ 264,850	207
Colorado	$ 7,416,208	$ 11,124,313	$ 274,696	185
Louisiana	$ 6,918,647	$ 10,377,970	$ 221,397	173
Indiana	$ 6,686,613	$ 10,029,919	$ 181,876	167
Illinois	$ 6,571,201	$ 9,856,802	$ 262,848	164
Michigan	$ 6,060,323	$ 9,090,485	$ 210,899	152
Mississippi	$ 5,268,583	$ 7,902,874	$ 168,595	132
Iowa	$ 5,193,121	$ 7,789,682	$ 141,253	130
North Carolina	$ 4,898,943	$ 7,348,414	$ 274,341	122
Utah	$ 4,636,240	$ 6,954,360	$ 185,450	116
Minnesota	$ 4,561,989	$ 6,842,984	$ 257,296	114
Maine	$ 3,444,594	$ 5,166,891	$ 192,897	86
Oklahoma	$ 3,410,294	$ 5,115,440	$ 143,232	85
Tennessee	$ 3,390,117	$ 5,085,175	$ -	85
New Mexico	$ 3,271,880	$ 4,907,821	$ 112,553	82
South Carolina	$ 3,185,523	$ 4,778,285	$ 178,389	80
Kentucky	$ 2,877,624	$ 4,316,437	$ 138,176	72
Wisconsin	$ 2,825,568	$ 4,238,352	$ 146,930	71
New Hampshire	$ 2,817,497	$ 4,226,246	$ -	70
Oregon	$ 2,632,274	$ 3,948,411	$ 63,175	66
Arkansas	$ 2,565,690	$ 3,848,535	$ 143,679	64
West Virginia	$ 1,504,791	$ 2,257,186	$ 72,230	38
Rhode Island	$ 1,364,360	$ 2,046,539	$ 58,326	34
Nevada	$ 1,255,001	$ 1,882,501	$ -	31
Vermont	$ 1,150,888	$ 1,726,333	$ 71,815	29
Hawaii	$ 1,041,126	$ 1,561,689	$ 59,969	26
Idaho	$ 932,978	$ 1,399,467	$ 55,232	23
Nebraska	$ 807,478	$ 1,211,217	$ 33,074	20
Alaska	$ 611,763	$ 917,644	$ -	15
Delaware	$ 557,285	$ 835,928	$ 24,743	14
Montana	$ 462,857	$ 694,286	$ 23,328	12
North Dakota	$ 453,576	$ 680,364	$ 10,233	11
South Dakota	$ 305,881	$ 458,822	$ -	8
Wyoming	$ 155,765	$ 233,648	$ -	4

Table 4: 2015 Total UAS Public Safety Sales Inputs

State	Labor	Parts	Taxes	Employment
California	$ 2,804,503	$ 4,206,755	$ 89,744	70
Washington	$ 1,624,382	$ 2,436,573	$ -	41
Texas	$ 1,518,125	$ 2,277,187	$ -	38
Florida	$ 854,052	$ 1,281,078	$ -	21
Arizona	$ 738,248	$ 1,107,373	$ 17,009	18
Connecticut	$ 710,387	$ 1,065,581	$ 28,415	18
Virginia	$ 638,874	$ 958,312	$ 29,388	16
Kansas	$ 637,456	$ 956,184	$ 31,873	16
New York	$ 594,774	$ 892,160	$ 30,690	15
Pennsylvania	$ 539,933	$ 809,899	$ 13,261	13
Massachusetts	$ 521,791	$ 782,687	$ 22,124	13
Georgia	$ 509,235	$ 763,853	$ 24,443	13
Ohio	$ 486,960	$ 730,440	$ 15,972	12
Maryland	$ 456,228	$ 684,342	$ 17,337	11
Alabama	$ 399,129	$ 598,993	$ 15,973	10
New Jersey	$ 358,013	$ 537,019	$ 21,338	9
Missouri	$ 354,709	$ 532,064	$ 11,351	9
Colorado	$ 317,838	$ 476,756	$ 11,773	8
Louisiana	$ 296,513	$ 444,770	$ 9,488	7
Indiana	$ 286,569	$ 429,854	$ 7,795	7
Illinois	$ 281,623	$ 422,434	$ 11,265	7
Michigan	$ 259,728	$ 389,592	$ 9,039	6
Mississippi	$ 225,796	$ 338,695	$ 7,225	6
Iowa	$ 222,562	$ 333,844	$ 6,054	6
North Carolina	$ 209,955	$ 314,932	$ 11,757	5
Utah	$ 198,696	$ 298,044	$ 7,948	5
Minnesota	$ 195,514	$ 293,271	$ 11,027	5
Maine	$ 147,625	$ 221,438	$ 8,267	4
Oklahoma	$ 146,155	$ 219,233	$ 6,139	4
Tennessee	$ 145,291	$ 217,936	$ -	4
New Mexico	$ 140,223	$ 210,335	$ 4,824	4
South Carolina	$ 136,522	$ 204,784	$ 7,645	3
Kentucky	$ 123,327	$ 184,990	$ 5,920	3
Wisconsin	$ 121,096	$ 181,644	$ 6,297	3
New Hampshire	$ 120,750	$ 181,125	$ -	3
Oregon	$ 112,812	$ 169,218	$ 2,707	3
Arkansas	$ 109,958	$ 164,937	$ 6,158	3
West Virginia	$ 64,491	$ 96,737	$ 3,096	2
Rhode Island	$ 58,473	$ 87,709	$ 2,500	1
Nevada	$ 53,786	$ 80,679	$ -	1
Vermont	$ 49,324	$ 73,986	$ 3,078	1
Hawaii	$ 44,620	$ 66,930	$ 2,570	1
Idaho	$ 39,985	$ 59,977	$ 2,367	1
Nebraska	$ 34,606	$ 51,909	$ 1,417	1
Alaska	$ 26,218	$ 39,328	$ -	1
Delaware	$ 23,884	$ 35,825	$ 1,060	1
Montana	$ 19,837	$ 29,755	$ 1,000	0
North Dakota	$ 19,439	$ 29,158	$ 439	0
South Dakota	$ 13,109	$ 19,664	$ -	0
Wyoming	$ 6,676	$ 10,013	$ -	0

The next series of tables we refer to as derived demand. The products that are used as inputs are manufactured by other companies, and the platform manufacturer must buy inputs for their finished goods. Table 5 shows the results for the derived demand for inputs for agriculture and Table 6 for public safety.

Table 5: 2015 Total UAS Agriculture Derived Demand

State	Labor	Parts	Taxes	Employment
California	$ 39,263,049	$ 58,894,573	$ 1,256,418	982
Washington	$ 22,741,344	$ 34,112,016	$ -	569
Texas	$ 21,253,744	$ 31,880,616	$ -	531
Florida	$ 11,956,729	$ 17,935,094	$ -	299
Arizona	$ 10,335,478	$ 15,503,217	$ 238,129	258
Connecticut	$ 9,945,419	$ 14,918,128	$ 397,817	249
Virginia	$ 8,944,243	$ 13,416,364	$ 411,435	224
Kansas	$ 8,924,389	$ 13,386,583	$ 446,219	223
New York	$ 8,326,831	$ 12,490,246	$ 429,664	208
Pennsylvania	$ 7,559,061	$ 11,338,591	$ 185,651	189
Massachusetts	$ 7,305,074	$ 10,957,611	$ 309,735	183
Georgia	$ 7,129,293	$ 10,693,940	$ 342,206	178
Ohio	$ 6,817,440	$ 10,226,160	$ 223,612	170
Maryland	$ 6,387,188	$ 9,580,782	$ 242,713	160
Alabama	$ 5,590,606	$ 8,385,908	$ 223,624	140
New Jersey	$ 5,012,175	$ 7,518,263	$ 298,726	125
Missouri	$ 4,965,930	$ 7,448,895	$ 158,910	124
Colorado	$ 4,449,725	$ 6,674,588	$ 164,818	111
Louisiana	$ 4,151,188	$ 6,226,782	$ 132,838	104
Indiana	$ 4,011,968	$ 6,017,952	$ 109,126	100
Illinois	$ 3,942,721	$ 5,914,081	$ 157,709	99
Michigan	$ 3,636,194	$ 5,454,291	$ 126,540	91
Mississippi	$ 3,161,150	$ 4,741,725	$ 101,157	79
Iowa	$ 3,115,873	$ 4,673,809	$ 84,752	78
North Carolina	$ 2,939,366	$ 4,409,048	$ 164,604	73
Utah	$ 2,781,744	$ 4,172,616	$ 111,270	70
Minnesota	$ 2,737,193	$ 4,105,790	$ 154,378	68
Maine	$ 2,066,757	$ 3,100,135	$ 115,738	52
Oklahoma	$ 2,046,176	$ 3,069,264	$ 85,939	51
Tennessee	$ 2,034,070	$ 3,051,105	$ -	51
New Mexico	$ 1,963,128	$ 2,944,692	$ 67,532	49
South Carolina	$ 1,911,314	$ 2,866,971	$ 107,034	48
Kentucky	$ 1,726,575	$ 2,589,862	$ 82,876	43
Wisconsin	$ 1,695,341	$ 2,543,011	$ 88,158	42
New Hampshire	$ 1,690,498	$ 2,535,748	$ -	42
Oregon	$ 1,579,364	$ 2,369,046	$ 37,905	39
Arkansas	$ 1,539,414	$ 2,309,121	$ 86,207	38
West Virginia	$ 902,874	$ 1,354,312	$ 43,338	23
Rhode Island	$ 818,616	$ 1,227,924	$ 34,996	20
Nevada	$ 753,001	$ 1,129,501	$ -	19
Vermont	$ 690,533	$ 1,035,800	$ 43,089	17
Hawaii	$ 624,676	$ 937,014	$ 35,981	16
Idaho	$ 559,787	$ 839,680	$ 33,139	14
Nebraska	$ 484,487	$ 726,730	$ 19,845	12
Alaska	$ 367,058	$ 550,586	$ -	9
Delaware	$ 334,371	$ 501,557	$ 14,846	8
Montana	$ 277,714	$ 416,572	$ 13,997	7
North Dakota	$ 272,146	$ 408,218	$ 6,140	7
South Dakota	$ 183,529	$ 275,293	$ -	5
Wyoming	$ 93,459	$ 140,189	$ -	2

Table 6: 2015 Total UAS Public Safety Derived Demand

State	Labor	Parts	Taxes	Employment
California	$ 1,682,702	$ 2,524,053	$ 53,846	42
Washington	$ 974,629	$ 1,461,944	$ -	24
Texas	$ 910,875	$ 1,366,312	$ -	23
Florida	$ 512,431	$ 768,647	$ -	13
Arizona	$ 442,949	$ 664,424	$ 10,206	11
Connecticut	$ 426,232	$ 639,348	$ 17,049	11
Virginia	$ 383,325	$ 574,987	$ 17,633	10
Kansas	$ 382,474	$ 573,711	$ 19,124	10
New York	$ 356,864	$ 535,296	$ 18,414	9
Pennsylvania	$ 323,960	$ 485,940	$ 7,956	8
Massachusetts	$ 313,075	$ 469,612	$ 13,274	8
Georgia	$ 305,541	$ 458,312	$ 14,666	8
Ohio	$ 292,176	$ 438,264	$ 9,583	7
Maryland	$ 273,737	$ 410,605	$ 10,402	7
Alabama	$ 239,597	$ 359,396	$ 9,584	6
New Jersey	$ 214,808	$ 322,211	$ 12,803	5
Missouri	$ 212,826	$ 319,238	$ 6,810	5
Colorado	$ 190,703	$ 286,054	$ 7,064	5
Louisiana	$ 177,908	$ 266,862	$ 5,693	4
Indiana	$ 171,941	$ 257,912	$ 4,677	4
Illinois	$ 168,974	$ 253,461	$ 6,759	4
Michigan	$ 155,837	$ 233,755	$ 5,423	4
Mississippi	$ 135,478	$ 203,217	$ 4,335	3
Iowa	$ 133,537	$ 200,306	$ 3,632	3
North Carolina	$ 125,973	$ 188,959	$ 7,054	3
Utah	$ 119,218	$ 178,826	$ 4,769	3
Minnesota	$ 117,308	$ 175,962	$ 6,616	3
Maine	$ 88,575	$ 132,863	$ 4,960	2
Oklahoma	$ 87,693	$ 131,540	$ 3,683	2
Tennessee	$ 87,174	$ 130,762	$ -	2
New Mexico	$ 84,134	$ 126,201	$ 2,894	2
South Carolina	$ 81,913	$ 122,870	$ 4,587	2
Kentucky	$ 73,996	$ 110,994	$ 3,552	2
Wisconsin	$ 72,657	$ 108,986	$ 3,778	2
New Hampshire	$ 72,450	$ 108,675	$ -	2
Oregon	$ 67,687	$ 101,531	$ 1,624	2
Arkansas	$ 65,975	$ 98,962	$ 3,695	2
West Virginia	$ 38,695	$ 58,042	$ 1,857	1
Rhode Island	$ 35,084	$ 52,625	$ 1,500	1
Nevada	$ 32,271	$ 48,407	$ -	1
Vermont	$ 29,594	$ 44,391	$ 1,847	1
Hawaii	$ 26,772	$ 40,158	$ 1,542	1
Idaho	$ 23,991	$ 35,986	$ 1,420	1
Nebraska	$ 20,764	$ 31,146	$ 850	1
Alaska	$ 15,731	$ 23,597	$ -	0
Delaware	$ 14,330	$ 21,495	$ 636	0
Montana	$ 11,902	$ 17,853	$ 600	0
North Dakota	$ 11,663	$ 17,495	$ 263	0
South Dakota	$ 7,866	$ 11,798	$ -	0
Wyoming	$ 4,005	$ 6,008	$ -	0

Forecast Conclusion

In this section, we outline the assumptions and methodology used in making our forecasts. We drew on experience in Japan for comparable sales. Japan and the U.S. are both countries that readily adapt new technologies. We conclude the following:

1) If the FAA adopts new rules allowing for commercial use of UAS in the nation's airspace, these products will be received rapidly into the marketplace;

2) The doubling rate can take place over either a three-year or six-year period. With the known rates of change in newer technologies, it is likely to be a three-year scenario given the fact that the potential marketplace is well aware of the product(s) unlike the introduction in Japan; and

3) The commercial agriculture market is by far the largest segment, dwarfing all others.

Agriculture is an important product group. It has the potential for bringing a more reliable, cost-effective and safe method to domestic farmers for a variety of uses. In the event that a new set of regulations is not enacted and UAS are not integrated in the U.S. National Airspace System (NAS), this study estimates the lost jobs, lost tax revenue, and total economic loss to the states and nation. In addition, a delay in airspace integration will impact the U.S. in terms of a lag in technology development, manufacturing, job development and economic stimulus. With U.S. integration of UAS, more than 103,000 good paying jobs with benefits will be created.

While this section shows the huge potential available to the nation, the exact calculations of these benefits are laid out in the next section, where we estimate the total economic impact of NAS integration.

Economic Impact Analysis

Economic impact is based on the theory that a dollar flowing into a local economy from the outside is a benefit to the regional economy. The financial return for residents is in the form of new jobs, more earnings and new tax revenues that follow because of the initial development of a new business organization, and through new spending, in the municipality due to the operation of such a business or industry. These earnings, for instance, are generated for residents who are not directly associated with the business but who are the beneficiaries of the positive externalities that the business or industry can provide to communities.

External benefits, or positive externalities, are those returns that are generated by a business but that are not captured by the business or local region. When the employees of a company spend money at local businesses, such as restaurants, gas stations and retail stores, their spending will benefit the owners and employees of those establishments, thereby creating a positive incremental impact.

According to Davis (1990) an impact analysis is purposely designed to produce quantitative results of the effects that a certain segment of an industry has in the local economy. From an industry's standpoint, these impact studies are based on the grounds of aggregate economic growth that may be derived from additional spending by the business. The range of the impact can be limited to the city, county, state or national levels.

There are various methodologies that aid the economic valuation of specific organizations in their local economies. From the literature review, we concluded that Economic Impact Analysis (EIA) mostly relies on input-output economic models. Economists evaluate the impact that one sector has on another in terms of indirect and induced effects. The total economic impact is then the sum of the direct, indirect and induced effects.

Direct Impacts

Direct impacts are consequences of economic activities carried out by a company or organization in the economy. For example, institutions (public or private) have a direct impact on the local economy because of the activities conducted by the institution, management, employees, visitors and other related events. Employing labor, purchasing locally produced goods and services, and contracting for construction and capital improvements are all examples of activities that generate direct impacts. Some direct impacts, such as UAS, occur on site. Others, such as local production of goods and services for use at the institution, may occur off site.

Expenditures by management, owners and visitors also generate direct impacts, but only those expenditures that lead to local business activity are relevant for a regional economic assessment. For this reason, it is important to distinguish between (a) the local value-added component of expenditures and (b) the regional import component. Thus, the manufacturers of UAS expenditures on utilities, supplies, professional services, meals and entertainment generate significant economic benefits to the local and national economy. In most parts of the country, only the former component is relevant for the analysis. The following is a list of local value-added components:

- Direct Spending Effects:
  Construction, maintenance, operations
- Direct Business Cost Savings:
  Value of user benefits
- Other Business Cost Savings:
  Logistics/inventory/ processing, scale economies
- Regional Business Markets:
  Tourism, business relocation effects
- Personal Cost Savings:
  Effect on disposable income

The distinguishing feature of a direct impact is that it is an immediate consequence of the manufacturers of UAS' economic activity.

Indirect Impacts

In addition to the direct effect of an economic activity, there are also indirect effects and induced effects. Indirect impacts derive from off-site economic activities that are attributable to the business activities of the manufacturers of UAS' presence. For example, if we are looking at the job impacts of a new UAS being manufactured in Arizona, the direct effect is the number of new jobs created by the company itself. The indirect effect is the number of new jobs created at those firms that supply ancillary services for individuals who are employed at the UAS manufacturing facility and for customers of the firm. These can include, but are not limited to, hotels, restaurants and other businesses that may expand because of the presence of the UAS manufacturing facility. These suppliers and clients employ labor, purchase locally produced goods and services, and invest in capital expansion and improvements. Indirect impacts differ from direct impacts in that they originate entirely off site.

Examples of indirect impacts would be:

- Ancillary business expansion due to the UAS firm;
- New capital investment in response to the UAS firm; and
- Supplies and equipment that may be purchased because of the new business opportunities created by the UAS manufacturing facility.

Induced Impacts

Induced impacts are the result of spending of the wages and salaries of the direct and indirect employees on items such as food, housing, transportation and medical services. In other words, induced effects are the multiplier effects caused by successive rounds of spending throughout the economy as a result of the direct and indirect effects discussed above.

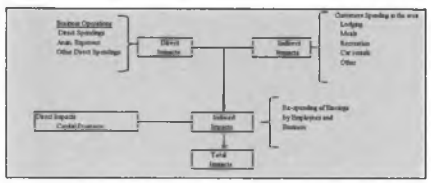
For example, most of the take-home income earned by the manufacturers of UAS employees is spent locally. Some of this spending becomes income to local businesses and their employees that provide services to the firm's employees. Then part of these second-round incomes are also spent locally and thus become income to another set of individuals. As successive rounds of spending occur, additional income is created. Although some of the induced impacts occur locally, some are felt outside the region because of the regional import components of the goods and services purchased. More economically self-sufficient regions have higher multipliers than do regions that are more dependent on regional imports, because more of the spending and respending is accomplished in the area. Similarly, two or more counties considered together as one economic region would have a higher multiplier than would each individual county.

Total Impact

The total impact is the sum of direct impacts, indirect impacts and induced impacts. Total impact is expressed in economic output, earnings or jobs.

Total Impacts = Direct Impacts + Indirect Impacts + Induced Impacts

Economic Impact Overview



Economists sometimes say that the direct economic impacts are "multiplied" through their indirect economic impacts. The ratio of the total (direct + indirect) economic impacts to the direct economic impacts is frequently referred to as the economic multiplier. The employment multiplier is the ratio of total employment to direct employment. The income multiplier is the ratio of total income to direct income created.

Multipliers are not directly observed; rather, they are inferred from an economic model. The direct measure is generally the most accurate since it can be measured more easily, but it only represents a part of the impact, so other multipliers are added to get the total. However, it should be emphasized that the sum of the multipliers is very important since these are virtually the only tools available to researchers attempting to identify the overall impact of activity within a regional economy.

Although a variety of methods can be used to generate economic multipliers, input-output (I-O) models are the most popular tool for such analysis and will be our focus. IMPLAN is a standard economic impact software package used to generate indirect, induced employment and sales estimates. IMPLAN utilizes user-supplied estimates of the direct sales and/or employment and provides associated indirect and induced effects estimates. Direct effects are the changes in the industries to which a final demand change was made; indirect effects are the changes in interindustry purchases as the response to demand of the directly affected industry; and induced effects generally reflect changes in household spending resulting from activity generated by the direct and indirect effects (MIG, p.102).

$$Multiplier = \frac{indirect\ impacts}{direct\ impacts}$$

Previous Economic Impact Studies

Conducting an economic impact study is important, because it is a useful tool to evaluate the economic impact of a business in a community in terms of jobs, income and tax revenue. Ten studies were selected from the literature to illustrate the different facets of economic impact and approaches used to assess impact. The purpose is to illustrate the range of values that may be achieved by different economic entities. The 10 examples are listed below:

- Marshall County Hospital Impact in Marshall County, Kentucky;
- Port of Baltimore impact in Maryland;
- University of Florida in Florida;
- Intel impact in Washington County;
- Intel impact in Oregon;
- Intel impact in Portland, Oregon Metro;
- Boeing impact in Arizona;
- All Acute Care Hospital Systems impact in New Hampshire;
- National Aeronautics and Space Administration (NASA) impact in Florida; and
- Nike impact in Oregon.

Methodology

The aircraft industry, undoubtedly, provides significant economic and social benefits for the regional, state and national economies. Most economic impact analyses utilize input-output models to provide detailed descriptions on how money invested in an economy travels and, through multiplier effects, creates additional employment and income. The basis of these input-output models is a summation of expenditures of the manufacturer (operations, capital and payroll) and the application of the multipliers to account for the interdependency of economic activity in a local economy (Siegfried et al., 2007). There are two well-known input-output programs: Regional Input-Output Modeling System (RIMS II) and the more advanced Impact Analysis for Planning (IMPLAN) software.

To more effectively use the multipliers for impact analysis, users must provide geographically and industrially detailed information

on the initial changes in output, earnings or employment that are associated with the project or program under study.

RIMS II was developed by the Bureau of Economic Analysis (BEA) and is based on an accounting framework called an I-O table, which shows the industrial distribution of inputs purchased and outputs sold for each industry (BEA, 2010). There are two sources for the I-O table: BEA's national I-O table, which shows the input and output structure of nearly 500 U.S. industries, and BEA's regional economic accounts, which are used to adjust the national I-O table to show a region's industrial structure and trading patterns. RIMS II has several advantages:

- Multipliers can be estimated for any region and for any industry;
- Low-cost estimates of regional multipliers because of data source accessibility are available; and
- Expensive surveys and RIMS II-based estimates are similar in magnitude.

IMPLAN is a more specialized software; it captures the actual dollar amounts of all business transactions taking place in a regional economy by utilizing Social Accounting Matrices (SAMs) accounts (IMPLAN, 2011). IMPLAN's advantages are:

- SAMs are a better measure of economic flow as they include "nonmarket" transactions (i.e., taxes and unemployment benefits);
- Multiplier Models are built directly from the region-specific SAMs, which reflect the region's unique structure;
- Trade Flows Method tracks regional purchases by estimating trade flows, allowing for more accurate capturing of indirect effects; and
- Data accessibility is cost effective and efficient.

For this study, we have utilized IMPLAN's input-output software to estimate the direct, indirect and induced effects of UAS integration in the NAS upon the local economy. The estimated economic impacts of this integration for each of the 50 states are provided in Appendix B.

Data

The most common economic measures used in economic impact analysis are:

- Employment [broken down to include full-time equivalents (FTEs)];
- Annual labor income;
- Taxes; and
- Total output or revenue.

This analysis is based on the following data provided by our own forecasts for the 50 states from 2015 through 2025:

1) Total spending by agriculture and public safety in payroll, parts, and taxes;

2) Total direct employment by agriculture and public safety; and

3) State adjustment factors.

Results

For this study, we used IMPLAN's input-output software to estimate the direct, indirect, induced and total effects of UAS integration on the economy of the state of Arizona. Because of the unique nature of manufacturing UAS and the specialized type of workers required, specific project payroll, parts, and taxes for agriculture and public safety were provided. Using the parts manufacturing distribution data in Table 7, we subtracted 4.10% (Arizona) from all values to get a distribution relative to Arizona. We then used this to modify the existing IMPLAN model for the rest of the states. Table 7 shows the adjustment factors to modify the multipliers for all states based on the Arizona multipliers that were derived from the IMPLAN's input output software.

Table 7: Multiplier Adjustment Factors Based on State Arizona's Multiplier

State	Abbreviation	Adjustment Factors	State	Abbreviation	Adjustment Factors
Alabama	AL	-1.88%	Montana	MT	-3.99%
Alaska	AK	-3.96%	Nebraska	NE	-3.91%
Aritona	AZ	0.00%	Nevada	NV	-3.80%
Arkansas	AR	-3.49%	New Hampshire	NH	-3.43%
California	CA	11.48%	New Jersey	NJ	-2.13%
Colorado	CO	-2.34%	New Mexico	NM	-3.32%
Connecticut	CT	-0.15%	New York	NY	-0.80%
Delaware	DE	-3.97%	North Carolina	NC	-2.93%
Florida	FL	0.64%	North Dakota	ND	-3.99%
Georgia	GA	-1.27%	Ohio	OH	-1.40%
Hawaii	HI	-3.85%	Oklahoma	OK	-3.29%
Idaho	ID	-3.88%	Oregon	OR	-3.47%
Illinois	IL	-2.54%	Pennsylvania	PA	-1.10%
Indiana	IN	-2.51%	Rhode Island	RI	-3.78%
Iowa	IA	-2.86%	South Carolina	SC	-3.34%
Kansas	KS	-0.56%	South Dakota	SD	-4.03%
Kentucky	KY	-3.42%	Tennessee	TN	-3.29%
Louisiana	LA	-2.45%	Texas	TX	4.33%
Maine	ME	-3.28%	Utah	UT	-3.00%
Maryland	MD	-1.57%	Vermont	VT	-3.83%
Massachusetts	MA	-1.20%	Virginia	VA	-0.55%
Michigan	MI	-2.66%	Washington	WA	4.92%
Minnesota	MN	-3.02%	West Virginia	WV	-3.74%
Mississippi	MS	-2.85%	Wisconsin	WI	-3.43%
Missouri	MO	-3.13%	Wyoming	WY	-4.06%

Total Economic and Employment Impacts of Agriculture Spending

Table 8 presents the estimated total economic and employment impacts of agriculture spending in all 50 states in 2015. The total economic impact in all 50 states is $2,096.5 million with total job creation of 21,565. The state with the largest economic and employment impacts is California with a total economic impact of about $366.9 million and creation of 3,774 new jobs. Following California are Washington, Texas, Florida and Arizona. The state with the least economic and employment impacts is Wyoming with an estimated $723,647 and creation of seven new jobs.

The average economic and employment impacts of agriculture spending per state are $41,929,742 and creation of 431 new jobs. The standard deviation of economic and employment impacts of agriculture spending are $61,565,404 and 633 new jobs. The large standard deviation indicates the wide variability (spread) of economic and employment impacts among states.

Table 8: 2015 Total Economic Employment Impacts of Agriculture Spending

State	Direct Spending				State + Local Multipliers	Total Economic Impact	Total Employment Impact
	Payroll	Parts	Taxes	Total			
Alabama	$8,371,475	$13,876,974	$312,707	$22,561,157	1.8693	$42,163,812	488
Alaska	$611,785	$917,644	$0	$1,529,428	1.8623	$2,848,213	29
Arizona	$17,328,784	$25,818,696	$266,992	$43,481,573	1.8638	$80,703,516	885
Arkansas	$2,585,890	$5,948,535	$143,676	$8,587,954	1.8716	$16,075,980	199
California	$65,438,414	$98,157,622	$2,284,028	$165,880,065	2.2145	$366,987,512	3,774
Colorado	$7,418,208	$11,124,313	$274,698	$18,815,217	1.8183	$34,547,580	368
Connecticut	$16,576,698	$24,863,547	$665,028	$42,102,272	1.8698	$82,512,054	846
Delaware	$567,286	$838,928	$24,743	$1,417,958	1.8194	$2,580,547	27
Florida	$16,927,862	$25,391,823	$0	$42,319,705	1.8477	$97,035,940	998
Georgia	$11,892,156	$17,833,233	$570,943	$30,276,732	1.8518	$56,177,947	598
Hawaii	$1,361,126	$1,581,888	$58,969	$2,982,784	1.8834	$4,983,944	51
Idaho	$932,678	$1,398,407	$65,212	$2,387,678	1.8433	$4,441,568	48
Illinois	$6,671,201	$9,856,802	$240,848	$16,690,851	1.8760	$31,306,940	321
Indiana	$6,698,013	$10,029,919	$191,676	$16,899,608	1.8630	$31,482,489	328
Iowa	$5,193,121	$7,789,682	$141,253	$13,124,056	1.8698	$24,538,926	251
Kansas	$14,873,981	$23,310,972	$745,698	$37,928,652	1.9782	$75,008,987	772
Kentucky	$2,877,824	$4,316,457	$138,128	$7,332,187	1.8691	$13,697,358	141
Louisiana	$6,918,847	$10,377,970	$221,397	$17,518,214	1.8654	$32,750,057	337
Maine	$3,444,594	$5,166,891	$162,997	$8,804,383	1.8654	$16,362,060	169
Maryland	$10,945,514	$15,967,971	$454,522	$27,017,806	1.8631	$51,458,041	530
Massachusetts	$12,175,124	$18,262,685	$516,225	$30,954,034	1.9162	$59,315,213	606
Michigan	$6,080,525	$9,092,486	$210,898	$15,381,707	1.8748	$28,833,128	296
Minnesota	$4,981,989	$6,942,884	$257,296	$11,982,269	1.8677	$21,781,920	224
Mississippi	$3,268,585	$7,902,874	$168,585	$13,340,052	1.8721	$24,840,511	256
Missouri	$8,278,550	$12,414,825	$364,650	$20,958,224	1.9034	$39,883,948	411
Montana	$492,857	$694,286	$23,328	$1,180,471	1.8788	$2,184,378	23
Nebraska	$927,479	$1,211,217	$33,074	$2,051,770	1.8630	$3,818,281	38
Nevada	$1,266,001	$1,902,001	$0	$3,157,502	1.8658	$5,890,402	61
New Hampshire	$2,817,467	$4,226,340	$0	$7,043,748	1.8612	$13,109,815	135
New Jersey	$8,183,835	$12,030,438	$497,876	$21,391,940	1.8683	$40,016,617	415
New Mexico	$5,271,880	$4,907,821	$112,563	$9,292,264	1.8662	$15,458,419	159
New York	$13,878,061	$20,817,077	$716,107	$35,411,235	1.8784	$67,862,915	699
North Carolina	$4,669,943	$7,348,414	$216,341	$12,521,698	1.8711	$23,426,548	241
North Dakota	$453,576	$680,364	$18,253	$1,144,172	1.8586	$2,126,446	22
Ohio	$11,362,400	$17,043,599	$372,687	$28,778,686	1.8139	$52,202,748	538
Oklahoma	$5,410,294	$8,115,440	$143,232	$13,668,966	1.8735	$25,606,913	267
Oregon	$2,932,274	$3,946,411	$63,175	$6,941,860	1.8695	$12,974,060	135
Pennsylvania	$12,598,434	$18,897,651	$536,418	$31,920,503	1.8594	$59,351,964	620
Rhode Island	$1,364,380	$2,046,539	$54,326	$3,465,245	1.8638	$6,460,342	67
South Carolina	$5,185,523	$4,778,285	$178,586	$8,142,108	1.8536	$15,132,275	156
South Dakota	$306,681	$459,822	$0	$766,703	1.8672	$1,427,992	15
Tennessee	$3,390,117	$5,085,175	$0	$8,475,292	2.0242	$17,340,439	177
Texas	$35,422,907	$53,134,361	$0	$88,557,268	1.8234	$169,788,758	1,716
Utah	$4,858,240	$6,954,360	$185,492	$11,778,049	1.8218	$21,503,827	220
Vermont	$1,150,688	$1,726,033	$71,815	$2,949,536	1.8678	$5,478,720	56
Virginia	$14,907,071	$22,360,607	$696,726	$37,963,403	1.8780	$71,049,771	731
Washington	$17,902,249	$26,853,369	$0	$44,755,621	2.1230	$95,355,851	2,079
West Virginia	$1,804,791	$2,257,186	$72,230	$3,934,206	1.8692	$7,158,596	74
Wisconsin	$2,825,569	$4,238,352	$148,930	$7,210,850	1.8742	$13,542,488	138
Wyoming	$158,746	$238,048	$0	$396,413	1.8258	$723,647	7
TOTAL	$342,690,200	$513,035,300	$12,104,581	$1,042,134,181		$2,096,457,150	21,565
Average						$41,929,743	431
STD						$61,565,404	633

Total Economic and Employment Impacts of Public Safety and Other Spending

Table 9 presents the estimated total economic and employment impacts in 2015 of public safety spending in all 50 states. Since the total spending for "other markets" is considered equivalent to the public safety estimates, these data are not repeated. The total economic impact of the public safety market in all 50 states is approximately $89.8 million with creation of 924 new jobs. As with agriculture spending, the state with the largest economic and employment impacts is California with a total of more than $15.7 million and creation of 162 new jobs. This is followed in descending order by the states of Washington, Texas, Florida and Arizona. The state of Wyoming has the least economic and employment impacts with $31,013 and no new jobs created.

The average economic and employment impacts of public safety spending per state are $1,796,989 and creation of 18 new jobs. The standard deviation of economic and employment impacts of public safety spending is $2,638,517 and creation of 27 new jobs. The large standard deviation again indicates the wide variability among states.

Table 9: 2015 Total Economic Employment Impacts of Public Safety Spending

State	Direct Spending				State Total Multipliers	Total Economic Impact	Total Employment Impact
	Payroll	Parts	Taxes	Total			
Alabama	$389,329	$560,903	$15,373	$1,014,298	1.8043	$1,831,020	20
Alaska	$26,218	$39,328	$0	$65,546	1.8023	$122,089	1
Arizona	$736,248	$1,107,373	$17,009	$1,852,630	1.8000	$3,968,006	38
Arkansas	$108,858	$164,807	$6,156	$281,053	1.8718	$526,075	5
California	$2,804,503	$4,208,755	$98,744	$7,101,503	2.2143	$15,723,761	162
Colorado	$317,838	$476,756	$11,773	$806,366	1.8082	$1,523,468	16
Connecticut	$710,367	$1,065,541	$28,415	$1,804,383	1.8088	$3,536,230	36
Delaware	$23,884	$35,826	$1,060	$60,770	1.8084	$112,965	1
Florida	$684,082	$1,261,078	$0	$2,128,130	1.8477	$4,158,592	43
Georgia	$509,235	$763,853	$24,443	$1,297,531	1.8218	$2,482,338	26
Hawaii	$44,630	$66,930	$2,575	$114,118	1.8804	$212,358	2
Idaho	$39,995	$59,977	$2,367	$102,329	1.8492	$190,353	2
Illinois	$261,623	$423,434	$11,295	$710,322	1.8750	$1,341,229	14
Indiana	$268,969	$428,654	$7,795	$724,317	1.8650	$1,365,150	14
Iowa	$222,562	$333,844	$8,084	$563,490	1.8589	$1,045,560	11
Kansas	$637,458	$956,184	$31,873	$1,625,514	1.9792	$3,217,217	33
Kentucky	$123,327	$184,990	$5,920	$314,237	1.8691	$587,025	6
Louisiana	$296,513	$444,770	$9,488	$750,772	1.8654	$1,402,742	14
Maine	$147,625	$221,436	$6,987	$377,331	1.8584	$701,231	7
Maryland	$469,228	$704,342	$17,337	$1,157,906	1.8061	$2,207,685	23
Massachusetts	$521,791	$782,687	$22,124	$1,326,601	1.9142	$2,538,381	26
Michigan	$259,726	$389,592	$9,039	$658,359	1.8748	$1,234,291	13
Minnesota	$165,514	$263,271	$11,027	$439,812	1.8677	$803,468	10
Mississippi	$225,796	$338,695	$7,225	$571,717	1.8921	$1,084,580	11
Missouri	$354,709	$532,064	$11,351	$898,124	1.8684	$1,712,160	18
Montana	$19,637	$29,735	$1,000	$50,592	1.8589	$94,045	1
Nebraska	$34,898	$51,908	$1,417	$87,933	1.8890	$166,555	2
Nevada	$53,796	$80,879	$0	$134,464	1.8686	$250,961	3
New Hampshire	$120,750	$181,125	$0	$301,875	1.8612	$561,849	6
New Jersey	$366,013	$537,019	$21,338	$918,369	1.8683	$1,730,376	18
New Mexico	$140,223	$210,335	$4,824	$355,382	1.8542	$662,504	7
New York	$594,774	$892,160	$30,690	$1,517,624	1.9184	$2,911,411	30
North Carolina	$209,955	$314,932	$11,757	$536,644	1.8711	$1,004,115	10
North Dakota	$19,439	$29,158	$439	$49,036	1.8585	$91,133	1
Ohio	$485,990	$728,440	$16,072	$1,230,372	1.8139	$2,232,218	24
Oklahoma	$149,155	$219,233	$5,139	$371,527	1.8753	$696,725	7
Oregon	$112,812	$169,218	$2,707	$284,737	1.8985	$532,031	5
Pennsylvania	$539,833	$809,689	$13,291	$1,363,093	1.8084	$2,564,875	27
Rhode Island	$58,473	$87,709	$2,500	$148,681	1.8658	$277,112	3
South Carolina	$136,522	$204,784	$7,645	$348,951	1.8585	$648,529	7
South Dakota	$13,139	$19,696	$0	$32,775	1.8873	$61,197	1
Tennessee	$145,291	$217,936	$0	$363,227	2.0242	$734,979	8
Texas	$1,518,125	$2,277,187	$0	$3,795,311	1.8834	$7,148,080	74
Utah	$166,696	$250,044	$7,948	$424,688	1.8519	$809,676	10
Vermont	$49,324	$73,986	$3,078	$126,387	1.8578	$234,802	2
Virginia	$638,674	$958,012	$29,588	$1,626,274	1.8720	$3,044,847	31
Washington	$1,024,342	$2,436,573	$0	$4,060,954	2.1250	$8,629,528	89
West Virginia	$84,491	$96,737	$3,096	$184,323	1.8692	$306,980	3
Wisconsin	$121,096	$181,644	$6,267	$309,008	1.8842	$578,108	6
Wyoming	$6,679	$10,018	$0	$16,698	1.8563	$31,013	0
TOTAL	$14,696,600	$22,044,900	$527,772	$45,527,772		$89,849,448	924
Average						$1,796,989	18
STD						$2,638,517	27
MAX						$15,723,761	162
MIN						$31,013	0

Total Economic and Employment Impacts of Agriculture, Public Safety and Other Spending

Table 10 presents the estimated total economic and employment impacts of agriculture, public safety and other spending in 2015 all 50 states. The total economic impact of these markets in all 50 states is more than $2,276 million with total job creation of 23,413. The state with the largest economic and employment impact is California with a total of more than $398.3 million and creation of 4,097 new jobs. Following California in descending rank order are Washington, Texas, Florida and Arizona. In addition, the order of job creation was similar to estimated total economic impact. Wyoming has the least economic and employment impacts with $785,674 and eight new jobs created.

The average economic and employment impacts of agriculture, public safety and other spending per state are approximately $45.5 million and creation of 468 new jobs. The standard deviation of economic and employment impacts is approximately $66.8 million and 688 new jobs created. As with agriculture, public safety and other state estimates, there is a wide variability of economic and employment impacts and job creation among states.

Table 10: 2015 Total Economic & Employment Impacts of Agriculture, Public Safety and Other Spending

State	Direct Spending				State Total Multiplier	Total Economic Impact	Total Employment Impact
	Payroll	Parts	Taxes	Total			
Alabama	$10,178,234	$10,174,301	$404,552	$20,940,456	1.2295	$25,743,914	352
Alaska	$664,189	$666,299	$0	$1,660,488	1.6823	$3,082,348	32
Arizona	$18,702,760	$28,653,440	$430,901	$47,188,634	1.6800	$80,429,535	961
Arkansas	$2,765,996	$4,178,410	$155,994	$7,120,010	1.6718	$13,327,235	137
California	$71,047,421	$108,571,152	$2,272,517	$179,892,071	2.2143	$398,326,913	4,097
Colorado	$8,051,883	$12,077,825	$296,242	$20,427,950	1.6893	$38,594,526	397
Connecticut	$17,998,472	$26,994,708	$719,859	$45,711,039	1.9588	$89,564,494	921
Delaware	$606,062	$907,578	$29,864	$1,539,495	1.8084	$2,962,537	29
Florida	$21,635,689	$32,453,879	$0	$54,089,998	1.8477	$100,301,029	1,084
Georgia	$12,906,638	$19,350,938	$819,230	$32,670,796	1.9216	$63,164,520	650
Hawaii	$1,130,366	$1,695,548	$65,109	$2,891,023	1.8804	$5,378,459	55
Idaho	$1,012,848	$1,519,422	$59,967	$2,592,336	1.8802	$4,822,263	50
Illinois	$7,134,447	$10,701,671	$265,378	$18,121,496	1.8750	$33,977,804	350
Indiana	$7,258,751	$10,889,627	$197,465	$18,346,843	1.8850	$34,583,799	356
Iowa	$5,658,240	$8,487,359	$153,280	$14,298,879	1.8588	$26,487,421	272
Kansas	$16,148,894	$24,223,341	$607,445	$41,179,679	1.8792	$61,502,821	638
Kentucky	$3,124,276	$4,686,417	$149,995	$7,960,690	1.8981	$14,671,309	153
Louisiana	$7,511,674	$11,267,511	$240,574	$19,019,759	1.8984	$36,936,142	386
Maine	$3,759,845	$5,639,768	$209,451	$9,609,045	1.8584	$17,764,526	183
Maryland	$11,567,788	$17,348,664	$439,196	$29,353,618	1.9081	$56,012,870	575
Massachusetts	$13,218,796	$19,828,059	$560,473	$33,607,237	1.9142	$64,330,974	662
Michigan	$9,579,779	$9,889,869	$226,976	$19,878,425	1.8748	$31,268,710	322
Minnesota	$4,963,017	$7,429,525	$279,390	$12,681,892	1.8877	$23,646,018	243
Mississippi	$5,720,176	$8,580,264	$183,048	$14,483,485	1.8821	$26,869,997	277
Missouri	$8,980,968	$13,479,863	$267,561	$22,752,472	1.9084	$43,370,313	446
Montana	$562,531	$753,796	$25,326	$1,281,654	1.6569	$2,262,467	25
Nebraska	$876,691	$1,315,036	$35,909	$2,227,636	1.8800	$4,143,402	43
Nevada	$1,362,572	$2,043,858	$0	$3,406,431	1.8868	$6,358,440	66
New Hampshire	$3,064,897	$4,588,496	$0	$7,647,493	1.8812	$14,233,514	146
New Jersey	$9,069,951	$13,604,479	$540,551	$23,214,878	1.8883	$43,838,276	451
New Mexico	$3,562,227	$5,329,491	$122,200	$9,083,018	1.8842	$16,783,427	173
New York	$15,067,598	$22,601,397	$777,468	$38,446,464	1.9184	$73,759,734	759
North Carolina	$5,316,852	$7,979,278	$267,356	$13,564,886	1.8711	$25,427,576	262
North Dakota	$462,454	$734,681	$11,110	$1,242,244	1.8585	$2,308,711	24
Ohio	$12,339,320	$19,004,479	$404,631	$31,245,430	1.9129	$59,769,383	615
Oklahoma	$5,762,905	$8,583,907	$155,508	$9,412,021	1.8753	$17,650,356	182
Oregon	$2,857,997	$4,286,846	$66,590	$7,213,333	1.8885	$13,479,112	139
Pennsylvania	$13,878,300	$20,817,450	$338,939	$34,531,688	1.8964	$65,485,695	674
Rhode Island	$1,467,306	$2,201,957	$62,326	$3,786,588	1.8838	$7,026,166	73
South Carolina	$3,456,566	$5,187,852	$193,660	$8,840,100	1.8585	$16,429,327	169
South Dakota	$332,180	$498,149	$0	$830,249	1.8873	$1,566,924	16
Tennessee	$3,860,994	$5,521,947	$0	$9,201,746	2.0342	$18,718,191	193
Texas	$38,459,190	$57,688,734	$0	$96,147,891	1.8834	$181,084,857	1,865
Utah	$5,003,652	$7,550,448	$201,346	$12,755,435	1.8819	$23,685,183	245
Vermont	$1,249,536	$1,874,304	$77,971	$3,201,811	1.8575	$5,948,324	61
Virginia	$18,164,820	$24,277,230	$744,502	$41,206,552	1.8720	$77,138,666	793
Washington	$41,161,804	$61,726,506	$0	$102,877,309	2.1250	$218,614,707	2,249
West Virginia	$1,533,773	$2,460,859	$78,421	$4,162,853	1.8882	$7,859,718	80
Wisconsin	$3,967,780	$4,951,840	$158,524	$7,828,823	1.8842	$14,994,878	150
Wyoming	$169,117	$253,675	$0	$422,792	1.8583	$785,674	8
TOTAL	$466,000,000	$684,000,000	$13,370,228	$1,150,370,228		$2,276,199,019	23,413
Average						$45,523,730	468
STD						$66,842,438	688
MAX						$398,326,913	4,097
MIN						$785,674	8

Total Economic and Employment Impacts of Agriculture Direct Spending

Tables 11, 12 and 13 show the 2015 direct, indirect and induced impacts respectively, of agriculture spending. Table 11 presents the total economic and employment impacts of direct agriculture spending in all 50 states. The nationwide total economic impact is an estimated $1,058,841,630 with about 11,094 newly created jobs. The largest economic and employment impacts of direct agriculture spending is in California with total economic impact of more than $185,307,769 and creation of 1,942 new jobs. As before, the order of job creation was similar to overall economic impact. The state with least economic and employment impacts is Wyoming with $365,503 and four newly created jobs.

The average economic and employment impacts of direct agriculture spending per state are approximately $21,176,833 and an estimated 222 new jobs. The standard deviation of economic and employment impacts of direct agriculture spending is approximately $31,094,684 and new job creation of 326. This again reflects the wide spread of economic and employment impacts among states.

Table 11: 2015 Direct Economic & Employment Impacts of Agriculture Spending

State	Direct Spending				State Direct Multiplier	Direct Economic Impact	Direct Employment Impact
	Payroll	Parts	Taxes	Total			
Alabama	$8,277,940	$10,174,301	$404,552	$20,356,793	0.9616	$19,579,252	238
Alaska	$611,783	$917,644	$0	$1,529,426	0.9405	$1,438,467	15
Arizona	$17,225,796	$25,838,695	$396,682	$43,461,373	0.46	$19,982,232	209
Arkansas	$2,565,690	$3,848,535	$143,679	$6,557,904	0.9453	$6,199,187	65
California	$65,438,414	$98,157,622	$2,094,029	$165,690,065	1.1184	$185,307,769	1942
Colorado	$7,416,208	$11,124,313	$274,696	$18,815,217	0.8942	$17,963,480	188
Connecticut	$16,575,696	$24,863,547	$663,028	$42,102,272	0.8998	$41,872,829	437
Delaware	$567,285	$828,928	$24,743	$1,417,956	0.9381	$1,330,062	14
Florida	$19,927,862	$29,891,823	$0	$49,819,705	0.8527	$42,483,417	236
Georgia	$11,882,156	$17,823,233	$570,343	$30,275,732	0.8705	$29,382,598	308
Hawaii	$1,041,126	$1,561,688	$59,969	$2,662,784	0.8398	$2,507,962	26
Idaho	$932,976	$1,399,467	$56,232	$2,387,676	0.8522	$2,240,223	24
Illinois	$6,571,201	$9,856,802	$262,648	$16,690,651	0.947	$15,806,236	166
Indiana	$6,686,613	$10,029,919	$181,876	$16,898,408	0.952	$16,087,286	169
Iowa	$5,193,121	$7,789,682	$141,253	$13,124,056	0.9388	$12,320,864	129
Kansas	$14,873,981	$22,310,972	$743,699	$37,928,652	0.8998	$37,913,480	397
Kentucky	$2,877,624	$4,316,437	$138,126	$7,332,187	0.9436	$6,917,916	72
Louisiana	$6,918,647	$10,377,970	$221,597	$17,518,014	0.9436	$16,529,996	173
Maine	$3,446,584	$5,169,891	$192,697	$8,809,363	0.8988	$9,265,794	97
Maryland	$10,645,314	$15,967,971	$404,522	$27,017,806	0.9427	$26,010,043	273
Massachusetts	$12,175,124	$18,262,685	$516,225	$30,954,034	0.9486	$29,926,360	314
Michigan	$8,080,323	$9,590,465	$210,899	$18,361,707	0.9468	$14,544,454	152
Minnesota	$4,561,989	$6,842,984	$257,296	$11,662,269	0.9433	$11,001,018	115
Mississippi	$5,268,563	$7,902,874	$168,596	$13,340,052	0.9408	$12,548,319	131
Missouri	$8,276,550	$12,414,825	$264,650	$20,956,224	0.9428	$20,176,053	211
Montana	$462,857	$694,286	$23,328	$1,180,471	0.9368	$1,106,220	12
Nebraska	$807,478	$1,211,217	$33,074	$2,051,770	0.9384	$1,907,452	20
Nevada	$1,255,001	$1,882,501	$0	$3,137,502	0.9427	$2,957,724	31
New Hampshire	$2,817,497	$4,226,246	$0	$7,043,743	0.94	$6,621,110	69
New Jersey	$8,353,625	$12,530,438	$497,678	$21,381,940	0.9537	$20,391,956	214
New Mexico	$3,271,880	$4,907,821	$112,553	$8,292,254	0.9415	$7,807,157	82
New York	$13,875,551	$20,817,077	$716,107	$35,411,235	0.9568	$34,399,946	359
North Carolina	$4,898,943	$7,348,414	$274,341	$12,521,698	0.945	$11,833,004	124
North Dakota	$463,576	$660,364	$10,233	$1,144,172	0.9386	$1,073,920	11
Ohio	$11,362,450	$17,043,598	$372,667	$28,778,698	0.9661	$27,803,098	291
Oklahoma	$5,418,284	$5,115,440	$143,232	$8,668,966	0.9471	$8,210,378	86
Oregon	$2,632,274	$3,948,411	$63,178	$6,643,858	0.9437	$6,269,410	66
Pennsylvania	$12,598,434	$18,897,651	$309,418	$31,805,503	0.9578	$30,463,311	319
Rhode Island	$1,364,380	$2,046,539	$58,326	$3,469,225	0.9413	$3,266,562	34
South Carolina	$3,185,523	$4,778,285	$178,388	$8,142,196	0.9388	$7,642,267	80
South Dakota	$305,881	$458,822	$0	$764,703	0.9431	$721,192	8
Tennessee	$3,390,117	$5,085,175	$0	$8,475,292	1.0274	$8,707,515	91
Texas	$35,422,907	$53,134,361	$0	$88,557,268	0.9512	$84,235,673	883
Utah	$4,608,240	$6,954,380	$185,450	$11,778,049	0.9402	$11,073,019	116
Vermont	$1,150,888	$1,726,333	$71,815	$2,949,036	0.9383	$2,767,081	29
Virginia	$14,907,071	$22,360,607	$685,725	$37,953,403	0.9455	$35,884,843	376
Washington	$37,902,240	$56,853,360	$0	$94,755,601	1.0732	$101,691,710	1065
West Virginia	$1,504,791	$2,257,186	$72,230	$3,834,206	0.9428	$3,613,758	38
Wisconsin	$2,825,568	$4,238,352	$146,830	$7,210,750	0.9415	$6,789,015	71
Wyoming	$155,795	$233,648	$0	$389,413	0.9386	$365,503	4
TOTAL	$422,000,000	$600,000,000	$12,374,667	$1,062,374,667		$1,058,841,630	11,094
Average						$21,176,833	222
STD						$31,094,684	326

Total Economic and Employment Impacts of Agriculture Indirect Spending

The total economic and employment impact of indirect agriculture spending in all 50 states is shown in Table 12. The nationwide total economic impact is approximately $487,060,836, with an estimated 5,103 new jobs. The largest economic and employment impacts of indirect agriculture spending is in the state of California with a total economic impact of approximately $85,230,970 and creation of 893 new jobs. The order of job creation was similar to overall economic impact. Wyoming has the least economic and employment impact with $168,110 and creation of two new jobs.

The average economic and employment impacts of indirect agriculture spending per state are $9,741,217 and creation of 102 jobs. The standard deviation of economic and employment impacts of indirect agriculture spending is $14,302,673 and job creation of 150. The large standard deviation indicates the wide variability of economic and employment impacts among states.

Table 12: 2015 Indirect Economic & Employment Impacts of Agriculture Spending

State	Direct Spending				State Indirect Multiplier	Indirect Economic Impact	Indirect Employment Impact
	Payroll	Parts	Taxes	Total			
Alabama	$1,900,294	$0	$0	$583,663	0.0924	$100,476,239	110
Alaska	$611,783	$917,644	$0	$1,529,426	0.4027	$981,774	7
Arizona	$17,225,796	$25,838,695	$396,682	$43,461,373	0.46	$19,982,232	209
Arkansas	$2,565,690	$3,848,535	$143,679	$6,557,904	0.4549	$2,852,032	30
California	$65,438,414	$98,157,622	$2,094,029	$165,690,065	0.5144	$85,230,970	893
Colorado	$7,416,208	$11,124,313	$274,696	$18,815,217	0.4589	$8,257,399	87
Connecticut	$16,575,696	$24,863,547	$663,028	$42,102,272	0.4553	$19,169,165	201
Delaware	$567,285	$828,928	$24,743	$1,417,956	1432	$812,557	6
Florida	$19,927,862	$29,891,823	$0	$49,819,705	0.4525	$22,543,417	236
Georgia	$11,882,156	$17,823,233	$570,343	$30,275,732	0.4464	$13,515,067	142
Hawaii	$1,041,126	$1,561,688	$59,969	$2,662,784	0.4322	$1,150,855	12
Idaho	$932,976	$1,399,467	$56,232	$2,387,676	0.4522	$1,031,354	11
Illinois	$6,571,201	$9,856,802	$262,648	$16,690,651	0.4356	$7,270,535	76
Indiana	$6,686,613	$10,029,919	$181,876	$16,898,408	0.4379	$7,399,813	78
Iowa	$5,193,121	$7,789,682	$141,253	$13,124,056	0.4319	$5,668,260	59
Kansas	$14,873,981	$22,310,972	$743,699	$37,928,652	0.4598	$17,439,594	183
Kentucky	$2,877,624	$4,316,437	$138,126	$7,332,187	1434	$3,182,169	33
Louisiana	$6,918,647	$10,377,970	$221,597	$17,518,014	0.4541	$7,954,570	80
Maine	$3,446,584	$5,169,891	$192,697	$8,809,363	0.4317	$3,800,852	40
Maryland	$10,645,314	$15,967,971	$404,522	$27,017,806	0.4428	$11,963,465	125
Massachusetts	$12,175,124	$18,262,685	$516,225	$30,954,034	0.4447	$13,765,258	144
Michigan	$8,080,323	$9,590,465	$210,899	$18,361,707	0.4356	$8,001,560	76
Minnesota	$4,561,989	$6,842,984	$257,296	$11,662,269	0.4338	$5,060,258	53
Mississippi	$5,268,563	$7,902,874	$168,596	$13,340,052	0.4328	$5,770,906	60
Missouri	$8,276,550	$12,414,825	$264,650	$20,956,224	0.4429	$9,281,512	97
Montana	$462,857	$694,286	$23,328	$1,180,471	0.4319	$509,846	5
Nebraska	$807,478	$1,211,217	$33,074	$2,051,770	0.4321	$886,526	9
Nevada	$1,255,001	$1,882,501	$0	$3,137,502	0.4337	$1,360,735	14
New Hampshire	$2,817,497	$4,226,246	$0	$7,043,743	0.4324	$3,045,715	32
New Jersey	$8,353,625	$12,530,438	$497,678	$21,381,940	0.4537	$9,380,257	98
New Mexico	$3,271,880	$4,907,821	$112,553	$8,292,254	0.4331	$3,591,375	38
New York	$13,875,551	$20,817,077	$716,107	$35,411,235	0.4457	$15,782,767	166
North Carolina	$4,898,943	$7,348,414	$274,341	$12,521,698	0.4347	$5,443,182	57
North Dakota	$463,576	$660,364	$10,233	$1,144,172	0.4315	$494,054	5
Ohio	$11,362,450	$17,043,598	$372,667	$28,778,698	0.4444	$12,789,248	134
Oklahoma	$5,418,284	$5,115,440	$143,232	$8,668,966	0.4357	$3,777,969	40
Oregon	$2,632,274	$3,948,411	$63,178	$6,643,858	0.4341	$2,884,088	30
Pennsylvania	$12,598,434	$18,897,651	$309,418	$31,805,503	0.4496	$14,013,505	147
Rhode Island	$1,364,380	$2,046,539	$58,326	$3,469,225	0.433	$1,502,175	16
South Carolina	$3,185,523	$4,778,285	$178,388	$8,142,196	0.4318	$3,515,891	37
South Dakota	$305,881	$458,822	$0	$764,703	0.4338	$331,728	3
Tennessee	$3,390,117	$5,085,175	$0	$8,475,292	0.4726	$4,005,423	42
Texas	$35,422,907	$53,134,361	$0	$88,557,268	0.4378	$38,752,660	406
Utah	$4,608,240	$6,954,380	$185,450	$11,778,049	0.4326	$5,094,319	53
Vermont	$1,150,888	$1,726,333	$71,815	$2,949,036	0.4316	$1,272,804	13
Virginia	$14,907,071	$22,360,607	$685,725	$37,953,403	0.4349	$16,505,935	173
Washington	$37,902,240	$56,853,360	$0	$94,755,601	0.4837	$46,780,840	490
West Virginia	$1,504,791	$2,257,186	$72,230	$3,834,206	0.4336	$1,662,512	17
Wisconsin	$2,825,568	$4,238,352	$146,830	$7,210,750	0.4331	$3,123,015	33
Wyoming	$155,795	$233,648	$0	$389,413	0.4317	$168,110	2
TOTAL	$422,000,000	$600,000,000	$12,374,667	$1,062,374,667		$487,060,836	5,103
Average						$9,741,217	102
STD						$14,302,673	150

Total Economic and Employment Impacts of Agriculture Induced Spending

Table 13 presents the total economic and employment impacts of induced agriculture spending in 2015 in all 50 states. The estimated nationwide total economic impact is $550,584,654 with the creation of 5,770 new jobs. The largest economic and employment impacts of induced agriculture spending is in the state of California with a total economic impact of approximately $96,348,773 and creation of 1,010 new jobs. The order of job creation was similar to economic impact. The state of Wyoming has the least amount economic and employment impact with $190,034 and the creation of two new jobs. The average economic and employment impacts of induced agriculture spending per state are an estimated 11,011,693 and creation of 115 jobs. The standard deviation of economic and employment impacts of induced agriculture spending is approximately $16,168,047 and 169 jobs. There is wide variability in economic and employment impacts among states as is evidenced by the large standard deviation.

Table 13: Economic & Employment Impacts of Agriculture Spending

State	Direct Spending				State Induced Multiplier	Induced Economic Impact	Induced Employment Impact
	Payroll	Perts	Taxes	Total			
Alabama	$5,570,000	$10,370,314	$972,700	$16,913,014	0.0001	$17,909,914	124
Alaska	$611,763	$917,644	$0	$1,529,406	0.4851	$748,033	8
Arizona	$17,225,796	$25,858,885	$388,562	$43,481,373	0.52	$22,599,914	237
Arkansas	$2,565,690	$3,644,535	$143,579	$6,557,804	0.4916	$3,223,866	34
California	$65,438,414	$98,157,622	$2,094,029	$165,690,065	0.5815	$96,348,773	1,010
Colorado	$7,416,208	$11,124,313	$274,636	$18,815,217	0.4962	$9,336,111	98
Connecticut	$16,575,698	$24,863,547	$663,038	$42,102,272	0.5147	$21,670,040	227
Delaware	$567,285	$835,928	$24,743	$1,417,956	0.4883	$692,388	7
Florida	$19,927,882	$29,891,823	$0	$49,819,705	0.5115	$25,482,779	267
Georgia	$11,882,156	$17,823,233	$576,348	$30,275,732	0.5047	$15,280,162	160
Hawaii	$1,041,129	$1,561,689	$59,969	$2,662,784	0.4886	$1,301,036	14
Idaho	$852,978	$1,599,467	$55,232	$2,387,678	0.4885	$1,166,381	12
Illinois	$6,571,201	$9,856,802	$262,845	$16,690,851	0.4924	$8,218,575	86
Indiana	$6,686,813	$10,029,919	$181,676	$16,898,408	0.4951	$8,366,402	88
Iowa	$9,193,121	$7,789,682	$141,253	$13,124,056	0.4882	$6,407,164	67
Kansas	$14,873,981	$22,310,972	$743,699	$37,928,652	0.5188	$19,715,313	207
Kentucky	$2,877,624	$4,316,437	$138,126	$7,332,187	0.4906	$3,597,171	38
Louisiana	$6,918,647	$10,377,970	$221,397	$17,518,014	0.4907	$8,596,083	90
Maine	$3,444,594	$5,166,891	$192,887	$8,804,383	0.4881	$4,297,419	45
Maryland	$10,645,314	$15,967,971	$404,522	$27,017,806	0.5008	$13,528,114	142
Massachusetts	$12,175,124	$18,262,685	$616,225	$30,954,034	0.5027	$15,560,593	163
Michigan	$6,960,323	$9,660,485	$210,699	$15,381,707	0.4924	$7,574,104	79
Minnesota	$4,561,949	$6,842,884	$257,296	$11,662,269	0.4905	$5,720,343	60
Mississippi	$5,268,583	$7,902,874	$168,595	$13,340,052	0.488	$6,523,265	68
Missouri	$8,276,556	$12,414,825	$264,850	$20,956,224	0.5007	$10,492,761	110
Montana	$462,657	$694,286	$23,328	$1,180,471	0.4882	$576,306	6
Nebraska	$867,478	$1,211,217	$33,074	$2,051,770	0.4885	$1,002,288	11
Nevada	$1,255,901	$1,882,501	$0	$3,137,502	0.4902	$1,538,004	16
New Hampshire	$2,817,497	$4,226,246	$0	$7,043,743	0.4888	$3,442,982	36
New Jersey	$8,353,725	$12,530,433	$487,976	$21,381,840	0.4959	$10,603,304	111
New Mexico	$3,271,880	$4,907,821	$112,553	$8,292,254	0.4896	$4,059,887	43
New York	$13,878,051	$20,817,077	$716,107	$35,411,235	0.5038	$17,840,180	187
North Carolina	$4,898,943	$7,348,414	$274,341	$12,521,698	0.4914	$6,153,162	64
North Dakota	$453,576	$680,364	$10,233	$1,144,172	0.4881	$558,471	6
Ohio	$11,362,490	$17,043,599	$372,687	$28,778,686	0.5024	$14,458,412	152
Oklahoma	$2,410,254	$3,615,440	$143,232	$6,168,966	0.4925	$3,038,486	45
Oregon	$2,832,274	$3,948,411	$43,175	$6,643,859	0.4907	$3,260,142	34
Pennsylvania	$12,598,434	$18,897,651	$309,418	$31,805,503	0.498	$15,838,141	166
Rhode Island	$1,364,360	$2,046,539	$56,328	$3,469,225	0.4895	$1,698,186	18
South Carolina	$3,185,523	$4,778,285	$178,388	$8,142,196	0.4881	$3,974,207	42
South Dakota	$365,881	$468,822	$0	$764,702	0.4904	$375,010	4
Tennessee	$3,380,117	$5,085,175	$0	$8,475,292	0.5342	$4,527,501	47
Texas	$38,422,907	$53,134,361	$0	$88,557,268	0.4946	$43,800,425	459
Utah	$4,636,240	$6,954,360	$165,450	$11,776,049	0.488	$5,750,488	60
Vermont	$1,150,888	$1,726,333	$71,815	$2,949,036	0.4879	$1,438,835	15
Virginia	$14,907,071	$22,360,607	$685,725	$37,953,403	0.4916	$18,657,883	196
Washington	$37,962,240	$56,853,360	$0	$94,755,601	0.5561	$52,543,101	554
West Virginia	$1,504,791	$2,257,186	$72,230	$3,834,206	0.4901	$1,879,145	20
Wisconsin	$2,829,540	$4,254,352	$146,930	$7,210,850	0.4268	$3,530,432	37
Wyoming	$155,795	$233,648	$0	$389,413	0.488	$190,034	2
TOTAL	$450,000,000	$650,000,000	$10,314,001	$1,062,214,001		$550,584,654	5,770
Average						$11,011,693	115
STD						$16,168,047	169

Total Economic and Employment Impacts of Public Safety and Other Direct Spending

Tables 14, 15, and 16 show the 2015 direct, indirect, and induced impacts respectively, of public safety spending. Since the impacts to "other" markets are equivalent to public safety, that data is not presented. Table 14 presents the total economic and employment impacts of direct public safety spending in all 50 states. The total economic impact is approximately $45,378,927 with a total job creation of 475. The largest economic and employment impacts of direct public safety spending is in the state of California with a total economic impact of $7,941,762 and creation of 83 new jobs. The state of Wyoming has the least economic and employment impacts among public safety direct spending with $15,664 and no new jobs created. The average economic and employment impacts of direct public safety spending per state are approximately $907,579 and creation of 10 new jobs. The standard deviation of economic and employment impacts of direct public safety spending are approximately $1,332,629 and new job creation of 14. The large standard deviation again indicates the variability of economic and employment impacts of direct public safety spending among states.

Table 14: Direct Economic & Employment Impacts of Public Safety Spending

State	Direct Spending				State Direct Multiplier	Direct Economic Impact	Direct Employment Impact
	Payroll	Perts	Taxes	Total			
Alabama	$388,129	$508,993	$15,073	$1,076,196	0.9618	$875,550	10
Alaska	$26,218	$39,328	$0	$65,546	0.9405	$61,646	1
Arizona	$738,248	$1,107,373	$17,009	$1,862,630	1	$1,682,630	20
Arkansas	$109,956	$164,937	$6,158	$281,053	0.9453	$265,678	3
California	$2,804,503	$4,206,755	$89,744	$7,101,003	1.1184	$7,941,762	83
Colorado	$317,838	$476,756	$11,773	$806,366	0.9542	$769,435	8
Connecticut	$710,387	$1,065,581	$28,415	$1,804,383	0.9898	$1,785,878	19
Delaware	$23,664	$35,825	$1,063	$60,770	0.9291	$57,068	1
Florida	$854,052	$1,281,078	$0	$2,135,130	0.9837	$2,100,328	22
Georgia	$509,235	$763,853	$24,443	$1,297,531	0.9705	$1,259,254	13
Hawaii	$44,620	$66,930	$2,570	$114,119	0.9396	$107,227	1
Idaho	$39,985	$59,977	$2,367	$102,329	0.9395	$96,138	1
Illinois	$281,623	$422,434	$11,285	$715,322	0.947	$677,410	7
Indiana	$286,569	$429,854	$7,795	$724,217	0.952	$689,456	7
Iowa	$222,562	$333,844	$6,054	$562,460	0.9388	$528,037	6
Kansas	$637,456	$956,184	$31,873	$1,625,514	0.9898	$1,624,863	17
Kentucky	$123,327	$184,990	$5,920	$314,237	0.9435	$296,482	3
Louisiana	$296,513	$444,770	$9,488	$750,772	0.9436	$708,428	7
Maine	$147,825	$221,438	$8,267	$377,531	0.9386	$354,163	4
Maryland	$456,228	$684,342	$17,337	$1,157,906	0.9827	$1,114,716	12
Massachusetts	$521,791	$782,687	$22,124	$1,326,601	0.9668	$1,282,568	13
Michigan	$298,728	$389,592	$9,039	$856,359	0.9466	$823,334	7
Minnesota	$195,514	$293,271	$11,027	$499,812	0.9433	$471,472	5
Mississippi	$225,796	$338,695	$7,225	$571,717	0.9405	$537,699	6
Missouri	$354,709	$532,064	$11,361	$898,124	0.9828	$884,714	9
Montana	$19,837	$29,755	$1,000	$50,592	0.9388	$47,495	0
Nebraska	$34,606	$51,909	$1,417	$87,933	0.9394	$82,604	1
Nevada	$53,786	$80,679	$0	$134,464	0.9427	$126,760	1
New Hampshire	$120,750	$181,125	$0	$301,875	0.94	$283,762	3
New Jersey	$358,013	$537,019	$21,338	$916,369	0.9637	$873,941	9
New Mexico	$140,223	$210,335	$4,824	$355,382	0.9415	$334,592	4
New York	$594,774	$892,160	$30,690	$1,517,624	0.9689	$1,470,426	15
North Carolina	$209,955	$314,932	$11,757	$536,644	0.945	$507,129	5
North Dakota	$19,439	$29,158	$439	$49,036	0.9396	$46,825	0
Ohio	$486,960	$730,440	$15,972	$1,233,372	0.9561	$1,191,561	12
Oklahoma	$146,155	$219,233	$6,139	$371,527	0.9471	$351,873	4
Oregon	$112,812	$169,218	$2,707	$284,737	0.9437	$268,706	3
Pennsylvania	$539,933	$809,899	$13,261	$1,363,093	0.9578	$1,305,570	14
Rhode Island	$58,473	$87,709	$2,500	$148,681	0.9413	$139,954	1
South Carolina	$136,522	$204,784	$7,645	$348,951	0.9338	$327,026	3
South Dakota	$15,109	$18,664	$0	$32,773	0.9431	$30,904	0
Tennessee	$145,291	$217,936	$0	$363,227	1.0074	$373,179	4
Texas	$1,618,125	$2,277,187	$0	$3,795,311	0.9512	$3,610,100	38
Utah	$198,698	$298,044	$7,848	$504,588	0.9403	$474,558	5
Vermont	$49,324	$73,986	$3,078	$126,387	0.9393	$118,688	1
Virginia	$636,874	$955,312	$29,388	$1,626,574	0.9455	$1,537,926	16
Washington	$1,624,382	$2,436,573	$0	$4,060,954	1.0732	$4,358,218	46
West Virginia	$64,491	$96,737	$3,098	$164,223	0.9425	$154,775	2
Wisconsin	$121,096	$181,644	$6,297	$309,036	0.9416	$290,958	3
Wyoming	$6,678	$10,013	$0	$16,689	0.9388	$15,664	0
TOTAL	$18,000,000	$27,000,000	$677,772	$45,527,772		$45,378,927	475
Average						$907,579	10
STD						$1,332,629	14
MAX						$7,941,762	83
MIN						$15,664	0

Total Economic and Employment Impacts of Public Safety and Other Indirect Spending

The total economic and employment impact of indirect public safety spending in 2015 in all 50 states is shown in Table 15. The nationwide total economic impact is approximately $20,874,036 creation of an estimated 219 new jobs. The largest economic and employment impacts of indirect public safety spending is in the state of California with total economic impact of more than $3,652,756 and creation of 38 new jobs. Wyoming has the least economic and employment impacts with $7,205 and no new jobs created.

The economic and employment impacts of indirect public safety spending per state averages approximately $417,481 and creation of four new jobs. The standard deviation of economic and employment impacts of indirect public safety spending are $612,972 creation of six new jobs. As with public safety direct spending, there is a wide variability of economic and employment impacts among the states.

Table 15: Indirect Economic & Employment Impacts of Public Safety Spending

State	Direct Spending				State Indirect Multipliers	Indirect Economic Impact	Indirect Employment Impact
	Payroll	Perts	Taxes	Total			
Alabama	$388,129	$508,993	$15,073	$1,076,196	0.4424	$940,124	9
Alaska	$26,218	$39,328	$0	$65,546	0.4327	$28,362	0
Arizona	$738,248	$1,107,373	$17,009	$1,862,630	0.46	$856,810	9
Arkansas	$109,956	$164,937	$6,158	$281,053	0.4349	$122,230	1
California	$2,804,503	$4,206,755	$89,744	$7,101,003	0.5144	$3,652,756	38
Colorado	$317,838	$476,756	$11,773	$806,366	0.4389	$353,914	4
Connecticut	$710,387	$1,065,581	$28,415	$1,804,383	0.4553	$821,596	9
Delaware	$23,664	$35,825	$1,063	$60,770	0.432	$26,252	0
Florida	$854,052	$1,281,078	$0	$2,135,130	0.4625	$966,146	10
Georgia	$509,235	$763,853	$24,443	$1,297,531	0.4464	$579,218	6
Hawaii	$44,620	$66,930	$2,570	$114,119	0.4322	$49,322	1
Idaho	$39,985	$59,977	$2,367	$102,329	0.4322	$44,227	0
Illinois	$281,623	$422,434	$11,285	$715,322	0.4356	$311,594	3
Indiana	$286,569	$429,854	$7,795	$724,217	0.4378	$317,138	3
Iowa	$222,562	$333,844	$6,054	$562,460	0.4319	$242,926	3
Kansas	$637,456	$956,184	$31,873	$1,625,514	0.4598	$747,411	8
Kentucky	$123,327	$184,990	$5,920	$314,237	0.434	$136,378	1
Louisiana	$296,513	$444,770	$9,488	$750,772	0.4341	$326,010	3
Maine	$147,825	$221,438	$8,267	$377,531	0.4317	$162,994	2
Maryland	$456,228	$684,342	$17,337	$1,157,906	0.4428	$512,721	5
Massachusetts	$521,791	$782,687	$22,124	$1,326,601	0.4447	$589,940	6
Michigan	$298,728	$389,592	$9,039	$856,359	0.4356	$286,781	3
Minnesota	$195,514	$293,271	$11,027	$499,812	0.4339	$216,868	2
Mississippi	$225,796	$338,695	$7,225	$571,717	0.4329	$247,525	3
Missouri	$354,709	$532,064	$11,361	$898,124	0.4429	$397,779	4
Montana	$19,837	$29,755	$1,000	$50,592	0.4319	$21,851	0
Nebraska	$34,606	$51,909	$1,417	$87,933	0.4321	$37,996	0
Nevada	$53,786	$80,679	$0	$134,464	0.4337	$58,317	1
New Hampshire	$120,750	$181,125	$0	$301,875	0.4324	$130,581	1
New Jersey	$358,013	$537,019	$21,338	$916,369	0.4387	$402,011	4
New Mexico	$140,223	$210,335	$4,824	$355,382	0.4331	$153,916	2
New York	$594,774	$892,160	$30,690	$1,517,624	0.4457	$676,405	7
North Carolina	$209,955	$314,932	$11,757	$536,644	0.4347	$233,279	2
North Dakota	$19,439	$29,158	$439	$49,036	0.4318	$21,174	0
Ohio	$486,960	$730,440	$15,972	$1,233,372	0.4398	$542,511	6
Oklahoma	$146,155	$219,233	$6,139	$371,527	0.4357	$161,874	2
Oregon	$112,812	$169,218	$2,707	$284,737	0.4341	$123,604	1
Pennsylvania	$539,933	$809,899	$13,261	$1,363,093	0.4406	$600,579	6
Rhode Island	$58,473	$87,709	$2,500	$148,681	0.433	$64,379	1
South Carolina	$136,522	$204,784	$7,645	$348,951	0.4318	$150,677	2
South Dakota	$15,109	$18,664	$0	$32,773	0.4338	$14,217	0
Tennessee	$145,291	$217,936	$0	$363,227	0.4726	$171,661	2
Texas	$1,618,125	$2,277,187	$0	$3,795,311	0.4378	$1,662,028	17
Utah	$198,698	$298,044	$7,848	$504,588	0.4326	$218,328	2
Vermont	$49,324	$73,986	$3,078	$126,387	0.4316	$54,549	1
Virginia	$636,874	$955,312	$29,388	$1,626,574	0.4349	$707,397	7
Washington	$1,624,382	$2,436,573	$0	$4,060,954	0.4807	$2,004,993	21
West Virginia	$64,491	$96,737	$3,098	$164,223	0.4336	$71,251	1
Wisconsin	$121,096	$181,644	$6,297	$309,036	0.4331	$133,844	1
Wyoming	$6,678	$10,013	$0	$16,689	0.4317	$7,205	0
TOTAL	$18,000,000	$27,000,000	$677,772	$45,527,772		$20,874,036	219
Average						$417,481	4
STD						$612,972	6
MAX						$3,652,756	38
MIN						$7,205	0

Total Economic and Employment Impacts of Public Safety and Other Induced Spending

Table 16 presents the total economic and employment impacts of induced public safety spending in 2015 in all 50 states. The total economic impact is estimated to be $23,596,485 with total new job creation of 247. The largest economic and employment impacts of induced public safety spending is in the state of California with a total economic impact of approximately $4,129,233 and creation of 43 new jobs. Following California are the states of Washington, Texas, Florida and Arizona. The order of job creation was similar to economic impact. The state with least economic and employment impacts is Wyoming with $8,144 and no new jobs created.

The average economic and employment impacts of induced public safety spending per state are an estimated $471,930 and creation of five jobs. The standard deviation of economic and employment impacts of induced public safety spending are approximately $692,916 and creation of seven new jobs. The large standard deviation indicates the wide variability of economic and employment impacts among states.

Table 16: 2015 Induced Economic & Employment Impacts of Induced Safety Spending

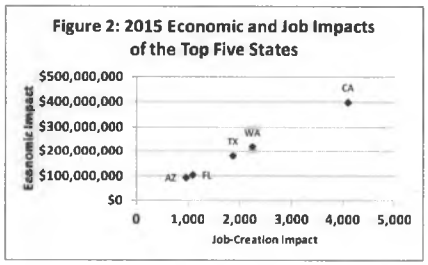
State	Direct Spending				State Induced Multipliers	Induced Economic Impact	Induced Employment Impact
	Payroll	Rents	Taxes	Total			
Alabama	$288,225	$268,963	$192,915	$1,074,296	0.3661	$307,249	2
Alaska	$26,218	$33,328	$0	$65,546	0.4891	$32,059	0
Arizona	$738,248	$1,107,373	$17,009	$1,862,630	0.62	$968,568	10
Arkansas	$109,954	$164,927	$6,158	$281,053	0.4916	$138,168	1
California	$2,804,603	$4,208,755	$89,744	$7,101,003	0.5815	$4,129,233	43
Colorado	$317,938	$476,756	$11,773	$806,366	0.4962	$400,118	4
Connecticut	$710,387	$1,065,581	$28,415	$1,804,383	0.5147	$928,715	10
Delaware	$23,884	$35,825	$1,060	$60,770	0.4883	$29,674	0
Florida	$854,052	$1,281,078	$0	$2,135,130	0.5115	$1,092,118	11
Georgia	$508,235	$762,553	$26,443	$1,297,591	0.5047	$654,964	7
Hawaii	$44,620	$66,930	$2,570	$114,119	0.4886	$55,758	1
Idaho	$39,886	$59,977	$2,367	$102,329	0.4885	$49,988	1
Illinois	$281,623	$422,434	$11,265	$715,322	0.4924	$352,225	4
Indiana	$286,568	$428,854	$7,795	$724,217	0.4951	$358,560	4
Iowa	$222,563	$333,844	$6,054	$562,460	0.4882	$274,593	3
Kansas	$437,456	$656,184	$31,873	$1,625,514	0.5198	$844,942	9
Kentucky	$123,327	$184,990	$5,920	$314,237	0.4908	$154,164	2
Louisiana	$296,513	$444,770	$9,488	$750,772	0.4907	$368,404	4
Maine	$147,425	$221,138	$8,267	$377,351	0.4881	$184,175	2
Maryland	$456,228	$684,342	$17,337	$1,157,906	0.5006	$579,648	6
Massachusetts	$521,791	$782,687	$22,124	$1,326,601	0.5027	$666,883	7
Michigan	$258,728	$388,092	$9,039	$656,359	0.4924	$324,178	3
Minnesota	$195,514	$293,271	$11,027	$499,812	0.4905	$245,158	3
Mississippi	$228,796	$338,695	$7,225	$571,717	0.489	$279,569	3
Missouri	$364,706	$532,054	$11,351	$908,124	0.5007	$449,691	5
Montana	$19,637	$29,756	$1,000	$50,592	0.4882	$24,699	0
Nebraska	$34,506	$51,909	$1,417	$87,833	0.4835	$42,955	0
Nevada	$63,786	$90,679	$0	$134,464	0.4902	$65,914	1
New Hampshire	$120,750	$181,125	$0	$301,875	0.4888	$147,566	2
New Jersey	$356,013	$537,019	$21,338	$916,369	0.4909	$454,427	5
New Mexico	$140,723	$210,335	$4,824	$355,382	0.4896	$173,995	2
New York	$584,774	$882,160	$30,690	$1,517,624	0.5038	$764,579	8
North Carolina	$208,955	$314,932	$11,757	$536,644	0.4914	$263,707	3
North Dakota	$15,430	$28,158	$438	$49,026	0.4881	$23,934	0
Ohio	$486,960	$730,440	$15,972	$1,233,372	0.5024	$619,646	6
Oklahoma	$148,156	$219,233	$6,139	$371,527	0.4925	$182,977	2
Oregon	$112,812	$168,218	$2,797	$284,737	0.4907	$139,720	1
Pennsylvania	$536,813	$809,899	$13,261	$1,363,093	0.498	$678,820	7
Rhode Island	$58,473	$87,709	$2,500	$148,681	0.4895	$72,778	1
South Carolina	$136,522	$204,784	$7,645	$348,951	0.4881	$170,323	2
South Dakota	$13,108	$19,664	$0	$32,773	0.4904	$16,072	0
Tennessee	$145,291	$217,936	$0	$363,227	0.5342	$194,036	2
Texas	$1,518,125	$2,277,187	$0	$3,795,311	0.4946	$1,877,161	20
Utah	$198,686	$298,044	$7,948	$504,688	0.489	$246,792	3
Vermont	$49,334	$73,986	$3,078	$126,387	0.4879	$61,664	1
Virginia	$438,874	$658,312	$29,368	$1,626,574	0.4918	$799,674	8
Washington	$1,624,382	$2,436,573	$0	$4,060,954	0.5581	$2,266,418	24
West Virginia	$64,491	$96,737	$3,096	$164,323	0.4901	$80,535	1
Wisconsin	$121,096	$181,644	$8,297	$309,036	0.4898	$151,304	2
Wyoming	$8,576	$12,913	$0	$16,689	0.488	$8,144	0
TOTAL	$18,000,000	$27,000,000	$627,772	$45,627,772		$23,596,485	247
Average						$471,930	5
STD						$692,916	7
MAX						$4,129,233	43
MIN						$8,144	0

Total Economic and Employment Impacts of UAS Development in the Top Five States

A comparison of the total economic and job creation impacts of UAS integration in the U.S. in the top five states is presented in Table 17. The orders of output and job multipliers are consistent with the order of the states in terms of direct spending. California is the number one state with the highest direct spending of $179,892,071 and the highest direct employment of 2,108, which resulted in the highest contribution to total economic impact of approximately $398,335,013 and total new job creation impact of approximately 4,097. In addition, California has the highest multipliers for job and output creation. Figure 2 graphically shows the total economic and job creation impacts of the top five states in the U.S.

Table 17: 2015 Total Economic and Employment Impacts of UAS Development in the Top Five States

State	Direct jobs	Total job Creation Impact	Job multiplier	Direct spending	Total Economic Impact	Output multiplier
California	2108	4,097	1.94	179,892,071	398,335,013	2.21
Washington	1157	2,249	1.94	102,877,509	218,614,707	2.13
Texas	958	1,863	1.94	96,147,891	181,084,937	1.88
Florida	557	1,084	1.94	54,089,966	105,351,026	1.95
Arizona	494	961	1.94	47,186,634	93,429,535	1.98



Total Economic and Employment Impacts of UAS Development in the United States From 2015-2025

UAS integration into the NAS will have tremendous economic and job creation impacts on the aerospace industry and aid in driving economic development in many states across the country. In today's economic environment, job creation will continue to be extremely important for the aerospace industry and the U.S. economy. Note that the economic impact of UAS integration will not stop with the primary UAS market. Similar to other industries, job growth will stretch into many additional sectors, and the economic growth in the aerospace industry will support the growth in many other businesses across multiple U.S. industries, including the hospitality and entertainment industries.

The total direct spending in UAS development and the total economic and employment impacts are expected to increase significantly in the next 11 years from 2015 through 2025, as seen in Table 18. The expected total direct spending in UAS development in 2015 is an estimated $1,153,370,225. This amount is expected to increase by 100% in 2016 to approximately $2,306,740,450. In 2017, total direct spending is expected to increase by 50% to an estimated $3,460,110,675. This rate of growth is expected to decrease in 2018 to approximately 5% with total spending of $3,633,116,209 and to level off at 5% between 2019 and 2025, with total spending in 2025 of 5,112,159,353.

Table 18: Direct Spending and Employment in The U.S. from 2015-2025

Year	Total Direct Spending	Total Direct Employment	Percent Change Over Previous Year
2015	$ 1,153,370,225	11,400	
2016	$ 2,306,740,450	22,800	100%
2017	$ 3,460,110,675	34,200	50%
2018	$ 3,633,116,209	35,910	5%
2019	$ 3,814,772,019	37,706	5%
2020	$ 4,005,510,620	39,591	5%
2021	$ 4,205,786,151	41,570	5%
2022	$ 4,416,075,459	43,649	5%
2023	$ 4,636,879,232	45,831	5%
2024	$ 4,868,723,193	48,123	5%
2025	$ 5,112,159,353	50,529	5%

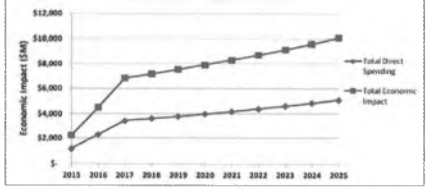
The expected total economic and employment impacts in the U.S. for UAS integration for the 11-year period from 2015 through 2025 is shown in Table 19. In 2015, the expected total economic and employment impacts are estimated to be $2,276,186,016 with creation of 23,413 jobs. These amounts are expected to increase by 100% in 2016 (from 2015) to approximately $4,552,372,033 in economic impact and job creation of 46,826. In 2017, the economic and employment impacts are expected to increase by approximately 50% to $6,828,558,049 and 70,240 jobs. This rate of growth is expected to decrease in 2018 to approximately 5% and level off at 5% through 2025. By 2025, the expected total economic impact is estimated to be $10,088,890,263 and total employment impact 103,776.

Table 19: Economic & Employment Impacts in The U.S. from 2015-2025

Year	Total Direct Spending	Total Economic Impact	Total Employment Impact	Percent Change Over Previous Year
2015	$1,153,370,225	$ 2,276,186,016	23,413	
2016	$2,306,740,450	$ 4,552,372,033	46,826	100%
2017	$3,460,110,675	$ 6,828,558,049	70,240	50%
2018	$3,633,116,209	$ 7,169,985,952	73,752	5%
2019	$3,814,772,019	$ 7,528,485,249	77,439	5%
2020	$4,005,510,620	$ 7,904,909,512	81,311	5%
2021	$4,205,786,151	$ 8,300,154,987	85,377	5%
2022	$4,416,075,459	$ 8,715,162,737	89,645	5%
2023	$4,636,879,232	$ 9,150,920,874	94,128	5%
2024	$4,868,723,193	$ 9,608,466,917	98,834	5%
2025	$5,112,159,353	$10,088,890,263	103,776	5%

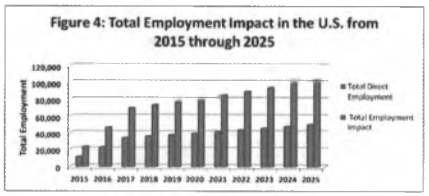
Figure 3 graphically compares total spending and economic impacts from 2015 to 2025. There are high growth rates for both spending and total economic impact in the first three years (2015-2017) but both spending and total economic impact growth are expected to decrease to 5% in 2018 and level off at 5% through 2025.

Figure 3: Total Spending and Economic Impact in the U.S. from 2015 - 2025



Direct employment and total employment impact from 2015 to 2025 are compared in Figure 4. There are high growth rates for both direct and total employment impacts in the first three years (2015-2017) to approximately 100% and 50% in 2016 and 2017, respectively. The growth rate of both direct employment and total employment impacts are expected to decrease to 5% in 2018 and level off at 5% through 2025.

Figure 4: Total Employment Impact in the U.S. from 2015 through 2025



Conclusion

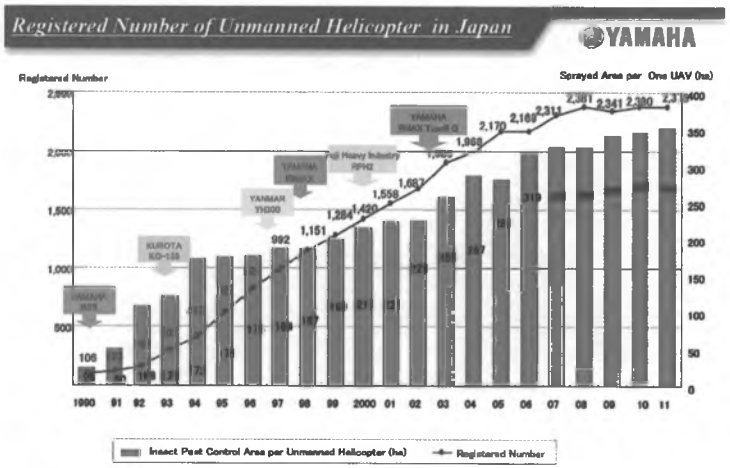
UAS integration into the NAS is expected to have enormous economic and job creation impacts in the United States. These impacts have been demonstrated to be due to direct, indirect and induced effects of total spending in UAS development. The results of these economic impacts are as follows:

During the 11-year period 2015-2025:

- UAS integration is expected to contribute $82.1 billion to the nation's economy by agriculture, public safety and other activities;
- 103,776 new jobs will be created, with 844,741 job years worked over the time period;
- UAS integration is expected to contribute $75.6 billion economic impact by agriculture, $3.2 billion by public safety and $3.2 billion by other activities;
- The manufacturing jobs created will be high paying ($40,000) and require technical baccalaureate degrees; and
- In the first three years, U.S. airspace integration will create more than 34,000 manufacturing jobs and more than 70,000 new jobs.

This study demonstrates the significant contribution of UAS integration to the economic growth and job creation in the aerospace industry and to the social and economic progress of the citizens in the United States.

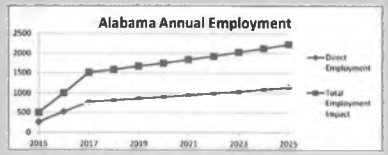
Appendix A

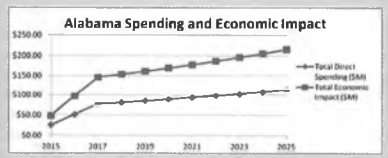


Sato, Akira (2011, October). Civil UAV Applications in Japan and Related Safety & Certification. Presented at the 1st Annual Agricultural UAS Conference: Precision Agriculture, Atlanta, GA.

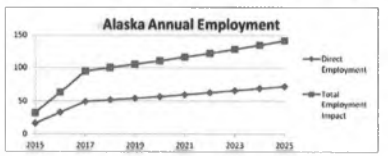
Appendix B
State Level Detailed Economic Impact

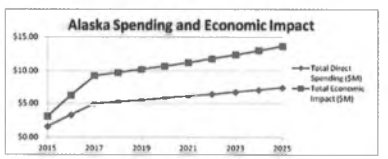
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	259	503	$25.70	$48.83	$404.65	
2016	518	1007	$51.39	$97.86	$809.31	100%
2017	777	1510	$77.09	$146.80	$1,213.96	50%
2018	816	1585	$80.94	$154.14	$1,274.66	5%
2019	856	1665	$84.99	$161.84	$1,338.39	5%
2020	899	1748	$89.24	$169.93	$1,405.31	5%
2021	944	1835	$93.70	$178.43	$1,475.58	5%
2022	991	1927	$98.38	$187.35	$1,549.35	5%
2023	1041	2023	$103.30	$196.72	$1,626.82	5%
2024	1093	2125	$108.47	$206.56	$1,708.16	5%
2025	1148	2231	$113.89	$216.88	$1,793.57	5%



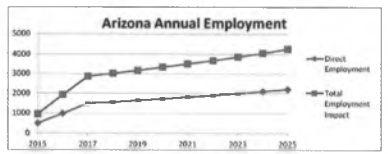


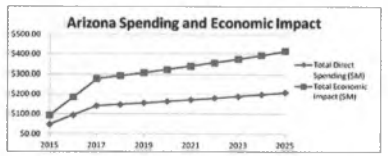
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	16	32	$1.66	$3.09	$0.00	
2016	33	64	$3.32	$6.18	$0.00	100%
2017	49	95	$4.98	$9.28	$0.00	50%
2018	52	100	$5.23	$9.74	$0.00	5%
2019	54	105	$5.49	$10.23	$0.00	5%
2020	57	110	$5.77	$10.74	$0.00	5%
2021	60	116	$6.06	$11.28	$0.00	5%
2022	63	122	$6.36	$11.84	$0.00	5%
2023	66	128	$6.68	$12.43	$0.00	5%
2024	69	134	$7.01	$13.05	$0.00	5%
2025	73	141	$7.36	$13.71	$0.00	5%



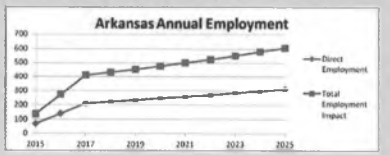


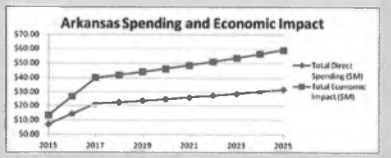
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	494	961	$47.19	$93.43	$430.90	
2016	989	1922	$94.37	$186.86	$861.80	100%
2017	1483	2883	$141.56	$280.29	$1,292.70	50%
2018	1557	3027	$148.64	$294.30	$1,357.34	5%
2019	1635	3179	$156.07	$309.02	$1,425.20	5%
2020	1717	3338	$163.87	$324.47	$1,496.46	5%
2021	1803	3504	$172.07	$340.69	$1,571.29	5%
2022	1893	3680	$180.67	$357.73	$1,649.85	5%
2023	1988	3864	$189.70	$375.61	$1,732.34	5%
2024	2087	4057	$199.19	$394.39	$1,818.96	5%
2025	2191	4260	$209.15	$414.11	$1,909.91	5%



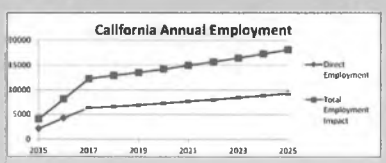


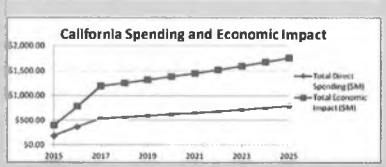
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	71	137	$7.12	$13.33	$155.99	
2016	141	274	$14.24	$26.65	$311.99	100%
2017	212	411	$21.36	$39.98	$467.98	50%
2018	222	432	$22.43	$41.98	$491.38	5%
2019	233	453	$23.55	$44.08	$515.95	5%
2020	245	476	$24.73	$46.28	$541.75	5%
2021	257	500	$25.96	$48.60	$568.83	5%
2022	270	525	$27.26	$51.03	$597.28	5%
2023	284	551	$28.62	$53.58	$627.14	5%
2024	298	579	$30.06	$56.26	$658.50	5%
2025	313	608	$31.56	$59.07	$691.42	5%



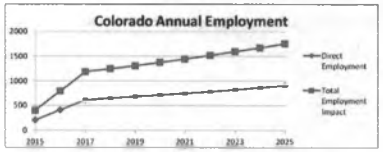


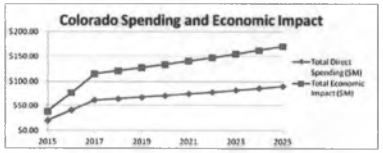
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	2108	4097	$179.89	$398.34	$2,273.52	
2016	4216	8195	$359.78	$796.67	$4,547.03	100%
2017	6324	12292	$539.68	$1,195.01	$6,820.55	50%
2018	6640	12907	$566.66	$1,254.76	$7,161.58	5%
2019	6972	13552	$594.99	$1,317.49	$7,519.66	5%
2020	7321	14230	$624.74	$1,383.37	$7,895.64	5%
2021	7687	14941	$655.98	$1,452.54	$8,290.42	5%
2022	8071	15688	$688.78	$1,525.18	$8,704.95	5%
2023	8475	16472	$723.22	$1,601.42	$9,140.19	5%
2024	8898	17296	$759.38	$1,681.49	$9,597.20	5%
2025	9343	18161	$797.35	$1,765.57	$10,077.08	5%



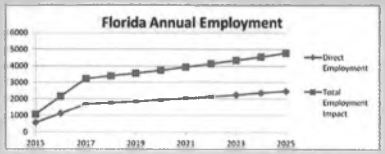


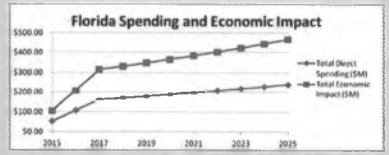
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	204	397	$20.43	$38.59	$298.24	
2016	408	794	$40.86	$77.19	$596.48	100%
2017	613	1191	$61.28	$115.78	$894.73	50%
2018	643	1251	$64.35	$121.57	$939.46	5%
2019	675	1313	$67.57	$127.65	$986.43	5%
2020	709	1379	$70.94	$134.03	$1,035.76	5%
2021	745	1448	$74.49	$140.74	$1,087.54	5%
2022	782	1520	$78.22	$147.77	$1,141.92	5%
2023	821	1596	$82.13	$155.16	$1,199.02	5%
2024	862	1676	$86.23	$162.92	$1,258.97	5%
2025	905	1760	$90.54	$171.07	$1,321.92	5%



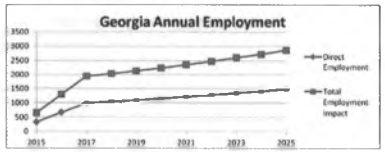


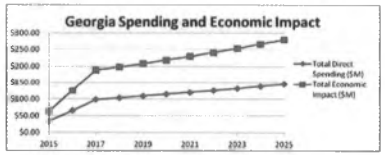
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	557	1084	$54.09	$105.35	$0.00	
2016	1115	2167	$108.18	$210.70	$0.00	100%
2017	1672	3251	$162.27	$316.05	$0.00	50%
2018	1756	3414	$170.38	$331.86	$0.00	5%
2019	1844	3584	$178.90	$348.45	$0.00	5%
2020	1936	3763	$187.85	$365.87	$0.00	5%
2021	2033	3952	$197.24	$384.16	$0.00	5%
2022	2135	4149	$207.10	$403.37	$0.00	5%
2023	2241	4357	$217.46	$423.54	$0.00	5%
2024	2353	4574	$228.33	$444.72	$0.00	5%
2025	2471	4803	$239.75	$466.95	$0.00	5%



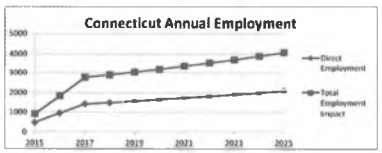


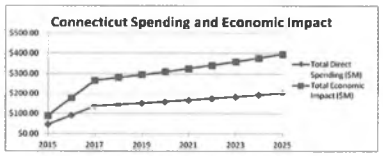
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	334	650	$32.87	$63.16	$619.23	
2016	668	1299	$65.74	$126.33	$1,238.46	100%
2017	1003	1949	$98.61	$189.49	$1,857.69	50%
2018	1053	2047	$103.54	$198.97	$1,950.57	5%
2019	1106	2149	$108.72	$208.92	$2,048.10	5%
2020	1161	2256	$114.16	$219.36	$2,150.51	5%
2021	1219	2369	$119.86	$230.33	$2,258.03	5%
2022	1280	2488	$125.86	$241.85	$2,370.94	5%
2023	1344	2612	$132.15	$253.94	$2,489.48	5%
2024	1411	2743	$138.76	$266.64	$2,613.96	5%
2025	1481	2880	$145.70	$279.97	$2,744.65	5%



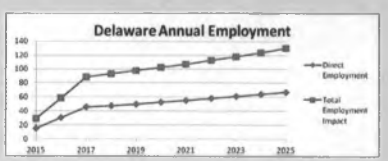


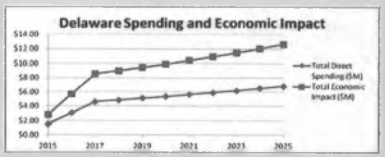
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	474	921	$45.71	$89.56	$719.86	
2016	948	1843	$91.42	$179.17	$1,439.72	100%
2017	1422	2764	$137.13	$268.75	$2,159.58	50%
2018	1493	2903	$143.99	$282.19	$2,267.56	5%
2019	1568	3048	$151.19	$296.30	$2,380.93	5%
2020	1646	3200	$158.75	$311.12	$2,499.98	5%
2021	1729	3360	$166.69	$326.67	$2,624.98	5%
2022	1815	3528	$175.02	$343.01	$2,756.23	5%
2023	1906	3705	$183.77	$360.16	$2,894.04	5%
2024	2001	3890	$192.96	$378.16	$3,038.74	5%
2025	2101	4084	$202.61	$397.07	$3,190.68	5%



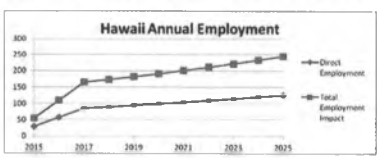


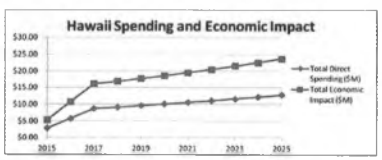
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	15	29	$1.54	$2.86	$26.88	
2016	30	59	$3.08	$5.73	$53.73	100%
2017	45	88	$4.62	$8.59	$80.59	50%
2018	48	93	$4.85	$8.02	$84.62	5%
2019	50	97	$5.09	$9.47	$88.85	5%
2020	53	102	$5.35	$9.94	$93.30	5%
2021	55	107	$5.61	$10.44	$97.96	5%
2022	58	113	$5.89	$10.96	$102.86	5%
2023	61	118	$6.19	$11.51	$108.00	5%
2024	64	124	$6.50	$12.08	$113.40	5%
2025	67	131	$6.82	$12.69	$119.07	5%



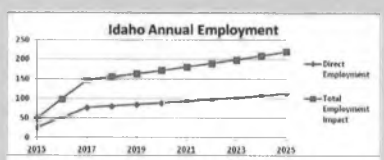


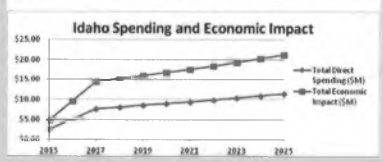
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	28	55	$2.89	$5.38	$65.11	
2016	57	111	$5.78	$10.76	$130.22	100%
2017	85	166	$8.67	$16.14	$195.33	50%
2018	90	174	$9.11	$16.94	$205.09	5%
2019	94	183	$9.56	$17.79	$215.35	5%
2020	99	192	$10.04	$18.68	$226.12	5%
2021	104	202	$10.54	$19.61	$237.42	5%
2022	109	212	$11.07	$20.59	$249.29	5%
2023	114	222	$11.62	$21.62	$261.76	5%
2024	120	234	$12.20	$22.70	$274.84	5%
2025	126	245	$12.81	$23.84	$288.59	5%



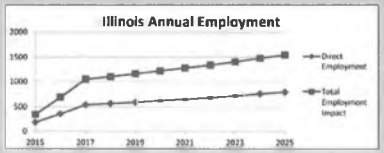


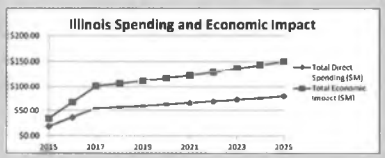
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	26	50	$2.59	$4.82	$59.97	
2016	51	99	$5.18	$9.64	$119.93	100%
2017	77	145	$7.78	$14.47	$179.90	50%
2018	80	156	$8.17	$15.19	$188.88	5%
2019	84	164	$8.57	$15.95	$198.34	5%
2020	89	172	$9.00	$16.75	$208.26	5%
2021	93	181	$9.45	$17.58	$218.67	5%
2022	98	190	$9.93	$18.46	$229.60	5%
2023	103	199	$10.42	$19.39	$241.08	5%
2024	108	209	$10.94	$20.36	$253.14	5%
2025	113	220	$11.49	$21.37	$265.79	5%



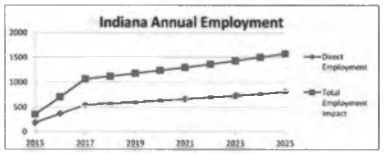


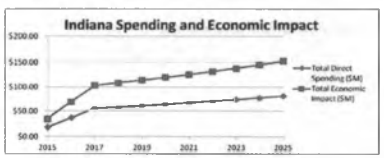
Illinois Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	180	350	$18.12	$33.98	$285.38	
2016	360	699	$36.24	$67.96	$570.76	100%
2017	539	1049	$54.36	$101.93	$856.13	50%
2018	566	1101	$57.08	$107.03	$898.94	5%
2019	595	1156	$59.94	$112.38	$943.89	5%
2020	624	1214	$62.93	$118.00	$991.08	5%
2021	656	1274	$66.08	$123.90	$1,040.64	5%
2022	688	1338	$69.38	$130.10	$1,092.67	5%
2023	723	1405	$72.85	$136.60	$1,147.30	5%
2024	759	1475	$76.50	$143.43	$1,204.67	5%
2025	797	1549	$80.32	$150.60	$1,264.90	5%



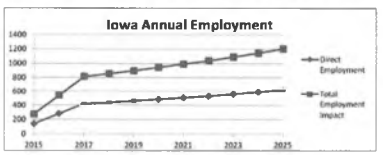


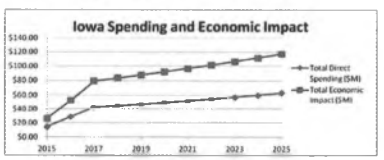
Indiana Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	183	356	$18.35	$34.58	$197.47	
2016	366	711	$36.69	$69.17	$394.93	100%
2017	549	1067	$55.04	$103.75	$592.40	50%
2018	576	1121	$57.79	$108.94	$622.02	5%
2019	605	1177	$60.68	$114.39	$653.12	5%
2020	636	1235	$63.72	$120.11	$685.77	5%
2021	667	1297	$66.90	$126.11	$720.06	5%
2022	701	1362	$70.25	$132.42	$756.06	5%
2023	736	1430	$73.76	$139.04	$793.87	5%
2024	773	1502	$77.45	$145.99	$833.56	5%
2025	811	1577	$81.32	$153.29	$875.24	5%



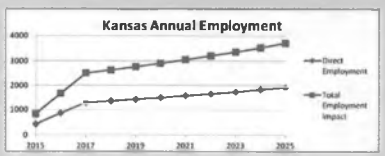


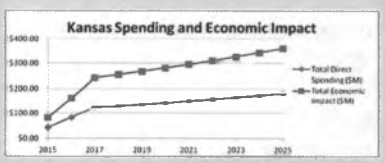
Iowa Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	140	272	$14.25	$26.49	$153.36	
2016	280	545	$28.50	$52.97	$306.72	100%
2017	420	817	$42.75	$79.46	$460.08	50%
2018	441	858	$44.88	$83.44	$483.08	5%
2019	464	901	$47.13	$87.61	$507.24	5%
2020	487	946	$49.48	$91.99	$532.60	5%
2021	511	994	$51.96	$96.59	$559.23	5%
2022	537	1043	$54.56	$101.42	$587.19	5%
2023	563	1095	$57.28	$106.49	$616.55	5%
2024	592	1150	$60.15	$111.81	$647.38	5%
2025	621	1208	$63.16	$117.40	$679.75	5%



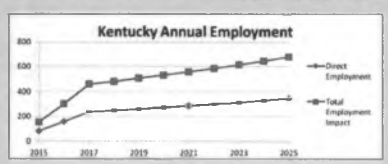


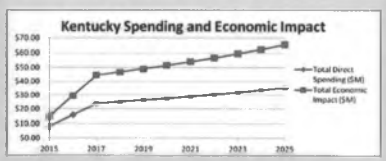
Kansas Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	431	838	$41.18	$81.50	$807.44	
2016	863	1677	$82.36	$163.01	$1,614.89	100%
2017	1294	2515	$123.54	$244.51	$2,422.33	50%
2018	1359	2641	$129.72	$256.73	$2,543.45	5%
2019	1426	2773	$136.20	$269.57	$2,670.62	5%
2020	1498	2911	$143.01	$283.05	$2,804.15	5%
2021	1573	3057	$150.16	$297.20	$2,944.36	5%
2022	1651	3210	$157.67	$312.06	$3,091.58	5%
2023	1734	3370	$165.55	$327.66	$3,246.16	5%
2024	1821	3539	$173.83	$344.05	$3,408.47	5%
2025	1912	3716	$182.52	$361.25	$3,578.89	5%



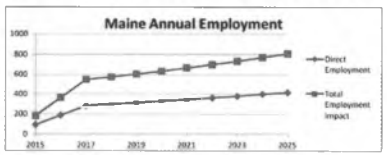


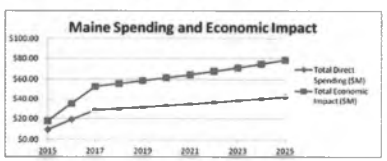
Kentucky Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	79	153	$7.96	$14.87	$149.97	
2016	157	306	$15.92	$29.74	$299.93	100%
2017	236	459	$23.88	$44.61	$449.90	50%
2018	248	482	$25.08	$46.84	$472.39	5%
2019	260	506	$26.33	$49.19	$496.01	5%
2020	273	531	$27.65	$51.65	$520.81	5%
2021	287	558	$29.03	$54.23	$546.85	5%
2022	301	586	$30.48	$56.94	$574.19	5%
2023	316	615	$32.00	$59.79	$602.90	5%
2024	332	646	$33.60	$62.78	$633.05	5%
2025	349	678	$35.28	$65.92	$664.70	5%



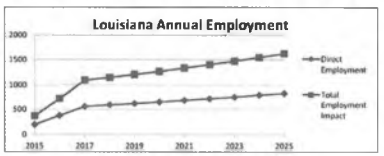


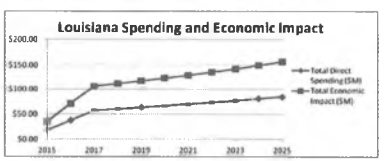
Maine Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	94	183	$9.56	$17.76	$209.43	
2016	188	365	$19.12	$35.53	$418.86	100%
2017	282	548	$28.68	$53.29	$628.29	50%
2018	296	576	$30.11	$55.96	$659.71	5%
2019	311	604	$31.62	$58.76	$692.69	5%
2020	326	635	$33.20	$61.69	$727.33	5%
2021	343	666	$34.86	$64.78	$763.70	5%
2022	360	700	$36.60	$68.02	$801.88	5%
2023	378	735	$38.43	$71.42	$841.97	5%
2024	397	771	$40.35	$74.99	$884.07	5%
2025	417	810	$42.37	$78.74	$928.28	5%



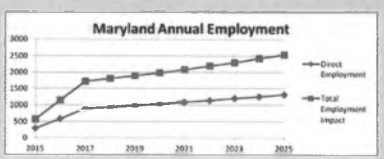


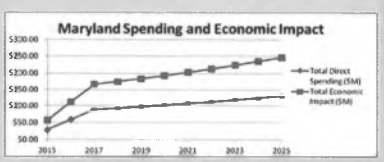
Louisiana Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	188	366	$19.02	$35.54	$240.37	
2016	376	731	$38.04	$71.07	$480.75	100%
2017	564	1097	$57.06	$106.61	$721.12	50%
2018	592	1151	$59.91	$111.94	$757.18	5%
2019	622	1209	$62.91	$117.54	$795.04	5%
2020	653	1269	$66.05	$123.41	$834.79	5%
2021	686	1333	$69.36	$129.58	$876.53	5%
2022	720	1400	$72.82	$136.06	$920.35	5%
2023	756	1470	$76.46	$142.87	$966.37	5%
2024	794	1543	$80.29	$150.01	$1,014.69	5%
2025	833	1620	$84.30	$157.51	$1,065.42	5%



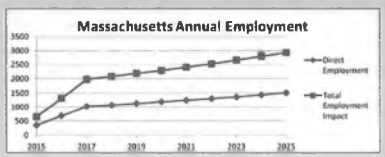


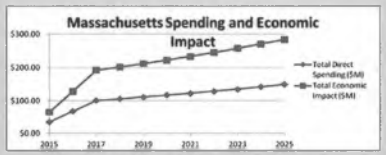
Maryland Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	296	575	$29.33	$55.91	$439.20	
2016	592	1150	$58.67	$111.83	$878.39	100%
2017	888	1725	$88.00	$167.74	$1,317.59	50%
2018	932	1812	$92.40	$176.13	$1,383.46	5%
2019	979	1902	$97.02	$184.93	$1,452.64	5%
2020	1028	1997	$101.87	$194.18	$1,525.27	5%
2021	1079	2097	$106.97	$203.89	$1,601.53	5%
2022	1133	2202	$112.31	$214.08	$1,681.61	5%
2023	1190	2312	$117.93	$224.79	$1,765.69	5%
2024	1249	2428	$123.83	$236.02	$1,853.98	5%
2025	1311	2549	$130.02	$247.83	$1,946.67	5%



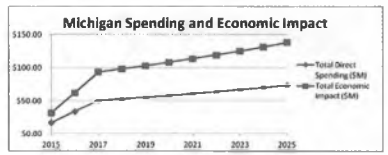


Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	340	662	$33.61	$64.33	$560.47	
2016	681	1323	$67.21	$128.66	$1,120.95	100%
2017	1021	1985	$100.82	$192.99	$1,681.42	50%
2018	1072	2084	$105.86	$202.64	$1,765.49	5%
2019	1126	2189	$111.16	$212.77	$1,853.76	5%
2020	1182	2298	$116.71	$223.41	$1,946.45	5%
2021	1241	2413	$122.55	$234.58	$2,043.78	5%
2022	1303	2534	$128.68	$246.31	$2,145.96	5%
2023	1369	2660	$135.11	$258.63	$2,253.26	5%
2024	1437	2793	$141.87	$271.56	$2,365.93	5%
2025	1509	2933	$148.96	$285.14	$2,484.22	5%

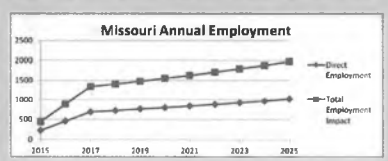


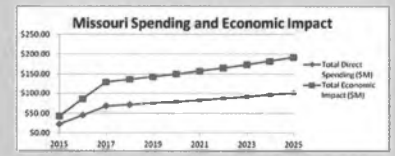


Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	185	322	$16.68	$31.27	$228.98	
2016	331	643	$33.36	$62.54	$457.95	100%
2017	496	965	$50.04	$93.81	$686.93	50%
2018	521	1013	$52.54	$98.50	$721.28	5%
2019	547	1064	$55.16	$103.42	$757.34	5%
2020	575	1117	$57.92	$108.59	$795.21	5%
2021	603	1173	$60.82	$114.02	$834.97	5%
2022	633	1231	$63.86	$119.72	$876.71	5%
2023	665	1293	$67.05	$125.71	$920.55	5%
2024	698	1358	$70.40	$131.99	$966.58	5%
2025	733	1426	$73.92	$138.59	$1,014.91	5%

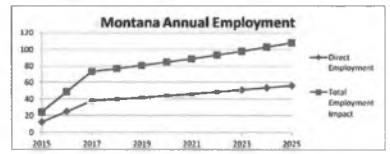


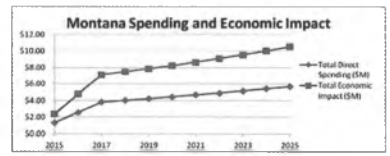
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	230	446	$22.75	$43.38	$287.55	
2016	459	892	$45.50	$86.75	$575.10	100%
2017	689	1338	$68.26	$130.13	$862.65	50%
2018	723	1405	$71.67	$136.63	$905.79	5%
2019	759	1476	$75.25	$143.46	$951.07	5%
2020	797	1549	$79.02	$150.64	$998.63	5%
2021	837	1627	$82.97	$158.17	$1,048.56	5%
2022	879	1708	$87.12	$166.08	$1,100.99	5%
2023	923	1794	$91.47	$174.38	$1,156.04	5%
2024	969	1883	$96.05	$183.10	$1,213.84	5%
2025	1017	1978	$100.85	$192.26	$1,274.53	5%



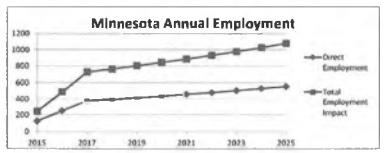


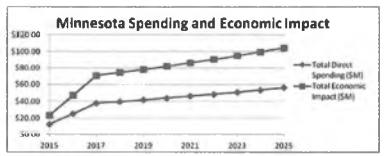
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	13	25	$1.28	$2.38	$25.33	
2016	25	49	$2.56	$4.76	$50.66	100%
2017	38	74	$3.84	$7.15	$75.98	50%
2018	40	77	$4.04	$7.50	$79.78	5%
2019	42	81	$4.24	$7.88	$83.77	5%
2020	44	85	$4.45	$8.27	$87.96	5%
2021	46	89	$4.67	$8.69	$92.36	5%
2022	48	94	$4.91	$9.12	$96.98	5%
2023	51	99	$5.15	$9.58	$101.82	5%
2024	53	103	$5.41	$10.06	$106.92	5%
2025	56	109	$5.68	$10.56	$112.26	5%



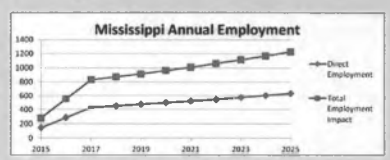


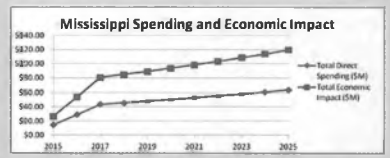
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	125	243	$12.66	$23.65	$279.35	
2016	250	487	$25.32	$47.30	$558.70	100%
2017	375	730	$37.99	$70.95	$838.05	50%
2018	394	766	$39.88	$74.49	$879.95	5%
2019	414	805	$41.88	$78.22	$923.95	5%
2020	435	845	$43.97	$82.13	$970.15	5%
2021	456	887	$46.17	$86.24	$1,018.66	5%
2022	479	931	$48.48	$90.55	$1,069.59	5%
2023	503	978	$50.90	$95.07	$1,123.07	5%
2024	528	1027	$53.45	$99.83	$1,179.22	5%
2025	555	1078	$56.12	$104.82	$1,238.18	5%



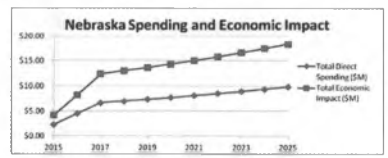


Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	143	277	$14.48	$26.97	$183.05	
2016	285	555	$28.97	$53.94	$366.09	100%
2017	428	832	$43.45	$80.91	$549.14	50%
2018	450	874	$45.62	$84.95	$576.59	5%
2019	472	918	$47.90	$89.20	$605.42	5%
2020	496	963	$50.30	$93.66	$635.69	5%
2021	520	1012	$52.81	$98.35	$667.48	5%
2022	546	1062	$55.48	$103.28	$700.85	5%
2023	574	1115	$58.23	$108.43	$735.90	5%
2024	602	1171	$61.14	$113.85	$772.69	5%
2025	633	1230	$64.20	$119.54	$811.33	5%

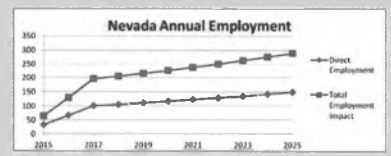


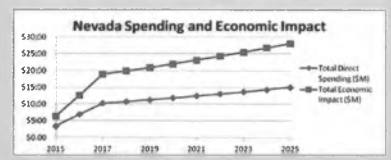


Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	22	43	$2.23	$4.14	$35.91	
2016	44	85	$4.46	$8.29	$71.82	100%
2017	66	128	$6.68	$12.43	$107.73	50%
2018	69	134	$7.02	$13.05	$113.11	5%
2019	73	141	$7.37	$13.70	$118.77	5%
2020	76	148	$7.74	$14.39	$124.71	5%
2021	80	155	$8.12	$15.11	$130.94	5%
2022	84	163	$8.53	$15.86	$137.49	5%
2023	88	171	$8.96	$16.66	$144.37	5%
2024	93	180	$9.40	$17.49	$151.58	5%
2025	97	189	$9.87	$18.37	$159.16	5%

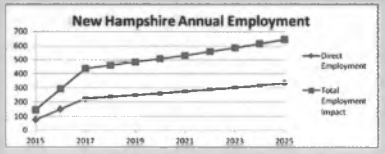


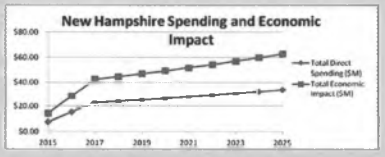
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	34	65	$3.41	$6.38	$0.00	
2016	67	131	$6.81	$12.72	$0.00	100%
2017	101	196	$10.22	$19.08	$0.00	50%
2018	106	206	$10.73	$20.03	$0.00	5%
2019	111	216	$11.27	$21.03	$0.00	5%
2020	117	227	$11.83	$22.08	$0.00	5%
2021	123	238	$12.42	$23.19	$0.00	5%
2022	129	250	$13.04	$24.35	$0.00	5%
2023	135	263	$13.69	$25.56	$0.00	5%
2024	142	276	$14.38	$26.84	$0.00	5%
2025	149	290	$15.10	$28.18	$0.00	5%



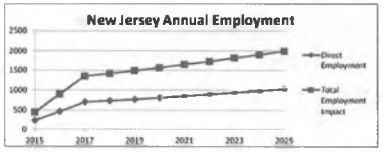


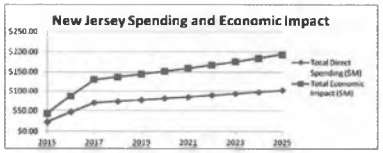
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	75	146	$7.65	$14.23	$0.00	
2016	151	293	$15.29	$28.47	$0.00	100%
2017	226	439	$22.94	$42.70	$0.00	50%
2018	237	461	$24.09	$44.84	$0.00	5%
2019	249	484	$25.29	$47.08	$0.00	5%
2020	262	508	$26.56	$49.43	$0.00	5%
2021	275	534	$27.89	$51.90	$0.00	5%
2022	288	561	$29.28	$54.50	$0.00	5%
2023	303	589	$30.75	$57.22	$0.00	5%
2024	318	618	$32.28	$60.08	$0.00	5%
2025	334	649	$33.90	$63.09	$0.00	5%



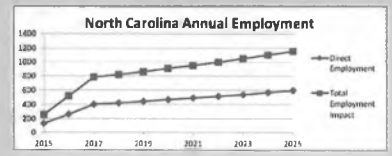


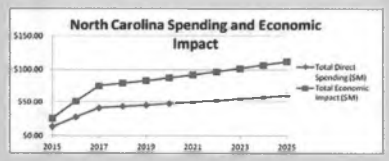
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	232	451	$23.21	$43.84	$540.55	
2016	464	902	$46.43	$87.67	$1,081.10	100%
2017	696	1353	$69.64	$131.51	$1,621.65	50%
2018	731	1420	$73.13	$138.08	$1,702.74	5%
2019	767	1491	$76.78	$144.99	$1,787.87	5%
2020	806	1566	$80.62	$152.24	$1,877.27	5%
2021	846	1644	$84.65	$159.85	$1,971.13	5%
2022	888	1726	$88.89	$167.84	$2,069.68	5%
2023	933	1813	$93.33	$176.23	$2,173.17	5%
2024	978	1903	$98.00	$185.05	$2,281.83	5%
2025	1028	1998	$102.90	$194.30	$2,395.92	5%



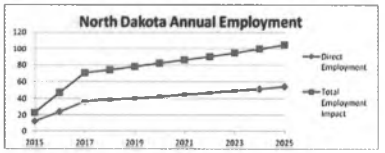


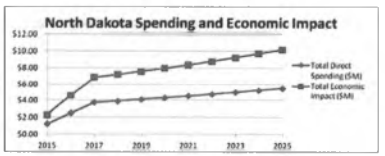
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	135	262	$13.58	$25.44	$297.86	
2016	269	523	$27.19	$50.88	$595.71	100%
2017	404	785	$40.78	$76.31	$893.57	50%
2018	424	824	$42.82	$80.13	$938.25	5%
2019	445	865	$44.97	$84.13	$985.16	5%
2020	467	909	$47.21	$88.34	$1,034.42	5%
2021	491	954	$49.57	$92.76	$1,086.14	5%
2022	515	1002	$52.05	$97.40	$1,140.44	5%
2023	541	1052	$54.66	$102.27	$1,197.47	5%
2024	568	1105	$57.39	$107.38	$1,257.34	5%
2025	597	1160	$60.26	$112.75	$1,320.21	5%



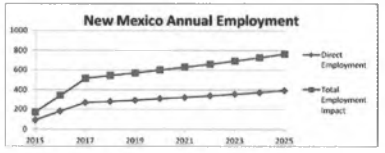


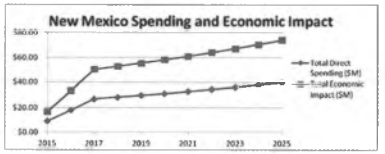
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	12	24	$1.24	$2.31	$11.11	
2016	24	47	$2.48	$4.62	$22.22	100%
2017	37	71	$3.73	$6.93	$33.33	50%
2018	38	75	$3.91	$7.27	$35.00	5%
2019	40	79	$4.11	$7.64	$36.75	5%
2020	42	82	$4.31	$8.02	$38.58	5%
2021	45	87	$4.53	$8.42	$40.51	5%
2022	47	91	$4.76	$8.84	$42.54	5%
2023	49	95	$4.99	$9.28	$44.66	5%
2024	52	100	$5.24	$9.75	$46.90	5%
2025	54	105	$5.51	$10.23	$49.24	5%



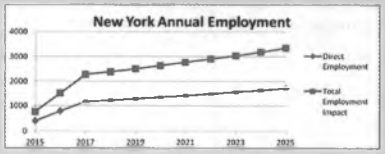


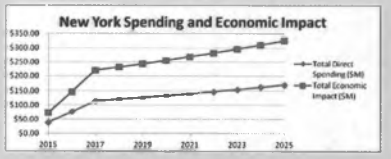
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	88	173	$9.00	$16.78	$122.20	
2016	178	345	$18.01	$33.57	$244.40	100%
2017	266	518	$27.01	$50.35	$366.60	50%
2018	280	544	$28.36	$52.87	$384.93	5%
2019	294	571	$29.78	$55.51	$404.18	5%
2020	308	600	$31.27	$58.29	$424.39	5%
2021	324	630	$32.83	$61.20	$445.60	5%
2022	340	661	$34.47	$64.26	$467.89	5%
2023	357	694	$36.19	$67.47	$491.28	5%
2024	375	729	$38.00	$70.85	$515.84	5%
2025	394	765	$39.90	$74.39	$541.64	5%



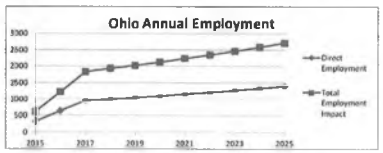


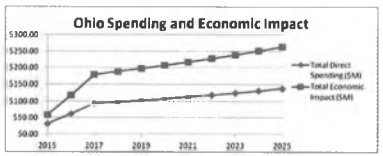
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	390	759	$38.45	$73.76	$777.48	
2016	781	1517	$76.88	$147.51	$1,554.98	100%
2017	1171	2276	$115.34	$221.27	$2,332.46	50%
2018	1229	2390	$121.11	$232.33	$2,449.09	5%
2019	1291	2509	$127.16	$243.95	$2,571.54	5%
2020	1355	2635	$133.52	$256.14	$2,700.12	5%
2021	1423	2768	$140.20	$268.95	$2,835.12	5%
2022	1494	2905	$147.21	$282.40	$2,976.88	5%
2023	1569	3050	$154.57	$296.52	$3,125.73	5%
2024	1648	3203	$162.29	$311.35	$3,282.01	5%
2025	1730	3363	$170.41	$326.91	$3,446.11	5%



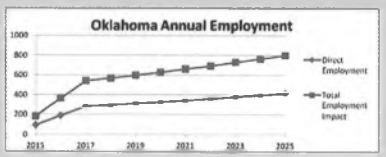


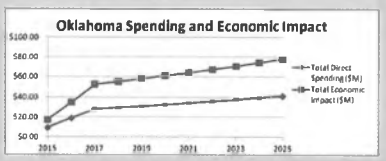
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	316	615	$31.25	$59.77	$404.63	
2016	633	1230	$62.49	$119.54	$809.26	100%
2017	949	1844	$93.74	$179.31	$1,213.89	50%
2018	996	1937	$98.42	$188.27	$1,274.59	5%
2019	1046	2033	$103.34	$197.69	$1,338.32	5%
2020	1098	2135	$108.51	$207.57	$1,405.23	5%
2021	1153	2242	$113.94	$217.95	$1,475.50	5%
2022	1211	2354	$119.63	$228.85	$1,549.27	5%
2023	1272	2472	$125.62	$240.29	$1,626.73	5%
2024	1335	2595	$131.90	$252.30	$1,708.07	5%
2025	1402	2725	$138.49	$264.92	$1,793.47	5%





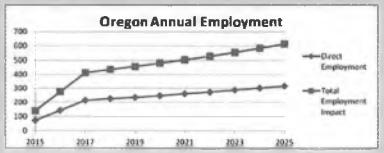
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	93	182	$9.41	$17.65	$155.51	
2016	187	383	$18.82	$35.30	$311.02	100%
2017	280	545	$28.24	$52.95	$466.53	50%
2018	294	572	$29.65	$55.60	$489.85	5%
2019	309	600	$31.13	$58.38	$514.35	5%
2020	324	631	$32.69	$61.30	$540.08	5%
2021	341	662	$34.32	$64.36	$567.07	5%
2022	358	695	$36.04	$67.58	$595.42	5%
2023	375	730	$37.84	$70.96	$625.19	5%
2024	394	766	$39.73	$74.51	$656.45	5%
2025	414	805	$41.72	$78.23	$689.27	5%

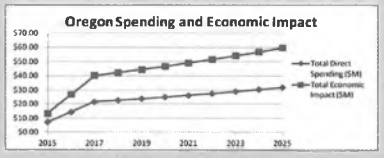




Oregon Economic Impact

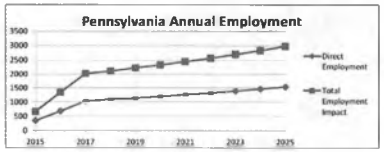
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	71	139	$7.21	$13.48	$68.59	
2016	143	277	$14.43	$26.96	$137.18	100%
2017	214	416	$21.64	$40.43	$205.77	50%
2018	225	437	$22.72	$42.46	$216.06	5%
2019	236	459	$23.86	$44.58	$226.86	5%
2020	248	481	$25.05	$46.81	$238.20	5%
2021	260	506	$26.30	$49.15	$250.11	5%
2022	273	531	$27.62	$51.61	$262.62	5%
2023	287	557	$29.00	$54.19	$275.75	5%
2024	301	585	$30.45	$56.90	$289.54	5%
2025	316	614	$31.97	$59.74	$304.01	5%

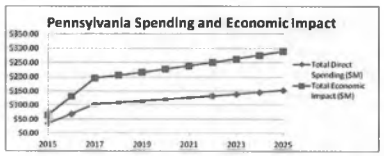




Pennsylvania Economic Impact

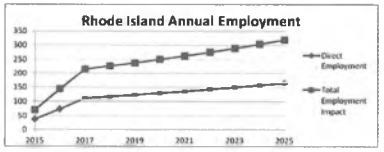
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	347	674	$34.53	$65.49	$335.94	
2016	693	1347	$69.06	$130.97	$671.88	100%
2017	1040	2021	$103.60	$196.46	$1,007.82	50%
2018	1092	2122	$108.77	$206.28	$1,058.21	5%
2019	1146	2228	$114.21	$216.59	$1,111.12	5%
2020	1203	2339	$119.92	$227.42	$1,166.67	5%
2021	1264	2456	$125.92	$238.80	$1,225.01	5%
2022	1327	2579	$132.22	$250.74	$1,286.26	5%
2023	1393	2708	$138.83	$263.27	$1,350.57	5%
2024	1463	2843	$145.77	$276.44	$1,418.10	5%
2025	1536	2986	$153.08	$290.26	$1,489.00	5%

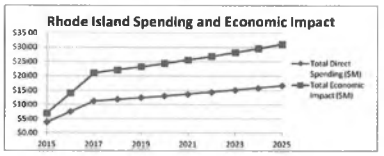




Rhode Island Economic Impact

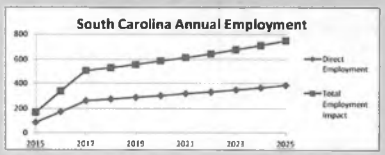
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	37	72	$3.77	$7.02	$63.33	
2016	74	144	$7.53	$14.04	$126.65	100%
2017	111	217	$11.30	$21.06	$189.98	50%
2018	117	227	$11.86	$22.11	$199.48	5%
2019	123	239	$12.46	$23.22	$209.45	5%
2020	129	251	$13.08	$24.38	$219.92	5%
2021	135	263	$13.73	$25.60	$230.92	5%
2022	142	276	$14.42	$26.88	$242.46	5%
2023	149	290	$15.14	$28.22	$254.59	5%
2024	157	305	$15.90	$29.63	$267.32	5%
2025	165	320	$16.69	$31.12	$280.68	5%

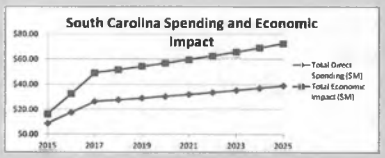




South Carolina Economic Impact

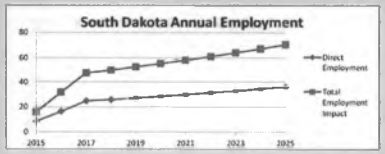
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	87	169	$8.84	$16.43	$193.68	
2016	174	338	$17.68	$32.86	$387.36	100%
2017	261	507	$26.52	$49.29	$581.04	50%
2018	274	532	$27.85	$51.75	$610.09	5%
2019	288	559	$29.24	$54.34	$640.60	5%
2020	302	587	$30.70	$57.06	$672.63	5%
2021	317	616	$32.24	$59.91	$706.26	5%
2022	333	647	$33.85	$62.91	$741.57	5%
2023	350	679	$35.54	$66.05	$778.65	5%
2024	367	713	$37.32	$69.35	$817.58	5%
2025	385	749	$39.18	$72.82	$858.46	5%

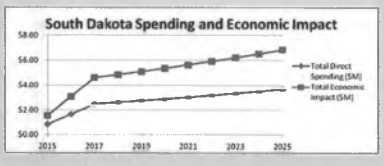




South Dakota Economic Impact

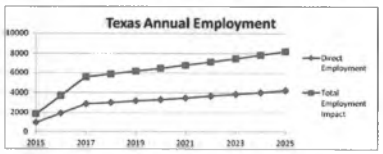
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	8	16	$0.83	$1.55	$0.00	
2016	16	32	$1.66	$3.10	$0.00	100%
2017	25	48	$2.49	$4.65	$0.00	50%
2018	26	50	$2.62	$4.88	$0.00	5%
2019	27	53	$2.75	$5.13	$0.00	5%
2020	28	55	$2.88	$5.38	$0.00	5%
2021	30	58	$3.03	$5.65	$0.00	5%
2022	31	61	$3.18	$5.94	$0.00	5%
2023	33	64	$3.34	$6.23	$0.00	5%
2024	35	67	$3.50	$6.54	$0.00	5%
2025	36	71	$3.68	$6.87	$0.00	5%

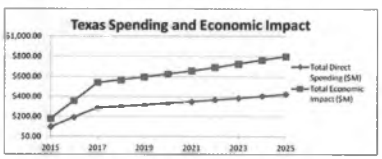




Texas Economic Impact

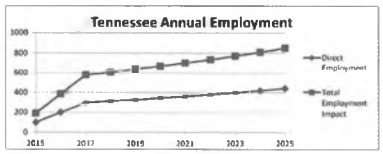
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	958	1863	$96.15	$181.08	$0.00	
2016	1916	3725	$192.30	$362.17	$0.00	100%
2017	2875	5588	$288.44	$543.25	$0.00	50%
2018	3018	5867	$302.87	$570.42	$0.00	5%
2019	3169	6161	$318.01	$598.94	$0.00	5%
2020	3328	6469	$333.91	$628.89	$0.00	5%
2021	3494	6792	$350.61	$660.33	$0.00	5%
2022	3669	7132	$368.14	$693.35	$0.00	5%
2023	3852	7488	$386.54	$728.01	$0.00	5%
2024	4045	7863	$405.87	$764.41	$0.00	5%
2025	4247	8256	$426.16	$802.63	$0.00	5%

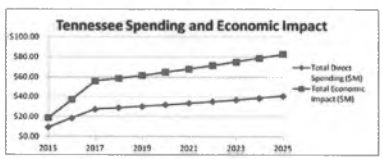




Tennessee Economic Impact

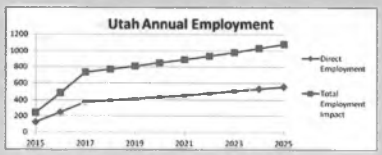
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	99	193	$9.20	$18.72	$0.00	
2016	198	385	$18.40	$37.44	$0.00	100%
2017	297	578	$27.61	$56.15	$0.00	50%
2018	312	606	$28.99	$58.96	$0.00	5%
2019	328	637	$30.43	$61.91	$0.00	5%
2020	344	669	$31.96	$65.01	$0.00	5%
2021	361	702	$33.55	$68.26	$0.00	5%
2022	379	737	$35.23	$71.67	$0.00	5%
2023	398	774	$36.99	$75.25	$0.00	5%
2024	418	813	$38.84	$79.02	$0.00	5%
2025	439	853	$40.79	$82.97	$0.00	5%

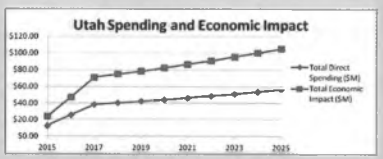




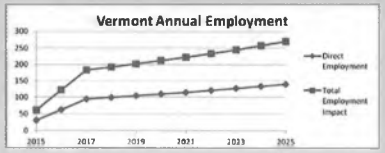
Utah Economic Impact

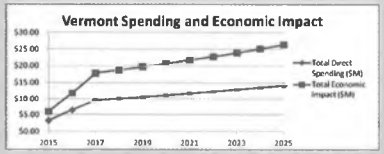
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	126	245	$12.79	$23.61	$201.35	
2016	252	490	$25.57	$47.61	$402.69	100%
2017	378	735	$38.36	$71.42	$604.04	50%
2018	397	771	$40.27	$74.99	$634.24	5%
2019	417	810	$42.28	$78.74	$665.95	5%
2020	437	850	$44.40	$82.67	$698.25	5%
2021	459	893	$46.62	$86.81	$734.21	5%
2022	482	938	$48.95	$91.15	$770.92	5%
2023	506	984	$51.40	$95.70	$809.47	5%
2024	532	1034	$53.97	$100.49	$849.94	5%
2025	558	1085	$56.67	$105.51	$892.44	5%



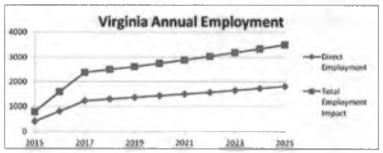


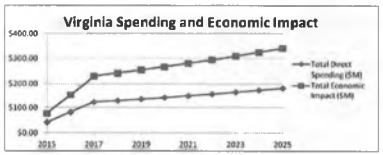
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	31	61	$3.20	$5.95	$77.97	
2016	63	122	$6.40	$11.90	$155.94	100%
2017	94	184	$9.61	$17.84	$233.91	50%
2018	99	193	$10.09	$18.74	$245.61	5%
2019	104	202	$10.59	$19.67	$257.89	5%
2020	109	212	$11.12	$20.66	$270.78	5%
2021	115	223	$11.68	$21.69	$284.32	5%
2022	121	234	$12.26	$22.78	$298.54	5%
2023	127	246	$12.87	$23.91	$313.47	5%
2024	133	258	$13.52	$25.11	$329.14	5%
2025	140	271	$14.19	$26.37	$345.60	5%



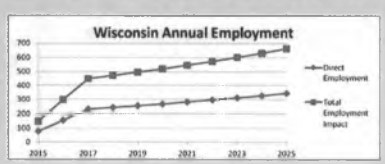


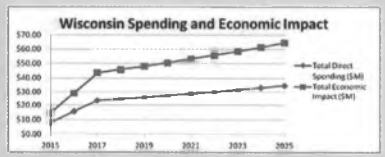
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	408	793	$41.21	$77.14	$744.50	
2016	816	1587	$82.41	$154.28	$1,489.00	100%
2017	1225	2380	$123.62	$231.42	$2,233.51	50%
2018	1286	2499	$129.80	$242.99	$2,345.18	5%
2019	1350	2624	$136.29	$255.14	$2,462.44	5%
2020	1418	2756	$143.11	$267.89	$2,585.56	5%
2021	1489	2893	$150.26	$281.29	$2,714.84	5%
2022	1563	3038	$157.77	$295.35	$2,850.58	5%
2023	1641	3190	$165.66	$310.12	$2,993.11	5%
2024	1723	3349	$173.95	$325.63	$3,142.77	5%
2025	1809	3517	$182.64	$341.91	$3,299.90	5%



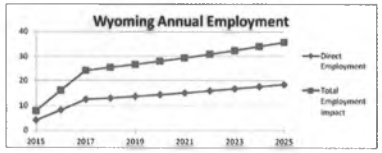


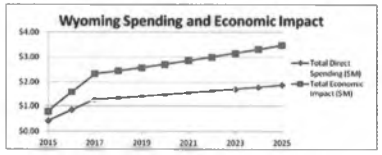
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	77	150	$7.83	$14.59	$159.52	
2016	154	300	$15.66	$29.19	$319.05	100%
2017	232	450	$23.49	$43.78	$478.57	50%
2018	243	473	$24.66	$45.97	$502.50	5%
2019	255	497	$25.89	$48.27	$527.62	5%
2020	268	521	$27.19	$50.69	$554.01	5%
2021	282	547	$28.55	$53.22	$581.71	5%
2022	296	575	$29.98	$55.88	$610.79	5%
2023	310	604	$31.47	$58.67	$641.33	5%
2024	326	634	$33.05	$61.61	$673.40	5%
2025	342	665	$34.70	$64.69	$707.07	5%





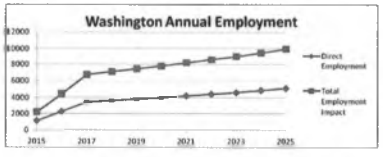
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	4	8	$0.42	$0.79	$0.00	
2016	8	16	$0.85	$1.57	$0.00	100%
2017	12	24	$1.27	$2.36	$0.00	50%
2018	13	25	$1.33	$2.47	$0.00	5%
2019	14	27	$1.40	$2.60	$0.00	5%
2020	14	28	$1.47	$2.73	$0.00	5%
2021	15	29	$1.54	$2.86	$0.00	5%
2022	16	31	$1.62	$3.01	$0.00	5%
2023	17	32	$1.70	$3.16	$0.00	5%
2024	18	34	$1.78	$3.32	$0.00	5%
2025	18	36	$1.87	$3.48	$0.00	5%

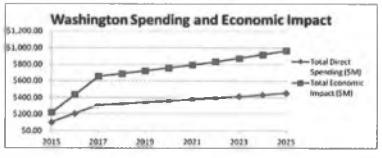




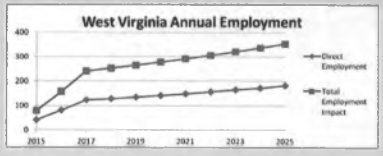
** Some states have zero tax revenue, because those states do not have a state income tax.

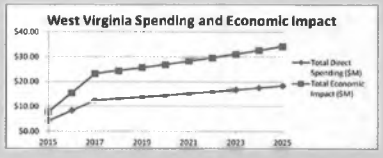
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	1157	2249	$102.88	$218.61	$0.00	
2016	2314	4497	$205.76	$437.23	$0.00	100%
2017	3470	6746	$308.63	$655.84	$0.00	50%
2018	3644	7083	$324.06	$688.64	$0.00	5%
2019	3826	7438	$340.27	$723.07	$0.00	5%
2020	4017	7809	$357.28	$759.22	$0.00	5%
2021	4218	8200	$375.14	$797.18	$0.00	5%
2022	4429	8610	$393.90	$837.04	$0.00	5%
2023	4651	9040	$413.60	$878.89	$0.00	5%
2024	4883	9492	$434.28	$922.84	$0.00	5%
2025	5127	9967	$455.99	$968.98	$0.00	5%





Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	41	80	$4.16	$7.77	$78.42	
2016	82	160	$8.33	$15.54	$156.84	100%
2017	123	240	$12.49	$23.31	$235.26	50%
2018	129	252	$13.11	$24.47	$247.03	5%
2019	136	264	$13.77	$25.70	$259.38	5%
2020	143	278	$14.46	$26.98	$272.35	5%
2021	150	291	$15.18	$28.33	$285.96	5%
2022	157	306	$15.94	$29.75	$300.26	5%
2023	165	321	$16.74	$31.23	$315.28	5%
2024	174	337	$17.57	$32.79	$331.04	5%
2025	182	354	$18.45	$34.43	$347.59	5%





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AUVSI FAST FACTS

MISSION

The mission of AUVSI is to advance the unmanned systems and robotics community through education, advocacy and leadership.

MEMBERS

AUVSI represents more than 7,000 individual members and more than 600 corporate members from 60+ allied countries involved in the fields of government, industry and academia. AUVSI members work in the defense, civil and commercial markets.

AUVSI ACTIVITIES

EVENTS

- **AUVSI's Unmanned Systems Conference and Exhibition** – More than 8,000 attendees and 600+ exhibitors from more than 40 countries and an average annual growth rate of 20% make this the leading event for the global unmanned systems and robotics marketplace. www.auvsishow.org
- **AUVSI's Unmanned Systems Program Review** – Providing the latest information on government and industry programs for ground, air and maritime systems, this annual event is one of the most important to the unmanned systems community. This is one event where business happens.
- **Networking Events** – AUVSI hosts meetings and events worldwide, providing education and networking opportunities for key industry leaders, including AUVSI's Driverless Car Summit.

ADVOCACY

AUVSI works with its membership to shape policy by advocating on behalf of the unmanned systems industry, monitoring legislation and assessing the impact of the industry. AUVSI plays a key role in addressing critical industry issues, such as National Airspace Access, Frequency Spectrum (GPS), NextGen/SESAR, Coalition Building and First Responder Grants. AUVSI works to influence legislation, including the FAA Reauthorization, Transportation Bill, DOD Reauthorization and Homeland Security Reauthorization.

EDUCATION CAMPAIGN

AUVSI is working hard to change the public perception of the unmanned systems and robotics industry through promotion of our members and the endless applications and benefits of their systems. Part of this campaign includes a public website: www.increasinghumanpotential.org.

PUBLICATIONS

- **Print** - *Unmanned Systems* magazine – A monthly magazine providing current industry news, trends and emerging developments; *Unmanned Systems: Mission Critical* – A quarterly supplement dedicated to unmanned systems sectors that, once tapped, will change the way the world works.
- **Electronic** – *AUVSI's Unmanned Systems eBrief* – A weekly electronic newsletter that includes the latest global industry and association news and information; Flight Unmanned – A biweekly electronic publication of the association for AUVSI members.

ONLINE CAREER CENTER

A leading resource for job-seekers and employers in the unmanned systems and robotics market.

KNOWLEDGE RESOURCES

Through its knowledge services AUVSI promotes vision, intellectual leadership and education in unmanned systems. AUVSI's Knowledge Vault provides AUVSI members a one-stop shop for all AUVSI event proceedings and publications.

AUVSI FOUNDATION

The AUVSI Foundation is a tax-exempt 501(c)3 public charity established to support educational initiatives such as AUVSI's Youth Education Program, discussion groups, forums and other programs. The foundation has provided more than $500,000 to educational programs worldwide. Each year, the AUVSI Foundation hosts and sponsors competitions to challenge students to design, build and deploy autonomous air, ground and maritime systems.

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Unmanned Aircraft System Operations

Industry "Code of Conduct"

The emergence of unmanned aircraft systems (UAS) as a resource for a wide variety of public and private applications quite possibly represents one of the most significant advancements to aviation, the scientific community, and public service since the beginning of flight. Rapid advancements in the technology have presented unique challenges and opportunities to the growing UAS industry and to those who support it. The nature of UAS and the environments which they operate, when not managed properly, can and will create issues that need to be addressed. The future of UAS will be linked to the responsible and safe use of these systems. Our industry has an obligation to conduct our operations in a safe manner that minimizes risk and instills confidence in our systems.

For this reason, the Association for Unmanned Vehicle Systems International (AUVSI), offers this Code of Conduct on behalf of the UAS industry for UAS operation. This code is intended to provide our members, and those who design, test, and operate UAS for public and civil use, a set of guidelines and recommendations for safe, non-intrusive operations. Acceptance and adherence to this code will contribute to safety and professionalism and will accelerate public confidence in these systems.

The code is built on three specific themes: Safety, Professionalism, and Respect. Each theme and its associated recommendations represent a "common sense" approach to UAS operations and address many of the concerns expressed by the public and regulators. This code is meant to provide UAS industry manufacturers and users a convenient checklist for operations and a means to demonstrate their obligation to supporting the growth of our industry in a safe and responsible manner. By adopting this Code, UAS industry manufacturers and users commit to the following:

Safety

- We will not operate UAS in a manner that presents undue risk to persons or property on the surface or in the air.
- We will ensure UAS will be piloted by individuals who are properly trained and competent to operate the vehicle or its systems.
- We will ensure UAS flights will be conducted only after a thorough assessment of risks associated with the activity. This risks assessment will include, but is not limited to:
    - Weather conditions relative to the performance capability of the system

- Identification of normally anticipated failure modes (lost link, power plant failures, loss of control, etc) and consequences of the failures
- Crew fitness for flight operations
- Overlying airspace, compliance with aviation regulations as appropriate to the operation, and off-nominal procedures
- Communication, command, control, and payload frequency spectrum requirements
- Reliability, performance, and airworthiness to established standards

Professionalism

- We will comply with all federal, state, and local laws, ordinances, covenants, and restrictions as they relate to UAS operations.
- We will operate our systems as responsible members of the aviation community.
- We will be responsive to the needs of the public.
- We will cooperate fully with federal, state, and local authorities in response to emergency deployments, mishap investigations, and media relations.
- We will establish contingency plans for all anticipated off-nominal events and share them openly with all appropriate authorities.

Respect

- We will respect the rights of other users of the airspace.
- We will respect the privacy of individuals.
- We will respect the concerns of the public as they relate to unmanned aircraft operations.
- We will support improving public awareness and education on the operation of UAS.

As an industry, it is incumbent upon us to hold ourselves and each other to a high professional and ethical standard. As with any revolutionary technology, there will be mishaps and abuses; however, in order to operate safely and gain public acceptance and trust, we should all act in accordance with these guiding themes and do so in an open and transparent manner. We hope the entire UAS industry will join AUVSI in adopting this industry Code of Conduct.

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AUVSI PRIVACY RIGHTS STATEMENT

AUVSI Statement on U.S. Constitutional Privacy Rights

The Association for Unmanned Vehicle Systems International (AUVSI) supports the expanded use of unmanned systems, and believes unmanned systems can be used lawfully and responsibly to avoid infringing upon Constitutional rights protecting privacy. AUVSI encourages an open dialogue at the national, state, and local level with all parties, including the police, citizens and advocacy groups, to address the concerns about the use of unmanned systems.

Summary

Unmanned systems, in particular, unmanned aircraft systems (UAS), are a tool to do tasks that are too difficult, dangerous, dull, or expensive for manned aviation. An unmanned aircraft is simply a vehicle on which to house and use some sort of system payload, such as a camera.

Although the use of the system payload onboard an unmanned aircraft defines its purpose, differentiating it from hobby or model aircraft, the system payload itself is not a new technology. Manned aircraft have been using cameras and sensors for decades.

AUVSI believes there is already a robust legal framework to allow unmanned systems to operate without infringing upon Constitutional rights protecting privacy. As with any new technology, there exists the possibility of abuse (i.e. computers, the internet, cell phones, GPS, satellites, etc.); however, used properly, in accordance with established rules and precedent, unmanned systems have the potential to greatly enhance public safety while also allowing for an entirely new industry to be formed.

Non-Military Applications

There are currently dozens of non-military uses of unmanned systems, including the use for law enforcement, firefighting, border surveillance, disaster surveillance, aerial photography, wildlife monitoring, agriculture applications, news coverage, mapping and more. The field of unmanned systems is changing rapidly, and it is likely that we have not fully comprehended all of the potential uses for unmanned systems. One thing is clear however, unmanned systems are here to stay.

Public Safety Use

Air support is an invaluable tool for public safety agencies, and the increased use of public UAS will undoubtedly save lives.

The objective of public UAS technology is to give an incident commander (whether it be police, fire, search and rescue, disaster response, or the military) access to the aerial imagery and other pertinent data necessary to efficiently and effectively bring an event to a successful conclusion. The end result is increased public safety.

The relatively small size and low cost of UAS will allow most, if not all, local public safety departments the ability to access aerial imagery. Law enforcement and first responders want to use small UAS (weighing less than 55 pounds) to give them situational awareness. These systems are very different than their larger military cousins (which can weigh tens of thousands of pounds and carry weapons) which many people picture when they think of an unmanned aircraft.

Rather than spending millions of dollars on manned helicopters and aviation units, law enforcement can use a small UAS to gain a lot of the same benefit of a manned aviation asset at a fraction of the cost. Although still expensive, small UAS will cost about the same as a police cruiser.

According to the U.S. Federal Bureau of Investigation, there are approximately 18,000 local police and sheriff departments in the United States; however, according to the Airborne Law Enforcement Association, less than 300 currently have aviation units (either fixed wing or rotary wing). According to the U.S. Fire Administration, there are approximately 30,000 fire departments in the United States; however, there are less than a dozen municipal or county fire aviation units. Because UAS are typically cheaper than manned assets, and because they can operate in dangerous environments, where manned aviation might not be feasible, UAS can provide great value to those agencies that want air assets, but cannot afford them.

In 2009, according to the National Fire Protection Association, there were more than 362,000 home fires. According to the National Interagency Fire Center, between 1 January 2010 and 4 October 2010, there were more than 57,000 wildfires, which burned nearly 3 million acres. In 2009, fires took more lives than all other natural disasters combined, with approximately 3,000 individuals and 90 firefighters dying as a result.

Some of the potential uses of UAS in firefighting include: persistent aerial surveillance, mapping, chemical sniffing, hot spot detection, designating water or suppressant drop areas, providing communication relays, search and rescue, medical evacuation, resupply, and weather monitoring. For law enforcement, UAS uses include aerial surveillance, suspect tracking, crash/crime scene photography, incident scene management, threat assessment of inaccessible areas, and emergency broadcast messaging.

Situational awareness is crucial for first responders and public safety agencies, and oftentimes, the best way to get situational information is from above. The development and use of UAS has the potential to increase public safety by allowing most, if not all, public safety agencies to acquire aerial surveillance equipment.

An Open and Transparent Discussion

Throughout the years, law enforcement agencies have proven their ability to use new technologies, even technologies with the capability to invade privacy, and use them in a safe and appropriate manner to increase public safety while still ensuring privacy protection. A few examples include manned helicopters, thermal imaging cameras, wire surveillance, GPS tracking, vast online databases, and CCTVs.

Law enforcement is able to ensure privacy rights are protected by adopting policies and procedures that govern their use. They can provide training, and they can hold people accountable if there is inappropriate behavior. They are also ultimately accountable to local elected officials and the community. AUVSI believes the easiest way to gain public support for UAS is to be forthright and open, and to invite a public discussion about the use of new technologies. Agencies that want to use UAS technology are encouraged to work with their communities to address any *reasonable* concerns and to tailor their policies and procedures to address them.

AUVSI plans on working with other law enforcement associations, such as the International Association of Chiefs of Police, the Airborne Law Enforcement Association, and the National Sheriff's Association to draft a model policy for the use of UAS by law enforcement agencies across the United States.

Existing Legal Framework

The Fourth Amendment of the U.S. Constitution prohibits unreasonable searches and seizures and requires search warrants to be based upon probable cause. The U.S. Supreme Court has interpreted the law and issued rulings that restrict the actions of police and their use of technology of all types. Courts, including the U.S. Supreme Court, have repeatedly held that airborne technology cannot be used to invade Constitutionally protected areas.

So far, in determining what is a Constitutionally protected area, the U.S. Supreme Court has distinguished between three types of areas: businesses, open fields, and homes. The Court has held that the expectation of privacy outside a home or outside a business is less than that for inside a residence.

In *Kyllo v. United States*, a case involving the use of thermal imaging by police, the U.S. Supreme Court held that all details, with respect to a home, are "intimate details" and that the use of "sense-enhancing technology" to gather information about a home, in this case forward-looking infrared imaging, is considered a search and cannot be done without a warrant. In the words of the court, "we think that obtaining by sense-enhancing technology any information regarding the interior of the home that could not otherwise have been obtained without physical intrusion into a constitutionally protected area ... constitutes a search." In other words, the court prohibits the use of airborne technology to invade Constitutionally protected areas without a

search warrant.

However, the Court has a differing view on the reasonable expectation of privacy in outdoor business property, and open fields and curtilage surrounding a residence, when observations can be made from a place where the observer has a legal right to be and the item or area is in "plain view".

In *Dow Chemical Company v. United States*, another case involving the airborne use of thermal imaging, the Court held that a Fourth Amendment protection does not include the open area of an industrial complex where there was no legitimate demand for privacy. The Court compared the aerial observations of the business with the lawful observations made over an "open field", where an individual also does not have a legitimate expectation of privacy.

With regards to the "open fields" doctrine, in *California v. Ciraolo*, the U.S. Supreme Court held that the police did not have to obtain a search warrant when observing a person's backyard or curtilage from an airplane more than 1,000 feet in altitude, and the Court went further in *Florida v. Riley*, when it held that police officers do not need a search warrant when flying a helicopter above 400 feet in altitude.

These cases can serve as the template for how law enforcement should use UAS. Because most small UAS will likely only be allowed to operate at or below 400 feet in altitude, it is likely that law enforcement will have to obtain a search warrant when using a UAS, absent exigent circumstances.

UAS Integration into the National Airspace

The Federal Aviation Administration's (FAA) mission is to "provide the safest, most efficient aerospace system in the world." The FAA's task for unmanned aircraft is coming up with the rules and regulations allowing for the safe operation and integration of UAS in the national airspace system. The UAS industry has, and will continue, to work with the FAA and other aviation stakeholders on establishing appropriate aviation safety standards.

That being said, the FAA should not be in the position to approve or deny a UAS operation based upon anything other than the safety of the airspace. Therefore, it would be inappropriate for the FAA to restrict UAS access based on anything other than aviation safety or airworthiness. Manned aviation does not need prior authorization to fly, and neither should UAS once safety standards are established and met.

On 14 February 2012, Congress passed an FAA bill into law, which requires the FAA to integrate all UAS by 30 September 2015. The bill mandates that small UAS (weighing less than 55 pounds) be integrated earlier, by the spring of 2014. The bill also instructs the FAA to expedite the access for public safety operators, and calls for the FAA to allow the use of very small UAS, weighing less than 4.4 pounds, by public safety agencies, by the middle of March 2012.

Conclusion

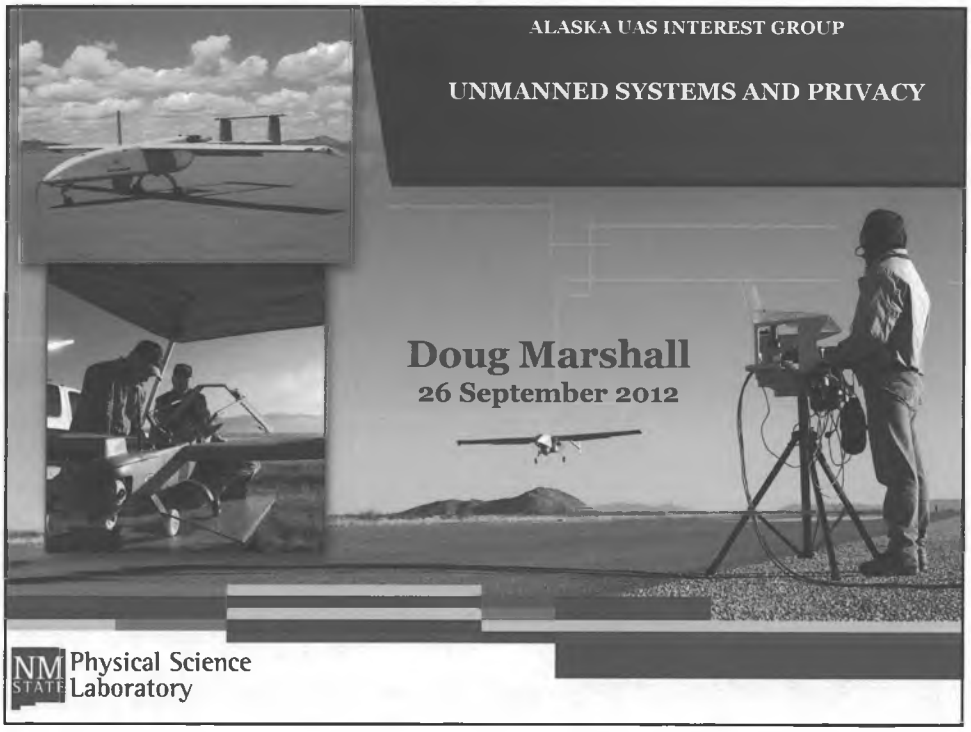
Unmanned aircraft systems will be the next major revolution in the aerospace industry, and UAS will likely change the way we think about aviation. AUVSI, as the industry's representative,

plans on playing a constructive role to ensure UAS are operated safely in the airspace and in a way that does not infringe upon Constitutionally protected privacy.

AUVSI welcomes feedback or suggestions at advocacy@auvsi.org.

###

The Association for Unmanned Vehicle Systems International (AUVSI) - the world's largest non-profit organization dedicated to the advancement of unmanned systems – represents more than 7,000 members from 55 allied countries and 2,500 organizations involved in the fields of government, industry and academia.



Privacy Cases

Key words and phrases:

- "Fourth Amendment"
- "Curtilage"
- "Reasonable/subjective Expectations of Privacy"
- "Constitutionally Protected Area"
- "Plain View"
- "Open Fields"
- "Intimate Details"
- "General Public Use"
- "Eavesdropping"
- "Routine flights on public airways"

Katz v. United States
389 U.S. 347 (1967)

- Listening device on a phone booth
- "Eavesdropping"
- "Fourth Amendment search occurs when the government violates a subjective expectation of privacy that society recognizes as reasonable"
- "These considerations do not vanish when the search in question is transferred from the setting of a home, an office, or a hotel room to that of a telephone booth. Wherever a man may be, he is entitled to know that he will remain free from unreasonable searches and seizures."

California v. Ciraolo
476 U.S. 207 (1986)

- Ciraolo grew marijuana plants in back yard
- Shielded from view by two fences
- Based on anonymous tip Santa Clara police flew over in private aircraft at 1,000 ft. and photographed house
- On evidence of naked eye observation, search warrant issued
- "The Fourth Amendment simply does not require the police traveling in the public airways at this altitude to obtain a warrant in order to observe what is visible to the naked eye."
- Reversed CA SCt's grant of motion to suppress.

Dow Chemical Company v. United States

476 U.S. 227 (1986)

- Environmental Protection Agency's aerial observation of Dow's plant complex
- EPA hired commercial aerial photographer, using a standard floor-mounted, precision aerial mapping camera, to take photographs of the facility from altitudes of 12,000, 3,000, and 1,200 feet.
- At all times the aircraft was lawfully within navigable airspace
- Held EPA's aerial photography of petitioner's 2,000-acre plant complex without a warrant was not a search under the Fourth Amendment
- Not "industrial curtilage", but an "open field"

Florida v. Riley

488 U.S. 445 (1989)

- Rural property, growing marijuana
- Unable to see inside a greenhouse behind Riley's mobile home
- Circled with helicopter at 400 ft., saw through two missing panels
- Held that police officials do not need a warrant to observe an individual's property from public airspace
- Any member of the public could legally have been flying over Riley's property in a helicopter at the altitude of 400 feet and could have observed Riley's greenhouse. The police officer did no more.
- Helicopter did not interfere with the normal use of the property (noise, dust, wind, etc.)
- Brennan's dissent worth reading w/ reference to UAS

Kyllo v. United States

533 U.S. 27 (2001)

- Use of a thermal imaging device from a public vantage point by agent of DOI to monitor the radiation of heat from person's home was a search within the meaning of the 4th Amendment and thus required a search warrant.
- The Agema 210 "is a non-intrusive device which emits no rays or beams and shows a crude visual image of the heat being radiated from the outside of the house"
- Because police did not have a warrant, the conviction for possession of marijuana was reversed.
- The question is what limits there are upon this power of technology to shrink the realm of guaranteed privacy.
- "....at the mercy of advancing technology – including imaging technology that could discern all human activity in the home."

U.S. v. Jones

- GPS tracking device attached to vehicle
- 4th Amendment violation because no warrant
- Justice Scalia stated that extended electronic surveillance "without an accompanying trespass" may be unconstitutional.
- Justice Alito: "…the use of longer term GPS monitoring in investigations of most offenses impinges on expectations of privacy.
- Could apply to UAS technology

GAO Report ("Not Ready for Prime Time")

- A June 2012 poll by Monmouth University found that 42 percent of Americans would be "very concerned" about their privacy if law enforcement started using drones, and just 15 percent said they wouldn't be concerned at all.
- "Many stakeholders believe that there should be federal regulations … to specifically protect the privacy of individuals," the report says. But "it is not clear what entity should be responsible for addressing privacy concerns across the federal government"

A gross invasion of privacy?

Does she lose her right to privacy because she is a "public figure"?

Backup Slides

Privacy and Public Policy Concerns for the UAS Owner/Operator

What types of current legal safeguards exist to protect us from misuse of UAS?

Privacy and Public Policy Concerns for the UAS Owner/Operator

- **Is there a right to privacy in the U.S.?**
- **If so, how could a UA operator violate that right?**
- **If a violation, what are the victim's remedies?**
- **How can the operator avoid liability and/or prosecution?**
- **How does the mandate to "do no harm" fit in?**

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Louis Brandeis/Samuel Warren and the "right to be let alone" (1890-Harvard Law Review)
- Dean Prosser' s four privacy tort claims (1960-Prosser, The Law of Torts)
- The Impact of the Internet

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Unguarded (or indiscreet) moments between friends can be captured in pictures and be instantly available across the world in digital form.
- A computer can identify the faces in each picture to create a searchable database - a fully indexed catalog of life, captured in still frames.
- The technology is here.

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Facial recognition search engines
- This technology creates an automatic, searchable pictorial documentary of one's life
- Flickr and Shutterfly were created to help anyone with a camera share pictures over the Internet.
- Flickr alone now catalogues over 325 million digital photos.

Privacy and Public Policy Concerns for the UAS Owner/Operator

- The new facial recognition systems (Polar Rose, Riva, Google Picasa, Facebook) make it possible for computers to tag photos with names even if the uploader and the subject are complete strangers
- For several reasons, existing privacy law may be ill-suited for this new technology

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Traditional tort law does not recognize invasions of privacy that occur in public, such as the taking of a photo in any public location.
- The few "public invasions" that do constitute torts involve celebrities or other individuals who have commercial interests in their likenesses.
- Courts have severely limited privacy protections to ensure that privacy claims do not limit the free flow of ideas.

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Dean Prosser's torts:
  - Intrusion upon seclusion
  - Public disclosure
  - False light
  - Misappropriation (the right of publicity)

Privacy and Public Policy Concerns for the UAS Owner/Operator

- "Intrusion upon seclusion" is an intrusion into "a private place or matter as to which a person would have a reasonable expectation of privacy.
- "Public disclosure" punishes those who reveal private information "that would be objectionable to a reasonable person of ordinary sensibilities."
- "False light" makes liable someone who falsely claims another person made certain statements or actions

Privacy and Public Policy Concerns for the UAS Owner/Operator

- These three torts probably don't apply to those photos taken in public spaces and then uploaded to the Internet.
- The fact that an image is snapped at a party, a restaurant, a park, or a bar would doom the claim.
- The torts do "not apply to matters which occur in a public place or a place otherwise open to the public eye."
- Intrusion upon seclusion" is an intrusion into "a private place or matter as to which a person would have a reasonable expectation of privacy

Privacy and Public Policy Concerns for the UAS Owner/Operator

The UAS problem is with images taken of people who are in situations where they have a reasonable expectation of privacy:

- Their own property
- In the wilderness
- On a boat
- Use your imagination...

Privacy and Public Policy Concerns for the UAS Owner/Operator

Misappropriation (the right of publicity)

- Only applies to those whose names and faces are well recognized
- Have commercial value that could be exploited
- Celebrities, usually
- A small UA that just happens to get an image of a famous person sun bathing on a "deserted" beach

Privacy and Public Policy Concerns for the UAS Owner/Operator

- When the lives of ordinary citizens are suddenly searchable, private or indiscreet moments can become lasting reminders open to the entire world
- The ability to keep parts of our lives private is central to our individual uniqueness

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Possible privacy scenarios :
  - Aerial photography
  - Remote sensing that records images
  - Surveillance activities over public (and private) land
  - Scientific payload with imaging capability
  - Scientific payload on a CBP or DoD UAS in a joint use arrangement

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Other issues:
  - Who owns the images?
  - Who is liable in case of "inadvertent" capture of images that somehow result in harm to the person depicted?
  - How to ensure security of data capture?
  - In joint-use situations, what are obligations/duties of operator, pilot, contractor to share digital data that may show criminal behavior?
  - What if a sensor operator puts an image or video on the Internet?

Privacy and Public Policy Concerns for the UAS Owner/Operator

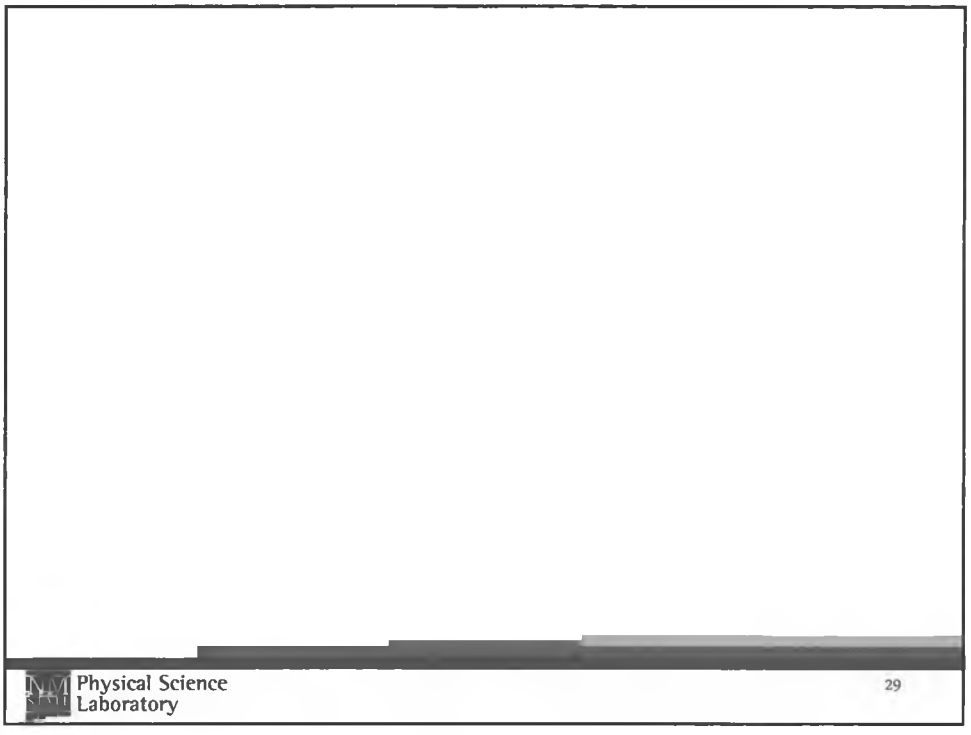
- Other issues:
  - If the potential for misuse of imaging is real, how to ensure that the system or operator "does no harm"?
  - For joint scientific, DHS/CBP and DoD operations, if law enforcement captures data on a science pod, can the data be legally used in prosecution?
  - Can owner/operator be civilly liable for turning over images or data to law enforcement?

Privacy and Public Policy Concerns for the UAS Owner/Operator

- In the law, there is the concept of "foreseeability"
- If it can happen, it probably will
- Possible solutions:
  - Courts or legislatures can expand "privacy" into public places
  - Legislative Intervention
    - Government regulation may be preferable to tort litigation in this circumstance

Privacy and Public Policy Concerns for the UAS Owner/Operator

- Some objections to any legislative intervention:
  - concern for the First Amendment
  - a desire for full information
  - faith in the market
  - anxiety about government interference with emerging technology
- Caveat-there is no good precedent for any of this....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Integration of Drones into Domestic Airspace - Congressional Research Service (2013)

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Integration of Drones into Domestic Airspace: Selected Legal Issues

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Legislative Attorney

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January 30, 2013

Congressional Research Service
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R42940

CRS Report for Congress
Prepared for Members and Committees of Congress

Summary

Under the FAA Modernization and Reform Act of 2012, P.L. 112-95, Congress has tasked the Federal Aviation Administration (FAA) with integrating unmanned aircraft systems (UASs), sometimes referred to as unmanned aerial vehicles (UAVs) or drones, into the national airspace system by September 2015. Although the text of this act places safety as a predominant concern, it fails to establish how the FAA should resolve significant, and up to this point, largely unanswered legal questions.

For instance, several legal interests are implicated by drone flight over or near private property. Might such a flight constitute a trespass? A nuisance? If conducted by the government, a constitutional taking? In the past, the Latin maxim *cujus est solum ejus est usque ad coelum* (for whoever owns the soil owns to the heavens) was sufficient to resolve many of these types of questions, but the proliferation of air flight in the 20th century has made this proposition untenable. Instead, modern jurisprudence concerning air travel is significantly more nuanced, and often more confusing. Some courts have relied on the federal definition of "navigable airspace" to determine which flights could constitute a trespass. Others employ a nuisance theory to ask whether an overhead flight causes a substantial impairment of the use and enjoyment of one's property. Additionally, courts have struggled to determine when an overhead flight constitutes a government taking under the Fifth and Fourteenth Amendments.

With the ability to house surveillance sensors such as high-powered cameras and thermal-imaging devices, some argue that drone surveillance poses a significant threat to the privacy of American citizens. Because the Fourth Amendment's prohibition against unreasonable searches and seizures applies only to acts by government officials, surveillance by private actors such as the paparazzi, a commercial enterprise, or one's neighbor is instead regulated, if at all, by state and federal statutes and judicial decisions. Yet, however strong this interest in privacy may be, there are instances where the public's First Amendment rights to *gather* and *receive* news might outweigh an individual's interest in being let alone.

Additionally, there are a host of related legal issues that may arise with this introduction of drones in U.S. skies. These include whether a property owner may protect his property from a trespassing drone; how stalking, harassment, and other criminal laws should be applied to acts committed with the use of drones; and to what extent federal aviation law could preempt future state law.

Because drone use will occur largely in federal airspace, Congress has the authority or can permit various federal agencies to set federal policy on drone use in American skies. This may include the appropriate level of individual privacy protection, the balancing of property interests with the economic needs of private entities, and the appropriate safety standards required.

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Introduction

The integration of drones into U.S. skies is expected by many to yield significant commercial and societal benefits.[1] Drones could be employed to inspect pipelines, survey crops, and monitor weather.[2] One newspaper has already used a drone to survey storm damage, [3] and real estate agents have used them to survey property.[4] In short, the extent of their potential domestic application is bound only by human ingenuity.

In an effort to accelerate this introduction, in the FAA Modernization and Reform Act of 2012, Congress tasked the Federal Aviation Administration (FAA) with safely integrating drones into the national airspace system by September 2015.[5] Likewise, sensing the opportunities that unmanned flight portend, lobbying groups and drone manufacturers have joined the chorus of those seeking a more rapid expansion of drones in the domestic market.[6]

Yet, the full-scale introduction of drones into U.S. skies will inevitably generate a host of legal issues. This report will explore some of those issues. To begin, this report will describe the regulatory framework for permitting the use of unmanned vehicles and the potential rulemaking that will occur over the next few years. Next, it will discuss theories of takings and property torts as they relate to drone flights over or near private property. It will then discuss the privacy interests implicated by drone surveillance conducted by private actors and the potential countervailing First Amendment rights to gather and receive news. Finally, this report will explore possible congressional responses to these privacy concerns and identify additional potential legal issues.

Development of Aviation Law and Regulations

The predominant theory of airspace rights applied before the advent of aviation derived from the Roman Law maxim *cujus est solum ejus est usque ad coelum*, meaning whoever owns the land

[1] A "drone" is simply an aircraft that can fly without a human operator. They are sometimes referred to as unmanned aerial vehicles (UAV), and the whole system—including the aircraft, the operator on the ground, and the digital network required to fly the aircraft—is referred to as an unmanned aircraft system (UAS). *See generally* CRS Report R42718, *Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System*, by Bart Elias.

[2] *See* GOV'T ACCOUNTABILITY OFFICE, UNMANNED AIRCRAFT SYSTEMS: MEASURING PROGRESS AND ADDRESSING POTENTIAL PRIVACY CONCERNS WOULD FACILITATE INTEGRATION INTO THE NATIONAL AIRSPACE SYSTEM (2012).

[3] It is reported that News Corp. has used a small drone to monitor storm damage in Alabama and flooding in North Dakota. Kashmir Hill, *FAA Looks Into News Corp's Daily Drone, Raising Questions About Who Gets to Fly Drones in the U.S.*, FORBES, (Aug. 2, 2011 3:52 P.M.), http://www.forbes.com/sites/kashmirhill/2011/08/02/faa-looks-into-news-corps-daily-drone-raising-questions-about-who-gets-to-fly-drones-in-the-u-s/.

[4] Nick Wingfield & Somini Sengupta, *Drones Set Sights on U.S. Skies*, N.Y. TIMES (Feb. 17, 2012), *available at* http://www.nytimes.com/2012/02/18/technology/drones-with-an-eye-on-the-public-cleared-to-fly.html?pagewanted=all&_r=0.

[5] FAA Modernization and Reform Act of 2012, P.L. 112-95, 126 Stat. 11.

[6] Groups such as the Association for Unmanned Vehicle Systems International, which boasts 7,200 members, including defense contractors, educational institutions, and government agencies, have been formed to advance the interests of the UAV community. Association for Unmanned Vehicle Systems International, http://www.auvsi.org/Home (last visited Jan. 7, 2012).

possesses all the space above the land extending upwards into the heavens.[7] This maxim was adopted into English common law and eventually made its way into American common law.[8] At the advent of commercial aviation, Congress enacted the Air Commerce Act of 1926[9] and later the 1938 Civil Aeronautics Act.[10] These laws included provisions stating that "to the exclusion of all foreign nations, [the United States has] complete sovereignty of the airspace" over the country.[11] Additionally, Congress declared a "public right of freedom of transit in air commerce through the navigable airspace of the United States."[12] This right to travel in navigable airspace came into conflict with the common law idea that each landowner also owned the airspace above the surface in perpetuity. If the common law idea was followed faithfully, there could be no right to travel in navigable airspace without constantly trespassing in private property owners' airspace. This conflict was directly addressed by the Supreme Court in *United States v. Causby*, discussed extensively below.

With the passage of the Federal Aviation Act in 1958,[13] the administrator of the FAA was given "full responsibility and authority for the advancement and promulgation of civil aeronautics generally.... "[14] This centralization of responsibility and creation of a uniform set of rules recognized that "aviation is unique among transportation industries in its relation to the federal government—it is the only one whose operations are conducted almost wholly within federal jurisdiction.... "[15] The FAA continues to set uniform rules for the operation of aircraft in the national airspace. In the FAA Modernization and Reform Act of 2012, Congress instructed the FAA to "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system."[16] These regulations must provide for this integration "as soon as practicable, but not later than September 30, 2015."[17]

Current FAA Regulations of Navigable Airspace

Fixed-Wing Aircraft

FAA regulations define the minimum safe operating altitudes for different kinds of aircraft. Generally, outside of takeoff and landing fixed-wing aircraft must be operated at an altitude that allows the aircraft to conduct an emergency landing "without undue hazard to persons or property on the surface."[18] In a congested area, the aircraft must operate at least "1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft."[19] The minimum safe

[7] Colin Cahoon, *Low Altitude Airspace: A Property Rights No-Man's Land*, 56 J. AIR L. & COM. 157, 161 (1990).

[8] *Id*; *see also* R. WRIGHT, THE LAW OF AIRSPACE 11-65 (1968).

[9] Air Commerce Act of 1926, P.L. 69-254, 44 Stat. 568, 572.

[10] Civil Aeronautics Act of 1938, P.L. 75-706, 52 Stat. 973.

[11] Codified as amended at 49 U.S.C. § 40103 (2012).

[12] Codified as amended at 49 U.S.C. § 40101 (2012).

[13] P.L. 85-726; 72 Stat. 737 (1958).

[14] H.Rept. 2360, 85th Cong., 2d Sess. (1958).

[15] S. Rept. 1811, 85th Cong., 2d Sess. (1958).

[16] P.L. 112-95, § 332(a)(1).

[17] *Id.* at § 332(a)(3).

[18] 14 C.F.R. § 91.119(a).

[19] *Id.* at § 91.119(b).

operating altitude over non-congested areas is "500 feet above the surface."[20] Over open water or sparsely populated areas, aircraft "may not be operated closer than 500 feet to any person, vessel, vehicle, or structure."[21] Navigable airspace is defined in statute as the airspace above the minimum safe operating altitudes, including airspace needed for safe takeoff and landing.[22]

Helicopters

While fixed-wing aircraft are subject to specific minimum safe operating altitudes based on where it is flying, regulation of helicopter minimum altitudes is less rigid. According to FAA regulations, a helicopter may fly below the minimum safe altitudes prescribed for fixed-wing aircraft if it is operated "without hazard to person or property on the surface."[23] Therefore, arguably a helicopter may be lawfully operated outside the zone defined in statute as navigable airspace.[24]

Current FAA Regulation of Drones

Public and Commercial Operators

Drones operated by federal, state, or local agencies must obtain a certificate of authorization or waiver (COA) from the FAA. After receiving COA applications, the FAA conducts a comprehensive operational and technical review of the drone and can place limits on its operation in order to ensure its safe use in airspace.[25] In response to a directive in the FAA Modernization and Reform Act of 2012, the FAA recently streamlined the process for obtaining COAs, making it easier to apply on their website.[26] It also employs expedited procedures allowing grants for temporary COAs if needed for time-sensitive mission.[27]

Private commercial operators must receive a special airworthiness certificate in the experimental category in order to operate.[28] These certificates have been issued on a limited basis for flight tests, demonstrations, and training. Presently, there is no other method of obtaining FAA approval to fly drones for commercial purposes. It appears these restrictions will be loosened in the coming

[20] *Id.* at § 91.119(c).

[21] *Id.*

[22] 49 U.S.C. § 40102(32).

[23] 14 C.F.R. § 91.119(d).

[24] *See* People v. Sabo, 185 Cal. App. 3d 845, 852 (1986) ("While helicopters may be operated at less than minimum altitudes so long as no hazard results, it does not follow that such operation is conducted within navigable airspace. The plain meaning of the statutes defining navigable airspace as that airspace above specified altitudes compels the conclusion that helicopters operated below the minimum are not in navigable airspace. The helicopter hovering above the surface of the land in such fashion as not to constitute a hazard to persons or property is, however, lawfully operated.").

[25] *See generally* FAA "Unmanned Aircraft Systems," *available at* http://www.faa.gov/about/initiatives/uas/cert/.

[26] *See* P.L. 112-95, § 334(a) (instructing the issuance of "guidance regarding the operation of public unmanned aircraft systems to ... expedite the issuance of a certificate of authorization process ... "); *see also* "Certificates of Authorization or Waiver (COA)," *available at* http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/.

[27] "FAA makes progress with UAS integration," *available at* http://www.faa.gov/news/updates/?newsId=68004.

[28] *See* 14 C.F.R. §§ 21.191, 21.193 (experimental certificates generally); 14 C.F.R. § 91.319 (operating limitations on experimental certificate aircraft).

years, since the FAA has been instructed to issue a rulemaking that will lead to the phased-in integration of civilian unmanned aircraft into national airspace.[29]

Recreational Users

The FAA encourages recreational users of model aircraft, which certain types of drones could fall under, to follow a 1981 advisory circular. Under the circular, users are instructed to fly a sufficient distance from populated areas and away from noise-sensitive areas like parks, schools, hospitals, or churches. Additionally, users should avoid flying in the vicinity of full-scale aircraft and not fly more than 400 feet above the surface. When flying within three miles of an airport, users should notify the air traffic control tower, airport operator, or flight service station. Compliance with these guidelines is voluntary. In the FAA Modernization and Reform Act of 2012, the FAA was prohibited from promulgating rules regarding certain kinds of model aircraft flown for hobby or recreational use. This prohibition applies if the model aircraft is less than 55 pounds, does not interfere with any manned aircraft, and is flown in accordance with a community-based set of safety guidelines. If flown within five miles of an airport, the operator of the model aircraft must notify both the airport operator and air traffic control tower.[30]

Safe Minimum Flying Altitude

The FAA does not currently regulate safe minimum operating altitudes for drones as it does for other kinds of aircraft. This may be one way that the FAA responds to Congress's instruction to write rules allowing for civil operation of small unmanned aircraft systems in the national airspace.[31] One possibility is for the FAA to create different classes of drones based on their size and capabilities. Larger drones that physically resemble fixed-wing aircraft could be subject to similar safe minimum operating altitude requirements whereas smaller drones could be regulated similar to helicopters.

Airspace and Property Rights

Since the popularization of aviation, courts have had to balance the need for unobstructed air travel and commerce with the rights of private property owners. The foundational case in explaining airspace ownership rights is *United States v. Causby*.[32]

United States v. Causby

In *United States v. Causby*, the Supreme Court directly confronted the question of who owns the airspace above private property.[33] The plaintiffs filed suit against the U.S. government arguing a violation of the Fifth Amendment Takings Clause, which states that private property shall not "be taken for public use, without just compensation." Generally, takings suits can only be filed

[29] P.L. 112-95, § 332(2).

[30] P.L. 112-95 § 336.

[31] *See id.* at § 332(b).

[32] United States v. Causby, 328 U.S. 256 (1946).

[33] *Id.*

against the government when a government actor, as opposed to a private part, causes the alleged harm.[34]

Causby owned a chicken farm outside of Greensboro, North Carolina that was located near an airport regularly used by the military. The proximity of the airport and the configuration of the farm's structures led the military planes to pass over the property at 83 feet above the surface, which was only 67 feet above the house, 63 feet above the barn, and 18 feet above the tallest tree.[35] While this take-off and landing pattern was conducted according to the Civil Aeronautics Authority guidelines, the planes caused "startling" noises and bright glare at night.

As the Court explained, "as a result of the noise, respondents had to give up their chicken business. As many as six to ten of their chickens were killed in one day by flying into the walls from fright. The total chickens lost in this manner was about 150.... The result was the destruction of the use of the property as a commercial chicken farm."[36] The Court had to determine whether this loss of property constituted a taking without just compensation.

At the outset, the Court directly rejected the common law conception of airspace ownership: "It is ancient doctrine that at common law ownership of the land extended to the periphery of the universe—*Cujus solum ejus est usque ad coelum.* But that doctrine has no place in the modern world."[37] The Court noted that Congress had previously declared a public right of transit in air commerce in navigable airspace and national sovereignty in the airspace.[38] These statutes could not be reconciled with the common law doctrine without subjecting aircraft operators to countless trespass suits. In the Court's words, "common sense revolts at the idea."[39]

Even though it rejected the idea that the Causbys held complete ownership of the air up to the heavens, the Court still had to determine if they owned any portion of the space in which the planes flew such that a takings could occur. The government argued that flights within navigable airspace that do not physically invade the surface cannot lead to a taking. It also argued that the landowner does not own any airspace adjacent to the surface "which he has not subjected to possession by the erection of structures or other occupancy."[40]

The Court did not adopt this reasoning, finding instead that "the landowner owns at least as much space above the ground as he can occupy or use in connection with the land. The fact that he does not occupy it in a physical sense—by the erection of building and the like—is not material."[41] Therefore, it found that the landowner owns the airspace in the immediate reaches of the surface necessary to use and enjoy the land and invasions of this space "are in the same category as invasions of the surface."[42] Above these immediate reaches, the airspace is part of the public

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[34] Takings claims filed against state government actors would not be filed under the Fifth Amendment. Rather, they would arise as state constitutional claims. For more information on takings, *see* CRS Report RS20741, *The Constitutional Law of Property Rights "Takings": An Introduction*, by Robert Meltz.

[35] *Id.* at 258.

[36] *Id.* at 259.

[37] *Id.* at 260-61.

[38] *Id.* at 260 (citing statutes then codified at 49 U.S.C. §§ 176(a), 403).

[39] *Id.*

[40] *Id.*

[41] *Id.* at 264 (citing Hinman v. Pacific Air Transport, 84 F.2d 755 (1936)).

[42] *Id.* at 265.

domain, but the Court declined to draw a clear line. The Court also noted that the government's argument regarding the impossibility of a taking based on flights in navigable airspace was inapplicable in this case because the flights over Causby's land were not within navigable airspace.[43] At the time, federal law defined navigable airspace as space above the minimum safe flying altitudes for specific areas, but did not include the space needed to take off and land. Even though these flights were not within navigable airspace, the Court seemed to suggest that if they were, the inquiry would not immediately end. Instead, the Court would then have to determine when the regulation itself, defining the navigable airspace, was valid.[44]

Ultimately, in the context of a taking claim, the Court concluded that "flights over private land are not a taking, unless they are so low and so frequent to be a direct and immediate interference with the enjoyment and use of the land."[45] With regard to the Causbys' chicken farm, the Court concluded that the military flights had imposed a servitude upon the land, similar to an easement, based on the interference with the use and enjoyment of their property. Although the land did not lose all its economic value, the lower court's finding clearly established the flights led directly to a diminution in the value of the property, since it could no longer be used for its primary purpose as a chicken farm.

Post-*Causby* Theories of Airspace Ownership

Causby clearly abandoned the ancient idea that private landowners each owned their vertical slice of the airspace above the surface in perpetuity as incompatible with modern life. The case set up three factors to examine in a taking claim that courts still utilize today: (1) whether the planes flew directly over the plaintiff's land; (2) the altitude and frequency of the flights; and (3) whether the flights directly and immediately interfered with the plaintiff's use and enjoyment of the surface land.[46]

However, it left many questions unanswered. Where is the dividing line between the "immediate reaches" of the surface and public domain airspace? Can navigable airspace intersect with the "immediate reaches" belonging to the private property? Can aircraft flying wholly within navigable airspace, as defined by federal law, ever lead to a successful takings claim? How does one assess claims based on lawfully operated aircraft, such as helicopters, flying below navigable airspace?

Subsequent cases have been brought using many different legal claims, including trespass and nuisance, as discussed below, and various ways of describing the resulting injury. Claims could include an "inverse condemnation," another way of describing a taking, or the establishment of an avigation, air, or flying easement. While these legal claims may have different names, it appears that courts use *Causby* as the starting point for analyzing all property-based challenges to

[43] *Id.* at 264.

[44] *Id.* at 263.

[45] *Id.* at 266.

[46] *See e.g.*, Andrews v. United States, 2012 U.S. Claims LEXIS 1644, *10 (explaining that the "The United States Court of Appeals for the Federal Circuit (Federal Circuit) has derived from Causby three factors for consideration 'in determining whether noise and other effects from overflights ... constitute a taking.... '"). *But see* Argent v. United States, 124 F.3d 1277, 1284 (1997) (finding a taking claim may be based on "a peculiarly burdensome pattern of activity, including both intrusive and non-intrusive flights").

intrusions upon airspace. Several different interpretations of *Causby* have emerged in the attempt to articulate an airspace ownership standard, a few of which are described here.

Following *Causby*, several lower courts employed a fixed-height theory and interpreted the decision as creating two distinct categories of airspace. On the one hand, the stratum of airspace that was defined in federal law as "navigable airspace" was always a part of the public domain. Therefore, flights in this navigable airspace could not lead to a successful property-right based action like a takings or trespass claim because the property owner never owned the airspace in the public domain. On the other hand, the airspace below what is defined as navigable airspace could be "owned" by the surface owner and, therefore, intrusions upon it could lead to a successful takings or property tort claim. Since this fixed-height theory of airspace ownership relies heavily on the definition of navigable airspace, the expansion of the federal definition of "navigable airspace" to include the airspace needed to take-off and land[47] greatly impacts what airspace a property owner could claim.

This strict separation between navigable airspace and the airspace a landowner can claim seems to have been disavowed by the Supreme Court. First, in dicta in *Braniff Airways v. Nebraska State Bd. of Equalization & Assessment*,[48] a case primarily dealing with the question of federal preemption of state airline regulations, the Court left open the possibility of a taking based on flights occurring in navigable airspace. It summarized *Causby* as holding "that the owner of land might recover for a taking by national use of navigable air space resulting in destruction in whole or in part of the usefulness of the land property."[49] Next, in *Griggs v. Allegheny County* the Supreme Court found that the low flight of planes over the plaintiff's property, taking off from and landing at a nearby airport's newly constructed runway, constituted a taking that had to be compensated under the Fifth Amendment.[50] The noise and fear of a plane crash caused by the low overhead flights made the property "'undesirable and unbearable'" for residential use, making it impossible for people in the house to converse or sleep.[51] The Court reached this conclusion that a taking occurred based on this injury, despite the fact that the flights were operated properly under federal regulations and never flew outside of navigable airspace.[52] Despite this holding, some lower courts have continued to lend credence to a fixed-height ownership theory as a reasonable interpretation of *Causby*.[53]

Another interpretation of *Causby* essentially creates a presumption of a non-taking when overhead flights occur in navigable airspace. This presumption would recognize the importance of unimpeded travel of air commerce and that Congress placed navigable airspace in the public domain. However, the presumption could be rebutted by evidence that the flights, while in navigable airspace, interfered with the owner's use and enjoyment of the surface enough to justify compensation. As one court reasoned, "as the height of the overflight increases... the Government's interest in maintaining sovereignty becomes weightier while the landowner's

[47] 49 U.S.C. § 40102(32) (2012).

[48] 347 U.S. 590 (1954).

[49] *Id.* at 596.

[50] Griggs v. Allegheny County, 369 U.S. 84, 90 (1962).

[51] *Id.* at 87.

[52] *Id.* at 86-89.

[53] *See, e.g.*, Aaron v. United States, 311 F.2d 798 (Ct. Cl. 1963); Powell v. United States, 1 Cl. Ct. 669 (1983).

interest diminishes, so that the damage showing required increases in a continuum toward showing absolute destruction of all uses of the property."[54]

Finally, some courts have concluded that the altitude of the overhead flight has no determinative impact on whether a taking has occurred. One federal court noted that the government's liability for a taking is not impacted "merely because the flights of Government aircraft are in what Congress has declared to be navigable airspace and subject to its regulation."[55] Under this approach, "although the navigable airspace has been declared to be in the public domain, 'regardless of any congressional limitations, the land owner, as an incident to his ownership, has a claim to the superjacent airspace to the extent that a reasonable use of his land involves such space.'"[56] Under this theory, the court would only need to examine the effect of the overhead flights on the use and enjoyment of the land, and would not need to determine if the flight occurred in navigable airspace.

While the definition of navigable airspace impacts each theory differently, it is clear that under the current interpretation a showing of interference with the use and enjoyment of property is required. Cases have clearly established that overhead flights leading to impairment of the owner's livelihood or cause physical damage qualify as an interference with use and enjoyment of property.[57] Additionally, flights that cause the surface to become impractical for its intended use by the current owner also satisfy the use and enjoyment requirement.[58] For example, in *Griggs*, the noise, vibration, and fear of damage caused by overhead flights made it impossible for the plaintiffs to converse with others or sleep within their house, leading to their retreat from the property, which had become "undesirable and unbearable for their residential use."[59] Some courts have recognized a reduction in the potential resale value of the property as an interference with its use and enjoyment, even if the property continues to be suitable for the purposes for which it is currently used.[60] One court explained: "Enjoyment of property at common law contemplated the entire bundle of rights and privileges that attached to the ownership of land ... Owners of fee simple estates ... clearly enjoy not only the right to put their land to a particular present use, but also to hold the land for investment and appreciation.... "[61] However, other courts have rejected the idea that restrictions on uses by future inhabitants, without showing loss of property value, are relevant to a determination of the owner's own use and enjoyment of the property.[62]

Trespass and Nuisance Claims Against Private Actors

Although *Causby* arose from a Fifth Amendment takings claim, its articulation of airspace ownership standards is also often used in determining state law tort claims such as trespass and nuisance. These state law tort claims could be used to establish liability for overhead flights

[54] Stephens v. United States, 11 Cl. Ct. 352, 362 (1986).

[55] Branning v. United States, 654 F.2d 88, 99 (1981).

[56] *Id.* at 98-99 (citing Palisades Citizens Association, Inc. v. C.A.B, 420 F.2d 188, 192 (D.C. Cir. 1969)).

[57] *See, e.g.*, *Causby*, 328 U.S. 256.

[58] *See, e.g., Griggs*, 369 U.S. 84; Pueblo of Sandia v. Smith, 497 F.2d 1043 (10th Cir. 1974) ("appellant failed to show interference with actual, as distinguished from potential, use of its land.").

[59] *Griggs*, 369 U.S. at 87.

[60] *See, e.g.*, Brown v. United States, 73 F.3d 1100 (1996); *Branning*, 654 F.2d 88.

[61] *Brown*, 73 F.3d 1100.

[62] Stephens v. United States, 11 Cl. Ct. 352 (1986).

operated by private actors, where a lack of government involvement precludes a takings claim. Generally, trespass is any physical intrusion upon property owned by another. However, unlike with surface trespass claims, simply proving that an object or person was physically present in the airspace vertically above the landowner's property is generally not enough to establish a trespass in airspace. Since *Causby* struck down the common law idea of *ad coelum*, landowners generally do not have an absolute possessory right to the airspace above the surface into perpetuity. Instead, airspace trespass claims are often assessed using the same requirements laid out in the *Causby* takings claim. Arguably, these standards are used in property tort claims because there can be no trespass in airspace unless the property owner has some possessory right to the airspace, which was the same question at issue in *Causby*.

To allege an actionable trespass to airspace, the property owner must not only prove that the interference occurred within the immediate reaches of the land, or the airspace that the owner can possess under *Causby*, but also that its presence interferes with the actual use of his land. As one court explained, "a property owner owns only as much air space above his property as he can practicable use. And to constitute an actionable trespass, an intrusion has to be such as to subtract from the owner's use of the property."[63] This standard for airspace trespass was also adopted by the Restatement (Second) of Torts.[64]

Nuisance is a state law tort claim that is not based on possessory rights to property, like trespass, but is rooted in the right to use and enjoy land.[65] Trespass and nuisance claims arising from airspace use are quite similar, since trespass to airspace claims generally require a showing that the object in airspace interfered with use and enjoyment of land. However, unlike trespass, nuisance claims do not require a showing that the interference actually occupied the owner's airspace. Instead, a nuisance claim can succeed even if the interference flew over adjoining lands and never directly over the plaintiff's land, as long as the flight constitutes a substantial and unreasonable interference with the use and enjoyment of the land.

Potential Liability Arising from Civilian Drone Use

The integration of drones into domestic airspace will raise novel questions of how to apply existing airspace ownership law to this new technology. How courts may apply the various interpretations of *Causby*, discussed above, to drones will likely be greatly impacted by the FAA's definition of navigable airspace for drones.

The potential for successful takings, trespass, or nuisance claims from drone use will also be impacted by the physical characteristics of the drone, especially given that current case law heavily emphasizes the impact of the flight on use and enjoyment of the surface property. Several characteristics of drones may make their operation in airspace less likely to lead to liability for drone operators than for aircraft operators. First, the noise attributed to drone use may be significantly less than noise created by helicopters or planes powered by jet engines. Second, drones commonly used for civilian purposes could be much smaller than common aircraft used today. This decreased size is likely to lead to fewer physical impacts upon surface land such as

[63] Geller v. Brownstone Condominium, 82 Ill. App. 3d 334, 336-37 (1980).

[64] RESTATEMENT (SECOND) OF TORTS § 159(2) (1965) (stating that "Flights by aircraft in the airspace above the land of another is a trespass if, but only if, (a) it enters into the immediate reaches of the airspace next to the land, and (b) it interferes substantially with the other's use and enjoyment of the land.").

[65] RESTATEMENT (SECOND) OF TORTS § 821D (1979); 2 DAN B DOBBS, ET AL. THE LAW OF TORTS § 398 (2d ed. 2011).

vibration and dust, which are common complaints arising from overhead aircraft and helicopter flights. Finally, it is unknown at this time how most drones will be deployed into flight. Will drone "airports" be used to launch the aircraft or will they take off and land primarily from individual property? If drone use remains decentralized and is not organized around an "airport," then drones are less likely to repeatedly fly over the same piece of property, creating fewer potential takings, trespass, or nuisance claims. Additionally, the majority of drones are more likely to operate like helicopters, taking off and landing vertically, than like traditional fixed-wing aircraft. This method of takeoff reduces the amount of surface the aircraft would have to fly over before reaching its desired flying altitude, minimizing the potential number of property owners alleging physical invasion of the immediate reaches of their surface property.

Alternatively, the potential ability for drones to fly safely at much lower altitudes than fixed-wing aircraft or helicopters could lead to a larger number of property-based claims. Low-flying drones are more likely to invade the immediate reaches of the surface property, thus satisfying part of the requirement for a takings or trespass claim.

Privacy

Perhaps the most contentious issue concerning the introduction of drones into U.S. airspace is the threat that this technology will be used to spy on American citizens. With the ability to house high-powered cameras, infrared sensors, facial recognition technology, and license plate readers, some argue that drones present a substantial privacy risk.[66] Undoubtedly, the government's use of drones for domestic surveillance operations implicates the Fourth Amendment and other applicable laws.[67] In like manner, privacy advocates have warned that private actors might use drones in a way that could infringe upon fundamental privacy rights.[68] This section will focus on the privacy issues associated with the use of drones by private, non-governmental actors. It will provide a general history of privacy law in the United States and survey the various privacy torts, including intrusion upon seclusion, the privacy tort most applicable to drone surveillance. It will then explore the First Amendment right to gather news. Application of these theories to drone surveillance will be discussed in the section titled "Congressional Response."

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[66] *See* Jennifer Lynch, *Are Drones Watching You?*, ELECTRONIC FRONTIER FOUNDATION (Jan. 10, 2012), https://www.eff.org/deeplinks/2012/01/drones-are-watching-you; M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 STAN. L. REV. ONLINE 29 (Dec. 12, 2011), http://www.stanfordlawreview.org/sites/default/files/online/articles/64-SLRO-29_1.pdf.

[67] For an analysis of the Fourth Amendment implications of government drone surveillance, see CRS Report R42701, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, by Richard M. Thompson II.

[68] *See* Press Release, Rep. Ed Markey, Markey Releases Discussion Draft of Drone Privacy and Transparency Legislation (Aug. 1, 2012), *available at* http://markey.house.gov/press-release/markey-releases-discussion-draft-drone-privacy-and-transparency-legislation.

> Drones are already flying in U.S. airspace – with thousands more to come – but with no privacy protections or transparency measures in place. We are entering a brave new world, and just because a company soon will be able to register a drone license shouldn't mean that company can turn it into a cash register by selling consumer information. Currently, there are no privacy protections or guidelines and no way for the public to know who is flying drones, where, and why. The time to implement privacy protections is now.

Id.

Early Privacy Jurisprudence

Although early Anglo-Saxon law lacked express privacy protections, property law and trespass theories served as proxy for the protection of individual privacy. Lord Coke pronounced in 1605 that "the house of everyone is to him as his castle and fortress, as well for his defence against injury and violence, as for his respose[.]"[69] This proposition that individuals are entitled to privacy while in their homes crossed the Atlantic with the colonists and appeared prominently in early revolutionary thinking.[70] In one early American common law decision, the court noted that "[t]he law is clearly settled, that an officer cannot justify the breaking open an outward door or window, in order to execute process in a civil suit; if he doth, he is a trespasser."[71] In cases lacking physical trespass, prosecutors relied on an eavesdropping theory, which protected the privacy of individuals' conversations while in their home.[72]

These century-old theories of trespass and eavesdropping, however, failed to keep up with a rapidly changing society fueled by advancing technologies. As with today's celebrity-obsessed society, late-19th century society experienced the birth and spread of "yellow journalism," a new media aimed at emphasizing the "curious, dramatic, and unusual, providing readers a 'palliative of sin, sex, and violence.'"[73] Faster presses and instantaneous photography enabled journalists to exploit and spread gossip.[74] Louis D. Brandeis (then a private attorney) and Samuel Warren were bothered with the press's constant intrusions into the private affairs of prominent Bostonians.[75] In 1890, they published a seminal law review article formulating a new legal theory—the right to be let alone.[76] Brandeis and Warren understood that existing tort doctrines such as trespass and libel were insufficient to protect privacy rights, as "only a part of the pain, pleasure, and profit of life lay in physical things."[77] They noted that this new right to privacy derived not from "the principle of private property, but that of an inviolate personality."[78] The authors observed that "instantaneous photographs and newspaper enterprise have invaded the sacred precincts of private and domestic life; and numerous mechanical devices threaten to make good the prediction that 'what is whispered in the closet shall be proclaimed from the house-tops.'"[79] Although this new theory had its detractors,[80] it found its way into the common law of several states.[81]

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[69] Semayne's Case, 5 Co. Rep. 91 (K. B. 1604).

[70] In contesting the use of general warrants by officials of the British Crown, known then as writs of assistance, James Otis argued that "one of the most essential branches of English liberty, is the freedom of one's house. A man's house is his castle; and while he is quiet, he is as well guarded as a prince in his castle." II LEGAL PAPERS OF JOHN ADAMS 142.

[71] *See* State v. Armfield, 9 N.C. 246, 247 (1822).

[72] Note, *The Right to Privacy in Nineteenth Century America*, 94 HARV. L. REV. 1892, 1896 (1981). In an early case from Pennsylvania, in recognizing eavesdropping as an indictable offense, the court noted: "Every man's home is his castle, where no man has a right to intrude for any purpose whatever. No man has a right to pry into your secrecy in your own house." Commonwealth v. Lovett, 4 Pa. L.J. Rpts. (Clark) 226, 226 (Pa. 1831); *see also* State v. Williams, 2 Tenn. 108, 108 (1808) (recognizing eavesdropping as an indictable offense).

[73] Ken Gromley, *One Hundred Years of Privacy*, 1992 WIS. L. REV. 1335, 1351 (1992) (quoting EDWIN EMERY & MICHAEL C. EMERY, THE PRESS AND AMERICA: AN INTERPRETATIVE HISTORY OF THE MASS MEDIA 349-50 (3d ed. 1972).

[74] *Id.* at 1350-51.

[75] William M. Prosser, *Privacy*, 48 Cal. L. Rev. 383, 383 (1960).

[76] Louis D. Brandeis & Samuel D. Warren, *The Right to Privacy*, 4 HARV. L. REV. 193, 205 (1890).

[77] *Id.* at 195.

[78] *Id.* at 205.

[79] *Id.* at 195.

[80] Herbert Spencer Hadley, *Right to Privacy*, 3 N.W. L. REV. 1, 3-4 (1894) ("The writer believes that the right to (continued...)

Privacy Torts

In 1939, the First Restatement of Torts (a set of model rules intended for adoption by the states) created a general tort for invasion of privacy.[82] By 1940, a minority of states had adopted some right of privacy either by statute or judicial decision, and six states had expressly refused to adopt such a right.[83] Twenty years later, Dean William Prosser surveyed the case law surrounding this right and concluded that the right to privacy entailed four distinct (yet, sometimes overlapping) rights: (1) intrusion upon seclusion; (2) public disclosure of private facts; (3) publicity which puts the target in a false light; and (4) appropriation of one's likeness.[84] These four categories were incorporated into the Restatement (Second) of Torts.[85]

Section 652B of the Restatement (Second) of Torts creates a cause of action for intrusion upon seclusion,[86] the privacy tort most likely to apply to drone surveillance.[87] It has been adopted either by common law or statute in an overwhelming majority of the states.[88] Section 652B provides: "One who intentionally intrudes, physically or otherwise, upon the solitude or seclusion of another or his private affairs or concerns, is subject to liability to the other for invasion of his privacy, if the intrusion would be highly offensive to a reasonable person."[89] Courts have developed a set of rules for applying § 652B. First, it requires an objective person standard, testing whether a person of "ordinary sensibilities" would be offended by the alleged invasion.[90] Thus, someone with an idiosyncratic sensitivity—say, an aversion to cameras—could not satisfy this standard by simply having his photograph taken. Likewise, the intrusion must not only be offensive, but "*highly* offensive,"[91] or as one court put it, "outrageously unreasonable conduct."[92] Generally, a single incident will not suffice; instead, the intrusion must be "repeated with such persistence and frequency as to amount to a course of hounding" and "becomes a burden to his existence.... "[93] However, in a few cases a single intrusion was adequate.[94] The invasion of

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privacy does not exist; that the arguments in its favor are based on a mistaken understanding of the authorities cited in its support[.]").

[81] *Compare* Roberson v. Rochester Folding Box Co., 171 N.E. 538, 542 (N.Y. 1902) (declining to adopt right of privacy), *with* Pavesich v. New England Life Ins. Co., 50 S.E. 68 (Ga. 1905) (recognizing a right to privacy).

[82] RESTATEMENT (FIRST) OF TORTS § 867 (1939).

[83] *See* Louis Nizer, *Right of Privacy – A Half Century's Development*, 39 MICH. L. REV. 526, 529-30 (1940).

[84] Prosser, *supra* note 75, at 385.

[85] RESTATEMENT (SECOND) OF TORTS §§ 652B (intrusion upon seclusion), 652C (appropriation of name or likeness), 652D (publicity given to private fact), 652E (publicity placing person in false light).

[86] *Id.* at § 652B.

[87] Because the use of drones for surveillance primarily concerns the collection, and not necessarily the dissemination, of information, this section will focus on the tort of intrusion upon seclusion, which has no publication requirement for recovery. *Id.* cmt. a.

[88] North Dakota and Wyoming are the only states not to adopt the privacy tort of intrusion upon seclusion. *See* Tigran Palyan, *Common Law Privacy in a Not So Common World: Prospects for the Tort of Intrusion Upon Seclusion in Virtual Worlds*, 38 SW. L. REV. 167, 180 n.106 (2008).

[89] *Id.*

[90] Shorter v. Retail Credit Co., 251 F. Supp. 329, 322 (D.S.C. 1966).

[91] RESTATEMENT (SECOND) OF TORTS § 652B (emphasis added).

[92] N.O.C., Inc. v. Schaefer, 484 A.2d 729, 733 (N.J. Super. Ct. Law Div. 1984).

[93] RESTATEMENT (SECOND) OF TORTS § 652B cmt. d.

[94] *See, e.g.*, Miller v. National Broadcasting Co., 187 Cal. App. 3d 1463 (Cal. Ct. App. 1986) (videotaping man in his (continued...)

privacy must been intentional, meaning the defendant must desire that the intrusion would occur, or as with other torts, [95] knew with a substantial certainty that such an invasion would result from his actions.[96] An accidental intrusion is not actionable. Finally, in some states, the intrusion must cause mental suffering, shame, or humiliation to permit recovery.[97]

A review of the case law demonstrates that the location of the target of the surveillance is, in many cases, determinative of whether someone has a viable claim for intrusion upon seclusion. For the most part, conducting surveillance of a person while within the confines of his home will constitute an intrusion upon seclusion.[98] The illustrations to § 652B offer an example of a private detective who photographs an individual while in his home with a telescopic camera as a viable claim.[99] Likewise, as one court observed, "when a picture is taken of a plaintiff while he is in the privacy of his home, ... the taking of the picture may be considered an intrusion into the plaintiff's privacy just as eavesdropping or looking into his upstairs windows with binoculars are considered an invasion of his privacy."[100]

The likelihood of a successful claim is diminished if the surveillance is conducted in a public place. The comments to § 652B explain that there is generally no liability for photographing or observing a person while in public "since he is not then in seclusion, and his appearance is public and open to the public eye."[101] Likewise, Prosser observed:

> On the public street, or in any other public place, the plaintiff has no right to be alone, and it is no invasion of his privacy to do no more than follow him about. Neither is it such an invasion to take a photograph in such a place, since this amounts to nothing more than making a record, not differing essentially from a full written description, of a public sight which anyone present would be free to see.[102]

The case law also supports this proposition. The Alabama Supreme Court dismissed a claim of wrongful intrusion against operators of a race track who photographed the plaintiffs while they were in the "winner's circle" at the track.[103] Similarly, a federal district court dismissed a claim by a husband and wife who had been photographed by Forbes Magazine while waiting in line at the Miami International Airport as it was taken in "a place open to the general public."[104] Likewise, a Vietnam veteran lost a claim for invasion of privacy based on photographs that depicted him and

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home while being resuscitated after having suffered a heart seizure); Nader v. General Motors Corp., 25 N.Y.2d 560, 570 (1970) (surveilling plaintiff in bank in an "overzealous" manner).

[95] RESTATEMENT (SECOND) OF TORTS § 652B.

[96] *See* DOBBS ET AL., *supra* note 65, at § 29.

[97] DeAngelo v. Fortney, 515 A.2d 594, 596 (Pa. Sup. 1986); Burns v. Masterbrand Cabinets, Inc., 369 Ill. App. 3d 1006, 1012 (Ill. App. Ct. 2007).

[98] *See, e.g.*, Wolfson v. Lewis, 924 F. Supp. 1413 (E.D. Penn. 1996).

[99] RESTATEMENT (SECOND) OF TORTS § 652B cmt. b, illus. 2.

[100] Lovgren v. Citizens First Nat. Bank of Princeton, 534 N.E.2d 987 (Ill. 1989); *see also* Souder v. Pendleton Detectives, 88 So.2d 716, 718 (La. Ct. App. 1956) (peeping into plaintiff's widows); Egan v. Schmock, 93 F. Supp. 2d 1090, 1094-95 (N.D. Cal. 2000) (filming plaintiff and family while in their home).

[101] RESTATEMENT (SECOND) OF TORTS § 652B cmt. c.

[102] Prosser, *supra* note 75, at 392.

[103] Schifano v. Green County, 624 So. 2d 178 (Ala. 1993).

[104] Fogel v. Forbes, 500 F. Supp. 1081, 1084, 1087 (E.D. Pa. 1980).

other soldiers during a combat mission in Vietnam—again, a public setting.[105] Other examples include the recording of license plate numbers of cars parked in a public parking lot[106] and photographing a person while walking on a public sidewalk.[107]

Indeed, even plaintiffs who were videotaped or photographed while on their own property have generally been unsuccessful in their privacy claims so long as they could be viewed from a public vantage point. Rejecting one plaintiff's claim for intrusion upon seclusion, the Supreme Court of Oregon held that even though the investigators trespassed on the plaintiff's property to film him, the investigation did not "constitute an unreasonable surveillance 'highly offensive to a reasonable man[,]'"[108] as the plaintiff could have been viewed from the road by his neighbors or passersby.[109] In another case, the wife of a prominent Puerto Rican politician sought damages from a newspaper for invasion of privacy allegedly committed when an agent of the newspaper photographed her house as part of a news story about her husband.[110] The court dismissed her claim as the photographers were not "unreasonably intrusive," and the photographs depicted only the outside of the home and no persons were photographed. [111] Similarly, in one case a couple sued a cell phone company for intrusion upon seclusion when the company's workers looked onto their property each time they serviced a nearby cell tower.[112] The court rejected their claim, holding that '[t]he mere fact that maintenance workers come to an adjoining property as part of their work and look over into the adjoining yard is legally insufficient evidence of highly offensive conduct."[113] There are many other examples.[114]

However, there have been some successful claims for intrusion upon seclusion involving surveillance conducted in public.[115] The comments to § 652B explain: "Even in a public place, however, there may be some matters about the plaintiff, such as his underwear or lack of it, that are not exhibited to the public gaze, and there may still be invasion of privacy when there is intrusion upon these matters."[116] One of the most famous cases concerning this "public gaze" theory involved a suit for invasion of privacy against a newspaper when it published a picture of

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[105] Tellado v. Time-Life, 643 F. Supp. 904, 907 (D.N.J. 1986).

[106] *See* International Union v. Garner, 601 F. Supp. 187, 191-92 (M.D. 1985); Tedeschi v. Reardon v. 5 F. Supp. 2d 40, 46 (D. Mass. 1998).

[107] Jackson v. Playboy Enterprises, Inc., 574 F. Supp. 10, 13 (S.D. Ohio 1983).

[108] McClain v. Boise Cascade Corp., 271 OR 549, 556 (1975). It should be noted that the court also relied on previous case law which held that one who seeks damages for alleged injuries "waives his right to privacy to the extent of a reasonable investigation." *Id.* at 554-555.

[109] *Id.* at 556.

[110] Mojica Escobar v. Roca, 926 F. Supp. 30, 32-33 (D.P.R. 1996).

[111] *Id.* at 35 (citing Dopp v. Fairfax Consultants, Ltd., 771 F. Supp. 494, 497 (D.P.R. 1990)).

[112] GTE Mobilnet of South Texas, LTD. Partnership v. Pascouet, 61 S.W. 3d 599, 605 (Tex. App. 2001).

[113] *Id.* at 618.

[114] *See, e.g.*, Aisenson v. American Broadcasting Co, 220 Cal. App. 3d 146, 162-63 (1990) (holding that broadcast of plaintiff while in his driveway and car was not an intrusion upon seclusion); Wehling v. Columbia Broadcasting System, 721 F.2d 506, 509 (5th Cir. 1983) (holding that broadcast of the outside of plaintiff's home taken from public street was not an invasion of privacy); Munson v. Milwaukee Bd. of School Directors, 969 F.2d 266, 271 (7th Cir. 1992) (same).

[115] *See* Kramer v. Downey, 684 S.W. 2d 524, 525 (Tex. Ct. App. 1984) ("[W]e now hold that the right to privacy is broad enough to include the right to be free of those willful intrusions into one's personal life at home and at work which occurred in this case.").

[116] RESTATEMENT (SECOND) OF TORTS § 652B cmt. c.

the plaintiff with her dress blown up as she was leaving a fun house at a county fair.[117] In upholding the plaintiff's claim, the court observed: "To hold that one who is involuntarily and instantaneously enmeshed in an embarrassing pose forfeits her right of privacy merely because she happened at the moment to be part of a public scene would be illogical, wrong, and unjust."[118] In *Huskey v. National Broadcasting Co. Inc.*, a prisoner sued NBC, a television broadcasting company, alleging that by filming him without consent while he was working out in the exercise yard at the prison, NBC invaded his privacy.[119] NBC countered that depictions of persons in a "publicly visible area" could not support the claim for invasion of seclusion.[120] Ultimately, the court permitted the prisoner's claim to go forward, observing that "[o]f course [the prisoner] could be seen by guards, prison personnel and inmates, and obviously he was in fact seen by NBC's camera operator. But the mere fact a person can be seen by others does not mean that person cannot legally be 'secluded.'"[121] Although relief is available for certain cases of public surveillance, recovery seems to be the exception rather than the norm.[122]

First Amendment and Newsgathering Activities

Based on the foregoing discussion, safeguarding privacy from intrusive drone surveillance is clearly an important societal interest. However, this interest must be weighed against the public's countervailing concern in securing the free flow of information that inevitably feeds the "free trade of ideas."[123] Unmanned aircraft can improve the press and the public's ability to gather news: they can operate in dangerous areas without putting a human operator at risk of danger; can carry sophisticated surveillance technology; can fly in areas not currently accessible by traditional aircraft; and can stay in flight for long durations. However, challenges arise in attempting to find an appropriate balance between this interest in newsgathering and the competing privacy interests at stake.

The First Amendment to the United States Constitution provides that "Congress shall make no law ... abridging the freedom of speech, or of the press.... "[124] The Court has construed this phrase to cover not only traditional forms of speech, such as political speeches or polemical articles, but also conduct that is "necessary for, or integrally tied to, acts of expression,"[125] such as distribution of political literature[126] or door-to-door solicitation.[127] Additionally, the Court has pulled within

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[117] Daily Times Democrat v. Graham, 276 Ala. 380, 381 (1964).

[118] *Id.* at 383.

[119] Huskey v. National Broadcasting Co., Inc., 632 F. Supp. 1282, 1285 (1986).

[120] *Id.* at 1286.

[121] *Id.* at 1287-88 (emphasis in original).

[122] Jennifer R. Scharf, *Shooting for the Stars: A Call for Federal Legislation to Protect Celebrities' Privacy Rights*, 3 BUFF. INTELL. PROP. L.J. 164, 183 (2006) ("Modifying intrusion to apply in public places would be necessary in order to provide any relief.").

[123] Abrams v. United States, 250 U.S. 616, 630 (1919) (Holmes, J., dissenting). Justice Stevens described this as a "conflict between interests of the highest order—on the one hand, the interest in the full and free dissemination of information concerning public issues, and, on the other hand, the interest in individual privacy and, more specifically, in fostering private speech." Bartnicki v. Vopper, 532 U.S. 514, 518 (2001).

[124] U.S. CONST. amend. I.

[125] Barry P. McDonald, *The First Amendment and the Free Flow of Information: Towards a Realistic Right to Gather Information in the Information Age*, 65 OHIO ST. L. J. 249, 260 (2004).

[126] Lovell v. City of Griffin, 3030 U.S. 444, 452 (1938).

[127] Watchtower Bible and Tract Soc'y of New York , Inc. v. Vill. of Stratton 536 U.S. 150, 168-69 (2002).

the First Amendment's protection other conduct that is not expressive in itself, but is "necessary to accord full meaning and substance to those guarantees."[128] For example, the Court has said that the public is entitled to a "right to receive news" as a correlative of the right to free expression.[129]

Like this right to receive news, the Court has intimated in a series of cases beginning in the 1960s that the public and the press may be entitled to *a right to gather news* under the First Amendment. Initially, in *Zemel v. Rusk*, the Court observed that the right "to speak and publish does not carry with it the unrestrained right to gather information."[130] The Court's reluctance to extend this right may have signaled its concern that an unconditional newsgathering right could subsume almost any government regulation that places a slight restriction on the ability to gather news.[131] However, several years later the Court indicated in *Branzburg v. Hayes* that although laws of general applicability apply equally to the press as to the general public, that "[n]ews gathering is not without its First Amendment protections,"[132] and that "without some protection for seeking out the news, freedom of the press could be eviscerated."[133] The Court, however, failed to clearly delineate the parameters of such a protection. In the Court's most recent case, *Cohen v. Cowles Media Co.*, the Court adhered to the "well-established line of decisions holding that generally applicable laws do not offend the First Amendment simply because their enforcement against the press has incidental effects on its ability to gather and report the news."[134] The Court noted that it is "beyond dispute 'that the publisher of a newspaper has no special immunity from the application of general laws. He has no special privilege to invade the rights of others.'"[135]

The lower federal courts have explored this right to gather news in the context of photographing or video recording. In *Dietemann v. Time, Inc.* the Ninth Circuit Court of Appeals explored the extent to which reporters could use surreptitious means to carry out their newsgathering.[136] There, defendants Time Life sent undercover reporters to a man's house where he claimed to use minerals and other materials to heal the sick. The reporters used a hidden camera to take pictures of the man, and a hidden microphone to transmit the conversation to other operatives. The defendants claimed that the First Amendment's right to freedom of the press shielded its newsgathering activities. In rejecting this claim, the court observed that although an individual accepts the risk when inviting a person into his home that the visitor may repeat the conversation to a third party, "he does not and should not be required to take the risk that what is heard and seen will be transmitted by photograph or recording, or in our modern world, in full living color and hi-fi to the public at large or to any segment of it that the visitor may select."[137] The court held that "hidden mechanical contrivances" are not indispensable tools of investigative reporting, and that the "First Amendment has never been construed to accord newsman immunity from torts

[128] McDonald, *supra* note 68, at 260.

[129] Kleindienst v. Mandel, 408 U.S. 753, 762–63 (1972).

[130] Zemel v. Rusk, 381 U.S. 1, 17 (1965).

[131] *Id.* at 16-17 ("There are few restrictions on action which could not be clothed by ingenious argument in the garb of decreased data flow. For example, the prohibition of unauthorized entry into the White House diminishes the citizen's opportunities to gather information he might find relevant to his opinion of the way the country is being run, but that does not make entry into the White House a First Amendment right.").

[132] Branzburg v. Hayes, 408 U.S. 665, 707 (1972).

[133] *Id.* at 681.

[134] *Id.* at 669.

[135] Cohen v. Cowles Media Co., 501 U.S. 663, 666 (1991).

[136] Dietemann v. Time, Inc., 449 F.2d 245 (9th Cir. 1971).

[137] *Id.* at 249.

or crimes committed during the course of newsgathering."[138] In *Galella v. Onassis*, Galella, a self-proclaimed "paparazzo," constantly followed around, harassed, and photographed Jacqueline Kennedy Onassis and her children.[139] As part of an ongoing lawsuit, Onassis sued Galella for, *inter alia*, invasion of her and her family's privacy. Galella argued that he was entitled to the absolute "wall of immunity" that protects newsmen under the First Amendment. The Second Circuit Court of Appeals quickly rejected this absolutist position: "There is no such scope to the First Amendment right. Crimes and torts committed in news gathering are not protected. There is no threat to a free press in requiring its agents to act within the law."[140] By contrast, the Seventh Circuit in *Desnick v. American Broadcast Companies, Inc.* held that surreptitious recording was not a privacy invasion because the target of the surveillance was a party to the conversation, thereby vitiating any claim to privacy in those conversations.[141]

Congressional Response

If Congress chooses to act, it could create privacy protections to protect individuals from intrusive drone surveillance conducted by private actors. Such proposals would be considered in the context of the First Amendment rights to gather and receive news. Several bills were introduced in the 112th Congress that would regulate the private use of drones. Additionally, there are other measures Congress could adopt.

In the 112th Congress, Representative Ed Markey introduced the Drone Aircraft Privacy and Transparency Act of 2012 (H.R. 6676).[142] This bill would amend the FAA Modernization and Reform Act of 2012 to create a comprehensive scheme to regulate the private use of drones, including data collection requirements and enforcement mechanisms. First, this bill would require the Secretary of Transportation, with input from the Secretary of Commerce, the Chairman of the Federal Trade Commission, and the Chief Privacy Officer of the Department of Homeland Security, to study any potential threats to privacy protections posed by the introduction of drones in the national airspace. Next, the bill would prohibit the FAA from issuing a license to operate a drone unless the application for such use included a "data collection statement." This statement would require the following items: a list of individuals who would have the authority to operate the drone; the location in which the drone will be used; the maximum period it will be used; and whether the drone would be collecting information about individuals. If the drone will be used to collect personal information, the statement must include the circumstances in which such information will be used; the kinds of information collected and the conclusions drawn from it; the type of data minimization procedures to be employed; whether the information will be sold, and if so, under what circumstances; how long the information would be stored; and procedures for destroying irrelevant data. The statement must also include information about the possible impact on privacy protections posed by the operation under that license and steps to be taken to mitigate this impact. Additionally, the statement must include the contact information of the drone operator; a process for determining what information has been collected about an individual; and a process for challenging the accuracy of such data. Finally, the FAA would be required to post the data collection statement on the Internet.

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[138] *Id.*

[139] Galella v. Onassis, 487 F.2d 986, 991-92 (2d Cir. 1973).

[140] *Id.* at 996-97 (internal citations omitted).

[141] Desnick v. American Broadcast Corporation, 44 F.3d 1345, 1353 (7th Cir. 1995).

[142] H.R. 6676, 112th Cong. 2d Sess. (2012).

H.R. 6676 includes several enforcement mechanisms. First, the FAA may revoke any license of a user that does not comply with these requirements. The Federal Trade Commission would have the primary authority to enforce the data collection requirements just stated. Additionally, the Attorney General of each state, or an official or agency of a state, is empowered to file a civil suit if there is reason to believe that the privacy interests of residents of that state have been threatened or adversely affected. H.R. 6676 would also create a private right of action for a person injured by a violation of this legislation.

Representative Ted Poe introduced the Preserving American Privacy Act of 2012 (H.R. 6199).[143] This bill would prevent any private actor from using a drone to conduct surveillance on any other private person without the consent of that other person. This ban on the private use of drones to record other private persons could present First Amendment concerns. First, a reviewing court would, in all likelihood, test whether this ban constituted a rule of general applicability under the *Cohen* and *Branzburg* line of cases.[144] In *Bartnicki v. Vopper*, the Supreme Court held that the wiretapping laws in question were of general applicability.[145] The Court observed that the statutes were designed to protect privacy and did not distinguish based on the content of the intercepted conversation. Instead, the communications were "singled out by virtue of the fact that they were illegally intercepted—by virtue of the source, rather than the subject matter."[146] This same argument could shield H.R. 6199 from a First Amendment challenge. Its purpose is to protect privacy,[147] and it does not distinguish between the subject matter of the drone surveillance, but instead bans any instance of private surveillance when the target has not consented to such monitoring. Additionally, this bill does not curtail the freedom to *publish* information,[148] but instead restricts the methods of collection. The public or media would have other avenues for obtaining the information sought. On the other hand, this measure could hinder the free flow of information, including coverage of newsworthy events, in contradiction to public's right to receive news and the Supreme Court's dicta in *Branzburg* that "[n]ews gathering is not without its First Amendment protections,"[149] and that "without some protection for seeking out the news, freedom of the press could be eviscerated."[150]

Additionally, Congress could create a cause of action for surveillance conducted by drones similar to the intrusion upon seclusion tort provided under Restatement § 652B.[151] How would a

[143] H.R. 6199, 112th Cong. 2d Sess. (2012).

[144] *See* "First Amendment and Newsgathering Activities," *supra*.

[145] Bartnicki v. Hopper, 532 U.S. 514, 526 (2001).

[146] *Id.*

[147] *See* Poe: Congress must Preserve American Privacy, http://poe.house.gov/index.php?option=com_content&view=article&id=8758:poe-congress-must-preserve-american-privacy-&catid=104:press-releases ("The bill seeks to ensure the privacy of American citizens by establishing specific guidelines about when and for what purposes law enforcement agencies and private individuals can use drones.")

[148] *See* Associated Press v. National Labor Relations Board, 301 U.S. 103, 133 (1937) (applying the National Labor Relations Act to the Associated press, the Court noted that the regulation in no way "circumscribes the full freedom and liberty of the [A.P.] to publish the news as it desires it published").

[149] Branzburg v. Hayes, 408 U.S. 665, 707 (1972).

[150] *See id.* at 707.

[151] As with the enactment of any federal statute, Congress must act within one of its constitutionally delegated powers when creating a federal privacy tort or a crime based on intrusion of privacy. It would appear that Congress could regulate this area under its Commerce Clause power, U.S. Const. art. I, § 8, cl. 3, which it acts under when regulating similar federal airspace issues. *See* Braniff Airways v. Nebraska Bd. of Equalization and Assessment, 347 U.S. 590 (1954); United States v. Helsley, 615 F.2d 784 (9th Cir. 1979).

court assess whether drone surveillance violated this type of tort? First, generally speaking, the location of the search would be determinative of whether a person is entitled to an expectation of privacy. Although courts have posited that the common law, like the Fourth Amendment, is intended to "protect people, not places[,]"[152] the *location* of an alleged intrusion factors heavily in a privacy analysis. The greatest chance for liability occurs when a person photographs or videotapes another while in the seclusion of his home. While technology has increasingly shrunk other spheres of privacy in the digital age, the home is still accorded significant legal protection. Using a drone to peer inside the home of another—whether looking through a window or utilizing extra-sensory technology such as thermal imaging—would likely constitute an intrusion upon seclusion. Moving from the home to a public space, or even a space on private property where one can be seen from a public vantage point, significantly reduces the chance of tort liability. However, certain instances of highly offensive surveillance in public may be actionable.

This leads to the second factor that will inform a reviewing court's analysis: the degree of offensiveness of the surveillance. The Ninth Circuit Court of Appeals, applying California law, observed that, in determining offensiveness, "common law courts consider, among other things: 'the degree of intrusion, the context, conduct and circumstances surrounding the intrusion as well as the intruder's motives and objectives, the setting into which he intrudes, and the expectations of those whose privacy is invaded.'" Several of these factors—especially, the context of the intrusion and the motive of the intruder—are fact intensive and require application in a particular case to fully understand. However, some generalizations can be made. The cases discussed above that did find an intrusion upon seclusion in a public place required highly offensive activity, such as closely following another person for an extended period or photographing another in a highly embarrassing shot. Likewise, a court might recognize liability if one were to use a drone to follow another for an extended period of time, particularly at a close distance. It is not clear, however, whether knowledge of being surveilled makes the monitoring more or less offensive. For example, one court seemed to rely on the fact that the defendant was unaware that her house was being photographed to hold that she did not have a viable privacy claim.[153] A drone flying at several thousand feet may not significantly disturb the target of the surveillance and could fall within this rationale. Nevertheless, filming someone in a compromising or embarrassing situation without his knowledge can be equally offensive. Here, the facts of the particular case would determine liability.

Congress could also create a privacy statute tailored to drone use similar to the anti-voyeurism statutes, or "Peeping Tom" laws, enacted in many states.[154] These laws prohibit persons from surreptitiously filming others in various circumstances and places.[155] Some states prohibit surreptitious surveillance of a person while on private property, usually a private residence.[156]

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[152] Pearson v. Dodd, 410 F.2d 701, 704 (D.C. Cir. 1969) (quoting Katz v. United States, 389 U.S. 347, 351 (1967)).

[153] Mojica Escobar v. Roca, 926 F. Supp. 30, 35 (D.P.R. 1996).

[154] Federal law does prohibit certain acts of voyeurism on federal property. Section 1801, Title 18 provides: "Whoever, in the special maritime and territorial jurisdiction of the United States, has the intent to capture an image of a private area of an individual without their consent, and knowingly does so under circumstances in which the individual has a reasonable expectation of privacy, shall be fined under this title or imprisoned not more than one year, or both." 18 U.S.C. § 1801(a). As discussed in note 151, *supra*, it appears Congress would have the authority to extend this section to voyeurism committed not only on federal property but that committed from federal airspace.

[155] Timothy J. Hortstmann, *Protecting Traditional Privacy Rights in Brave New Digital World: The Threat Posed by Cellular Phone-Cameras and What States Should Do to Stop It*, 111 PENN. ST. L. REV. 739, 742 (2007).

[156] *See, e.g*, GA. CODE ANN. § 16-11-61; MONT. CODE ANN. § 45-5-223.

Nevada employs this model, prohibiting a person from entering the property of another with the intent to peep through a window of the building.[157] Likewise, New Jersey prohibits a person from peering into the window of the dwelling of another "under circumstances in which a reasonable person in the dwelling would not expect to be observed."[158] Other states require a prurient intent when conducting the surveillance. Under Washington State's statute, a person commits the crime of voyeurism if, for the purpose of arousing or gratifying his sexual desire, he films or photographs (1) a person in a place where he or she would expect privacy; or (2) the intimate areas of another person, whether he or she is in a public or private place.[159]

Similarly, Congress could adopt an "anti-paparazzi" statute, like that enacted in California, to prevent intrusive drone surveillance.[160] In fact, Congress considered a similar measure in the 105th Congress. The Privacy Protection Act of 1998 and the Personal Intrusion Act of 1998 would have made it unlawful to persistently follow or chase another person for the purpose of obtaining a visual image of that person if the plaintiff met the following elements: (1) the image was transferred in interstate commerce or the person taking the photograph traveled in interstate commerce; (2) the person had a reasonable expectation of privacy from such intrusion; (3) the person feared death or bodily injury from being chased; and (4) the taking of the image was for commercial purposes.[161] Also, these bills would have created a civil remedy for an individual whose privacy was intruded upon. Congress could use this model to make it unlawful to persistently monitor another person using drone surveillance.

Related Legal Issues

In addition to the legal issues described above, there are a host of other issues that may arise when introducing drones into United States national airspace system.

Right to Protect Property from Trespassing Drones. There may be instances where a landowner is entitled to protect his property from intrusion by a drone. Under Restatement (Second) of Torts § 260, "one is privileged to commit an act which would otherwise be a trespass to a chattel or a conversion if the act is, or is reasonably believed to be, necessary to protect the actor's land or chattels or his possession of them, and the harm inflicted is not unreasonable as compared with the harm threatened."[162] What this means is, in certain instances, a landowner would not be liable to the owner of a drone for damage necessarily or accidentally resulting from removing it from his property. However, there appear to be no cases where a landowner was

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[157] NEV. REV. STAT. § 200.603.

[158] N.J. STAT. ANN. § 2C:18-3c.

[159] WASH. REV. CODE § 9A.44.115; *see also* CAL. PENAL CODE § 647; R.I. GEN. LAWS § 11-64-2.

[160] California Civil Code § 1708.8 provides:

> A person is liable for constructive invasion of privacy when the defendant attempts to capture, in a manner that is offensive to a reasonable person, any type of visual image, sound recording, or other physical impression of the plaintiff engaging in a personal or familial activity under circumstances in which the plaintiff had a reasonable expectation of privacy, through the use of a visual or auditory enhancing device, regardless of whether there is a physical trespass, if this image, sound recording, or other physical impression could not have been achieved without a trespass unless the visual or auditory enhancing device was used.

[161] H.R. 3224, H.R. 2448, 105th Cong., 2d sess. (1998).

[162] RESTATEMENT (SECOND) OF TORTS § 260.

permitted to use force to prevent or remove an aircraft from his property. Additionally, as discussed above, determining whether a drone in flight is trespassing upon one's property may be unusually challenging.

Stalking, Harassment, and Other Crimes. Traditional crimes such as stalking, harassment, voyeurism, and wiretapping may all be committed through the operation of a drone. As drones are further introduced into the national airspace, courts will have to work this new form of technology into their jurisprudence, and legislatures might amend these various statutes to expressly include crimes committed with a drone.

Wiretap Laws. Under the federal wiretap statute, it is unlawful to intentionally intercept an "oral communication"[163] by a person "exhibiting an expectation that such communication is not subject to interception under circumstances justifying such expectation.... "[164] Currently, commercial microphones can record sounds upwards of 300 feet.[165] Use of such a microphone on a drone to record private conversations could implicate the federal wiretap statute.

Preemption of State Aviation Regulations. The increased presence of drones in domestic airspace raises the question of which aspects of drone use states may be able to individually regulate. The Supreme Court has stated that federal preemption of state laws and regulations occurs where "the pervasiveness of the federal regulation precludes supplementation by the States, where the federal interest in the field is sufficiently dominant, or where the object sought to be obtained by the federal law and the character of obligations imposed by it reveal the same purpose."[166] Congress vested sole responsibility for the aviation industry and domestic airspace with the federal government in the Federal Aviation Act of 1958.[167] According to the legislative history, the FAA was to have "full responsibility and authority for the advancement and promulgation of civil aeronautics generally, including promulgation and enforcement of safety regulations."[168]

Generally, state regulations of aviation safety, airspace management, and aviation noise are preempted by federal laws and regulations.[169] In *City of Burbank v. Lockheed Air Terminal, Inc.*, the Supreme Court struck down a local city ordinance that prohibited planes from taking off during certain hours of the day as preempted by the federal regulatory scheme.[170] Expressing its fear regarding local control of airspace, the Court stated, "If we were to uphold the Burbank ordinance and a significant number of municipalities followed suit, it is obvious that fractionalized control of the timing of takeoffs and landings would severely limit the flexibility of

[163] 18 U.S.C. § 2511(1)(a).

[164] 18 U.S.C. § 2510(2).

[165] *See, e.g.*, Electromax International, Inc., http://www.electromax.com/penmics.html (last visited Jan. 22, 2013).

[166] Schneidewind v. ANR Pipeline Co., 485 U.S. 293, 300 (1988).

[167] P.L. 85-726; 72 Stat. 737 (1958).

[168] H.R. Rept. No. 2360, 85th Cong. (1958).

[169] *See, e.g.*, City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973); Abdullah v. American Airlines, Inc., 181 F.3d 363 (3d Cir. 1999); San Diego Unified Port Dist. v. Gianturco, 651 F.2d 1306, 1316 (9th Cir. 1981); Price v. Charter Township, 909 F. Supp. 498 (E.D. Mich. 1995).

[170] *City of Burbank*, 411 U.S. at 639.

the FAA in controlling air traffic flow."[171] The Supreme Court has, however, upheld state regulations imposing taxes on aircraft equipment located within the state.[172]

Conclusion

The legal issues discussed in this report will likely remain unresolved until the civilian use of drones becomes more widespread. To that end, the FAA has been tasked with developing "a comprehensive plan to safely accelerate the integration" of drones into the national airspace, which focuses on the safety of the drone technology and operator certification. While the deadline for development of the plan has already elapsed, the FAA has until the end of FY2015 to implement such a plan.[173] Additionally, the FAA must identify six test ranges where it will integrate drones into the national airspace. This deadline, 180 days after enactment of the act, has also elapsed without FAA compliance. Once these regulations are tested and promulgated, the unique legal challenges that could arise based on the operational differences between drones and already ubiquitous fixed-wing aircraft and helicopters may come into sharper focus.

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[171] *Id.*

[172] Braniff Airways v. Nebraska Board, 347 U.S. 590 (1954). Additionally, several courts have determined that state law tort claims based on injuries caused by aircraft are not federally preempted. *See, e.g.*, Bieneman v. City of Chicago, 864 F.2d 463 (7th Cir. 1988) (overturning Luedtke v. County of Milwaukee, 521 F.2d 387 (7th Cir. 1975), which ruled that *City of Burbank* preempted application of state tort laws, such as negligence and nuisance, to flights that complied with federal laws and regulations); Greater Westchester Homeowners Association v. City of Los Angeles, 603 P.2d 1329 (Sup. Ct. Cali. 1979).

[173] *See* P.L. 112-95, § 332(a) (requiring development of a plan within 270 days of enactment of the act, falling in November 2012).

Misc. Meeting Notes - No Date

<TARGET><BILL></BILL><SUBJECT>Misc. Meeting Notes - No Date</SUBJECT><COMM><TARGET></COMM></TARGET>

need sept + Nov June 2015

minutes | summary

DOD UAS Briefing

12 gray eagles in in AK currently – $20mil a pop

Fort Wainwright has a platoon of Shadows – four aircraft, and 48 Ravens

Gray Eagles will be employed with Apache helicopters, can transfer control from Gray Eagles to Apaches and the GEs can fly up to 90 miles in front of the Apaches, guiding them. US Army implementation.

Joint Alaska Pacific Range is the primary deployment area – restricted air space. Can be employed in ANY airspace with proper

Sensors on Gray Eagle – Synthetic Aperture Radar – can sense footprints or imprints based on what is moving on the ground – could be great for search and rescue. EO = Electrical Optical and IR = infrared

SHADOW SYSTEM: can be used as a "private satellite" for coms purposes.

Question: Runway for Gray Eagle to land, but do you need one for a Shadow?

Answer: trailer launch catapult for shadow. Can land on 2-300 foot runway or can be captured in a smaller area.

ARMY UAS are controlled by the ground/helicopter. AIR FORCE UAS are operated from space/satellites

Satellites are very expensive in terms of bandwith.

AK has not done any mission planning yet outside of their established ground control and training arena.

Only reason gray eagle is here in AK = only location in Pacific AOR, where PayCom commander (four star admiral) in Hawaii could have access to the assets within the Pacific footprint.

Satellite system called Open Source currently in operation to increase communication in the Northern Hemisphere.

US Army in AK has balloons that operate at 80,000 feet with transmitters that allow for fully operational communications within Alaska.

OSRVT – One system remote viewing terminal

Feb 2017 – will have Gray Eagle Operations mission ready.

Ro Bailey – requests that after this fire season, we get the right people in the same room to discuss prepping for next season for planning and use of UAS in fire response so that the capability of UAS implementation is there.

***SSH generate a letter requesting that the state, UAF test site, emergency responders coordinate for situations like Sockeye fire etc..

Search and Rescue is different form DSCA. In Alaska, General Handy is the decision-maker when it comes to DOD response in search and rescue situations. DOD assets are on alert for Search and rescue situations – only place in the states where this happens.

Incident Awareness and Assessment = what DoD UAS can do in Alaska.

Imagery will be taken over general areas, never of specific people or businsesses, when in the US.

"Incidental Collect" imagery taken during, for example, an earthquake. There will be incidental collect of images of people, businesses, etc... there is a very restrictive guideline in place that places limits on how long DoD can keep information, what they can do with it and when to protect the rights of individuals. Sensitivity level is so high, that even state National Guard requires Secretary of Defense approval for use.

Proper Use Memorandum (PUM) is required for any DoD assistance to the state ops in Alaska – anything involving UAS requires SECDEF approval.

Standard Collection - Infrared, electronic imaging, thermal

Special Collection – collecting electrons, cell phone signals, etc, "stuff that starts to scare people" – typically NEVER used on US soil.

LTFUAS Meeting Notes

Ginger – UAVs in the media update:

Sam's Club is gearing up for drones to be one of their top selling gift items this year.

Unmanned Aircraft encounters with manned aircraft are on the rise – summer months lead to increase in UAS recreational flight.

Second round of million $ UAE drone innovation contest.

New investment funds through DJI SkyFund

AMA online flight school being offered.

FAA National Policy: Aviation related videos or other electronic media on the Internet –

- Lt. Adams asked if law enforcement have encountered anything involving drone video and what the can be done.
- Adams – We would not file any charges, no statutes currently that would allow for charges.

Alaska Aerial Media – Ryan Marlow

Integration of UAS into public safety at an affordable rate is their main goal.

Main uses thus far –

1. documenting historical landmarks in Alaska –
2. Next big push: Emergency Services – search and rescue, fire, flood. Insurance issues are the biggest hurdles for UAS implementation in emergency response

Ro Bailey: Need an emergency COA for flight in non-COA'd

Alaska Aerial Media has a new COA for up to 400 feet now, with new stipulations for communication with the FAA.

3. Construction, Project inspection and risk mitigation.
4. Thermal Scanning – Search and rescue, inspection (pipeline). Response time can be dramatically reduced with thermal scanning from UAV during search and rescue scenario.
5. Equipment/facility/mechanical inspection – power lines etc...
6. Surveying: Digital Surface Models, Orthomosaics, volumetric scans.
7. Wildlife Monitoring: thermal equipment used for monitoring Beluga whale, data collected from this can help solve mystery of why whales are beaching themselves.
8. Media – lives streaming events – Iditarod, irondog.

These are examples of Alaska's Aerial Media is involved with currently.

Backgrounds of Ryan, Beau and Tyler – software engineering, electrical engineering.

AAM received their latest COA recently for 400 feet anywhere outside of Class C and D airspace. None of their equipment have "Mode C" transponders currently. No longer call into tower, now use Kenai Flight Services. Flight planning still needs to be done beforehand. Fly in airspace, but not restricted by the five mile from airport rule anymore.

AAM currently has five UAVs, but only one listed in their COA.

Ethan Tyler Question: From a business perpective, what would you say are the barriers you're currently running into, as far as growth?

Ryan: Turn-around time for the COA. Red tape and paperwork really slows down the process.

Beau: An example of a hurdle: "we got an email from a Peter Greenberg production company job, they wanted some filming help" but because of the COA and airspace restrictions – they are losing these jobs to people from out of state coming up and taking these jobs by not following the rules.

John Parker Question: Can you run us through the 333 exemption. When did you get it? How long did it take?

Answer: 333 exempts them from commercial UAV operation, must have a COA, and adhere to airspace requirements. Applied for the COA in October of 2014, took 60 days for a response, told they had to submit more paperwork and make some changes. In total, about 5-6 months. Tyler, Beau, and Ryan all filed separately as pilots for 333 waivers, but only Ryan has received the waiver thus far.

John Parker: 333 waiver exempts you from certain regulations.

Steve Wackowski – Hollywood has been operating UAVs illegally for years. The FAA is putting a lot of onus on these guys, but not going after these Hollywood companies.

Ro Bailey: Are you actually doing all of the things listed in the presentation?

Ryan: our COA says we are certified for "scanning" we are more just researching where and how we can operate I those areas.

Ro: I applaud your patience and willingness to work within the rules because the FAA will trust you and eventually entrust you with more responsibility.

Alaska Aerial Media has a $2 million liability insurance policy, as well as coverage on their UAVs.

Bob May: Would like to see some action from the state to require companies that come into Alaska to film for a profit to operate with the proper waiver, certifications, insurance coverage.

Lt. Adams: These companies who are filming without proper licensing or coverage are violating a civil action, unless they are operating their equipment in a manner that is reckless, there are no laws that we can charge them criminally on.

***Ro Bailey: A simple fix would be to require any operator hired by an agency to provide PROOF of a COA in order to operate commercially in Alaska – without a COA, they won't have the other required certs.

Captain Cook – Anchorage Police Department

One bad experience with an individual in Eagle River. Following kids home from school, multiple occasions since then. Could not do any civil action against the man because it is a civil issue. FAA could not act on the issue either, as the man was operating within the regs – far enough away from airports, height, etc.. APD will now be able to pursue trespassing charges for future occurrences via a trespassing charge if it is in fact, evident that drones are used to look into windows.

SSH: Why was a search warrant not obtained in this situation?

Capt. Cook: We believe that the situation was handled sufficiently in the end, but if there are any future occurrences with the same individual you will see a much more aggressive handling.

Capt. Cook: Outside of that circumstance, the majority of our encounters with drone operators has been very positive. Operators are very concerned for the well-being of the industry and do not take kindly to these outlier type abuses of the technology (in regard to the eagle river situation).

DRONE PRIVACY DOCUMENT:

1.) Include the term UAS or Unmanned Aircraft System, with or without using drone. Insert "(UAS)" after drone on title line, page 1. Insert "FAQ about Privacy"
2.) Delete "Frequently Asked Questions on Unmanned Aircraft Systems"
3.) Bottom of page 2, include "causing damage" rather than "shooting down"
4.) Possibly add a statement at the beginning of this document to address what is the national air space. (referenced on Page 2).
5.) Move the crowd issue listed on page 6 closer to the front of the document, page 2 possibly?

Jay Skaggs: There is a public law that says it is illegal to damage aircraft. Legal interpretation that does include model aircraft as aircraft.

Skaggs: Issue comes down to structuring language that protects both the operator flying UAVs and the privacy of individuals, when it comes to instances like the Eagle River issue.

John Parker question: AMA drones – are they certified by the FAA in any way?

Skaggs: FAA is prohibited by public law to certify or regulate model aircraft. Model aircraft, right now, we're saying that if they create a moderate threat to the NAS (near-miss or mid-air collision) then we will pursue enforcement. If not a moderate threat, then we are pursuing education first. If person continues to operate contrary to regs after letter of education, then they will pursue enforcement.

Update on the FAA's know before you fly app? Skaggs had no info, but good idea to ask if Alaska can be the first to roll out the app when its completed.

Steve Strait Question to Ro: What do think the university's role will be going forward with changes in FAA regs, funding form legislature.

Ro: recently acquired a 250 pound SeaHunter UAV, testing nanotechnology for deicing of aircraft, numerous other research projects. All of the aspects of big systems, and operating out of airports is still ahead of us. Bridge inspection work done with UAVS, pipeline inspection work slated, acquired a single-rotor helicopter for heavy payloads.

Updates:

John Binder: DOT Airport Managers training – where UAS training was involved in the statewide manager training. Educate them on current regs, what to do when UAS operators call them. What to do when they encounter people are not abiding by the rules. The session was geared toward education, the Know Before You Fly documents was distributed.

Steve Wackowski: Seattle Robotics Conference. University of Washington Law review of UAS impact on laws and regs. Disappointing to see how rule-abiding companies and individuals are left scratching their heads and stalled while other companies go around the rules.

Ethan Tyler: Division of Economic Development secured a booth at the AUVSI trade show. Collaborative effort with multiple agencies at the booth to showcase Alaska as a great place to do business.

Ro: UAV demonstration at the Fairbanks fire training center near the hotel for September interest group meeting dates.

SSH: talked to barb Johnson about dinner during the Interest Group meeting to debrief.

September 3 public testimony.

NEXT MEETING: Look into statute changes pertaining defining geographic location that determines whether a UAV is on a person's property and how. Statutes related to stalking. Lt. Adams believes it is time for statute changes to make charges a "slam dunk" in terms of when and where you CANNOT operate a UAV.

Board of Game, Board of Fish regs banning drone use for scouting.

Letter to congressional delegation regarding funding for FAA test site. Crafting a letter to congressional delegation, what are we asking for? Ro: we may not need to pursue this task any more. We have very strong support from all three of our members of congress. Working on the FAA Reauthorization Act. Conversing with the test sites to see what can make their operations easier. The FAA won't tell them what areas they would like them to research because they don't have the money to pay for them.

Ethan Tyler: we work with the Alaska Minerals commission. They share their recommendations to the state on actions they'd like to see taken each year. For this group, perhaps a goal for the next meeting would be to put together some recommendations for both state and federal needs. Three-five issues identified by this group to better articulate the needs for this industry to grow and be beneficial to

Alaskans. Would be willing to dedicate some staff time to put together a document to distribute to both the state legislature and the federal delegation.

***Crafting a general letter in support of the FAA Reauthorization Act.

FOR SEP MEETING: put together a list of Federal priorities/needs in Alaska for UAS industry.

Steve Colligan: AMA resolution notification. Was there a letter provided to those listed in the resolution or interested in the legislation? Liet gov's office sends letters to each entity listed in the resolution. Colligan: would be good to see our logo (state seal or whatever works) to see our state included in national Know Before You Fly initiative. Governor's office is ready for the Task Force document, we just need to get it to them.

NEXT MEETING: Josh Waite presentation possibility.

Steve Strait: Do we have the issue of drafting some kind of statutory language in the next meeting? Yes.

Skaggs: with the recent emergency management issues, the state does not have a COA filed with the FAA so they can exercise operational control to hire someone to do their flying as a public entity. That COA could be used for other things for the states, such as surveying construction projects, AK airports to save money for the state on the operations side. Would like to see the state file for a COA so we can use UAVs for state operations.

SSH: John Binder, Mike O'Hare, many other agencies would be involved in portions of the COA.

Wackowski: Would be smart to establish a primary POC for the state of Alaska.

***RO: maybe a subcommittee – Mike O'Hare John Binder, Lt. Adams, Ro, Jay Skggs, to work on filing a COA for the state prior to the next meeting? All of the people representing the various departments should be involved. NEXT MEETING: have an agenda item for a report from this subcommittee.

Name Affiliation Do you want to testify

documents @ vivint.com
Oct $60.99
acct 247 3587

Leadership Conf.
Wisn-
Nov 30 - December 3
15 minutes

Newsletter
November

Mike Holman Deputy Chief
Unalaska
Legislative Dist

Hot Topics Oct 4-5
1 page flyer
electronic
no time limit

Public Testimony

Erik Folkstad - WA AUVSI Cascade Chapter
~~on WA Task force~~
Gov Isley vetoed 1st bill
authorized a task force - not able to agree on a bill
two competing bills - neither have been passed

Steve Wackowski
WA state economic impact very positive
Insitu
10,000 jobs - multi faceted

Mike O'Hare
is it good that WA does not have UAS law?

Ted Ralston - Univ of Hawaii Natl Disaster Preparedness center
tourist issues with drones
law enforcement and hotels are just starting to work together
333 exemption vs non COA business conflicts

Terry Hinman → citizen
private property owner has problems with aircraft - (manned) what happens w/ UAS
privacy document seems to side w/ pilot
citizens seem to have less rights

Steve Strait just called in

Sen Micciche –

Collection of complaints of manned / UAS
to FAA
privacy and safety
▷ Report for Alaska from FAA

Bob May -
reporting on air flight issues
future legislation

Josh Waite -

Privacy document

add phone numbers for contact

don't fly drone around wild fires
Know Before you Fly

"How to - phone numbers"
Incorporate with sales of drones.

add version number — one website and one number on every page = header / footer

#7 safety — add something about safety

new document
- Mike O'Hare
- Ro Bailey
- Bob May
- Steve Wackowski

Ro Bailey - privacy document

UAS LTF NOV 5 13:00
teleconference

State Agency COA
Tom Eller - ACUASI take through COA application
▷ Mike O'Hare - chair
Oct [redacted] 1pm (23rd)

John Bender - DOT presentation
Airports working w/ FAA to be part of approval process
COA approvals have been surprise to airports

Jon Skeen
Steve Adams

▷ Assoc. of Chiefs of Police Oct 5-6
Sen Micciche supports attending meeting
Bob May - yes

suggested legislation —
(1) AMA - can we require certificate KBYF
license w/ stickers for aircraft

Legislation before AMA in January
▷ Steve Colligan
RO - qualify for insurance
Bob May
notice / flyer in drone sales. online and in state

(2) State regulate airspace below 500'
▷ Steve Wackowski 10th Amendment
Bob May John Bender Steve Colligan
Sen Micciche Steve Strait
RO - David Voss. Google X wants this as well (NASA AOMS conference)

"Loitering" rules under 500'

exemptions - Life flight - UAS delivery of defibrulator

can I help the sub committees set meeting dates?

sub committees	date/time	chair
— State Agency COA	Oct 23 1pm	Mike O'Hare
// — hobby certs & licensing // retailer packaging		Steve Colligan
// — 3-D airspace as part of property rights.		Steve Wackowski

BASIS meeting notices —

No October 16 ? money ...

No October 23 — or any of the sub committees?

Nov 5 1pm teleconference

= updates from sub committees and possible legislation

Executive session?

Ryan Marlow —

non-civilian use COA

law enforcement waiver for emergency services

one hour rather than 48 hour notice

APD asked for their help and they were denied

when there was a man hunt

MOA between USDOT, FAA, UAS Integration Office, US Dept. of Justice

<TARGET><BILL></BILL><SUBJECT>MOA between USDOT, FAA, UAS Integration Office, US Dept. of Justice</SUBJECT><COMM><TARGET></COMM></TARGET>

MEMORANDUM OF UNDERSTANDING
BETWEEN
FEDERAL AVIATION ADMINISTRATION,
UNMANNED AIRCRAFT SYSTEMS INTEGRATION OFFICE
AND
THE U.S. DEPARTMENT OF JUSTICE,
OFFICE OF JUSTICE PROGRAMS,
NATIONAL INSTITUTE OF JUSTICE
CONCERNING
OPERATION OF UNMANNED AIRCRAFT SYSTEMS
BY LAW ENFORCEMENT AGENCIES

I. PURPOSE: This Memorandum of Understanding (MOU) sets forth an agreement between the Department of Transportation, Federal Aviation Administration (FAA) Unmanned Aircraft Systems Integration Office, and the Department of Justice (DOJ), Office of Justice Programs (OJP), National Institute of Justice (NIJ), hereinafter, "the Parties," to implement a streamlined training and authorization process to enable nonfederal law enforcement agencies (LEAs) to operate unmanned aircraft systems (UAS) within the United States safely, effectively, and lawfully.

II. AUTHORITY: This MOU is entered into on the part of NIJ pursuant to Titles II, III, and V of the Homeland Security Act of 2002 (6 U.S.C. §§ 121 *et seq.* and 182 *et seq.*); and Title I of the Omnibus Crime Control and Safe Streets Act of 1968 (42 U.S.C. §§ 3711 *et seq.*), and on the part of the FAA pursuant to the Federal Aviation Act of 1958 (49 U.S.C. §§ 40101, 40103, and §§ 44701-44735).

III. BACKGROUND:

The FAA is charged with regulating the use of U.S. airspace to ensure its safety and efficient use. With regard to public UAS, including those used by LEAS and other public safety agencies, Public Law 112-95, the FAA Modernization and Reform Act of 2012, directs the FAA to issue guidance regarding the operation of public UAS to—

1) Expedite the issuance of a certificate of authorization (COA) process.
2) Provide for a collaborative process with public agencies to allow for an incremental expansion of access to the national airspace system as technology matures and the necessary safety analysis and data become available and until standards are completed and technology issues are resolved.
3) Facilitate the capability of public agencies to develop and use test ranges, subject to operating restrictions required by the FAA, to test and operate unmanned aircraft systems.
4) Provide guidance on a public entity's responsibility when operating an unmanned aircraft without a civil airworthiness certificate issued by the FAA.

It further requires that the FAA shall, not later than December 31, 2015, develop and implement operational and certification requirements for the operation of public UAS in the national airspace system.

NIJ is the research, development, and evaluation arm of the U.S. Department of Justice and is dedicated to researching crime control and justice issues. NIJ provides objective, independent, evidence-based knowledge and tools to meet the challenges of crime and justice particularly at the state and local level. Through its Office of Science and Technology, NIJ, in part, serves as the national focal point for research, development, testing, and evaluation of technology for law enforcement. NIJ identifies the needs of the law enforcement community for new technologies and tools and develops solutions. NIJ develops standards and conducts testing to evaluate technologies that may be used by law enforcement agencies. NIJ works with other federal agencies to establish a coordinated federal approach on issues relevant to law enforcement and with government agencies at all levels and professional associations to foster the adoption into practice of new tools and technologies. The activities NIJ sponsors in this regard include development of relevant training materials, best practice guides, and policies.

Through a research project aimed at identifying low-cost aviation solutions for small and rural agencies that cannot afford the costs associated with operating traditional fixed-rotary-wing aircraft, NIJ determined that UAS could provide an affordable solution for those agencies that need "eyes in the sky" but lack the budget or for those agencies that need to supplement their current aviation units with more cost effective aircraft for specific missions.

NIJ and the FAA have a shared mission to ensure the safe and effective use of UAS in public aircraft operations. It is in the interest of both agencies to meet or exceed the goal set by Congress to develop and implement operational and certification requirements for the operation of public UAS in the national airspace system (NAS). To that end, they have collaborated since 2005 to develop the attached streamlined training and authorization process, which reflects the input of the state, local and federal law enforcement community gathered and represented by NIJ. The result of this collaboration will allow for real-time access to the (NAS) for agencies responding to emergency circumstances.

IV. SCOPE: To further this shared mission, the parties will now collaborate to implement the attached streamlined training and authorization process for LEAs' use of UAS, particularly those agencies without prior aviation experience.

V. IMPLEMENTATION:

A. NIJ will:

1. Prepare and coordinate with the FAA UAS Integration Office (FAA UASIO) and the Department of Homeland Security Science and Technology (DHS S&T) the distribution of a technical bulletin that addresses the utilization of UAS in the NAS for LEAs and other public safety agencies, which NIJ will maintain and update as

necessary.

2. In coordination with FAA UASIO, develop and promulgate a process for collecting, analyzing and publishing UAS training and operational mission data that specifically captures and assesses mission capability of the technology (to include "Lessons Learned").

B. The FAA UASIO will:

Through the COA validation process, FAA will assess each LEA applying to operate under this agreement to ensure that it demonstrates a level of capability to operate its specific UAS safely and competently within the NAS. The FAA assessment of the proposed UAS operations' impact on the level of safety in the NAS will evaluate whether adequate mitigations are available to compensate for any inability to comply with 14 CFR §§ 91.111 and 91.113(b).

C. Each Party to this MOU will fund its expenses associated with participation covered by this MOU. This MOU in no way restricts any Party from participating in similar activities or arrangements with other public or private agencies, organizations or individuals.

D. Each Party will provide personnel and resources as appropriate to implement its responsibilities under this MOU.

E. Each Party will take appropriate steps to ensure that its employees, agents, contractors, and consultants involved in projects conducted under this MOU comply with any pertinent provisions of this MOU.

F. Each Party will handle and expend its own funds. The responsibilities each Party assumes under this MOU are subject to the availability of funds for such purposes. Nothing in this MOU, in and of itself, obligates any Party to expend appropriations or to enter into any contract, assistance agreement, interagency agreement or other financial obligations. Any endeavor involving reimbursement or contribution of funds between the Parties will be handled in accordance with applicable laws, regulations and procedures, and will be subject to separate interagency agreements that will be effected in writing by representatives of the Parties.

G. Management Points of Contact. The Parties designate the following individuals to serve as their management points of contact for matters related to this MOU. Each Party may change the individual designated as its management point of contact upon notice to the other Parties of such change.

National Institute of Justice
Office of Science and Technology
Program Manager
202-305-7954

Federal Aviation Administration
UAS Integration Office
Air Traffic Manager
202-385-4661

VIII. MODIFICATION AND TERMINATION:

A. Amendments or modifications to this MOU must be approved by each of the Parties in writing in accordance with applicable policies, procedures and legal requirements.

B. Any Party may terminate its participation in this MOU at any time, but should provide thirty (30) days written notice to the other Party. Disposition of any efforts in progress at the time of notification will be determined by agreement of the Parties.

C. In the event of disagreement between the Parties with respect to this MOU, the Parties will each undertake to attempt a good faith effort to resolve the disagreement. Nothing in this MOU, however, will take precedence over, or negate or affect in any way, the policies, procedures and directives of the respective Parties or any applicable laws or regulations. If a disagreement cannot be resolved, the parties may modify or terminate this MOU.

IX. NATIONAL SECURITY INFORMATION: Security classification guidance for activities undertaken pursuant to a subsequent interagency agreement will be determined in accordance with the laws, regulations and policies governing the lead agency for those activities.

X. PUBLIC INFORMATION COORDINATION: Public disclosures of information regarding projects and activities conducted under this MOU are subject to the Freedom of Information Act (5 U.S.C. § 552). The Parties will consult with each other prior to any public disclosure of information.

XI. EFFECTIVE DATE: The provisions of this MOU become effective as of the date of the last signature hereunder, and will remain in effect for five (5) years, unless terminated earlier in accordance with the provisions of this MOU.

Agreed:

James H. (Jim) Williams
Unmanned Aircraft Systems Integration Office
FAA Aviation Safety Organization
Federal Aviation Administration

Date: 3/4/13

Gregory R. Ridgeway, Ph.D.
Acting Director
National Institute of Justice
Office of Justice Programs
U.S. Department of Justice

Date: 2/27/13

ATTACHMENT TO THE MEMORANDUM OF UNDERSTANDING
BETWEEN
FEDERAL AVIATION ADMINISTRATION,
UNMANNED AIRCRAFT SYSTEMS INTEGRATION OFFICE
AND
THE U.S. DEPARTMENT OF JUSTICE,
OFFICE OF JUSTICE PROGRAMS,
NATIONAL INSTITUTE OF JUSTICE
CONCERNING
OPERATION OF UNMANNED AIRCRAFT SYSTEMS
BY LAW ENFORCEMENT AGENCIES

PART 1 — LEA UAS Operational Requirements, Elements, and Procedures

I. UAS Safety Risk Analysis Plan (SRAP) and Defined Incident Perimeter

a. For the purpose of identifying and mitigating risks arising from UAS operations, any LEA wanting to use the streamlined LEA UAS authorization process would be required to submit a formal SRAP as an attachment to its Certificate of Waiver or Authorization (COA) application that specifically identifies the boundaries of the agency's jurisdiction and all unique operational areas within that jurisdiction and attendant hazards *(e.g., airports, motor speedways, large sports complexes, major highways, strategic/sensitive infrastructures, university campuses with airspace, obstruction clearance, public access, evacuation mitigation, rush hour heavily trafficked roads, or other incumbent hazards)*. The SRAP must include a description of specific risk controls to be employed to mitigate any attendant hazard for UAS operations within the jurisdiction in the vicinity of those identified unique operational areas.

b. All UAS operations will be conducted within the boundaries specified in the LEA's COA. These boundaries will fall within the area of the LEA's jurisdictional control. Further, the operation will be conducted within a nonmoving "Defined Incident Perimeter" that is controlled by the LEA and identified by geographic coordinates (pursuit missions are not authorized).

c. The use of the streamlined LEA UAS authorization process may be used only by LEA's deploying UAS with a gross take-off weight that does not exceed 25 lbs.

II. UAS Airworthiness, Employment, and Safety of Operations

a. The accountable executive (e.g., agency head) of each LEA will acknowledge in writing that the UAS the LEA intends to deploy is airworthy and in a condition for safe operation based on the manufacturer's specifications, maintenance recommendations and operating procedures of the aircraft, control station, communications links and lost link procedures. This process does not constitute an Airworthiness Certification by the FAA.

b. Upon the first application by each LEA, the applicant must submit a legal determination that it is eligible to operate a public aircraft under the applicable paragraph of 49 U.S.C. § 40102(a)(41) (citing the applicable paragraph and support in its determination), that the UAS will be operated in accordance with 49 U.S.C. § 40125 (will not receive compensation or reimbursement for operation except as specified in the statute) and will not operate the aircraft in any manner that endangers life or property in accordance with 14 CFR § 91.13.

c. These airworthiness, operational safety and public aircraft statements will be on LEA letterhead stationery, signed and dated by the agency head making the acknowledgements, and must be included as an attachment to the COA application. In the event of a LEA leadership change, a new or revised statement must be submitted to ensure that the new leadership is fully aware and informed of the COA.

III. Pilot & Observer Qualifications for UAS operations at and below 400 feet AGL

a. Each UAS pilot must be an FAA-certificated airman or successfully pass either the FAA's pilot knowledge exam or complete an FAA-approved UAS pilot training curriculum. If operating in an area that requires Air Traffic Controller (ATC) communication, additional pilot training may be required if the UAS pilot is not a certificated manned-aircraft airman.

b. Pilots will receive training specific to the UAS to be operated. This training must be conducted and documented by a qualified instructor designated by the proponent as being the individual(s) trained and certified by the manufacturer to provide training on the specified UAS.

c. Pilots are prohibited from flying any public safety mission without having completed three UAS flight events within the preceding 90 days.

d. Observers must successfully complete a UAS observer training curriculum that includes, at a minimum, instruction on rules and responsibilities described in 14 CFR § 91.111, Operating Near Other Aircraft, 14 CFR § 91.113, Right of Way Rules, Cloud Clearances, and that emphasizes "See and Avoid" concepts and fundamental radio communications, including standard ATC phraseology. Observer training must include thorough instruction regarding manned aircraft traffic conflicts and pilot communications for any maneuvers/actions required to avoid traffic conflicts.

e. Pilots and observers must not perform duties for more than one UAS at a time and are not allowed to perform concurrent duties both as pilot and observer.

f. LEA standard operating procedures (SOP) must include Crew Resource Management (CRM) techniques to ensure the highest possible situational awareness and effective communication by pilots and observers during each flight operation. Pilots and observers must be trained in these procedures and techniques.

g. All pilot and observer training must be conducted and documented by a qualified instructor designated by the proponent as being an individual trained and certified by the manufacturer to provide training on the specified UAS.

h. Pilots and observers must be medically qualified and have in their possession a second class (or higher) airman medical certificate that has been issued under 14 CFR Part 67, Medical Standards and Certification.[1]

i. 14 CFR § 91.17, Alcohol and Drugs, applies to UAS pilots and observers.

[1] The FAA, at the request of DOJ/NIJ, is working to change the requirement for a second-class airman medical certification to "self-certification" as to being healthy to fly and a letter from a competent medical authority confirming the operator's eyesight to the second-class medical certification requirements of correctable to 20/20.

IV. UAS Flight Operations

a. The pilot-in-command (PIC) will conduct a thorough premission briefing prior to commencing any UAS flight operation. At a minimum, the briefing must include a review of the SRAP for the specific hazards within the area of operations, the LEA's standard operating policies and procedures, specific objective(s) of the mission, expected duration of the mission, operating limitations/restrictions, specific duties of each crew member, specific communications plan including a lost communications procedure, and emergency procedures.

b. UAS operations, within the area of jurisdiction, must remain within a nonmoving "Defined Incident Perimeter" at or below 400 feet above ground level (AGL). The LEA will identify and manage all potential air and ground hazards inside the "Defined Incident Perimeter," especially concerning overflight of people and private property. "See and Avoid" is paramount to safe UAS operations, and all flights will remain within the visual line of sight of the pilot and employ at least one observer, not including the PIC. All of the risks and associated liabilities that exist within the "Defined Incident Perimeter" must be legitimately mitigated, and the safety of people and property assured.

c. UAS flight operations will only be conducted during daylight hours and must adhere to Day Visual Flight Rules (VFR) with Visual Meteorological Conditions (VMC) with visibility and cloud clearances specified for Class E airspace.

d. Use of visual observers in a linear fashion away from the control station (daisy chaining) is prohibited.

e. Moving "Defined Incident Perimeters" to accommodate pursuit missions are prohibited. UAS pursuit missions are NOT authorized outside of the "Defined Incident Perimeter."

f. Only one LEA UAS will be flown at a time within the "Defined Incident Perimeter."

g. The UAS will not fly over outdoor assemblies of people or heavily trafficked roadways. LEA UAS flight operations must be offset as needed to ensure the orbit or flight path of the UAS does not incur a risk of injury to persons or property along its flight path. A mitigation strategy may include, but is not limited to,

evacuation of persons from within the defined incident perimeter by legal police authority.

h. The PIC shall comply with all ATC instructions and/or clearances.

i. Operations within Class A and B airspace are prohibited. *(Note: A description of classes of airspace is included as an attachment at the end of this document)*

j. UAS operations within Class C and D airspace are prohibited, unless the LEA has a Letter of Agreement (LOA)/procedure with the controlling ATC facility, the ATC facility has given the proponent specific approval to operate without a transponder at the time of the notification of the operation, two-way communications are maintained with the ATC for the duration of the UAS operation, and the UAS is configured with an independent flight termination system.

k. The PIC or his designee will monitor Universal Communications (UNICOM) or appropriate ATC frequencies during all flights. The LEA will not fly in airspace other than Class G inside the area of jurisdiction without the approval of the managing ATC facility.

l. The PIC will maintain two-way radio communications when flying within five nautical miles of an operational control tower. During the period of time a control tower is closed, the PIC will monitor the appropriate UNICOM or Common Traffic Advisory Frequency (CTAF). Operations will not be conducted within a one-half-mile radius of noncontrolled airports, heliports or water landing areas without ATC or airport management approval.

m. For operations within 5 NM from any airport or heliport, the PIC shall hold, at a minimum, an FAA private pilot certificate.

n. In accordance with 14 CFR § 91.3 and § 91.111, the PIC is responsible at all times for collision avoidance with other aircraft and the safety of all operations, persons and property. In the event of a potential conflict with other aircraft, the PIC will immediately terminate the flight and land the UAS to ensure safety. LEA will not conduct UAS flight operations if a manned LEA aircraft is operating within the "Defined Incident Perimeter."

o. The PIC must coordinate with the ATC facility having jurisdiction over the airspace above the "Defined Incident Perimeter" no less than 2 hours prior to commencement of flight operations for routine (noncritical and training) missions and normally 60 minutes, but no less than 30 minutes, for missions requiring critical/immediate response.

V. Requirements

It is understood that because of the immediacy of some tactical operations, the timeliness of Notice to Airmen (NOTAM) notification may need to be reduced to accommodate the criticality of the mission. For those missions where response to the event is critical, a distance (D) NOTAM must be filed with ATC no later than 1 hour prior to commencing UAS flight operations. This NOTAM must provide:

a. Name and contact data of entity conducting UAS operations.
b. Location and altitude of the specific operating area ("defined incident perimeter").
c. Name of PIC.
d. Time and nature of the UAS activity.

Additionally, to use the 1-hour notification timeframe for these critical operations, the proponent must place a notice in the Airport Facility Directory (AFD) advising of the possibility of Unmanned Aircraft Operations in the operational area during the period of time this COA is valid. Until the AFD entry is published, the 48-hour minimum NOTAM requirement remains in effect, unless otherwise authorized. For all UAS missions NOT classified as a critical or immediate response (e.g., currency/proficiency or training missions), a distance (D) NOTAM shall be issued 48 to 72 hours prior to normal unmanned aircraft operations being conducted.

An LEA does not need to file a NOTAM for a specific mission if it is determined that issuing the NOTAM could reasonably place the safety of officers or the success of the mission at jeopardy. Such determination shall be documented in the UAS flight log. Immediate, critical operations below 100 feet AGL, not exceeding 15 minutes in duration, are authorized provided a notice of UAS operations within the jurisdiction has been published in the AFD, UAS operations will not commence within 5 NMs of an airport or heliport without ATC coordination, and UAS operations are not being conducted within Class B airspace. The proponent must contact the appropriate ATC facility prior to the operation to obtain approval.

VI. Formal Training Program

a. Each LEA shall establish a training program that addresses the initial and refresher training of all pilots and observers assigned to the UAS program, crew members, or individuals who may be used for missions of the LEA UAS program. The training program will include the identification/location of a UAS training site that is confined to Class G airspace remaining well clear (as specified in the minimum requirements of 14 CFR § 91.119) of housing areas, roads, and any persons or watercraft within the specific operating location. This training site will be used for the development and exercising of scenarios that address the utilization of the UAS technology integrated with other internal and external agencies and organizations that may use the UAS technology for operational missions.

b. Each LEA's formal training program for UAS crew members and ground crew will concentrate on scenario based training exercises that focus on, but are not limited to; Standard Operating Procedures (SOP), Crew Resource Management (CRM), emergency and abnormal procedures, and coordination and communication between operational elements. All pilot, observer and crew member training must be formally documented, including initial manufacturer training and LEA training and currency. Instructors and evaluators must be designated by LEA in writing, including manufacturer personnel.

c. Initially, the COA will restrict LEA UAS operations to the training and evaluation of LEA pilots, observers and crew members using the UAS technology. When the LEA believes its personnel are sufficiently proficient to safely conduct LEA operational missions, the LEA will request the FAA to conduct a thorough program review, including a review of all training records, flight manuals, standard operating procedures and other supporting program documentation. The FAA will work to conduct an onsite evaluation of a LEA UAS exercise to demonstrate the competency and safety of the LEA UAS program and the coordination and control among LEA supporting elements within 30 days of notification by the agency. After a successful program review and evaluation by the FAA of an actual exercise for safety and competency, the FAA will issue an operational COA approving UAS operation within the jurisdictional boundaries. It is understood that training of ATC personnel may need to precede the implementation of the COA.

VII. Standard Operating Procedures

SOPs are essential to the successful growth and maturity of a safe program. LEAs must create, distribute, implement and provide training on UAS SOPs for each phase of flight operation from notification for deployment through preflight, launch, recovery, postflight and mission recordkeeping. Effective SOPs must include, at a minimum, emergency procedures and standards for expected scenarios (e.g., lost link, lost communications between observers and the (PIC) or between the PIC and the ATC, medical emergencies), CRM, sterile cockpit protocols, standard communications between the PIC and the observer, and any special mitigation procedures.

VIII. Safety/Mission Analysis

a. In an effort to assist NIJ in gathering technology application data regarding the integration of UAS in the NAS, the LEA will provide NIJ with an Unmanned Aircraft Aviation Operations Report (AOR) that includes the description of the operations; the areas of operations, the nature, dates and flight durations of the missions; and any system malfunctions, discrepancies or incidents (e.g., lost communications, lost link, flyaway or unintentional termination of flight where no damage was sustained by the UAS, CRM breakdowns, UAS issues) noted during a mission. Additionally, to assist the FAA in gathering safety data regarding the integration of UAS in the NAS, the AOR will include a "Lessons Learned" section that contains specific issues experienced or discovered during each UAS flight operation (training or operational). This reporting requirement is in addition to the requirements related to incident/accident and normal operational reporting provisions currently required on all COAs.

b. In the event of a UAS accident or incident (i.e., damage to property, the UAS or other aircraft; injury to persons; or fatality), the LEA shall immediately notify the appropriate regional FAA office and the UAS Integration Office via the Washington Operations Control Center at 202-493-4170 or 202-267-3333, and provide the LEA activity name, address and contact information, date, time,

location, and UAS nomenclature, along with a brief preliminary description of the circumstances. A summary response will be provided to FAA via the COA online procedures.

PART 2 — FAA Administrative Strategy Supporting Streamlined UAS Authorization Process

I. **LEA-Centric Streamlined COA Application Process**

a. In order for LEAs to achieve more rapid authorization for the employment of UAS technology within their respective jurisdictions, the current COA authorization process may be restructured or "streamlined" to address unique LEA operational constraints which would permit LEAs to provide only specific operational and administrative information in the online filing of the COA application. This streamlined process would recognize an acceptable, predefined, UAS description, performance characteristics and operational avionics/equipment technologies verified by an approved third party testing organization. These approved technologies would be contained and maintained within a data library contained and updated within a DOJ and/or DHS online library.

b. The particular UAS to be employed would be selectable via the library. The "streamlined" LEA-unique COA authorization process would also include standardized operational elements. LEAs would be required to formally acknowledge their agreement to accept and abide by preapproved operational guidelines that would include predetermined flight operations processes, procedural and operating limitations or restrictions, pilot and observer qualifications, a LEA certification airworthiness statement, and qualification/remedial/recurring training and recordkeeping. These processes, procedures and operating limitations/restrictions would be standardized, would apply to all LEAs, and would be similar to mitigation provisions already imposed in various other UAS COA approvals.

Observations From Above: Unmanned Aircraft Systems and Privacy

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OBSERVATIONS FROM ABOVE: UNMANNED AIRCRAFT SYSTEMS AND PRIVACY

JOHN VILLASENOR*

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INTRODUCTION

Military aviation experts and model airplane hobbyists have known for decades that an airplane can be flown without a human in the cockpit. Until very recently, however, for most people the very concept of an aircraft was inextricably tied to that of the pilot it was presumed to carry. In the long run, that may turn out to be a historical aberration.

"Drones"—more accurately, unmanned aircraft—will dominate the future of aviation as thoroughly as manned aircraft have dominated its past. In the military the transition is well under way. In 2012, the United States military had close to 6,300 unmanned aircraft systems (UAS)[1] and is training hundreds of

1. UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS, DEPARTMENT OF DEFENSE REPORT TO CONGRESS ON FUTURE UNMANNED AIRCRAFT SYSTEMS TRAINING, OPERATIONS, AND SUSTAINABILITY 2 (2012), *available at* http://www.fas.org/irp/program/collect/uas-future.pdf. The

new pilots each year to fly them.[2] Civilian UAS use in the United States is also set to grow rapidly in the wake of a law enacted in February 2012 providing for the integration of unmanned aircraft into the national airspace over the next several years.[3]

UAS can be employed in an endless variety of civilian applications, the overwhelming majority of them beneficial. They can be used, for example, to help rescuers identify people in need of assistance following a natural disaster, or to provide vital overhead imagery to police officers attempting to defuse a hostage standoff. In the commercial world, UAS will be increasingly employed for tasks as diverse as surveying, crop spraying, and traffic congestion monitoring. Scientific applications include air quality assessment, wildlife tracking, and measuring the internal dynamics of violent storms. UAS will also generate a number of economic benefits, both by creating jobs that involve the design and production of UAS and by spurring advances in robotics that will apply well beyond aviation, in fields ranging from manufacturing to surgery.

However, like any technology, UAS can be misused. The most common concern regarding domestic UAS relates to their potential impact on privacy. This is a legitimate concern. Existing laws and jurisprudence provide an important foundation, but they also leave many questions unanswered. And although in some respects UAS simply represent one more manifestation of the always complex intersection between technology and privacy, they are also unique in making it possible, for the first time ever, to easily and inexpensively obtain observations from above.

As Justice Samuel Alito wrote in a concurrence in *United States v. Jones*, the January 2012 Supreme Court ruling that addressed the constitutionality of affixing a GPS tracking device

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term unmanned aircraft system (UAS) refers to an unmanned aircraft as well as the associated communication and control components used in its operation. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012). "UAS" is also sometimes expanded as "unmanned aerial system." The term unmanned aerial vehicle (UAV) refers to the aircraft itself. *See, e.g.*, Bart Elias, Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System 1 n. 1 (2012), *available at* http://www.fas.org/sgp/crs/natsec/R42718.pdf.

2. Elisabeth Bumiller, *A Day Job Waiting for a Kill Shot a World Away*, N.Y. TIMES, July 29, 2012, http://www.nytimes.com/2012/07/30/us/drone-pilots-waiting-for-a-kill-shot-7000-miles-away.html.

3. *See* FMRA §§ 331–336, 126 Stat. at 72–78.

to a vehicle without a valid warrant, "[i]n the pre-computer age, the greatest protections of privacy were neither constitutional nor statutory, but practical."[4] Although Justice Alito's statement was directed toward GPS tracking, it has direct relevance to UAS. In comparison with manned aircraft, UAS can be very inexpensive to procure and operate. As the practical barriers to obtaining aerial imagery fall away, the resulting privacy issues take on heightened importance.

This Article considers the constitutional, statutory, and common law frameworks that will inform privacy rights with respect to observations from unmanned aircraft.[5] The potential privacy challenges raised by unmanned aircraft are direct consequences of their capabilities and of the rules governing the manner in which they can be flown. Accordingly, Part I provides the historical context for UAS technology and describes the range of platforms available today. Part II addresses the current regulatory environment in the United States, with particular attention to those provisions of the FAA Modernization and Reform Act of 2012 (FMRA) that relate to UAS.

Part III discusses government operation of unmanned aircraft in light of the Supreme Court's Fourth Amendment jurisprudence. Although the Supreme Court has never specifically ruled on the question of UAS privacy, it has examined the Fourth Amendment implications of aerial surveillance on several occasions. Part III examines those cases in some detail, as well as *Jones*[6] and *Kyllo v. United States*,[7] and the interpretations they suggest with respect to the constitutionality of UAS observations.

Part IV addresses UAS operated by private entities, who are unconstrained by the Fourth Amendment restrictions that apply to the government. Private UAS users will enjoy strong First Amendment protections for gathering information in public spaces. But the rights conferred by the First Amendment are not unbounded, and it does not take much imagination to conclude

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4. United States v. Jones, 132 S. Ct. 945, 963 (2012) (Alito, J., concurring in the judgment).

5. For another treatment of some of the issues discussed here, see generally ALISSA M. DOLAN & RICHARD M. THOMPSON, II, INTEGRATION OF DRONES INTO DOMESTIC AIRSPACE: SELECTED LEGAL ISSUES (2013), *available at* http://www.fas.org/sgp/crs/natsec/R42940.pdf. Dolan and Thompson's report was released while this Article was in the process of revision for publication.

6. *Id.* at 945.

7. 533 U.S. 27 (2001).

that paparazzi, stalkers, and others could employ UAS in manners that pose clear violations of privacy. Part IV then explores some of the laws that can be used to address such behavior. Part V considers potential new voluntary and statutory privacy solutions and discusses some of the preemption issues that may arise when non-federal entities attempt to regulate UAS use.

Several overarching conclusions result from the analysis presented in this Article. First, a careful examination of Supreme Court privacy jurisprudence suggests that the Constitution will provide a much stronger measure of protection against government UAS privacy abuses than is widely appreciated. The Fourth Amendment has served us well since its ratification in 1791, and there is no reason to suspect it will be unable to do so in a world where unmanned aircraft are widely used. In addition, there are substantial statutory and common law protections that will limit the ability of non-government entities to violate privacy using unmanned aircraft.

This does not mean that there is no need for additional statutory UAS privacy protections. However, when drafting new laws it is critical to adopt a balanced approach that recognizes the inherent difficulty of predicting the future of any rapidly changing technology. In the early days of the Internet and mobile phones, it would have been nearly impossible to accurately foresee all of the uses—both positive and otherwise—to which these technologies have been applied. It is similarly difficult today to predict exactly how UAS will be used—or even what they will look like—in the coming decades. Although unmanned aircraft pose real and increasingly well recognized privacy concerns, they also offer real and much less widely appreciated benefits. A dialogue conducted with full awareness of this balance will be much more likely to lead to positive policy outcomes.

I. UNMANNED AIRCRAFT SYSTEMS TECHNOLOGY

In addressing UAS privacy, it is important to start with an understanding of the technology, including both the historical context and the range of platforms that exist today. Privacy approaches designed to address only the concerns raised by the larger unmanned aircraft that have dominated much of the current press coverage may be inadequate or inappropriate for unmanned aircraft weighing only a few pounds. And, as is clear from the history of unmanned aircraft, although near-

term predictions regarding emerging aviation technology are feasible, it can be exceedingly difficult to look more than a few years into the future.

A. Historical Context: The Nineteenth and Twentieth Centuries

Unmanned flight has a long history. In fact, early research in unmanned aviation laid some of the critical groundwork that was later used by pioneers in manned aviation,[8] including the Wright Brothers, who achieved sustained manned airplane flight in 1903.[9] As early as the 1830s, William Samuel Henson was exploring the fundamentals of airframe design,[10] and in 1848 John Stringfellow successfully carried out an indoor flight of a steam-powered unmanned airplane with a wingspan of ten feet.[11] In the 1870s Alphonse Penaud demonstrated the use of twisted rubber strands as an energy source for "model"-sized airplanes and helicopters.[12] In 1896, Samuel Pierpont Langley, then Secretary of the Smithsonian Institution, flew an unmanned twin-propeller, steam-engine-powered aircraft with a wingspan of slightly under fourteen feet.[13] The aircraft, called Aerodrome Number 5, was catapult launched from a houseboat on the Potomac River and made two test flights, in each case travelling several thousand feet before landing in the river.[14]

The Sperry Aerial Torpedo, developed during World War I and demonstrated in 1918, was a bomb-equipped biplane that used an on-board timer to shut off the engine and, in theory (it was never actually used in combat), send it diving onto a tar-

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8. Bill Hannan, *History in Models, Models in History*, MODEL AVIATION, Dec. 1986, at 78, 79–81.

9. *Milestones of Flight: 1903 Wright Flyer*, SMITHSONIAN NAT'L AIR AND SPACE MUSEUM, http://airandspace.si.edu/exhibitions/gal100/wright1903.html (last visited Jan. 28, 2013).

10. LOUIS H. HERTZ, THE COMPLETE BOOK OF MODEL AIRCRAFT SPACECRAFT AND ROCKETS 178 (1967).

11. *Id.* at 185. A two-pound steam-powered helicopter was flown even earlier, by W.D. Phillips in 1842. *Id.* at 178.

12. Hannan, *supra* note 8, at 79–81.

13. *Langley Aerodrome Number 5*, SMITHSONIAN NAT'L AIR AND SPACE MUSEUM, http://airandspace.si.edu/collections/artifact.cfm?id=A19050001000 (last visited Jan. 28, 2013).

14. *Id.*

get.[15] This was a very early example of "autonomous" flight, in which a UAS is controlled from within the aircraft, without intervention from a human on the ground.

The first unmanned airplane to be successfully flown by radio remote control was a modified N9 Navy seaplane that remained aloft for about twelve minutes during a September 1924 test, sometimes at a distance of several miles from the transmitter held by the pilot on the ground.[16] By the late 1930s, radio-controlled unmanned aircraft had started to gain significant attention in the hobbyist community[17] and in the military. During the ten-year period starting in 1934, the British military purchased hundreds of radio-controlled unmanned "Queen Bee" biplanes to use for target practice;[18] in fact, the term "drone" may have originally arisen to describe the unmanned aircraft used for this purpose.[19]

In the United States, the Radioplane Company was founded in the late 1930s[20] and during World War II built over 15,000 "drones" for the U.S. military to use in training antiaircraft gunners.[21] Radioplane was acquired by Northrop in 1952,[22] and continued to supply the U.S. military with unmanned aerial vehicles including, in the 1950s, models equipped with an on-board film-based camera.[23] Other countries with unmanned aircraft programs in the years during or shortly following World War II included Russia, France, Italy, Germany, and Japan.[24]

In the 1960s, military reconnaissance use of unmanned aircraft became increasingly common. Ryan Aeronautical Company,

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15. *Curtiss / Sperry Aerial Torpedo*, CRADLE OF AVIATION MUSEUM, http://www.cradleofaviation.org/exhibits/ww1/sperry_torpedo/index.html (last visited Jan. 28, 2013).

16. Walt Good, *History of RC Flying*, MODEL AVIATION, Mar. 1986, at 56, 126.

17. Walt Good, *History of RC Flying, Part 2*, MODEL AVIATION Apr. 1986, at 58, 148; Walt Good, *History of RC Flying, Part 3*, MODEL AVIATION, May 1986, at 76, 76–81.

18. STEVEN J. ZALOGAUNMANNED AERIAL VEHICLES: ROBOTIC AIR WARFARE 1917–2007, at 7 (2008).

19. LAURENCE R. "NOISE" NEWCOME, UNMANNED AVIATION: A BRIEF HISTORY OF UNMANNED AERIAL VEHICLES 4 (2004).

20. *Id.* at 57.

21. ZALOGA, *supra* note 18, at 7.

22. *Id.*

23. *Id.* at 10.

24. NEWCOME, *supra* note 19, at 49–56.

which won a contract with the U.S. Air Force in 1948,[25] was a major provider of U.S. military UAS for much of the 1950s and 1960s. Versions of the Ryan Firebee flew thousands of reconnaissance and electronic warfare missions over Vietnam.[26]

The 1970s and 1980s saw continued development of military UAS technology, with the United States, Russia, Canada, Israel, and Europe all possessing active programs.[27] In the conflict with Lebanon in 1982, Israel used a relatively small UAS called the Mastiff to provide reconnaissance imagery,[28] and during the 1991 Gulf War, the U.S. military flew over 500 missions using the Pioneer UAS.[29] The Gnat-750, a precursor to the Predator, was first flown in 1989 and was employed in the mid-1990s to acquire imagery during the conflict in the former Yugoslavia.[30]

B. Unmanned Aircraft Systems Today

Since 2000, worldwide UAS use for both military and civilian applications has increased dramatically. One key factor contributing to this growth is the continuing advance of computing, imaging, and communications technologies. Computational power and storage that would have filled multiple rooms in the 1960s can now easily fit within a single chip. In the context of UAS, this has made it possible to equip even very small platforms with sophisticated on-board computational systems for tasks such as navigation and image processing. The advent of high-resolution, low-cost digital imaging systems, when combined with high-bandwidth communications links, enables high-resolution images and video acquired by an unmanned aircraft to be transmitted in real time to an observer fifty feet—or 5000 miles—away. Thanks to continuing innovations in airframe design and flight control algorithms, the cameras that can be mounted on UAS are becoming smaller and more agile.

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25. ANTHONY FINN & STEVE SCHEDING, DEVELOPMENTS AND CHALLENGES FOR AUTONOMOUS UNMANNED VEHICLES: A COMPENDIUM 15 (2010).

26. JASJIT SINGH, AIR POWER IN MODERN WARFARE 198 (1988).

27. ZALOGA, *supra* note 18, at 16–24.

28. BENJAMIN S. LAMBETH, MOSCOW'S LESSONS FROM THE 1982 LEBANON AIR WAR 7 (1982), *available at* http://www.rand.org/pubs/reports/2007/R3000.pdf.

29. ZALOGA, *supra* note 18, at 26–28.

30. *Id.* at 29–33.

The American global positioning system (GPS),[31] which began development in 1973 and was completed in 1995,[32] has also helped to spur UAS growth. GPS makes it possible for UAS to determine their precise location using on-board systems, and therefore to perform missions involving much more complex navigational tasks than could be attempted in the pre-GPS era.[33]

Today, unmanned aircraft come in an incredible variety of shapes and sizes. Some, such as the Global Hawk used by the U.S. military, are as large and nearly as fast as business jets.[34] Others are small enough to fit in a backpack or even the palm of a hand. The video-capable Nano Hummingbird, developed by California-based AeroVironment, weighs only two-thirds of an ounce.[35] The solar-powered QinetiQ Zephyr, which weighs only slightly over 110 pounds despite having a wingspan of about 74 feet, stayed aloft for over two continuous weeks in Arizona during the summer of 2010.[36]

UAS can be controlled during flight in a variety of ways. A pilot on the ground who maintains visual contact with a UAS can fly it using a handheld or computer-based radio remote control interface. Alternatively, or in addition, in a "first-person-view" (FPV) system, a UAS-mounted camera transmits a real-time "cockpit" view to a pilot on the ground who flies

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31. The United States developed the GPS system and, in 1983, made it available for civilian applications. MICHAEL RUSSELL RIP & JAMES M. HASIK, THE PRECISE REVOLUTION: GPS AND THE FUTURE OF AERIAL WARFARE 9–10 (2002). Russia, the European Union, China, and India have also developed or are developing comparable satellite-based positioning systems. *See* UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, CURRENT AND PLANNED GLOBAL AND REGIONAL NAVIGATION SATELLITE SYSTEMS AND SATELLITE-BASED AUGMENTATIONS SYSTEMS, at v (2010), *available at* http://www.oosa.unvienna.org/pdf/publications/icg_ebook.pdf.

32. Randy James, *GPS*, TIME, May 26, 2009, http://www.time.com/time/magazine/article/0,9171,1901500,00.html.

33. *See, e.g.*, Rip & Hasik, *supra* note 31, at 191–275 (discussing the role of GPS in modern warfare).

34. *RQ-4 Global Hawk Factsheet*, THE OFFICIAL WEB SITE OF THE U.S. AIR FORCE, http://www.af.mil/information/factsheets/factsheet.asp?id=13225 (last visited Jan. 28, 2013).

35. Press Release, AeroVironment Inc., AeroVironment Develops World's First Fully Operational Life-Size Hummingbird-Like Unmanned Aircraft for DARPA, Feb. 17, 2011, *available at* http://www.avinc.com/resources/press_release/aerovironment_develops_worlds_first_fully_operational_life-size_hummingbird.

36. Andrew Chuter, *Solar UAV Lands After Record 2 Weeks Aloft*, DEFENSENEWS, July 23, 2010, http://www.defensenews.com/article/20100723/DEFSECT01/7230304/Solar-UAV-Lands-After-Record-2-Weeks-Aloft. The weight and length are reported in this article at 50 kilograms and 22.5 meters, respectively. *Id.*

the aircraft as if he or she were physically on-board. If the radio link between the UAS and the pilot is sufficiently strong, the UAS can be flown beyond the visual line of sight.

Autonomous flight using information from an on-board GPS receiver to perform navigation without any human intervention can also be used. Many UAS have the capability to operate in multiple modes—for example, navigating semi-autonomously to a destination based on a set of GPS waypoints input by a pilot, who then takes over active control using an FPV system. Of course, what is possible technologically and what is permitted by regulations are two very different things. At present, with very limited exceptions,[37] the Federal Aviation Administration (FAA) does not permit UAS flights in which the operator on the ground is unable to maintain continuous visual contact with the aircraft.

The UAS industry today is large, global, and rapidly growing. According to the Association for Unmanned Vehicle Systems International (AUVSI), the largest international association for unmanned systems, there are now over 400 active manufacturers of UAS globally, including 150 in the United States.[38] Other countries with significant UAS development include Australia, Brazil, Canada, China, France, Germany, India, Iran, Israel, Japan, Pakistan, Turkey, Russia, and the United Kingdom.[39] The Teal Group, an aerospace and defense consultancy based in Virginia, predicts that global annual UAS spending will rise from an estimated $6.6 billion in 2012 to over $11 billion over the next decade, corresponding to a total ten-year expenditure of nearly $90 billion.[40]

Even as overall spending is increasing, per-unit costs for the smaller platforms are dropping. Large military surveillance

37. The FAA Modernization and Reform Act of 2012, discussed later in this Article, includes a provision (Section 332(d)) that will allow beyond-line-of-sight operation in the Arctic (northern Alaska). *See id.* at 11–15.

38. E-Mail from Melanie Hinton, Senior Commc'ns Manager, AUVSI, to author (Aug. 15, 2012, 12:44 PDT) (on file with author).

39. U.S. Gov't Accountability Office, GAO-12-536, Nonproliferation: Agencies Could Improve Information Sharing and End-Use Monitoring on Unmanned Aerial Vehicle Exports 10–16 (2012).

40. Press Release, Teal Group Corp., Teal Group Predicts Worldwide UAV Market Will Total $89 Billion in Its 2012 UAV Market Profile and Forecast (Apr. 11, 2012), *available at* http://www.prnewswire.com/news-releases/teal-group-predicts-worldwide-uav-market-will-total-89-billion-in-its-2012-uav-market-profile-and-forecast-147008115.html.

platforms such as the Global Hawk can cost many tens of millions of dollars or more to purchase[41] and require large teams of highly trained people using specialized equipment to fly.[42] However, there are increasing numbers of highly capable commercially available small UAS that can be purchased for under $1000. It is only a matter of time—and probably not much time—before GPS and video-equipped UAS drop below $100, and then below $10.

UAS can be used in law enforcement, search and rescue, surveying, scientific research, and many other civilian applications. Although many people equate the prospect of law enforcement use of UAS with surveillance, in practice this may be the exception rather than the rule. In this respect, the experience of the Mesa County, Colorado, Sheriff's Office is instructive. Mesa County has one of the only current FAA Certificates of Authorization for operational (as opposed to training) use of UAS.[43] The Mesa County Sheriff's Office has (as of February 2013) flown approximately 40 missions since 2011, and has never used them to perform surveillance.[44] Instead, typical operations have been for obtaining after-the-fact crime scene images, search and rescue, and providing imagery for structure fire suppression and arson investigations. Ben Miller, the Unmanned Aircraft Program Manager in Mesa County, puts the per-hour operating cost of Mesa County's UAS at $25;[45] a manned helicopter, by contrast, costs hundreds of dollars per hour to operate. The dramatically lower operating cost for unmanned aircraft provides a powerful economic incentive for their adoption. In addition, they can be used in circumstances where a manned helicopter would have been too dangerous or disruptive.

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41. A U.S Government Accountability Office report put the "unit cost" of a Global Hawk at $176 million as of July 2010. MICHAEL J. SULLIVAN, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-233SP, DEFENSE ACQUISITIONS: ASSESSMENTS OF SELECTED WEAPON PROGRAMS 69 (2011), *available at* http://www.gao.gov/assets/320/317081.pdf.

42. *See, e.g.*, *RQ-4 Global Hawk*, U.S. AIR FORCE, http://www.af.mil/information/factsheets/factsheet.asp?id=13225 (last visited Jan. 28, 2013).

43. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Aug. 13, 2012, 10:45 PDT) (on file with author).

44. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Feb. 7, 2013, 7:02 PST) (on file with author).

45. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Aug 15, 2012, 13:19 PDT) (on file with author).

In Australia, where certain commercial operations using small unmanned aircraft have been permitted for over ten years,[46] applications have included mining surveys and transportation of equipment to drilling rigs.[47] In Japan, agricultural spraying is often performed using small unmanned helicopters.[48] In the United States, NASA researchers have used UAS for studying Hawaiian volcanoes.[49] UAS are also ideal platforms for identifying wildfire hotspots without putting a human pilot at risk.[50]

II. REGULATORY FRAMEWORK

A. The Federal Aviation Administration

When considering the regulatory framework applicable to UAS in the United States, it is helpful to start by briefly addressing how aircraft operations in general are regulated. The FAA, which was established in 1958 and has been part of the

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46. *See* Duncan Jefferies, *Drone journalism set for takeoff – once they're permitted to use our airspace*, THE GUARDIAN MEDIA NETWORK BLOG (Oct. 29, 2012, 7:09 AM), http://www.guardian.co.uk/media-network/media-network-blog/2012/oct/29/drone-journalism-take-off (noting that commercial drones have been licensed in Australia since 2002); *see also* Australia Civil Aviation Safety Authority Advisory Circular 101-1(0), *Unmanned Aircraft and Rockets: Unmanned Aerial Vehicle (UAV) Operations, Design Specification, Maintenance and Training of Human Resources* (July 2002), *available at* http://www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/101/101c01.pdf. The Advisory Circular states "Provided that a small UAV is operated not above 400ft AGL [above ground level] and remains clear of designated airspace, aerodromes and populous areas, there are no restrictions imposed upon the operation of a small UAV." *Id.* § 7.1.1. The Australia Civil Aviation Safety Authority defines "small" UAS as those weighing under 150 kilograms. *See* Gary Carr, *Unmanned Aircraft CASA Regulations* 2, Australian Gov't Civil Aviation Safety Auth., *available at* http://www.uatar.com/CASA%20Presentation%20-%20Unmanned%20Aircraft%20CASA%20Regulations.pdf.

47. Ry Crozier, *Australian miners send drones to work*, ITNEWS, May 28, 2012, http://www.itnews.com.au/News/302240,australian-miners-send-drones-to-work.aspx.

48. REG AUSTIN, UNMANNED AIRCRAFT SYSTEMS: UAVS DESIGN, DEVELOPMENT AND DEPLOYMENT 273–74 (2010).

49. Mark Brown, *Nasa sends UAV back to explore explosive Hawaiian volcano*, WIRED.CO.UK, Apr. 5, 2011, http://www.wired.co.uk/news/archive/2011-04/5/nasa-sends-out-volcano-spying-drone.

50. Brian Bennett, *Drones tested as tools for police and firefighters*, L.A. TIMES, Aug. 5, 2012, http://articles.latimes.com/2012/aug/05/nation/la-na-drones-testing-20120805.

Department of Transportation since the 1960s,[51] oversees nearly all[52] aircraft operations in the United States.[53] This is a complex task in a national airspace that has an "average of more than 100,000 aviation operations per day, including air carrier, air taxi, general aviation, and military aircraft."[54]

Like other administrative agencies of the United States government, the FAA makes and enforces rules to implement and interpret laws passed by Congress.[55] New rules,[56] such as those to be developed by the FAA to enable the integration of UAS into the airspace, are formulated through a rulemaking process that includes an internal drafting and review stage, publication of a draft rule in the Federal Register, a period of public comment, revisions based on the comments, and publication of a final rule.[57]

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51. *A Brief History of the FAA*, FED. AVIATION ADMIN., http://www.faa.gov/about/history/brief%5Fhistory/http://www.faa.gov/about/history/brief_history/ (last visited Nov. 10, 2012) [hereinafter *Brief History*].

52. There are a few exceptions. For example, the FAA does not have any responsibility to ensure the separation of military aircraft operating within "MARSA" airspace. MARSA is an acronym for "Military Assumes Responsibility for Separation of Aircraft." FED. AVIATION ADMIN., AIR TRAFFIC ORG. POLICY ¶ 2-1-11 (2012), *available at* http://www.faa.gov/air_traffic/publications/atpubs/atc/atc0201.html. In addition, the FAA does not oversee model aircraft operated in accordance with FAA Advisory Circular 91-57 or with Section 336 of the FAA Modernization and Reform Act of 2012, which creates a special rule for model aircraft. *See* FED. AVIATION ADMIN., ADVISORY CIRCULAR 91-57, MODEL AIRCRAFT OPERATING STANDARDS (1981) [hereinafter ADVISORY CIRCULAR 91-57], *available at* http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf; FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 336, 126 Stat. 11, 77 (2012).

53. Brief History, supra note 51.

54. *Fact Sheet: Unmanned Aircraft Systems (UAS)*, FED. AVIATION ADMIN., http://www.faa.gov/about/initiatives/uas/media/uas_fact_sheet.pdf (last visited Jan. 28, 2013) [hereinafter *Fact Sheet*].

55. Formally, a "rule" is "the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy. . . ." Administrative Procedure Act § 1, 5 U.S.C. § 551(4) (2012).

56. FAA "rules" are also called "regulations." *See, e.g.*, 49 U.S.C. § 40103 (directing that the Administrator of the FAA promulgate "regulations" governing the flight of aircraft).

57. There are actually various forms of rulemaking in accordance with the Administrative Procedure Act, which was enacted in 1946. The steps described in the text (and provided in 5 U.S.C. § 553) occur in association with what is referred to as informal rulemaking, which is by far the most common form. There is also a formal rulemaking process under 5 U.S.C. §§ 556–557 that includes a hearing and

FAA regulations[58] classify aircraft, without regard to whether they are manned, as either "public"[59] or "civil."[60] Public aircraft are those operated by local, state, and federal public entities, including law enforcement agencies.[61] Civil aircraft, typically, are operated by private companies, individuals, and other non-government entities. The public-civil distinction is extremely important both generally and with respect to UAS.

B. The FAA and Unmanned Aircraft Systems

On February 14, 2012, President Obama signed the FAA Modernization and Reform Act of 2012 (FMRA)[62] into law. FMRA provides, among other things, a set of overlapping deadlines for the integration of UAS into the national airspace over the next three years.[63] Although UAS integration has been on the proverbial radar screen of the FAA for a number of years, FMRA represents the first significant congressional legislation addressing the domestic use of UAS.

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a number of other steps. RAYMOND C. SPECIALE, FUNDAMENTALS OF AVIATION LAW 124–25 (2006).

58. FAA regulations are provided in the Code of Federal Regulations (CFR), Title 14 ("Aeronautics and Space"), Volumes 1–3, which comprise parts 1–199 (not all of the numbers in this range are currently used). "General Operating and Flight Rules" for aircraft are found in Volume 2, Subchapter F ("Air Traffic and General Operating Rules"), Part 91, denoted 14 C.F.R. § 91 and sometimes referred to as FAR Part 91. FAR is an acronym for "Federal Aviation Regulations." "General Definitions" are in 14 C.F.R. § 1.1. An unofficial version of the CFR is provided through the Electronic Code of Federal Regulations (e-CFR) by the government at http://ecfr.gov.

59. Section 331(4) of the FAA Modernization and Reform Act provides that "[t]he term 'public unmanned aircraft system' means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft . . . ." FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012). The term "public aircraft" is defined in 49 U.S.C.A. § 40102(a)(41) (2012), as well as in 14 C.F.R. § 1.1 (2012).

60. *See* 49 U.S.C. § 40102(a)(16).

61. *See* § 40102(a)(41). Whether an aircraft has "public aircraft status" depends, in part, on how it is being used. An aircraft that is owned by a government entity but engaged in an operation that replicates a service that could be obtained from a commercial air carrier does not have public aircraft status during that operation. As used in this Article, "public aircraft" and "government aircraft" refer to aircraft that satisfy the statutory qualifications for public aircraft status under § 40125.

62. Pub. L. No. 112-95, 126 Stat. 11 (2012).

63. *Id.* §§ 331–336, 126 Stat. at 72–78.

Recognizing that UAS raise unique issues that "may differ substantially from manned aircraft operations and systems,"[64] the FAA created a new Unmanned Aircraft Program Office in early 2006.[65] In accordance with policies established well before the enactment of FMRA, operators of UAS engaged in public aircraft operations are required to obtain a Certificate of Authorization (COA).[66] Civil (i.e. private) UAS operators need a "special airworthiness certificate."[67] Use of UAS for commercial purposes is currently prohibited,[68] though that is expected to change by 2014.

According to data released in early 2012 in response to a Freedom of Information Act lawsuit filed by the Electronic Frontier Foundation, the FAA had issued "about 700–750 authorizations since the program began in 2006," of which approximately 300 remained active as of April 2012.[69] Public entities that have been issued COAs include the U.S. Air Force,

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64. James Sizemore & Richard Posey, Fed. Aviation Admin., Unmanned Aircraft Systems (UAS) Certification Status 2 (2006), *available at* http://www.faa.gov/about/initiatives/uas/reg/media/uas_policyupdate.pdf.

65. *Id.* at 1.

66. *See* DEP'T. OF TRANSP., UNMANNED AIRCRAFT OPERATIONS IN THE NATIONAL AIRSPACE SYSTEM, DOCKET NO. FAA-2006-25714 (2007), *available at* http://www.faa.gov/about/initiatives/uas/reg/media/frnotice_uas.pdf. In addition to "Certificate of Authorization," COA is sometimes written in expanded form as "Certificate of Waiver or Authorization" or "Certificate of Authorization or Waiver." *See id.* An exception to the COA requirement is MARSA airspace. *See supra* note 52.

67. *See* 14 C.F.R. § 21.175 (2012). Although model aircraft are obviously unmanned, provided that they are flown for hobby or recreational use, they are not treated as "civil UAS" by the FAA. *See* ADVISORY CIRCULAR 91-57, *supra* note 52; FMRA § 336, 126 Stat. at 77.

68. Even though this prohibition is not explicit with respect to UAS, it is implicit in the list, provided in 14 C.F.R. § 21.191, of purposes for which experimental certificates can be issued. To date, special airworthiness certificates have been issued only in the experimental category. *Fact Sheet*, *supra* note 54, at 146 ("An SAC-EC is the only certification means available to civil operators for UAS and optionally-piloted aircraft (OPA)."). "SAC" is an acronym for special airworthiness certificate. The list in § 21.191 includes purposes such as "[r]esearch and development," "[a]ir racing," and "[c]rew training," but not commercial use. In addition, 14 C.F.R. § 91.319, which describes operating limitations for aircraft having experimental certificates, provides, among other things, that "[n]o person may operate an aircraft that has an experimental certificate—(1) For other than the purpose for which the certificate was issued; or (2) Carrying persons or property for compensation or hire."

69. Jennifer Lynch, *FAA Releases Lists of Drone Certificates—Many Questions Left Unanswered*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/deeplinks/2012/04/faa-releases-its-list-drone-certificates-leaves-many-questions-unanswered.

U.S. Army, the Defense Advanced Research Projects Agency (DARPA), FBI, NASA, some county and municipal law enforcement agencies, and various public universities.[70] The list of companies that have been issued special airworthiness certificates includes Raytheon, Honeywell, General Atomics, and other defense companies.[71]

COAs specify where and under what circumstances a UAS can be used. For example, a COA might require that the UAS only be flown during daylight hours, and only within the visual line of sight of the operator.[72] In the case of a UAS operated by a law enforcement agency, the COA might specify that flights must be performed only for training, as opposed to operational, purposes. In early 2008, the FAA began the process of developing recommendations for regulating "small" UAS (those weighing under fifty-five pounds).[73] Thus, by the time FMRA was signed into law in February 2012, the FAA had already been actively planning for UAS integration for several years.

FMRA sets a goal of integrating UAS into the national airspace system by late 2015.[74] Under the new law, public UAS operators have had access to expedited COAs since May 14, 2012.[75] UAS under these authorizations must weigh no more than twenty-five pounds[76] and be operated within the line of sight of the op-

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70. *FAA List of Certificates of Authorizations (COAs)*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/document/faa-list-certificates-authorizations-coas (last visited Jan. 28, 2013).

71. *FAA List of Special Airworthiness Certificates – Experimental Category (SACs)*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/document/faa-list-special-airworthiness-certificates-experimental-categorysacs (last visited Jan. 28, 2013).

72. *Fact Sheet*, *supra* note 54, at 2.

73. In April 2008, the FAA created the Small Unmanned Aircraft System Aviation Rulemaking Committee. *See* FED. AVIATION ADMIN., ORDER 1110.150, SMALL UNMANNED AIRCRAFT SYSTEM AVIATION RULEMAKING COMMITTEE (2008), http://www.faa.gov/documentLibrary/media/Order/1110.150.pdf. This committee is often referred to using the acronym sUAS ARC, and has members from both government and industry. The sUAS ARC issued a set of recommendations for sUAS regulatory development in April 2009. *See* FED. AVIATION ADMIN., SMALL UNMANNED AIRCRAFT SYST. AVIATION RULEMAKING COMM., COMPREHENSIVE SET OF RECOMMENDATIONS FOR SUAS REGULATORY DEVELOPMENT (2009), *available* at http://www.modelaircraft.org/faa/recommendations.pdf.

74. FMRA, Pub. L. No. 112–95, § 332(a)(3), 126 Stat. 11, 73 (2012).

75. *See id.* § 334(c), 126 Stat. at 76.

76. *FAA Makes Progress with UAS Integration*, FED. AVIATION ADMIN., http://www.faa.gov/news/updates/?newsId=68004 (last visited Jan. 28, 2012). Interestingly, with respect to weight, the FAA went further than was required by

erator, less than 400 feet above the ground, and during daylight conditions.[77] By December 31, 2015, the FAA is required to "develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system by September 30, 2015."[78]

For civil UAS, FMRA mandates the development of a "comprehensive plan" that will "provide for the safe integration of civil unmanned aircraft systems into the national airspace."[79] Additionally, regulations for the operation of small civil UAS (including allowing their use for commercial purposes) are due by August 2014.[80]

The FAA is in somewhat of a unique position with respect to deadlines laid out in legislation such as FMRA. FMRA requires that the FAA "provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015."[81] This language contains no explicit provision for what happens if, in the FAA's view, "as soon as practicable" is later than that date. However, Congress is unlikely to hold the FAA to a deadline that might risk jeopardizing airspace safety.

C. *The Impact of Safety Regulations on Privacy*

Though privacy and airspace safety are distinct UAS issues, they are in some respects closely intertwined. By placing limitations on where and how unmanned aircraft can be operated, airspace safety regulations can impact privacy.

For example, under the FAA regulations that prescribe "flight rules governing the operation of [both manned and un-

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FMRA, which provided that the authorizations must "allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less." FMRA § 334(c)(2)(C), 126 Stat. at 77.

77. These requirements are among those provided in FMRA § 334(c)(2)(C). Additional requirements in this Section restrict operation to Class G (uncontrolled) airspace more than five miles from airports and other locations with aviation activities. *See id.*

78. *Id.* § 334(b), 126 Stat. at 76.

79. *Id.* § 332(a)(1).

80. *Id.* § 332(b)(1).

81. *Id.* § 332(a)(3).

manned] aircraft within the United States,"[82] it is illegal to operate an aircraft "in a careless or reckless manner so as to endanger the life or property of another."[83] Aircraft must also be operated at a sufficiently high altitude to allow "an emergency landing without undue hazard to persons or property on the surface" in the event of an engine failure.[84] Compliance with these rules, which apply to both manned and unmanned aircraft,[85] could be called into question, for example, in the monitoring of a peaceful protest if a UAS is flown (either by law enforcement or by a protester) at very low altitudes directly above a crowd of people.[86]

The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of FMRA have a "line of sight" requirement.[87] The rules for civil small UAS due for implementation in August 2014 likely will also have this constraint. From the FAA's standpoint, any such requirement would be solely motivated by safety concerns related to the need to "sense and avoid" other aircraft and to problems that might arise if a UAS beyond the line of sight loses communication with its operator.[88] But there are privacy consequences as well.

It is easy for an operator standing on the street in front of a house to fly a UAS high enough to obtain overhead images of a fenced-in backyard while maintaining visual contact with the

82. Subpart B of part 91 applies to "the operation of aircraft within the United States and within 12 nautical miles from the coast of the United States." 14 C.F.R. § 91.101 (2012).

83. 14 C.F.R. § 91.13(a).

84. 14 C.F.R. § 91.119(a).

85. *See* 14 C.F.R. § 91.1(a) (stating that part 91 "govern[s] the operation of aircraft . . . within the United States.").

86. *See* 14 C.F.R. § 91.13(a).

87. FMRA § 334(c)(2)(c).

88. *See Fact Sheet*, *supra* note 54, at 2. Not everyone in the unmanned aviation community is in agreement regarding the safety value of a line of sight requirement. Opponents of such a requirement could argue, among other things, that a UAS beyond the visual line of sight that loses communication with an operator can be programmed to land itself safely. Opponents could also argue that even if a UAS is within visual line of sight, if the ability of the operator to communicate with it is lost, being able to see it does little to mitigate any resulting risks. Nonetheless, this is an area in which regulators are likely to act very conservatively.

aircraft. It is far harder, by contrast, to maintain visual line of sight while lowering the UAS into the yard to obtain eye-level images through the back windows of the house. Thus, the questions of if, when, and under what circumstances non-visual line of sight operation will be permitted will have an impact on privacy.[89]

Even assuming that FAA regulations adopted in the next several years continue to require visual line of sight operation, in the longer term this requirement is likely to be relaxed for some specific classes of UAS operations. Some of the most promising applications of UAS, by their very nature, require non-visual line of sight operation. For example, UAS have enormous potential for search and rescue in large part because they can enable an operator to quickly and safely examine many square miles of potentially inhospitable terrain. Surveying of pipelines, long-distance electric transmission lines, and other extended structures can also entail large separations between an operator and a UAS. As "sense and avoid" technologies become more mature, these sorts of non-line of sight operations may eventually be permitted. This will expand ways in which a UAS flown in compliance with FAA regulations might be used to violate privacy.

III. GOVERNMENT UNMANNED AIRCRAFT AND THE FOURTH AMENDMENT

The Fourth Amendment is central to the privacy issues with respect to government UAS operation. Although the Supreme Court has never explicitly considered the question of UAS privacy, there is a long list of relevant precedents.[90] Among them

89. The term "line of sight" is more complex than it first appears. Some people in the UAS community use "line of sight" to refer to operation in which a radio signal can be transmitted directly from an operator to a UAS, without being relayed through a satellite, other aircraft, or ground-based communications network (sometimes also called "electronic line of sight"). This does not ensure that the operator can necessarily see the UAS, as radio signals can easily pass through trees and other objects, sometimes traveling for miles. The term "*visual* line of sight," by contrast, is unambiguous: The operator must be able to see, with his or her eyes, the UAS.

90. In addition to the cases discussed at greater length in Part III of this Article, see, e.g., City of Indianapolis v. Edmond, 531 U.S. 32 (2000), Minnesota v. Carter, 525 U.S. 83 (1998), United States v Karo, 468 U.S. 705 (1984), Oliver v. United States, 466 U.S. 170 (1984), United States v. Knotts, 460 U.S. 276 (1983), Steagald v.

are several cases from the 1980s that specifically considered aerial observations and the Fourth Amendment. The 2001 *Kyllo v. United States*[91] and 2012 *United States v. Jones*[92] decisions are also pertinent.

A. Dow Chemical Co. v. United States

In 1978, the Environmental Protection Agency, without Dow Chemical's consent, contracted with a commercial aerial photographer to provide images of a 2000-acre Dow Chemical manufacturing facility from altitudes of 1200, 3000, and 12,000 feet.[93] When Dow Chemical became aware of this, it filed suit in Federal District Court, which granted summary judgment, finding the aerial photography to be a search in violation of the Fourth Amendment.[94] The Sixth Circuit reversed the decision, ruling that even though the company had taken precautions, including installing a perimeter fence and alarm system[95] that provided a subjective expectation of privacy from ground-level intrusions, it did not have such an expectation with respect to aerial surveillance.[96] Thus, the Sixth Circuit concluded, the acquisition of aerial images without a warrant was not a Fourth Amendment search.[97]

In reviewing this ruling on certiorari, the Supreme Court affirmed the Sixth Circuit's decision, concluding in a 1986 ruling that the open areas in the 2000-acre industrial facility were more akin to an "open field"[98] than to the curtilage of a home,

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United States, 451 U.S. 204 (1981), Smith v. Maryland, 442 U.S. 735 (1979), Rakas v. Illinois, 439 U.S. 128 (1978), City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973), Katz v. United States, 389 U.S. 347 (1967), Camara v. Mun. Court, 387 U.S. 523 (1967), Griggs v. Allegheny Cnty., 369 U.S. 84 (1962), Silverman et al. v. United States, 365 U.S. 505 (1961), Johnson v. United States, 333 U. S. 10 (1948), United States v. Causby, 328 U.S. 256 (1946), Hester v. United States, 265 U.S. 57 (1924), and Boyd v. United States, 116 U.S. 616 (1886).

91. 533 U.S. 27 (2001).

92. 132 S. Ct. 945 (2012).

93. Dow Chem. Co. v. United States, 476 U.S. 227, 229 (1986).

94. *Id.* at 230.

95. *Id.* at 240–41 (Powell, J., concurring in part and dissenting in part).

96. *Id.* at 230.

97. *Id.* at 229.

98. The Court wrote that "open fields do not provide the setting for those intimate activities that the [Fourth] Amendment is intended to shelter from governmental interference or surveillance" and that "an individual may not legitimately demand privacy for activities out of doors in fields, except in the area immedi-

and, as a result, were "open to the view and observation of persons in aircraft lawfully in the public airspace immediately above or sufficiently near the area for the reach of cameras."[99] The Court also noted the role of technology diffusion as a factor, writing that "surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant."[100] However, the Court observed, "[a]ny person with an airplane and an aerial camera could readily duplicate"[101] the photographs at issue. "[T]he taking of aerial photographs of an industrial plant complex from navigable airspace is not a search prohibited by the Fourth Amendment."[102]

B. California v. Ciraolo

Ciraolo[103] was decided in 1986, on the same day as *Dow Chemical*. On September 2, 1982, police in Santa Clara, California, received a tip regarding backyard marijuana cultivation.[104] After finding the yard surrounded by high fencing obscuring the view from the street, they obtained a small airplane and flew over the residence at 1000 feet.[105] The officers on the airplane observed and photographed what they concluded to be marijuana plants growing in the backyard.[106] This evidence was used to obtain a search warrant to seize the plants.[107]

The Supreme Court granted certiorari after the California Court of Appeal ruled that the warrantless aerial observations violated the Fourth Amendment.[108] In May 1986, the Supreme Court issued a five-to-four decision reversing the lower court.[109] Writing for the majority, Chief Justice Burger framed

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ately surrounding the home." *Id.* at 235–36 (alteration in original) (quoting Oliver v. United States, 466 U.S. 170, 178–79 (1984)) (internal quotation marks omitted).

99. *Id.* at 239.

100. *Id.* at 238.

101. *Id.* at 231.

102. *Id.* at 239.

103. California v. Ciraolo, 476 U.S. 207 (1986).

104. *Id.* at 209.

105. *Id.*

106. *Id.*

107. *Id.*

108. People v. Ciraolo, 161 Cal. App. 3d 1081, 1090 (Ct. App. 1984).

109. *Ciraolo*, 476 U.S. at 215.

the analysis in terms of the "reasonable expectation of privacy"[110] articulated in Justice Harlan's concurrence in *Katz*.[111] For an expectation of privacy to be "reasonable" under *Katz*, two separate criteria must be satisfied. First, the person must "have exhibited an actual (subjective) expectation of privacy."[112] Second, the expectation must "be one that society is prepared to recognize as 'reasonable.'"[113]

With respect to the first criterion, the *Ciraolo* Court wrote that although the presence of fences clearly conveyed a "desire to maintain privacy," and indeed successfully did so with respect to "normal sidewalk traffic," the marijuana plants might well have been visible from a truck or two-level bus.[114] Thus, it was unclear that the respondent had "a subjective expectation of privacy from all observations of his backyard."[115]

With respect to the second criterion, the Court did not dispute that the backyard was in the curtilage of the home,[116] but noted that police observations of curtilage are not necessarily unconstitutional. "The Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares."[117] Moreover, "the mere fact that an individual has taken measures to restrict some views of his activities [does not] preclude an officer's observations from a public vantage

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110. *Id.* at 211.

111. Katz v. United States, 389 U.S. 347, 360 (1967) (Harlan, J., concurring).

112. *Id.* at 361.

113. *Id.* Much turns on the interpretation of "reasonable." For example, in *Illinois v. Caballes*, the Supreme Court explained that "the expectation 'that certain facts will not come to the attention of the authorities' is not the same as an interest in 'privacy that society is prepared to consider reasonable.'" 543 U.S. 405, 408–09 (2005) (quoting United States v. Jacobsen, 466 U.S. 109, 122 (1984)). In *Caballes*, the Court also distinguished between legitimate privacy expectations with respect to lawful, as opposed to unlawful, activity: "The legitimate expectation that information about perfectly lawful activity will remain private is categorically distinguishable from respondent's hopes or expectations concerning the nondetection of contraband in the trunk of his car." *Id.* at 410.

114. *Ciraolo*, 476 U.S. at 211.

115. *Id.* at 211–12.

116. *See, e.g.*, Oliver v. United States, 466 U.S. 170, 180 (1984) ("Thus, courts have extended Fourth Amendment protection to the curtilage; and they have defined the curtilage, as did the common law, by reference to the factors that determine whether an individual reasonably may expect that an area immediately adjacent to the home will remain private.").

117. *Ciraolo*, 476 U.S. at 213.

point where he has a right to be and which renders the activities clearly visible."[118] Because the observations were made from "public navigable airspace . . . in a physically nonintrusive manner," the respondent's expectation of privacy from such aerial observations was not one "that society is prepared to honor."[119] The Court concluded that "[i]n an age where private and commercial flight in the public airways is routine, it is unreasonable for respondent to expect that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet."[120]

The dissent, delivered by Justice Powell, criticized the Court's reliance on the absence of a "physical invasion of the curtilage" in finding no constitutional violation: "Since *Katz*, we have consistently held that the presence or absence of physical trespass by police is constitutionally irrelevant to the question whether society is prepared to recognize an asserted privacy interest as reasonable."[121] The dissent also disagreed with the Court's view that conducting an overflight with the specific goal of enabling trained officers to observe a suspect's backyard raised no more constitutional questions than overflights by members of the flying public: "[T]he actual risk to privacy from commercial or pleasure aircraft is virtually nonexistent. Travelers on commercial flights, as well as private planes used for business or personal reasons, normally obtain at most a fleeting, anonymous, and nondiscriminating glimpse of the landscape and buildings over which they pass."[122] And, in an observation that would foreshadow the *Kyllo* decision fifteen years later, Justice Powell warned that "[r]apidly advancing technology now permits police to conduct surveillance in the home itself, an area where privacy interests are most cherished in our society, without any physical trespass."[123]

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118. *Id.*

119. *Id.* at 213–14.

120. *Id.* at 215.

121. *Id.* at 223 (Powell, J., dissenting).

122. *Id.* In a footnote to this text, Justice Powell called the Court's "analogy to commercial and private overflights" "wholly without merit." *Id.* at 223 n.8.

123. *Id.* at 226.

C. Florida v. Riley

Just under three years after *Ciraolo*, the Supreme Court once again ruled on the constitutionality of aerial observations of a home's curtilage by law enforcement. Like *Ciraolo*, *Florida v. Riley*[124] arose from a tip involving marijuana cultivation behind a house, where the plants could not be seen from the street. In *Riley*, the observations were made from a helicopter at 400 feet, enabling officers to see the plants through openings in the roof and sides of a greenhouse located behind a mobile home.[125] A majority of the justices in *Riley* found these observations constitutional.

Writing for the plurality,[126] Justice White wrote that "our decision in *California v. Ciraolo* controls this case."[127] While Riley took steps that "protected against ground-level observation," "the sides and roof of his greenhouse were left partially open" and "what was growing in the greenhouse was subject to viewing from the air."[128] "Any member of the public could legally have been flying over Riley's property in a helicopter at the altitude of 400 feet and could have observed Riley's greenhouse. The police officer did no more."[129]

Despite Justice White's statement that "[w]e would have a different case if flying at that altitude had been contrary to law or regulation,"[130] his opinion also provided an important qualifier: "This is not to say that an inspection of the curtilage of a house from an aircraft will always pass muster under the Fourth Amendment simply because the plane is within the navigable airspace specified by law."[131] Specifically, in ruling that there was no violation of the Fourth Amendment in the present case, Justice White found it of note that "no intimate

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124. 488 U.S. 445 (1989).

125. *Id.* at 448.

126. The *Riley* decision comprised an opinion delivered by Justice White and joined by Chief Justice Rehnquist and Justices Scalia and Kennedy; an opinion from Justice O'Connor concurring in the judgment; a dissent from Justice Brennan joined by Justices Marshall and Stevens; and a separate dissent filed by Justice Blackmun. Thus, even though there was no majority opinion, a majority of the Justices found the observations constitutional.

127. *Id.* at 449 (plurality opinion) (internal citation omitted).

128. *Id.* at 450.

129. *Id.* at 451.

130. *Id.*

131. *Id.*

details connected with the use of the home or curtilage were observed, and there was no undue noise, and no wind, dust, or threat of injury."[132]

In her opinion concurring in the judgment, Justice O'Connor raised concerns about relying on "compliance with FAA regulations alone" as a litmus test for privacy from overhead surveillance.[133] Rather, she wrote, "consistent with *Katz*, we must ask whether the helicopter was in the public airways at an altitude at which members of the public travel with sufficient regularity that Riley's expectation of privacy from aerial observation was not 'one that society is prepared to recognize as reasonable.'"[134] She then concluded that because there is "considerable public use of airspace at altitudes of 400 feet and above," Riley did not have a reasonable expectation of privacy from naked-eye observations from that altitude.[135] However, she wrote, "public use of altitudes lower than that—particularly public observations from helicopters circling over the curtilage of a home—may be sufficiently rare that police surveillance from such altitudes would violate reasonable expectations of privacy, despite compliance with FAA air safety regulations."[136]

Justice Brennan's dissent also took issue with the tie between FAA safety regulations and privacy: "It is a curious notion that the reach of the Fourth Amendment can be so largely defined by administrative regulations issued for purposes of flight safety."[137] He observed that the police officer's "ability to see over Riley's fence depended on his use of a very expensive and sophisticated piece of machinery to which few ordinary citizens have access."[138] The question, in Justice Brennan's view, was not whether the flights were in compliance with the FAA regulations, "but whether public observation of Riley's curtilage was so commonplace that Riley's expectation of privacy in his backyard could not be considered reasonable."[139] And while privately owned helicopters occasionally fly over populated areas

132. *Id.* at 452.
133. *Id.* at 453 (O'Connor, J., concurring in the judgment).
134. *Id.* at 454 (quoting Katz v. United States, 389 U.S. 347,361 (1967)).
135. *Id.* at 455.
136. *Id.*
137. *Id.* at 458 (Brennan, J., dissenting).
138. *Id.* at 460.
139. *Id.*

at 400 feet, "such flights are a rarity."[140] Justice Blackmun's dissent also cited the rarity of helicopter overflights at 400 feet and stated that for any observations below 1000 feet (the altitude of the fixed-wing aircraft in *Ciraolo*), the prosecution should have the burden of proving that a suspect whose curtilage was observed lacked a reasonable expectation of privacy.[141]

D. Kyllo v. United States

Although *Kyllo*[142] involved ground-based observations of a home, the case is nonetheless highly relevant to privacy from aerial observations; in fact, *Ciraolo* was invoked multiple times in the Court's 2001 *Kyllo* opinion. In January 1992, a government agent in a car used a thermal imaging device to measure the external temperature of the roof and outside wall of the home of Danny Lee Kyllo, who was suspected of growing marijuana.[143] The roof and wall were found to be abnormally warm, and a search warrant was issued based in part on this information.[144] Upon execution of the search warrant, marijuana plants were found and Kyllo was arrested.[145] A district court and the Ninth Circuit upheld the use of the thermal imager, in part on the grounds that it "merely indicated amorphous 'hot spots' on the roof and exterior wall and not the detailed images of private activity."[146]

The Supreme Court reversed the Ninth Circuit in a five-to-four opinion delivered by Justice Scalia.[147] The Court framed its analysis by noting that "well into the 20th century, our Fourth Amendment jurisprudence was tied to common-law trespass."[148] More recent rulings have "decoupled violation of a person's Fourth Amendment rights from trespassory violation of his property, but the lawfulness of warrantless visual surveillance of a home has still been preserved."[149] However, with

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140. *Id.* at 465.
141. *Id.* at 468 (Blackmun, J., dissenting).
142. Kyllo v. United States, 533 U.S. 27 (2001).
143. *Id.* at 29–30.
144. *Id.* at 30.
145. *See id.*
146. United States v. Kyllo, 190 F.3d 1041, 1047 (9th Cir. 1999).
147. *Id.* at 29.
148. *Id.* at 31.
149. *Id.* at 32 (citation omitted).

respect to searches of the interior of a home, "there is a ready criterion, with roots deep in the common law, of the minimal expectation of privacy that *exists*, and that is acknowledged to be *reasonable*."[150]

The Court expressed concern that allowing the government to freely collect any information "emanating from a house" would put people "at the mercy of advancing technology—including imaging technology that could discern all human activity in the home."[151] The Court also noted that "[w]hile the technology used in the present case was relatively crude, the rule we adopt must take account of more sophisticated systems that are already in use or in development."[152] The Court then concluded that when "the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a 'search' and is presumptively unreasonable without a warrant."[153]

In dissent, Justice Stevens criticized the Court for, in his view, failing to follow established principles providing that searches inside a home are presumptively unreasonable, while searches of property "in plain view" are not.[154] Justice Stevens also wrote that "any member of the public might notice that one part of a house is warmer than another part or a nearby building if, for example, rainwater evaporates or snow melts at different rates across its surfaces," and that "[h]eat waves, like aromas that are generated in a kitchen, or in a laboratory or opium den, enter the public domain if and when they leave a building."[155] Justice Stevens also criticized the Court's use of a standard that would diminish privacy protection as "intrusive equipment becomes more readily available."[156] Indeed, in the decade following *Kyllo*, thermal imagers have become less ex-

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150. *Id.* at 34.

151. *Id.* at 35–36.

152. *Id.* at 36.

153. *Id.* at 40.

154. *Id.* at 42 (Stevens, J., dissenting) (quoting Payton v. New York, 445 U.S. 573, 586–87 (1980)).

155. *Id.* at 43–44.

156. *Id.* at 47. Justice Stevens also disputed the Court's "assumption that the thermal imager used in this case" was not in general public use, and noted in a footnote that similar imagers were available for rental through a toll-free telephone number. *Id.* at 47 & n.5.

pensive and more widely available. Writing in 2010, Orin Kerr observed that "remote infrared temperature-sensing has become quite common in a wide range of applications" and "it seems to me that there's at least a plausible case that the police can now use thermal imaging devices—or at least the simple single-point infrared devices—without a warrant."[157]

E. United States v. Jones

The most recent major Supreme Court privacy ruling is *United States v. Jones*,[158] decided in January 2012. In September 2005, agents on a joint FBI and Metropolitan (Washington D.C.) Police Department task force installed, without a valid warrant,[159] a GPS tracking device on a vehicle used by a suspect in a narcotics investigation.[160] The GPS tracker collected location data for approximately one month, and was used to place the suspect, Antoine Jones, at a house at a date and time where drug sales allegedly occurred.[161] After two trials in the United States District Court for the District of Columbia (the first ended in a mistrial), Jones and another defendant were convicted on a drug conspiracy charge.[162]

On appeal, Jones' conviction was overturned.[163] While noting that a person's reasonable expectation of privacy is highest in his or her home, the District of Columbia Circuit Court of Appeal recognized that "[a] person does not leave his privacy behind when he walks out his front door . . . . On the contrary, in *Katz* the Court clearly stated 'what [one] seeks to preserve as private, even in an area accessible to the public, may be constitutionally

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157. Orin Kerr, Can the Police Now Use Thermal Imaging Devices Without a Warrant? A Reexamination of Kyllo in Light of the Widespread Use of Infrared Temperature Sensors, THE VOLOKH CONSPIRACY, (Jan. 4, 2010, 12:33 PM), http://www.volokh.com/2010/01/04/can-the-police-now-use-thermal-imaging-devices-without-a-warrant-a-reexamination-of-kyllo-in-light-of-the-widespread-use-of-infrared-temperature-sensors/.

158. 132 S. Ct. 945 (2012).

159. The agents had obtained a warrant, but it was for the District of Columbia and was valid for a ten-day period. The agents installed the tracking device in Maryland on the eleventh day. *See id.* at 948.

160. *Id.*

161. *Id.* at 948–49.

162. *Id.*

163. *Id.* at 949.

protected.'"[164] In using the warrantless GPS tracker to discover "the totality and pattern of his movements," the court concluded that the government violated the Fourth Amendment.[165]

The Supreme Court granted the government's petition of certiorari.[166] The Court's January 2012 decision was unanimous in finding the government's actions unconstitutional, but the Justices widely diverged in the bases for that finding. The majority opinion, delivered by Justice Scalia, found a Fourth Amendment violation in the physical trespass that occurred during the placement of the GPS device on the vehicle.[167] That intrusion, wrote Justice Scalia, "would have been considered a 'search' within the meaning of the Fourth Amendment when it was adopted."[168] The Court acknowledged that extended electronic surveillance "without an accompanying trespass" may be unconstitutional, but noted that the "present case does not require us to answer that question."[169]

In his opinion concurring in the judgment, Justice Alito criticized "the Court's reliance on the law of trespass" to decide the case.[170] Instead, he wrote, the question is whether the "respondent's reasonable expectations of privacy were violated by the long-term monitoring" of his vehicle.[171] Because "law enforcement agents tracked every movement that respondent made in the vehicle he was driving" for four weeks—a level of monitoring that Justice Alito felt impinged on reasonable expectations of privacy—Justice Alito concluded that the monitoring constituted a search.[172] Justice Sotomayor, in addition to joining the majority, provided a separate concurring opinion arguing that "the trespassory test . . . reflects an irreducible constitutional minimum."[173] Justice Sotomayor also expressed concern that the unchecked abil-

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164. United States v. Maynard, 615 F.3d 544, 563 (D.C. Cir. 2010) (second alteration in original) (citation omitted).

165. *Id.* at 558, 568.

166. *Jones*, 132 S. Ct. at 949.

167. *See id.*

168. *Id.*

169. *Id.* at 953–54.

170. *Id.* at 962 (Alito, J., concurring in the judgment).

171. *Id.* at 958.

172. *Id.* at 964. Justice Alito left open the possibility that some periods of GPS surveillance might not constitute a search, but noted that in this case "the line was surely crossed before the 4-week mark." *Id.*

173. *Id.* at 955 (Sotomayor, J., concurring).

ity of the government to conduct long-term monitoring of "the sum of one's public movements" could enable it to obtain private information regarding political and religious beliefs.[174]

F. Privacy and Unmanned Aircraft Systems in Light of Supreme Court Jurisprudence

In *Ciraolo*, *Riley*, and *Kyllo*, the Supreme Court expressed a view that the extent to which an expectation of privacy is "reasonable" is tied, at least in part, to the level of technology diffusion. In addition, with respect to the specific question of the constitutionality of aerial observations, in *Ciraolo*, *Riley*, and *Dow Chemical*, the Court considered the use of public navigable airspace to be important, though not necessarily determinative. In those three rulings the Court also explicitly or implicitly distinguished overhead observations made using the naked eye or widely available camera technology from those made using less common imaging systems. For UAS privacy, these three tests—whether a technology is in general public use, whether the observations are made from public navigable airspace, and the nature of the imaging (or other information-gathering) system—will play fundamental roles.

Jones is most relevant to UAS in relation to extended surveillance. Today, tethered blimps called "aerostats" are being stationed in the sky in some places along the U.S.-Mexico border.[175] In addition, in the future, it will become practical to utilize fixed-wing unmanned aircraft for long-term surveillance. Thus, the types of constitutional questions considered (though not resolved) in *Jones* have direct implications for some categories of UAS.

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174. *Id.* at 956.

175. Kathleen Hickey, *Former wartime blimp refitted for border surveillance*, GOV'T COMPUTER NEWS, Aug. 16, 2012, http://gcn.com/Articles/2012/08/16/CBP-aerostats-unmanned-blimps-border-surveillance.aspx.The government has increased search powers near the border. For example, within twenty-five miles of "any external boundary of the United States," 8 U.S.C. § 1357(a)(3) allows the government, without a warrant, "to have access to private lands, but not dwellings, for the purpose of patrolling the border to prevent the illegal entry of aliens into the United States."

1. Technology in "General Public Use"

In *Dow Chemical*, the Supreme Court wrote that warrantless "surveillance of private property by using highly sophisticated surveillance equipment *not generally available to the public*" may be unconstitutional.[176] But the Court also noted that the "photographs at issue in this case are essentially like those commonly used in mapmaking. Any person with an airplane and an aerial camera could readily duplicate them."[177]

In the *Ciraolo* ruling issued on the same day, the Court concluded that in an era when private and commercial flight is "routine," there is no reasonable expectation of privacy from naked-eye observations made from public navigable airspace.[178] The *Ciraolo* Court stopped short of stating whether or not similar overhead observations made using non-routine aircraft or imaging technology would pass constitutional muster.

Fifteen years later in *Kyllo*, the Court again viewed the extent to which a technology was publicly available as highly relevant to defining a Fourth Amendment "search." The *Kyllo* Court was clearly concerned about future developments that might enable the Government to "see" into the interior of the home from the outside.[179] This concern was reflected in the Court's expressed desire to protect people from "advancing technology" that might "discern all human activity in the home" and the resulting need to "adopt" a "rule" taking account "of more sophisticated systems that are already in use or in development."[180] Yet, in the end, the rule adopted was more narrowly crafted.

The *Kyllo* holding that a search occurs when "the Government uses a device that is not in general public use, to explore details

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176. Dow Chem. Co. v. United States, 476 U.S. 227, 238 (1986) (emphasis added).

177. *Id.* at 231.

178. California v. Ciraolo, 476 U.S. 207, 215 (1986).

179. *See* Kyllo v. United States, 533 U.S. 27, 34 (2001). Recently, there have been significant advances in "terahertz" imaging, which refers to the formation of images using electromagnetic waves with a frequency on the order of one trillion times per second. As described in a conference paper published in early 2012, researchers at University of Texas at Dallas "have designed an imager chip that could turn mobile phones into devices that can see through walls, wood, pastics, paper and other objects." *New Research Could Mean Cellphones That Can See Through Walls*, UNIV. OF TEXAS AT DALLAS NEWS CENTER, Apr. 18, 2012, http://www.utdallas.edu/news/2012/4/18-17231_New-Research-Could-Mean-Cellphones-That-Can-See-Th_article-wide.html.

180. *Kyllo*, 533 U.S. at 35–36.

of the home that would previously have been unknowable without physical intrusion"[181] clearly bars the use of uncommon technology for this purpose. However, sophisticated and uncommon are two different things. Indeed, the *Kyllo* Court called the thermal imager in question "crude"[182] while also recognizing that it was nonetheless not in general public use. Furthermore, the district court in *Dow Chemical* had found a Fourth Amendment violation, in part, because the images were taken with "the finest precision aerial camera available," permitting capture of "a great deal more than the human eye could ever see."[183] In upholding the Sixth Circuit's reversal of this decision, the Supreme Court considered the wide public availability of the camera to be more relevant than its sophistication.[184]

So how does *Kyllo* bear on the issue of "routine" technology? As the dissent in *Kyllo* noted, the Court's language raises at least the possibility that the protection offered "dissipates as soon as the relevant technology is in general public use."[185] However, to conclude from *Kyllo* that use of a widely available technology to examine a home will necessarily be constitutional is not an entirely fair reading of Justice Scalia's opinion. As Justice Scalia stated in a footnote, in response to the dissent on this specific point, thermal imaging is not routine (or at least was not in 1992, the year in which law enforcement officers used the thermal imager at issue in *Kyllo*).[186] Based on existing Supreme Court precedent, that was sufficient to find its use unconstitutional. To the extent that there is a loophole through which overhead surveillance using "routine" (and possibly but not necessarily sophisticated) technologies might slip, it was created by *Ciraolo* and *Dow Chemical*, and the Court in *Kyllo* declined to revisit it.[187]

And what about technology *not* in general public use, which at least for the moment describes the state of UAS in the United

181. *Id.* at 40.

182. *Id.* at 38.

183. Dow Chem. Co. v. United States, 476 U.S. 227, 230 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982)).

184. *See id.* at 238–39.

185. *Kyllo*, 533 U.S. at 47 (Stevens, J., dissenting) (internal quotation marks omitted).

186. *Id.* at 39–40 n.6 (majority opinion).

187. *See id.* ("Given that we can quite confidently say that thermal imaging is not 'routine,' we decline in this case to reexamine that factor.").

States? Under a fair reading of *Kyllo*, that fact alone would not automatically bar its use for surveillance of a home. *Kyllo* did not prevent government use of uncommon technology generally, but instead was focused on the use of such technology to "explore details of the home that would previously have been unknowable without physical intrusion."[188] Thus, although warrantless use of a UAS equipped with a sophisticated thermal imaging camera to "see" through the walls of a home would certainly run afoul of *Kyllo*, acquisition of visible-light images of a home's exterior or curtilage using a UAS-mounted consumer-grade, low-resolution imaging system in public navigable airspace would likely not. After all, the information those images would reveal could be acquired easily from manned aircraft, something that the Court has found multiple times to be constitutional. Perhaps most importantly, to the extent that a "not in general public use" test furnishes a measure of privacy protection with respect to UAS platforms, that protection inevitably will soon disappear as their use becomes more widespread.

2. *"Public Navigable Airspace"*

As is clear from *Ciraolo*, *Riley*, and *Dow Chemical*, the use of "public navigable airspace" is a threshold test for determining whether warrantless aerial observations are constitutional.[189] This does not imply that all such observations will be constitutional, but those that are made from outside public navigable airspace are almost certainly unconstitutional. The question of what constitutes "public navigable airspace" for UAS operated by the government is thus central to the privacy inquiry.

This is not as easy to answer as it might first appear. FAA regulations provide that, except as necessary for takeoff or landing, fixed-wing manned aircraft must generally operate above 1000 feet when over congested areas, and above 500 feet over most non-congested areas.[190] UAS operated above these

188. *Id.* at 40.

189. *See* Florida v. Riley, 488 U.S. 445, 450 (1989); California v. Ciraolo, 476 U.S. 207, 213–14 (1986); *Dow Chem. Co.*, 476 U.S. at 239.

190. 14 C.F.R. § 91.119(b)–(c) (2012). The full set of minimum altitude rules is more complex. For example, for congested areas, the minimum is 1000 feet above the highest obstacle within a horizontal radius of 2000 feet of the aircraft. § 91.119(b). For noncongested areas other than over open water or sparsely popu-

minimums therefore are certainly in public navigable airspace.[191] In addition, the altitude must always be sufficiently high to allow "an emergency landing without undue hazard to persons or property on the surface."[192]

But this is not the whole story. The FAA regulations specifically exempt helicopters[193] from the minimums if "the operation is conducted without hazard to persons or property on the surface."[194] FAA regulations nonetheless provide a *de facto* impediment to very low altitude operation of manned helicopters over residential areas: In the event of an engine failure, it would be difficult to claim that the pilot of a manned helicopter hovering fifty feet over a home could perform an emergency landing without endangering persons or property on the ground. For an unmanned helicopter (or fixed wing aircraft) weighing only a few pounds, however, the risks posed to persons on the ground by an emergency landing, though not nonexistent, are certainly modest compared to those posed by manned aircraft. Thus, the combination of the helicopter rules and the "emergency landing" provision in current FAA minimum safe altitude regulations have little or no protective power with respect to UAS privacy concerns.

An additional complicating factor is that for at least some categories of unmanned aircraft, the traditional paradigm is inverted and the FAA imposes altitude *maximums* instead of minimums. Public unmanned aircraft operated in accordance with Section 334(c)(2)(C) of FMRA must be operated at a height lower than 400 feet.[195] Unless FMRA paradoxically is read to mandate navigation outside of "navigable airspace," with respect to this class of aircraft, altitudes of 350 feet, 300 feet, and 250 feet would almost always be within public navigable airspace. However, just as

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lated areas, the minimum is 500 feet. § 91.119(c). Over open water and sparsely populated areas, "the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure." *Id.*

191. Provided, of course, that there are no other restrictions associated with the airspace.

192. § 91.119(a).

193. § 91.119(d). A helicopter is "a rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors"; a rotorcraft, in turn, is "a heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors." *Id.* § 1.1 (2012).

194. § 91.119(d).

195. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 122-95, § 334(c)(2)(C), 126 Stat. 11, 77.

clearly, the air five feet above the ground in the backyard of a home is not within any reasonable definition of public navigable airspace. As the Supreme Court wrote in 1946 in *United States v. Causby*,[196] "[w]e have said that the airspace is a public highway. Yet it is obvious that if the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere."[197]

Attempts to identify a precise boundary where the "immediate reaches" under the "exclusive control" of a landowner end and the area available to the public begins can lead to complex questions.[198] For example, it could be argued that a warrantless government-operated UAS that dips into a backyard at eye level to obtain photographs into the house through a back window would be operating outside of public navigable airspace, and that the images it acquired would be unconstitutional for that reason (among others).[199]

Interestingly, airspace that may not be "publicly navigable" can still be subject to governmental control. In places such as the Washington, D.C. Metropolitan Area Flight Restricted Zone, the FAA prohibits *all* outdoor flight operations (including UAS), at any altitude, unless authorized by the FAA/Transportation Security Administration.[200] Thus, the FAA can and does promulgate regulations that control the air all the way down to the ground, even over private property. However, that the government has a right to *prohibit* certain flight operations in the air a few feet above private land does not mean that the government (or a private party) has an affirma-

196. 328 U.S. 256 (1946).

197. *Id.* at 264.

198. The definition of "navigable airspace" in 49 U.S.C. § 40102 does little to resolve this question. "Navigable airspace" is defined as the "airspace above the minimum altitudes of flight prescribed by regulations under this subpart and subpart III of this part, including airspace needed to ensure safety in the takeoff and landing of aircraft." § 40102(a)(32).

199. The Supreme Court considered the more general question of whether looking into a home through a window constitutes a Fourth Amendment search in *Minnesota v. Carter*, 525 U.S. 83 (1998). In that case, police had observed of a drug transaction through a gap in the closed blinds of a window. Because the respondents "were essentially present for a business transaction and were only in the home a matter of hours," the relevant expectation of privacy was that tied to commercial premises, not residential property. As a result, the Court found that the police observations were not a Fourth Amendment violation. *Id.* at 90.

200. *See* 14 C.F.R. § 93.341 (2012).

tive right to *conduct* flight operations in that same airspace without the property owner's consent.

In the dense urban cores of cities such as New York, Chicago, and Boston, public navigable airspace can unquestionably extend *below* the level of many residences. In New York, for example, manned helicopters routinely fly over the Hudson River at altitudes significantly lower than the taller buildings in Manhattan. The air 550 feet over the Hudson River is in public navigable airspace.[201] But there is a good argument that the air six inches outside the window of a fiftieth-floor apartment in midtown Manhattan is not. As noted above, in *Causby* the Court recognized the importance of providing a landowner with "exclusive control of the immediate reaches of the enveloping atmosphere."[202] A high-rise apartment dweller should have at least as much control over the enveloping atmosphere of his or her home.[203] That control, however, will only extend a modest distance. Thus, a UAS operated at several hundred feet above the ground and at a reasonable horizontal standoff from any nearby buildings would almost always be in public navigable airspace.[204]

Will warrantless UAS surveillance from public navigable airspace always be constitutional? Certainly not. The holding in *Ciraolo* addressed naked eye observations from "public airways."[205] *Ciraolo* would provide little support for use of an imaging system capturing much more detail than could the human eye.[206] The opinions in the (slightly) more recent *Riley* decision also imply the existence of some limits. Both of the *Riley* opinions that found in favor of the government expressed concern about using operation in public navigable airspace as

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201. Although the airspace 550 feet above the Hudson near Manhattan is publicly navigable, there are special flight rules that apply within the "Hudson River Exclusion." *See* 14 C.F.R. § 93.352 (2012). Altitudes below 1000 feet within the Hudson River Exclusion are available to aircraft conducting a "local operation" as defined in § 93.350(a).

202. *Causby*, 328 U.S. at 264.

203. An additional complication with respect to control over the air surrounding buildings in cities like New York relates to the "air rights" that are commonly transacted in association with real estate development. *See Zoning Glossary*, NEW YORK CITY DEPARTMENT OF CITY PLANNING, http://www.nyc.gov/html/dcp/html/zone/glossary.shtml#development_rights (last visited Jan. 29, 2013).

204. An exception would occur in locations subject to temporary or permanent flight restrictions.

205. California v. Ciraolo, 476 U.S. 207, 215 (1986).

206. *See id.* at 214–15.

the only threshold for constitutionality. Writing for the plurality, Justice White noted that "simply because the plane is within the navigable airspace specified by law," it does not follow that the observations it makes will always "pass muster under the Fourth Amendment."[207] Justice O'Connor also warned against relying on "compliance with FAA regulations alone,"[208] and Justice Brennan's dissent raised the same issue.[209]

Justice White's opinion in *Riley* also identifies some specific tests beyond simply being in public navigable airspace that might be applied. For example, the opinion implies that observations from legally operated aircraft that generated undue noise, wind, dust, or threat of injury could be unconstitutional.[210] Although a UAS weighing a few pounds or less would generate very little noise, wind, or dust, if it loses power it could certainly cause injuries. This could occur both directly, if it lands on a person, or indirectly, if it lands in traffic or becomes caught in power lines and initiates an injury causing event. Interestingly, the language of the opinion ties privacy expectations in part to the freedom from being subjected to a *threat* of injury, as distinct from an actual injury itself.

3. *The Role of Imaging Technology*

In *Ciraolo* and *Riley*, the aerial observations of the curtilage of a home were performed with the naked eye, a fact specifically noted by the *Ciraolo* Court[211] and by both of the *Riley* opinions that found against the government.[212] But in *Dow Chemical*, the use of a camera permitting capture of "a great deal more than the human eye could ever see" did not render the observations

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207. Florida v. Riley, 488 U.S. 445, 451 (1989).

208. *Id.* at 453 (O'Connor, J., concurring in the judgment).

209. *Id.* at 464 (Brennan, J., dissenting).

210. *See id.* at 452 (plurality opinion).

211. "[I]t is unreasonable for respondent to expect that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet." *Ciraolo*, 476 U.S. at 215.

212. Justice White's opinion stated that the investigating officer in *Riley* "circled twice over respondent's property in a helicopter at the height of 400 feet. With his naked eye, he was able to see through the openings in the roof and one or more of the open sides of the greenhouse and to identify what he thought was marijuana growing in the structure." *Riley*, 488 U.S. at 448. Justice O'Connor wrote that "I conclude that Riley's expectation that his curtilage was protected from naked-eye aerial observation from that altitude was not a reasonable one." *Id.* at 455 (O'Connor, J., concurring in the judgment).

unconstitutional; it was the public availability of the camera that mattered.[213]

What is the constitutionality of warrantless use of an extremely high-resolution (but widely available) camera on a UAS to observe the curtilage of a suspect's home? The Court has never grappled with this specific question, and existing case law is unclear on this point. A suspect could find support in *Ciraolo* and *Riley* when arguing that a Fourth Amendment violation occurred; the government could also find support in *Ciraolo* as well as in *Dow Chemical* and *Kyllo* in arguing that it did not.[214] That *Kyllo* is more recent is not dispositive in light of, among other things, the discussion of *Ciraolo* it contains.

Imaging technology is also relevant given Justice White's opinion in *Riley* that found no Fourth Amendment violation in part because "no intimate details connected with the use of the home or curtilage were observed."[215] Even though he was not speaking for a majority, Justice White's language is nonetheless intriguing, as it indicates that there may be some level of detail beyond which warrantless UAS observations, even if conducted from public navigable airspace, may cross the line into a Fourth Amendment search.

With present-day imaging capabilities, it would be an easy matter to use a UAS (or a manned aircraft) within navigable airspace to acquire imagery that includes "intimate details." For example, a government UAS at an altitude of several hundred feet could identify the topic of an electronic or paper news article being read by a person sitting in his or her fenced-in backyard. A strong case could be made that these observations, even when made from public navigable airspace, would be unconstitutional in the absence of a warrant.

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213. Dow Chem. Co. v. United States, 476 U.S. 227, 230 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982)) (internal quotation marks omitted). Another key factor in *Dow Chemical* was the Court's conclusion that the observed areas were more akin to "open fields" than to the curtilage of a home. *See id.* at 239.

214. Aspects of *Ciraolo* could be cited to support both positions. A suspect could cite the reference in *Ciraolo* to "naked eye" observations. The government could in response point to the *Ciraolo* language regarding the "routine" nature of the technology of flight, which was also referenced in *Kyllo*. *See Ciraolo*, 476 U.S. at 215; Kyllo v. United States, 533 U.S. 27, 39–40 n.6.

215. *Riley*, 488 U.S. at 452.

4. *Extended Surveillance Using Unmanned Aircraft in Light of* Jones

For financial, regulatory, and logistical reasons, law enforcement agencies will usually use small UAS. Today, these platforms generally have flight durations measured in hours, rendering their continuous use for days or weeks to perform surveillance impractical. But future developments will make long-term surveillance with UAS possible. In addition, at least along the U.S.-Mexico border, aerostats already are in use today.[216]

Some of the most vexing constitutional questions will arise in association with the use of high-altitude long-endurance (HALE) UAVs. These solar-powered UAVs can stay aloft for extraordinarily long periods of time. As noted above, the QinetiQ Zephyr stayed aloft for over two weeks in a 2010 demonstration.[217] Boeing is under contract with DARPA to develop the SolarEagle, which will be able to stay aloft in the stratosphere for five continuous years.[218] Because they fly at such high altitudes, HALE UAS could potentially track every car trip in a city, or the times when lights in residences were turned on and off.[219] It will likely be much later in the decade before HALE technology becomes sufficiently advanced and cost-effective to make it practical to install a permanent HALE presence above an American city. Currently, there is no indication that any government agency plans to do so.

No Supreme Court case is directly on point with respect to the type of extended surveillance that could be performed using a HALE platform, though some of the issues involved arose in *Jones*. The *Jones* opinions contain extensive discussion of the Court's 1983 holding in *United States v. Knotts* that a "person

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216. Hickey, *supra* note 175.

217. Chuter, *supra* note 36.

218. Press Release, Boeing Co., Boeing Wins DARPA Vulture II Program (Sept. 15, 2010), *available at* http://boeing.mediaroom.com/index.php?s=43&item=1425.

219. Satellites are not well-suited to perform extended, continuous high-resolution surveillance. The only satellites that can remain in place over one spot are in geostationary orbits, which are over 22,000 miles above the Earth—much too far to gather images revealing details of a home or curtilage. Satellites in lower orbits can acquire very detailed images, but not on a continuous basis. *See Phoenix, Tactical Technology Office*, DARPA, http://www.darpa.mil/our_work/tto/programs/phoenix.aspx (last visited Feb. 8, 2013).

traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements."[220]

Justice Scalia's majority opinion in *Jones* states that performing extended surveillance "through electronic means, without an accompanying trespass" *may* be unconstitutional, "but the present case does not require us to answer that question."[221] In his concurrence in the judgment, Justice Alito expressed a view that extended electronic surveillance of public movements *is* unconstitutional, writing, "the use of longer term GPS monitoring in investigations of most offenses impinges on expectations of privacy."[222] Justice Sotomayor's concurrence also expressed doubts about the constitutionality of extended electronic surveillance: "I do not regard as dispositive the fact that the Government might obtain the fruits of GPS monitoring through lawful conventional surveillance techniques."[223] In the end, however, it was the physical trespass involved in installing the GPS tracker, not the tracking itself, that formed the basis for the *Jones* decision.[224]

While HALE UAS surveillance is like GPS tracking in that it gathers information using technology that would have required a "large team of agents"[225] in the past, in one respect it is very different: A GPS tracker only identifies the movement of the single vehicle or other object to which it is attached, whereas HALE platforms equipped with banks of cameras could easily capture images of all the vehicle movements in an entire city. The prospect that the government might be able to capture—and then use at will—this level of information about the travels of private individuals is sobering. But if that is unconstitutional, where does that leave the networks of ground-level cameras and license plate readers that are increasingly being deployed along public streets and intersections? Those ground-level systems collect information that, when aggregated, can

220. 460 U.S. 276, 276 (1983).

221. United States v. Jones, 132 S. Ct. 945, 954 (2012).

222. *Id.* at 964 (Alito, J., concurring in the judgment).

223. *Id.* at 956 (Sotomayor, J., concurring).

224. *See id.* at 949 (majority opinion).

225. In his concurrence in the judgment in *Jones*, Justice Alito wrote that "constant monitoring of the location of a vehicle for four weeks" using traditional surveillance methods from the pre-computer age "would have required a large team of agents, multiple vehicles, and perhaps aerial assistance." *Id.* at 963 (Alito, J., concurring in the judgment).

track automobile trips just as thoroughly as a solar-powered HALE UAS making slow circles in the stratosphere.[226] An argument against the constitutionality of HALE systems would need to be reconciled with the information available through aggregated street-level traffic surveillance data. If government tracking of effectively all traffic in a city is unconstitutional, that holding should apply regardless of whether the technology used is on the ground or in the air.[227]

In future years it may also be necessary to revisit the assumption that widely available small, low-altitude UAS can only stay aloft for several hours. UAV Factory, a company based in Latvia, announced in the summer of 2012 that its "Penguin B" small UAS had stayed aloft for over fifty-four hours.[228] Future technological advances presumably will lead to flights of even longer durations. From a purely technological standpoint, platforms such as these conceivably could be used to survey a target for several days. Whether this is likely to happen in practice is another matter. At least under current regulations, this UAS class can only be operated by a government agency within line of sight of an operator.[229] A law enforcement agency could thus use rotating shifts of operators to fly this class of small UAS for several continuous days.

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226. Depending on where the cameras on the aerostats along the U.S.-Mexico border are aimed, similar questions regarding long-term surveillance are raised. An important difference between aerostats and HALE UAS is the altitude. HALE platforms fly many times higher, and can survey a much larger area than can aerostats.

227. Jurisprudence related to traffic checkpoints is relevant to this issue. In *City of Indianapolis v. Edmond*, the Court noted that it "is well established that a vehicle stop at a highway checkpoint effectuates a seizure within the meaning of the Fourth Amendment." 531 U.S. 32, 40 (2000). Recording a license plate of a passing car—or tracking the car using a HALE UAS—is certainly not a seizure. However, the *Edmond* ruling also noted that "stops can only be justified by some quantum of individualized suspicion," a test that would not be met by systems that perform pervasive tracking of all vehicles in a city. *Id.* at 47.

228. *UAV Factory Touts Endurance Flight Record*, UNMANNED SYSTEMS MAGAZINE, Aug. 2012, at 13; Press Release, UAV Factor, New Endurance Record for Small Unmanned Aircraft (July 7, 2012), *available at* http://www.uvs-interntional.org/index.php?option=com_docman&task=doc_view&gid=1969&Itemid=25.

229. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 334(c)(2)(C), 126 Stat. 11, 77.

5. *Residual Privacy Rights When a Warrant Is Obtained?*

When law enforcement officers wiretap a phone pursuant to a warrant, a great deal of privacy is lost, but ultimately some minimal privacy is still maintained. For example, a tapped phone does not provide images of the interior of a home.

But with UAS, the implication that a search warrant should have some limits is not unreasonable. Imagery acquired by UAS pursuant to a warrant could lead to profound violations of privacy for both a suspect and the other residents of a house. It is one thing for a wiretap to capture the private conversations of a suspect's spouse. It is quite another for a UAS, hovering in a backyard and taking pictures through a window (or in the future, hiding unseen inside the house), to acquire images that might show an occupant of the house in a state of undress. To assert that the government, even when armed with a warrant, has an unfettered right to acquire, store, and view such images raises significant concerns. Thus, questions of UAS privacy do not end with the issuance of a warrant.

IV. NON-GOVERNMENT UNMANNED AIRCRAFT AND THE FIRST AMENDMENT

Although much of the attention regarding UAS privacy has focused on government use and the Fourth Amendment, it is non-government use that is likely to raise some of the most significant privacy challenges in the coming years. For private entities, which are not bound by Fourth Amendment restrictions that apply to the government, the key constitutional question is the extent of their First Amendment privilege to gather information.

As the Supreme Court recognized in its 1972 *Branzburg v. Hayes* decision, "[w]ithout some protection for seeking out the news, freedom of the press could be eviscerated."[230] Furthermore, the freedom to gather information is not limited to the press. In a 2011 ruling upholding the right of a citizen to record the actions of police in a public space, the First Circuit wrote that "[i]t is firmly established that the First Amendment's aegis extends further than the text's proscription on laws 'abridging the freedom of speech,

230. 408 U.S. 665, 681 (1972).

or of the press,' and encompasses a range of conduct related to the gathering and dissemination of information."[231]

However, the freedoms conferred by the First Amendment are not unlimited. In *Branzburg*, for example, the Supreme Court recognized the existence of some bounds: "It is clear that the First Amendment does not invalidate every incidental burdening of the press that may result from the enforcement of civil and criminal statutes of general applicability."[232]

Even though almost all companies and individuals will endeavor to operate UAS responsibly, there undoubtedly exist some classes of potential UAS users who will perceive observe less restraint. If paparazzi are willing to engage in high-speed freeway chases to capture images of a celebrity,[233] it would be optimistic to the point of naïveté to expect them to always operate UAS in a manner respectful of privacy considerations and in compliance with FAA safety regulations. When, as will inevitably occur, a paparazzo or stalker flies a UAS into a backyard and takes pictures through a back window, what laws will come into play?

A. Trespassing

Common sense would suggest that a homeowner[234] has the right to prevent a UAS from being flown around his or her backyard at eye level. And indeed, in some states, trespassing statutes are worded in a manner that would encompass trespassory use of a UAS. In Arizona, for example, "entry" in association with criminal trespass is defined as "the intrusion of any part of any instrument or any part of a person's body inside the external boundaries of a structure or unit of real property."[235] Unless an argument could be made that a UAS is not an "instrument," this statute would cover intrusion by a UAS

231. Glik v. Cunniffe, 655 F.3d 78, 82 (2011).

232. 408 U.S. at 682.

233. For an example of one alleged such incident, see Kate Mather, *Photographer who allegedly chased Justin Bieber charged*, L.A. TIMES, July 26, 2012, http://articles.latimes.com/2012/jul/26/local/la-me-bieber-paparazzi-20120726.

234. Or other person legally occupying the property, such as a lessee.

235. ARIZ. REV. STAT. § 13-1501 (West 2012).

at extremely low altitudes (for example, at eye level) that are under the control of a property owner.[236]

In Oregon, by contrast, "enter" as defined in association with criminal trespass is, among other things, "[t]o enter or remain in or upon premises . . . when the entrant is not otherwise licensed or privileged to do so."[237] While this somewhat circular definition is clearly intended to criminalize unauthorized entry by a person, it leaves open the question of whether entry by a very low-flying UAS would be covered. California's trespassing laws prohibit driving a vehicle on another person's property without consent,[238] but define vehicle in a manner that excludes UAS.[239]

The general lack of attention to the potential trespassory use of UAS in current state criminal statutes is not at all surprising. In the future, it almost certainly will be necessary to add specific language to criminal trespassing statutes addressing UAS.

B. Invasion of Privacy

Use of a UAS to invade an individual's privacy could result in civil or criminal liability. With respect to civil liability, courts in most jurisdictions recognize the two forms of common law invasion of privacy most likely to arise in connection with UAS: intrusion upon seclusion and public disclosure of private

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236. As discussed above, the question of the altitude at which a landowner's control over the air above the ground in his or her backyard ends, and the public's access begins, was at issue in *United States v. Causby*. Under any reasonable reading of *Causby* (and other relevant case law), the space in a backyard at eye level is certainly within the "immediate reaches of the enveloping atmosphere" that are under the "exclusive control" of the landowner. *See Causby*, 328 U.S. 256, 256 (1946). This interpretation is also supported by the manner in which overhanging tree branches from a neighbor's property are often handled. In many states, a homeowner has the right (subject to some exceptions) to trim tree branches in the air above his or her land. *See, e.g.*, Macero v. Busconi Corp., 12 Mass. L. Rep. 521 (Super. Ct. 2000) ("Massachusetts law recognizes a right of self-help by which a property owner can cut the limbs or branches of a tree that invade his property as long as such cutting is done at the property line.").

237. OR. REV. STAT. § 164.205(3)(a) (West 2012).

238. CAL. PENAL CODE § 602(n) (West 2012).

239. California Vehicle Code § 670, referenced in the criminal trespassing statute, defines a vehicle as "a device by which any person or property may be propelled, moved, or drawn upon a highway, excepting a device moved exclusively by human power or used exclusively upon stationary rails or tracks." CAL. VEH. CODE § 670 (West 2012).

facts.[240] In addition, some states also have civil or criminal statutes, or both, related to invasion of privacy.[241]

1. Intrusion Upon Seclusion

The potential of a UAS to intrude upon seclusion in the home is obvious. A person who is unwillingly photographed in his or her own home by a UAS hovering just outside an otherwise inaccessible window would have strong grounds for a valid cause of action. Even public figures, whose privacy rights are presumptively lower than those of private individuals,[242] can nonetheless reasonably expect views into the interior of their residences from their own backyards to be private.

Although privacy expectations are greatly reduced outside the home, the non-governmental use of a UAS to capture images and other information taken while the individual is in a public setting could nonetheless constitute an invasion of privacy. *Shulman v. Group W Productions, Inc.*,[243] a 1998 California Supreme Court ruling regarding filming that occurred following a car accident, is instructive in this regard. In *Shulman*, the victims of an accident were captured on video and audio recording, without their consent, for a television program called *On Scene: Emergency Response*.[244] The recording occurred both at the scene of the accident as well as in a rescue helicopter during transport to a hospital.[245]

The California Supreme Court affirmed the court of appeals' decision to reverse the trial court's summary judgment finding that the television program producers' activities were protected

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240. Prosser articulated four forms of the common law invasion of privacy tort in 1960: (1) "[i]ntrusion upon the plaintiff's seclusion or solitude, or into his private affairs;" (2) "[p]ublic disclosure of embarrassing private facts about the plaintiff;" 3) "[p]ublicity which places the plaintiff in a false light in the public eye;" and 4) "[a]ppropriation, for the defendant's advantage, of the plaintiff's name or likeness." William L. Prosser, *Privacy*, 48 CALIF. L. REV. 383, 389 (1960); *see also* RESTATEMENT (SECOND) OF TORTS §§ 652A–652E (1997).

241. *See, e.g.*, CAL. CIV. CODE § 1708.8 (West 2011); N.J STAT. ANN. §§ 2C:14-9, 2A:58D-1 (2004).

242. *See generally* Hustler Magazine, Inc. v. Falwell, 485 U.S. 46 (1988); Gertz v. Robert Welch, Inc., 418 U.S. 323 (1974); New York Times Co. v. Sullivan, 376 U.S. 254 (1964).

243. 955 P.2d 469 (Cal. 1998).

244. *Id.* at 475.

245. *Id.* at 474–75.

under the First Amendment.[246] The court held that a woman injured in the accident "was entitled to a degree of privacy in her conversations with [the nurse] and other medical rescuers at the accident scene."[247] It was improper, the ruling stated, to conclude that the "plaintiffs had no reasonable expectation of privacy at the accident scene itself because the scene was within the sight and hearing of members of the public."[248] At the time of the rescue, the vehicle was located "in a ditch many yards from and below" a highway, rendering it "unlikely . . . that any passersby on the road could have heard" the conversation of the victim with the nurse and other rescuers.[249]

The *Shulman* decision provides important guidance regarding newsgathering and UAS with respect to intrusion upon seclusion by drawing a distinction between the information about a newsworthy event available to passersby and the potentially greater amount of information available only to those intimately involved in the event itself. Under some circumstances, there will be no difference: If a crowd of people has gathered around an assault victim who is being treated by paramedics, the conversation between the victim and the paramedics may well be audible to all, and the victim's reasonable expectation of privacy correspondingly lower. But there will be many cases in which, as in *Shulman*, passersby have far from complete information about an unfolding event. Using a UAS to fill in the gaps would carry a risk of crossing the line into intrusion.

Just as the First Amendment does not provide an impenetrable shield for all uses of video, audio, and other electronic monitoring in public areas, intrusion upon seclusion is not automatically implicated for all observations of activities occurring in a home. A passerby on the street at night who happens to glance up and notice that the light in a nearby home has just been turned off is certainly not violating privacy rights. Likewise, courts will be very unlikely to consider a fleeting, acci-

246. *See id.* at 497–98.

247. *Id.* at 491.

248. *Id.*

249. *Id.* In addition to considering whether the audio and video recorded at the scene of the accident intruded on the victim's expectation of privacy, the California Supreme Court also considered the recording that took place within the helicopter, ruling that the "Court of Appeal correctly found [that] triable issues exist as to whether defendants invaded plaintiffs' privacy by accompanying plaintiffs in the helicopter." *Id.* at 477.

dental capture of imagery of a home's curtilage or (through a window) interior acquired by a passing UAS to be an invasion of privacy. Although the specifics vary from state to state, to prevail in a common law or statutory intrusion upon seclusion claim, a plaintiff generally must establish, at a minimum, that the intrusion was intentional and that it would be "highly offensive to a reasonable person."[250]

Some highly offensive intrusions upon seclusion have nonetheless been protected under the First Amendment. Most notably, in *Snyder v. Phelps*[251] the Supreme Court ruled in favor of members of the Westboro Baptist Church who had picketed the funeral of a serviceman killed in Iraq. A jury in Maryland had found members of Westboro Baptist Church liable for damages based on claims including intrusion upon seclusion.[252] However, in affirming the Fourth Circuit's reversal, the Supreme Court ruled that "the First Amendment bars Snyder from recovery for intentional infliction of emotional distress or intrusion upon seclusion" against Westboro Baptist Church members and that "we must likewise hold that Snyder cannot recover for civil conspiracy based on those torts."[253]

2. *Publication of Private Facts*

Precedents from state court rulings unrelated to aviation indicate that UAS could also figure into invasion of privacy through the publication of private facts. This could be particularly important with respect to UAS images of private individuals who become involuntarily caught up in newsworthy events.

In September 1999, *Sports Illustrated* published a story entitled "Every Parent's Nightmare" that included a photograph of a Little League team.[254] There were eighteen people in the photograph, including a team manager who had been convicted of molestation

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250. Restatement (Second) of Torts § 625B (1977).

251. 131 S. Ct. 1207 (2011).

252. *Id.* at 1214. The District Court reduced the damages award but left the verdict intact. *Id.*

253. *Id.* at 1220.

254. William Nack & Don Yaeger, *Every Parent's Nightmare*, SPORTS ILLUSTRATED, Sept. 13, 1999, at 40, 42–43, *available at* http://sportsillustrated.cnn.com/vault/edb/reader.html?magID=SI&issueDate=19990913&mode=reader_vault.

charges in 1971 and who pled guilty in April 1998 to charges of molesting five of the children he coached in Little League.[255]

Ten of the people in the photograph filed suit against Time Warner, Inc., the then-owner of *Sports Illustrated*, for invasion of privacy and infliction of emotional distress.[256] In 2001, the California Court of Appeal upheld a lower court decision to deny Time Warner's motion to strike the complaint, writing that the "plaintiffs have demonstrated a prima facie case for invasion of privacy," particularly in relation to public disclosure of a private fact.[257] The court recognized that while the identity of the molester was publicly known and certainly newsworthy, the identities of the other coaches and the players on the team were not.[258]

Publication of private facts via imagery was also at issue in a Florida case involving a woman who suffered from a poorly performed plastic surgery.[259] The woman consented to be interviewed for a television program under the condition that the video would be edited to alter her voice and obscure her face.[260] When the broadcast took place without these two things occurring as promised, thereby revealing her identity, she filed suit.[261] In reversing a summary judgment in favor of the defendant, the Florida Court of Appeals held that "while the topic of the broadcast was of legitimate public concern, the plaintiff's identity was not."[262]

Images acquired by UAS could easily convey facts not previously known to the public, and, upon publication, could be an actionable invasion of privacy in many states. While news organizations are well aware of the tension between the privacy rights of their subjects and the organizations' First Amendment right to gather news, they will almost certainly need to reexamine existing policies in light of the unique imaging and other information gathering capabilities (such as monitoring of wire-

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255. *Id.* at 43.

256. M.G. v. Time Warner, Inc., 89 Cal. App. 4th 623, 626 (2001).The same photograph had also been broadcast on the HBO program *Real Sports*. HBO was also owned by Time Warner.

257. *Id.*

258. *Id.* at 632.

259. Doe v. Univision Television Grp., Inc., 717 So. 2d 63, 64 (Fla. Dist. Ct. App. 1998).

260. *Id.*

261. *Id.*

262. *Id.* at 65.

less signals) of UAS. In addition, given the ease with which anyone—not only news organizations—can now publish content, all users of UAS who contemplate publishing aerial images or other information from UAS would be well advised to give careful consideration to the common law and statutory invasion of privacy frameworks that apply in their jurisdictions.

C. Stalking and Harassment

In January 2009, the U.S. Department of Justice released a report based on data collected from over three million stalking victims and two million harassment victims.[263] About 245,000 of the stalking victims and 70,000 of the harassment victims stated that they had been subjected to electronic monitoring using one or more of the following devices: video or digital cameras, computer spyware, listening devices, and GPS tracking.[264] Stalkers will have no qualms about adding UAS to this list.

It was not until 1990 that California became the first state to criminalize stalking.[265] Today, statutes addressing stalking (and typically harassment) are now on the books in all fifty states and in Washington, D.C. Fortunately, many of these statutes are worded broadly enough that use of a UAS to persistently follow a person or peer into his or her car or home would be considered, at the very least, harassment. Stalking often carries the additional connotation of causing the victim to fear for his or her safety.[266] Under some circumstances, UAS use alone could constitute stalking (for example, if it is used to chase or corner a person).[267] More often, a stalker using a UAS would also be engaged in a larger constellation of behaviors consistent with stalking. To the extent that anti-harassment and anti-stalking statutes specifi-

263. Katrina Baum et al., U.S. Dep't. of Justice, Bureau of Justice Statistics Special Report, Stalking Victimization in the United States (2009), http://bjs.ojp.usdoj.gov/content/pub/pdf/svus.pdf.

264. *Id.* at 5.

265. *See* Christine B. Gregson, Comment, *California's Antistalking Statute: The Pivotal Role of Intent*, 28 GOLDEN GATE U. L. REV. 221, 221 (1998).

266. *See, e.g.*, CAL. PENAL CODE § 646.9 (West 2008): "Any person who willfully, maliciously, and repeatedly follows or willfully and maliciously harasses another person and who makes a credible threat with the intent to place that person in reasonable fear for his or her safety, or the safety of his or her immediate family is guilty of the crime of stalking . . . ."

267. Obviously, the other requirements of the legal definition of stalking must be met. As such, a child who momentarily chases his or her sibling using a 9-ounce toy remote control helicopter is clearly not engaging in stalking.

cally enumerate the technologies that might be exploited, UAS should be added to the list. If a stalker employing a UAS crosses state lines (or operates a UAS, with the assistance of someone local to the victim, from a different state), then federal anti-stalking statutes could also be implicated.[268]

D. Unmanned Aircraft and Business Privacy

In 2011, a Texas man flew an unmanned aircraft over land near a Dallas-area meat packing plant and acquired images appearing to show environmental violations.[269] He contacted the Coast Guard, and in early 2012 the Texas Environmental Crimes Task Force served a search warrant on the company.[270] Once on the property, investigators found a pipe that "originate[d] in the back of the slaughterhouse" that appeared to be channeling pigs' blood into a nearby river and "[was] not linked to a waste water system."[271]

Though few would rush to defend a slaughterhouse that may be in violation of environmental codes, the ability of private citizens or groups to easily inspect for such violations via overflights raises complex issues. To the extent that such overflights are lawfully conducted and reveal activities that may be endangering public health, they are obviously valuable. But what happens if a well-meaning but overzealous environmental group conducts daily flights over a large, fenced-in manufacturing facility and repeatedly reports "violations" to the government that turn out, after costly and time-consuming on-the-ground inspections, not to be violations after all? Does the company that owns the facility have grounds to ask a court to enjoin the environmental group from further overflights? What if the group posts pictures from its daily aerial surveillance missions on the Internet, and in doing so exposes information that the company regards as a trade secret? Could the group use a UAS to examine the interior of buildings at the facility using an advanced thermal imager that, if in government

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268. *See, e.g.*, 18 U.S.C. §§ 2261, 2261A, 2262, 2265 (2006).

269. Meghan Keneally, *Drone plane spots a river of blood flowing from the back of a Dallas meat packing plant*, MAILONLINE, Jan. 24, 2012, http://www.dailymail.co.uk/news/article-2091159/A-drone-plane-spots-river-blood-flowing-Dallas-meat-packing-plant.html.

270. *Id.*

271. *Id.*

hands and used to inspect a home, would be unconstitutional under *Kyllo*? More generally, to what extent does a corporation have common law or constitutional privacy rights that parallel those accorded to individuals?

This last question was raised but not fully resolved in a recent Supreme Court case, *FCC v. AT&T, Inc.*[272] While noting that "this case does not call upon us to pass on the scope of a corporation's 'privacy' interests as a matter of constitutional or common law,"[273] the Court ruled that the "protection in [the Freedom of Information Act] against disclosure of law enforcement information on the ground that it would constitute an unwarranted invasion of personal privacy does not extend to corporations."[274] The Court also expressed skepticism regarding arguments that corporations have a common law right to personal privacy, writing that "[o]n the contrary, treatises in print around the time that Congress drafted the exemptions at hand reflect the understanding that the specific concept of 'personal privacy,' at least as a matter of common law, did not apply to corporations."[275] Corporate privacy rights are related in part to the much broader question regarding the extent to which constitutional protections extend to corporations.[276] UAS represent one of the many ways in which those rights may be tested in the coming years.

The fact that UAS might be used to perform corporate espionage is another important issue. Observations of a competing company's facilities and activities—whether made from the ground or the air—are not necessarily illegal. For example, consider a person who drives by a competing company on public roads as part of his or her regular commute to work. If this person notices that there are suddenly far fewer cars in the company's parking lot than in previous months, he or she might infer that there have been significant layoffs. Under this scenario, visual observations have yielded potentially valuable information about a competitor without breaking any laws. Analogous scenarios involving incidentally acquired UAS imagery can also be envisioned.

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272. 131 S. Ct. 1177 (2011).
273. *Id.* at 1184.
274. *Id.* at 1185.
275. *Id.* at 1183–84.
276. *See, e.g.*, Citizens United v. FEC, 558 U.S. 310 (2010).

By contrast, circling a UAS over the roof of a competing company to intercept wireless signals emanating from the building would represent something similar to an "illegal wiretap" and violate the Stored Communications Act.[277] Photographs taken from a UAS without authorization that both (1) convey a trade secret, and (2) are obtained for the purpose of benefiting a "foreign government, foreign instrumentality, or foreign agent" would violate economic espionage statutes.[278]

V. NEW FRAMEWORKS FOR UNMANNED AIRCRAFT SYSTEMS AND PRIVACY

Many of the most important UAS privacy questions relate directly to the scope and interpretation of the First and Fourth Amendments. Those questions will be addressed in the inevitable court tests that will arise with increased UAS use. But there are also proactive steps that can be taken, including the adoption of voluntary policies by law enforcement agencies as well as new federal, state, and local legislation.

A. Voluntary Approaches

Several voluntary approaches for addressing UAS privacy have been proposed. These include the Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct, which calls for a commitment to "respect the privacy of individuals,"[279] as well as a set of model guidelines released by the International Association of Chiefs of Police (IACP).[280]

Although the IACP guidelines are not binding, many American law enforcement agencies likely will adopt the guidelines or use them as a starting point to develop more extensive guidelines. The IACP guidelines recommend that "[w]here there are specific and articulable grounds to believe that the UA [unmanned aircraft] will collect evidence of criminal

277. *See* 18 U.S.C. § 2511(1)(a) (2006).

278. *See, e.g.*, 18 U.S.C. § 1831(a)(2) (2006).

279. *Unmanned Aircraft System Operations Industry "Code of Conduct"*, ASS'N FOR UNMANNED VEHICLE SYS. INT'L, www.auvsi.org/conduct/ (last visited Feb. 1, 2013).

280. *Recommended Guidelines for the use of Unmanned Aircraft*, INT'L ASS'N OF CHIEFS OF POLICE: AVIATION COMM. http://www.theiacp.org/portals/0/pdfs/IACP_UAGuidelines.pdf (last visited Feb. 1, 2013).

wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight."[281] The guidelines also address data minimization, community involvement and feedback regarding policies for UAS use, and documentation of UAS flights.[282] Some of these recommendations are consistent with recommendations provided by the American Civil Liberties Union in a December 2011 report on "Protecting Privacy From Aerial Surveillance."[283] Voluntary frameworks will play a vital role in addressing UAS privacy concerns both directly, in terms of encouraging law enforcement agencies to use UAS responsibly, and indirectly, by spurring an important dialog between law enforcement agencies and their communities.

B. Federal Legislation

There were multiple bills related to UAS privacy introduced in the 112th Congress, though none were enacted.[284] In June 2012, Senator Rand Paul introduced the "Preserving Freedom from Unwarranted Surveillance Act of 2012,"[285] a bill that, subject to a small number of exceptions (such as preventing "imminent danger to life"), would have required a warrant for gov-

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281. *Id.* at 3.

282. *Id.* at 2–3. In the context of privacy, "data minimization" refers to the practice of collecting only relevant information, and destroying data that has ceased to become relevant. *See, e.g.*, ANDREAS PFITZMANN, MARIT HANSEN, & HANNES TSCHOFENIG, INTERNET ENGINEERING TASK FORCE, TERMINOLOGY FOR TALKING ABOUT PRIVACY BY DATA MINIMIZATION: ANONYMITY, UNLINKABILITY, UNDETECTABILITY, UNOBSERVABILITY, PSEUDONYMITY, AND IDENTITY MANAGEMENT (2010), http://tools.ietf.org/id/draft-hansen-privacy-terminology-00.html.

283. *See* Jay Stanley & Catherine Crump, Protecting Privacy From Aerial Surveillance: Recommendations for Government Use of Drone Aircraft, Am. Civil Liberties Union 15–16 (2011), http://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf.

284. Some of these UAS privacy legislative initiatives, as well as more general Fourth Amendment UAS issues are discussed in Richard M. Thompson II, Cong. Research Serv., R42701, Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses (2012), *available at* http://www.fas.org/sgp/crs/natsec/R42701.pdf.

285. Preserving Freedom from Unwarranted Surveillance Act of 2012, S. 3287, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/s3287. Essentially the same bill was introduced in the House by Representative Austin Scott. *See* Preserving Freedom from Unwarranted Surveillance Act of 2012, H.R. 5925, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr5925.

ernment use of UAS to "gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation."[286] A week later, Representative Shelley Capito introduced H.R. 5961, which would have limited "aerial surveillance of agricultural land."[287] The next month, Representative Ted Poe introduced the "Preserving American Privacy Act of 2012,"[288] which would have prohibited the use of UAS "for law enforcement purposes or for surveillance of a United States national or real property owned by that national . . . except pursuant to warrant and in the investigation of a felony."[289]

In December 2012, Representative Edward J. Markey introduced the "Drone Aircraft Privacy and Transparency Act of 2012." The bill would have required all entities seeking a "grant of authority to operate an unmanned aircraft system in the national airspace system" to provide a "data collection statement" specifying, among other things, "whether the unmanned aircraft system will collect information or data about individuals or groups of individuals," and if so, how it will be used.[290] Applications from law enforcement agencies would also have had to provide a "data minimization statement" describing the agencies' policies for minimizing data collection unrelated to a crime investigation and "requir[ing] the destruction of such information and data, as well as of information and data collected by the unmanned aircraft system that is no longer relevant to the investigation of a crime under a warrant."[291] With some exceptions for exigent circumstances, the bill would also have required law enforcement agencies to obtain a warrant for "generalized surveillance."[292]

There will undoubtedly be a new set of UAS privacy bills and privacy related amendments introduced (or reintroduced) in the 113th Congress and beyond. It is relatively easy to draft

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286. *Id.*

287. Farmer's Privacy Act of 2012, H.R. 5961, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr5961.

288. Preserving American Privacy Act of 2012, H.R. 6199, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr6199.

289. *Id.* § 2.

290. Drone Aircraft Privacy and Transparency Act of 2012, H.R. 6676, 112th Cong. § 339 (2012), *available at* http://www.govtrack.us/congress/bills/112/hr6676/text.

291. *Id.* § 339(c).

292. *Id.* § 341.

legislative language that will increase privacy from UAS observations. It is far harder to do so without negatively impacting the use of UAS in applications that raise few or no privacy concerns. For example, as part of an arson investigation, police might want to employ a UAS to acquire overhead images of a formerly vacant industrial building that has been damaged by a suspicious fire. Requiring police to first obtain a warrant would delay the investigation and increase the burden on the courts with no benefit to privacy.

When drafting legislation, it is also important to consider the role that could be played by unintentionally captured images. Suppose that a brutal assault that takes place on a sidewalk is captured on video by a government-operated UAS that happens to be monitoring traffic on the adjacent street. Suppose further that the video from the UAS turns out to be the only available evidence that can identify the perpetrator. It would defy common sense if the police or prosecutors were barred by new UAS privacy rules from making use of this information.

Legislation that would include a blanket prohibition on government use of private UAS data in criminal investigations would also be ill advised, as well as inconsistent with what routinely occurs in nonaviation settings. Investigators often use images collected from privately owned surveillance cameras to help solve crimes, including, in many cases, cameras that were not owned or operated by the victim of the crime. In June 2012, a man suspected of killing three people in New York was arrested thanks in large part to images captured by a surveillance camera down the street from the scene of the crime.[293] What mattered most was that the camera captured the images vital to identifying the suspect, not whether it was publicly or privately owned. If, in the example in the previous paragraph, the images of the assault on the street had been captured by a UAS operated by a television station instead of by the government, it would make no sense to place them beyond the legal reach of investigators.

Any new legislation should also recognize that images of public spaces from government (or private) UAS will sometimes also include images of nearby homes. Residences next to a freeway are often within the frame of view of video from

293. *Police arrest suspect accused of executing three men outside Columbia University*, MAILONLINE, June 23, 2012, http://www.dailymail.co.uk/news/article-2163776/Police-arrest-suspect-accused-executing-men-outside-Columbia-University.html.

manned traffic helicopters reporting on a freeway problem. Video from UAS used to monitor traffic will be no different. Thus, a law stating that no UAS images of any nonpublic spaces can ever be acquired by the government without a warrant would, at least on its face, effectively ban government UAS use in almost any suburban or urban setting.

UAS privacy legislation, either at the federal or state level, should also avoid creating collateral damage for the operation of model aircraft. The Academy of Model Aeronautics, which, with over 150,000 members,[294] constitutes the world's largest model aviation organization, has an exemplary seventy-five-year safety record and a safety code that requires pilots of radio-controlled model airplanes to "avoid flying directly over unprotected people, vessels, vehicles or structures."[295] Aircraft operated in this manner are ill-suited for surveillance. Impeding their operation in the name of privacy would benefit no one.

"Drone" hobbyists should similarly be protected from legislation that leaves them as collateral damage. If, five years from now, a parent and child acting in compliance with applicable FAA regulations wish to fly a very small UAS in a backyard or public park, new privacy laws should not force the parent to file paperwork with the government documenting the date, time, duration, location, and image collection status of every flight.

As is clear from the above, there is no shortage of unsuitable legislative approaches. The best solutions are those that increase privacy protections without impeding reasonable, non-privacy-violating uses. Laws addressing data retention by government UAS users are one possible example. It is also reasonable to require law enforcement agencies to keep thorough records identifying the details of flight operations, including the date and time, location, who was operating the aircraft, and what sort of data was collected.[296]

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294. *What is AMA?*, ACAD. MODEL AERONAUTICS, http://www.modelaircraft.org/files/102.pdf (last visited Feb. 1, 2013).

295. *Academy of Model Aeronautics National Model Aircraft Safety Code* para. B(1), ACAD. MODEL AERONAUTICS, http://www.modelaircraft.org/files/105.pdf (last visited Feb. 1, 2013).

296. Laws specifically addressing UAS image data retention would raise the issue of consistency with respect to retention of data from ground-level, government-operated surveillance cameras.

C. *State and Local Legislation and the Scope of Federal Preemption*

The prospect of state and local UAS privacy regulation raises the issue of federal preemption.[297] Higher courts have repeatedly ruled that aircraft safety regulation has been preempted by the federal government. In 2007, the Ninth Circuit held that "[t]he [Federal Aviation Act] and regulations promulgated pursuant to it establish complete and thorough safety standards for air travel, which are not subject to supplementation by, or variation among, state laws."[298] Similarly, a 1999 Third Circuit ruling stated "[b]ecause the legislative history of the FAA and its judicial interpretation indicate that Congress's intent was to federally regulate aviation safety, we find that *any* state or territorial standards of care relating to aviation safety are federally preempted."[299]

Aircraft noise is another aviation-related field that has been federally preempted. In a 1973 decision involving Burbank's right to establish an airport curfew to address noise concerns, the Supreme Court ruled that the federal government "has full control over aircraft noise, preempting state and local control."[300] And in 1978, the Airline Deregulation Act included an express preemption prohibiting states from enacting laws "related to a price, route, or service of an air carrier that may provide air transportation."[301]

Yet this does not prevent states from passing any laws relating to how aircraft are flown. Reckless operation of aircraft is

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297. As the Supreme Court explained in a 1987 ruling, "when acting within constitutional limits, Congress is empowered to pre-empt state law by so stating in express terms." Cal. Fed. Sav. & Loan Ass'n v. Guerra, 479 U.S. 272, 280 (1987). In addition, "congressional intent to pre-empt state law in a particular area may be inferred where the scheme of federal regulation is sufficiently comprehensive to make reasonable the inference that Congress 'left no room' for supplementary state regulation. . . . As a third alternative, in those areas where Congress has not completely displaced state regulation, federal law may nonetheless pre-empt state law to the extent it actually conflicts with federal law." *Id.* at 280–81 (citation omitted).

298. Montalvo v. Spirit Airlines, 508 F.3d 464, 468 (9th Cir. 2007).

299. Abdullah v. Am. Airlines, 181 F.3d 363, 371 (3d Cir. 1999).

300. City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624, 633 (1973).

301. 49 U.S.C. § 41713(b)(1) (2006); *see also* John Maggio & Allison M. Surcouf, *Federal Preemption in The Field of Aviation*, 78 J. TRANSP. L., LOGISTICS & POL'Y 243, 249–50 (2011).

prohibited by both FAA regulations[302] and criminal statutes in many states. In ruling that a Maryland law making it a crime to "operate an aircraft . . . in a careless or reckless manner so as to endanger the life or property of another"[303] was not preempted by federal law, the Maryland Court of Appeals wrote that it "would be incongruous indeed, in light of the federal purposes and objectives, if Maryland were to be constitutionally precluded from the criminal prosecution of a person for such conduct because a federal regulation authorized civil penalties."[304] More generally, the court observed, "[w]e have no difficulty whatever in deciding that Congress has not occupied the entire field of aeronautics by the Federal Aviation Act of 1958."[305] Thus, federal preemption is complex both generally[306] and with respect to aviation.[307]

A state does not have the authority to enact UAS privacy laws that would decrease the safety of flight operations. A state law aiming to prevent UAS from hovering for too long over a home by requiring a certain minimum speed would raise concerns with respect to airspace safety, and would be unlikely to withstand a legal challenge. On the other hand, although it would be unadvisable, a state or municipality could enact legislation forbidding the use of any public funds to purchase or operate unmanned aircraft. There is also a gray area between these two extremes. State laws attempting to limit where and how government UAS can be operated, the resolution of the cameras they carry, or the retention of the data they collect would almost certainly be subject to preemption challenges.

From a preemption standpoint, the safest legislative role for states with respect to UAS privacy lies in minimizing privacy abuses by non-government UAS operators. State power to address trespass, invasion of privacy, harassment, and stalking is well established. Current civil and criminal statutes in those areas were drafted in an era, which is now ending, when UAS

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302. 14 C.F.R. § 91.13 (2006).

303. Ward v. State, 374 A.2d 1118, 1118 (Md. 1977) (quoting MD. ANN. CODE. art. 38, § 1 (1971), *repealed by* Acts 2004, Ch. 26, § 1 (2004)).

304. *Id.* at 1125.

305. *Id.* at 1123–24.

306. See Geoffrey C. Hazard, Jr., Quasi-Preemption: Nervous Breakdown in Our Constitutional System, 84 TUL. L. REV. 1143, 1145 (2010).

307. *See* Maggio & Surcouf, *supra* note 301, at 243.

were not widely accessible to private citizens. As a result, in many cases these laws fail to anticipate some of the unique ways in which UAS in the hands of irresponsible operators could be used to threaten privacy. These statutes should be reexamined to identify and close any loopholes that might be exploited.

State UAS privacy regulations also run the risk of being undermined by the physics and geometry of flight. Consider a UAS operated over Maryland, at the Virginia border, and at a high enough altitude to obtain very precise imagery of activities in Virginia five miles south of the Potomac River.[308] While the operators of the UAS would certainly need to comply with federal and Maryland laws, they could very credibly argue that their data collection practices should not be subject to Virginia law.[309] The scenarios that could play out in relation to municipal-level regulations are even more varied. If Berkeley, California, were to prohibit its police department from purchasing or using UAS, a UAS owned and operated by the City of Oakland, which is adjacent to Berkeley, could easily remain over Oakland while acquiring video of portions of Berkeley. The Oakland UAS could also freely cross into the airspace over Berkeley.

The early months of 2013 have seen a significant increase in UAS-related legislative activity at the state and local levels. To cite some of the many examples, in February 2013 the Virginia General Assembly passed a bill that, if signed into law by the Governor, would place broad restrictions on state and local law enforcement UAS use until July 2015.[310] An Oregon Senate bill, if enacted, would prohibit certain UAS uses within what it defines as the "Airspace of Oregon"; that is, "the space above the ground that is not part of airspace governed by federal law." [311]

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308. In this hypothetical scenario, it is assumed that the flight would occur outside the restricted zone in the Washington, D.C., area. *See Notice to Airmen 0/8326*, FED. AVIATION ADMIN., http://tfr.faa.gov/save_pages/detail_0_8326.html (last visited Feb. 1, 2013).

309. The ability of state law to reach high into the sky is questionable even in its "own" airspace. It is doubtful, for example, that a state could enact a valid law prohibiting passengers in commercial airliners flying over the state at 36,000 feet from taking pictures through the aircraft windows of the scenery below.

310. Jason Koebler, *Virginia Becomes First State to Pass Drone Regulations*, US NEWS, Feb. 5, 2013, http://www.usnews.com/news/articles/2013/02/05/virginia-becomes-first-state-to-pass-drone-regulations-.

311. S.B. 71, 77th Legis. Assemb., Reg. Sess. (Or. 2013), *available at* http://www.leg.state.or.us/13reg/measures/sb0001.dir/sb0071.intro.html.

Other states in which UAS-related measures have been introduced include California,[312] Florida,[313] and Texas.[314]

CONCLUSION

The only certain aspect of the debate about unmanned aircraft and privacy is that it will be contentious. Some people believe that there is no need to create new laws,[315] whereas others believe that UAS "could be just the visceral jolt society needs to drag privacy law into the twenty-first century."[316]

In the quarter of a century since *Ciraolo*, the cost of sophisticated imaging technology has plummeted. UAS will make it easy to put that technology in the air. Thus, the constitutionality of government UAS observations of a home or its curtilage using imaging technology that is both sophisticated and in general public use is certain to be tested.

None of the key Supreme Court precedents definitively resolve this issue. *Ciraolo* and *Riley* involved naked eye observations. *Dow Chemical* involved a camera that was both widely available and sophisticated for its time, but did not concern a home or curtilage. In *Kyllo*, the Court considered the thermal imager to be nonroutine. And *Jones* concerned GPS, not imaging.

In combination, however, these rulings indicate that the Fourth Amendment is likely to provide significantly more protection from government UAS observations than is commonly assumed. At the very least, the Court will not grant the government the unconstrained power to perform warrantless UAS surveillance. Instead, the Court is more likely to adopt a test tied to the amount of detail revealed as opposed to the level of technology diffusion. Under that standard, even unsophisticated imag-

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312. S. B. 15, 2013–2014 Legis., Reg. Sess. (Cal. 2013), *available at* http://www.leginfo.ca.gov/pub/13-14/bill/sen/sb_0001-0050/sb_15_bill_20121203_introduced.html.

313. S.B. 92, 2013–2014 Legis., Reg. Sess. (Fla. 2013), *available at* http://www.flsenate.gov/Session/Bill/2013/0092/BillText/Filed/PDF.

314. *See* Robert Stanton, *Bill wants to make sure drone owners aren't neighborhood spies*, HOUSTON CHRONICLE, Feb. 6, 2013, http://www.chron.com/news/houston-texas/houston/article/Bill-wants-to-make-sure-drone-owners-aren-t-4256365.php.

315. *E.g.*, Jim Harper, *Old Laws Can Cover New Technologies*, N.Y. TIMES, Feb. 22, 2012, http://www.nytimes.com/roomfordebate/2012/02/20/civilian-drones-in-the-united-states/old-laws-can-cover-new-technologies.

316. M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 STAN. L. REV. ONLINE 29, 29 (2011), http://www.stanfordlawreview.org/online/drone-privacy-catalyst.

ing technology might lead to a Fourth Amendment violation if it is misused in a low-flying government UAS, while images from a sophisticated camera flown at a high altitude might reveal very few details and raise no constitutional concerns.

When considering potential new statutory UAS privacy protections, it is helpful to keep in mind what has occurred with the Internet and mobile telephones, two technologies that are associated with privacy threats that are in some respects much more significant than those that will arise from unmanned aircraft. Both the Internet and mobile phones grew as fast as their underlying technologies enabled. As a result, the public and legislative dialogue regarding how best to address the privacy issues they raise has been conducted with a strong appreciation of their benefits. By contrast, while the privacy concerns associated with domestic UAS are real and deserving of attention, they are getting significant focus long before the potential benefits of the technology are widely recognized.

This early consideration creates both opportunities and risks. The opportunities lie in the ability to proactively address the privacy issues associated with a new technology before it becomes common. The risks lie in letting this information imbalance—in which the privacy downsides are well-known but the benefits are not—lead to correspondingly imbalanced legislative approaches.

If, in 1995, comprehensive legislation to protect Internet privacy had been enacted, it would have utterly failed to anticipate the complexities that arose after the turn of the century with the growth of social networking and location-based wireless services. The Internet has proven useful and valuable in ways that were difficult to imagine over a decade and a half ago, and it has created privacy challenges that were equally difficult to imagine. Legislative initiatives in the mid-1990s to heavily regulate the Internet in the name of privacy would likely have impeded its growth while also failing to address the more complex privacy issues that arose years later.

Thus, while it is important to proactively consider how to protect against the privacy abuses UAS could make possible, in doing so it is important to recognize the near impossibility of predicting all of the ways that a rapidly developing technology can be used—for good or for ill—in future years. Maintaining that perspective will be vital in achieving good UAS policy outcomes.

Pilotless Drones - Congressional Research Service (2012)

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Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System

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Summary

Growing interest in the use of unmanned aerial vehicles (UAVs), particularly for homeland security and law enforcement applications, has spurred considerable debate over how to accommodate these unmanned aircraft and keep them safely separated from other air traffic. Additionally, the use of these pilotless aircraft, popularly referred to as drones, for aerial surveillance and law enforcement purposes has raised specific concerns regarding privacy and Fourth Amendment rights and potential intrusiveness. These issues have come to the forefront in policy debate in response to provisions in the FAA Modernization and Reform Act of 2012 (P.L. 112-95) that require the Federal Aviation Administration (FAA) to begin integrating unmanned aircraft into the national airspace system by the end of FY2015.

While drones have been used extensively by the military and small radio-controlled model aircraft have been around for more than 50 years, advances in more complex vehicle controls and imaging sensor capabilities are spurring public sector and commercial interest in unmanned aircraft for a variety of purposes, including law enforcement, homeland security, aerial imaging, and scientific research. FAA currently approves public entities (such as federal agencies, public universities, and local police departments) to operate UAVs on a case-by-case basis, but growing interest is making this approach increasingly untenable. Moreover, commercial users are seeking authorization to fly drones, but so far FAA has only allowed test and demonstration flights by manufacturers. FAA faces a number of challenges to address anticipated growth in demand for civilian UAV operations and develop regulations governing the certification and operation of unmanned aircraft systems in domestic airspace.

Congress has generally supported efforts to integrate unmanned aircraft into the national airspace system and foster growth in the unmanned aircraft industry. It enacted extensive provisions in P.L. 112-95 that are designed to streamline and accelerate the operation of unmanned aircraft in domestic airspace by both public entities and commercial operators. Notably, that law requires FAA to issue regulations pertaining to the operation of small UAVs (weighing less than 55 pounds) and requires FAA to create and implement a plan to begin the integration of unmanned aircraft into the national airspace system by the end of FY2015. Toward that goal, the act requires FAA to establish six test ranges throughout the United States to study unmanned aircraft integration technical issues.

The act establishes an ambitious timeline for FAA to grapple with and resolve a number of complex issues regarding the safety and security of unmanned aircraft operations. Furthermore, aircraft operators have expressed specific concerns that drone operations should not result in airspace restrictions or other measures that could limit accessibility to the national airspace system.

In addition to these various challenges, the privacy implications and potential intrusiveness of drone operations have emerged as a significant issue before Congress. Civil liberties and privacy groups have cautioned that voluntary industry measures, including a code of conduct to, among other things, respect privacy, are inadequate to assure that drones will not be misused in ways that could infringe upon the privacy of individuals and intrude upon their daily activities. Moreover, FAA's authority over specific uses of civilian unmanned aircraft appears limited so long as safety and national security are not compromised, raising additional concerns that future drone operations could lead to complaints and lawsuits over noise, intrusiveness, and interference with the use and enjoyment of public or private property.

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Background

In the early 2000s, military and intelligence use of unmanned aircraft systems (UASs)[1] in Afghanistan and Iraq spurred interest in potential domestic use of these systems. The safe integration of unmanned aircraft in the crowded airspace above the United States poses a number of regulatory challenges for the Federal Aviation Administration (FAA) and raises some unique legal and ethical questions. These issues have come to the forefront following enactment of the FAA Modernization and Reform Act of 2012 (P.L. 112-95), which requires FAA to begin integrating unmanned aircraft into the national airspace system by the end of FY2015.

Military Roots

While much of the policy debate surrounding civilian use of unmanned aircraft is new, unmanned aircraft have been used by the military since the early days of aviation. During World War I, the Navy funded research to develop a prototype flying bomb called the Hewitt-Sperry Automatic Airplane. Building on this concept, the first full-scale powered unmanned aerial vehicles, the Curtiss-Sperry Flying Bomb and the Kettering Aerial Torpedo, nicknamed the "Bug," were developed in 1918 as unpiloted bomb delivery platforms. The "Bug" was designed to fly a pre-set course, then shed its wings delivering an explosive payload that would detonate on impact. It was never used in combat, and further development was halted in the 1920s.[2] As evidenced by these early prototypes, the U.S. military has long had an interest in unmanned aircraft, which evolved into the development of several successful guided missile designs during World War II.

The military has used autonomous target drones and remotely piloted vehicles extensively since the 1950s. These vehicles first served as targets for training combat pilots and as decoys in combat arenas, but their roles evolved with advances in sensor technology, allowing them to take on more advanced aerial reconnaissance roles.

In the 1980s, spurred by Israeli initiatives, the military developed more sophisticated unmanned systems with extensive ground-based command and control capabilities. Unmanned aircraft were used by U.S. forces for intelligence missions in the Balkans in the late 1990s, and in Afghanistan and Iraq for reconnaissance and surveillance as well as, more recently, for combat missions.[3] In support of military research, development, testing, and training, the military now operates unmanned aircraft extensively in U.S. airspace. The military services work closely with FAA to designate special use airspace for conducting unmanned aircraft operations, typically over military bases or sparsely populated land.

[1] Unmanned aircraft systems (UASs) refer to aircraft that fly without onboard pilots along with ground control stations, networks, and personnel needed to operate these aircraft. Unmanned aerial vehicles (UAVs) refer to the unmanned aircraft in these systems, which are often referred to as drones in the media. The terms UAVs, unmanned aircraft, and drones are used interchangeably throughout this report.

[2] Kettering Aerial Torpedo Bug, *Fact Sheet*, National Museum of the Air Force: Dayton, Ohio, available at http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=320.

[3] For further information on military and intelligence UASs see CRS Report R42136, *U.S. Unmanned Aerial Systems*, by Jeremiah Gertler.

From Longtime Hobby to a Burgeoning Civilian Market

Until recently, civilian interest in operating unmanned aircraft in U.S. airspace had largely been limited to long-standing hobbyist use of radio-controlled model aircraft. The Academy of Model Aeronautics, a national organization representing model aviation enthusiasts, was founded in 1936 and claims a membership of more than 150,000.[4] It serves as the chartering organization for more than 2,400 model airplane clubs across the United States. At present, radio-controlled model aircraft operate under a voluntary standard that generally permits flights only below 400 feet above the surface. These guidelines specify that model aircraft be flown away from populated areas and not in close proximity to full-scale aircraft. They further request coordination with air traffic facilities when planning operations within 3 miles of an airport and suggest that model aircraft be adequately flight tested before being operated in front of spectators.[5]

While most radio-controlled model aircraft are powered by small propeller engines and weigh only a few pounds, some are jet-powered scale models weighing over 100 pounds. The distinction between functional model aircraft and small unmanned aerial vehicles is, therefore, largely based on an aircraft's use rather than its size or capabilities: whereas model aircraft are regarded as being used for recreational purposes, UAVs serve public use missions, such as law enforcement and disaster relief, and commercial applications. The prospect of robust growth in use of UAVs had triggered more formal analysis of the process for granting approvals and development of regulations for UAV operations. The challenges associated with safely integrating civilian UAVs into domestic airspace are discussed in detail below (see "Domestic Airspace Integration Issues").

Flight missions considered to be "dirty, dull, or dangerous" are regarded as prime candidates for the use of unmanned aircraft. Examples include aerial surveillance missions for homeland security, border protection, and law enforcement; highway traffic monitoring; forest fire scouting; disaster response; aerial applications of pesticides; pipeline and transmission line inspection; aerial surveying and geospatial imaging; atmospheric and environmental science; wildlife and natural resources management; scientific data collection; and hurricane and severe storm monitoring. Some industry experts foresee eventual use of unmanned aircraft for cargo transport. At this point, however, passenger-carrying UAVs are not on the horizon.

Industry analysts anticipate a robust market for unmanned aircraft systems, although the extent to which civilian sales will contribute to this market is highly dependent on how the regulation of civilian drones proceeds. The Teal Group, an aviation and aerospace consulting firm, predicted that, over the next ten years, annual spending on unmanned aircraft systems and sensor payloads will increase by 73% and worldwide spending on unmanned aircraft systems will total $89 billion, with the United States accounting for 62% of the research and development spending and 55% of procurement totals.[6] Similarly, VisionGain, a UK-based business information provider, foresees strong demand for unmanned aircraft payloads and subsystems, as well for UAV flight training and simulation.[7]

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[4] For additional information see the Academy of Model Aeronautics (AMA) website at http://www.modelaircraft.org.

[5] Federal Aviation Administration, *Model Aircraft Operating Standards*, Advisory Circular AC 91-57, June 9, 1981, Washington, DC.

[6] Teal Group Corporation, *Teal Group Predicts Worldwide UAV Market Will Total $89 Billion in Its 2012 UAV Market Profile and Forecast*, available at http://tealgroup.com/index.php/about-teal/teal-group-in-the-media/3/79-teal-group-predicts-worldwide-uav-market-will-total-89-billion-in-its-2012-uav-market-profile-and-forecast.

[7] VisionGain, *The UAV Payload and Subsystem Market 2012-2022*, July 19, 2012, available at
(continued...)

Unmanned Aircraft Designs

Unmanned aircraft come in all shapes and sizes. They range in size from bug-sized "nano drones" to vehicles the size and weight of large business jets. Small UAVs have an upper weight limit of 55 pounds. Typical civilian drones are likely to fall in the range of a few pounds up to that weight limit, while medium-sized unmanned aircraft, like the MQ-9 Predator 2/Reaper (with a 65-foot wingspan and a maximum takeoff weight of about 10,000 pounds) may be used on more specialized, medium-altitude and high-altitude, long-duration missions like border and maritime patrols and environmental research missions. Unmanned aircraft include fixed-wing airplanes, helicopters, rotorcraft, and even blimps. Unmanned aircraft may also include certain vehicles, referred to as optionally piloted vehicles, that are capable of being flown by a pilot as a conventional aircraft or being operated remotely or autonomously depending on mission conditions, needs, and requirements. **Figure 1** provides a montage of various unmanned systems illustrating a range of different vehicle sizes and designs including (clockwise from top left) the hand-launched AeroVironment RQ-20 Puma; an unmanned version of the Kaman K-MAX external load helicopter operated by the U.S. Marine Corps; the Honeywell RQ-16 "Tarantula" T-Hawk; the AAI RQ-2 Pioneer; and the "Altair" variant of the General Atomics MQ-9 Predator 2/Reaper.

Figure 1. A Variety of Small to Medium-Sized Unmanned Aircraft Designs

Sources: Clockwise from top left, U.S. Army, U.S. Marine Corps, U.S. Army, U.S. Army, National Oceanographic and Atmospheric Administration (NOAA).

(...continued)

http://www.visiongain.com/Report/857/The-UAV-Payload-and-Subsystems-Market-2012-2022; VisionGain, *The UAV Flight Training & Simulation Market 2012-2022*, May 17, 2012, available at http://www.visiongain.com/Report/823/The-UAV-Flight-Training-Simulation-Market-2012-2022.

While a substantial portion of this market will be accounted for by the defense sector, manufacturers are increasingly looking toward the civilian sector, fearing that military sales may stagnate as operations in Afghanistan are scaled back and U.S. defense budgets grow tighter. However, some forecasters have concluded that growth in the civilian market is unlikely until a regulatory framework allowing routine UAS operations is established.[8] FAA anticipates that once such regulations are put in place, roughly 10,000 active civilian UASs will commence operations within the first five years.[9]

It is important to distinguish public-use missions from purely civilian activities involving UAVs, although certain commercial operations, such as utility line inspection, may serve a public benefit. The distinction matters because aircraft owned or leased by federal and state agencies, counties, and municipalities, are regulated differently from civil aircraft operated by private individuals and corporations.[10] Although the regulatory distinctions are complex, in general, FAA oversight and authority over public-use aircraft are more limited. For this reason, some public-sector entities, particularly homeland security and law enforcement agencies and public universities, are already making limited use of UAVs while the commercial market awaits FAA regulatory action.

Congressional Interest and Related Legislation

Congress has generally been supportive of efforts to integrate unmanned aircraft into the national airspace system and foster growth in the unmanned aircraft industry. Through oversight and legislation, it has pushed FAA to accelerate its regulatory processes regarding the certification and operation of unmanned aircraft.

UAVs in Vision 100—The Century of Aviation Reauthorization Act

In 2003, Congress included language in Vision 100—The Century of Aviation Reauthorization Act (P.L. 108-176) specifying that the Next Generation Air Transportation System (NextGen), which FAA is developing to handle air traffic control, shall "accommodate a wide range of aircraft operations, including airlines, air taxis, helicopters, general aviation, and *unmanned aerial vehicles*."[11] That language set the stage for ongoing policy and technical consideration of how to best accommodate unmanned aircraft in the future airspace system.

While unmanned aircraft were only briefly mentioned in the act, the specific language requiring that they be accommodated in the design of NextGen served as an important step toward recognizing that drones would likely play a significant role in the aviation system of the future. Nearly a decade later, unmanned aircraft have evolved considerably, and the importance of

[8] U.S. Government Accountability Office, *Unmanned Aircraft Systems: Use in the National Airspace System and the Role of the Department of Homeland Security*, Statement of Gerald L. Dillingham, Ph.D., Director, Physical Infrastructure Issues, Before the Subcommittee on Oversight, Investigations, and Management, Committee on Homeland Security, House of Representatives, July 19, 2012, GAO-12-889T.

[9] Federal Aviation Administration, *FAA Aerospace Forecasts FY2012-2032*, p. 57.

[10] 49 U.S.C. §40125 specifies the qualifications for public aircraft status.

[11] P.L. 107-76, Section 709c(6), italics added.

considering them in aviation regulation and the design and operation of the national airspace system has become a major policy and technical consideration.

Provisions of the FAA Modernization and Reform Act of 2012

During debate over the most recent FAA reauthorization, the integration of unmanned aircraft in national airspace was an issue of considerable interest. The resulting legislation, the FAA Modernization and Reform Act of 2012 (P.L. 112-95) contained extensive provisions designed to promote and facilitate the use of civilian unmanned aircraft. These included mandates for

- development of an integration plan that is to commence by the end of FY2015, if not sooner, along with a five-year roadmap for achieving integration objectives;
- selection of six test sites to study UAV integration into the national airspace system;
- designation of certain permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for commercial and research purposes, including flights conducted beyond line-of-sight;
- a simplified process for issuing authorizations for entities seeking to operate public UASs in the national airspace system;
- a collaborative process to incrementally expand airspace access as technology matures and safety data and analysis become available, and to facilitate public agency access to UAS test ranges;
- a requirement to develop and implement operational and certification requirements for public UASs by December 31, 2015; and
- an exemption from rules and regulations pertaining to the operation of unmanned aircraft for model aircraft weighing 55 pounds or less that are flown within visual line-of-sight strictly for hobby or recreation.

Current FAA Policy and Oversight

The provisions in P.L. 112-95 reflect a general view that FAA's slow progress to date on addressing regulatory requirements for unmanned aircraft may be a barrier to civilian drone operations. While FAA has been studying unmanned aircraft operations for almost a decade, it continues to address requests to operate unmanned aircraft on a case-by-case basis. This approach is becoming increasingly untenable as growing numbers of public and commercial entities seek authorization to operate unmanned aircraft in domestic airspace.

On February 13, 2007, FAA issued a notice of policy declaring that "no person may operate a UAS in the National Airspace System without specific authority."[12] This policy applies to both public and private unmanned aircraft. FAA currently has two methods for granting authority to operate unmanned aircraft, depending on whether the operator is a public or a private entity.

[12] Federal Aviation Administration, "Unmanned Aircraft Operations in the National Airspace System," *Federal Register*, 72(39), February 13, 2007, 6689-6690.

Current Approvals Process

Unmanned aircraft operated by the military or other federal, state, or local agencies must obtain a Certificate of Waiver or Authorization (COA) from FAA. Since 2006, FAA has issued COAs to more than 100 unique public entities throughout the United States, ranging from local fire departments to research laboratories. Since the COAs have narrow scopes and durations, entities must obtain new authorizations every few months. In 2009, FAA issued 146 such COAs. In 2010, the number of COAs issued grew to 298.[13] Although FAA has streamlined its approval process, as required by P.L. 112-95, growing interest in operating unmanned aircraft from public entities is expected to place strains on the current case-by-case approach to authorization.

Additionally, in much the same manner as manned aircraft developers and builders must obtain FAA certification to test fly their aircraft, a number of drone developers have received special airworthiness certificates in the experimental category. Special airworthiness certificates, which offer the only legal route for private entities to operate unmanned aircraft for commercial purposes, have been issued on a limited basis for flight tests, demonstrations, and training.

FAA has raised concerns that other civilian users are operating commercial UAVs under the voluntary guidelines issued in the early 1980s that were intended to apply only to recreational users of model aircraft. As previously described, these guidelines advise such users to maintain altitudes lower than 400 feet above the ground, select sites away from populated and noise-sensitive areas, give right of way to full-scale aircraft, and advise airport operators and air traffic facilities if operating within 3 miles of an airport. The FAA statement of policy clarifies that these general guidelines alone are not sufficient for commercial operators of unmanned aircraft, regardless of the size of such aircraft. The FAA did, however, indicate that it has undertaken a safety review to determine whether certain small, slow-moving unmanned aircraft could be safely operated under a similar set of guidelines without requiring special airworthiness certification.

Regulating Small Unmanned Aircraft

Developers of small-scale unmanned aircraft are concerned that FAA has been moving too slowly on measures to safely accommodate these types of aircraft. Since 2007, industry has been pushing for separate regulations for "ultralight, low-speed, short-life UASs that will not be flying over populated areas or in controlled airspace," arguing that a one-size-fits-all approach to regulation would not likely be effective given the wide range of systems being considered for civilian use.[14]

Other than streamlining the case-by-case approvals process, FAA has not taken any formal action addressing the regulation of civilian small unmanned aircraft. After several delays, FAA plans to release a proposed rule regarding the certification and operation of small unmanned aircraft systems (sUAS) in October 2012, as a step toward meeting the August 2014 statutory deadline for issuance of a final rule. Additionally, P.L. 112-95 directed FAA to assess whether certain unmanned aircraft operations do not pose a safety hazard or a threat to national security and can therefore safely be allowed. Actions to address this mandate are currently in progress.

[13] Federal Aviation Administration, *Fact Sheet: Unmanned Aircraft Systems (UAS)*, Updated July 2011, available at http://www.faa.gov/about/initiatives/uas/media/UAS_FACT_Sheet.pdf.

[14] David Hughes, "Civil Use of Unmanned Aircraft Systems Could Grow Rapidly," *Aviation Week and Space Technology*, February 12, 2007, p. 49.

Wide Scale Integration of Unmanned Aircraft in Domestic Airspace

UAV manufacturers and users are seeking a regulatory structure for the certification of UAV systems and approval for operation in domestic airspace. Ideally, operators of approved systems want the ability to "file and fly," meaning that they would be granted vehicle certification with broad operating authority akin to current manned aircraft certification standards. Such regulation would potentially allow unmanned aircraft operators to file routine flight plans, or in some cases simply carry out flight operations without any specific notification requirements, much as manned aircraft do.[15] While FAA's approach to address the mandates set forth in P.L. 112-95 regarding unmanned aircraft integration into the national airspace system is yet to be defined, it is most likely that FAA regulation and oversight of UAVs will adopt an evolving, risk-based approach toward this end goal of seamless integration.

As a first step, P.L. 112-95 mandated that FAA identify six test sites to specifically test concepts and technologies for integrated unmanned aircraft operations. FAA held public meetings and webinars and solicited public comments on the selection of test sites in March 2012, but has not yet gone through a formal source selection process or announced further details regarding test site selection, even though it was mandated to identify the sites by the summer of 2012 and have at least one site operational by February 2013.

Under P.L. 112-95, FAA is also required to develop a comprehensive plan to safely accelerate integration of civilian unmanned aircraft into the national airspace system as soon as practical but not later than September 2015. Meeting this mandate will require extensive research and regulatory action over the next three years.

Domestic Airspace Integration Issues

Key challenges to drone integration in domestic airspace include safety concerns, potential security risks, and concerns regarding airspace restrictions and possible disruptions to manned flight operations.

Safety Concerns

Threshold criteria for integrated unmanned aircraft operations are that UAVs do not pose undue risk other aircraft or compromise safety to persons or property on the ground.[16] To meet safety objectives, UASs will require technology and standard procedures for sensing and avoiding other air traffic under all possible scenarios, including lost communications. System reliability and human factors are important systems design considerations, as are training and qualification standards for drone pilots, unmanned aircraft systems operators, and other safety-critical personnel.[17]

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[15] Katherine McIntire Peters and Beth Dickey, "Droning On," Government Executive, October 15, 2004, pp. 68-76.

[16] Federal Aviation Administration, *Fact Sheet: Unmanned Aircraft Systems (UAS)*, Updated July 2011, available at http://www.faa.gov/about/initiatives/uas/media/UAS_FACT_Sheet.pdf.

[17] *Drone pilots* refers to ground personnel responsible for direct flight control of the unmanned vehicle whereas the term *systems operators* refers to personnel responsible for operating sensor payloads or other aircraft systems, such as fuel systems, that do not involve direct manipulation of flight controls or flight guidance systems. Other safety critical (continued...)

Sensing and Avoiding Other Air Traffic

Domestic airspace accommodates more than 70,000 flights per day[18] at a variety of altitudes, including low- and high-altitude military training flights, high-altitude air carrier and business jet flights, medium-altitude commuter and general aviation flights, and low-altitude recreational and sightseeing flights and helicopter operations. The risk of collision between these users and unmanned aircraft must be adequately mitigated before unmanned aircraft can routinely utilize the national airspace system.

The Government Accountability Office (GAO) concluded that no suitable technology is currently available to provide unmanned aircraft, particularly small UAVs, with the detect, sense, and avoid requirements needed to safely operate within the national airspace system. GAO noted that small unmanned aircraft pose a particular challenge because they operate at low altitudes. Many other aircraft operating at these altitudes do not use electronic transponders to broadcast their position and altitude, and in any case many small UAVs lack the ability to receive transponder signals. The needed equipment is simply too large and heavy to install on many small UAVs.[19]

Currently, these limitations substantially restrict UAV operations to line-of-sight scenarios, where operators on the ground or spotters in chase planes can provide the necessary capabilities to detect and avoid other air traffic. FAA is currently evaluating options for routinely allowing small unmanned aircraft to use line-of-sight as an acceptable means to detect and avoid manned aircraft under a regulatory regime for small UAVs.

For more sophisticated medium and large-sized UAVs seeking approval for operations beyond line of sight, technology advancements are needed to assure safety in an environment shared with manned flights. Remote sensing capabilities, including onboard cameras, airborne radars, and equipment to interrogate aircraft transponder signals (similar to the traffic collision avoidance systems on jetliners) can combine to provide operators with robust air traffic information.

An emerging technology, Automated Dependent Surveillance-Broadcast (ADS-B) will be required on manned aircraft by 2020 and will serve as the principal means for aircraft tracking under NextGen. Using ADS-B, aircraft will broadcast precise global positioning system (GPS) location information to air traffic controllers and other air traffic, potentially including unmanned aircraft. While ADS-B may provide unmanned aircraft operators with the capability to gather precise position and flight path information for nearby air traffic in the future, backup systems will likely be needed because ADS-B transmission and reception may not be guaranteed all the time.

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personnel may include maintenance personnel and equipment technicians that service the air vehicle, the ground station or command and control linkages between the vehicle and the ground station.

[18] Based on 2010 total combined aircraft operations at towered airports reported in Federal Aviation Administration, *FAA Aerospace Forecasts FY2012-2032.* This does not include activity at non-towered airports and, therefore, understates the total number of daily flights, for which there is no definitive count.

[19] U.S. Government Accountability Office, *Unmanned Aircraft Systems: Use in the National Airspace System and the Role of the Department of Homeland Security*, Statement of Gerald L. Dillingham, Ph.D., Director, Physical Infrastructure Issues, Before the Subcommittee on Oversight, Investigations, and Management, Committee on Homeland Security, House of Representatives, July 19, 2012, GAO-12-889T.

FAA has not specifically approved any technology or suite of technologies as being sufficient to provide acceptable "sense and avoid" capabilities.[20] Part of the challenge is that existing technologies do not assure avoidance capabilities under all operational conditions, including autonomous UAV operations or in situations when UAVs lose their command guidance links with ground control facilities. Standardized procedures for responding when UAV guidance has been lost are currently lacking, but will be needed to ensure that air traffic controllers and airspace managers can redirect nearby traffic and mitigate collision risks.

No single technology is likely to address the complex sense and avoid requirements that are critical for unmanned aircraft integration. FAA has been working closely with RTCA, Inc., which functions as a federal advisory committee on aviation technologies, to develop consensus standards regarding minimum aviation system performance standards for sense and avoid technologies as well as for command, control, and communications systems for unmanned aircraft systems.[21] RTCA has been performing this work under its standards committee on unmanned aircraft systems (SC-203), which is scheduled to complete its work on these issues by December 2013 and intends to publish recommended standards soon thereafter. These standards, along with findings from unmanned aircraft integration testing, will likely form the basis of FAA regulations and guidance regarding sense and avoid technologies and UAV operating procedures.

Mitigating Risks to Persons and Property on the Ground

In addition to risks to other air traffic, unmanned aircraft operations may pose a risk to persons and property on the ground. Thus far, unmanned aircraft testing and operational use, such as for military testing and training and for border and maritime patrol operations, have been conducted largely over sparsely populated areas. In the future, however, law enforcement and commercial users are expected to undertake flights over densely populated areas, a prospect which raises specific concerns over safety procedures. For example, to minimize the likelihood of a crash when communications, command, and control linkages between the vehicle and the ground control station are disrupted, UAVs may need the ability to autonomously return to base.

Drone crashes, such as the 2006 crash of an MQ-9 Predator B drone operated by Customs and Border Protection (CBP) near Nogales, NM, and the more recent crash of a Navy RQ-4A Global Hawk near Salisbury, MD in June, 2012, have raised public concern over the safety of unmanned aircraft operations. While drone safety has improved considerably over the past decade, the accident rate for unmanned aircraft is still far above that of manned aircraft, although direct comparisons are difficult, given that most drone operations examined have involved riskier flying during development and testing and in war and conflict zones.[22]

The risk posed to persons and property on the ground is a function of both crash likelihood and the potential consequences in terms of loss of life, injury, or property damage. While smaller

[20] "Sense and avoid" refers to technologies and capabilities allowing unmanned aircraft to reliably detect other air traffic and maneuver away from such traffic in a manner that adequately mitigates collision risks.

[21] RTCA was organized in 1935 as the Radio Technical Commission for Aeronautics. Today it operates as a private, not-for-profit corporation. Its recommendations are used by FAA as a basis for policy, program, and regulatory decisions.

[22] Roland E. Weibel and R. John Hansman, *Safety Considerations for Operation of Unmanned Aerial Vehicles in the National Airspace System*, MIT International Center for Air Transportation, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, MA, March 2005, Report No. ICAT-2005-1.

UAVs may be expected to crash more frequently, the potential for catastrophic consequences is less given that these vehicles do not weigh enough or carry enough fuel to cause major damage on the ground. On the other hand, larger UAVs, like the MQ-9 Reaper or the RQ-4 Global Hawk, can potentially cause as much damage as a mid- to large-sized corporate jet. However, safety considerations in the design and operation of these more complex systems may reduce the likelihood of a crash. Additional procedures that can be incorporated into safety regulations for unmanned aircraft systems may further mitigate flight risks. These procedures may include

- formal risk assessments for systems certification and mission planning;
- development of ground impact models and mitigation plans to reduce risks to persons and property on the ground;[23] and
- structured training and certification requirements for unmanned aircraft pilots, systems operators, and other safety critical personnel.

Human Factors Considerations

The issue of training and certification requirements for unmanned aircraft systems personnel raises a much broader issue regarding the role of humans in these systems. Indeed, the term *unmanned* aircraft system (UAS) is a misnomer: while the aircraft themselves may be unmanned, the systems needed to operate them safely depend extensively on human interaction. Although drones operate without a pilot on board, human performance is a major consideration in setting policy for the integration of unmanned aircraft systems in domestic airspace. Key human factors to be considered include operator interfaces and controls and the training and qualifications of drone pilots, systems operators, and other safety critical personnel.

The previously mentioned 2006 crash of a UAV operated by Customs and Border Protection (CBP) illustrates the importance of these human factors considerations. On April 25, 2006, a Predator B (MQ-9) drone crashed in a remote area along the U.S.-Mexico border near Nogales, AZ following a loss of engine power. The National Transportation Safety Board (NTSB) determined that the probable cause of the mishap was the drone pilot's failure to follow appropriate procedures when switching to an alternate control console in the ground control station following a computer malfunction.[24] The error resulted in the pilot inadvertently cutting off the vehicle's fuel supply.

CBP had only been operating the Predator B aircraft since September 2005, eight months prior to the mishap. NTSB concluded that during this time CBP was providing a minimal amount of operational oversight of its UAS program and cited its inadequate surveillance of the program as a contributing factor in the crash.

The NTSB investigation revealed that, despite repeated computer malfunctions, neither CBP nor its contractors had a program in place to ensure that maintenance tasks were performed correctly or that corrective measures were applied. The NTSB investigation also found that while the mishap pilot had only 27 hours of flight time with the Predator B model, and had only been given

[23] Ibid.

[24] National Transportation Safety Board, NTSB Identification: CHI06MA121, Aviation Accident Database & Synopses, Probable Cause Approval Date: October 31, 2007. Available at http://www.ntsb.gov/aviationquery/brief.aspx?ev_id=20060509X00531&key=1.

verbal approval to fly the vehicle accompanied by an instructor pilot, the instructor pilot was not present in the ground control station when the error occurred. NTSB further noted that the verbal approval was not standard practice for CBP.

The incident illustrates that, despite the lack of an onboard pilot, human performance considerations are critical in the design of unmanned aircraft systems. The failure that led to the crash was preventable had the system been designed and operated with certain safeguards in place to compensate for human fallibility. Greater attention to human factors considerations in the design and operation of unmanned aircraft systems and in the development of training programs and operational procedures could improve safety and facilitate the integration of unmanned aircraft in the national airspace system.

Operator Training and Qualification

One particularly important human factors consideration for regulators is a determination regarding training standards and minimum qualification requirements for personnel involved in flight operations. The appropriate training and qualifications may depend in part on the size of the aircraft and the complexity of the system, as a "one size fits all" approach may be inappropriate given the diversity among vehicles, systems, and operational missions.

Currently the U.S. Air Force requires its Predator/Reaper and Global Hawk pilots to be pilot-rated military officers.[25] The other military services do not require drones to be operated by rated pilots, but do require specialized training. It is uncertain how these different approaches may serve as a basis for FAA to develop training requirements and qualification standards for civilian UAV pilots and operators, as military approaches vary considerably and are tailored to specific systems and missions.

One approach would be for FAA to develop basic training and certification standards for operators of small UAVs, while requiring more elaborate training and certification requirements for personnel seeking to operate or maintain large, complex unmanned aircraft systems. The extent to which requirements for UAV personnel may overlap with requirements for piloting or maintaining manned aircraft remains uncertain but could have significant implications for the industry's development. One perceived advantage of unmanned aircraft over manned aircraft is lower operating costs, and mandating that unmanned systems have highly trained pilots and operators with specialized certifications could reduce that potential cost advantage.

Another issue may involve medical certification. Medical conditions or poor eyesight preclude some individuals from obtaining pilot certification, and the rigors of the flight environment demand stringent medical requirements. Given the significant differences in the work environment and the potential consequences of medical problems in an aircraft compared to inside a ground control station, FAA may choose to relax some medical requirements to allow certain individuals that would otherwise not be medically fit to fly to operate unmanned aircraft.

[25] See CRS Report R42136, *U.S. Unmanned Aerial Systems*, by Jeremiah Gertler.

Addressing Potential Security Risks

In addition to safety risks, the operation of civilian unmanned aircraft in domestic airspace raises potential security risks, including the possibility that terrorists could use a drone to carry out an attack against a ground target. It is also possible that drones themselves could be targeted by terrorists or cybercriminals seeking to tap into sensor data transmissions or to cause mayhem by hacking or jamming command and control signals.

Drone Weapons

Terrorists could potentially use drones to carry out small-scale attacks using explosives, or as platforms for chemical, biological, or radiological attacks. In September 2011, the FBI arrested Rezwan Ferdaus, a U.S. citizen from Ashland, MA, charging him in a terrorist plot to attack the Pentagon and the Capitol using large model aircraft packed with high explosives. While the small payload of the model aircraft may have limited the lethality of the explosions, Ferdaus planned to recruit others to use assault rifles to target people fleeing the Pentagon after the drone attack.[26] In July 2012, Ferdaus pleaded guilty to attempting to provide material support to terrorists and attempting to damage and destroy federal buildings by means of an explosive in a plea agreement under which additional charges were dropped. The incident has raised specific concerns about potential terrorist attacks using unmanned aircraft, although the payload capacities of small UAVs would limit the damage these attacks could inflict using only conventional explosives.

Intentional Hacking and Signal Jamming

Additionally, unmanned aircraft command and control links could potentially be intentionally jammed or hacked resulting in a loss or hostile takeover of control. For example, Todd Humphreys, an assistant professor at the University of Texas at Austin, demonstrated a remote hijacking of an unmanned aircraft by GPS guidance signals. In congressional testimony, he warned that advances in software-defined radio and the availability of GPS signal simulators may provide average hackers with the capability to interfere with unmanned aircraft operations.[27]

Humphreys recommended that non-recreational civilian unmanned aircraft weighing more than 18 pounds be required to have spoof-resistant navigation systems. More broadly, he recommended that GPS-based timing and navigation systems used in national critical infrastructure also be required to be spoof-resistant. He noted that while "[t]here is no quick, easy, and cheap fix for the civil GPS spoofing problem…reasonable, cost-effective spoofing defenses exist which, if implemented, will make successful spoofing much harder."[28] As a long-range solution, he further recommended that the Department of Homeland Security commit to funding the development and implementation of methods for performing cryptographic authentication of GPS signals, or at least for the augmented GPS signals used for civil aviation.

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[26] Milton J. Valencia, "Ashland Man Faces Terrorism Charges," *Boston Globe*, September 29, 2011.

[27] Todd Humphreys, *Statement on the Vulnerability of Civil Unmanned Aerial Vehicles and Other Systems to Civil GPS Spoofing*, Submitted to the Subcommittee on Oversight, Investigations, and Management of the House Committee on Homeland Security, July 19, 2012.

[28] Ibid. In this context, spoofing refers to transmitting false navigation signals that could cause a drone or aircraft to veer off course.

Additionally, GAO noted that "low cost devices that jam GPS signals are prevalent."[29] However, it concluded that the issue could be mitigated by using additional navigation systems that do not rely on GPS, and/or by encrypting communications and telemetry signals.

Availability and Protection of Radiofrequency Spectrum

GAO also noted that the lack of dedicated radiofrequency spectrum for UAS operations raises the risk of lost communications links due to either unintentional or intentional signal interference.[30] Issues regarding dedicated radiofrequency spectrum for unmanned aircraft, which sometimes involve satellite control links, are typically addressed in an international forum to assure global harmonization. The appropriate forum for such determinations is International Telecommunication Union (ITU), the United Nations agency responsible for global information and communications technologies.

In December 2009, ITU issued guidance on spectrum requirements for safe operation of unmanned aircraft in non-segregated or integrated airspace. It concluded that unmanned aircraft operations will require radiofrequency spectrum for air traffic control, vehicle command and control, and sense and avoid capabilities.[31] In November 2011, it published specific guidance on the technical feasibility and advantages and disadvantages of several candidate frequency bands for beyond line of sight communications, command, and control for unmanned aircraft systems.[32] It did not formally consider or propose regulatory methods for how these frequency bands might be allocated, which would be left up to individual regulatory authorities such as the Federal Communications Commission (FCC) in the United States.

FCC has addressed radiofrequency licensing for UAVs on a case-by-case basis, much as FAA has done for certifying drone flight operations. With continued demand for spectrum from mobile broadband providers, securing dedicated radiofrequency spectrum for unmanned aircraft operations is likely to be an ongoing challenge. Moreover, the protection of radiofrequency signals to prevent potential hacking and spoofing through encryption and other methods has not yet been adequately addressed and remains a threat to the security of unmanned aircraft systems operations.

[29] U.S. Government Accountability Office, *Unmanned Aircraft Systems: Use in the National Airspace System and the Role of the Department of Homeland Security*, Statement of Gerald L. Dillingham, Ph.D., Director, Physical Infrastructure Issues, Before the Subcommittee on Oversight, Investigations, and Management, Committee on Homeland Security, House of Representatives, July 19, 2012, GAO-12-889T.

[30] Ibid.

[31] International Telecommunication Union, ITU-R Radiocommunication Sector of ITU, Characteristics of Unmanned Aircraft Systems and Spectrum Requirements to Support Their Safe Operation in Non-Segregated Airspace, Report ITU-R M. 2171, December, 2009, Geneva, Switzerland.

[32] International Telecommunication Union, ITU-R Radiocommunication Sector of ITU, Frequency Sharing Between Unmanned Aircraft Systems for Beyond Line of Sight Control and Non-Payload Communications Links and Other Existing and Planned Services in the Frequency Bands 13.25-13.40 GHz, 15.4-15.7 GHz, 22.5-22.55 GHz and 23.55-23.60 GHz, Report ITU-R M. 2230, November, 2011, Geneva, Switzerland.

Responsibility for Security Issues

Under the Aviation and Transportation Security Act (ATSA, P.L. 107-71), responsibility for aviation security was transferred from FAA to the newly formed Transportation Security Administration (TSA) in 2001. TSA has not specifically addressed the potential security concerns arising from the operation of drones in domestic airspace.

With regard to matters involving hacking and signal jamming, responsibility for the regulation and oversight of system security is far more complex. While TSA maintains responsibility for airspace security, FAA has regulatory authority over the certification of air vehicles. FAA has not issued certification standards for unmanned aircraft and systems, but future FAA standards may include hardware and software security and reliability assurance requirements.

FAA has worked closely with RTCA and the European Organization for Civil Aviation Equipment (EUROCAE) to define software or information assurance criteria for aircraft systems, and RTCA has released specific guidance on software considerations for airborne systems and equipment. FAA has issued advisory information for aircraft and aircraft equipment manufacturers regarding systems security and software assurance. This information indicates that the RTCA document is only one guideline manufacturers may utilize in applying systems engineering principles to ensure that aircraft component hardware and software are reliable and robust against hacking, signal interference, and other threats.[33]

Additionally, the National Information Assurance Partnership (NIAP), a partnership between the National Security Agency (NSA) and the National Institute of Standards and Technology (NIST), has established common criteria for information technology systems evaluation. Systems meeting the highest levels in the testing process are regarded as having "high robustness," meaning that they have stringent failure protections and rigorous security measures. Some avionics systems for airliners are now being tested using these common criteria methods, although such testing is not currently required. As the issue of unmanned aircraft systems certification is addressed, specific requirements for hardware and software security could be put in place. Additionally or alternatively, drone manufacturers may voluntarily apply various systems engineering and information assurance methods, such as those specified in the RTCA guidance or in the NIAP common criteria methodology, to protect systems against various information security threats.

As with many aspects of unmanned systems, a "one size fits all" approach may not be suitable, and FAA and TSA may choose to adopt a risk-based approach in addressing security matters related to unmanned aircraft operations. Under a risk-based approach, larger, more complex unmanned aircraft may be required to adopt more specific systems security and software and information assurance requirements, while more basic operational security procedures may suffice for small UAVs weighing less than 55 pounds, for example.

In general, a comprehensive approach to security issues pertaining to unmanned aircraft systems operations will likely require close coordination between TSA, FAA, FCC, manufacturers, and operators to address security issues pertaining to systems hardware and software, radiofrequency communications, and flight operations.

[33] Federal Aviation Administration, Advisory Circular 20-115B—Radio Technical Commission for Aeronautics, Inc. Document RTCA/DO-178B, January 11, 1993.

Airspace Restrictions

Besides safety and security, the potential impact of drone operations on airspace accessibility for other aircraft has been raised as a specific concern, particularly among operators of smaller general aviation aircraft.

One significant difference between military unmanned aircraft and unmanned aircraft operated by other public agencies or by civilian users is that the military, for many years, has negotiated with FAA to set aside airspace designated for military training, testing, and other purposes. Military airspace consists of military operations areas, military training routes, test ranges, and other restricted or prohibited airspace. Military operations areas and training routes are typically located in remote areas. While not set aside exclusively for military use, these areas and routes are charted and documented, allowing other airspace users, especially smaller general aviation aircraft, to be alert for military flight operations, including operations involving unmanned aircraft. The military has also worked with FAA to set aside specific restricted and prohibited airspace (e.g., above test sites and bombing ranges) to accommodate operations that pose greater risks to other air traffic. This airspace is charted and documented to allow pilots to avoid these areas when restrictions designating them as off limits to non-military users are in effect.

Airspace restrictions can serve as an effective tool for mitigating risks to civilian air traffic. However, their use concerns some airspace users because they pose inconveniences and sometimes raise additional safety issues. With additional restrictions, civilian pilots may be forced to fly more circuitous routes, leaving pilots with fewer options to avoid bad weather or plan for fuel stops. The Aircraft Owners and Pilots Association (AOPA), which represents more than 400,000 general aviation pilots and aviation enthusiasts across the United States, has been particularly critical of the use of restricted airspace designations to separate unmanned aircraft operations from other air traffic. AOPA has asserted that unmanned aircraft operations should not have a negative impact on general aviation operations and should not require special airspace designations, such as restricted airspace, for their operation.[34] It, however, generally supports the integration of unmanned aircraft so long as they do no harm to current manned operations.[35]

AOPA has been particularly critical of FAA's issuance of temporary flight restrictions (TFRs) to separate CBP drone operations for border surveillance from other air traffic. Testifying before the House Subcommittee on Aviation at a March 2006 hearing, AOPA Executive Vice President for Government Affairs Andrew Cebula stated that "AOPA believes that the use of 'temporary' large-scale flight restrictions for yearlong UAV operations is not appropriate and the FAA needs to fully explore the alternatives available to allow CBP (or any other agency for that matter) to secure our borders without impacting the aviation community."[36]

[34] Aircraft Owners and Pilots Association, *Regulatory Brief Unmanned Aircraft Systems*, Updated January 31, 2008, Frederick, MD, available at http://www.aopa.org/whatsnew/regulatory/unmanned.html.

[35] Benet J. Wilson, "Integrating Manned, Unmanned Vehicles in Airspace System," Aircraft Owners and Pilots Association, Frederick, MD, available at http://www.aopa.org/advocacy/articles/2012/120608intregating-manned-unmanned-vehicles-in-airspace-syste.html.

[36] Aircraft Owners and Pilots Association, Statement of Andrew V. Cebula, Executive Vice President, Government Affairs Concerning Unmanned Aerial Vehicles in the National Airspace System, Before the Committee on Transportation and Infrastructure, Aviation Subcommittee, U.S. House of Representatives, March 29, 2006.

Industry Initiatives

The unmanned aircraft industry, collectively consisting of unmanned aircraft systems and system component manufacturers and system operators, has been cognizant of concerns regarding the operation of unmanned aircraft for civilian uses in domestic airspace. Collectively, the views of drone developers and operators worldwide are represented by the Association for Unmanned Vehicle Systems International (AUVSI). AVUSI has addressed many of the public concerns surrounding UAV operations in a voluntary industry code of conduct issued in July 2012, which is summarized in the text box below.

Voluntary Industry Code of Conduct for Drone Operations

In July 2012, the Association for Unmanned Vehicle Systems International (AUVSI) issued a voluntary industry code of conduct for the operation of unmanned aircraft systems. The code of conduct addresses concerns raised by the public and regulators regarding safety, professionalism, and respect.

With regard to safety, operators adopting the code commit to

- operating in a manner that will not present undue risk to persons or property on the surface or in the air;
- ensuring that vehicles are piloted by competent and properly trained individuals; and
- ensuring that flights are conducted only after thorough risk assessments, including consideration of weather conditions, potential failures and possible consequences, crew fitness for flight operations, airspace issues, applicable aviation regulations, frequency spectrum requirements, and the reliability, performance, and airworthiness of the aircraft.

With regard to professionalism, adopters of the code commit to

- complying with all federal, state, and local laws, ordinances, covenants, and restrictions pertaining to unmanned aircraft operations;
- operating systems as responsible members of the aviation community;
- being responsive to public needs;
- cooperating fully with federal, state, and local authorities in response to emergency deployments, mishap investigations, and media relations; and
- establishing contingency plans for all anticipated non-normal events and sharing these plans openly with all appropriate authorities.

Finally, with regard to respect, operators adopting the code commit to

- respecting the rights of other airspace users;
- respecting the privacy of individuals;
- respecting the concerns of the public regarding unmanned aircraft operations; and
- supporting improved public awareness and education regarding the operation of unmanned aircraft.

Source: Association for Unmanned Vehicle Systems International (AUVSI), Unmanned Aircraft System Operations Industry "Code of Conduct," Arlington, VA.

Eyes in the Sky: Sensor Payloads

A central issue surrounding the use of unmanned aircraft is the airborne sensors, particularly imaging sensors, that are mounted to the underbellies of these vehicles to gather data and collect images of the earth below. While these sensors may be utilized for a variety of beneficial applications, they have also raised considerable concerns regarding their potential intrusiveness, despite the aforementioned industry commitments to respect the privacy of individuals (see "Concerns over Privacy and Intrusiveness" below).

Cameras and Electro-Optical Imagers

Typical cameras and sensors placed on unmanned aircraft can collect data across a broad range of the electromagnetic spectrum, both within and beyond the range of human vision. They can provide aerial surveillance capabilities and spectral data under a wide range of lighting and atmospheric conditions. In many cases, small UAVs used in surveillance applications are simply equipped with commercial, off-the-shelf digital still photograph or video cameras. Usually, for aerial work, high-end digital cameras with image stabilization are needed to provide detailed resolution from a distance and avoid motion blur from the movement and vibration of the aircraft and the camera platform. UAVs used for detailed earth imaging are fitted with more advanced high resolution cameras. These cameras may have advanced optical features, including very large digital imaging arrays, large zoom lenses, and advanced image stabilization capabilities, allowing them to take highly detailed aerial photographs.

Captured videos and images may be transmitted for further processing or, in some cases, may be processed onboard by computer vision and video analytic software. Analytics may include tools such as scene motion detection and analysis, object detection capabilities, license plate readers, and, possibly in some cases, facial recognition software.

Drones may also be equipped with electro-optical sensors that are specifically designed for aerial operations. With regard to their imaging capabilities, electro-optical imagers are similar to high-end consumer digital cameras and typically take either still or video images within the visual electromagnetic spectrum, similar to human visual capabilities. Thus these sensors, like cameras, provide eyes in the sky when operated in good daylight and twilight visual conditions, when not obscured by clouds or fog.

Infrared Sensors

Cameras and electro-optical sensors cannot provide quality images during nighttime operations or when operating in low visibility, such as in clouds or in fog. Therefore, to augment electro-optical imaging capabilities and allow for imaging under a broader range of light conditions, sensor platforms often also include two-dimensional infrared (IR) imaging arrays. Since the longer wavelengths in the IR bands are not absorbed or attenuated by clouds or fog and are emitted by warm objects at night, IR sensors are capable of providing images beyond the capabilities or normal human sight. In the far infrared spectrum, passive millimeter wave sensors provide thermal imaging capabilities particularly for night vision and thermal imaging applications. The thermal sensing properties of IR sensors make them well suited for law enforcement and border security applications, for example, for providing eyes in the sky for foot pursuits. IR sensors are

also important for command and control of UAVs operated beyond line of sight, giving operators improved situational awareness at night and in poor visibility.

Electro-optical and infrared sensors, collectively known as EO/IR sensors, are often housed together in a turret pod with gyro-stabilized gimbals that allow the sensors to move, either at the direction of a preprogrammed mission plan or from commands issued by a sensor operator remotely controlling the device (see **Figure 2**).

Figure 2. An Electro-Optical/Infrared (EO/IR) Sensor Housed in a Pod Mounted on an MQ-9 Predator B/Reaper Drone Operated by Customs and Border Protection (CBP)

Source: Customs and Border Protection (CBP).

Synthetic Aperture Radar

In addition to passive EO/IR sensors, aircraft are sometimes fitted with active synthetic aperture radar (SAR) antennas, which measure reflections of emitted microwaves to generate sensor imagery. Real time SAR imagery can penetrate through rain, fog, smoke and dust, providing surveillance capabilities in poor weather and in maritime and desert environments that can augment or replace IR and millimeter wave sensors. Some civilian applications of SAR include maritime search and rescue in adverse conditions, fire line tracking in smoke, iceberg detection

and tracking, and oil spill monitoring.[37] While SAR platforms had only been available for large unmanned aircraft until recently, in 2008, defense contractors demonstrated a 2-pound SAR payload for small UAVs that was made commercially available in 2010.[38]

Specialized Sensors

Although cameras, EO/IR, and radars are the most typical types of sensors for UAV applications, unmanned aircraft can be equipped with other sensors for special applications. For example, chemical, biological, or radiological sensors may be used to collect air samples in hazardous environments. NOAA has equipped its UAVs with instruments to collect and analyze air samples.

Concerns over Privacy and Intrusiveness

While unmanned aircraft may carry a wide variety of sensor payloads for diverse applications, cameras and imaging sensors have raised particular concerns among privacy advocates who fear that widespread civilian unmanned aircraft operations could lead to abuses in monitoring, tracking, and surveilling people throughout the courses of their daily lives. Civil liberties and privacy groups including the American Civil Liberties Union (ACLU) and the Electronic Privacy Information Center (EPIC) argue that aerial drones pose a unique threat to privacy.[39] Proponents of drones have countered these arguments by underscoring the many potential benefits of domestic drone use. For example, aerial imaging of farm crops across multiple spectral bands can provide data on crop conditions and may provide critical information on the impacts of drought conditions or other factors affecting crop health. Drone proponents also contend that while unmanned aircraft have been singled out in public policy debate, the sensor technologies, imaging systems, and data collection capabilities in question are not unique to unmanned aircraft, as these devices could just as easily be installed on manned aircraft, or on utility poles, cell phone towers, and tall buildings.[40]

While the main focus of current public policy debate regarding drone use centers on the law enforcement and government use of UAVs for surveillance purposes, additional concerns have been raised regarding the commercial use of drones, including their potential use by marketing firms, private investigators, and paparazzi. While such uses may be considered intrusive by many, Fourth Amendment concerns would not specifically apply to data collections that are not conducted by or on behalf of governmental entities. Besides tracking and surveillance activities

[37] Mike Hanlon, "ScanEagle UAV Gets Synthetic Aperture Radar (SAR), *GizMag*, March 18, 2008, available at http://www.gizmag.com/scaneagle-uav-gets-synthetic-aperture-radar-sar/9007/.

[38] Ibid., "Insitu Announces Availability of NanoSAR—Synthetic Aperture Radar Payload." *BusinessWire*, February 23, 2010, available at http://www.businesswire.com/news/home/20100223005511/en.

[39] Jay Stanley and Catherine Crump, *Protecting Privacy From Aerial Surveillance: Recommendations for Government Use of Drones,"* American Civil Liberties Union, New York, NY, December 2011; Testimony and Statement for the Record of Amie Stepanovich, Association Litigation Counsel, Electronic Privacy Information Center, Hearing on "Using Unmanned Aerial Systems Within the Homeland: Security Game Changer?" Before the Subcommittee on Oversight, Investigations, and Management of the U.S. House of Representatives Committee on Homeland Security, July 19, 2012.

[40] For further information on the legal implications of domestic drone use, including Fourth Amendment and other privacy concerns, see CRS Report R42701, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, by Richard M. Thompson II.

that raise specific privacy concerns, civilian unmanned aircraft operations may raise additional concerns regarding their potential intrusiveness. Various potential commercial uses, such as aerial advertising (using drones to tow banners or display other targeted visual advertisements), may not raise privacy concerns per se, but may nonetheless be regarded by some as intrusive and a nuisance because of aircraft noise and visual distraction.

FAA's authority over specific uses for civilian unmanned aircraft appears limited. As a matter of law, aircraft have privileged access to navigable airspace. U.S. law generally maintains that equal access and availability of navigable airspace to all users are basic principles underlying the national airspace system, so long as safety and national security are not compromised. Notably, 49 U.S.C. Section 40101(c) (2) specifies that FAA, in carrying out its authority to regulate aviation, shall consider the public right of freedom of transit through the navigable airspace.

Navigable airspace is defined in statute as that airspace above minimum flight altitudes prescribed by regulation, including airspace needed to ensure safety during takeoff and landing.[41] Away from airports, minimum altitudes defining navigable airspace are largely predicated on safety concerns and depend on characteristics of the aircraft and risks posed to persons and property on the ground. In general, navigable airspace is considered to be 500 feet above ground level and higher, except in congested areas where the minimum safe altitude rises to 1,000 feet above the highest obstacle within a 2,000-foot radius of the aircraft's position at any given time.[42] In sparsely populated areas and over water, navigable airspace can be considered to be much lower, so long as operators assure that they can make an emergency landing after an engine failure without undue hazard to persons or property on the ground. Moreover, helicopters, powered parachutes, and powered hang gliders can be operated below established minimums so long as operations are conducted without hazard to persons or property on the ground, and so long as helicopters follow certain prescribed routes and altitudes when defined, usually for noise abatement purposes. Minimum altitudes for drones are yet to be defined. However, unregulated model aircraft are generally permitted below 400 feet, outside of navigable airspace for most manned aircraft.

Small low-flying drones may pose particular concerns regarding intrusiveness, especially if they become widely proliferated in urban and suburban areas. For example, it is imaginable that drones displaying advertising material might hover noisily above a beach, or that a magazine might deploy a drone equipped with high-resolution cameras to photograph a celebrity's garden party. As FAA is primarily concerned with balancing safety concerns with its obligation to facilitate access to navigable airspace, it is likely to tread lightly with regard to matters pertaining to the regulation of specific drone uses based upon their perceived intrusiveness.

Although FAA may be reluctant to address such issues, matters pertaining to the use of domestic airspace generally fall exclusively within its purview. 49 U.S.C. §40103(a)(1) specifies that the federal government has exclusive sovereignty of domestic airspace, thus significantly limiting state and local governments from promulgating laws, regulations, or ordinances affecting access to the national airspace system. This may make it particularly difficult for state and local governments to restrict or regulate the use of drones, including imposing limitations on noise.

[41] 49 U.S.C. §40102(a)(32).

[42] See 14 C.F.R. §91.119 Minimum safe altitudes: General.

On the federal level, landowner rights with regard to the navigable airspace above private property are similarly restricted. The Supreme Court has stated that "the air is a public highway, as Congress has declared. Were that not true, every transcontinental flight would subject the operator to countless trespass suits. Common sense revolts at the idea."[43]

While the concept of the air as a public highway has largely overturned the ancient Roman concept that the owner of a land also holds title to the air above, it does not preclude civilians from potentially seeking civil remedies in the courts against aircraft operators flying overhead or in close proximity to an individual's land. This may potentially include civil action against private or commercial drone operators, if damage or interference can be demonstrated. It may also include claims against federal drone operators if the operations are considered to constitute a taking of property by the government because the aviation activity results in a loss of use or a loss of enjoyment of the property. The Fifth Amendment, among other things, protects citizens from a taking of private property for public use without just compensation.

In these matters, case law relating to aircraft noise may have particular relevance to potential landowner actions in response to nuisances and interference caused by drone operations. Nuisance suits pertaining to aviation noise have allowed recovery for annoyance, inconvenience, discomfort, and mental and emotional distress, as well as for property damage. Additionally, citizens have been successful in actions against the federal government under the "just compensation" clause of the Fifth Amendment in cases where federal aviation operations, usually from military airbases or military training areas, have interfered with the use and enjoyment of private land, thereby constituting a "taking" of the land without any formal exercise of powers of eminent domain. To the extent that case law regarding aircraft noise from the early days of civil jet air transportation may bolster potential legal challenges to drone operations, history suggests that the introduction of civilian drones in the national airspace system is likely to be a highly contentious matter.

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[43] United States v. Causby, 328 U.S. 256, 260-61 (1946).

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LEGISLATIVE TASK FORCE FOR UNMANNED AIRCRAFT SYSTEMS

Name		Received	Seat Position	SSH Summary	Recommendation
David Palmer	<resume>	Jun 11	Industry	Arctic ATC and Aviation Technologies, **Palmer**. Lots of experience with Air Force, FAA air traffic manager, and has flight ratings: commercial pilot, flight instructor and aviation safety counselor.	
Jon Dehart	<resume>	Jun 13	Industry	American UAV, received letter only – no resume. No contact information other than email address. Filed for business in Juneau but physical address is **Deer Park, WA**.	
Lincoln Larson Jr.	<resume>	Jun 13	Industry	Modern Innovations, **Wasilla**. Has just begun in the UAS industry focusing on filming. His primary interest is bringing UAS film services to the Pacific Northwest; although his roots are in Alaska his focus is WA, OR, ID	
Jennifer Haney	<resume>	Jun 12	Industry	Peak 3 Technical Services, **Anchorage**. Has conducted missions in Alaska through the DOD and PPUTRC. Is a member of many aviation associations and is a pilot with Air National Guard.	
Steve Wackowski	<resume>	Apr 22	Industry	Tulugaq; Fairweather Inc, **Anchorage**. Has experience flying in the arctic. Oil and gas missions also used unmanned submarines, variety of work beyond filming services with UAS	
John Parker	<resume>	Apr 19	Industry	Integrated Robotics, **Kenai**. Patent work on sense and avoid. Micceche recommended	
Dan Monarch	<resume>	May 5	Industry	UpAngle Productions, **Palmer**. Pilot and technology professional.	
Ken Kadow	<resume>	May 28	Industry	Immersive Video Solutions, **Anchorage**. Lots of work in Australia including working through certification and regulation processes. Has provided education to the public on privacy. Democrat family in politics but he has stayed out of politics	Withdrawn application due to potential conflict of interest at his request
Tyler Hawker	<resume>	May 21	Industry	UMS3, **Colorado**. Military experience now working from Colorado. Address is Rep Hawker's Anchorage and Colorado. Is there an issue with out of state appointment?	
Brandon Grimshaw	<resume>	May 28	Public	Anchorage. UAA student in Mechanical Engineering	
Justin Guiles	<resume>	Jun 9	Public	Did not submit letter of interest	
Dave Jenkins	<resume>	Jun 9	Public	Palmer. Retired Local 341, real estate, social services, talk radio	
Bob May		Jun 22	Public	Kenai. Has been a pilot, retired marines, owns Kasilof River Gallery Lodge	Email in SSH
George Sahlstrom	<resume>	Jun 9	Public	Submitted one sentence email that he's interested; no further info	

Brandon Grimshaw
Public

Ginger Blaisdell

From: Rep. Shelley Hughes
Sent: Wednesday, May 28, 2014 3:15 PM
To: Ginger Blaisdell
Subject: FW: Alaska Drone taskforce
Attachments: Resume Drone Task Force.docx

Categories: Drone

From: Brandon Grimshaw [mailto:bgrim@amc-engineers.com]
Sent: Wednesday, May 28, 2014 12:02 PM
To: Rep. Shelley Hughes
Subject: Alaska Drone taskforce

Representative Shelley Hughes,

I would like to be considered for one of the open positions for the drone taskforce here in Alaska. I a Mechanical Engineering student at UAA graduating in April 2015. I am very interested in finding the first of many solutions to the UAV addition to our airspace. I currently work several jobs one as Engineering Support at AMC Engineers where we specialize in schools, museums, and libraries. I also work as a handyman during the nights and weekends. I am a very driven person and am very good at finding solutions for issues whether they be mathematical, ethical or social. I could see myself in the future using drones for commercial and personal use as I enjoy the hobby. Alaska needs aerial photography which won't disturb the natural habitat but give us very useful data about what is going on in our very large state.

Thank you for considering me for this position,

Brandon Grimshaw
Engineering Support

AMC Engineers |Anchorage, Alaska
cell: 907-887-6146 work: 907.257.9100 |www.amc-engineers.com
Engineering Excellence

BRANDON GRIMSHAW

1740 Dimond Dr. Anchorage, AK | brandon_grimshaw@yahoo.com | 907-887-60146

OBJECTIVE | To assist the Alaska Drone task force in finding solutions to usage and safety of drones in Alaska's airspace.

SKILLS & ABILITIES | Mechanical Engineering student at UAA graduating April 2015

Eagle Scout (I continue to work with the BSA to strengthen the boys in my area)

Served Mormon mission in Thailand (speak Thai fluently 2002-2004)

Alaska resident for 14 years

Airplane, rocket, helicopter hobbyist

English as first language

Member of ASME, IEEE organizations

EXPERIENCE | **ENGINEERING SUPPORT** AMC ENGINEERS
2012-PRESENT

- Assist Engineers with Specifications on project work
- Aid with AutoCAD drafting in Electrical and Mechanical sets
- Support Engineers through-out each phase of project
- Calculate air change overs
- Involved in multi-million dollar projects through all phases to completion

HANDIMAN
2000-PRESENT

- Diagnose and repair electronic and mechanical systems
- Remodel kitchens and bathrooms
- Finish trim and painting houses
- Repair bicycles

EDUCATION | **UAA**, ANCHORAGE, AK
BS MECHANICAL ENGINEER, MINOR MATH GRADUATION DATE 4-2015

3.0 GPA

Team Leader NASA SLI rocket project 2014-2015

LEADERSHIP | CESA (Community Engaged Student Assistant) - Assisted Dr. Dorn Van Dommelen in Geography 101 course. Educate students about community engagement and the affects they have on the world around them.

Mormon mission (Thailand) - Trained missionaries to speak language and be affective tools to help the Thai people.

Team Leader NASA SLI (Student Launch Initiative) - Formed a team of engineers to design, build and launch a rocket 4 miles into the sky. This project helps advance NASA's resources to data for future launches. Project will be completed next year 2015. Wish us luck!!

Teach Sunday school class for 6 and 7 year old kids at church. I have been doing this for 4 years.

REFERENCES

DAPHNE JENKINS, RECORDS MANAGER- CURRENT BOSS
AMC ENIGINEERS

907-257-9100 ajenk@amc-engineers.com

JEFF LAVOICE, PROPERTY MANAGER
SELF-EMPLOYED

907-230-8070

DR. DORN VAN DOMMELEN, PROFESSOR OF GEOGRAPHY, CHAIR OF GEOGRAPHY AND ENVIRONMENTAL STUDIES
907-786-1765 dvandommelen@uaa.alaska.edu

DAVE SHUMWAY, P.E., CCS, VICE PRESIDENT MECHANICAL GROUP
AMC ENGINEERS

907-257-9100 dshum@amc-engineers.com

AARON JORDAN, PE ELECTRICAL ENGINEERING
AMC ENGINEERS

907-257-9100 ajord@amc-engineers.com

Justin Guiles
Public

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Monday, June 09, 2014 11:06 AM
To: 'akoathkeeper@yahoo.com'
Subject: FW: Legislative Task Force on Unmanned Aircraft

Categories: Drone

- has worked with Predators in the military
- now just citizen

From: Ginger Blaisdell
Sent: Monday, June 09, 2014 11:01 AM
To: 'daniel_hamm@hotmail.com';'akboatkeeper@yahoo.com'
Cc: Rep. Shelley Hughes
Subject: Legislative Task Force on Unmanned Aircraft

If you are interested in applying for a seat on the unmanned aircraft task force, please submit a letter/email of interest and a brief resume no later than Friday June 13. Representative Hughes will send the applicant packet to the President and Speaker on Monday June 16 for their appointments.

The following is the information I sent to the existing task force members for their comment but it is informative for prospective members as they express interest in applying to be a member:

HCR15 re-establishes the task force with five new members, the two departments will each assign a member and we are still receiving letters of interest/resume's for the industry and public seats. I encourage you to send a letter of interest and resume to Rep.Shelley.Hughes@akleg.gov by this **Friday, June 13**. Rep Hughes will forward the packet of interested folks to the President and Speaker for their appointment to the task force.

A TENTATIVE schedule for the Task Force could include the following:

July 8 teleconference to introduce new members to the task force and talk about agenda items to discuss at the upcoming task force meetings.

Task force is tasked with

1) Review FAA guidelines and rules
2) Suggest legislation
3) Evaluate complaints and concerns expressed to the task force (we need a system for this)
4) Identify privacy and safety concerns
5) Recommend public education on UAS
6) Study FAA integration of UAS in national air space
7) Conduct a public hearing concerning privacy and data collection
8) Study non-public use of UAS to encourage industry
9) Study existing laws to make sure UAS users comply with applicable laws

Embry Riddle Aeronautic University has offered to conduct a course designed for Alaska, regarding regulations and industry use of unmanned aircraft. They can offer the course on **July 30-31 (Wed/Thurs)** but need to know how many task force members would be available to attend at that time. The course would likely be offered on campus at UAA or at JBER and requires a tuition fee of $700 (some of which the task force budget may be able to pay). If we do not have enough interest from our task force members, Embry Riddle may not conduct the course – they need to know a approx. head count by this Friday.

- The Task Force would then have its first face-to-face meeting on **Friday, August 1 in Anchorage**.

The next event we'd like to tie into the Task Force schedule is the UAA/UAF Interest Group Meeting September 16-18 (Tues-Thurs). This meeting is scheduled to be held in Anchorage and many UAS folks attend to learn about the test ranges, industry use, new rules and regulations, networking, and much more. We would like to hold a Task Force meeting the day following the Interest Group meeting on **Friday September 19 in Anchorage**.

November meeting would be scheduled if the group determines we need to prepare legislation, request regulations, respond to citizen requests/concerns.

Possibly a winter meeting if the task force needs to respond to citizen requests/concerns.

The tentative schedule is what I've asked the existing task force members to review and comment on. None of the dates and events are confirmed but it's what we are looking at as far as commitment for task force member participation.

Ginger

Chief of Staff
Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 409
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

If you would like to subscribe to Representative Hughes' newsletter, please click here.

Dave Jenkins
Public

Ginger Blaisdell

From: Rep. Shelley Hughes
Sent: Monday, June 09, 2014 11:15 AM
To: Ginger Blaisdell
Subject: FW: Unmanned Aircraft Advisory Task Force

Categories: Drone

-----Original Message-----
From: newliver04@yahoo.com [mailto:newliver04@yahoo.com]
Sent: Friday, June 06, 2014 9:44 PM
To: Rep. Shelley Hughes
Subject: Unmanned Aircraft Advisory Task Force

I would like to be considered for appointment as a public advocate for citizen concerns on the above mentioned task force. The age of the drone is indeed upon us and it is incumbent that we act as good stewards for ours and future generations of Alaskans in managing this technology to the highest and best use taking the privacy of the people and adherence to the Constitution as prime consideration in formulation of regulations.
I was born in rural upstate New York and have an AAS in Business Administration from Jefferson Community College. I moved to Alaska in May 1972 and have lived and worked in Anchorage, Seward, Barrow and Prudhoe Bay. In 1998 I purchased a house in the Springer System where myself and my wife currently live. I am a retired member of Laborers Local 341 and was an ASEA labor steward when employed at AVTEC in Seward in the late 90's. Over the years I have worked in real estate, social services, talk radio and other diverse forms of employment. My life experience, I believe, makes me a strong and able candidate for the force. Should you desire more information or character references please contact me at your convenience.
Sincerely, David A. Jenkins

Sent from my iPad

George Sahlstrom
Public

Ginger Blaisdell

From: Rep. Shelley Hughes
Sent: Monday, June 09, 2014 10:39 AM
To: Ginger Blaisdell
Subject: FW: UAS Task Force

Categories: Drone

This is Stuart, forwarding from SSH's email.

From: George Sahlstrom [mailto:geosahlstrom@gmail.com]
Sent: Friday, June 06, 2014 9:39 PM
To: Rep. Shelley Hughes
Subject: UAS Task Force

Hi Shelley,

I'm interested in the UAS Task Force, as you may expect! Would you please send me more information on what this would involve, responsibilities; etc?

Thank you!

George Sahlstrom

Tyler Hawker
Industry

Ginger Blaisdell

From: Tyler Hawker <tyler.hawker@ums3.com>
Sent: Wednesday, May 21, 2014 12:06 PM
To: Ginger Blaisdell
Subject: Legislative Task Force on Unmanned Aircraft Systems
Attachments: Tyler-Hawker_Cover-Letter.pdf; Tyler-Hawker_Resume.pdf

Categories: Drone

Ginger,

This is Tyler Hawker, with UMS3. I wanted to say thank you again for letting me know about the selection process for the two additional industry representative seats on the Legislative Task Force for Unmanned Aircraft Systems in Alaska. I hope everything is going well, and hopefully settling down now that the 2014 session is over.

Attached are a copy of my Resume summary and cover letter for Shelley for application for one of the two industry representative seats on the Legislative Task Force. I have also mailed a physical copy to President Huggins and Speaker Chenault.

Again, I appreciate you taking the time to update me about the Task Force and I appreciate Shelley's and your willingness to continue this Task Force to help build this new industry in Alaska. Please do not hesitate to contact me if you have any questions or concerns.

Thank you,
--Tyler Hawker

Tyler.Hawker@ums3.com
Cell: (970) 420 - 6812

Tyler J. Hawker

11001 Glazanof Drive, Anchorage, AK 99511
2330 Rollingwood Drive, Fort Collins, CO 80525
(970) 420 – 6812 · tyler.hawker@ums3.com

May 20, 2014

Senate President Charles Huggins
Speaker of the House Mike Chenault
Alaska State Legislature
733 W 4th Avenue, Suite 100
Anchorage, AK 99501

Dear President Huggins and Speaker Chenault,

This cover letter and attached summary resume are being submitted as a request that I be selected as one of the two appointments you will be making of industry representatives to the Task Force on Unmanned Aircraft Systems pursuant to HCR 15 recently passed by the 2014 Alaska legislature. I have the required participatory Unmanned Aircraft Systems (UAS) experience and am actively involved in developing the unmanned aircraft industry in Alaska and throughout the country. My qualifications have been developed through career experience designing, operating and training users of unmanned aircraft systems in hobby, commercial, and military environments.

My goal, as a member of the Task Force, is to work collaboratively with its other members, the University of Alaska, and the other federally recognized test sites, to develop a safe and successful private sector UAS industry and UAS industry jobs in Alaska and the continental US.

Currently I am the owner of an Unmanned Aircraft Systems (UAS) operating, engineering and consulting business based out of Fort Collins, Colorado, with a focus on opportunities to develop UAS applications in Alaska. My business, UMS_3, is a broad-range UAS consulting and services firm consisting of a team of individuals with extensive UAS, general aviation, and engineering background in Department of Defense and civil UAS operations, engineering, research and development, manufacturing, and training. My business and our partners around the country have been working to stand up UAS operational services in the State of Alaska and on the North Slope. We are currently in direct communication and/or working with the University of Alaska, other universities, Alaska Native Corporations, various private companies, and the oil and gas producers in Alaska and the continental US to provide UAS flight and engineering services and operational consulting advice. Last year, I participated and presented public testimony to the Alaska Legislative Task Force for UAS, have continued communications to Representative Hughes office, and am seeking to assist Christi Bell at the Alaska Center for Economic Development in Alaska's economic development of the private UAS industry across the state.

My commercial and military experience with autonomous Unmanned Aircraft began with the military as a civilian contractor providing flight services to the Navy, US Marine Corps, Air Force, and Special Forces through my then-employer AAI / Textron Systems. I am a fully qualified UAS Test and Engineering Operator (Pilot), Maintainer, Technician, Instructor Pilot, Emergency External Pilot, and Mission Commander with over 1,000 direct flight hours in high-stress, complex engineering flight test and combat environments with additional

11001 Glazanof Drive, Anchorage, AK 99511
2330 Rollingwood Drive, Fort Collins, CO 80525
(970) 420 – 6812 · tyler.hawker@ums3.com

over-sight flight hours as an instructor and operations flight director. I have flown UAS in many areas of the United States as well as in Afghanistan, having deployed in 2011 as a senior level operator and engineer to support the stand-up and success of AAI's DOD contracts.

My passion and involvement in UAS began many years ago when I began flying Remote Controlled (RC) Model Aircraft. Since then, I have been an avid RC pilot and supporter of the Academy of Model Aeronautics (AMA), competing at the highest levels in aerobatics as a professionally sponsored pilot. I have represented, through sponsorship, employment, and ownership, several radio controlled aircraft manufacturers, suppliers, and AMA Clubs and related organizations.

My commercial and military flight mission experience includes all forms of UAS from small electric quad-rotors, to medium-endurance, long-range military-oriented aircraft with payloads ranging from infrared to particle detection and data-acquisition for research and development. Most recently, my involvement with UAS has focused heavily on the commercial advancement of the technology, ranging from utilizing aircraft for civil uses, such as pipeline monitoring and security, public safety and disaster response, and heavy equipment inspection and monitoring.

With my background and involvement in UAS ranging from RC model aircraft, to commercial UAS, to military UAS, I will bring the experience and commitment Alaska is looking for in the members of the Task Force on Unmanned Aircraft Systems. I am extremely interested in the proper development of UAS-related legislation and regulations from business, public safety, and aviation industry perspectives. I believe my commitment to Alaska, and broad background and experience in UAS, as well as my connections, partnerships, and support from several other UAS manufacturers and service providers would make me a particularly good fit for the Alaska Legislative Task Force for Unmanned Aircraft Systems.

I appreciate you taking the time to review my resume for consideration for a position on the Alaska Legislative Task Force for Unmanned Aircraft Systems. Please do not hesitate to contact me if you have any further questions. I look forward to hearing from you in the near future.

Cordially,

Tyler Hawker

Tyler.Hawker@ums3.com
(970) 420 - 6812

Tyler J. Hawker Professional Resume

11001 Glazanof Drive, Anchorage, AK 99511
2330 Rollingwood Drive, Fort Collins, CO 80525
(970) 420 – 6812 · tyler.hawker@ums3.com

Objective

To work collaboratively with the Alaska Task Force on Unmanned Aircraft Systems members, the University of Alaska, and the other federally recognized test sites, to develop a safe and successful private sector UAS industry and UAS industry jobs in Alaska and the continental US.

Professional Experience

UMS_3, Inc. **2013 – Present**
Founder, VP, Operations and Product Development Colorado Springs, CO

Textron / AAI - Unmanned Aerial Systems (UAS) **2011 – 2013**
SUAS Engineering & SUAS Test Flight Crew Hunt Valley, MD

3D Hobby Shop **2010 – 2011**
Director of Operations and Demonstration Pilot Fredericksburg, TX

Intel Corporation **2004 – 2009**
Mask Design Engineering & Programming Fort Collins, CO

Hawker Technology Consultants **2003 – Present**
IT System Administration & Network Consultant Fort Collins, CO

Education

Colorado State University **2005 – 2010**
Electrical and Computer Engineering Fort Collins, CO
Academic Focus: Electrical Engineering, Computer Science, Math, Digital Logic Devices, DC/AC Analog Circuit Analysis, Business Information Technologies, Technical Journalism, and Economics

Front Range Community College **2004 – 2005**
Electrical Engineering Fort Collins, CO
Academic Focus: Electrical Engineering, DC / AC Circuit Analysis

Fort Collins High School **Graduated 2007**

Relevant Skills

Advanced Computing

Advanced in: Piccolo Command Center, Viewpoint, Mission Planner, Arduino Autopilot, Microsoft Windows, Unix / Linux; Mac OSX, iOS, Windows Networking

Proficient in: Global Mapper, Google Earth, AutoCAD 2012

Programming: Java, C, C++, Perl, HTML, CSS, PHP

Technical Skills & Qualifications

Electronics: PCB and Wire soldering & repair, Wiring harness assembly, Circuit analysis
Other: Composite repair, HAZMAT shipping, handling & storage

Remote Control Model Aviation

Build, fly, and maintain all varieties and sizes of model aircraft
Competed in Unlimited Class IMAC and Masters Class F3A Pattern
Demonstration and sponsored pilot for 3D Hobby Shop (2009 – 2011)

References Available Upon Request

Ken Kadow
Industry

Ginger Blaisdell

From: Rep. Shelley Hughes
Sent: Wednesday, May 28, 2014 3:15 PM
To: Ginger Blaisdell
Subject: FW: UAV advisory task force

Categories: Drone

From: Kenn Kadow [mailto:kenn@immersivevideosolutions.com]
Sent: Wednesday, May 28, 2014 2:00 PM
To: Rep. Shelley Hughes
Subject: UAV advisory task force

Representative Hughes,

I'm interested in learning more about the task force that was mentioned on this morning's radio show. I have a 25 year background in crisis management, much of it in Alaska where my focus was primarily on tactical response decisions so aerial mapping, reconnaissance and image documentation was a priority.

Since 2005 I've operated one of the few companies in the world that specializes in 360° geo spatial imagery. We utilize full motion, high definition viewer controlled spherical video that can be matched to anything from Google Maps, smart phone apps and simple video players to proprietary project software. We collect imagery from the air, river boats/marine, backpack, underwater, helmets, ATV and other vehicles.

We were involved in some of the early development of StreetView and MapQuest360 tools and then took it into full motion, geo referenced video ground and aerial tools. You can see examples at one of our cloud sites www.im360.com, For the purposes of this note, the helicopter tours channel is probably the best one but you can see that the immersive world is here if you spend a few minutes looking at other channels.

We're also involved in the expansion of the 360 Hero's system which utilizes GoPro cameras and software to "stitch" them into spherical video. From there, it's a fairly small jump to the web. Lightweight, mass produced, easy to operate, cheap, understood by all ages from about 5 and up.

The immediate display of imagery is ubiquitous, we see it on mounted televisions in airports and our phones dozens of time a day. The capability to provide 180/360° video, live, viewer controlled and on the web is here. The hosting of immersive content for non live needs is a simple and for the most part, very economical process.

As the owner of an emerging and disruptive technology company, I'm pretty familiar with the issues that will push on the boundaries over the next few years. I've underlined the issue of viewer controlled because 50,000 (or a million, or…) people could be looking at whatever they wanted to, on the same clip, on the web, at the same time. All taken from a UAV, maybe live.

We're Alaskan based and have worked extensively in the state but provide our services around the world. I look forward to hearing from your office regarding the task force and their objectives or any questions you may have.

Respectfully,

Kenn Kadow

Immersive Video Solutions, LLC.

907 E. Dowling Road, Suite 14

Anchorage Alaska, 99518

(907) 279-4000 Office

(907) 440-9876 Mobile

Visit www.immersivevideosolutions.com to learn more about 360° spherical video.

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Thank you. Immersive Video Solutions, LLC

Ginger Blaisdell

From: Ginger Blaisdell
Sent: Monday, June 09, 2014 11:43 AM
To: 'Kenn Kadow'
Subject: RE: UAV Task Force-follow up

Categories: Drone

Good morning Ken,
I'm just following up to see if you sent anything to Rep Hughes for the UAS Task Force.
I attaching the email that I've just sent to the existing task force members that includes some tasks, dates and times – ALL TENTATIVE

Ginger

If you are interested in applying for a seat on the unmanned aircraft task force, please submit a letter/email of interest and a brief resume no later than Friday June 13. Representative Hughes will send the applicant packet to the President and Speaker on Monday June 16 for their appointments.

The following is the information I sent to the existing task force members for their comment but it is informative for prospective members as they express interest in applying to be a member:

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1) Review FAA guidelines and rules
2) Suggest legislation
3) Evaluate complaints and concerns expressed to the task force (we need a system for this)
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Ginger

Chief of Staff
Office of Representative Shelley Hughes
Serving Greater Palmer
Capital Building Room 409
Juneau, Alaska 99801

907-465-5265
1-800-565-3743

From: Kenn Kadow [mailto:kenn@immersivevideosolutions.com]
Sent: Thursday, May 29, 2014 6:07 PM
To: Ginger Blaisdell
Subject: UAV Task Force-follow up

Ms. Blaisdell,

Thank you for taking the time to explain the mission and history of the task force on UAV issues.

As a company that's heavily involved in the collection of aerial geospatial data, we have a strong interest in the regulations being promulgated in Alaska. Policy is often a reactive practice so I appreciate Representative Hughes interest in looking ahead at issues like this.

To good days and the people we share them with.

Kenn Kadow

Immersive Video Solutions, LLC.

907 E. Dowling Road, Suite 14

Anchorage Alaska, 99518

(907) 279-4000 Office

(907) 440-9876 Mobile

Visit www.immersivevideosolutions.com to learn more about 360° spherical video.

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Thank you. Immersive Video Solutions, LLC

Dan Monarch
Industry

Ginger Blaisdell

From: dan@upangle.com
Sent: Monday, May 05, 2014 11:13 PM
To: Rep. Shelley Hughes
Cc: Ginger Blaisdell
Subject: Legislative Task Force on Unmanned Aircraft Systems (UAS)
Attachments: DanielMonarch_Cover_Hughes_20140505.docx; DanielMonarch_Resume_UpAngle.docx

Categories: Red Category

Shelly,
I wanted to provide you with some of my personal information for possible consideration for a position on the Legislative Task Force on Unmanned Aircraft Systems. I am very motivated to assist with this work and have the skills necessary to provide valuable input. The work being done by the task force will be critical to the development of my business. I strongly support sensible rules and regulations that will protect this industry and the individuals of our state. Please let me know if you need any additional information or if I can answer any questions that you might have.
Sincerely,

Dan Monarch
Owner/Pilot
907-354-3326
www.upangle.com
UPANGLE
PRODUCTIONS

14934 E Outer Springer Loop
Palmer, AK 99645
May 5, 2014

Shelly Hughes
Alaska State Legislature
Juneau, Alaska

Dear Representative Hughes,

I am interested in speaking with you and anyone else in the legislature about possible participation in the Legislative Task Force on Unmanned Aircraft Systems (UAS). I believe I have specific qualifications that meet the requirements for this role. I have over 25 years of experience in business covering numerous industries. This includes work at both private and public entities. I have started companies and worked for both large and small organizations. My roles at most of the organizations I worked for have been very technical in nature and typically involved emerging technologies.

Here are a few of my top qualifications:

- Strong Commitment to Service
- Solid Collaboration and Communications Skills
- Broad Industry Background
- Focused Project and Process Management Experience
- Technically Savvy Professional
- Self-Motivated, Results Oriented, Team Player
- Great Attitude!!

I am currently an Owner and Pilot at UpAngle Productions. We are starting to establish ourselves in the aerial photography industry and are very motivated in assisting with the adoption of rules and regulations that will allow us to continue. This industry is growing rapidly and that will continue as technologies improve and more uses for UAS are identified. UpAngle Productions strongly believes that UAS guidelines must be developed to protect our industry and to provide for safe operation and appropriate use of these platforms. I would appreciate an opportunity to meet with you to discuss how my experience could best meet your needs. I can be reached at 907-745-3326 if you would like to speak about how I might be able to help you out. I can also be reached by email at dan@upangle.com if you wish to contact me that way.

I look forward to discussing possible involvement with the task force.

Sincerely,

Daniel Monarch

Daniel Monarch

DANIEL R. MONARCH

14934 E OUTER SPRINGER LOOP • PALMER, AK 99645
(907) 745-3326 • dan@upangle.com

TECHNOLOGIST / ENTREPRENEUR

Multi-faceted business professional possessing extensive hands-on experience in management, systems development, business integration, and start-up situations to support operating, financial, and organizational needs. Contributed millions of dollars in revenues and profits through achievements in financial and asset management, operating cost reduction, market development, contract negotiations, project coordination, systems support, software development and general business management.

PROFESSIONAL EXPERIENCE

UPANGLE PRODUCTIONS **8/2012 - PRESENT**
OWNER/PILOT

Responsible for startup operations of an aerial photography business utilizing UAS for aerial based images. Developed initial business plan to launch the company. Researched and built UAS platforms to support the aerial photography operations. Tracked evolving regulatory changes that would have an impact on the commercial aerial photography industry. Worked with business partners to identify potential business segments, build the customer base, generate/edit video content and grow the company. The business was started utilizing one quadcopter carrying a GoPro camera and now has a fleet of UAS in various configurations carrying multiple camera platforms.

MATANUSKA TELEPHONE ASSOCIATION, INC.
IT DIRECTOR

Senior level executive position for the second largest rural coop in the US. Responsible for all aspects of the IT environment at MTA. Collaborate with departmental stakeholders to assess needs and implement appropriate solutions. Provide management for a team consisting of 30 FTE and contract staff. Responsible for developing and managing the annual IT budget in excess of $5M and providing executive input to the overall corporate budget in excess of $100M.

CASCADE TELECOM RESOURCES
DIRECTOR – NEW BUSINESS DEVELOPMENT/SALES

Defined corporate strategies to establish a subsidiary that provides exclusive staffing services for the telecommunications industry. Integrated Cascade Telecom Resources into Cascade Software Consulting – focused on sales, marketing and business development. Full responsibility for P&L of $5 million in annual revenue and direct accountability for sales and marketing, client support and staff management.

INDUSTRY EXPERIENCE

Aerial Photography, Marketing/Advertising, Multimedia, Telecommunications, Financial, Utility, Manufacturing, Sales/Staffing, Transportation

EDUCATION

Washington State University, Pullman, Washington - 1985
Major: BA in Business Administration - MIS Emphasis **Minor:** Computer Science
Puyallup High School, Puyallup, Washington - 1980

REFERENCES AVAILABLE

John Parker
Industry

Ginger Blaisdell

From: Integrated Robotics <iris@uav-alaska.com>
Sent: Saturday, April 19, 2014 10:54 AM
To: Rep. Shelley Hughes
Subject: RE: UAS legislation passes in Alaska
Attachments: CV-2012.doc; IRIS Letter of Interest.docx

Shelly:

I know everyone is busy and thanks for all your work. Larry Semmons said Sen. Micciche was forwarding it to you today with his recommendation. I'm attaching what I sent to his office in case he is unable to due to his schedule.

John

From: Rep. Shelley Hughes [mailto:Rep.Shelley.Hughes@akleg.gov]
Sent: Saturday, April 19, 2014 10:40 AM
To: Integrated Robotics
Subject: RE: UAS legislation passes in Alaska

I don't believe we've received it yet, but it's a busy time right now here in Juneau. I'd recommend that you forward it this way. Thanks.

Shelley

Shelley Hughes

Representative

Alaska State Legislature

Integrated Robotics Imaging Systems

April 16, 2014

The Honorable Senator
Peter Micciche
District O
State Capital Room 125
Juneau, Alaska 99801

Re: Letter of Interest – Alaska UAS Task Force

Dear Senator Micciche:

In the past two years the Alaska UAS Task Force chaired by Representative Hughes has done outstanding work on behalf of the State of Alaska to address privacy issues in the operation of UAS and help Alaska become a leader in the commercialization of UAS's in the U.S.

The most recent version of HCR-15 (3/27/14) allows for, "two industry representatives who are participants in the unmanned aircraft system industry with experience operating unmanned aircraft systems who shall be appointed jointly by the President of the Senate and the Speaker of the House of Representatives."

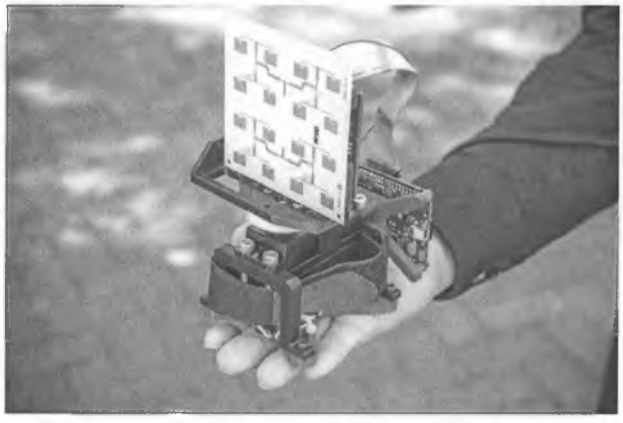
We would like to formally request that you submit our name as a member of the task force. Integrated Robotics was formed in late 2012 to provide advanced, versatile, mission capable unmanned aerial vehicles to meet real world challenges. We are the North American Manufacturer and Distributor's representative for a specialized UAV platform uniquely capable of performing in our arctic environment and in conditions not suitable for other small UAS's. Our platform is the Infotron IT180-5 electric or gas UAS.

This UAS weighs 14kg and has an endurance of ~1 hour in the electric version and ~3 hours in the gas version. Integrated Robotics will be manufacturing this UAS in Kenai within the next 3 years. We will also conduct research on the feasibility of using a recently patented Sodium Borohydride Fuel Cell to replace our current LiPo batteries. Our successful research will achieve two important things. We will increase the endurance of our UAS by approximately an order of magnitude. More importantly, we will be able to lower our carbon footprint by replacing our gas engine with the fuel cell.

Corporate Offices: 140 Main Street Loop - Kenai, Alaska 99611-7722 – USA Phone: +1 907-283-4223
Email: iris@uav-alaska.com Web: www.uav-alaska.com

Additionally, on April 9, 2014, Integrated Robotics acquired exclusive patent rights from the University of Denver, for a miniature, (8 oz.) collision avoidance radar specifically designed for small UAS. During the next 18 months we will be integrating this radar into our UAS, testing it at the Pan-Pacific UAS Test Range Complex (PPUTRC) in Fairbanks and working to certify it through the FAA. This will enable us to hire personnel and begin manufacturing the radar in Kenai, to make it available to other UAS industry stakeholders in Alaska, the lower 48 and globally.

Left to right Dr. Kimon Valavanis, Dr. Matt Rutherford, John C Parker and Dr. Allistair Moses – University of Denver.



Frequency Shift Keyed Continuous Wave Radar

As you can see we have a substantial stake in furthering the commercialization of UAS in the National Airspace and we feel that the Alaska UAS Task Force could benefit from the input that we can provide and we certainly would benefit from the views of the other members of the Task Force as well as the public.

Attached per your request is my personal resume and should you have any questions or require further information, please feel free to contact my office at your convenience.

Very truly yours,

John C. Parker, President
INTEGRATED ROBOTICS IMAGING SYSTEMS

JCP/ejb

Encl:

Confidential Resume

JOHN C. PARKER

140 Main Street Loop
Kenai, Alaska 99611
(907) 283-3007
iris@uav-alaska.com

John C. Parker

140 Main Street Loop - Kenai, Alaska 99611 (907) 283-3007

PERSONAL

Born	September 8, 1943
Height	5'11"
Physical Condition	Excellent
Married	5/30/92
Wife's Name	Marie
Children	Two Sons 47, 46 and Two Daughters 37 from previous marriage

MILITARY

US ARMY	1964-1971
Rank	Sergeant E-5 (Warranted)
Duties	MP Criminal Investigator
Assignments	Southeast Asia & US
NATIONAL GUARD	1979-1981
Rank	Sergeant E-5 (Warranted)
Duties	MP Criminal Investigator
Assignments	Sacramento, California

EDUCATION

United States Armed Forces Institute – 2 years college
Columbia Pacific University – 126 Credits
American River College Placerville, CA – Admin. of Justice Courses
Sierra College Roseville, CA – Engineering Courses

LICENSES AND CERTIFICATES

Member Association of Unmanned Vehicle Systems International
Member Alaska Peace Officers Association
State of Alaska Licensed Insurance Investigator (1998-2005)
Nuclear Safety Certification-Troxler Laboratories
Licensed Pre-Trial Investigator (1982-1997)
Officer of the Court Third Judicial Dist. (1982-1998)
Member Alaska Association of Legal Assistants (Past)

PUBLICATIONS

Contributor	MASCA Newsletter May 1969 Olmec Archeological Investigation Yucatan Peninsula - Mexico
Contributor	NTSB Blue Cover Report KAL/SCA Crash 12/23/83 Anchorage, Alaska
Contributor	NTSB Blue Cover Report SCA Crash 12/23/87 Kenai, Alaska

John C. Parker

140 Main Street Loop - Kenai, Alaska 99611 (907) 283-3007

WORK EXPERIENCE

July-'12-Present — ***President/COO*** — Integrated Robotics Imaging Systems, Ltd. 140 Main Street Loop Kenai, AK 99611

Unmanned aerial vehicle company. Specializing in providing advanced, versatile mission capable unmanned aerial systems to meet real world challenges. We also will be conducting research in collision avoidance and fuel cell technology. Our company holds exclusive patent rights for a miniature (8 oz.), collision avoidance radar designed for UAV's.

Aug '05 – Present — ***Owner – General Manager*** — Parker & Associates 140 Main Street Loop Kenai, AK 99611

Investigator handling a wide range of investigations including, commercial property, aviation, engineering, personal injury and product liability cases. Requires the ability to gather and correlate information and evidence, write concise reports of investigation and testify at trial.

Jan '05 – Present — ***President*** — Integrated Account Management, Inc. 140 Main Street Loop Kenai, AK 99611

Purchase and sale of Deed of Trust notes on the secondary investor market. Preparation of in-depth due diligence reports, negotiating with a wide range of investor clients for contract investing and management. Purchase, rehabilitation and sale of commercial real estate properties including creating and selling new first position notes for those properties.

Jun '98 - Present — ***President & Sr. Opns. Mngr.*** — Trustee Services of Alaska 140 Main Street Loop Kenai, AK 99611

Provide Trustee services to Professional Escrow Services, Inc., and real estate and title companies in the State of Alaska. Named as Trustee on all deeds of trust prepared by PESI to secure the performance of the obligation within the Trust Deed and administer foreclosures should the need arise.

John C. Parker

140 Main Street Loop - Kenai, Alaska 99611 (907) 283-3007

Jun '93 - Present

Corporate Officer – Scty/Treasurer Professional Escrow Services, Inc.
140 Main Street Loop
Kenai, AK 99611

Provide full service escrow closings and note servicing throughout the State of Alaska. Prepared all legal documents necessary to facilitate closing of real estate and other property transactions. Collection and auditing of portfolio notes for investors of Integrated Account Management, Inc.

Nov 98 – Aug '05

Insurance Investigator-Owner Parker & Associates
908 Highland Ave. Ste. 1
Kenai, Alaska 99611

Licensed through the State of Alaska Division of Insurance to provide insurance investigations of claims on behalf of insured's and insurers. Specialized in commercial aviation, marine, oil & gas and property losses throughout the State of Alaska, lower 48 states and abroad.

Apr '02- May '04

Code Enforcement Officer City of Kenai
210 Fidalgo Avenue
Kenai, Alaska 99611

Duties include investigation of City of Kenai Municipal Code violations, disposition of offenders and reports to the Chief of Police and City Attorney. Requires ability to write chronological reports, gather evidence, deal with citizens of the community in a professional manner and testify in court. This was a successful two year pilot program. I also authored a Policies & Procedures Manual for this position.

Jan '90 – Jun '92

Director of Security Indian Summer Mine, LTD
110 Trading Bay, Ste 130
Kenai, Alaska 99611

Duties included day to day security operations during the drilling program. I also worked directly with the CFO, in writing a $30M funding proposal which was presented to and accepted by investors from New York.

May '87 – Dec'89

President Lasernetics Research, Inc.
P.O. Box 1137
Kenai, AK 99611

Conducted primary feasibility research into laser energy project aimed at development of small laser/photovoltaic energy solution. Research failed to support initial cost/benefit claims.

May '82 – Nov '98 ***Pre-Trial Investigator-President*** Document Service Co., Inc.
908 Highland Ave. Ste. 1
Kenai, Alaska 99611

Investigations to prepare for trial including, gathering evidence, identifying plaintiffs, defendants and witnesses. Handling a range of technical cases including, personal injury, product liability and environmental investigations. Required a high degree of public contact, ability to correlate information, write concise reports and testify at trial.

Nov '81 – May '82 ***Electrician/Laborer*** Onis King A&S Company
52239 Myron Street
Nikiski, Alaska 99635

Responsible to supply explosion proof electrical lighting and loads to workers excavating and repairing oil pipeline at Mobil Oil Company Drift River Alaska field.

Mar '78 – Feb '81 ***Engineering Technician*** Terrasearch, Inc.
904 B Tribute Road
Sacramento, CA 95825

I invented a tool needed by this company to complete soil investigations and was subsequently offered a position in the company. My responsibilities included application of engineering requirements to field operations, ability to consult on a professional basis with engineers and contractors working on the construction of dams, commercial and residential structures. I also built and maintained a variety of lab equipment used in soil testing and investigations.

1970 – 1978 ***Owner/Partner*** Kerand Investments
P.O. Box 926
Placerville, CA 95667

Purchasing, building and re-selling small businesses. Required knowledge of all aspects of finance, business management and employee relations. Managed up to 50 employees. Many of the businesses purchased were distressed due to mismanagement. All were rehabilitated and sold at substantial profit.

John C. Parker

140 Main Street Loop - Kenai, Alaska 99611 (907) 283-3007

1974 – 1976 ***Police Officer*** Placerville Police Dept.
489 Main Street
Placerville, CA 95667

Patrol and investigative assignments as directed by shift supervisor. Follow-up investigations, evidence gathering and preparation for trail. I also worked as a dispatcher and training officer.

Dec '68 – May '69 ***Electronic Technician*** Varian Associates
611 Hansen Way
Palo Alto, CA 94305

I contracted my services to the University of Pennsylvania Applied Science Center for Archaeology through Varian Associates of Palo Alto, California. In consortium with the Mexican Government, I conducted a magnetic investigation of an Olmec archaeological site in the Yucatan Peninsula of Mexico. The investigation was performed using a Cesium Magnetometer. I also conducted prototype testing of a Proton Precession Magnetometer that led to the development of what is now the EG&G Geometrics G856AX magnetometer.

REFERENCES: Provided upon request.

Steve Wackowski
Industry

Ginger Blaisdell

From: Steve Wackowski <steve.wackowski@fairweather.com>
Sent: Tuesday, April 22, 2014 8:04 AM
To: Rep. Shelley Hughes
Cc: Ginger Blaisdell
Subject: UAS TF
Attachments: Wackowski Resume 2014 FINAL.pdf

Categories: Econ Dev

Rep Hughes-

Congratulations on getting your UAS legislation passed in the legislature. It is a testament to you and your staff's hard work and leadership that your team has been able to pass UAS legislation in several sessions.

I would like to submit myself for consideration to serve on the Task Force. As a lifelong Alaskan, I am thrilled at the opportunity Alaska has to be a leader in this blossoming industry. My company is Alaskan-owned and will be focusing on local hires and local work in the unmanned remote sensing industry. Furthermore, I am still serving in the Air Force Reserve and qualified as a SUAS operator and in my prior life as a staffer for Senators Stevens I worked on UAS policy and issues.

I've attached my resume. Please let me know if you need any more information to consider my nomination.

My Best,

Steve

TULUGAQ **Steve Wackowski** *Operations Manager, Tulugaq*

Main: 907-346-3247 Cell: 907-306-8007 Fax: 907-349-1920 steve.wackowski@fairweather.com

STEPHEN M. WACKOWSKI

3663 Mirage Cir, Anchorage, AK 99504

(907) 306-8007 | steve.wackowski@fairweather.com

PROFESSIONAL EXPERIENCE

TULUGAQ II, LLC. — **JULY 2013 – PRESENT**

Operations Manager | Anchorage, AK

Hand-picked by joint venture partners to lead and manage newly formed unmanned remote sensing company. Tulugaq II, owned by Kaktovik Inupiat Corporation, Olgoonik Oilfield Services, and Fairweather Science, LLC is home-based in Anchorage. The company is ANC majority-owned and is preparing for a major UAS operation staged from the North Slope this fall.

Selected Achievements

- Served on program management team for historic 2013 Conoco Phillips/Olgoonik Fairweather Scan Eagle flights over the Chukchi Sea
- Authored the Plan of Operations for 2013 CP/OF Scan Eagle flights
- Coordinates activities for manned/unmanned aerial survey working group
- Conducted outreach to Alaska AOPA on behalf of UAS community with ACUASI

CAPTAIN, UNITED STATES AIR FORCE RESERVE — **MAY 2005 – PRESENT**

Headquarters Air Force Intelligence Directorate's ISR Innovations Office | Pentagon, DC

Director of Battlefield Networking, UAS Operator

Directed multi-million dollar research and development efforts to improve and rapidly integrate emerging ISR technologies for the Global War on Terrorism. Trained, equipped, led, and deployed with ISR teams world-wide for contingency response, including in Afghanistan, Iraq, and Haiti. Drove public affairs strategy to highlight impact of Air Force ISR efforts in contingency operations. Executed over $30 million of USAF/DoD Research and Development, procurement, and contingency operation funds. Wrote requirements and contracting justifications for joint contingency R&D and procurement programs with Air Force Research Laboratory, the DoD ISR Task Force, and Joint Improvised Explosive Device Defeat Organization.

Selected Achievements

- Promoted from Deputy to Director of acclaimed Eagle Express Program, recipient of the 2009 Geospatial Intelligence Foundation's Military Achievement Award
- Highlighted in national press as manager and action officer for Project Robin Hood, saving U.S. Government over $12 million in IT equipment costs
- Coordinated humanitarian assistance for Operation Care, delivering aid directly to Afghanistan
- First ever to operate UAS in High Arctic, conducted shipborne flights of RQ-11s in support of DIA research
- Repurposed over $4 million in excess government UAS equipment for use as government-furnished equipment for university research
- Forged enduring joint R&D effort with NATO's Command, Control, and Communications Agency, delivering first-ever direct combat support to deployed NATO Geospatial Intelligence cells
- Conducted first-ever test flights of NASA's Dragon Eye UAS, enabling testing of prototype atmospheric sensors for remote sensing development

Additional Air Force Qualifications and Military Education

- Senior Cyberspace Operations Officer Qualified
- AM490 Free Fall/Basic Parachutist Qualified
- Special Operations Command Small UAS Operator Qualified
- Right-of-Line flight, In-residence Squadron Officer School Graduate (5% of Reserve Officers are selected)
- Joint Professional Military Education, In-Residence at National Intelligence University selectee
- Current Top Secret/Sensitive Compartmented Information clearance and indoctrination

LISA MURKOWSKI FOR U.S. SENATE **MAY 2010 – NOVEMBER 2010**

Communications Director and Spokesman | Anchorage, AK

Spokesman for Senator Murkowski's historic – and victorious – write-in campaign. Created, directed, and implemented press strategy for primary campaign. Represented campaign in both local and national media, in print, online, and television to include live interviews. Hired and managed team of six communications staff. Executed and managed earned media budgets for radio, print, and television.

Selected Achievements

- Senior staff member on both primary and write-in phases of campaign
- #1 in the US! Communications Team earned the Public Relations Society of America's Senior Anvil award
- Personal efforts on campaign highlighted in Alaska Dispatch's *Race of a Lifetime* series
- Spoke on campaign's behalf in national press, in print media and live television newscasts
- Singled out by Senator Murkowski during post-election victory rally as integral member of team

U.S. SENATE, OFFICE OF SENATOR TED STEVENS **JULY 2005 – JANUARY 2009**

Press Secretary and Special Assistant, Personal Office | Washington, DC

Last serving Press Secretary for Senator Ted Stevens of Alaska. Assumed roles as both traveling Press Secretary and DC spokesman. Coordinated crisis communications and press response to Alaska, national, and international press. Led communications team of two full-time staff and three interns.

Selected Achievements

- Credited with devising and co-writing the Rural Veterans Travel Benefit, Senator Stevens' amendment to the Post 9-11 GI Bill, which enabled reimbursement of highly rural veterans' travel costs for education.
- Official spokesman for Senator Stevens, spoke on-the-record in national and Alaska press

Professional Staff, Committee on Science, Commerce, and Transportation | Washington, DC

Legislative portfolio included Oceans, Atmosphere, and Maritime issues. Served as lead committee staff for oversight over the National Oceanic and Atmospheric Administration (NOAA) and U.S. Coast Guard. Oversaw passage of the U.S.-Russia International Treaty on Protection of Polar Bears. Tasked by Senator Stevens to coordinate directly with Alaska fisheries groups during passage of 2006 Magnuson-Stevens Fishery Conservation and Management Act. Vetted Coast Guard and NOAA nominees for Senate confirmation and managed several congressional fellows/interns.

Selected Achievements

- Lead staff for first-ever Commerce Committee hearing on non-military use of UAS in national airspace for disaster response, disaster mitigation, and threatened/endangered species monitoring
- Lead staff for first-ever joint hearing between the Commerce and Foreign Relations Committees on the International Polar Year
- Staff member of the U.S. State Department's delegation to the International Whaling Commission

EDUCATION

National Intelligence University **2010-Present (July 2014 graduation)**

Master of Science and Technology Intelligence

- Thesis work on Arctic ISR/UAS operations featured in press and presented at several scientific forums/conferences
- Recognized by NIU President and Dean of Students for outstanding field research in the Arctic
- By name requested for Intelligence Community wide briefs on Arctic UAS operations

Saint Mary's College of California **2000-2005**

Bachelor of Science, Computer Science and Politics/Minor, Philosophy

- Lifetime Member, National Society of Collegiate Scholars
- President, SMC Chapter of Knights of Columbus 2003-2005
- NCAA Division I-AA Football Letterman

-REFERENCES AVAILABLE UPON REQUEST-

Small Unmanned Aircraft System Rulemaking Committee (Federal)

<TARGET><BILL></BILL><SUBJECT>Small Unmanned Aircraft System Rulemaking Committee
(Federal)</SUBJECT><COMM><TARGET></COMM></TARGET>

Small Unmanned Aircraft System Aviation Rulemaking Committee

Comprehensive Set of Recommendations for sUAS Regulatory Development

April 1, 2009

Co-Chairs:

Bruce Tarbert, Federal Aviation Administration
Ted Wierzbanowski, AeroVironment, Inc

Aviation Rulemaking Committee Members

Ellis Chernoff, Air Line Pilots Association
Patrick Egan, Remote Control Aerial Photography Association
Mike Fagan, Association of Unmanned Vehicle Systems International
Carrie Haase, Auora Flight Sciences
Rob Hackman, Aircraft Owners and Pilots Association
Richard Hanson, Academy of Model Aeronautics
Andrew Lacher, The MITRE Corporation
Fred Marks, FMA
Douglas Marshall, University of North Dakota
Paul McDuffe, Boeing - Insitu
Tad McGeer, Aerovel Corporation
Mike O'Shea, Department of Justice
Andrew Roberts, National Aeronautics and Space Administration
Don Shinnamon, International Association of Chiefs of Police
Dan Schultz, ASTM International
LTC Wade Wheeler, Department of Defense—Policy Board for Federal Aviation
Ardyth Williams, Federal Aviation Administration
David York, Helicopter Association International

Unless flagged with a solid dot (●), the material contained in this document represents general consensus of the members of the Small Unmanned Aircraft System (sUAS) Aviation Rule-making Committee. When there is less than general consensus, alternative views are included along with their accompanying rationale.

Forward

The Small Unmanned Aircraft System (sUAS) Aviation Rulemaking Committee (ARC) was focused on making recommendations for Federal regulations for the operation of civil (commercial) sUAS. However it was understood by the members of the ARC that a public entity could fly under the provisions of any rule that might result from these recommendations in lieu of flying under the provisions of a Certificate of Authorization (COA) or in restricted, prohibited, or warning areas. In formulating the recommendations contained in this document, sUAS ARC used the following guiding principles:

1. Enable the operation of sUAS by mitigating, to an acceptable level of risk, the hazards posed to manned aircraft and other airborne objects operating in the National Airspace System (NAS) as well as the public on the surface.
2. The development of regulations authorizing specific operations of certain sUAS could provide a means for operators to request a waiver(s) from such a rule. Such an option is not available to operators today.
3. Visual "see and avoidance" will be used by the sUAS flight crew to mitigate the risk of collision with other aircraft and airborne objects.
4. The primary burden of maneuvering for potential collision risk avoidance should be on the sUAS flight crew.
5. All other aircraft have the right-of-way over sUAS.
6. The above two principles do not relieve burden upon any pilot to see and avoid other aircraft.
7. Operating limitations will be defined to reduce or minimize potential encounters between manned and unmanned aircraft and reduce vulnerability of those on the surface.
8. A formal Federal Aviation Administration (FAA) safety risk assessment will be used to determine whether proposed regulations are acceptable to the FAA from a safety perspective. If a specific recommendation is not acceptable from a safety perspective then the FAA may require additional mitigations and/or controls.
9. Mitigations and controls should be tied to the level of risk to avoid being overly burdensome on the application of sUAS technology. If a specific recommendation is overly excessive or burdensome then the FAA may elect to modify the recommendation in developing proposed regulations.
10. The recommended regulations should not be overly complex to facilitate analysis by the FAA and other stakeholders.
11. Recommendations will leverage existing standards and regulations which govern the operation of small unmanned and Model Aircraft.
12. Where feasible, the ARC will use existing definitions and regulations to develop recommendations.

13. sUAS ARC recommendations for an Special Federal Airworthiness Regulation (sFAR):
    - Are intended to enable some initial sUAS operations
    - Are not intended to cover all potential applications or aircraft
        - Existing processes such as COAs for public-use aircraft and Special Airworthiness Certificate will remain options.
        - Recommendations are directed at sUAS not necessarily all unmanned aircraft systems.

Overall the committee was focused on a layered approach to ensuring that the potential risks associated with mid-air collisions and/or injury to persons and property is within acceptable levels. Many of the committee's recommendations were made based upon experience with existing aviation operations and regulations and perceptions of risk. Overall, the committee was equally focused on protecting existing air traffic and persons/property on the surface. In general, the philosophy was to minimize encounters, keep sUAS separated from other aircraft and surface risks, avoid collisions, and minimize the impact of collisions that may happen. See Figure 1.

The committee perceives that the recommendations in this document combine together to enable sUAS operations at an acceptable level of risk. As more experience with sUAS is gained and more data generated, these recommendations should be revisited.

For the most part, the committee's recommendations are written in a language like proposed regulations. Rationale and commentary which explain the recommended regulations are imbedded throughout the document and appear inside boxes in italic text. Unless flagged with a solid dot (●), the material contained in this document represents general consensus of the members of the sUAS ARC. When there was less than general consensus, alternative views are included inside boxes in italic text along with their accompanying rationale.

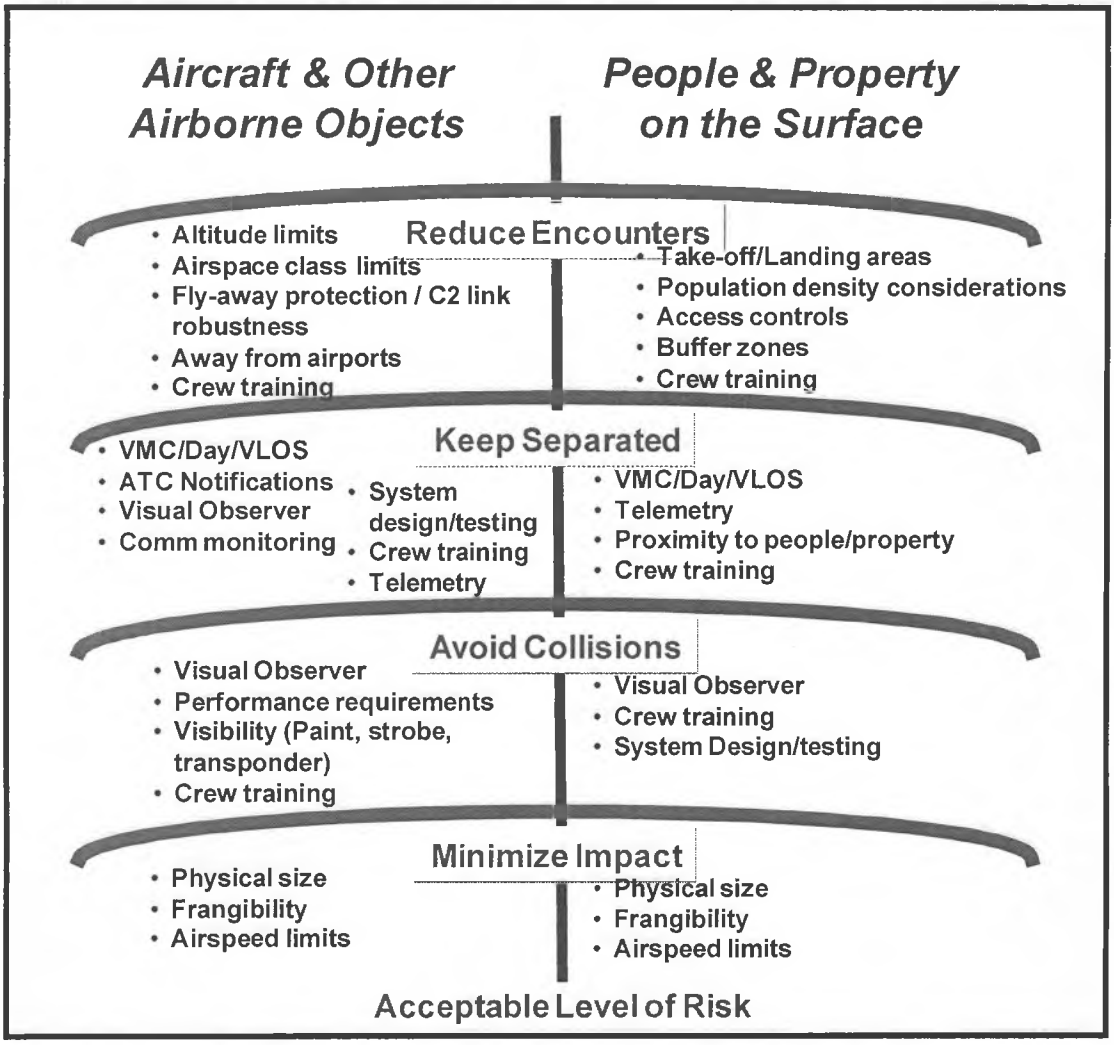


Figure 1. Layered Approach for Ensuring Safety

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1. Definitions

The following definitions apply to all small unmanned aircraft systems (sUAS) referred to in this regulation.

Auto Flight Management: Pilot-in-Command (PIC) is able to maintain stable flight without constant direct intervention. To at least some degree, control surface movements result from sensors and software automation on-board the aircraft.

Collision Avoidance: Considered a last resort maneuver of an aircraft to avoid an imminent collision. Without the maneuver a collision might occur.

Conflict Avoidance: Activity which seeks to ensure that aircraft remain safely separated and well clear of each other as to not present a collision hazard.

Control Station: Equipment, not on the aircraft, used to maintain control, communicate, guide, or otherwise operate an unmanned aircraft.

Data Communications Links: All links between the unmanned aircraft and the Control Station which includes the command, status, communications, and payload links.

Launch/Recovery Equipment: Equipment, not on-board the aircraft, used to launch and recover an unmanned aircraft which could also include unique navigation and differential positioning equipment used for autonomous landing.

Model Aircraft: A sUAS used by hobbyists and flown within visual line-of-sight under direct control from the pilot, which can navigate the airspace, and which is manufactured or assembled, and operated for the purposes of sport, recreation and/or competition.

"Mode C Veil": The airspace within 30 nautical miles (NM) of an airport listed in Appendix D, Section 1 of 14 Code of Federal Regulations (CFR) Part 91 (generally primary airports within Class B airspace areas), from the surface upward to 10,000 feet mean sea level (MSL). Unless otherwise authorized by Air Traffic Control (ATC), aircraft operating within this airspace must be equipped with automatic pressure altitude reporting equipment having Mode C capability. However, an aircraft that was not originally certificated with an engine-driven electrical system or which has not subsequently been certified with a system installed may conduct operations within a Mode C veil provided the aircraft remains outside Class A, B, or C airspace; and below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport or 10,000 feet MSL, whichever is lower. [Directly quoted from the Federal Aviation Administration's (FAA's) Aeronautical Information Manual: Official Guide to Basic Flight Information and ATC Procedures, February 14, 2008].

Pilot-in-Command: Same as 14 CFR 1.1

Manual Flight Control: PIC is able to directly control the aircraft such that control inputs made at the Control Station are translated directly into corresponding control surface positions. Augmentations which help maintain flight stability are permitted.

sUAS Flight Crewmember: A pilot, visual observer, payload operator or other person assigned duties for a sUAS for the purpose of flight.

sUAS Pilot: A person exercising control over an unmanned aircraft during flight.

Unmanned Aircraft: An aircraft (as defined by 14 CFR 1.1) that is intended to navigate in the air without an onboard pilot.

Unmanned Aircraft System (UAS): An unmanned aircraft and its associated elements related to flight operation which may include Control Stations, data communications links, support equipment, payloads, flight termination systems, and launch/recovery equipment.

Visual Line-of-Sight: Unaided (corrective lenses and/or sunglasses exempted) visual contact with aircraft sufficient to be able to maintain operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to decisively see and avoid other air traffic or objects.

Visual Observer: A sUAS flight crew member who assists the sUAS PIC in the duties associated with collision avoidance. This includes, but is not limited to, avoidance of other traffic, airborne objects, clouds, obstructions, and terrain.

Subpart A. Model Aircraft

2. Model Aircraft Operated in Accordance with FAA Accepted Standards

2.1 Applicability

Model Aircraft operations that are conducted in accordance with an FAA accepted set of standards established and administered by a community based association as discussed in Section 2.2, shall otherwise be exempt from the requirements of any Special Federal Airworthiness Regulation (SFAR) that results from this recommendation as long as they are operated by:

- Hobbyist for the sole purpose of sport, recreation and/or competition under the conditions of such an FAA accepted program
- Manufacturers which are flight testing aircraft intended to be operated for the sole purpose of sport, recreation, and/or competition and they are tested at an approved field as defined by and in accordance with an FAA accepted program with the approval of the community-based association responsible for the location
- Educational institutions and/or students for the sole purpose of education or research and they are operated at an approved field as defined by and in accordance with an FAA accepted program with the approval of the community-based association responsible for the location
- Manufacturers which are flight testing aircraft intended to be operated for other than sport, recreation, and/or competition and they are tested at an approved field as defined by and in accordance with an FAA accepted program with the approval of the community-based association responsible for the location

> ***RATIONALE:*** *Reflects FAA's concept of regulating model aviation by exempting Model Aircraft from regulation. Under this approach, modelers participating within an aeromodeling structure/organization such as the Academy of Model Aeronautics (AMA) may operate their Model Aircraft in accordance with an accepted set of standards and operating procedures. Based on a more rigorous attention to safety, risk assessment, and risk mitigation, the accepted standards may provide greater latitude in the Model Aircraft operations. Modelers not participating in the additional safety programming established in an accepted set of standards shall comply with the requirements of Section 3.*

COMMENTARY: *It is important that manufacturers of Model Aircraft are able to test fly their aircraft as they do today without having to adhere to sUAS regulations. In order to give educational institutions (e.g., universities) the flexibility to provide "hands on" instruction and training to students preparing for careers in the UAS and aviation industries they are allowed to fly these systems under the requirements for Model Aircraft. For consistency, manufacturers who develop sUAS that are functionally similar to Model Aircraft, are allowed to test at a location following a community-based and FAA-accepted program.*

2.2 Accepted Model Aircraft Standards and Procedures

Accepted Model Aircraft Standards and Procedures may be established and administered by a community-based association. An accepted set of standards shall be based upon accepted and recognized safety principles and will include but not be limited to the following:

RATIONALE: *Community based organizations, such as the AMA, that have credibility within the Model Aircraft community and that have an established safety record and have demonstrated the ability to influence participant compliance shall be afforded the opportunity to establish a set of safety standards that are more comprehensive than the requirements and limitations given for non participating modelers, and use these standards as an alternative means of compliance with any regulations which may results from these recommendations. Since such standards are more comprehensive, operations under such standards shall allow for a broad spectrum of operations and greater latitude in the AMA operations.*

(1) Prescribed safety program entailing oversight, assessment, risk mitigation, and accident/incident reporting.

(2) General safety guidelines and operating principles.

(3) Operating guidelines specific to the location and to the type, size, performance, and propulsion of the various Model Aircraft.

(4) Comprehensive programming addressing Model Aircraft having non standard weight, or identified as having unusual propulsion types or extraordinary flight characteristics.

(5) Programming to facilitate Model Aircraft events, competition, national and international record attempts, gatherings, and Model Aircraft demonstrations and exhibitions.

(6) Educational programming that assures participants are provided relevant safety information and validates the learning process.

(7) Educational programming that addresses essential piloting issues including:

- Recognition and avoidance of manned aircraft
- Safe operation near spectators and other non participants

- Safe and cooperative operation with other modelers
- Transitioning to higher performance and more complex models

(8) Methodology for establishing and designating dedicated Model Aircraft flying sites providing:

- Guidelines for flying site location, configuration and design layout applicable to its intended use and the type(s) of Model Aircraft flown, and which ensures Model Aircraft operations do not interfere with manned flight operations
- Safety guidelines that ensure the safety of the public and provide adequate separation of persons and property from the Model Aircraft operations
- Guidelines for coordinating and reviewing operating policies and procedures with the airspace controlling authority for those flying sites located within controlled airspace
- Guidelines for coordinating and reviewing operating policies and procedures with the airport and applicable airspace control authority for those flying sites located within 3 NM of a military or public-use airport, heliport, or seaplane base.
- Guidelines for establishing and disseminating flying site operating procedures, limitations and safety guidelines including the following:
  - Hours of Operation
  - Flying site operating procedures
  - Frequency control procedures (if applicable)
  - Traffic pattern and flight operations
  - Cooperation with other modelers
  - Applicable altitude restrictions
  - Applicable No-Fly zones and operating area limits
  - Flight line and pit area safety procedures
  - Spectator and public access policies
  - Emergency Procedures (e.g., Fire, First Aid)

3. Model Aircraft Not Operated in Accordance with Accepted Set of Standards ●

3.1 Applicability ●

The following general requirements and limitations apply to Model Aircraft which are not operated in accordance with an FAA accepted set of standards, but are operated by hobbyists for the sole purpose of sport, recreation, and/or competition.

ALTERNATIVE VIEW: Eliminate Section 3.0 in its entirety.

ALTERNATIVE RATIONALE: AMA believes this approach is flawed in that it fails to recognize the substantial diversity of the hobby, establishes unrealistic and unenforceable restrictions, and leaves absent a safety surveillance program to oversee the activities of those modelers who choose not to participate in a formal aeromodeling structure/organization More importantly, as a baseline set of standards, these limitations have the inherent potential of imposing a devastating impact on the aeromodeling activity and the hobby industry.

3.2 General Requirements ●

(1) Model Aircraft shall be flown in open spaces and in a manner that does not endanger the life and property of others.

(2) Model Aircraft shall yield the right of way to all manned aircraft.

(3) Model Aircraft shall not interfere with operations and traffic patterns at airports, heliports, and seaplane bases.

(4) Model Aircraft shall not be operated at locations where Model Aircraft activities are prohibited.

(5) Model Aircraft are limited to unaided visual line-of-sight operations. The Model Aircraft pilot must be able to see the aircraft throughout the entire flight well enough to maintain control, know its location, and watch the airspace it is operating in for other air traffic. Unaided visual line-of-sight does not preclude the use of prescribed corrective lenses.

(6) Model Aircraft shall be designed, equipped, maintained and/or operated in a manner in which the aircraft remains within the intended area of flight during all operations.

(7) Model Aircraft pilots may not intentionally drop any object from a Model Aircraft that creates a hazard to persons or property.

(8) Model Aircraft shall be operated in a manner that respects property rights and avoids the direct overflight of individuals, vessels, vehicles, or structures.

(9) Model Aircraft shall not be operated in a careless or reckless manner.

(10) Model Aircraft pilots shall not operate their aircraft while under the influence of alcohol or while using any drug that affects the person's faculties in any way contrary to safety.

(11) Model fixed-wing and rotorcraft aircraft shall not use metal-blade propellers.

(12) Model Aircraft shall not use gaseous boosts.

(13) Model Aircraft shall not use fuels containing tetranitronmethane or hydrazine.

(14) Model Aircraft shall not use turbine-powered engines (e.g., turbo-fan, turbo-jet) as a propulsion source. ●

RATIONALE: *Turbine powered aircraft are perceived by many members of the sUAS Aviation Rulemaking Committee (ARC) as being a higher risk.*

ALTERNATIVE VIEW: *Eliminate the limitation.*

ALTERNATIVE RATIONALE: *The blanket prohibition of turbine engines does not take into consideration the various and diverse turbine engines currently produced and impose an unjustified economic impact on the hobby industry.*

3.3 General Limitations ●

(1) Model Aircraft shall not exceed 55 pounds (lbs).

(2) Model Aircraft shall remain clear of clouds.

(3) Model Aircraft will not operate in Class B airspace without the permission of the ATC authority.

(4) Model Aircraft shall not be operated within 3 NM miles of an airport, heliport, or seaplane base without the permission of the ATC authority or airport manager.

(5) Model Aircraft shall operate in close proximity to the ground, at or below 400 feet (') above ground level (AGL), and shall at all times remain below and well clear of all manned aircraft. ●

RATIONALE: *By keeping Model Aircraft at or below 400' encounters with manned aircraft are reduced. This recommended general limitation is consistent with the current Model Aircraft guidance contained in AC91-57.*

ALTERNATIVE VIEW: Replace (5) with the following:

Model Aircraft shall operate in close proximity to the ground, shall stay at or below 400' AGL when within 3 NM of an airport, and shall at all times remain below and well clear of all manned aircraft.

ALTERNATIVE RATIONALE: *Though it is agreed that there needs to be some altitude limit on the modelers that are not participating in a structured safety program such as AMA's, AMA also knows from their experience that creating a hard and fast across the board altitude limit, such as 400' is unnecessarily restrictive, unrealistic, and arguably poses a greater risk to personnel on the ground. AMA's experience has shown that the greatest risk to other participants in the NAS and perhaps the only significant risk posed by model aviation is when Model Aircraft are operated within three miles of an airport. The language in the ATERNATIVE VIEW mirrors the current guidelines in the AMA Safety Code.*

(6) Notwithstanding the above limitations, Model Aircraft weighing less than or equal to two lbs incapable of reaching speeds greater than 60 miles per hour (mph) (52 knots), and powered by electric motor or mechanical stored energy (e.g.,

rubber-band powered) may operate within 3 NM of a military or public-use airport or heliport; if they remain a safe distance from the airport or heliport, remain well clear of all manned aircraft, and remain below 400' AGL.

RATIONALE for the above limitations:

(1) Currently accepted domestic weight limit and has international precedent as well.

(2) Is consistent with the concept of visual line-of-sight (VLOS).

(3) Class B is positive control. All aircraft are required to operate on a clearance. Gaining permission from ATC is equivalent to receiving a clearance.

(4) Model Aircraft permitted to operate within 3 NM of the airport will be provided applicable operating limitations.

(5) 400' is appropriate for Model Aircraft operations in Class C airspace without coordinating with ATC and is consistent with the intention of current domestic policy and with the UK, CASA, and Canada.

(6) This is consistent with the guidelines currently established by AC91-57.

(7) Makes a blanket exception for models weighing two lbs or less. This is an appropriate allowance for "Park Flier" and "toy" type models and allows them to use parks and small fields closer to airports.

(7) Model Aircraft will not be flown at an airspeed that would cause the aircraft to inadvertently leave the prescribed maneuvering area. ●

RATIONALE: *The pilot will be responsible for limiting their speed so that they can remain within the prescribed maneuvering area.*

ALTERNATIVE VIEW: Replace (7) with the following:

Model Aircraft cannot be operated at airspeeds which exceed 100 mph (87 knots).

ALTERNATIVE RATIONALE: *Restricting the speed of Model Aircraft not participating in an FAA-accepted safety program will mean that high-performance aircraft will not be operated by individuals that are not being scrutinized by their peers. Eliminating high-performance aircraft will also help to ensure that the operator will be able to keep their aircraft within the defined operational area (line-of-sight and below 400' AGL). Limiting the speed also will reduce the likelihood of turbine powered aircraft being operated without the guidance of an FAA-accepted safety program. Turbine powered aircraft are perceived by many members of the ARC as being a higher risk.*

(8) Model Aircraft cannot launch pyrotechnic devices which explode or burn.

(9) Excluding take-off and landing, no powered Model Aircraft may be flown closer than 25 feet to any individual, except for the pilot and the pilots helper located at the flight line.

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Subpart B. Operating Rules

4. General Operating Limitations

The following general operating limitations determine the times, locations, and notification requirements for all sUAS operated under this regulation.

4.1 Daylight Operations

No person may operate a sUAS except between the hours of sunrise and sunset.

> ***RATIONALE:*** *Visual "see and avoid" is the primary mitigation for mid-air collisions.*

4.2 Visual Meteorological Conditions (VMC)

No person may operate a sUAS except in VMC with a minimal visibility of three miles.

> ***RATIONALE:*** *Visual "see and avoid" is the primary mitigation for mid-air collisions.*

4.3 Visual Line-of-Sight

No person may operate a sUAS unless they or another sUAS flight crew has sufficient unaided (corrective lenses exempted) visual contact with aircraft to be able to maintain operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating for other air traffic.

> ***RATIONALE:*** *Visual "see and avoid" is the primary mitigation for mid-air collisions.*

4.4 Safety of Those on the Surface ●

(1) No person may operate an sUAS in a manner that endangers the safety of persons and property on the surface.

(2) No person may operate a sUAS directly over an open air assembly of people. ●

> ***ALTERNATIVE VIEW: Add text –*** *"unless the sUAS is certified to have reliability and lack of lethality equal to any aircraft certified by the FAA for operation over an open air assembly of people."*
>
> ***ALTERNATIVE RATIONALE:*** *The applicant must have an opportunity to offer evidence that his sUAS can operate over open air assemblies without creating a hazard for people in that crowd. Public safety could be enhanced by the presence of sUAS in situations in which manned aircraft cannot operate without risk to people on the ground.*

(3) During an emergency, the safety of people on the surface must be given priority over the sUAS.

RATIONALE: *Makes it clear that the sUAS PIC is responsible for the safety of persons on surface (whether on the ground or on the surface in a vessel or vehicle).*

(4) In an in-flight emergency requiring immediate action, the PIC may deviate from any rule of this part to the extent required to meet that emergency.

RATIONALE: *Consistency with 14 CFR 91.3b.*

4.5 Notifications—Air Traffic Coordination

(1) UAS PIC must establish communications with the ATC and notify the airport manager if planning to operate within 10 NM of an airport with an operating control tower. sUAS PICs must comply with ATC instruction regarding operations.

(2) When operating within 3 NM of a military or public-use airport, heliport, or seaplane base without an operating control tower, sUAS PIC must notify the airport manager, if available.

(3) For all flights which are intended to operate greater than 400' AGL and are either: a) expected to exceed 30 minutes in duration or b) there is an expectation of one or more additional flights within a four hour period, the PIC will request the issuance of a Notice to Airmen (NOTAM) for the length of the operation as far in advance as feasible (recommend more than 24 hours, but less than 48 hours) by notifying the nearest ATC facility or Flight Service Station (FSS).

RATIONALE: *Makes the responsibility clear when the ATC or airport manager needs to be aware of sUAS operations. The ATC would be aware of all sUAS operations in Class C and D airspace or near towered-airports. ATC or FSS awareness would enable the ability to issue a NOTAM. All operations over 400' AGL would be eligible for a NOTAM as well.*

The group did not intend that the PIC would be required to have access to two-way ATC communications in Class C airspace unless ATC requires such access.

4.6 Operational Area

No person may operate a sUAS in the following areas:

(1) In a prohibited, restricted, or warning area without permission from the using or controlling agency, as appropriate.

(2) In a Flight Restricted Zone (FRZ) or Washington, DC Metropolitan Area Special Flight Rules Area (SFRA).

(3) On a published low altitude Military Training Routes (MTRs) without prior authorization from the controlling authority.

(4) In Class B Airspace.

RATIONALE: *Keeps sUAS from operating in areas where there are restrictions on civil operations. Also, keeps sUAS from operating in Class B airspace due to the complexity of these operations. Avoiding low altitude MTRs helps to reduce risk of collision between a low-flying fast-moving military aircraft and a sUAS.*

5. Operational Considerations Regarding Other Aircraft

5.1 Proximity to Other Aircraft

No person may operate a sUAS so close to manned aircraft as to create a collision hazard.

5.2 Requirement for a Qualified Visual Observer ●

The PIC must determine if a visual observer is necessary. A visual observer is necessary:

(1) If the sUAS is operated by a PIC either in a shelter or "headsdown", the operation requires the use of a qualified visual observer.

(2) For operations >400' AGL one dedicated qualified visual observer is required. ●

(3) If the PIC determines that a visual observer is necessary to maintain the safety of the operation.

RATIONALE: *Visual see and avoid is the primary mechanism of ensuring safe separation and avoiding collisions. These considerations make it clear when additional qualified visual observers are required. Given that there is more likely to be other aircraft above 500'AGL increasing the probability of a collision, an additional visual observer is added for sUAS operations over 400' AGL to aid in the ability to* ***see*** *and thus avoid other aircraft.*

ALTERNATIVE VIEW: *Require* ***two*** *dedicated qualified visual observers when operating above 400' AGL.*

ALTERNATIVE RATIONALE: *Given that there is more likely to be other aircraft above 500'AGL increasing the probability of a collision a minimum of two visual observers should be used.*

5.3 Visual Observer Duties

A qualified visual observer must scan the airspace around the sUAS for other aircraft which may be potential collision hazards.

(1) PIC or qualified visual observer (close proximity of PIC) must maintain position of the sUAS through direct visual observation in order to avoid creating a collision hazard with other aircraft, airborne hazards, persons on the ground, terrain, or obstructions.

(2) The qualified visual observer, if used, must maintain effective two-way communications with the PIC.

> ***RATIONALE:*** *Clearly defines visual observer duties as being focused on the "seeing" component of "see and avoid". Emphasizes that the visual observer is not necessarily focused on the sUAS but focused on scanning the airspace with awareness of the sUAS's location.*

(3) When using other aids to vision, such as binoculars, field glasses, or telephoto television, qualified visual observers must use caution to ensure that the unmanned aircraft remains within the approved visual limitation distance. Due to field of view and distortion issues, the use of such aids can be used to augment the qualified visual observer's visual capability, but cannot be used as the primary means of visual contact.

5.4 Right-of-Way Rules

sUAS must yield the right-of-way to all other aircraft. UAS flight crews must assume that other pilots cannot see their aircraft and therefore the burden of maneuvering for potential collision risk shall be on the sUAS PIC.

(1) The PIC must yield the right-of-way and when a manned aircraft is detected, always maneuver early to prevent a potential conflict. The preferred means of conflict avoidance is to descend and maneuver closer to the landing area and the PIC and/or qualified visual observer.

(2) Although sUAS should descend as its primary means of collision avoidance; the PIC should use the most appropriate maneuver for the situation.

(3) During an emergency, the safety of manned aircraft must be given priority over the sUAS.

(4) For sUAS encounters with other sUAS, the right-of-way rules defined in 14 CFR 91.113 apply, except that all sUAS must yield the right-of-way to manned aircraft.

> ***RATIONALE:*** *Most sUAS approximate the size of birds. Manned pilots expect birds to dive when encountering an aircraft, thus sUAS should behave similarly. Given that the PIC and/or observer on the surface may not always be able to accurately determine relative altitude or relative lateral bearing, it was felt by the consensus of the group that by descending as close to the surface as possible, the risk of collision could be reduced to the maximum extent. The working group also wanted to make it clear that the prime responsibility for maneuvering was on the sUAS PIC and that the safety of manned aviation had priority.*
>
> ***COMMENTARY:*** *It is not the intent of the ARC to limit the options available to the PIC, but to offer guidance as what is likely to be the most appropriate maneuver.*
>
> ***COMMENTARY:*** *These recommendations will need to be updated pending the development of recommendations focused on Lighter-Than-Air (LTA) sUAS.*

5.5 Communications Monitoring

When operating in Class C and D airspace, a sUAS PIC or qualified visual observer shall monitor ATC voice communications as instructed by ATC.

> ***COMMENTARY:*** *If the Control Station is equipped with ATC communications radio, the PIC and/or qualified visual observer* ***should*** *monitor ATC voice communications when operating in Class E or G airspace in the "Mode C veil" to identify aircraft that could potentially enter the airspace in which the sUAS is operating.*
>
> *If the Control Station is equipped with a UNICOM radio (Frequencies Used For Aeronautical Advisory Services To Private Aircraft) or Common Traffic Advisory Frequency (CTAF), the PIC and/or qualified visual observer* ***should*** *monitor to identify aircraft that could potentially enter the airspace in which the sUAS is operating.*
>
> ***RATIONALE:*** *For added situational awareness, it was felt that monitoring appropriate frequencies would aid the PIC and/or visual observers in being aware of other aircraft potentially in the airspace. While there may be some costs associated with the capabilities required, the consensus of the group was that the added safety value warranted the investment.*
>
> *Using the term "monitor" was deliberate. It was not the group's intent that the PIC or visual observer would be transmitting via 2-way ATC communications. This was for the following reasons:*
>
> - *It is unclear that a transmitter located on the surface several miles from the ATC radio antenna would be effective*
> - *We did not want to increase the workload of ATC controllers and increase ATC frequency congestion with chatter from sUAS operators. If controllers need to instruct all sUAS operators to cease operations due to an emergency in their sector, they can simply broadcast on the ATC channel which would be monitored by the sUAS operators*

6. General Operational Considerations

6.1 Take-off and Landing Area

(1) The PIC must ensure that sufficient space is available at the flying location to conduct safe take-off and landings.

(2) The PIC must ensure that the take-off and landing area(s) is clear of persons and property not associated with the operation to which the aircraft could pose a hazard.

> ***COMMENTARY:*** *It may be appropriate to establish a consensus standard on how a manufacturer should go about determining the minimum space required for take-off and landing.*

6.2 Control Station Operations ●

No person may operate a sUAS unless there is a one-to-one correspondence between Control Station and the unmanned aircraft. Control may be transferred from one Control Station to another provided procedures exist to affect the transfer including clear and immediate designation of the PIC at all times. The following is prohibited under this regulation:

(1) Using a Control Station to control more than one unmanned aircraft at a time.

(2) Simultaneously controlling an unmanned aircraft from more than one Control Station. **NOTE:** This does not apply to control of a payload or sensor package provided that operation of the sensor package or payload is electrically isolated from the sUAS flight control systems and operation has no significant effect on the flight parameters of the sUAS.

(3) A second Control Station cannot be used to increase operational range. ●

> ***ALTERNATIVE VIEW: Replace (3) with the following:***
>
> *A second Control Station may be used to increase operational range if all other provisions of this regulation are met.*
>
> ***ALTERNATIVE RATIONALE:*** *If each Control Station is equipped manned and operated like the initiating station with the required observer, communication capability and conforms with all required airspace restrictions minimal additional risks are introduced by transferring control and extending the operational range. It would be analogous to the aircraft landing at close to its maximum range and then taking off again under control of a second Control Station with overlapping coverage.*

6.3 Pilot-in-Command

With the exception of those aircraft operated in accordance with the provisions described in Section 9, no person may operate a civil sUAS under this regulation without a PIC who is certified to operate a sUAS consistent with the requirements in 15.

> ***RATIONALE:*** *Operators of Group I sUAS will not require certification.*

6.4 Pre-flight Procedures

The PIC is responsible for the following pre-flight procedures:

(1) **Familiarization:** The PIC must become familiar with the following information concerning the intended flight:

- Available weather reports and forecasts
- Fuel requirements
- Take-off and landing minimum space requirements
- Landing alternatives and emergency ditching locations
- Potential ground hazards
- Location of personnel directly involved with the operation

- Restrictions or limitations associated with the airspace in which operations will occur
- Local air traffic activity
- Location of persons and property on the surface
- Weight and Balance

(2) **Crew Verification:** The PIC must verify that all persons involved in the operation are trained and sufficiently knowledgeable and skilled in their operational responsibilities and that they meet the appropriate certifications, currency requirements, and medical qualifications for the intended flight.

(3) **Environment Assessment:** The PIC must assess the operating environment considering risks to people and property in the immediate vicinity both on the surface and in the air. This assessment must include weather conditions, local air traffic activity, the location of persons and property on the surface, and other ground hazards.

(4) **Pre-Flight Briefing:** The PIC must ensure that all sUAS flight crew members receive a pre-flight briefing on the operating conditions, emergency procedures, contingency procedures, roles and responsibilities, and potential hazards.

(5) **Aircraft and Equipment Inspections:** The PIC must ensure that the aircraft, Control Station, and other flight critical equipment are inspected for damage and are ready for flight per manufacturer guidelines.

(6) **Communications Check:** The PIC must ensure that the command, control, and communications link is working properly.

(7) **Weight and Balance:** The PIC must ensure that the weight is appropriately distributed in order to maintain the aircraft center of gravity to ensure stable flight in accordance with manufacturer recommendations.

6.5 Crew Fitness for Duty

The PIC must ensure that all crew members are rested and fit for intended duty. For flight operations, 10 hours of consecutive rest in the 24 hour period preceding the planned completion of his duty time. Non-local travel and other work duties associated with the employer are not considered part of the rest period.

> ***RATIONALE:*** *As with any commercial operation, crew duty day limits will help ensure that the flight crew is alert to maintain appropriate safety vigilance.*

6.6 Alcohol or Drugs

No person may act as a crewmember of a sUAS under the following conditions:

(1) Within eight hours after the consumption of any alcoholic beverage.

(2) While under the influence of alcohol.

(3) While using any drug that affects the person's faculties in any way contrary to safety.

(4) While having an alcohol concentration of 0.04 or greater in a blood or breath specimen. Alcohol concentration means grams of alcohol per deciliter of blood or grams of alcohol per 210 liters of breath.

> ***RATIONALE:*** *Consistent with operational regulations contained in 14 CFR 91.17.*

6.7 Dropping Objects

No PIC of a sUAS may allow any object to be dropped from that aircraft in flight unless reasonable precautions are taken to avoid injury or damage to persons or property.

> ***RATIONALE:*** *Consistent with operational regulations contained in 14 CFR 91.15.*

6.8 Careless and Reckless

No person may operate a sUAS in a careless or reckless manner so as to endanger the life or property of another.

> ***RATIONALE:*** *Consistent with operational regulations contained in 14 CFR 91.13.*

6.9 Reserves

The PIC must ensure that there is enough fuel and/or battery charge to fly for the intended time period and for no less than five minutes of reserved power.

> ***RATIONALE:*** *This requirement is loosely based upon 14 CFR 91.151, fuel requirements for flight in Visual Flight Rules (VFR) conditions. By having a reserve requirement, helps to ensure that the PIC does not run out of fuel/power during flight resulting in an uncontrolled aircraft. 91.151 requires 20 minutes VFR fuel reserves for rotorcraft. Given that sUAS will not be flying far from their landing areas, will remain relatively close to the surface, and have flight duration that may be extremely short, the requirement was modified five minutes. The main purpose of the reserve is to ensure that there is sufficient power for the aircraft to return from its farthest point and to ensure that it can remain aloft for a sufficient time period to ensure that the landing area is clear of hazards.*

6.10 Cloud Clearance ●

The sUAS PIC must ensure that the aircraft remains at least 500 feet below and 2000 feet horizontal from clouds in Class C, D, and E airspace and clear of clouds in Class G airspace.

> ***RATIONALE:*** *Enables the sUAS PIC and/or visual observer an opportunity to visually identify potential collision threats which may emerge from the clouds.*

*ALTERNATIVE VIEW: The sUAS PIC must ensure that the aircraft remains at least 500 feet below and 2000 feet horizontal from clouds in **all classes** of airspace.*

ALTERNATIVE RATIONALE: The 500 feet below and 2000 feet horizontal distances are consistent with the ultra-light requirements in 14 CFR 103.23 and parachute cloud clearance requirements in 14 CFR 105.17.

6.11 Operation from a Moving Vehicle ●

No person may control a sUAS from a moving vehicle or aircraft.

***RATIONALE:** Ensures that the area of sUAS operation is contained and controlled. Operation from a vessel on the water is allowed provided that this vessel is not moving. It is envisioned that those who desire to operate from a moving marine vessel in open water (e.g., Ocean or Great Lakes) could petition the FAA for a waiver from this provision.*

***COMMENTARY:** The sense of the sUAS ARC was that operations in open ocean from a moving ship should not necessarily be a significant risk and should be enabled. Considerations should be made for existing air traffic density (e.g., Gulf of Mexico where there is significant rotorcraft operations associated with oil platforms).*

***ALTERNATIVE VIEW**: Eliminate restriction of operating from a moving vehicle.*

***ALTERNATIVE RATIONALE:** Military operators have found that operating a sUAS from a ground vehicle or vessel on the water is not significantly different than operating from a fixed location provided the PIC and/or visual observer is placed in a position in the vehicle or vessel where they have the same unobstructed view as they would if they were on the ground and "waypoint position relative" feature as discussed below is provided.*

"Waypoint position relative" feature rationale. Mobile operations are very different from stationary operations because navigation waypoints maintain a position relative to Earth, not the PIC at the ground station. A PIC at a control station will lose relative knowledge of position if the PIC and the control station move. Global Positioning System (GPS) reports absolute position but an interface can also be provided to calculate and report position relative to another position. Key waypoints for relative situational awareness do not move with the PIC and control station unless the particular system has some sort of "waypoint position relative" feature to manage this. The ground station also must have its own GPS or similar to keep track of its position in order to make relative aircraft position reports to the PIC and provide relative situation awareness such as range and bearing to the aircraft relative to PIC/ control station (situational

awareness during mobile operations are really difficult without this capability).

6.12 Airspeed

No person may operate a sUAS faster than an airspeed of 87 knots.

RATIONALE: *The AMA has determined that aircraft flying faster than 100 mph are considered a high performance aircraft. Faster aircraft are perceived as having greater risks.*

7. General Operational Capabilities

RATIONALE: *These operational capability and/or equipment provisions are analogous to the provisions contained in 14 CFR 91, subpart C, Equipment, Instrument, and Certificate Requirements.*

All sUAS operated under this regulation must have the following operational capabilities:

7.1 Command and Control Link

(1) The PIC must only operate a sUAS that employs appropriate technology to ensure reliability of communications control links and minimizes system vulnerability to radio frequency interference.

(2) When operating using 72-76 Megahertz (MHz) commonly used by the Model Aircraft community, the PIC must employ technology which ensures that there is no interference with Model Aircraft operations.

COMMENTARY: *Consensus standards will clearly define how to appropriately achieve the intended capabilities above. Thus, the defintion and specification of the appropriate technology will be left to consensus standards. The technology defined for 72-76 Mhz must ensure that the new transmission technology does not intefere with the legacy technology used by Model Aircraft today.*

7.2 Fly-away Protection

No person may operate a sUAS that does not employ a technical mechanism which automatically executes a strategy to retain the aircraft in the intended operational area in the event of the loss of control. The fly-away protection mechanism must return the sUAS safely to the surface, as soon as practical.

COMMENTARY: *Consensus standards will clearly define how to appropriately achieve the capabilities intended. Thus, the definition and specification of the appropriate technical mechanisms will be left to consensus standards.*

7.3 High Visibility

All sUAS operated under this regulation must be colored with a high-contrast scheme.

> ***RATIONALE:*** *Facilitates unmanned aircraft tracking by the PIC and visual observers as well as to increase the probability that it would be detected by pilots of manned aircraft.*
>
> ***COMMENTARY:*** *Consensus standards will clearly define how to appropriately achieve the capability intended. A single consensus standard could not only address coloring schemes for sUAS visibility, but also address the issue of identification markings (See Section 19.2). Thus, the sUAS ARC envisions a standard like "Standard Guide to the Visibility and Identification Markings of Small Unmanned Aircraft Systems for Commercial Use."*

7.4 Maneuverability ●

All sUAS must have the capability to descend 50 feet within five seconds of the PIC recognizing the need for an avoidance maneuver. Maneuver should be repeatable or the aircraft should return to the ground. ●

> ***RATIONALE:*** *Helps to ensure that the PIC can maneuver the sUAS to avoid potential conflicts and maneuver in the event of an imminent collisions threat. Capability could accommodate larger descents through repeat instruction or continued control surface deflection.*
>
> ***ALTERNATIVE VIEW:*** *To allow either a* ***climb*** *or descent of 50 feet within five seconds.*
>
> ***ALTERNATIVE RATIONALE:*** *Limiting an avoidance maneuver to only a descent may be impractical and could introduce risks. Circumstances may dictate that other options may be more appropriate. Having options may reduce risks.*

7.5 Position Reporting

If operating greater than 400' AGL all sUAS weighing over 4.4 lbs (2 kilograms (kgs)) must have the capability to display position and altitude information to the PIC.

> ***RATIONALE:*** *Helps the PIC maintain situational awareness and ensure that the aircraft remain within appropriate operating limits. If available, down-linked aircraft telemetry can be used by the PIC and/or qualified visual observers to aid in flight operation and visual acquisition.*
>
> ***COMMENTARY:*** *In the future, the FAA may want to consider having Automatic Dependent Surveillance-Broadcast (ADS-B) OUT either transmitting from on-board the aircraft or as a relay from the Control Station. This may assist manned aviation in the vicinity with situational awareness of the location of sUAS operations, especially as ADS-B IN utilization grows in the aviation community whom typically fly at low altitudes.*

8. Multiple Kinds of sUAS Operations

There are multiple kinds of operations for sUAS each with different operational limits and required operational capabilities determined by gross take-off weight, system robustness, and relative risk. The PIC is responsible for ensuring that operations are conducted consistent with these constraints. The five operating groups are summarized in the table below.

Group	Gross Take-Off Weight	Additional Operational Limits	Additional Required Operational Capabilities
I	≤ 4.4 lbs (2 kgs)	Section 9.2	Section 9.3
II	≤ 4.4 lbs (2 kgs)	Section 10.2	Section 10.3
III	≤ 19.8 lbs (9 kgs)	Section 11.2	Section 11.3
IV	≤ 55 lbs (25 kgs)	Section 12.2	Section 12.3
V	*LTA only*	Section 13 (Reserved)	Section 13 (Reserved)

9. Additional Provisions—Group I sUAS

Group I sUAS are very maneuverable, frangible, and slow moving aircraft which pose minimal risk to those on the surface and other aircraft.

9.1 Group I Physical Characteristics

The following physical characteristics apply to all Group I sUAS:

(1) Gross take-off weight equal to or less than 4.4 lbs (2 kgs) including fuel, batteries, and payload.

(2) Must not be capable of exceeding more than 30 knots calibrated airspeed at full power in level flight.

(3) Constructed in a frangible manner that would minimize injury to those on the surface and reduce damage to other aircraft in the event of a mid-air collision. A sUAS can be considered frangible if it is made of paper, wood, or breakable plastic and contains no substantial metal parts.

> ***RATIONALE:*** *A key differentiator between Group I and Group II sUAS is frangibility.*
>
> *Some alternatives discussed include the following:*
>
> - *Given that the word frangible means "breaks into pieces" the definition could focus on the nature of pieces such as the size of the largest hard piece or the frontal area of the largest piece*
> - *Ratio of plan view area to weight*
> - *Energy absorbing of the material*
>
> *With the "keep-it-simple" guidance in mind, the above definition is being proposed. The notion of frangibility is important in that the consequence*

of a collision between a sUAS and another aircraft or person/property on the surface is reduced if the sUAS itself is frangible.

COMMENTARY: *Consensus standards could be developed for how to construct a sUAS that would be considered frangible.*

9.2 Group I Additional Operational Limits ●

In addition to the limitations outlined in Sections 4, 5, and 6 of this regulation, a Group I sUAS must be operated:

(1) At or below 400' AGL in Class C, D, E, and G airspace.

RATIONALE: *Limiting Group I aircraft to at or below 400' mean that sUAS which are certified to a lower degree of robustness and operated by unlicensed PICs are less likely to encounter manned aircraft (since in the majority of airspace, manned aircraft must be at a minimum altitude of 500' or higher for fixed winged aircraft).*

(2) Within visual line-of-sight of the PIC and/or qualified visual observer or less than 1500' lateral distance from the location of the PIC and/or visual observer whichever is less.

(3) Greater than 3 NM of a military or public-use airport, heliport, or seaplane base.

RATIONALE: *Within 3 NM of an airport is the airspace where manned aircraft are likely to be operating close to the ground. To reduce encounters with unmanned aircraft which are certified to a lower degree of robustness and operated by unlicensed PICs, Group I aircraft are restricted from operating within 3 NM of an airport. The Group I sUAS is limited to specific operating areas.*

ALTERNATIVE VIEW: (Replace 9.2) with the following:

In addition to the limitations outlined in Sections 4, 5, and 6 of this regulation, a Group I small UAS must be operated:

(1) At or below 400' AGL in Class C, D, E, and G airspace.

(2) Within visual line-of-sight of the PIC and/or qualified visual observer or less than 1500' lateral distance from the location of the PIC and/or visual observer whichever is less.

(3) Greater than 3 NM of a charted public-use airport, heliport, or seaplane base unless the following requirements are met:

(a) The PIC, no less than one hour prior to beginning a flight, informs the controlling authority of all public use airports, heliports or seaplane bases within three miles of the area in which the flight will take place, the time and place of the flight operations, and inquires regarding any specific areas where sUAS flight shall be avoided.

(b) The PIC will initiate a call by cell phone to the nearest controlling authority to assure cell coverage and provide a call back number to facilitate contact of the PIC by the Controlling Authority if for any reason sUAS flight operations must suddenly be restricted or suspended.

(c) The sUAS shall operate no more than 200' higher than the maximum height of obstructions such as trees, power lines, structures, steep cliffs or bluffs within the flight area, or 400' AGL whichever is the lower altitude.

***ALTERNATIVE RATIONALE:** A distance of 3 miles from airport identified in this recommendation limits the commercial viability of sUAS employment for small business. It prohibits operation in the environment where nearly all the commercial opportunity exists. The mitigating factors in the alternate view establish definable and analyzable risk characteristics.*

9.3 Group I Additional Operational Capabilities ●

In addition to the operational capabilities outlined in Section 7 of this regulation the following capabilities are required:

(1) **Manual Flight Control:** Group I SUAS must be capable of only manual flight control, ensuring that PIC control inputs made in the Control Station are translated directly into corresponding control surface positions. ●

***RATIONALE:** The idea for Group I aircraft were that they are operated like a Model Aircraft for compensation and hire. Model Aircraft are not generally operated in any other manner than manual flight control. Such*

a system is likely to be less complex and thus easier for a non-license PIC to operate.

For operations requiring other than manual flight control (i.e., auto flight management) would thus have to be operated as Group II.

***ALTERNATIVE VIEW:** Group I sUAS should be allowed to utilize simple auto flight management systems as long as manual flight control can be assured.*

***ALTERNATIVE RATIONALE:** Technology has progressed to such a state that to preclude the use of simple auto flight management is unnecessarily restrictive. Consensus standards could be written to define such systems and the mechanisms to test and verify their performance.*

9.4 System Certification

The entire sUAS including airframe, communications link, and Control Station will be certified to standards outlined in Section 20.

***COMMENTARY:** The intent is that Group I sUAS will be certified to a lower level of robustness than other sUAS due to their relatively low perceived risk to people on the surface and other aircraft due to operational limits, frangibility requirements, short flight duration, stick-to-surface control, and low speed of operation. See Appendix B.*

10. Additional Provisions—Group II sUAS

Group II sUAS due to their small size, system robustness and maneuverability pose minimal risk to those on the surface and other aircraft.

10.1 Group II Physical Characteristics

The following physical characteristics apply to all Group II sUAS:

(1) Gross take-off weight equal to or less than 4.4 lbs (2 kgs) including fuel, batteries, and payload.

(2) Capable of less than 60 knots calibrated airspeed at full power in level flight.

(3) Cruise speed of less than 40 knots in level flight.

10.2 Group II Additional Operational Limits ●

In addition to the limitations outlined in Sections 4, 5, and 6 of this regulation, a Group II sUAS must be operated:

(1) At or below 400' AGL in Class C, D, E, and G airspace within 30 NM of an airport listed in Appendix D, Section 1 of 14 CFR Part 91 or within the lateral limits of Class B or Class C airspace area designated for an airport. ATC Notification is required per Section 4.5 for flights in Class C and D airspace or within 10 NM of an airport with an operating control tower or local airport advisory.

RATIONALE: *The operational area for Group II sUAS is similar for that of a Group I sUAS with the exception that a Group II can operate within 3 NM of a military or public-use airport, heliport, or seaplane base after coordination with ATC because the PIC is certified and the system has certified to a higher level of robustness.*

(2) At or below 700' AGL in Class G Airspace beyond 30 NM from an airport listed in Appendix D, Section 1 of 14 CFR Part 91 and not within the lateral limits of Class B or Class C airspace area designated for an airport (and operated consistent with the requirements in Sections 4.5 and 5.2).

RATIONALE: *Due to the added risk of operating above 400' AGL in Class G airspace, an additional visual observer and pilot notification via NOTAM is required. For all flights in Class C or D airspace or within 10 NM of an airport with a tower, ATC notification would enable a NOTAM to be issued as well.*

(3) Within the visual line-of-sight of the PIC and/or qualified visual observer or less than 1500' lateral distance from the location of the PIC and/or visual observer whichever is less. ●

ALTERNATIVE VIEW: *When position information is provided to the PIC, allow Group II sUAS flights to operate up to a lateral distance of ½ statute mile (sm) from the location of the PIC or qualified visual observer while still maintaining visual-line-of-sight.*

ALTERNATIVE RATIONALE: *Restricting Group II aircraft to visual line-of-sight or 1500' lateral distance from the PIC and/or qualified visual observer whichever is less is overly restrictive for systems capable of providing position information (bearing, range, and altitude) to the PIC. If this capability is provided the verification of the position of the aircraft is much easier than for a system that does not have this capability. Because this added capability ensures the PIC and/or qualified visual observer can quickly reacquire the aircraft after scanning the airspace for intruding aircraft it can be safely operated within visual line-of-sight of the PIC and/or qualified visual observer or less than ½ sm lateral distance from the location of the PIC and/or visual observer whichever is less.*

(4) If operating with 3 NM of a military or public-use airport, heliport, or seaplane base, the PIC must ensure coordination with ATC and/or the airport manager, if available.

10.3 Group II Additional Operational Capabilities

There are no additional operational capabilities required than those outlined in Section 7 of this regulation.

10.4 System Certification

The entire sUAS including airframe, communications link, and Control Station will be certified to standards outlined in Section 20.

> ***RATIONALE:*** *The intent is that all Group II sUAS will be fully certified and operated by fully certified flight crews.*

11. Additional Provisions—Group III sUAS

Group III sUAS are larger and thus pose a higher perceived risk than Groups I and II to those on the surface and their operations are restricted to sparsely populated regions.

11.1 Group III Physical Characteristics

(1) Gross take-off weight equal to or less than 19.8 lbs (9 kgs) including fuel, batteries, and payload.

> ***RATIONALE:*** *FAA-Department of Defense (DoD) Memorandum of Understanding for operation of sUAS involves a weight limit of 20 lbs.*

11.2 Group III Additional Operational Limits

In addition to the limitations outlined in Sections 4, 5, and 6 of this regulation, all Group III sUAS must be operated in the following manner:

(1) Not over populated places as depicted in "yellow" on sectional charts.

(2) At least 100 feet from any person, vessel, vehicle, or structure that is not associated with the operations.

(3) At or below 400' AGL in Class D, E, and G airspace within 30 NM of an airport listed in Appendix D, Section 1 of 14 CFR Section 91 or within the lateral limits of Class B or Class C airspace area designated for an airport. ATC Notification is required per Section 4.5 for flights in Class D airspace or within 10 NM of an airport with an operating control tower or local airport advisory.

> ***RATIONALE:*** *The operational area for Group III sUAS is similar for that of a Group II sUAS with the exception that, Group III sUAS cannot operate in Class C airspace.*

(4) At or below 700' AGL in Class G Airspace beyond 30 NM from an airport listed in Appendix D, Section 1 of 14 CFR Part 91 and not within the lateral limits of Class B or Class C airspace area designated for an airport (and operated consistent with the requirements in Sections 4.5 and 5.2).

> ***RATIONALE:*** *Due to the added risk of operating above 400' AGL in Class G airspace, an additional visual observer and pilot notification via NOTAM is required. For all flights in Class D airspace or within 10 NM of an airport with an operating tower, ATC notification would enable a NOTAM to be issued as well.*

(5) Within the visual line-of-sight of the PIC and/or qualified visual observer or less than ½ sm lateral distance from the location of the PIC and/or visual observer whichever is less.

(6) Greater than 3 NM of a military or public-use airport, heliport, or seaplane base.

(7) If operating beyond 1500 feet laterally from PIC, there must be at least one qualified visual observer in addition to the PIC.

11.3 Group III Additional Operational Capabilities

In addition to the operational capabilities outlined in Section 7 of this regulation the following capabilities are required for the operation of all Group III sUAS:

(1) **Position Reporting:** The sUAS must be capable of providing position and altitude data to the PIC.

> ***RATIONALE:*** *Knowing position and altitude information will assist the PIC in maintaining situational awareness and ability to adhere to operational limitations.*

(2) **Aviation Band Radio:** If operating within 5 NM of a non-towered airport, a qualified visual observer involved with the operation must monitor UNICOM or CTAF and announce sUAS activity on the frequency of the closest airport consistent with applicable procedures.

(3) **Electronic Position Reporting Capability:** All Group III sUAS operating beneath the floor of the lateral limits of Class C or B airspace, or within the Mode C veil, must be equipped and operate an electronic positioning reporting system consistent with 14 CFR 91.215 or acceptable to the Administrator.

> ***COMMENTARY:*** *The ARC feels that electronic position reporting is recommended if feasible for all Group III operations.*

11.4 System Certification

The entire sUAS including airframe, communications link, and Control Station will be certified to standards outlined in Section 20.

> ***RATIONALE:*** *The intent is that all Group III sUAS will be fully certified and operated by fully certified flight crews.*

12. Additional Provisions—Group IV sUAS

Group IV sUAS are the largest sUAS permitted to operate under this regulation. Because of their large size, their operation is restricted to extremely remote areas that pose minimal perceived risk to those on the surface.

12.1 Group IV Physical Characteristics

(1) Gross take-off weight equal to or less than 55 lbs (25 kgs) including fuel, batteries, and payload.

12.2 Group IV Additional Operational Limits ●

In addition to the limitations outlined in Sections 4, 5, and 6 of this regulation, a Group IV sUAS must be operated in the following manner:

(1) The PIC must obtain a Letter of Authorization (LOA) from the FAA verifying that the planned area of operation can be considered uninhabited and extremely remote.

> ***CRITERIA:*** *To be considered as uninhabited and extremely remote, the operational area must include all of the following characteristics:*
>
> - *Class G airspace*
> - *Outside of 30 NM of an airport listed in Appendix D, Section 1 of 14 CFR Part 91*
> - *At or below 700' AGL, must be at least 5 NM from a military or charted airport, heliport, or seaplane base* ●
> - *If operating above 700' AGL up to 1200' AGL, must be at least 10 NM from military or charted airport, heliport, or seaplane base*
> - *Not following published federal airways or MTRs (intent is not to prohibit sUAS from crossing airways or MTRs but to reduce encounters by minimizing exposure)*
> - *No occupied structures with the exception of structures inhabited by persons involved with the operation*
> - *Not over National Parks*
> - *Not under restricted areas or Military Operations Area (MOA)*
>
> *The FAA will need to determine the mechanism by which the FAA issues the LOA. The Operations Working Group envisions something like the local Flight Standards District Office (FSDO) applying the criteria above based upon an application from a potential operator. The criteria will be clearly communicated.*
>
> ***ALTERNATIVE VIEW:*** *Change above criteria to restrict operations to at least 10 NM from charted airport, heliport, or seaplane base.*

(2) The PIC must ensure that the Group IV sUAS is only operated in the area designated under the FAA LOA in (1) above.

(3) The PIC must not operate a Group IV sUAS within 100 feet from any person, vessel, vehicle, or structure that is not associated with the operations.

(4) The PIC must operate a Group IV sUAS at or below 1200' AGL.

(5) The PIC must ensure that the Group IV sUAS must remain within the visual line-of-sight of the PIC and/or qualified visual observer or less than 1sm lateral distance from the location of the PIC and/or visual observer whichever is less.

(6) There must be at least one qualified visual observer in addition to the PIC. If operating within 10 NM of a chartered airport, heliport, or seaplane base, two visual observers in addition to the PIC are required.

(7) If the sUAS is operated by a PIC either in a shelter or "headsdown", the operation requires the use of two qualified visual observers in addition to the PIC.

(8) The PIC must ensure that ATC is notified per Section 4.5.

12.3 Group IV Additional Operational Capabilities

> ***RATIONALE:*** *These operational capability and/or equipment provisions are analogous to the provisions contained in 14 CFR 91, subpart C, Equipment, Instrument, and Certificate Requirements.*

(1) **Position Reporting:** The sUAS must be capable of providing position and altitude data to the PIC.

> ***RATIONALE:*** *Knowing position and altitude information will assist the PIC in maintaining situational awareness and ability to adhere to operational limitations.*
>
> ***COMMENTARY:*** *The sUAS ARC discussed the potential value of Electronic Position Reporting Capability to enable manned aircraft that are appropriately equipped to maintain situation awareness of the sUAS operation. However, a concern was expressed that such equipment may not be available for sUAS and that the majority of manned aircraft likely to be operating in the vicinity may not be equipped. In the future, the FAA should consider requiring all Group IV sUAS to be equipped and operated with an electronic positioning reporting system consistent with 91.215 or acceptable to the Administrator (e.g., ADS-B).*

12.4 System Certification

The entire sUAS including airframe, communications link, and Control Station will be certified to standards outlined in Section 20.

> ***RATIONALE:*** *The intent is that all Group IV sUAS will be fully certified and operated by fully certified flight crews.*

13. RESERVED: Additional Provisions—Group V Lighter-than-Air sUAS ●

> ***COMMENTARY:*** *The sense of the sUAS ARC is that the FAA should address provisions for LTA unmanned aircraft. During the sUAS ARC deliberations, an attempt to develop additional provisions for these systems was made. Although the ARC consulted with subject-matter experts to develop these provisions, the ARC felt that the membership did not have the adequate expertise to make appropriate judgments to provide specific LTA recommendations to the FAA.*

14. Provisions Concerning sUAS Operations in Designated Testing Areas

A sUAS Testing Area is a location designated for the purpose of test flying sUAS. Consists of an uninhabited and extremely remote surface area including a safety buffer zone where surface access is controlled and thus is free of non-participants.

14.1 Groups of sUAS Allowed

The following Groups of sUAS are allowed to operate in Designated sUAS Testing Areas: Group I, II, III, and IV.

14.2 Additional Operational Limits for Operations in Designated sUAS Testing Areas

In addition to the limitations outlined in Sections 4, 5, and 6 of this regulation, a sUAS operated in a designated test area must be operated in the following manner:

(1) The area must be designated as an sUAS Testing Area via an FAA LOA.

CRITERIA: *To be considered as uninhabited and extremely remote area suitable for designation as a sUAS Testing Area, the operational area must include all of the following characteristics:*

- *Class G airspace*
- *Outside of 30 NM of an airport listed in Appendix D, Section 1 of 14 CFR Part 91*
- *Outside of the lateral footprint of Class B and Class C airspace*
- *Not over surface area containing populated places depicted as "yellow" on sectional charts*
- *Must be at least 5 NM from military or charted airport, heliport, or seaplane base unless operating at a private airport with the explicit permission of the airport authority*
- *If the intended designated test area is closer than 10 NM from a chartered or military airport, heliport, or seaplane base, there must be a public comment period to seek input from local users similar to the obstruction review process outlined in AC 70/7460-2K: "Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace" (1 March 2000). This would involve public notice to be distributed to those agencies, organizations, or individuals with known aeronautical interests to determine if the proposal would be a hazard to air navigation. State and local aviation authorities, as well as various military organizations of the Department of Defense, are also offered the opportunity to comment on the aeronautical effects of the proposed sUAS test area*
- *The sUAS Operator must control surface access to physical footprint which includes the operational area and a buffer zone. The buffer*

zone shall extended from the perimeter of the operational area by at least ½ the greatest distance across the operational area. Thus, if the intended operational area is a circle with a radius of one mile, the physical footprint which includes the operational area and buffer zone would have a radius of two miles. The sUAS operator must ensure that there are no un-authorized people in the physical footprint

- *No occupied structures with the exception of structures inhabited by persons involved with the operation*

***NOTE:** Test Area should be NOTAM'ed as an "alert area" and appear on sectional charts including operational hours and appropriate point-of-contact. If the test area activity would continue beyond a six month period. [There is some concern that it may not be feasible to chart test areas on sectional charts due to issues associated with clutter.] Other aircraft are not prevented from accessing the alert area but do so with the full knowledge of potential sUAS activity in the area. Alert area and area of surface access control should exceed the operational area (area where sUAS is flown) by 100 percent, effectively creating a buffer zone.*

The FAA will need to determine the mechanism by which the FAA issues the LOA. The Operations Working Group envisions something like the local FSDO applying the criteria above based upon an application from a potential operator. The criteria will be clearly communicated.

(2) The PIC must ensure that the sUAS is only operated in the area designated under the FAA LOA in (1) above.

(3) At least 100 feet from any person, vessel, vehicle, or structure that is not associated with the operations.

(4) The sUAS must remain at or below 1200' AGL.

(5) The sUAS must remain within the visual line-of-sight of the PIC and/or qualified visual observer or less than 1sm lateral distance from the location of the PIC and/or visual observer whichever is less.

(6) There must be two qualified visual observers in addition to the PIC.

(7) The PIC must ensure that ATC is notified per Section 4.5.

14.3 Operational Capabilities

All sUAS operating in a designated sUAS testing area must have the operational capabilities identified in Section 7 of this regulation as well as the additional operational capabilities as defined in the table below.

Gross Take-Off Weight	Additional Required Operational Capabilities
0 lbs < and ≤ 4.4 lbs	Section 9.3 or Section 10.3
4.4 lbs < and ≤ 19.8 lbs	Section 11.3
19.8 lbs < and ≤ 55 lbs	Section 12.3
Lighter-than-Air	Section 13 (reserved)

14.4 System Certification

The PIC of sUAS operating in a designed sUAS testing area shall be responsible for assuring the sUAS is airworthy and ready for flight testing.

> ***COMMENTARY:*** *Consensus standards should be established which define the criteria for determing a system is ready for flight testing. The ARC envisions a basic check list to ensure safety of flight system components prior to first flight.*

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Subpart C. Personnel

15. Pilots

15.1 Applicability

This Section applies to all persons who seek to serve as PIC of sUASs. An approved training source as specified in this section can be one of the following:

(1) Certificated Instructor Pilot that meets the requirements of Section 17.

(2) Approved training program that meets the requirements of Section 18.

(3) PIC of an aircraft that has been flown under the provisions of Section 2.1, Section 14 or Section 23, or operating under a Certificate of Authorization (COA) or a Special Airworthiness Certificate

15.2 Certificate

Except as provided in Section 15.4, no person may act as PIC of a sUAS or in any capacity as a required pilot flight crewmember of a civil sUAS of the United States registry unless that person holds a valid pilot certificate issued under this recommendation in that persons possession or readily accessible when exercising the privileges of that pilot certificate.

15.3 Eligibility

To be eligible for a sUAS pilot certificate, a person must:

(1) Be at least 18 years of age.

(2) Be able to read, speak, write, and understand the English language.

(3) Complete an approved course of training on the aeronautical knowledge areas and on the areas of operation listed in this sub part.

(4) Pass the required knowledge test on the aeronautical knowledge areas listed in this sub part.

(5) Receive an endorsement from an approved training source.

RATIONALE: *Establishes eligibility requirements. The committee felt that establishing an age requirement of 18 was appropriate in that all manned aircraft commercial activity requires that minimum age.*

The committee also felt strongly that all sUAS pilots should complete sUAS specific written exam covering the knowledge areas specified as opposed to requiring completion of a Private Pilot written exam.

COMMENTARY: *The sUAS knowledge test should be the same for Groups I-IV.*

COMMENTARY: *The FAA should consider mechanisms to "grandfather" developers of sUAS and/or military personal who can present evidence of appropriate flight experience to a FSDO.*

15.4 Operations Not Requiring a Pilot Certificate

A person acting as PIC of a Group I aircraft as described in Section 9 does not require a pilot certificate. They must either pass a sUAS written knowledge test or complete an approved Group I sUAS training program which addresses the aeronautical knowledge areas listed in Section 15.5.

> ***COMMENTARY:*** *It is the intent of the sUAS ARC, that community-based organizations could establish and conduct the appropriate training program and associated testing for Group I sUAS student pilots.*

15.5 Aeronautical Knowledge Requirements

A person who applies for (a) a sUAS pilot certificate or (b) authorization to act as PIC of a sUAS satisfying the requirements in 15.4; must receive and log ground training from an authorized instructor or approved school and pass a knowledge test on the aeronautical knowledge areas listed below.

> ***COMMENTARY:*** *The FAA should develop an approach for giving credit to individuals that hold a current private, commercial, or airline transport pilot certificate or a person having passed the private pilot written.*
>
> ***RATIONALE:*** *The group felt that if sUAS of any size or performance characteristic was to be flown in the NAS for commercial purposes, the pilot should have demonstrated some level of knowledge appropriate to such operations. Again this is not intended to be a Private Pilot written exam. The committee expects that a knowledge test will be developed specifically for sUAS.*
>
> *These suggested knowledge areas are a watered down version of the knowledge areas required by Private Pilots. They have been established to reflect knowledge areas the group felt were appropriate to commercial operation of a sUAS.*
>
> *More specific details regarding these knowledge areas could be contained in a consensus standard to facilitate FAA approval of specific training programs.*

(1) Applicable regulations relating to sUAS pilot privileges, limitations, and flight operations.

(2) Incident/accident reporting requirements of the National Transportation Safety Board (NTSB) and FAA.

> ***RATIONALE:*** *Reporting of incidents/accidents are critical to the data gathering efforts.*

(3) Use of applicable portions of the aeronautical information manual and FAA advisory circulars.

(4) Use of aeronautical charts for VFR and Instrument Flight Rules (IFR) navigation, overlying airspace consideration, obstacle clearance requirements, and flight restrictions affecting sUAS operations.

RATIONALE: *Knowledge of aeronautical charts is essential for identifying airspace boundaries.*

(5) Recognition of critical weather situations from the surface that may affect safe sUAS operation. This would include procurement and use of aeronautical weather reports and forecasts.

RATIONALE: *General knowledge of hazardous weather will have a positive effect on accident/incident rates and reliability.*

(6) Safe and efficient operation of the sUAS including collision avoidance and recognition of hazardous in-flight situations.

RATIONALE: *To operate safely the PIC must understand collision avoidance procedures.*

(7) Effects of weather on sUAS performance.

RATIONALE: *Knowledge of temperature and altitude effects on sUAS performance is necessary for safe flight.*

(8) UAS configuration management including but not limited to weight and balance consideration or other factors affecting sUAS performance.

(9) Principles of aerodynamics, power plants, and aircraft systems appropriate to sUAS.

RATIONALE: *Fundamental understanding of aerodynamic principles and aircraft systems will contribute to reliability and better pilot performance.*

(10) Emergency procedures including recovery from unusual flight attitudes and recognition of stall/spins as applicable.

RATIONALE: *Stall/spin awareness and emergency procedures are an essential element to flight. Particularly to sUAS under direct pilot control.*

(11) Aeronautical decision making and risk management.

RATIONALE: *Decision making and risk assessment/management are essential elements in aviation.*

(12) Crew Resource Management.

RATIONALE: *Many sUAS operations will involve a PIC working with one or more visual observers.*

15.6 Flight Proficiency

A person who applies for an unmanned aircraft pilot certificate must have flown that aircraft under the provisions of Section 2.1, Section 14, Section 23, or under a COA or a Special Airworthiness Certificate, or must receive and log ground and flight training from an authorized instructor or approved school on the areas of operation listed below:

RATIONALE: *Establishes flight proficiency requirements for all system PICs regardless of aircraft size and performance. The committee left plenty of latitude for each operator/manufacturer to define how the training courses are constructed, left the number of training hours required out of the rule thereby allowing training to proficiency as determined by the school/instructor.*

These areas are modified extracts from 14 CFR Part 61 Private Pilot requirements. They have been tailored for sUAS operations and represent what the group felt were generic areas applicable to ALL platforms. The committee decided not to get overly specific due to the varied nature of the available systems and to provide ample latitude to instructors and schools to define training program's as they deem appropriate.

No reference to sensor package training requirements.

More specific details regarding flight proficiency could be contained in a consensus standard to facilitate FAA approval of specific training programs.

Flight proficiency requirements do not apply to perspective PICs of Group I sUAS.

(1) Preflight preparation.

(2) Preflight procedures.

(3) Range or operational area safety and risk assessment.

(4) Launches, recoveries, go-arounds, or wave-offs.

(5) Mission operations and management to include VFR navigation, adherence to prescribed flight plan, collision avoidance, and ATC communications.

(6) Flight and ground crew management as applicable.

(7) Emergency procedures as applicable to aircraft.

(8) Post-flight procedures.

15.7 Flight Review: Pilot-in-Command ●

(1) To operate a sUAS except if operated under Section 15.4, or Section 23, or under a COA or a Special Airworthiness Certificate, the PIC must complete a flight review administered by an authorized instructor or an approved school in the preceding 24 calendar months. ●

(2) The review must consist of a minimum of one hour of ground training including a review of current general operating rules for sUAS and applicable flight rules of 14 CFR 91 and; a minimum of one hour of flight training or of a duration equal to the operational limitation of the aircraft whichever is shorter and including at least one launch and recovery of the aircraft.

RATIONALE: The dynamic nature of the regulatory environment relating to sUAS operations in the NAS coupled with rapid technology changes makes it imperative that crews remain "current" and knowledgeable.

The flight review concept is an adaptation of the 14 CFR Part 61 requirements for manned aircraft. 14 CFR Part 61.56

ALTERNATIVE VIEW: Add a Recent Flight Experience Section, as follows: *(1) Except for flight training or to meet the proficiency requirements of this Part, no person may act as PIC of an unmanned aircraft unless that person has made a minimum of three successful flights including launch and recovery in the preceding 90 days. (2) For the purpose of meeting requirements of this part, the flights including launch and recovery can be accomplished in a training device approved by the Administrator.*

ALTERNATIVE RATIONALE: *Most segments of aviation require some form of PIC currency. There is concern that sUAS piloting skills will erode over time and thus increase risk. It is anticipated that the burden on the PIC would be minimal.*

15.8 Medical Certificate: Requirements and Duration

15.8.1 Operations Requiring a Medical Certificate ●

A person performing the duties of PIC of a sUAS shall:

(1) For all operations except those meeting the requirements of Section 15.4, possess at least a second class medical certificate with limitations for sUAS operations.

(2) As an alternative to (1) above, possess documentation from a licensed medical professional asserting that the individual has visual ability consistent with description contained in second class medical certificate requirements as defined in 14 CFR Part 67.203 and hearing consistent with the description contained in second class medical certificate requirements as define in 14 CFR 67.205.a.1. ●

(3) Have no physical limitation that would prevent carrying out the duties and responsibilities of an observer.

ALTERNATIVE VIEW: *Except as provided in Section 15.8.2 of this Part, a PIC must hold at least a second-class medical certificate with waivers as identified by designated medical examiner for sUAS operations as applicable.*

ALTERNATIVE RATIONALE: *Even an FAA medical certificate issued with limitations for sUAS privileges is more comprehensive than vision standards (i.e., reflexes, medical history, conditions, neurology, and pathology.)*

15.8.2 Operations Not Requiring a Medical Certificate

A person is not required to hold a medical certificate:

(1) When operating an aircraft that meets the requirements of 15.4 of this sub part.

(2) When acting as a sUAS instructor if that person is not acting as PIC.

(3) When taking a test for sUAS certification.

(4) When piloting a sUAS not as the PIC.

> ***RATIONALE:*** *It is the opinion of the sub group that medical certificates should be required of ALL sUAS PICs. However, under the "Group I" provisions and the realization that we are trying to afford opportunities to grow the light-weight side of the spectrum, the committee has agreed to waive the certification and medical requirements for Group I operations.*
>
> *The committee feels a second class medical was appropriate for all others in that these are operations for other than recreational purposes and the eyesight requirements for line-of-sight operations greater than 1500 feet away required a higher level of visual acuity.*
>
> *Driver's license eyesight requirements are too generous and inconsistent from state to state.*
>
> *(1) and (3) are consistent with manned aircraft operations.*

15.8.3 Duration of Medical Certificate ●

For sUAS operations under this sub part, a second-class medical certificate or medical examination expires at the end of the 36th month after the month of the date of the examination shown on the certificate. ●

> ***RATIONALE:*** *The group felt that extending the valid period for a second class medical for sUAS operations was appropriate given the nature of the operations and no passengers were involved.*
>
> *The third class medical duration is consistent with the newly released rules governing medical duration for pilots under 40 years of age. The committee thought this was appropriate for all sUAS observers regardless of age.*
>
> ***ALTERNATIVE VIEW:*** *The duration of the medical certificate should be consistent with the duration contained 14 CFR 61.23.*

15.9 Issuance of sUAS Certificate and Authorizations

An applicant for sUAS pilot certificate must comply with the requirements of Federal Aviation Regulations (FAR) Part 61.13 (a), (b). Additional requirements for sUAS group authorizations.

(1) Authorization to act as PIC of sUAS shall require instruction from an authorized instructor and demonstration of proficiency in all the flight proficiency areas of operation found in Section 15.5 of this sub part.

(2) Receive a logbook endorsement from an authorized instructor that the pilot has received the required instruction and been found competent to act as PIC of that style of aircraft.

RATIONALE: *This is general boiler plate establishing the requirement that states you must be a United States citizen or pay the necessary non citizen fee's to the government before a certificate can be issued.*

Requires that you apply for the certificate and be found competent to hold the certificate.

Clarifies the intent to permit operations of multiple aircraft types with a logbook endorsement.

16. Qualified Visual Observer

This Section applies to all persons who seek to serve in the capacity of a qualified visual observer per requirements outlined in Section 5.2.

16.1 Eligibility

To be eligible to perform the duties of visual observer for sUAS operations, a person must:

(1) Be at least 18 years of age.

(2) Be able to read, speak, write, and understand the English language.

(3) Been found competent by the PIC to serve in an observer capacity.

(4) Received training from a certificated sUAS pilot on the duties and responsibilities of an observer pertaining to the sUAS on which observer duty will be performed and on the aeronautical knowledge areas prescribed in Section 16.2 of this Subpart.

RATIONALE: *This Section delineates the requirements for observers as members of the sUAS flight crew. The committee does not advocate issuance of a certificate for this position, however we believe empowering the PIC with responsibility to train and "certify" an individual for observer duty is adequate.*

16.2 Aeronautical Knowledge Requirements

The PIC must ensure that any person serving as a qualified visual observer for sUAS operations has received instruction on the areas listed below:

(1) Regulations pertaining to operation of the sUAS.

(2) Use of aeronautical charts and FAA publications appropriate to the operation conducted.

(3) Determining ground or in flight visibility as appropriate and identification of hazardous weather conditions.

(4) Safe and efficient operation of the sUAS including collision avoidance and recognition of hazardous in flight conditions.

(5) Effective communication procedures including radio operations and direct, effective verbal communication with all sUAS flight crewmembers.

RATIONALE: *Because the qualified visual observer is essentially the "eyes and ears" of the PIC, the committee believes it appropriate that the visual observer be familiar with a sub set of the knowledge areas required of the pilot. The areas selected relate directly to the aircraft in flight and the environment in which it operates. The PIC retains full responsibility for the actions of the observer.*

16.3 Medical Requirements ●

A person performing the duties of visual observer when required by a sUAS shall:

(1) For operations meeting the requirements of Section 15.4, possess at least a third class medical certificate with limitations for sUAS operations.

(2) For all other operations, possess at least a second class medical certificate with limitations for sUAS operations.

(3) As an alternative to (1) and (2) above, possess documentation from a licensed medical professional asserting that the individual has visual ability consistent with description contained in second class medical certificate requirements as defined in 14 CFR Part 67.203 and hearing consistent with the description contained in second class medical certificate requirements as define in 14 CFR 67.205.a.1.

(4) Have no physical limitation that would prevent carrying out the duties and responsibilities of an observer.

RATIONALE: *Given that visual see and avoidance is a critical aspect of avoiding mid-air collisions and the visual observers primary function is to visually monitor the unmanned aircraft and the airspace around it for potential collision threats, it is critically important that their eyesight be professionally tested and verified. The recommended regulation makes it clear that either a third or second class medical certificate is required as appropriate or that there be some other form of documentation which indicates that the visual observer has the visual acuity consistent with the standards defined for a second class medical.*

COMMENTARY: *14 CFR Part 67.203 Contains the following visual standards for a second-class airman medical certificate:*

(1) Distant visual acuity of 20/20 or better in each eye separately, with or without corrective lenses. If corrective lenses (spectacles or contact lenses) are necessary for 20/20 vision, the person may be eligible only on the condition that corrective lenses are worn while exercising the privileges of an airman certificate.

(2) Near vision of 20/40 or better, Snellen equivalent, at 16 inches in each eye separately, with or without corrective lenses. If age 50 or older, near vision of 20/40 or better, Snellen equivalent, at both 16 inches and 32 inches in each eye separately, with or without corrective lenses.

(3) Ability to perceive those colors necessary for the safe performance of airman duties.

(4) Normal fields of vision.

(5) No acute or chronic pathological condition of either eye or adnexa that interferes with the proper function of an eye, that may reasonably be expected to progress to that degree, or that may reasonably be expected to be aggravated by flying.

(6) Bifoveal fixation and vergence-phoria relationship sufficient to prevent a break in fusion under conditions that may reasonably be expected to occur in performing airman duties. Tests for the factors named in this paragraph are not required except for persons found to have more than one prism diopter of hyperphoria, six prism diopters of esophoria, or six prism diopters of exophoria. If any of these values are exceeded, the Federal Air Surgeon may require the person to be examined by a qualified eye specialist to determine if there is bifoveal fixation and an adequate vergence-phoria relationship. However, if otherwise eligible, the person is issued a medical certificate pending the results of the examination.

COMMENTARY: *The existing "Guide for Aviation Medical Examiners Application Process for Medical Certification" could be used as testing criteria.*

ALTERNATIVE VIEW: *Accept a valid United States driver's license in lieu of a second-or third-class medical certificate.*

ALTERNATIVE RATIONALE: *In 14 CFR 61.303, a United States driver's license is accepted for the operation of light-sport aircraft.*

16.4 Duration of Medical Certificate ●

For sUAS operations under this sub part, a second-class medical certificate or medical examination expires at the end of the 36th month after the month of the date of the examination shown on the certificate. For operations requiring a 3rd class medical, the medical certificate expires at the end of the 60th month after the month of the date of the examination shown on the certificate. ●

RATIONALE: *The group felt that extending the valid period for a second class medical for sUAS operations was appropriate given the nature of the operations and no passengers were involved.*

The third class medical duration is consistent with the newly released rules governing medical duration for pilots under 40 years of age. The committee thought this was appropriate for all sUAS observers regardless of age.

ALTERNATIVE VIEW: *The duration of the medical certificate should be consistent with the duration contained 14 CFR 61.23.*

17. UAS Instructor

This Section prescribes the requirements for the issuance of sUAS instructor certificates, the conditions under which the certificate is necessary, and the limitations on the certificate.

17.1 Eligibility Requirements

To be eligible for a sUAS instructor certificate a person must:

(1) Be at least 18 years of age.

(2) Be able to read, speak, write, and understand the English language.

(3) Hold a sUAS pilot certificate.

(4) Pass a knowledge test on the aeronautical knowledge areas listed in 17.2 of this section unless the applicant:

- Holds a flight instructor certificate or ground instructor certificate issued under this part
- Holds a current teacher's certificate issued by a state, county, city, or municipality that authorizes the person to teach at an educational level of 7th grade or higher
- Is employed as teacher at an accredited college or university

> ***RATIONALE:*** *This recommendation is consistent with 14 CFR Part 61 instructor requirements for manned aircraft. 14 CFR Part 61.183. Provides for exemptions for an additional knowledge test.*
>
> ***COMMENTARY:*** *The FAA should consider mechanisms to "grandfather" developers of sUAS and/or military personal who can present evidence of appropriate flight experience to a FSDO.*

(5) Receive a logbook endorsement from an authorized instructor or aviation safety inspector on the areas of operation listed in Section 15.6.

(6) Logged at least 20 successful launch and recoveries with the sUAS to which instructor privileges are sought.

> ***RATIONALE:*** *The committee believes instructors need to have logged significant experience on a particular system. The committee wants to see consistent acceptable performance from the pilot, an ability to make good judgment calls, and know a system well enough to achieve a good track record of successful operations.*

17.2 Aeronautical Knowledge

Except as provided in Section 17.1 (4), a person who is applying for a sUAS instructor certificate must receive and log ground training from an authorized instructor on:

(1) The learning process.

(2) Elements of effective teaching.

(3) Student evaluation and testing.

(4) Course development.

(5) Lesson planning.

(6) Classroom training techniques.

17.3 Flight proficiency

17.3.1 Areas of Operation

A person who is applying for a sUAS instructor certificate must receive and log flight and ground training from an authorized instructor on the areas of operation listed below.

(1) Fundamentals of instructing.

(2) Technical subject areas.

(3) Preflight preparation.

(4) Preflight procedures.

(5) Range or operational area safety and risk management.

(6) Launches, recoveries, go-around's, or wave offs.

(7) Mission operations and management to include VFR navigation, adherence to prescribed flight plan, collision avoidance, and ATC communications.

(8) Flight and ground crew management as applicable.

(9) Emergency procedures as applicable to aircraft.

(10) Post-flight procedures.

> ***RATIONALE:*** *These areas are straight from 14 CFR Part 61. The FAA has a testing instrument in place which fits the bill for this part. Commercially available courseware is readily available to prepare an applicant for this test.*
>
> *This is an enhanced list of areas which include a requirement that the applicant demonstrate some teaching ability. All the areas are the same as those required for pilot certification.*

17.3.2 Endorsement

The applicant's logbook must contain an endorsement from an authorized instructor certifying the person is proficient in all the areas of operation and has been found qualified to hold a sUAS instructor certificate.

> ***RATIONALE:*** *This section provides for the certification of an instructor applicant with an endorsement by a qualified instructor. Again, like the sUAS Pilot Certificate, no additional practical test is required.*

17.4 sUAS Instructor Limitations and Qualifications

17.4.1 Hours of Training

In any 24 hour consecutive period, a sUAS instructor may not conduct more than 12 hours of instruction.

> ***RATIONALE:*** *As with manned aircraft instruction, the committee believes performance suffers when fatigue sets in. The committee felt it appropriate to limit instructor duty time to 12 hours per day. This is a longer duty day as compared to manned aircraft. 14 CFR Part 61.195 (a.)*

17.4.2 Aircraft Type Training

A sUAS instructor may not conduct instruction on a system for which the instructor does not hold a PIC endorsement.

> ***RATIONALE:*** *Fairly obvious that if you aren't qualified to fly a particular platform, you shouldn't instruct students on it.*

17.4.3 Limitations on Endorsements

A sUAS instructor may not endorse or recommend a student for a sUAS pilot certificate unless that instructor has given the instruction required by Section 15.5 of this subpart and/or found the student competent in all the prescribed knowledge and flight proficiency areas or; endorse a pilot's logbook for the flight review required by Section 15.6 of this subpart.

> ***RATIONALE:*** *The committee believes that it essential that an instructor take responsibility for a student from "cradle to grave". This rule mandates that before an endorsement is rendered, an instructor MUST provide the student with all the instruction or have the student demonstrate competency in the knowledge and skill areas. This is consistent with manned aircraft (14 CFR Part 61.195 (d)).*

17.4.4 Qualifications of the Instructor for Training First Time sUAS Instructor Applicants

The instruction provided to an initial applicant for a sUAS instructor certificate must be given by an authorized instructor who has held an instructor certificate for at least 12 months and has recommended at least three students for sUAS pilot certification.

> ***RATIONALE:*** *This rule is an attempt to insure that instructors who recommend other instructor applicants for a certificate have at least been performing the duties of an instructor for a reasonable amount of time. This is an attempt to insure quality and legitimacy to the instructor certification process. This is consistent with the requirements concept in 14 CFR Part 61.195 (h).*

18. sUAS Training Programs

This section describes the requirements for development and approval of training courses for sUAS pilots and instructors and the general operating rules for training programs and schools.

18.1 Requirements for Training Courses

An applicant for sUAS pilot training course approval must:

(1) Complete and submit application on a form prescribed by the administrator to the FAA FSDO having jurisdiction over the area where the training school is based.

> ***RATIONALE:*** *The committee is trying to capture the idea that community based organizations, operators and manufacturers have significant latitude in how to develop and administer training. This rule provides opportunity for individuals, organizations, or commercial training program developers to create sUAS training courses and deploy them. The work done by ASTM and others can certainly be leveraged. FAA will be responsible for "approving" the courses to make sure they comply with this sub part under guidance to be developed*

(2) For courses leading to a sUAS pilot certificate, submit a training course outline that includes:

- Lesson descriptions and content that covers all required knowledge and flight proficiency areas of operation found in 15.5 and 15.6 of this subpart
- A description of student evaluation criteria and all tests
- A description of the sUAS to be used in training
- For courses leading to a sUAS instructor certificate submit a training course outline that includes:
  - Lesson descriptions and content that covers all required knowledge and flight proficiency areas of operation found in 17.2 and 17.3 of this subpart
  - A description of student evaluation criteria and all tests

> ***RATIONALE:*** *This section identifies specific requirements all approved courses must contain prior to submittal. This is a subset of the requirements for training course outlines found in Part 141.*
>
> *This proposed rule provides opportunity for a school to hold authorizations to train on multiple platforms.*

18.2 Operating Rules and Limitations

This section describes the operating rules for approved sUAS training schools. An approved school includes any certified sUAS instructor or instructors who have submitted and received approval of a training course outline as prescribed in Section 18.1 of this subpart.

RATIONALE: *This section simply defines "approved school". An approved school could be a single instructor, community-based organization, university, sUAS manufacturer, or other appropriate entity. A school may be approved to train and qualify students for one or more Operating Group(s) of sUAS. Such approval shall involve progressive qualifications with Group I being the most basic and Group IV the most comprehensive.*

(3) No approved school may recommend an applicant for a sUAS pilot certificate or sUAS instructor certificate unless that student has completed the entire course of training and successfully passed all required examinations and tests.

(4) An approved school may train students on more than one sUAS.

(5) Training may be conducted in any suitable location at the discretion of the instructor but shall remain under the jurisdiction of the approving FAA FSDO.

RATIONALE: *This section puts some restrictions on schools and mandates that short-cuts are not allowed. Training to proficiency is permitted and encouraged but ALL the training must be completed prior to certification.*

Due to the nature of the business, it is conceivable that training could be offered in multiple locations by a single provider. This rule allows for this but the responsibility still lies with the approving FSDO.

Subpart D. Aircraft and Systems

19. Registration, Identification, and Marking

(1) All applicants for sUAS Certificates of Registration shall comply with Title 14, CFR, Part 47 unless that Part conflicts with this Subpart.

(2) sUAS registration shall be accomplished online via the FAA Aircraft Registry website. The aircraft is registered as of the date the online registration process is completed. A Certificate of sUAS Registration may be downloaded or printed following registration. The Certificate of Registration expires three years from the last day of the month in which the aircraft was registered. Renewal applications are accepted up to 90 days in advance of the expiration date of the current certificate. During flight operations the original or a copy of the Certificate of Registration will be located at the Control Station.

19.1 Registration Required

All civil sUAS shall be properly registered unless the aircraft is operated as defined in Subpart A.

19.2 Identification and Marking

All sUAS shall have its individual identification number on an identification plate and/or markings in accordance with the recognized consensus standards to ensure the identity of the aircraft can be determined following an incident or accident.

20. Initial Airworthiness Certification

COMMENTARY: *The General Aircraft provisions should account for mechanisms associated with certifying individual aircraft as well as aircraft production. Individual aircraft could be production models, kit built, or individual designs.*

Certification requirements should include the use of common language and consist of a program and regime that are applicable/attainable by small business (<5 persons).

If an aircraft is sold in kit form and/or the aircraft initial purchaser builds or assembles more than 51 percent of the aircraft, that individual shall be considered the first owner and the manufacturer.

20.1 Eligibility

For a civil sUAS to be eligible for a sUAS certificate

(1) An applicant must be able to provide the FAA upon request with the following:

- The system's operating instructions
- The system's maintenance and inspection procedures
- The manufacturer's statement of compliance with Section (3)

(2) The system must be inspected and found to be in a condition for safe operation by the applicant.

(3) The manufacturer must provide a statement of compliance which:

- Identifies the sUAS by make and model, serial number, date of manufacture, and any consensus standard used.
- State that the system meets the provisions of the identified consensus standard.
- State that the manufacturer will make available to any interested person the following documents that meet the identified consensus standard:
  - The system's operating instructions
  - The system's maintenance and inspection procedures

RATIONALE: *Following the Light Sport Aircraft approach, the sUAS ARC is recommending that details for certification be moved to consensus standards. The text above is modeled on the Light Sport Aircraft regulatory language contained in 21.190. The text above directs the use of consensus standards for declaring compliance for certification.*

Using the output from the System Certification Working Group and the thinking regarding system maturity from the Operations Working Group the ARC should include recommendations for consensus standards that follow the specifics outlined in Appendix B.

There may need to be Design and Construction standards for the following:

- *Aircraft (Fixed Wing, Lighter-than-Air, Rotorcraft, Power lift)*
- *Control Stations*
- *Command, Control, and Communications*
- *Launch and Recovery Systems*

In addition, consensus standards are needed to offer guidelines for test and evaluation including flight testing and production testing.

20.2 Initial Test and Evaluation

The person who registers the sUAS must ensure that equipment requirements and design provisions described in FAA accepted standards have been successfully tested.

> ***COMMENTARY:*** *Consensus standards will offer guidelines on appropriate processes and procedures for acceptance testing. See section 14.4.*

20.3 Production Approval

The production of multiple copies of a single sUAS for sale for commercial purposes shall follow production acceptance and quality assurance procedures as outlined in recognized consensus standards.

(1) For each system completed, the manufacturer shall state that he has complied with the production acceptance and quality assurance standards including:

- Ground and flight testing the aircraft
- Found the system performance acceptable
- Determined that the system is in a condition for safe operation

(2) The manufacturer will establish a monitoring program in order to identify and correct safety-of-flight issues.

> ***COMMENTARY:*** *The manufacturer should set up a monitoring program in accordance with established consensus standards.*

(3) On an annual basis, the manufacturer will report to the FAA relevant information regarding operational safety of their systems.

> ***COMMENTARY:*** *The FAA will need to define when and how and the content of such reporting.*

21. Continued Airworthiness

21.1 Inspection and Maintenance

The PIC will ensure that the sUAS has been inspected and maintained in accordance with manufacturer's procedures.

21.2 Record Keeping

The PIC is responsible for recording hours of operation, number of takeoffs/launches and landings/recoveries as well as mechanical discrepancies discovered during operation. The owner/operator is responsible for maintaining a log of repairs, alterations, and replacements.

21.3 Repairs and Modifications

Systems that are new, modified, suspected of damage, or that have undergone major maintenance or repair should be re-inspected in accordance with manufacturer's procedures.

> ***COMMENTARY:*** *The sUAS ARC recommends that consensus standards shall establish guidelines for manufacturer's inspection and maintenance procedures, record keeping, and repair and modification procedures.*

22. Reporting

22.1 Operational Safety Monitoring

The PIC will ensure that any equipment malfunctions are logged along with their effect on the operation and reported to the manufacturer in a timely fashion.

22.2 Annual Flight Hour Reporting

The certificate holder is responsible for reporting all flight hours on an annual basis to the FAA.

22.3 UAS Incident Reporting

COMMENTARY: *A definition of a reportable incident is needed. Some members of the ARC felt that that it is vital, in order to evaluate the sUAS safety case, that the FAA must list certain errors, failures and incidents that must be reported in short course such as typically done for flight interruption reports, flight reliability reporting etc. In addition, certain members of the ARC also felt that malfunctions such as failure of the aircraft to respond to flight commands from the control unit, failure of the flyaway protection system, failure of the lost link program, in-flight collision with another aircraft, structure, or person etc. should be reported immediately to FAA. It was also recommended by the ARC that the FAA should develop a sUAS safety program that would allow for data analysis that could enable safety-based data decisions to lead to future sUAS regulatory changes.*

Subpart E. Alternative Means of Compliance

23. Demonstration of Acceptable Level of Risk

Any sUAS may be operated in such a manner that the associated risk of harm to persons and property not participating in the operation is expected to be less than acceptable threshold value(s) as specified by the Administrator. Estimates of risk of harm shall be made according to recognized consensus standards acceptable to the Administrator. Aircraft operated in compliance with this provision need not comply with the provisions of Subpart B.

RATIONALE: *The intent of this recommendation is to enable non-model sUAS operations while bounding the associated risk of harm to manned aircraft, and to people and property on the surface. Accordingly, the regulations should exclude those operations which have excessive risk of harm, and permit those operations which have sufficiently low risk of harm—within the limits imposed by the FAA's overall terms of reference. To a much greater extent than for manned aircraft, this means that regulation must allow reliability and hazard-mitigation measures to vary from mission to mission, with the required reliability and mitigation increasing with density of traffic and population. A "risk-based" means of compliance provides the necessary flexibility, allowing designers and operators to deploy technology and procedures as appropriate to their intended applications.*

The committee considered the alternative of a waiver process for designs and applications not covered by the "bins and boxes" of other subparts. The waiver process has the disadvantages of relatively high cost to the FAA, lack of standardization, and uncertainty of outcome for designers and operators. An affirmative compliance path instead offers standardization, transparency, and predictability, which is essential for encouraging new investment and applications.

This subpart invites industry, academia, and government to apply analysis and experience to establishment of practical standards for risk estimation, which the FAA can choose to accept or reject. Any accepted standard(s) can effectively be made part of the regulations by Notice of Acceptability. Such action would enable use of this subpart. Implementation would involve relatively low cost for the FAA, liability would fall under the blanket of the standard, and modifications can be made as indicated by experience.

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Appendix A: Summary Matrix

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Physical Characteristics						
Max Weight	4.4 lbs (2 kgs)	4.4 lbs (2 kgs)	19.8 lbs (9 kgs)	55 lbs (25 kgs)	Reserved	
Frangibility	Required	Not Required	Not Required	Not Required		
Max speed	< 30 knots cruise	<60 knots calibrated @ full power; <40 knots cruise	87 knots	87 knots		
Manual Flight Control	✓	✓	✓	✓		
Auto Flight Management	×	✓	✓	✓		
Operational Area						
Class A	n/a	n/a	n/a	n/a		
Class B	×	×	×	×		×
Class C	≤400' AGL	≤400' AGL	×	×		×
Class D	≤400' AGL	≤400' AGL	≤400' AGL	×		×
Class E	≤400' AGL	≤400' AGL	≤400' AGL	×		×
Class G (Mode c veil)	≤400' AGL	≤400' AGL	≤400' AGL	×		×
Class G (outside Mode c)	≤400' AGL	≤700' AGL	≤700' AGL	≤700' AGL if <10 NM of military or charted airport, heliport, or seaplane ≤1200' AGL if ≥ 5 NM of military or charted airport, heliport, or seaplane		≤1200' AGL

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Proximity to airports	> 3 NM from a military or public-use airports, heliports, and seaplane bases	< 3 NM from a military or public-use airports, heliports, and seaplane bases requires ATC notification	> 3 NM from a military or public-use airports, heliports, and seaplane bases	> 10 NM for ops up to 1200'AGL > 5nm for ops up to 700' AGL		>5 NM (<10nm requires public comment)
Prohibited, restricted, or warning area	Permission required	Permission required	Permission required	Permission required		Permission required
Flight restricted zone	×	×	×	×		×
Military Training Route	Permission required	Permission required	Permission required	Permission required		Permission required
Population Density						
Directly over open air crowds	×	×	×	×		×
< 100 feet from persons, vessels, vehicles, or structures	✓	✓	×	×		×
Populated Places (yellow on sections)	✓	✓	×	×		×
Occupied Structures	✓	✓	✓	×		×
Conditions						
Daylight	✓	✓	✓	✓		✓
VMC (with > 3 miles visibility)	✓	✓	✓	✓		✓
Cloud Clearance in Class C, D, and E airspace	500' below and 2000' horizontal	500' below and 2000' horizontal	500' below and 2000' horizontal	500' below and 2000' horizontal		500' below and 2000' horizontal
Cloud Clearance in Class G Airspace	Clear of Clouds	Clear of Clouds	Clear of Clouds	Clear of Clouds		Clear of Clouds

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Visual Line-of-Sight **VLOS or lateral max**	1500'	1500'	½ sm	1 sm		1 sm
Visual Observers **Min # required**	At the PIC's discretion	At the PIC's discretion	1 minimum if operating >1500' from the PIC	1 or 2 if operating < 10nm from a charted airport		2
> 400' AGL	n/a	Additional observer required 1 Minimum	Additional observer required 1 Minimum	Additional observer required 1 Minimum		Required
"Heads-down"	Minimum One Required	Minimum One Required	Minimum One Required	Required		Required
Equipment/ Capabilities **Position Reporting**	Not required	Required if operating > 400' AGL	Required	Required		
Anti-collision strobe	Not required	Not required	Not required	Not required		
UNICOM radio	Not required	Not required	Required if operating < 5 NM from a non-towered airport	Not required		
Electronic position reporting acceptable to the administrator	Not required	Not required	Required for operations in Class D or Class G airspace (within lateral limits of Class C/B, or in Mode C veil	Not required		

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Mechanisms to reduce vulnerability of Command and Control Link (e.g., spread spectrum)	Required	Required	Required	Required		
Permitted Frequency Ranges **(* requires technical mechanism to ensure no interference with Model Aircraft operations)**	72-76 MHz* 902–928 MHz 2400–2500 MHz	72-76 MHz* 902–928 MHz 2400–2500 MHz	72-76 MHz* 902–928 MHz 2400–2500 MHz	72-76 MHz* 902–928 MHz 2400–2500 MHz		
Fly-away Protection	Required	Required	Required	Required		
High-visibility	Required	Required	Required	Required		
Maneuverability	50' in 5 secs	50' in 5 secs	50' in 5 secs	50' in 5 secs		
Communications Monitoring						
Should Monitor	ATC: If Control Station equipped and operating in Class E or G airspace in Mode c veil UNICOM: If Control station equipped	ATC: If Control Station equipped and operating in Class E or G airspace in Mode c veil UNICOM: If Control station equipped	ATC: If Control Station equipped and operating in Class E or G airspace in Mode c veil UNICOM: If Control station equipped	ATC: If Control Station equipped and operating in Class E or G airspace in Mode c veil UNICOM: If Control station equipped		ATC: If Control Station equipped and operating in Class E or G airspace in Mode c veil UNICOM: If Control station equipped

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Must Monitor	ATC: C or D airspace as instructed by ATC	ATC: C or D airspace as instructed by ATC	ATC: D airspace as instructed by ATC UNICOM: <5 NM from a non-towered airport	Not required		Not Required
Other operational requirements						
ATC Notifications	If operating < 10 NM from airport with control tower (Class C or D airspace)	If operating • < 10 NM from airport with control tower (Class C or D) • > 400' AGL for more than 30 mins or 2 or more ops in 4 hrs	If operating • < 10 NM from an airport with control tower (Class D) • >400' AGL for more than 30 mins or 2 or more ops in 4 hrs	If operating >400' AGL for more than 30 mins or 2 or more ops in 4 hrs		If operating >400' AGL for more than 30 mins or 2 or more ops in 4 hrs
Airport Managing Authority Notification	If operating < 3 NM from a military or public-use airport, heliport, or seaplane base without control tower	If operating < 3 NM from a military or public-use airport, heliport, or seaplane base without control tower	Not Required	Not Required		Not Required
NOTAM Routinely Issued	Per ATC	Per ATC and >400' AGL for more than 30 mins or 2 or more ops in 4 hrs	Per ATC and >400' AGL, in Class D, or <10 NM from airport with tower	Per ATC and >400' AGL for more than 30 mins or 2 or more ops in 4 hrs		Yes
Operational Area Charted on Sectional	n/a	n/a	n/a	n/a		Yes

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Pilot-in-Command						
UAS Pilot Certificate	Not required	Required	Required	Required		Required
Eligibility (18 years old; read, speak, understand English); approved course of training)	(complete approved training course)	Required	Required	Required		Required
UAS Knowledge Exam Passed	Required	Required	Required	Required		Required
Aircraft Specific Competency Endorsement	Required	Required	Required	Required		Not required if flight testing uncertified aircraft
Flight Review (Every 24 calendar months)	Not Required	Required	Required	Required		Required
Medical Certificate	Not required	Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos	Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos	Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos		Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos
Visual Observers						
UAS Pilot Certificate	Not required	Not required	Not required	Not required		Not required
Eligibility (18 years old; read, speak, understand English; received and logged training)	Required	Required	Required	Required		Required

×: Not permitted ✓: Allowed	Group I	Group II	Group III	Group IV	Group V LTA	Test Center
Medical Certificate	Required Class III every 60 mos -or- Visual /hearing exam consistent with Class II every 36 mos	Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos	Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos	Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos		Required Class II every 36 mos -or- Visual /hearing exam consistent with Class II every 36 mos
UAS Instructor						
UAS Pilot Certificate	Required	Required	Required	Required		Required
Receive and log ground training on teaching fundamentals (unless holding a teaching certificate)	Required	Required	Required	Required		Required
Receive and log instruction on technical areas and flight proficiency	Required	Required	Required	Required		Required
Fundamentals of instruction knowledge test passed (unless holding a teaching certificate or CFI)	Required	Required	Required	Required		Required
Experience Requirement (20 L/R's in specific aircraft requesting teaching privileges)	Required	Required	Required	Required		Required
Medical Certificate	Not required unless acting as PIC or observer	Not required unless acting as PIC or observer	Not required unless acting as PIC or observer	Not required unless acting as PIC or observer		Not required unless acting as PIC or observer

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Appendix B: Summary of Recommendations for System Standards

Technical Requirements	Group I	Group II, III, and IV
Structural Integrity: The aircraft should be designed so that it maintains structural integrity for intended flight.	X	X
Adhering to Manufacturer's Specification: The system should be designed such that no component used in the system exceeds the manufacturer's maximum rating(s) for that component under normal operating conditions, if any.	X	X
Safe System Start-up: The system should be designed to initialize in a known, safe state upon power up.	X	X
Flight Control Cables: The aircraft should be designed such that flight control cables will not bind, jam, or chafe under all intended flight conditions.	X	X
Fire Protection: The system should be designed to minimize the likelihood of fire in the event of a crash.	X	X
Connectors: The aircraft should be designed such that control surface actuators, linkages, and control horns, if so equipped, and electrical connectors to flight critical components, if any, cannot disconnect due to normal or expected operations.	X	X
Control Station Synchronization: The system should provide a means to verify the Control Station software and the on-board systems are compatible and synchronized prior to flight.	X	X
Communications Range Test:		X
Operators Manuals: All sUAS must have an Operator's Manual that contains all of the information necessary for flight as identified in the recognized consensus standard. The Operator's Manual must be readily accessible to the PIC. The operator's manual should contain instructions, methods, and procedures to safely operate the system.		X

Technical Requirements	Group I	Group II, III, and IV
Maintenance and Inspection Procedures: All sUAS should have procedures for maintenance and inspection for the entire system to ensure continued airworthiness. The procedures should include applicable check lists for annual condition inspections and pre-flight inspection.		X
Component Failure Protection: The system should be designed such that in the event of any single component or system failure other than primary structure, the aircraft either remains controllable or a technical mechanism will automatically execute to ensure aircraft returns safely to the surface as soon as practical.		X
Powerplant Fail Safe: The aircraft should be designed such that a failure of the primary powerplant shall not result in the failure of primary flight control systems.		X
Fuel / Power Information: The system should provide a means of determining the amount of available on-board fuel or primary battery capacity for the primary propulsion unit and if equipped battery capacity for control power battery.		X
Fuel / Power Markings: The aircraft must have clear markings to indicate the type of fuel required (if any) and the polarity, type, and proper installation of batteries.		X
Prevention of Commands Which Exceed Structural Limits: The system should be designed to prevent control commands which would cause the aircraft to exceed structural limits of the airframe and control surfaces within the entire operating envelop.		X
Weight and Balance: The system should be designed to account for the weight and balance of intended payloads, fuel, batteries, etc., to ensure that the center of gravity is maintained in a manner that would enable stable flight.		X
Materials: The aircraft should be constructed of materials that will not break-up in flight when operated within the intended flight envelop.		X

Survey of Other States' Legislation and Programs Governing UAS Use

<TARGET><BILL></BILL><SUBJECT>Survey of Other States Legislation and Programs Governing UAS Use</SUBJECT><COMM>JUNM28</COMM></TARGET>

US HR 972
Arizona H 2574
AZ H 2269
Florida H 119
FL S 92
Iowa S 276
IA H 427
Indiana S 1051
ID S 1067
ID S 1134
Illinois S 1587
IL HR 141
IL S 1587
Kansas H 2394
Kentucky H 454
Maryland H 1233
Minnesota H 612
MN S 485
MN H 1076
Missouri H 46
Nebraska L 412
New Hampshire H 619
New Jersey A 3157
New Mexico S 556
NORTH DAKOTA – failed
Oregon D 907
OR S 71
OR H 2710
OR S 524
South Carolina H 3415
Tennessee H 591
TN S 796
Virginia S 954 - passed
West Virginia H 2732
Wyoming H 242

20 states have introduced UAS legislation

moratorium for law enforcement for 2 years

Reps. Zoe Lofgren and Ted Poe Introduce Bipartisan Bill to Protect Americans' Privacy Rights from Domestic Drones

WASHINGTON, D.C. - Reps. Zoe Lofgren (D-CA) and Ted Poe (R-TX) have introduced legislation, H.R. 637, The Preserving American Privacy Act, to establish due process protections for Americans against government-operated unmanned aircraft systems (UAS) in U.S. airspace. The bipartisan legislation would also forbid law enforcement and private UAS from being armed with firearms or explosives while operating within U.S. airspace.

"The expanded use of drones on U.S. soil raises serious Constitutional and civil liberties issues that Congress needs to address," Rep. Lofgren said. "These devices should be used in a safe, open, and responsible manner. This bill would ensure that drones follow strict guidelines to protect Americans' privacy while still realizing their practical applications for science, border security, public safety, and commercial development."

"As we enter this uncharted world of drone technology, Congress must be proactive and establish boundaries for drone use that safeguard the Constitutional rights of Americans," Rep. Poe said. "Individuals are rightfully concerned that these new eyes in the sky may threaten their privacy. It is the obligation of Congress to ensure that this does not happen. Just because Big Brother can look into someone's backyard doesn't mean it should. Technology may change, but the Constitution does not."

Specific provisions governing the use of UAS in the Preserving American Privacy Act include:

- Government-operated UAS must obtain a warrant to collect information that can identify individuals in a private area;
- Government-operated UAS must obtain a court order and provide public notice beforehand to collect information that can identify individuals in defined public areas;
- The warrant and court order requirements are subject to exceptions for emergencies, border security, and consent;
- Private UAS cannot capture visual images or sound recordings of individuals engaging in personal activities in certain circumstances in which the individual has a reasonable expectation of privacy;
- State laws on the use of UAS in the airspace of the state are not preempted;
- Private and law enforcement UAS cannot use or operate UAS equipped with firearms or explosives in U.S. airspace.

Click here for a section-by-section of the bill.

###

12 6 1 40

Aaron's Law Modified Draft

Click here to read Zoe's modified draft bill "Aaron's Law" regarding the Computer Fraud and Abuse Act (CFAA)

Home Affordable Refinance Program

Click here to learn about new HARP loan eligibility programs.

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Visiting D.C.

Section-by-Section Summary of H.R. 637 – The "Preserving American Privacy Act"

Section 2 – Use of Unmanned Aircraft Systems

- The bill creates a new Chapter 205A in Title 18 of the United States Code.

Section A – Definitions

- "Covered information" means information that is reasonably likely to enable identification of an individual, or information about an individual's property that is not in plain view.
- "Public unmanned aircraft system" (public UAS) means a UAS operated by a governmental entity, such as an agency of the federal, state, or municipal governments.

Section B – Use of Public Unmanned Aircraft Systems

- Governmental entities must operate public UAS in accordance with this Act.
- Governmental entities operating public UAS must minimize, to the extent practicable, the collection or disclosure of covered information.
- Governmental entities that seek a license or certificate to operate a public UAS must submit to the Dept. of Justice (DOJ) a data collection statement that includes following: the purpose for which the UAS will be used, whether the UAS is capable of collecting covered information, the length of time for which collected information will be retained, the unit of the governmental entity that is responsible for safe and appropriate use of the UAS, an individual point of contact for citizen feedback, the rank and title of the individual who can authorize the use of the UAS, the applicable data minimization policies, and applicable audit and oversight procedures.
- The DOJ may request that the Secretary of Transportation revoke a certificate or license to operate a public UAS if the operator's activity contravenes the data collection statement.
- The Attorney General must issue regulations to establish a publicly accessible database indexing the certificates or licenses and associated data collection statements for public UAS.

Section C – Use of Covered Information as Evidence

- Covered information collected by a governmental entity's operation of a public UAS in violation of this Act cannot be used as evidence against any individual at any trial, hearing or other procedure before any court, agency, regulatory body, or other authority of the United States.

- A governmental entity may not operate a public UAS for a law enforcement purpose, or collect or disclose covered information through such operation.

- A governmental entity may operate a public UAS and collect or disclose covered information for a law enforcement purpose under the following circumstances:

    - Pursuant to a warrant, and within ten days of the execution of the warrant serves a copy of the warrant to each person on whom covered information was collected – unless the notice would seriously jeopardize an ongoing criminal or national security investigation;

    - Pursuant to a court order based on specific and articulable facts supporting reasonable suspicion of criminal activity, the public UAS will operate only in a stipulated public area for a period of not more than 48 hours, and

        1. The governmental entity serves a copy of the warrant to each person on whom covered information was collected within ten days of the execution of the warrant, OR

        2. The governmental entity posts public notification 48 hours prior to the UAS operation, either via public signage in the area in which the operation takes place, notice in a major publication (circulation of at least 1,000) serving the area, or notice on the entity's public website.

    - If the public UAS is operated within 25 miles of any external land boundary of the U.S. for the purpose of patrolling or securing the border;

    - If the individuals on whom the covered information is collected or disclosed provide prior written consent;

    - An investigative or law enforcement office reasonably believes an emergency situation exists involving immediate danger of death or physical injury, conspiratorial activities threatening the national security, conspiratorial activities characteristic of organized crime – and the officer must apply for a warrant not later than 48 hours after the operation.

Section D – Administrative Discipline

- The section allows for oversight and administrative discipline of governmental entities that intentionally violate the provisions of the bill.

Section E – Reporting

- Once a year all Federal judges who have issued an order or warrant under this Act must report the following: the fact the warrant or order was applied for, if the application was granted or denied, the time period of UAS operation requested, the offense the application was in relation to, and the identity of the governmental entity that made the application.

- Once a year the Attorney General (Federal and State) must report, in addition to the above information, the following: a general description of information gathered under the warrant or order, the approximate nature and frequency of incriminating conduct observed, the approximate number of persons on whom covered information was gathered, the approximate cost of manpower and other resources used in public UAS operation, and the number of arrests, trials, motions to suppress, and convictions resulting from public UAS operation.

Section F – Private Use of Unmanned Aircraft Systems

- It shall be unlawful to use a private UAS equipped with a visual or auditory enhancing device to capture, in a manner that is highly offensive to a reasonable person, any type of visual image, sound recording, or other physical impression of a individual engaging in a personal or familial activity under circumstances in which the individual has a reasonable expectation of privacy – if the image, recording, or impression could not have been achieved without a trespass unless the visual or auditory enhancing device was used. This restriction applies regardless of whether there is a physical trespass.

- This provision is modeled on Cal. Civ. Code 1708.8.

Section G – No preemption of 18 USC Chapter 119

- This law does not preempt federal laws on wire and electronic communications interception.

Section H – Ban on Weaponization

- It is unlawful for private individuals or law enforcement officers to use or operate an unmanned aircraft system that is armed with a firearm (includes explosives) in the national airspace of the United States.

Section I – No State Preemption

- This law does not preempt state laws on the use of UAS exclusively in the airspace of the state.

END

Ginger Blaisdell

From: David Palmer <ArcticATC@mtaonline.net>
Sent: Friday, March 15, 2013 10:55 AM
To: Ginger Blaisdell
Cc: Jane Dale; joy@alaskaaircarriers.org; Jim Cieplak; George, Tom
Subject: AACC Participation in Unmanned Aircraft Systems Task Force.
Attachments: AACC Documents - Excerpts.docx

To: Ginger Blaisdell, Reference your Request for Participation.

Mr. Jim Cieplak forwarded your request to me, and after considerable discussion amongst the Executive Committee of the Alaskan Aviation Coordination Council (AACC) we feel that the AACC must decline direct participation in the Task Force. This pertains to AACC participation in the work of the Task Force as a distinct and separate entity. We do not represent the individual members of the Council outside of that forum, and as such have no direct legal, administrative, or policy influence over the conduct and activities of our members. I have attached a short document containing several excerpts from our website which may be of use to you. We provide a discussion forum for subjects of mutual interest among members of the Aviation Community. The AACC is a government/industry partnership group, and affords the opportunity for information sharing on the strategic level - useful for all parties in understanding and responding to subjects impacting within Alaskan Aviation. As a group we do not advocate for or against specific issues, rather we focus on the coordination and sharing of information so that appropriate organizations/entities can identify and resolve issues in an expedient manner. As the Task Force "stands-up" and determines its agenda we may be able to assist with some elements of coordination and would look forward to that discussion in the future. Please contact me at ArcticATC@mtaonline.net or my cell 907-354-2399 if you have questions or concerns regarding this information.

Thanks! /Dave Palmer

From: Ginger Blaisdell [mailto:Ginger.Blaisdell@akleg.gov]
Sent: Wednesday, March 13, 2013 1:11 PM
To: jcieplak@gci.net
Subject: Unmanned Aircraft Task Force

Thank you for considering being part of this policy directive group. The tasks of the group would be:

The Unmanned Aircraft Systems Task Force is created in the legislative branch for the purpose of making recommendations for a statewide comprehensive plan to regulate that use of unmanned aircraft systems for public and private sector purposes. The task force would be made of approximately 11 members (one from each legislative body and 9 govt agency and industry folks).

The task force shall, not later than January 15, 2014, submit an initial report to the legislature, and not later than Jan 2015, submit a final report to the legislature. The reports must include
Policy options and recommendations to provide for the use of unmanned aircraft systems while protecting privacy w by law enforcement, and allowing the use of unmanned aircraft systems for other public and private applications;
Recommendations to the legislature and the governor, including draft legislation required to achieve the policy objec proposed by the task force.
The task force shall meet as frequently as necessary to carry out its responsibilities.
The task force may request administrative and technical support from the University of Alaska Fairbanks.
Members of the task force shall serve without compensation but are entitled to per diem and travel expenses authoriz boards and commissions under AS 39.20.180.
The task force terminates on January 15, 2015.

Thank you for thinking about being part of this group.

Ginger Blaisdell

Office of Representative Shelley Hughes

Room 409 State Capitol

Juneau, AK 99811

907-465-5265

Ginger Blaisdell

From: Jeremiah Campbell
Sent: Friday, March 15, 2013 4:15 PM
Subject: AK House Majority Caucus Press Release: Hughes Intros Resolution Creating Legislative Task Force
Attachments: 20130315_Hughes_HCR6.pdf

HUGHES INTROS RESOLUTION CREATING LEGISLATIVE TASK FORCE

HCR 6 establishes task force on Unmanned Aircraft Systems

Friday, March 15, 2013, Juneau, Alaska – Representative Shelley Hughes today introduced House Concurrent Resolution 6 which would establish a Task Force on Unmanned Aircraft Systems and recognizes the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks.

"We've been saturated recently with news about drones causing destruction and killing people, and we've been listening to hours of testimony nationally," Hughes, R-Palmer, said. "Even local news reported just yesterday on this seemingly hot topic. The other side of the story may not be as newsworthy as death and filibustering, but it's very important for Alaska."

Unmanned aircraft have been used in Alaska for some years doing jobs that are determined "dull, dirty, and dangerous." Unmanned Aircraft Systems (UA Systems) helped with guiding the oil tanker to Nome to restock their tank farm in the winter, locating a downed airplane near Bethel a few months ago, and have even been used for accurately counting sea lions that kept them off of the endangered species list. The missions that UA Systems have successfully completed have protected pilots that would have been flying in inclement weather and have conducted research in an economical fashion with reduced risk to human and animal lives.

At the same time, privacy concerns will not be ignored, according to Hughes. "Miniature helicopters will not be recording us while singing in the shower," Hughes said. "But we won't toss the baby out with the bath water. We can work to address those concerns and still embrace the technology that's moving forward."

HCR 6 has a referral to the House Special Committee on Economic Development, Trade and Tourism.

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To contact Rep. Hughes, please call 907-465-3743.

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Next Story >

Arianna Huffington: Drone damage is political as well as human

Ariana Huffington: Drone damage is political as well as human

Published: March 14, 2013 Updated 11 hours ago

By Arianna Huffington — comment

It's become accepted wisdom that Washington has become pathologically polarized and partisan, with every new debate inevitably breaking down along party lines. That's why it was so remarkable when Rand Paul's old-fashioned talking filibuster last week scrambled the even more old-fashioned right-vs.-left way of looking at the world. The Paul-provoked debate on the confirmation of John Brennan to head the CIA in turn provoked a wider and critical debate about the use of drones — a debate that needs to continue well beyond Brennan's confirmation.

In February, Paul had sent Brennan a letter asking, "Do you believe that the president has the power to authorize lethal force, such as a drone strike, against a U.S. citizen on U.S. soil?"

A few weeks later, Attorney General Holder replied:

"The question you have posed is therefore entirely hypothetical. … It is possible, I suppose, to imagine an extraordinary circumstance in which it would be necessary and appropriate under the Constitution and applicable laws of the United States for the president to authorize the military to use lethal force within the territory of the United States."

And so Paul took to the floor to mount the first talking filibuster since 2010.

Democrat Ron Wyden soon joined the filibuster. "The executive branch should not be allowed to conduct such a serious and far-reaching program by themselves without any scrutiny because that's not how American democracy works," said Wyden.

On the other side of the aisle, Lindsey Graham called the idea of the U.S. using drones to kill American citizens on U.S. soil "ridiculous," and said the controversy was the result of "paranoia between the libertarians and the hard left that is unjustified," while his frequent ally John McCain, went the other way, calling Paul and fellow filibusterers "wacko birds" (which sounds like a good name for a cereal). Right vs. left was suddenly scrambled.

Not surprisingly, the poles of the debate were only partly dislodged from party affiliation, as Wyden was the only Democrat to join Paul — though Democrats Patrick Leahy and Jeff Merkley, along with Independent Bernie Sanders, did ultimately vote against Brennan.

But even if the terms of the debate on drones were only partly rearranged, it was still a step in the right direction. We need to stop framing the debate as a question of national security vs. human rights. Those in favor of drone strikes have simply assumed for themselves the national security position. From their perspective, it's unquestionable that drones make us safer, so those arguing against them a) don't care about protecting us, and b) must come up with some other — and softer — rationale for their opposition. The problem is that this line of reasoning just isn't true.

Until Paul vs. Holder, the debate was largely about drone use overseas. Bringing the question to the U.S. definitely served to heighten the legal arguments, but the questions we are facing with the use of drones overseas are anything but "hypothetical."

First, there's the right/left-scrambling statistic that President Obama has authorized six times more drone strikes than President Bush — his 300th was on Dec. 1 of last year. And what kind of national security return are we getting for all those aerial attacks? Since 2004, only 2 percent of those killed have been confirmed as militant leaders.

Even more sobering were numbers from a study by professors from NYU and Stanford last year. Relying on data from the Bureau of Investigative Journalism, they found that from mid-2004 to mid-2012, between 474 and 881 civilians were killed in Pakistan. This includes 176 children. While "we may not have declared war on Pakistan, the people living in Northwest Pakistan under drones," might as well be "in a war zone."

And when people feel like war has been declared on them, they tend to mirror the feeling back.

"What scares me about drone strikes is how they are perceived around the world," said retired Gen. Stanley McChrystal in January. "The resentment created by American use of unmanned strikes ... is much greater than the average American appreciates. They are hated on a visceral level, even by people who've never seen one or seen the effects of one."

Visceral-level hate — not exactly an effective "hearts and minds" strategy. In Iraq, it finally became conventional wisdom that we couldn't win with a military strategy alone. But this kind of thinking has yet to penetrate the conventional wisdom on drones. We euphemistically call them "targeted strikes" but the collateral damage they inflict is political as well as human.

So do drone strikes make us more safe or less safe? Those in favor of them, especially those ordering them and charged with their oversight, seem to think the answer is so obvious that it needs no justification. Maybe this is because they won't even acknowledge the facts in the first place. And, as we saw in Iraq, the combination of refusing to look at the facts and allowing claims of national security to go unquestioned can be toxic.

Arguing against drone strikes on the basis of their legality is certainly important, but there's no reason to cede the national security card to the pro-droners. Even those who care deeply about civil liberties need to push back against the idea that this is a trade-off between civil liberties and our safety. The drone debate may have ended on the Senate floor, but let's keep it going everywhere else.

Arianna Huffington is president and editor-in-chief of Huffington Post Media Group. Her email address is arianna@huffingtonpost.com.

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Arianna Huffington: Drone damage is political as well as human

The American Spectator

THE SPECTACLE BLOG

Judiciary Committee Opens Domestic Drone Hearing

By Luca Gattoni-Celli on 3.20.13 @ 11:15AM

I'm live at a Senate Judiciary Committee hearingentitled "The Future of Drones in America: Law Enforcement and Privacy Considerations."

Chairman Leahy stated that the committee will attempt to conduct the hearing while members rotate in and out to take votes.

An excerpt from Chairman Patrick Leahy's (D-VT) opening statement follows (emphasis added):

> The focus of today's hearing is on the domestic, non-military use of drones. Recently, the debate about the use of unmanned aerial vehicles, or "drones", has largely focused on the lethal targeting of suspected terrorists, including Americans. **I continue to have deep concerns about the constitutional and legal implications of such targeted killings.** I have spoken with Senator Durbin, and next month he will chair a hearing in the Constitution subcommittee that will examine these issues carefully. In addition, I will continue to press the administration to provide this Committee with all relevant Office of Legal Counsel opinions related to the use of drones to conduct targeted killings.
>
> As I noted at the beginning of this Congress, I am convinced that the domestic use of drones to conduct surveillance and collect other information will have a broad and significant impact on the everyday lives of millions of Americans going forward.
>
> ...
>
> On this issue, we cannot take a short-sighted view, and we must realize that technology in this area will advance at an incredible rate. This topic is of significant interest to many members of our Committee, and I hope that this hearing will be just the beginning of an ongoing dialogue as to how best to manage the unique privacy threats associated with this modern technology, while not stifling this nascent industry that has enormous potential to improve our lives.

Before giving his own statement, Ranking Member Sen. Chuck Grassley (R-IA) said to Leahy that, "I don't think there are any differences between your concern and my concern on this issue." His worries were similar: "We must remember that the power of new technology creates greater responsibility" to protect the rights of our citizens. "Just because the government [observes] the constitution does not mean it can" surveill citizens constantly. He invoked "Big Brother" and asserted that constant monitoring is incompatible with the ideal of living in a free society. Another topic of discussion was the potential for prosecutorial use and abuse of unmanned systems. "It's very important that the American people know when and how the Justice Department will use these machines."

Reflecting the uncertainty and controversy surrounding drones, one of the witnesses, Michael Toscano, took exception to the term, which he said carries an unduly negative connotation.

About the Author

Luca Gattoni-Celli *is an editorial intern at* The American Spectator *and a D.C.-based journalist focusing on economic policy, information technology, and government accountability. He graduated from the College of Charleston in May of 2012 with a degree in economics.*

http://spectator.org/blog/2013/03/20/sen-jud-committee-opens-domest

Drones will require new privacy laws, Senate told

By JOAN LOWY
Associated Press / March 20, 2013

WASHINGTON (AP) — Privacy laws urgently need to be updated to protect the public from information-gathering by the thousands of civilian drones expected to be flying in U.S. skies in the next decade or so, legal experts told a Senate panel Wednesday.

A budding commercial drone industry is poised to put mostly small, unmanned aircraft to countless uses, from monitoring crops to acting as lookouts for police SWAT teams, but federal and state privacy laws have been outpaced by advances in drone technology, said experts appearing at a Senate hearing.

Current privacy protections from aerial surveillance are based on court decisions from the 1980s, the committee was told, before the widespread drone use was anticipated. In general, manned helicopters and planes already have the potential to do the same kinds of surveillance and intrusive information gathering as drones, but drones can be flown more cheaply, for longer periods of time and at less risk to human life. That makes it likely that surveillance and information-gathering will become much more widespread, legal experts said.

The Federal Aviation Administration recently predicted about 7,500 civilian drones will be in use within five years after the agency grants them greater access to U.S. skies. Congress has directed the FAA to provide drones with widespread access to domestic airspace by 2015, but the agency is behind in its development of safety regulations and isn't expected to meet that deadline.

If Americans' privacy concerns aren't addressed first, the benefits of potentially "transformative" drone technology may not be realized, Ryan Calo, a University of Washington law professor, told the Judiciary Committee.

But experts were divided on whether Congress should update federal privacy laws to set a national standard, or whether the responsibility should be left to state lawmakers to craft their own solutions. Several bills have been introduced in Congress that would, among other things, require warrants before drones could be used for surveillance.

A variety of drone-related bills have been introduced this year in more than 30 state legislatures.

There is already limited civilian drone use. The FAA has granted several hundred permits to state and local governments, police departments, universities and others to experiment with using small drones.

Initially, most civilian drones are expected to be around the size of backpack or smaller, weighing less than 55 pounds and unable to fly higher than most birds. The U.S. military, on the other hand, uses everything from unarmed, hand-launched drones like the 2.9-pound Wasp to systems like the MQ-9 Reaper that flies up to 50,000 feet, has a 66-foot wingspan, weighs up to 10,500 pounds and can fire Hellfire missiles and guided bombs.

"I am convinced that the domestic use of drones to conduct surveillance and collect other information will have a broad and significant impact on the everyday lives of millions of Americans going forward," said the committee's chairman, Sen. Patrick Leahy, D-Vt.

"Small, quiet unmanned aircraft can easily be built or purchased online for only a few hundred dollars, and equipped with high-definition video cameras while flying in areas impossible for manned aircraft to operate without being detected," Leahy said. "It is not hard to imagine the serious privacy problems that this type of technology could cause."

Earlier this year, the FAA solicited proposals to create six drone test sites around the country. With a nod to privacy concerns, the FAA said test site applicants will be required to follow federal and state privacy laws and to make a privacy policy publicly available.

The test sites are supposed to evaluate what requirements are needed to ensure the drones don't collide with planes or endanger people or property on the ground. Remotely controlled drones don't have a pilot who can see other aircraft the way an onboard plane or helicopter pilot can.

The agency has received 50 applications to create test sites in 37 states. Eventually, every state may have a test site, said Michael Toscano, president and CEO of the Association for Unmanned Vehicle Systems International, a trade association for the domestic drone industry.

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National/World

Drones will require new privacy laws, Senate told

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Associated Press

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Local News

Originally published February 8, 2013 at 8:55 PM | Page modified February 8, 2013 at 8:55 PM

Bill would put tight restrictions on drone use in state

A bill introduced Friday in Olympia would severely restrict the purchase and use of aerial drones by law-enforcement and state departments.

The Associated Press

A new bill introduced by a Republican lawmaker in Olympia would put strict restrictions on how law-enforcement agencies and state departments can buy and deploy aerial drones.

Rep. David Taylor's proposal was introduced Friday, a day after Seattle Mayor Mike McGinn ordered the city's Police Department to abandon its nascent drone program, which had received approval from the Federal Aviation Administration but was awaiting the go-ahead from the City Council.

Taylor's extensive bill covers the purchase of drones, data collection by the unmanned aerial vehicles, search-warrant requirements and mandated audits.

The Moxee, Yakima County, lawmaker worked for about two months on the measure, which would regulate drones for both law-enforcement and state agencies, such as the Department of Ecology or the Department of Transportation.

"One reason to write this bill was to open dialogue," Taylor said. "We need to understand where we're heading."

Lawmakers in at least 11 states are looking at plans to restrict the use of drones over their skies amid concerns the vehicles could be exploited to spy on Americans. Concerns have increased since the FAA began establishing safety standards for civilian drones, which are becoming increasingly affordable and small in size.

The Seattle Police Department bought two Draganflyer X6 vehicles through a federal grant without public input. The Draganflyer X6 vehicle is 36 inches wide and is 33.5 inches long, and stands just under a foot.

Taylor's bill immediately gained the backing of the Washington state chapter of the American Civil Liberties Union, which spearheaded the opposition to Seattle police drones.

"Aerial drones can provide law-enforcement agencies with unprecedented capabilities to engage in surveillance and intrude on people's privacy," ACLU spokesman Doug Honig said in an email.

So far Taylor's bill has only Republican backers, but that's expected to change. Across the country, opposition to the use of domestic drones has come from opposite sides of the political spectrum, including civil-liberties advocates and those worried about government intrusion.

Taylor's measure would require legislative approval from local or state lawmakers before a corresponding police agency obtains a drone, meaning a city council would have to vote before its police department could acquire a drone.

Under the bill's provisions, an agency must have a warrant to use a drone unless there are exigent circumstances, such as search-and-rescue or hostage situations. Such situations still would require retroactive warrants.

The measure calls for deletion of data gathered within 30 days if no criminal activity is recorded. It requires erasing data collected from people who are not the target of a drone deployment within 24 hours. It also calls for an annual report from law-enforcement agencies and courts showing how drones have been used, as well as an annual audit for each agency that uses drones.

Taylor said the bill is aimed at protecting privacy and reducing the liability of any Washington agencies that use the vehicles. He added that should the bill get a hearing in committee, he expects to hear from law-enforcement agencies on how they would use drones.

U.S. Department of Homeland Security drones do enter Washington airspace occasionally, patrolling the Canadian border east of the Cascade mountains. The two Predator-B aircraft are based in North Dakota.

GrandForksHerald.com

Published March 11, 2013, 10:15 PM

BRUCE GJOVIG: Don't strap tie-downs on N.D.'s chance to soar

House Bill 1373 is a bill to limit the use of unmanned aircraft systems for surveillance by law enforcement except by use of search warrant.

By: **Bruce Gjovig**, Grand Forks Herald

GRAND FORKS — House Bill 1373 is a bill to limit the use of unmanned aircraft systems for surveillance by law enforcement except by use of search warrant.

This bill sends the wrong message to the Federal Aviation Administration at a time when North Dakota is heavily invested in UAS and wants to secure one of six UAS integration test sites.

These sites will lead the way in the testing, development and maintenance of UAS and the training of the systems' operators.

Even negative publicity can hurt that application in the next few months as the FAA is looking for any reason to narrow the pool of applicants.

The FAA wants to send UAS integration activity to states where the UAS innovation and technology are welcomed, not fought. That is good government policy to pave the way for safe, efficient and prudent integration of UASs in the future.

FAA application guidelines for the UAS integrations test site say the agency's preference is for a state without laws limiting aircraft operations within the proposed test site area. That could be interpreted to include HB 1373.

The FAA's "Unmanned Aircraft Systems Test Site Selection" document states, "Applicants that declare there are no local/state statutes limiting aircraft operations within the proposed Test Site area would be scored highest."

Let the Airspace Integration Team in North Dakota submit an application in 2013 that is unfettered with unnecessary limitations.

Tough competition

The FAA competition is going to be tough, as more than 28 states are competing for six UAS designations. A state law that regulates and restricts drone use likely will hurt North Dakota's chances by lowering the state's score.

Let us not chance it for a law that is premature at best — likely totally unneeded and based on fear, not facts.

Being one of six test sites is tantamount to being one of the hubs of this emerging industry. North Dakota is well positioned to welcome and attract many UAS-related companies and their high-paying, high-tech jobs.

Grand Forks is committing to a 220-acre UAS Business Park to provide up to 1.2 million square feet of facilities and infrastructure and a dynamic community in which to develop the UAS industry.

Over five to 10 years, it is projected this UAS Business Park will support 3,700 jobs related to the UAS industry.

Ultimately, this is about innovation, high-paying jobs, economic development and significant uses for unmanned systems in agriculture, energy and so on.

For example:

• UAS will be used in precision farming to offer lower cost, higher resolution and more efficient monitoring and detection of diseases and stress in valuable crops such as corn, soybeans, sugar beets, potatoes, wheat and more.

The earlier the detection of insects and disease, the fewer chemicals can be used, a fact that's good for farmers and consumers alike.

North Dakota has been a leader in adapting precision agriculture to maximize quality, efficiency and profitability on farms. North Dakota farmers want to pioneer the use of unmanned aircraft systems.

A UAS test site will allow that.

• UAS will be used to monitor and inspect hundreds of miles of pipelines and transmission lines, doing a better job at less cost.

UAS can inspect and monitor flared gas sites and test for chemicals that can be harmful or even deadly. UAS are best used for tasks that are "dirty, dangerous or dull."

Let us be a leader in the development of this innovative technology for commercial uses.

• UAS can monitor and count wildlife at a safe distance to cause the least disruption.

• Perhaps a UAS will deliver a pizza to your door someday, but I am not betting on that one.

Another problem with HB1373 is that the bill would create a new legal framework that would treat the use of unmanned aircraft differently than the use of manned aircraft. Law enforcement has employed manned aircraft for decades and with the full approval of the U.S. Supreme Court.

So, passing entirely new laws makes no sense. Police officers know they are under a microscope on the use of unmanned aircraft, and they are very cautious because they see the great potential to enhance safety, help with search and rescue missions and save lives.

They will not be reckless as this is a tool for safety.

Phone vs. drone

We have more to fear from a camera phone than a camera drone when it comes to invasions of privacy. It was a camera phone, not a drone, that caught Prince Harry with his pants down.

Privacy concerns need to be respected and will be. The International Association of Chiefs of Police, the world's largest police organization, issued recommended policies and procedures for law enforcement's use of UAS to ensure the technology is used safely, responsibly and in a way that respects privacy.

Rather than banning the use of UAS and the benefits the aircraft provide, law enforcement should be encouraged to adopt these regulations, which won praise even from the American Civil Liberties Union.

Likewise, the Association for Unmanned Vehicle Systems International, the trade association for the UAS industry, put out a code of conduct that addresses the safe and responsible use of UAS.

Wrong law, wrong time

In other words, the rules of the road are being put into place. But seat belt laws did not come about before cars even were on the road.

There are ways to meet people's privacy concerns, and Congress is reviewing those proposals now. North Dakota does not need to duplicate or replicate what Congress is doing.

If state laws still are needed, they can be passed two years from now. There is no rush.

Please kill HB 1373 before it kills innovation.

Gjovig is entrepreneur coach and CEO at the UND Center for Innovation.

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SHERIFF ROBERT W ROST

Don't try to fix something that is not broken...

We must have missed something...Has there been a sudden rash of invasion of privacy cases involving unmanned aircraft systems (UAS, the devices the media has dubbed "drones") in North Dakota? North Dakota House Bill 1373 would lead one to believe that this is the case. HB-1373 is a North Dakota House Bill, aimed at unmanned aircraft systems, which is currently being reviewed by the North Dakota Senate Judiciary Committee. The proposed law imposes unnecessary reporting requirements on law enforcement; fails to identify the agency responsible for monitoring compliance; and will discourage North Dakota law enforcement agencies from establishing UAS Units. The end result will be that the citizens of North Dakota are deprived of a valuable technological resource that could assist in locating lost persons, monitor disasters, and help apprehend dangerous criminals.

The privacy protection detailed in HB 1373 already exists. This important protection was granted by the U.S. Supreme Court 99 years ago in the case of Weeks vs. U.S. (232 U.S 383) and later applied to all states in Mapp v. Ohio (367 U.S. 643). The ensuing legal concept is called the "exclusionary rule" and prohibits the admission of illegally obtained evidence in a criminal trial. The exclusionary rule places the question of evidence admissibility before the courts, the branch of government our founding fathers charged with the responsibility of deciding such important matters.

HB-1373 is clearly focused on law enforcement use of UAS and almost completely ignores the significant risks of privacy infringements by non-law enforcement entities such as the news media or the voyeuristic neighbor who enjoys flying his UAS over your home. The true risk of invasion of privacy rests with private individuals who are not subject to the proposed law, Federal Aviation Administration regulations, or well-developed policies and procedures.

The proposed law dictates that search warrants permitting use of UAS may only be issued in criminal investigations. This requirement would prohibit a state or local agency from obtaining a search warrant to conduct an administrative investigation focused on suspicion of an administrative violation such as dumping toxins into our beautiful North Dakota lakes and rivers. Why?

The idea the U.S. Congress, or a state legislature, passing legislation to attempt to control a technology, such as UAS, that is still maturing and growing is premature and ill-advised. It is unprecedented in any other technology including telephones and computers. Each of those technologies was allowed to mature prior to the enacting of privacy related legislation. And, such legislation was only enacted when problems with privacy protection related to those technologies arose. Enacting UAS related privacy legislation will have a chilling effect on the

development of UAS technology. Slowing the development of UAS technology will deprive North Dakotans of the significant public safety missions that UAS can perform.

The reality is that only two law enforcement agencies in the State of North Dakota (U.S. Customs and Border Protection and the Grand Forks County Sheriff's Department) have received authorization from the Federal Aviation Administration to operate unmanned aircraft systems. I cannot address U.S. Customs and Border Protection policies regarding UAS. However, as the Sheriff of Grand Forks County, I can provide a synopsis of Grand Forks County Sheriff's Department (GFSD) policies and procedures related to the operation of UAS. The GFSD UAS Unit is a collaborative research effort with the University of North Dakota and two UAS manufacturers, Aerovironment and Draganfly Innovations. The UAS research project goals focus on determining if UAS can be used effectively in public safety missions. The GFSD UAS Unit is subject to the "GFSD UAS Unit Policy and Procedures Manual" which dictates strict safety and privacy protections. The GFSD intends to utilize UAS for essential public safety missions such as searching for lost people, post-disaster damage assessments, crime and traffic accident scene photography, and searches for dangerous criminals. There are no plans to utilize the aircraft for covert surveillances. In fact, the limited flight duration and line-of-sight limitations of the UAS we utilize make them very poor platforms for that type of mission. In addition to adherence with internal policies and procedures, our UAS operations must comply with numerous Federal Aviation Administration requirements including remaining at or below 400' above-ground-level and within line-of-sight of the UAS pilot. These requirements effectively limit UAS flights to within ½ mile of the operator. One final check and balance is the review of all UAS research project mission sets by the University of North Dakota's Unmanned Aircraft Systems Research Compliance Committee. This committee is composed of fifteen members representing local government, local citizens, UND faculty and administrators, and local public safety agencies. The committee is charged with the duty of applying community standards and values when evaluating all UND UAS research projects. No UAS mission is launched unless it has been pre-approved by the committee.

An interesting aspect of UAS operations is the need to comply with all of the previously listed privacy requirements. If GFSD had chosen to purchase a small manned aircraft, none of the listed requirements would apply. In fact, anyone is free to fly over almost any location and make observations from a manned aircraft. The important message here is that unmanned aircraft systems operated by government agencies are already subject to significant additional scrutiny in contrast to manned aircraft operated by law enforcement agencies.

In an opinion piece, appearing on the editorial page of the March 8, 2013 edition of the *Grand Forks Herald*, Steve Morrison makes some seriously misleading statements that require correction. Mr. Morrison says that "Drones are, essentially, highly sophisticated remote control

aircraft. They range in size from the largest military drones like the Predator down to drones that look like a mosquito." The reality is that most small UAS have about the same sophistication as a RC model aircraft purchased from a hobby store and none are as small as a mosquito. Later in the article, Mr. Morrison states that small UAS payloads can carry "small weapons." It is this type of unfounded and sensationalized statement that causes the public concern. Again, the reality is that Small UAS are woefully inadequate platforms for weapons. No law enforcement agency is currently arming small UAS and arming of our UAS is expressly prohibited by Grand Forks County Sheriff's Department policies and procedures. If law enforcement agencies wished to arm aircraft wouldn't the over 200 local and state law enforcement agencies that use manned aircraft have armed them? Again, the reality is that there are no non-federal U.S. law enforcement agencies operating armed aircraft, unmanned or manned, and no agency has expressed a plan to do so in the future.

Small unmanned aircraft systems have a yet to be determined number of applications to both humanitarian and law enforcement missions. North Dakota is positioned to be a leader in this exciting new field. Enacting laws which limit the use of unmanned aircraft systems is an attempt to fix something that is not broken. It sends the wrong message to the Federal Aviation Administration who will, in the near future, be reviewing North Dakota's proposal to be selected as one of six UAS national test sites. Retirement of HB-1373 and creation of a legislative study session group to research UAS is a much more logical and measured approach to this issue.

Robert W. Rost
Grand Forks County Sheriff

Monday, 04 March 2013

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WORLD

Domestic drones are already reshaping US crime-fighting

Last updated: Monday, March 04, 2013 12:13 AM

GRAND JUNCTION, COLO. — As US authorities grapple with how to regulate the use of unarmed drones in US skies, a small network of police, first responders and experts is already flying unmanned aircraft.

These operators say rapidly evolving drone technology is already reshaping disaster response, crime scene reconstruction, crisis management and tactical operations. Critics of US domestic drone use worry about privacy and safety.

Several dozen local police departments, federal agencies and universities have special FAA permits to fly drones in US airspace.

"Like a lot of law enforcement agencies, our first thoughts were, 'Cool! Let's use it for tactical missions – for chasing bad guys across the county,'" said Ben Miller, a Mesa County, Colorado, sheriff's deputy. "But the reality is you'll have a mission like that once or twice a year," he said. "The real utility of unmanned aerial systems is not the sexy stuff. It's the crime scene and accident reconstruction."

Miller's department in rural western Colorado has the widest approval to fly drones of any local law enforcement agency in the US.

Mesa has flown 40 missions in just over three years, "none of them surveillance," said Miller, who crafted the department's drone program and spent a year devising training protocol for fellow deputies before receiving FAA approval. "We can now bring the crime scene right into the jury box, and literally re-enact the crime for jurors," he said.

Recent applications to the FAA, obtained by the civil liberties group Electronic Freedom Foundation, indicate many police want drones for drug investigations, covert surveillance and high-risk tactical operations.

Domestic drones currently cost anywhere from $10,000 to $20,000 for a small system like the DraganflyerX6, which stays aloft only 15 minutes, to more than $1 million for sophisticated fixed-wing drones that can remain aloft for hours.

Military models are also being used by the Department of Homeland Security, which has a fleet of at least 10 unarmed Predator drones, powerful enough to identify a tennis shoe from 60,000 feet up.

First-generation drones can't yet carry an onboard sense-and-avoid system, a requirement of manned aircraft. Experts said mass-produced, drone-mounted sense-and-avoid technology is still two to five years away. FAA officials are required to open US skies in 2015 to widespread use of unmanned aircraft by public agencies and private industry.

The boom in drone use, both private and public, is also raising privacy concerns.

Civil liberties groups are urging federal and state legislators to place immediate restrictions on drone use by US law enforcement agencies. At least 15 states have drafted legislation that would restrict drone use. In Seattle last month, a public outcry prompted the mayor to order the police chief to return the department's two new drones to their manufacturer. — Agencies

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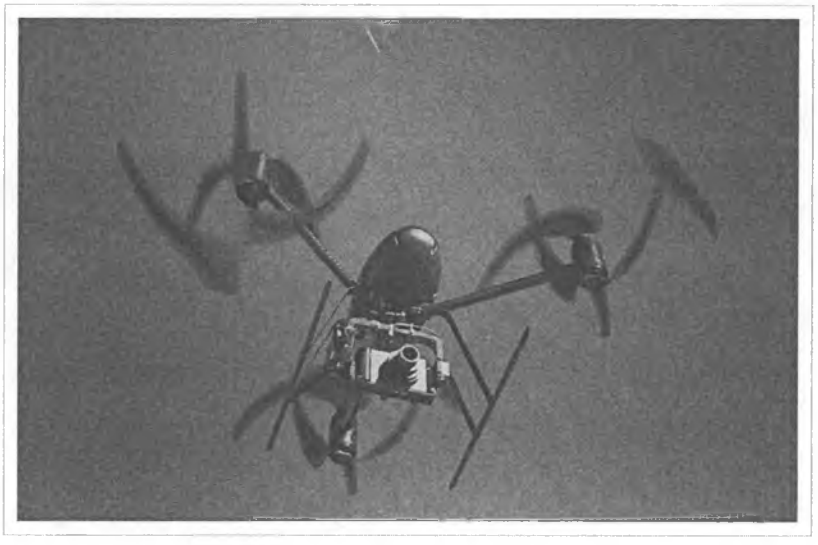
Damn the regulations! Drones plying US skies without waiting for FAA rules



Chris Francescani / Reuters

A Draganflyer X6, six-rotor remote controlled helicopter, which can fly up to 20 mph and travel a quarter mile, is pictured at the Grand Valley Model Airfield in Mesa County, Colo. The Draganflyer X6 is a property of Mesa County Sheriff's Department.

By Chris Francescani
Reuters

NEW YORK -- They hover over Hollywood film sets and professional sports events. They track wildfires in Colorado, survey Kansas farm crops and vineyards in California. They inspect miles of industrial pipeline and monitor wildlife, river temperatures and volcanic activity.

They also locate marijuana fields, reconstruct crime scenes and spot illegal immigrants breaching U.S. borders.

Tens of thousands of domestic drones are zipping through U.S. skies, often flouting tight federal

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Ten years of war have given robot developers a chance to refine and improve their bots. Now the robots are finding all sorts of new jobs on the homefront.

For decades, model airplane hobbyists have been allowed to fly small, remote-controlled aircraft up to 400 feet and at least a quarter mile from any airport. While public agencies can get permission to use unarmed drones, all commercial use remains banned.

"As a hobbyist - I can do whatever I want right now, within remote-control guidelines," said Bateson, the aerial photographer. "But as soon as you turn it into a business ... the FAA says you are violating the national airspace."

Bateson said that whether his drone shoots video for fun or for profit, "There is no greater danger to the national airspace."

Last year the National Football League petitioned the FAA to speed the licensing of commercial drones, joining Hollywood's Motion Picture Association of America, which has been lobbying the agency for several years, an MPAA spokesman told the drone news website UAS Vision.

The FAA has issued 1,428 drone permits to universities, law enforcement and other public agencies since 2007, when the agency formally banned commercial drone use. Of those, 327 permits remain active, said FAA spokesman Les Dorr.

Tough to enforce

Bateson flies a customized 48-inch-wide Styrofoam fixed-wing remote-controlled aircraft that cost about $20,000 - compared with up to $1 million for a helicopter. He said his aircraft has logged 1,800 miles and has recorded 60 hours of high-resolution video. He said he has never run into trouble with the FAA.

Patrick Egan, an unmanned aircraft consultant to the U.S. military and editor of sUAS News, a drone news website, said the FAA's commercial ban on drones is unenforceable.

"How do you possibly enforce these regulations?" he said.

Earlier this year, Connecticut marketing firm ImageMark Strategy and Design launched a drone-powered aerial photo and video service to offer to its existing clients, which include universities, golf resorts and real estate firms.

Partner Scott Benton said his company invested about $20,000 in remote-controlled multi-rotor copters equipped to carry camcorders or SLR digital cameras with swivel tilts. Benton said he wasn't even aware of FAA restrictions on commercial drone use until after he purchased all the equipment.

He said his company plans to charge clients for editing and post-production work, not the drone flights.

Many commercial drone operators offer similar arguments. Some say they operate only on private land. Others say they are selling data, not drone flight time.

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Still others say they will simply take their chances.

"Honestly?" said one commercial operator, who requested anonymity to protect his business. "My hope is that I'm far afield enough and small enough potatoes to the FAA that I can fly under the radar on this one."

Privacy concerns

In 2011, News Corp's tablet news site, the Daily, sent a Microdrone MD4-1000 into the skies over Alabama, Missouri and North Dakota to capture dramatic aerial footage of flood damage. A subsequent FAA investigation resulted in a warning, an FAA spokesman told Reuters. A News Corp spokesman declined to comment.

Last fall, a collective shudder rose up from Hollywood when false reports surfaced that the aggressive tabloid news website TMZ was seeking permission to fly its own drone.

The report was false, but it raised concerns.

"I'm less worried about the police getting a fleet of drones than I am about the news media," said Egan.

"Imagine what it will be like when the paparazzi can send a fleet of drones into the Hollywood hills."

The boom in drone use, both private and public, is also raising privacy concerns.

Civil liberties groups are urging federal and state legislators to place immediate restrictions on drone use by U.S. law enforcement agencies, which have historically been quick to capitalize on emerging technology like cell phone tracking.

At least 15 states have drafted legislation that would restrict drone use. In Seattle last month, a public outcry prompted the mayor to order the police chief to return the department's two new drones to their manufacturer.

Blacksheep drones

An even bigger concern for many is security. The activities of some drone operators are fueling fears about the potential for terrorism or that drones could interfere with manned air traffic and cause an accident.

A group of skilled drone operators using "first person view," or FPV, technology, has sent Ritewing Zephyr drones that capture high-quality video of visual thrill rides around some of the world's most famous landmarks.

The group, known as Team Blacksheep, has made a series of videos using drones circling the torch on New York City's Statue of Liberty and London's Big Ben clock tower. Team Blacksheep's FPV drones have darted through the arches of the Golden Gate Bridge and buzzed the peak of the Matterhorn.

The videos, captured at dizzying angles, are wildly popular online, but hobbyists and other drone enthusiasts worry that such videos give the industry a bad name.

"Those are the people the FAA should be going after," Bateson said.

A Team Blacksheep founder did not respond to requests for comment on security concerns.

Would-be attackers have already tried to exploit drones. Last fall, a Massachusetts man was sentenced to 17 years in prison for plotting to attack Washington, D.C., with three remote-controlled airplanes carrying C-4 explosives.

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Anticipating domestic boom, colleges rev up drone piloting programs

Drones may also be vulnerable to hacking.

Last summer, Department of Homeland Security officials challenged Texas aerospace engineering professor Todd Humphreys and his class to try to "spoof" a DHS drone's GPS system.

GPS "spoofing" is a technique by which a vehicle's GPS receiver can be tricked and taken over by a slightly more powerful signal that mimics the attributes of the original signal - essentially an airborne hack.

Humphreys and his students succeeded in hacking the drone and took control of its flight path.

If a college class "can spoof the GPS, what can other nation states or terrorist groups do?" Representative Paul Broun (R-Ga.) asked at a recent congressional hearing on domestic drones.

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Chinese espionage?

Some U.S. drone designers worry about the consequences of what they see as a slow U.S. response to a rapidly evolving technology.

"The Chinese are going to kill us," said Texas pilot Gene Robinson, who spent $20,000 designing an innovative fixed-wing drone for search-and-rescue missions. "They have copied every single design, including mine, that they can get their hands on."

Robinson said he installed Web-tracking software on his drone design Web page and then watched last spring as a Chinese design company "spent a month on my Web page ... reverse-engineered my design" and began selling mass-produced copies in December - for $169.

Side-by-side pictures of Robinson's model and the Chinese model that he showed a reporter look virtually identical.

Robinson went online and ordered one of Chinese models - to see if he could attach his equipment to the cheaper version.

"It was a dog, a pig," he said. "It didn't fly worth a damn."

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By: Mario Mairena, Mar 5, 2013 9:39 AM

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The New York Times

March 8, 2013

Visions of Drones Swarming U.S. Skies Hit Bipartisan Nerve

By SCOTT SHANE and MICHAEL D. SHEAR

WASHINGTON — The debate goes to the heart of a deeply rooted American suspicion about the government, the military and the surveillance state: the specter of drones streaking through the skies above American cities and towns, controlled by faceless bureaucrats and equipped to spy or kill.

That Big Brother imagery — conjured up by Senator Rand Paul of Kentucky during a more than 12-hour filibuster this week — has animated a surprisingly diverse swath of political interests that includes mainstream civil liberties groups, Republican and Democratic lawmakers, conservative research groups, liberal activists and right-wing conspiracy theorists.

They agree on little else. But Mr. Paul's soliloquy has tapped into a common anxiety on the left and the right about the dangers of unchecked government. And it has exposed fears about ultra-advanced technologies that are fueled by the increasingly fine line between science fiction and real life.

Drones have become the subject of urgent policy debates in Washington as lawmakers from both parties wrangle with President Obama over their use to prosecute the fight against terrorism from the skies above countries like Pakistan and Yemen.

But they are also a part of the popular culture — toys sold by Amazon; central plot points in "Homeland" and a dozen other television shows and movies; the subject of endless macabre humor, notably by The Onion; and even the subject of poetry. ("Ode to the MQ-9 Reaper," a serious work by the Brooklyn poet Joe Pan that was just published in the journal Epiphany, describes the drone as "ultra-cool & promo slick, a predatory dart" that is "as self-aware as silverware.")

Benjamin Wittes, a national security scholar at the Brookings Institution who has written extensively about drones, said he thought Mr. Paul's marathon was a "dumb publicity stunt." But he said it had touched a national nerve because the technology, with its myriad implications, had already deeply penetrated the culture.

"Over the last year or so, this thing that was the province of a small number of technologists and national security people has exploded into the larger public consciousness," Mr. Wittes said.

On the right, Mr. Paul has become an overnight hero since his filibuster. Self-proclaimed defenders of the Constitution have shouted their approval on Twitter, using the hashtag #StandWithRand and declaring him to be a welcomed member of their less-is-better-government club.

"The day that Rand Paul ignited Liberty's Torch inside the beltway!" one Tea Party activist wrote on Twitter. "May it never be extinguished!"

But even as the right swooned, the left did, too. Senator Ron Wyden of Oregon — the only Democrat to join Mr. Paul's filibuster — said the unexpected array of political forces was just the beginning, especially as Congress and the public face the new technologies of 21st-century warfare.

"I believe there is a new political movement emerging in this country that's shaking free of party moorings," Mr. Wyden said. "Americans want a better balance between protecting our security and protecting our liberty."

P. W. Singer, whose 2009 book "Wired for War: The Robotics Revolution and Conflict in the 21st Century" anticipated the broad impact of drones, said he believed they had shaken up politics because they were "a revolutionary technology, like the steam engine or the computer."

"The discussion doesn't fall along the usual partisan lines," he said. The dozen states that have passed laws restricting drones do not fall into conventional red-blue divisions, nor do the score of states competing to be the site of the Federal Aviation Administration's test sites for drones.

The serious issues raised by the government's lethal drones seem inextricably mixed with the ubiquitous appearance of the technology in art, commerce and satire.

A four-minute video by the Air Force Research Laboratory on "micro aerial vehicles" shows a futuristic bee-size drone flying in an open window and taking out an enemy sniper with a miniature explosive payload. Since it was posted in 2009, it has been viewed hundreds of thousands of times and reposted all over the Web.

When Amazon advertised a six-inch model of the Predator, made by Maisto, in its toy section, people wrote politically charged mock reviews that became Internet hits: "This goes well," one reviewer wrote, "with the Maisto Extraordinary Rendition playset, by the way — which gives you all the tools you need to kidnap the family pet and take him for interrogation at a neighbor's house,

where the rules of the Geneva Convention may not apply. Loads of fun!"

Senator John McCain, Republican of Arizona, was not laughing Thursday when he took to the Senate floor to chastise Mr. Paul and defend the use of drones. In an interview with The Huffington Post, Mr. McCain dismissed Mr. Paul and the other critics of drones as "the wacko birds on right and left that get the media megaphone."

But the issue is larger than Mr. Paul, whose ambitions may include a run for the presidency in 2016. For many, Mr. Paul gave voice to the dangers they whisper about to anyone who will listen: that the government is too powerful to be left unchecked.

"It's not merely the black helicopter crowd of the folks on the far right," said Mark Potok, a senior fellow at the Southern Poverty Law Center, which tracks extremist groups. "What Rand Paul had to say about drones absolutely fired up conspiracy theorists on the left as well as the right."

Human Rights Watch plans to join other groups next month in starting an effort called the Campaign to Stop Killer Robots. The technology, fully autonomous weapons that are still at the drawing-board stage, would find and fire at their programmed targets without requiring a human being to pull the trigger.

Some national security experts find the campaign overwrought, but Mary Wareham, the advocacy director for the arms division of Human Rights Watch, noted that the Defense Department in November issued a policy directive on autonomous weapons that recognized the challenges they pose.

At the same time, there are people like Everett Wilkinson, a Tea Party organizer and self-proclaimed conspiracy theorist in Florida, who is hailing Mr. Paul as a "rock star for the Constitution." On Mr. Wilkinson's Web site, Liberty.com, he warns that the United States government is building "internment camps" for political dissidents. He is wary of what comes next.

"First they said we are just going to use drones to observe stuff, and then they put Hellfire missiles on them," Mr. Wilkinson said. "How soon are we going to have drones overhead with Tasers on them?"

In Washington, Code Pink, a leftist group of antiwar activists, showed up with flowers and chocolates at Mr. Paul's Senate offices on Thursday to thank him for standing up against abuses of power. Known around Capitol Hill mainly for disrupting Congressional hearings, the group had found a new champion.

"People say: 'Oh, my God, Code Pink is praising Rand Paul. Hell has frozen over!' " said Medea Benjamin, a co-founder of the group. "But we were glued to C-Span to the bitter end of the filibuster. We were amazed to see the education of the public that was taking place, and that has never occurred before."

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FAA to create 6 drone test sites in US

Major step toward opening American skies to unmanned aerial vehicles

UPDATED 18:11 PM EST, FEBRUARY 15, 2013 | JOAN LOWY, ASSOCIATED PRESS

WASHINGTON (AP) — In a major step toward opening U.S. skies to thousands of unmanned drones, federal officials Thursday solicited proposals to create six drone test sites around the country.

The Federal Aviation Administration also posted online a draft plan for protecting people's privacy from the eyes in the sky. The plan would require each test site to follow federal and state laws and make a privacy policy publicly available.

Privacy advocates worry that a proliferation of drones will lead to a "surveillance society" in which the movements of Americans are routinely monitored, tracked, recorded and scrutinized by the authorities.

The military has come to rely heavily on drones overseas. Now there is tremendous demand to use drones in the U.S. for all kinds of tasks that are too dirty, dull or dangerous for manned aircraft. Drones also are often cheaper than manned aircraft. The biggest market is expected to be state and local police departments.

The FAA is required by a law enacted a year ago to develop sites where civilian and military drones can be tested in preparation for integration into U.S. airspace that's currently limited to manned aircraft.

The law also requires that the FAA allow drones wide access to U.S. airspace by 2015, but the agency is behind schedule, and it's doubtful it will meet the deadline, the Transportation Department's inspector general said in a report last year.

The test sites are planned to evaluate what requirements are needed to ensure the drones don't collide with planes or endanger people or property on the ground. Remotely controlled drones don't have a pilot who can see other aircraft the way an onboard plane or helicopter pilot can.

There's also concern that links between drones and their on-the-ground operators can be broken or hacked, causing the operator to lose control of the drone. Military drones use encrypted GPS signals for navigation, which protects them from hacking, but the GPS signals used by civilian drones don't have that protection.

"Our focus is on maintaining and improving the safety and efficiency of the world's largest aviation system," Transportation Secretary Ray LaHood said in a statement. "This research will give us valuable information about how best to ensure the safe introduction of this advanced technology into our nation's skies."

The test sites are also expected to boost the local economy of the communities where they are located. About two dozen government-industry partnerships have been formed over the past year to compete for the sites.

"Today's announcement by the FAA is an important milestone on the path toward unlocking the potential of unmanned aircraft and creating thousands of American jobs," said Michael Toscano, president and CEO of the Association for Unmanned Vehicle Systems International.

"States across the country have been eager to receive this FAA designation because they recognize the incredible economic and job creation potential it would bring with it," he said in a statement.

Industry experts predict the takeoff of a multibillion-dollar market for civilian drones as soon as the FAA completes regulations to make sure they don't pose a safety hazard to other aircraft. Potential civilian users are as varied as the drones themselves. Power companies want them to monitor transmission lines. Farmers want to fly them over fields to detect which crops need water. Ranchers want them to count cows. Film companies want to use drones to help make movies. Journalists are exploring drones' newsgathering potential.

The FAA forecasts an estimated 10,000 civilian drones will be in use in the U.S. within five years.

The Defense Department says the demand for drones and their expanding missions requires routine and unfettered access to domestic airspace, including around airports and cities, for military testing and training. Currently, the military tests drones in specially designated swaths of airspace in mostly remote parts of the country where they are likely to encounter relatively few other aircraft.

The Customs and Border Patrol uses drones along the U.S.-Mexico border. And the FAA has granted several hundred permits to universities, police departments and other government agencies to use small, low-flying drones. For example, the sheriff's department in Montgomery County, Texas, has a 50-pound ShadowHawk helicopter drone intended to supplement its SWAT team.

The sheriff's department hasn't armed its drone, although the ShadowHawk can be equipped with a 40 mm grenade launcher and a 12-guage shotgun. The prospect of armed drones patrolling U.S. skies has alarmed some lawmakers and their constituents. More than a dozen bills have been introduced in Congress and state legislatures to curb drone use and protect privacy.

President Barack Obama was asked Thursday about concerns that the administrations believes it's legal to strike American citizens abroad with drones and whether that's allowed

against citizens in the U.S. If not, how would he create a legal framework to help citizens know drone strikes can't be used against them?

"There's never been a drone used on an American citizen on American soil," the president said, speaking during an online chat sponsored by Google in which he was promoting his policy initiatives.

"We respect and have a whole bunch of safeguards in terms of how we conduct counterterrorism operations outside of the United States. The rules outside of the United States are going to be different than the rules inside the United States, in part because our capacity, for example, to capture terrorists in the United States are very different than in the foothills or mountains of Afghanistan or Pakistan.

He said he would work with Congress to make sure the American public understands "what the constraints are, what the legal parameters are, and that's something that I take very seriously."

Earlier this week, an FAA official told a meeting of potential test site bidders that aviation regulations prohibit dropping anything from aircraft, which could be interpreted to bar arming civilian drones, according to an industry official present at the meeting who requested anonymity because he wasn't authorized to speak publicly.

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Politics

Eric Holder: Drone strikes against Americans on U.S. soil are legal

March 5, 2013 | 4:09 pm | Modified: March 5, 2013 at 5:00 pm

1322 Comments

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Attorney General Eric Holder can imagine a scenario in which it would be constitutional to carry out a drone strike against an American on American soil, he wrote in a letter to Sen. Rand Paul, R-Ky.

"It is possible, I suppose, to imagine an extraordinary circumstance in which it would be necessary and appropriate under the Constitution and applicable laws of the United States for the President to authorize the military to use lethal force within the territory of the United States," Holder replied in a letter yesterday to Paul's question about whether Obama "has the power to authorize lethal force, such as a drone strike, against a U.S. citizen on U.S. soil, and without trial."

Paul condemned the idea. "The U.S. Attorney General's refusal to rule out the possibility of drone strikes on American citizens and on American soil is more than frightening – it is an affront the Constitutional due process rights of all Americans," he said in a statement.

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Holder noted that Paul's question was "entirely hypothetical [and] unlikely to occur," but cited the September 11, 2001 terrorist attacks as the type of incidents that might provoke such a response.

"Were such an emergency to arise, I would examine the particular facts and circumstances before advising the President on the scope of his authority," he concluded.

Sen. Mike Lee, R-Utah, an attorney and Judiciary Committee member, told *The Washington Examiner* last month that the drone policy so far outlined by the administration is too vague.

"That has the potential to swallow the rule," Lee said after the drone program white paper was leaked. "If you're going to regard somebody as presenting an imminent threat of an attack on the U.S. simply because you have concluded that they are an 'operational leader' or they are involved in planning an attack in one way or another, you find yourself giving way to much discretion to the government."

Lee said that the White House should release the formal legal analysis underpinning the drone program. "We know that in some instances where the government has released it

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Pelosi: Obama can keep drone strikes against Americans a secret

February 18, 2013 | 11:16 am | Modified: February 18, 2013 at 12:05 pm

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House Minority Leader Nancy Pelosi, D-Calif., believes that President Obama doesn't necessarily have to announce that an American citizen suspected of terrorism has been killed in a drone strike.

"Maybe. It just depends," Pelosi replied when The Huffington Post asked her if "the administration should acknowledge when it targets a U.S. citizen in a drone strike." When Anwar al-Awlaki was killed in a drone strike, President Obama announced the killing within hours. "People just want to be protected," Pelosi also said. "And I saw that when we were fighting them on surveillance, the domestic surveillance. People just want to be protected: 'You go out there and do it. I'll criticize you, but I want to be protected.'"

Sen. Mike Lee, R-Utah, responded less blithely. "Anytime the government willfully executes a citizen, regardless of the circumstances, it is a very serious issue," Lee, a member of the Senate Judiciary Committee, said in a statement to *The Washington Examiner*. "As the body that oversees executive branch actions, at the very least, Congress should have a full accounting – even if it must sometimes be in a classified setting – of the specific considerations that went into the decision."

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The top House Democrat suggested that the disclosure issue "depends on the timing, because that's right — it's all about timing, imminence. What is it that could be in jeopardy if people know that happened at this time? I just don't know."

Lee also acknowledged the possibility of some situations that need for congressional review. "Government should always e details public where they can," he said in his statement. "Whe concerns about releasing certain details, the appropriate com... perform oversight."

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Pelosi suggested that she would have the same position if President George W. Bush were still in office. "Those opposed are pretty critical, and other people are just listening to see what this is and why this is necessary, because we're in a different world," she told HuffPo.

Lee wants Obama to reveal the Justice Department legal analysis underpinning the drone program to the Judiciary Committee, rather than just the intelligence committees in both chambers of Congress.

"If you're going to regard somebody as presenting an imminent threat of an attack on the U.S. simply because you have concluded that they are an 'operational leader' or they are involved in planning an attack in one way or another, you find yourself giving way to much discretion to the government," he told *The Examiner* in an interview after NBC revealed the DOJ white paper on the drone program.

"We know that in some instances where the government has released its legal analysis, it gets it wrong," Lee added.

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Sen. Lee: Obama drone strike white paper threatens due process

February 7, 2013 | 7:36 pm

12 Comments

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President Obama's white paper justification for carrying out drone strikes against U.S. citizens suspected of terrorism could "swallow the rule" guaranteeing the due process rights of Americans, Sen. Mike Lee, R-Utah, suggested today.

"There is nothing more serious than the taking of the life of a U.S. citizen by the U.S. government," Lee said in a phone interview with *The Washington Examiner* while discussing the Justice Department white paper that explains some of the rationale behind the drone strike counter-terrorism program.

"You would think that consistent with the principles of due process, the government shouldn't be able to kill one of its own citizens without some kind of showing that they present an imminent threat," he continued. "But when you dig a little bit deeper into this white paper . . . they have sort of a loose [definition] of 'imminent'."

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NBC News reported that it had obtained an unclassified DOJ white paper that articulated a broader claim of power to kill U.S. citizens suspected of terrorist activities.

"The condition that an operational leader present an 'imminent' threat of violent attack against the United States does not require the United States to have clear evidence that a specific attack on U.S. persons and interests will take place in the immediate future," NBC quotes the memo as saying.

"That has the potential to swallow the rule," Lee warned. "If you're going to regard somebody as presenting an imminent threat of an attack on the U.S. simply because you have concluded that they are an 'operational leader' or they are involved in planning an attack in one way or another, you find yourself giving way to much discretion to the government."

Lee said the president needs to be more transparent with Congress about the drone strike program as pertaining to American citizens.

"I certainly think that Members of Congress ought to have the they make public," he said. "They have not made that availabl Judiciary Committee I think I ought to have access to it."

The Senate Judiciary Committee has oversight jurisdiction of given Senate Intelligence Committee members access to a m more detailed legal justification for the program. The lawmakers are not allowed to make copies, take notes, or reveal the memo to their staff.

"We know that in some instances where the government has released its legal analysis, it gets it wrong," Lee recalled, citing the D.C. Circuit Court of Appeals just repudiated the Obama Justice Department's legal analysis for making 'recess' appointments when Congress is in session.

The former appellate lawyer also criticized the White House for failing to identify a constitutional principle that would prevent the U.S. military from carrying out a drone strike on a suspected American terrorist in the United States.

"They ought to be able to articulate that," Lee told *The Examiner*. "To whatever extent they make a difference

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between their operations here and their operations elsewhere, they ought to have some explanation for that, and the mere fact that they don't have one is itself cause for concern."

"I am not a lawyer and these are the kinds of things that are probably best expressed and explained by lawyers," White House Press Secretary Jay Carney told reporters when asked why the administration's argument for killing Americans overseas doesn't also allow Obama to order strikes within the country. "There are issues here about . . . feasibility of capture that I think are pertinent to that question."

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February 5, 2013 | 2:21 pm

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White House Press Secretary Jay Carney could not identify a constitutional principle that would prevent President Obama from carrying out a drone strike on an American citizen in the United States.

"I am not a lawyer and these are the kinds of things that are probably best expressed and explained by lawyers," Carney said during the press briefing. "There are issues here about . . . feasibility of capture that I think are pertinent to that question."

The Fifth Amendment to the U.S. Constitution, in the Bill of Rights, says that "no person shall . . .be deprived of life, liberty, or property, without due process of law."

A Justice Department white paper emphasized the importance of believing that an American citizen overseas, such as terrorist leader Anwar al-Awlaki, is an imminent threat to Americans when debating a drone strike.

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"The condition that an operational leader present an 'imminent' threat of violent attack against the United States does not require the United States to have clear evidence that a specific attack on U.S. persons and interests will take place in the immediate future," the white paper, obtained by NBC News, said.

Carney also said that "These strikes are legal, they are ethical and they are wise," though he indicated that discussion of them at the upcoming CIA director confirmation hearings might not be legal.

"[D]iscussing classified matters in public hearings is generally not an appropriate thing to do or a legal thing to do," Carney said.

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March 26, 2013

Representative Shelley Hughes
State Capitol Building
Room #409
Juneau, AK 99801

Dear Representative Hughes,

The Greater Fairbanks Chamber of Commerce represents over 700 businesses and organizations in the greater Fairbanks area and our mission is to ensure a healthy economic environment. The Chamber supports the Alaska House of Representatives Concurrent Resolution No. 6, recognizing the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks as a national leader in unmanned aircraft research and development, and establishing a legislative Task Force on Unmanned Aircraft Systems.

The University of Alaska has led the way for research on unmanned aircraft systems (UAS) and continues this pioneering work in its bid to become one of the nation's six test sites for aircraft systems testing and research. The Resolution recognizes this substantial effort. More significantly, it establishes a legislative Task Force to address potential impacts and opportunities of unmanned aircraft systems for our state.

Alaska's immense land mass and associated airspace presents opportunities no other state can offer for testing and flight training. Vast existing Military Operations Areas and expansive ground maneuver areas can easily support virtually all military applications for current and future UAS technology, and military UAS infrastructure can only complement civilian and commercial applications.

As with any new technology, a myriad of concerns must be addressed before unmanned aircraft become a common fixture in our National airspace. This resolution takes the necessary step to begin addressing those concerns to insure Alaska leads the way for this transformative and dynamic flight environment.

Sincerely,

Lisa Herbert
Executive Director

Terri Froese
Board of Directors, Chair

Tim Jones
Military Affairs Committee, Chair

Anna Atchison
Government Relations Committee, Chair

Cc: Governor Sean Parnell
Alaska State Legislature
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Ideas Changing the World

Federal Aviation Administration Proposes Unnecessary Privacy Regulations on Drone Test Sites

April 30, 2013

Unmanned aerial vehicles, commonly referred to as drones, have begun the slow transition from the military sector to the commercial sector. As part of the mandate from Congress, the Federal Aviation Administration (FAA) is charged with safely integrating civil drones into the existing airspace. The FAA is now seeking applications for establishing six test ranges but has recently proposed new privacy guidelines that would stifle innovation, say Jerry Brito, Eli Dourado and Adam Thierer of the Mercatus Center.

- As with any new technology, the public has been initially skeptical of this new technology but will likely adapt to it gradually as more than 10,000 drones enter the skies by 2020.
- Drone research and development is decentralized, meaning that many developers, from small companies to industry behemoths, are testing new capabilities.
- The FAA must find a balance between too many commercial restrictions, which will delay integration, and too few restrictions, which could pose safety risks.
- Drones have potential applications in law enforcement, national security, agricultural and earth science.

The FAA has proposed new privacy requirements for test range operators to address concerns about drones infringing on individuals' privacy.

- The FAA should refrain from making any guidelines on privacy because its expertise is solely in regulating aeronautics, not in Fourth Amendment jurisprudence, an area in which numerous laws already govern privacy, property and peeping toms.
- The fears about privacy infringements are also unsubstantiated, being based solely on hypothesized scenarios rather than actual events, the latter of which might require the courts, and not the FAA, to sort out.
- The FAA should allow nongovernmental privacy protection mechanisms to develop instead of stifling the creation of market-based solutions or voluntary codes of conduct.

The proposed privacy rules are inappropriate for this stage of development because they require the prohibitively expense action of full disclosure to an individual who is inadvertently captured on camera. While the proposed privacy regulations are supposed to be implemented for test sites only, there is a risk that they could serve as a baseline for future legislation and rulemaking as full integration nears.

Source: Jerry Brito, Eli Dourado and Adam Thierer, "Federal Aviation Administration Unmanned Aircraft System Test Site Program," Mercatus Center, April 23, 2013.

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Federal Aviation Administration: Unmanned Aircraft System Test Site Program

Jerry Brito [1], Eli Dourado [2], Adam Thierer [3] | Apr 23, 2013

In the FAA Modernization and Reform Act of 2012 (FMRA),[1] Congress tasked the Federal Aviation Administration (FAA) with integrating unmanned aircraft systems (UASs), sometimes referred to as unmanned aerial vehicles or drones, into the National Airspace System by September 2015. As part of that effort, Congress directed the FAA to establish six test ranges to serve as integration pilot projects.[2] On February 22, 2013, the FAA issued a notice in the Federal Register announcing the process for selection of the sites and a request for public comment on its "proposed approach for addressing the privacy questions raised by the public and Congress with regard to the operation of unmanned aircraft systems within the test site program."[3]

The Technology Policy Program (TPP) of the Mercatus Center at George Mason University is dedicated to advancing knowledge of the impact of regulation on society. As part of its mission, TPP conducts careful and independent analyses employing contemporary economic scholarship to assess rulemaking proposals from the perspective of the public interest. Therefore, this comment on the FAA's Notice of Availability and Request for Comments does not represent the views of any particular affected party or special interest group, but is designed to assist the administration as it carries out Congress's mandate to safely integrate UASs into the National Airspace System.

CONCEIVING OF AIRSPACE AS A PLATFORM FOR INNOVATION

In analyzing the proposed policies being developed to carry out Congress's mandate, it is important to remember that the purpose of the mandate is to open America's skies to commercial UAS use in order to reap the social benefits that such use will bring.[4] The commercial use of UASs is an important step toward the efficient utilization of airspace. When an important national resource like airspace arbitrarily excludes commercial uses, the social costs of such exclusion may not always be immediately evident. For example, until 1989, commercial use of the Internet was prohibited. As a 1982 MIT handbook for the use of ARPAnet, the progenitor of what would become the Internet, warned students:

> It is considered illegal to use the ARPAnet for anything which is not in direct support of government business...Sending electronic mail over the ARPAnet for commercial profit or political purposes is both anti-social and illegal. By sending such messages,

> you can offend many people, and it is possible to get MIT in serious trouble with the government agencies which manage the ARPAnet[5]

Undoubtedly, these commercial restrictions were put in place with the best of intentions. Had rulemakers understood the nature of the revolution that they were forestalling, they probably would never have imposed restrictions on commercial use of the Internet. They were simply unable to imagine the enormous benefits that would be generated by allowing the Internet to become an open platform for social and commercial innovation.

Vint Cerf, one of the "fathers of the Internet," credits "permissionless innovation" for the economic benefits that the Internet has generated.[6] As an open platform, the Internet allows entrepreneurs to try new business models and offer new services without seeking the approval of regulators beforehand.

Like the Internet, airspace is a platform for commercial and social innovation. We cannot accurately predict to what uses it will be put when restrictions on commercial use of UASs are lifted. Nevertheless, experience shows that it is vital that innovation and entrepreneurship be allowed to proceed without ex ante barriers imposed by regulators.[7] We therefore urge the FAA not to impose *any* prospective restrictions on the use of commercial UASs without clear evidence of actual, not merely hypothesized, harm.

PRIVACY AND COMMERCIAL UASS

The FAA's proposed privacy requirements for test range operators address concerns about hypothesized impositions on individual privacy. In view of the importance of "permissionless innovation" for the development of airspace as a platform for commercial and social entrepreneurship, we believe that the FAA should not impose any additional privacy rules for UAS Test Sites, for four reasons.

First, the FAA does not have the authority to impose such requirements. A plain reading of Subtitle B of the FMRA (the relevant section that covers UASs) reveals that Congress's charge to the FAA is simply to ensure the safe integration of UASs into the national airspace.[8] There are over 20 references to safety in the section, but not one reference to privacy or related concerns.[9] Additionally, the specific section mandating the establishment of test ranges lists six requirements that the administrator must meet in doing so.[10] These requirements exclude privacy considerations, suggesting that Congress did not intend to give the FAA any authority to include privacy consideration in its requirements. This view is buttressed by the fact that Congress is now considering the Drone Aircraft Privacy and Transparency Act of 2013, which would amend FMRA to require the FAA to develop privacy regulations in conjunction with the Federal Trade Commission and the Departments of Commerce and Homeland Security[11]. The implication is that at least some in Congress do not believe the FAA now has a privacy mandate. These facts comport with the FAA's history as a safety regulator. Indeed, the FAA's mission is "to provide the safest, most efficient aerospace system in the world,"[12] not to regulate for privacy.

Second, there is no evidence of a materialized harm that calls out for the proposed privacy requirements for test range operators. Prospective regulation at this juncture necessarily involves hypothesizing about the privacy violations that might arise. Since many of these

harms may never materialize, forward-looking regulation is likely to overprotect privacy at the expense of innovation.

Third, as the proposed privacy requirements make clear, there already exist "federal, state, and other laws regard- ing the protection of an individual's right to privacy."[13] If harms due to privacy violations can be shown in court, damages will be awarded to the victims of those violations. Property law already governs trespass, and new court rulings may well expand the body of such law to encompass trespass by commercial UASs by focusing on actual cases and controversies, not merely imaginary hypotheticals. In particular, state "peeping Tom" laws already prohibit spying into individual homes.[14] Privacy torts—including the tort of intrusion upon seclusion—may also evolve in response to technological change and provide more avenues of recourse to plaintiffs seeking to protect their privacy rights.[15]

Fourth, adequate time should be afforded for the development of nongovernmental privacy protection mechanisms, ranging from market-based solutions to voluntary codes of conduct to individual self-help. The UAS industry has already developed a set of industry best practices, which include respect for the privacy of individuals.[16] These guidelines will likely be refined over time to meet new challenges and concerns. Industry norms and practices will also be influenced by pressure from media, activists, and consumers. Such less-restrictive solutions can greatly reduce the need for administrative intervention and can therefore increase the "permissionlessness" of airspace as a platform for innovation.

SOCIAL ADAPTATION

Patience is also wise here not only because it provides breathing space for future innovation, but also because it provides an opportunity to observe both the evolution of societal attitudes toward this new technology and how citizens adapt to it. It is possible that citizen attitudes about UASs will follow a familiar cycle we have seen play out in other contexts of initial *resistance,* gradual *adaptation,* and then eventual *assimilation* of that new technology into society.[17] As technology author Larry Downes has observed, "after the initial panic, we almost always embrace the service that once violated our visceral sense of privacy."[18]

The introduction and evolution of the camera and photography provides a useful comparison in this regard. The camera was initially viewed as a highly disruptive force when photography became more widespread in the late 1800s. Indeed, the most important essay ever written on privacy law, Samuel D. Warren and Louis D. Brandeis's famous 1890 *Harvard Law Review* essay on "The Right to Privacy," decried the spread of the device.[19] The authors lamented that "instantaneous photographs and newspaper enterprise have invaded the sacred precincts of private and domestic life" and claimed that "numerous mechanical devices threaten to make good the prediction that 'what is whispered in the closet shall be proclaimed from the house-tops.'"[20]

Similar fears often animate criticisms of UASs today. But just as personal norms and cultural attitudes toward cameras and public photography evolved quite rapidly over a century ago, attitudes about UASs may evolve in coming years. Just as cameras and photography became an ingrained part of the human experience, UASs might, as well.

And just as social norms and etiquette evolved to address those who would use cameras in inappropriate, privacy-invasive ways, the same could happen for UASs.

Toward that end, just as we did not preemptively foreclose photographic innovation in the late 1800s, we should not foreclose UAS innovation today with overly prescriptive privacy regulations. Let innovation continue, and address tangible harms as they develop, if they do.

APPLICATION TO THE PROPOSED PRIVACY REQUIREMENTS

In light of these arguments, section (1) of the proposed privacy rules is inappropriate for the current stage of experimentation with commercial UASs. The requirement that site operators develop privacy policies that are informed by Fair Information Practice Principles is quite onerous for commercial operators of UASs, and its cost will likely outweigh any hypothetical benefits.

Consider, for example, a real estate agent that uses an UAS to create a detailed, three-dimensional photograph of the exterior of a property that is for sale. In doing so, the UAS inadvertently captures images of passersby in the street adjacent the property. According to so-called Fair Information Practice Principles,[21] must the UAS operator treat the passersby as potential victims of privacy violation? If so, then would the following requirements apply?

- To give all passersby notice of data collection before any photos are taken.
- To publicly identify the real estate agent before any photos are taken.
- To ensure that passersby understand that pictures of their faces and information about their whereabouts may be used on a real estate listing website.

- To give passersby a choice to opt-in or opt-out of such photography.
- To ensure that all inadvertently photographed passersby are given access to all photographs, including ones that are not used on the real estate listing website.
- To take expensive security measures to protect photos that were taken in a public place.

If adhered to strictly, Fair Information Practice Principles could make it prohibitively costly to use commercial UASs in applications as benign as taking photographs near public spaces. It is not clear that they could comply, in this context or any other, with Executive Order 13563, which requires that any regulation promulgated by an executive agency be cost-beneficial. It should also be noted that Fair Information Practice Principles are law nowhere else in the federal government.

CONCLUSION

While the FAA makes clear in its Notice that the privacy requirements it proposes are only applicable to the test site operators and "are not intended to pre-determine the long-term policy and regulatory framework under which commercial UASs would operate,"[22] it would be unreasonable to believe that the precedent set in this proceeding will not affect future deliberations. Indeed, the actions the FAA takes in this proceeding will begin to set the baseline for future UAS regulation.

The FAA further notes that the purpose of the privacy requirements are simply to "assure maximum transparency of privacy policies associated with UAS test site operations in order to engage all stakeholders in discussion about which privacy issues are raised by UAS operations and how law, public policy, and the industry practices should respond to those issues in the long run."[23] Unfortunately, by mandating that test site operators issue privacy policies and that those policies be informed by Fair Information Practice Principles, the FAA would be excluding an important possible alternative from the discussion: some operators might choose not to issue a privacy policy or adopt a non-FIPPs-compliant policy. If the true purpose of the pilot programs is "to develop a body of data and operational experiences to inform integration and the safe operation of these aircraft in the National Airspace System," then the FAA should seek not just geographic and climatic diversity, but policy diversity as well.

We therefore urge the FAA to strike section (1) of its proposed privacy regulations and rely exclusively on existing law and other mechanisms to protect individuals' privacy rights. We believe that such an approach would have the virtue of protecting individual rights, fostering the use of airspace as a platform for innovation, and allowing the scope of any necessary future privacy laws to be narrowly tailored by actual cases and controversies that emerge. To the extent that it remains the subject of public concern, the FAA should recognize its lack of authority on the matter, leaving further deliberations about the privacy implications of UASs to Congress, where elected officials can consider these concerns while weighing the benefits and costs of potential regulation.

Endnotes

1. FAA Modernization and Reform Act of 2012, Pub L. No. 112-95, 126 Stat. 11 (hereinafter "FMRA").
2. Id., § 332(c).
3. Unmanned Aircraft System Test Site Program, 78 Fed. Reg. 12259 (Feb. 22, 2013) (hereinafter, "FAA Notice"). It should be noted that, as will be shown below, Congress has raised no such privacy questions and has clearly omitted privacy considerations in its mandate to the FAA.
4. Jerry Brito, "Domestic Drones Are Coming Your Way," *Reason.com,* March 11, 2013, http://reason.com/archives/2013/03/11/domestic [4] -drones-are-coming-your-way. Chris Anderson, "Why We Shouldn't Fear Personal Drones," *Time,* January 31, 2013, http://ideas.time [5] .com/2013/01/31/why-we-shouldnt-fear-personal-drones.
5. L. Gordon Crovitz. "WeHelpedBuildThat.com," *Wall Street Journal,* July 29, 2012. http://online.wsj.com/article/SB10000872396390443931 [6] 404577555073157895692.html
6. Vinton Cerf. "Keep the Internet Open," *New York Times,* May 24, 2012. http://www.nytimes.com/2012/05/25/opinion/keep-the-internet [7] -open.html
7. As Brookings Institution senior fellow John Villasenor has recently explained,

When considering potential new statutory UAS privacy protections, it is helpful to keep in mind what has occurred with the Internet and mobile telephones, two technologies that are associated with privacy threats that are in some respects much more significant than those that will arise from unmanned aircraft. Both the Internet and mobile phones grew as fast as their underlying technologies enabled. As a result, the public and legislative dialogue regarding how best to address the privacy issues they raise has been conducted with a strong ap- preciation of their benefits. By contrast, while the privacy concerns associated with domestic UAS are real and deserving of attention, they are getting significant focus long before the potential benefits of the technology are widely recognized. . . .

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the complexi- ties that arose after the turn of the century with the growth of social networking and location-based wireless services. The Internet has proven useful and valuable in ways that were difficult to imagine over a decade and a half ago, and it has created privacy challenges that were equally difficult to imagine. Legislative initiatives in the mid-1990s to heavily regulate the Internet in the name of privacy would likely have impeded its growth while also failing to address the more complex privacy issues that arose years later.

John Villasenor, "Observations from Above: Unmanned Aircraft Systems and Privacy," *Harvard Journal of Law & Public Policy* 36, no. 2 (2013): 517.

8. FMRA §§ 331–336.

9. Id.

10. FMRA § 332(c)(2)(A)–(F).

11. H.R. 1262, 113th Cong. 1st Sess. (1st Sess. 2013).

12. "Mission," Federal Aviation Administration, last modified April 23, 2010, http://www.faa.gov/about/mission/ [8].

13. FAA Notice at 12260.

14. For example, see Va. Code Ann. § 18.2–130, Peeping or spying into dwelling or enclosure.

15. Restatement (Second) of Torts §§ 652B (1977).

16. "Unmanned Aircraft System Operations Industry 'Code of Conduct,'" Association for Unmanned Vehicle Systems International, accessed April 19, 2013, http://www.auvsi.org/conduct [9].

17. Adam Thierer, "Technopanics, Threat Inflation, and the Danger of an Information Technology Precautionary Principle," *Minnesota Journal of Law, Science & Technology* 14, no. 1 (2013): 309–386.

18. Larry Downes, "A Rational Response to the Privacy 'Crisis,'" *Cato Institute Policy Analysis* no. 716 (Jan. 7, 2013): 10.

19. Samuel D. Warren & Louis D. Brandeis, "The Right to Privacy," *Harvard Law Review* 4 (1890): 193.

20. Id., at 195.

21. White House, *Consumer Data Privacy in a Networked World: A Framework for Protecting Privacy and Promoting Innovation in the Global Digital Economy* (Washington, DC, February 2012), 1, http://www.whitehouse.gov/sites/default/files/privacy-final.pdf [10]. (listing as FIPPs: Transparency, Individual Control, Respect for Context, Security, Access, Accuracy, Focused Collection, and Accountability.)

22. FAA Notice, 12260.

23. Id., 12259.

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[9] http://www.auvsi.org/conduct
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Bridging the gap between academic ideas and real-world problems

PUBLIC INTEREST COMMENT

FEDERAL AVIATION ADMINISTRATION
Unmanned Aircraft System Test Site Program
Docket No: FAA-2013-0061

By Jerry Brito, Eli Dourado, and Adam Thierer

In the FAA Modernization and Reform Act of 2012 (FMRA),[1] Congress tasked the Federal Aviation Administration (FAA) with integrating unmanned aircraft systems (UASs), sometimes referred to as unmanned aerial vehicles or drones, into the National Airspace System by September 2015. As part of that effort, Congress directed the FAA to establish six test ranges to serve as integration pilot projects.[2] On February 22, 2013, the FAA issued a notice in the Federal Register announcing the process for selection of the sites and a request for public comment on its "proposed approach for addressing the privacy questions raised by the public and Congress with regard to the operation of unmanned aircraft systems within the test site program."[3]

The Technology Policy Program (TPP) of the Mercatus Center at George Mason University is dedicated to advancing knowledge of the impact of regulation on society. As part of its mission, TPP conducts careful and independent analyses employing contemporary economic scholarship to assess rulemaking proposals from the perspective of the public interest. Therefore, this comment on the FAA's Notice of Availability and Request for Comments does not represent the views of any particular affected party or special interest group, but is designed to assist the administration as it carries out Congress's mandate to safely integrate UASs into the National Airspace System.

CONCEIVING OF AIRSPACE AS A PLATFORM FOR INNOVATION

In analyzing the proposed policies being developed to carry out Congress's mandate, it is important to remember that the purpose of the mandate is to open America's skies to commercial UAS use in order to reap the social benefits that such use will bring.[4] The commercial use of UASs is an important step toward the efficient utilization of airspace. When an important national resource like airspace arbitrarily excludes commercial uses, the social costs of such exclusion may not always be immediately evident. For example, until 1989, commercial use of the

1. FAA Modernization and Reform Act of 2012, Pub L. No. 112-95, 126 Stat. 11 (hereinafter "FMRA").
2. Id., § 332(c).
3. Unmanned Aircraft System Test Site Program, 78 Fed. Reg. 12259 (Feb. 22, 2013) (hereinafter, "FAA Notice"). It should be noted that, as will be shown below, Congress has raised no such privacy questions and has clearly omitted privacy considerations in its mandate to the FAA.
4. Jerry Brito, "Domestic Drones Are Coming Your Way," *Reason.com*, March 11, 2013, http://reason.com/archives/2013/03/11/domestic-drones-are-coming-your-way. Chris Anderson, "Why We Shouldn't Fear Personal Drones," *Time*, January 31, 2013, http://ideas.time.com/2013/01/31/why-we-shouldnt-fear-personal-drones.

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The ideas presented in this document do not represent official positions of the Mercatus Center or George Mason University.

Internet was prohibited. As a 1982 MIT handbook for the use of ARPAnet, the progenitor of what would become the Internet, warned students:

> It is considered illegal to use the ARPAnet for anything which is not in direct support of government business...Sending electronic mail over the ARPAnet for commercial profit or political purposes is both anti-social and illegal. By sending such messages, you can offend many people, and it is possible to get MIT in serious trouble with the government agencies which manage the ARPAnet.[5]

Undoubtedly, these commercial restrictions were put in place with the best of intentions. Had rulemakers understood the nature of the revolution that they were forestalling, they probably would never have imposed restrictions on commercial use of the Internet. They were simply unable to imagine the enormous benefits that would be generated by allowing the Internet to become an open platform for social and commercial innovation.

Vint Cerf, one of the "fathers of the Internet," credits "permissionless innovation" for the economic benefits that the Internet has generated.[6] As an open platform, the Internet allows entrepreneurs to try new business models and offer new services without seeking the approval of regulators beforehand.

Like the Internet, airspace is a platform for commercial and social innovation. We cannot accurately predict to what uses it will be put when restrictions on commercial use of UASs are lifted. Nevertheless, experience shows that it is vital that innovation and entrepreneurship be allowed to proceed without ex ante barriers imposed by regulators.[7] We therefore urge the FAA not to impose *any* prospective restrictions on the use of commercial UASs without clear evidence of actual, not merely hypothesized, harm.

PRIVACY AND COMMERCIAL UASS

The FAA's proposed privacy requirements for test range operators address concerns about hypothesized impositions on individual privacy. In view of the importance of "permissionless innovation" for the development of airspace as a platform for commercial and social entrepreneurship, we believe that the FAA should not impose any additional privacy rules for UAS Test Sites, for four reasons.

First, the FAA does not have the authority to impose such requirements. A plain reading of Subtitle B of the

5. L. Gordon Crovitz. "WeHelpedBuildThat.com," *Wall Street Journal*, July 29, 2012. http://online.wsj.com/article/SB10000872396390443931404577555073157895692.html

6. Vinton Cerf. "Keep the Internet Open," *New York Times*, May 24, 2012. http://www.nytimes.com/2012/05/25/opinion/keep-the-internet-open.html

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> When considering potential new statutory UAS privacy protections, it is helpful to keep in mind what has occurred with the Internet and mobile telephones, two technologies that are associated with privacy threats that are in some respects much more significant than those that will arise from unmanned aircraft. Both the Internet and mobile phones grew as fast as their underlying technologies enabled. As a result, the public and legislative dialogue regarding how best to address the privacy issues they raise has been conducted with a strong appreciation of their benefits. By contrast, while the privacy concerns associated with domestic UAS are real and deserving of attention, they are getting significant focus long before the potential benefits of the technology are widely recognized. . . .
>
> If, in 1995, comprehensive legislation to protect Internet privacy had been enacted, it would have utterly failed to anticipate the complexities that arose after the turn of the century with the growth of social networking and location-based wireless services. The Internet has proven useful and valuable in ways that were difficult to imagine over a decade and a half ago, and it has created privacy challenges that were equally difficult to imagine. Legislative initiatives in the mid-1990s to heavily regulate the Internet in the name of privacy would likely have impeded its growth while also failing to address the more complex privacy issues that arose years later.

John Villasenor, "Observations from Above: Unmanned Aircraft Systems and Privacy," *Harvard Journal of Law & Public Policy* 36, no. 2 (2013): 517.

FMRA (the relevant section that covers UASs) reveals that Congress's charge to the FAA is simply to ensure the safe integration of UASs into the national airspace.[8] There are over 20 references to safety in the section, but not one reference to privacy or related concerns.[9] Additionally, the specific section mandating the establishment of test ranges lists six requirements that the administrator must meet in doing so.[10] These requirements exclude privacy considerations, suggesting that Congress did not intend to give the FAA any authority to include privacy consideration in its requirements. This view is buttressed by the fact that Congress is now considering the Drone Aircraft Privacy and Transparency Act of 2013, which would amend FMRA to require the FAA to develop privacy regulations in conjunction with the Federal Trade Commission and the Departments of Commerce and Homeland Security.[11] The implication is that at least some in Congress do not believe the FAA now has a privacy mandate. These facts comport with the FAA's history as a safety regulator. Indeed, the FAA's mission is "to provide the safest, most efficient aerospace system in the world,"[12] not to regulate for privacy.

Second, there is no evidence of a materialized harm that calls out for the proposed privacy requirements for test range operators. Prospective regulation at this juncture necessarily involves hypothesizing about the privacy violations that might arise. Since many of these harms may never materialize, forward-looking regulation is likely to overprotect privacy at the expense of innovation.

Third, as the proposed privacy requirements make clear, there already exist "federal, state, and other laws regarding the protection of an individual's right to privacy."[13] If harms due to privacy violations can be shown in court, damages will be awarded to the victims of those violations. Property law already governs trespass, and new court rulings may well expand the body of such law to encompass trespass by commercial UASs by focusing on actual cases and controversies, not merely imaginary hypotheticals. In particular, state "peeping Tom" laws already prohibit spying into individual homes.[14] Privacy torts—including the tort of intrusion upon seclusion—may also evolve in response to technological change and provide more avenues of recourse to plaintiffs seeking to protect their privacy rights.[15]

Fourth, adequate time should be afforded for the development of nongovernmental privacy protection mechanisms, ranging from market-based solutions to voluntary codes of conduct to individual self-help. The UAS industry has already developed a set of industry best practices, which include respect for the privacy of individuals.[16] These guidelines will likely be refined over time to meet new challenges and concerns. Industry norms and practices will also be influenced by pressure from media, activists, and consumers. Such less-restrictive solutions can greatly reduce the need for administrative intervention and can therefore increase the "permissionlessness" of airspace as a platform for innovation.

SOCIAL ADAPTATION

Patience is also wise here not only because it provides breathing space for future innovation, but also because it provides an opportunity to observe both the evolution of societal attitudes toward this new technology and how citizens adapt to it. It is possible that citizen attitudes about UASs will follow a familiar cycle we have seen play out in other contexts of initial *resistance*, gradual *adaptation*, and then eventual *assimilation* of that new technology

8. FMRA §§ 331–336.
9. Id.
10. FMRA § 332(c)(2)(A)–(F).
11. H.R. 1262, 113th Cong. 1st Sess. (1st Sess. 2013).
12. "Mission," Federal Aviation Administration, last modified April 23, 2010, http://www.faa.gov/about/mission/.
13. FAA Notice at 12260.
14. For example, see Va. Code Ann. § 18.2–130, Peeping or spying into dwelling or enclosure.
15. Restatement (Second) of Torts §§ 652B (1977).
16. "Unmanned Aircraft System Operations Industry 'Code of Conduct,'" Association for Unmanned Vehicle Systems International, accessed April 19, 2013, http://www.auvsi.org/conduct.

into society.[17] As technology author Larry Downes has observed, "after the initial panic, we almost always embrace the service that once violated our visceral sense of privacy."[18]

The introduction and evolution of the camera and photography provides a useful comparison in this regard. The camera was initially viewed as a highly disruptive force when photography became more widespread in the late 1800s. Indeed, the most important essay ever written on privacy law, Samuel D. Warren and Louis D. Brandeis's famous 1890 *Harvard Law Review* essay on "The Right to Privacy," decried the spread of the device.[19] The authors lamented that "instantaneous photographs and newspaper enterprise have invaded the sacred precincts of private and domestic life" and claimed that "numerous mechanical devices threaten to make good the prediction that 'what is whispered in the closet shall be proclaimed from the house-tops.'"[20]

Similar fears often animate criticisms of UASs today. But just as personal norms and cultural attitudes toward cameras and public photography evolved quite rapidly over a century ago, attitudes about UASs may evolve in coming years. Just as cameras and photography became an ingrained part of the human experience, UASs might, as well. And just as social norms and etiquette evolved to address those who would use cameras in inappropriate, privacy-invasive ways, the same could happen for UASs.

Toward that end, just as we did not preemptively foreclose photographic innovation in the late 1800s, we should not foreclose UAS innovation today with overly prescriptive privacy regulations. Let innovation continue, and address tangible harms as they develop, if they do.

APPLICATION TO THE PROPOSED PRIVACY REQUIREMENTS

In light of these arguments, section (1) of the proposed privacy rules is inappropriate for the current stage of experimentation with commercial UASs. The requirement that site operators develop privacy policies that are informed by Fair Information Practice Principles is quite onerous for commercial operators of UASs, and its cost will likely outweigh any hypothetical benefits.

Consider, for example, a real estate agent that uses an UAS to create a detailed, three-dimensional photograph of the exterior of a property that is for sale. In doing so, the UAS inadvertently captures images of passersby in the street adjacent the property. According to so-called Fair Information Practice Principles,[21] must the UAS operator treat the passersby as potential victims of privacy violation? If so, then would the following requirements apply?

- To give all passersby notice of data collection before any photos are taken.
- To publicly identify the real estate agent before any photos are taken.
- To ensure that passersby understand that pictures of their faces and information about their whereabouts may be used on a real estate listing website.
- To give passersby a choice to opt-in or opt-out of such photography.
- To ensure that all inadvertently photographed passersby are given access to all photographs,

17. Adam Thierer, "Technopanics, Threat Inflation, and the Danger of an Information Technology Precautionary Principle," *Minnesota Journal of Law, Science & Technology* 14, no. 1 (2013): 309–386.
18. Larry Downes, "A Rational Response to the Privacy 'Crisis,'" *Cato Institute Policy Analysis* no. 716 (Jan. 7, 2013): 10.
19. Samuel D. Warren & Louis D. Brandeis, "The Right to Privacy," *Harvard Law Review* 4 (1890): 193.
20. Id., at 195.
21. White House, *Consumer Data Privacy in a Networked World: A Framework for Protecting Privacy and Promoting Innovation in the Global Digital Economy* (Washington, DC, February 2012), 1, http://www.whitehouse.gov/sites/default/files/privacy-final.pdf. (listing as FIPPs: Transparency, Individual Control, Respect for Context, Security, Access, Accuracy, Focused Collection, and Accountability.)

including ones that are not used on the real estate listing website.

- To take expensive security measures to protect photos that were taken in a public place.

If adhered to strictly, Fair Information Practice Principles could make it prohibitively costly to use commercial UASs in applications as benign as taking photographs near public spaces. It is not clear that they could comply, in this context or any other, with Executive Order 13563, which requires that any regulation promulgated by an executive agency be cost-beneficial. It should also be noted that Fair Information Practice Principles are law nowhere else in the federal government.

CONCLUSION

While the FAA makes clear in its Notice that the privacy requirements it proposes are only applicable to the test site operators and "are not intended to pre-determine the long-term policy and regulatory framework under which commercial UASs would operate,"[22] it would be unreasonable to believe that the precedent set in this proceeding will not affect future deliberations. Indeed, the actions the FAA takes in this proceeding will begin to set the baseline for future UAS regulation.

The FAA further notes that the purpose of the privacy requirements are simply to "assure maximum transparency of privacy policies associated with UAS test site operations in order to engage all stakeholders in discussion about which privacy issues are raised by UAS operations and how law, public policy, and the industry practices should respond to those issues in the long run."[23] Unfortunately, by mandating that test site operators issue privacy policies and that those policies be informed by Fair Information Practice Principles, the FAA would be excluding an important possible alternative from the discussion: some operators might choose not to issue a privacy policy or adopt a non-FIPPs-compliant policy. If the true purpose of the pilot programs is "to develop a body of data and operational experiences to inform integration and the safe operation of these aircraft in the National Airspace System," then the FAA should seek not just geographic and climatic diversity, but policy diversity as well.

We therefore urge the FAA to strike section (1) of its proposed privacy regulations and rely exclusively on existing law and other mechanisms to protect individuals' privacy rights. We believe that such an approach would have the virtue of protecting individual rights, fostering the use of airspace as a platform for innovation, and allowing the scope of any necessary future privacy laws to be narrowly tailored by actual cases and controversies that emerge. To the extent that it remains the subject of public concern, the FAA should recognize its lack of authority on the matter, leaving further deliberations about the privacy implications of UASs to Congress, where elected officials can consider these concerns while weighing the benefits and costs of potential regulation.

22. FAA Notice, 12260.
23. Id., 12259.

latimes.com/news/nationworld/nation/la-na-drone-race-20130408,0,115048.story

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States in a race to secure drone testing

Groups in 37 states are vying to become one of six federally designated sites for testing the remotely piloted crafts for use in the nation's airspace. They see a chance to generate jobs.

By Richard Simon, Los Angeles Times

3:30 AM PDT, April 8, 2013

advertisement

WASHINGTON — Although the prospect of drones flying over U.S. cities is generating cries of spies in the skies, groups from California to Florida are fiercely competing to become one of six federally designated sites for testing how the remotely piloted aircraft can safely be incorporated into the nation's airspace.

North Dakota boasts of its "minimal air traffic congestion." North Carolina, whose license plates read "First in Flight," cites its aviation history. California pitches its diverse geography: desert, mountains and ocean.

Technically, the designation itself offers no money, but 50 groups in 37 states have entered the Federal Aviation Administration competition. States see the designation as an opportunity to generate jobs from a burgeoning industry.

"Clearly, we wouldn't be interested unless we thought there was money," said Bob Knauff, a retired general leading a New York-Massachusetts bid.

And so the pitches keep coming. Oklahoma notes its experience in testing drones for the military. Arizona boasts of its nearly year-round "perfect flying weather." Florida, on the other hand, sees its sometimes severe weather a plus for testing drones in all kinds of conditions.

And the leader of a joint effort by Alaska, Hawaii and Oregon says, "We think we bring something to the table that is going to be hard to match," citing the diversity of environments and "massive amounts" of "relatively unpopulated airspace," especially up in the Last Frontier.

Not everyone, however, is so enthusiastic.

Even as the competition rages, lawmakers from city halls to Congress are writing legislation to restrict drone flights. The FAA also is getting an earful from a public anxious about drones invading their privacy.

"This is a highly visible step toward a Big Brother-like state," a Wisconsin resident complained to the FAA.

Those vying for test sites say that privacy concerns should be addressed separately from the testing. But they are aware of the concerns.

North Carolina has proposed testing in airspace over crops. "Corn doesn't care" about drones flying overhead, said Kyle Snyder, director of the NextGen Air Transportation Center at North Carolina State University. Still, the FAA has directed that existing privacy laws be obeyed during testing.

Those bidding for test sites — in many cases alliances of economic development groups, universities and aerospace companies — believe that if they land a test site, drone manufacturers will follow.

Aerospace research firm Teal Group Corp. estimated that worldwide drone spending will almost double over the next decade to $11.4 billion. Thousands of drones are expected to be deployed over the U.S. within the next five years for all sorts of chores, including inspecting pipelines, scouting film locations, searching for lost hikers, helping police track criminal suspects.

"Simply put, unmanned aircraft systems are the next big thing in the aerospace industry," California Assemblyman Al Muratsuchi (D-Torrance), chairman of the California Assembly Select Committee on Aerospace, said at a recent Sacramento hearing.

Florida, which is investing $1.4 million in its pitch, sees drones as a way to recover from the end of the space shuttle program. Nevada officials have said they see an opportunity to become the "Silicon Valley of unmanned aerial systems."

The FAA, which will select the six test sites by the end of the year, was directed by Congress to draw up rules by 2015 for drone flights in U.S. airspace. Among those pushing for the legislation was the 49-member Congressional Unmanned Systems Caucus, founded by Rep. Howard P. "Buck" McKeon (R-Santa Clarita), who has cited the potential for jobs and improvements to public safety and emergency response times from integrating drones into the nation's airspace.

The FAA has largely left it to the applicants to propose the parameters for the test sites.

North Carolina proposes a range just 14 miles long and four miles wide; other states propose ranges that take in hundreds of miles of restricted airspace, generally over lightly populated areas. Two California groups propose testing over the desert and ocean and at small airports.

In Maryland, a group led by the University System of Maryland has proposed testing over the Chesapeake Bay, among other places. New York and Massachusetts propose testing over the Adirondacks and Cape Cod.

Tests initially are expected to focus on small drones, typically 50 pounds or less, flying at altitudes of up to 5,000 to 10,000 feet, but eventually could include bigger drones like the ones used in combat — but unarmed.

Some states hoping to be named test sites have combined forces, seeing strength in numbers. Virginia and New Jersey are working together.

In California, groups based in Ventura and Kern counties, with partners from throughout the state, are bidding to become test sites, but state officials worry the intrastate competition could hurt California's chances.

Although states aren't saying much publicly about their bids for fear of helping their competitors, they are looking for any edge they can get.

North Dakota, to highlight its expertise on drones, noted that one of its universities was the first in the nation to offer a bachelor's degree in "unmanned aircraft systems operations." The governor has allocated $1 million for the state's bid and pledged an additional $4 million to support the testing if North Dakota is selected.

Ohio noted that it was home to development of the "world's first unmanned aerial system," a sort of flying bomb known as an "aerial torpedo" developed in 1918.

richard.simon@latimes.com

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① John Madden = DMVA director
Steve Hadder

Craig Campbell = AK aerospace

② Alaska UAS Interest Group
Dept of Interior
Harry_kielinge 271-3700
NBC.gov

Arctic Policy

Call from Mead Treadwell 5:20pm

Aerospace States Association
Lt Gov is chair, nationwide

just made deal w/ AUVSI
w/ CSG to come up with
model legislation.
@ AUVSI show/convention.
in August

on task force
and to work w/
CSG, NCSL, ALEC

what already exist

laws on the books that protect
AG privacy, due process,
and property rights.
harassment by noise air space use
quiet enjoyment of their property

-what right do citizens have
in Natl. Air Space —
100 yd from private dwelling

Ginger Blaisdell

From: Treadwell, Lt. Governor (GOV sponsored) <ULmead.treadwell@alaska.gov>
Sent: Wednesday, March 13, 2013 5:39 PM
To: Ginger Blaisdell
Cc: Propes, Barbara A (GOV)
Subject: FW: Use of UAVs and Model aircraft
Attachments: Madden Testimony - UAS in Alaska.pdf; UAS_Executive_Summary.pdf

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From: Madden, John W (MVA)
Sent: Wednesday, March 06, 2013 7:15 AM
To: Treadwell, Lt. Governor (GOV sponsored)
Cc: Kemp, Pat J (DOT); Goertzen, Michaela J (GOV); Toohey, Michelle K (GOV)
Subject: RE: Use of UAVs and Model aircraft

Sir –
Forgive me for replying yesterday but all my files on UAS are here in the office. There are several UAS groups that I am associated with or that I have addressed on potential UAS missions.

First, I attach my 2006 testimony on UAS in Alaska that I gave before Senator Stevens' Senate Commerce, Science, and Transportation Committee. I designed a concept of operations that included some aspects of privacy. I emphasized that UAS should not be developed, deployed, or operated entirely independently but as part of an enterprise with unified logistics, airspace coordination, privacy, and other difficult challenges.

Second, I attach the executive summary of the Unmanned Aircraft Systems Consortium and their Center for Innovation located in Arlington Texas. I addressed them last November on the UAS potential for science, safety, and security. In the audience were several involved with the Texas Governor's office through Texas A&M on private sector R&D and use of UAS.

Third, the U.S. Army at Redstone Arsenal has an office for unmanned aircraft systems that has a network with other government agencies to help establish and grow UAS programs within those organizations and agencies. I talked with them about the conops by telcon last December.

Fourth, there is an Alaska UAS Interest Group that holds periodic workshops with mostly federal agencies but some state and university agencies as well. It is coordinated by the Alaska Center for UAS Integration in the Department of the Interior here in Anchorage.

Fifth, New Mexico State University has the TAAC (Technical Analysis and Applications Center) that focuses on UAS potential – mostly federal agencies. They hold several conferences each year that are mostly technical but also have elements of societal and privacy considerations.

I have contact information for each of these groups.

As always, please do not hesitate to contact me if you have questions or need further information.

JWM
907.782.8287 (NEW!)

From: Treadwell, Lt. Governor (GOV sponsored)
Sent: Tuesday, March 05, 2013 6:19 PM
To: Hatter, Steve D (DOT); Masters, Joseph A (DPS); Madden, John W (MVA); Katkus, Thomas H (MVA)
Cc: Kemp, Pat J (DOT); Goertzen, Michaela J (GOV); Toohey, Michelle K (GOV)
Subject: Use of UAVs and Model aircraft

Commissioners, I hope this finds you well. Quick question:

I chair the Aerospace States Assn., which is looking to develop model state legislation on privacy issues as they relate to model aircraft and UAV's. We are likely to partner with industry groups, the Council on State Governments, and privacy groups as we look at this. In your balliwicks – public safety commissioners or adjutant generals or emergency homeland security directors or transport/aviation authorities – are there national organizations we should have involved?

Virginia has a bill on the Governor's desk which restricts the use of UAVs in law enforcement, and almost two dozen other laws are pending across the country. ASA's presumption is we can work to protect privacy and civil rights and allow this tool to be used for its beneficial uses.

Thanks.
Mead Treadwell, Lieutenant Governor of Alaska

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WRITTEN TESTIMONY OF
JOHN W. MADDEN
DEPUTY DIRECTOR FOR HOMELAND SECURITY
DIVISION OF HOMELAND SECURITY AND EMERGENCY MANAGEMENT
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS
STATE OF ALASKA

HEARING ON
"UNMANNED AERIAL SYSTEMS IN ALASKA AND THE PACIFIC REGION: A FRAMEWORK FOR THE NATION"

BEFORE THE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE
July 13, 2006

Introduction

Thank you, Mr. Chairman and Members of the Committee, for inviting me to present testimony on the potential use of unmanned aerial systems (UAS) in Alaska and the Pacific Region. I am the Deputy Director for Homeland Security for the State of Alaska and have held this position since September of 2005. Before beginning my service to the State of Alaska, I served 37 years in seven federal agencies, most recently three years with the Department of Homeland Security and Transportation Security Administration in Alaska. For eleven years before that, I worked with the Alaskan Region of Federal Aviation Administration (FAA). I also worked nine years with the Alaska Region of the National Weather Service and National Oceanic and Atmospheric Administration (NOAA).

Before transferring to Alaska from Washington, D.C. in 1982, I served with the headquarters of the Department of Energy working on fossil fuels research, the Joint Cruise Missile Project of the U.S. Navy and U.S. Air Force, several major defense programs, and on active duty with the U.S. Army in Vietnam and Washington, D.C.

With my experience in federal and state agencies with missions supporting science, safety, and security, I am in a position to analyze and describe the UAS initiative with a well rounded view.

Initial Concepts

In October 2005, I first learned of NOAA's interest in UAS in Alaska to conduct long-term climate research in the Arctic. I understood their objective to be regular and frequent flights over the Arctic Ocean taking atmospheric and other scientific measurements to improve the climate prediction models.

I immediately saw a possible dual mission for these flights. During the flights to and from the Arctic, the aircraft could monitor the critical infrastructure of the Trans Alaska Pipeline System (TAPS), the oil production fields of the North Slope, refineries, oil

storage facilities, and the Alaska Railroad. There was clearly a potential for one flight to accomplish two missions.

As I discussed this possibility with other state agencies and our federal partners, I realized that the range of potential missions was far broader than first evident. There was a clear need to examine the possibility of unmanned aerial systems achieving many missions on one flight – for science, safety, and security. Also, it was evident that while several organizations were interested in UAS, there was no forum for formal discussions and examination of the technology.

Workshop on Unmanned Aerial Systems in Alaska

On April 18, 2006, the State of Alaska hosted an open workshop on unmanned aerial systems. The 55 attendees represented 34 federal and state agencies, universities, private sector companies, and non-profit organizations. I have included a list of the attending agencies and organizations with my written testimony. At the workshop, we exchanged information on current UAS activities and technology around the world and identified potential uses of unmanned aircraft vehicles and systems in Alaska. There was a strong emphasis on the possibility of Alaska as a testbed for UAS technology and applications that may prove beneficial to the entire nation across a broad range of public service missions.

The attendees at the UAS workshop identified many potential mission areas broadly aligned along the themes of science, safety, and security. Some potential missions recurring during the workshop included Arctic climate and weather research, ecosystems and wildlife habitat, monitoring volcanoes and wildfires, emergency communications platform, monitoring of critical infrastructure, fisheries enforcement, emergency response management, and search and rescue. These are representative of the missions that, on first examination, seem incongruent and incompatible. However, we found these missions shared three common elements:

- UAS could improve the effectiveness of achieving the mission of each agency;
- an integrated UAS program would likely reduce the costs of many aspects of the individual missions; and
- UAS could reduce the risks to flight crews and aircraft often operating in very hazardous conditions.

Undoubtedly, there are several lists of potential mission areas prepared by other organizations. These lists should be seen as complementary rather than competitive. The civilian UAS industry is a new field and the ideas are emerging rapidly from many quarters. It is too soon to definitively include or exclude any single idea. Rather, that should be left for a later, more detailed review and planning process.

To describe each potential mission would require testimony of several hundred pages. As an expedient, I will describe a few areas that illustrate the range and diversity of missions. While I describe these missions from an Alaskan perspective, the conditions and challenges in Alaska will replicate those found in other states and regions throughout the country.

- Arctic Climate and Weather Research -- I leave it to my associates from NOAA to describe the scientific missions for UAS in Alaska. However, I emphasize that whatever conditions NOAA detects and whatever predictions arise from improved climate models, Alaska -- its people, economy, and culture -- will be affected first. This mission, as I understand it, requires a platform with intercontinental range, sensing packages, and delivery systems for sondes.

- Monitoring of Critical Infrastructure – A significantly large amount of critical infrastructure in Alaska is located in remote areas. This infrastructure is critical to the people and economy of Alaska and Nation. We Alaskans take this charge very seriously. We devote a significant amount of state, local and corporate resources to deter, detect, and defend against all hazards and threats. To protect just the energy sector – power generation and distribution, oil and gas production fields, pipeline, pump stations, refineries, rail transport, and storage facilities -- there are more than two dozen federal, state, and local agencies and private sector corporations providing some piece of the overall protection. Through the coordinated use of UAS, we could radically improve our ability to integrate all these protective activities and eliminate any gaps, seams, or overlaps in the security. To meet this mission, a variety of aircraft platforms would be needed.

- Fire Management and Response – In this area the diversity of UAS technology and missions is dramatically demonstrated. The rapidly changing nature of firefighting, constantly shifting and always threatening, is extremely challenging to the firefighters and those supporting them. In some future fire scenario, there will be an integrated use of specialized unmanned aerial systems. A high altitude platform continually captures the perimeter, damage, and direction of all fires within range and locates the hotspots within the fire. This information is transmitted real-time to the incident commander who develops and refines the strategy and tactics for the entire fire area. A medium altitude aircraft serves as an airborne radio communications base to ensure every element is in constant contact despite the terrain or ground based stations. A medium to low flying platform drops weather sondes around the fire for atmospheric readings critical to extremely accurate weather predictions down to the range of one kilometer. In the past two years, Alaska has lost more than 11 million acres to wildfires – as much as the rest of the nation combined. There will be no shortage of opportunities to test technology, tactics, and techniques in Alaska that will be immediately useful to other states with wildfires.

- Volcano monitoring – Alaska has about 40 volcanoes active in historical times. As recently as January of this year, Mt. Augustine threatened communities along Cook Inlet and the air routes over the Northern Pacific. In recent years, other eruptions from Mt. Spurr, Mt. Redoubt, and Mt. Augustine, disrupted commercial aircraft operations throughout the Pacific and half the country. While NOAA, the FAA, and the Alaska Volcano Observatory have greatly improved their ability to monitor and predict the movement of ash clouds, other information remains

difficult to obtain. During the UAS Workshop, there was speculation on the use of small, low-cost, sacrificial unmanned aerial vehicles to fly into volcanic ash clouds to gather and transmit information on the chemical composition and size of the particulate. Also, it would be of significant value to have an unmanned aircraft remain on station for hours or days to monitor and transmit visual and infrared information from the volcano. Again, a variety of unmanned aerial vehicles would supplement the ground and satellite based monitoring resources.

- River Ice and Flooding – Each spring as the ice on the Alaskan rivers begin to break up, dozens of river communities endure the uncertainty of if or when they may be flooded. During the Yukon River breakup in May 2006 – 150 miles of ice traveled downriver with the potential of blocking the river at any turn and flooding several communities. The river watch program of the National Weather Service and the State of Alaska flew small, piloted aircraft at slow speed and low elevation to monitor and assess the ice. This approach places pilot and crew at great personal risk and cannot stay on station for long. Similar conditions of seasonal flooding exist throughout the country. The process of gaining situational awareness of water conditions and rapidly identifying changes to predictions could immediately be exported to other states and regions.

Model for the Civilian UAS Testbed and Operations Center in Alaska

It was evident from discussions during and since the April workshop that no single type of UAS could meet all these missions. Rather, the ideal UAS test program would include several platform types – from the high altitude, long endurance aircraft requiring a long runway to very small aircraft capable of low and slow flight, launched pneumatically or by hand, and easily deployed. Also, the UAS initiative is more than the vehicles and technology. The unmanned aircraft are essentially tools to acquire data and information for the other elements of the system to analyze and distribute.

To accommodate this wide range of aircraft and missions, I envision an operations center at one of the hundreds of State owned airports. The center is operated by a federal government agency or contractor. The center has hangar and maintenance space for the aircraft along with a test area for assembly, test, fabrication, and modification of payload equipment and technology. Near the aircraft base is the center for communications, information processing, logistical, and administrative support for a range of clients – government, academia, and industry. The operations center is linked to the clients in Alaska and throughout the nation via high-speed, broadband fiber optic and satellite network. The center has sufficient computing power for processing, analysis, and archiving huge amounts of data and imagery. The center provides for the maximize productivity of each flight hour by aligning missions, equipment, sensing packages, and priorities from clients. Further, the center would safeguard the information from unauthorized access and use.

Depending on the missions, there may be UAS forward deployed to other locations during seasonal events such as flooding, fire, wildlife migration, fisheries seasons, and breakup of river ice. There would be accommodations for the actively participating

organizations as well as observers (real or virtual) from the private sector, other states, federal agencies, and even nations. These observers could learn first hand the UAS operations relevant to their needs and plans. Each could then make informed recommendations and decisions on the transfer of the UAS technology and procedures to their constituency or organization.

The center is governed by a charter that broadly prescribes how priorities are set, how conflicts are resolved, and how business is conducted. Through this governance, the participating agencies and organizations decide under what conditions to sacrifice a day of scientific observations to conduct a search and rescue operation or under what conditions to delay a wildlife census to monitor a threatening volcano.

Profile of One Flight with Many Missions

I will describe the flight and mission plan for one flight of an unmanned aerial vehicle should this initiative be realized. While it is unlikely that a single flight will ever perform all of these, this hypothetical flight contains several mission elements that, individually, would be extremely difficult, dangerous, or expensive with manned aircraft or through satellite observations.

1. A long-range unmanned aerial vehicle launches from a base in Southcentral Alaska with its primary mission to drop weather sondes over the Arctic Ocean. It is also equipped with optical and infrared sensors to accomplish several secondary missions along the way.
2. The aircraft quickly climbs above the general aviation operating altitudes and heads north on its programmed flight.
3. As scheduled, the aircraft flies over the Trans Alaska Pipeline System, the pump stations and river crossings. The imagery is relayed through a high speed, secure downlink to the pipeline security operations center.
4. The aircraft also flies over Ft. Greeley and the national missile defense base. The imagery is relayed to security forces.
5. The UAS Operations Center receives a report from Alaska State Troopers of a boat overdue from a trip on the Yukon River from Circle to Fort Yukon. The aircraft is directed to divert slightly to follow and monitor the Yukon River. The aircraft collects the imagery and transmits it to the UAS Control Center. The center quickly analyzes the imagery and relays to the Alaska State Troopers the locations of the most likely search areas. The search by manned aircraft is now more focused and effective.
6. Over the North Slope, the aircraft begins collecting imagery of a caribou herd for several federal and state agencies as well as universities researching the wildlife of that area. The imagery is retained onboard the aircraft for later forwarding to the client agencies and universities.
7. As the aircraft approaches the Arctic Ocean, it flies a scheduled path over the oil fields at Prudhoe Bay and takes optical and infrared images to detect hotspots indicative of leaks and the surrounding areas for unauthorized people and vehicles. The imagery is relayed real time to the pipeline operations center.

8. Over the next several hours, the aircraft conducts its primary mission of atmospheric observations over a large swath of the Arctic Ocean.
9. On its return to the mainland, the aircraft follows the flight plan along the pipeline from Prudhoe Bay to Fairbanks, again concentrating on pump stations, river crossings, and other critical elements. It relays imagery in real-time to the pipeline operations center.
10. The UAS Operations Center receives a report from the Alaska Rescue Coordination Center (RCC) in Anchorage of an emergency locator transmitter detected near Chandalar Lake in the Brooks Range above the Arctic Circle. The Control Center recalls a portion of the imagery already collected for pipeline security and reroutes it to the RCC for analysis and action.
11. The aircraft flies a planned route through the military special use airspace near Fairbanks to simulate a commercial aircraft deviating from flight plan. This provides a highly realistic test for the FAA and the North American Aerospace Defense Command to detect, identify, and intercept an aircraft under these conditions.
12. The flight plan includes a scheduled reconnaissance flight over an active fire area near Nenana. The infrared and optical imagery of the fires is relayed real time to the Alaska Fire Service in Fairbanks who matches it with information from other UAS on low-level flights.
13. The aircraft continues southward above the Alaska Railroad and monitors the remote rail bridges before the transport of a large shipment of highly hazardous materials. The imagery is sent real time to the railroad operations center.
14. The aircraft completes its one flight and its many missions and returns to base. The imagery, atmospheric observations, and other data are downloaded for archiving, distribution, and analysis.

Aviation Safety

I anticipate that the aviation community in Alaska may raise safety concerns about sharing airspace with unmanned aircraft. Alaska is the ideal venue to develop and test the standards for ensuring the safety of integrating UAS into the National Airspace System. While the per capita numbers of active pilots and registered aircraft in Alaska are the highest in the nation, there is still a great amount of airspace in Alaska. According to FAA records, there were about the same number of active pilot certificates in Alaska as in Maryland or Massachusetts, states with significantly larger populations but much smaller land area and airspace.

Also, Alaska has about the same number of registered aircraft – private, corporate, and commercial – as Ohio or Washington State, states with more population centers, fewer landing facilities, and more controlled airspace. I understand there are many other factors such as number of flights, distance and duration of flights, controlled and uncontrolled airspace, weather and radar coverage, and the limited road system. However, the risks of flying in Alaska are widely recognized and increasingly well documented.

It is often said, and I agree, that aviation is the lifeblood of Alaska – more so than any other state. Alaskans know and greatly appreciate the improvements in recent years in aviation safety and security. The collaboration between FAA, the aviation industry and associations, and the flying public is innovative, inclusive, and incredibly successful. The most notable programs in recent years are the Capstone program, the Medallion Foundation, the Circle of Safety, and the statewide system of weather cameras.

Aviation safety is and will remain vital to the state and worthy of the focus and resources afforded it. But there is strong need for the aviation community to collaborate on this initiative to confront other hazards that are just as threatening to our citizens. It is not enough to be safe while in flight as other imminent dangers – fires, floods, volcanoes, coastal and river erosion, terrorism – face our families and communities. The aviation community is a critical component of Alaskan life and it is critical to the thoughtful examination and implementation of UAS technology and operations in Alaska and across the Nation.

Benefits to the Nation from a UAS Testbed and Operations Center in Alaska

A civilian UAS operations center in Alaska will facilitate the methodical test and evaluation of existing and emerging technologies in challenging field conditions. It also is the perfect laboratory to find the best means and timetable for introducing unmanned aerial systems into the National Airspace System.

For the emerging UAS industry in the United States to establish itself in the world market, it must demonstrate reliable technology that meets business needs and government missions, and that operates in the widest range of environmental conditions, and with logistical support. Alaska is the right location for such a testbed because there is more of the world like Alaska than many parts of the United States.

Conclusion

My foremost duty is to provide for the safety and security for the people and economy of Alaska. The UAS initiative will significantly contribute to a safer and more secure Alaska. Just as importantly, I believe that a civilian testbed in Alaska also serves the best interests of other states and the Nation as a whole. Only in Alaska can we test the full range of potential missions of UAS without immediately confronting the complex airspace found in most of the National Airspace System. Only in Alaska can UAS be used to maximum efficiency through one flight conducting many missions – on each flight. Only in Alaska can the unmanned aerial system initiative be subjected to the most demanding climactic, environmental, logistical, and administrative challenges without dooming it to early and avoidable failure.

This concludes my prepared remarks. I stand ready to answer any questions you, or other Members of the Committee, may have.

Unmanned Aircraft Systems in Alaska: A Workshop on Safety, Science, and Security

Sponsored by the State of Alaska
Held at the Aviation Technology Center
University of Alaska Anchorage
Anchorage, Alaska

April 18, 2006

Participating Agencies and Organizations

State of Alaska Agencies:

Alaska Department of Commerce, Community, and Economic Development
Alaska Department of Environmental Conservation
Alaska Department of Military and Veterans Affairs
- Alaska State Defense Force
- Alaska Air and Army National Guard
- Division of Homeland Security and Emergency Management

Alaska Department of Natural Resources
- Division of Forestry

Alaska Department of Public Safety
- Alaska State Troopers

Alaska Department of Transportation and Public Facilities
- Ted Stevens Anchorage International Airport

Alaska Railroad

Federal Agencies:

Department of Commerce/National Oceanic and Atmospheric Administration
- National Weather Service, Alaska Region
- Earth Systems Research Laboratory

Department of Defense
- Alaskan Command/Joint Task Force-Alaska
- Space and Naval Warfare Systems Command, San Diego

Department of Energy
- Sandia National Laboratory

Department of Homeland Security
- U.S. Coast Guard

Department of Interior
- Bureau of Land Management/Alaska Fire Service
- U.S. Geological Survey/Alaska Volcano Observatory

National Aeronautics and Space Administration
- Jet Propulsion Laboratory

Academic Organizations:
Alaska Geophysical Institute
New Mexico State University
University of Alaska Anchorage
    Aviation Technology Division
University of Alaska Fairbanks
    Geophysical Institute

Private Sector:
ACS Alaska
Aerospace Missions
Alyeska Pipeline Service Company
BP
Conoco Phillips
GCI
Northrup Grumman

Other Organizations:
Alaska Airman's Association
Alaska Sealife Center

CENTER FOR innovation™

Unmanned Aircraft Systems Consortium (UASC)

Executive Summary

Introduction

The Center for Innovation's (CFI) Unmanned Aircraft Systems Consortium (UAS) is focused on the development of the Unmanned Aircraft Systems industry. It's primary purpose is to develop, implement and expand UAS technological and production capabilities.

CFI's Unmanned Aircraft Systems Consortium was established as a means of addressing one of the priority issues of three federal agencies CFI represents as a Federal Partnership Intermediary; the U.S. Departments of Agriculture, Defense, and Homeland Security.

A UAS is comprised of the unmanned aircraft, payload, human element, control element, weapons systems platform, display, communication architecture, life cycle logistics, and includes the supported soldiers or civilian ground crew. Unmanned aircraft are fixed or rotary winged aircraft or lighter-than-air vehicles, capable of flight without an onboard crew.

Background

In 2010, the Center for Innovation established TechComm at the invitation of the U.S. Department of Defense, as a "multi-agency" Federal Partnership Intermediary. As such, TechComm is responsible to support the formation of strategic "public-private" partnerships, facilitating and enabling the integration of industry, academic, and government research and discovery with venture capital and talent & know how. The ultimate goals; (1) enable the commercialization of patented technology discovered in federal labs; and (2) enable federal agencies to secure both technology and contract services from business and industry.

TechComm currently represents five federal agencies, including the U.S. Department of Defense (DoD), the U.S. Department of Agriculture (USDA), the U.S. Department of Homeland Security (DHS), the National Institutes of Health (NIH), and the U.S. Department of Energy. TechComm works with these agencies through their Offices of Technology Transfer and Transition, and the 272 labs they operate. These labs collectively spend $100 billion annually on research, employ 100,000 federal researchers and scientists, with 20,000 patents available for license by business and industry for their own use, manufacture, or production.

Premise and Rationale

CFI's rationale for establishing a UAS consortium is based on our contracts to represent the U.S. Departments of Agriculture, Defense, and Homeland Security as a Federal Partnership Intermediary, as all three are keenly interested in UAS.

Currently, the Department of Defense buys approximately 70 % of all unmanned aircraft vehicles produced in the world. The U.S. Department of Agriculture is interested in UAS for their work in assessing land use, crop density and production. UAS is also of strong interest to the U.S. Department of Homeland Security (DHS), and in a broader sense,

the nations' first responder community. In addition, UAS is a current focus of the Federal Aviation Administration (FAA), as it works to respond to a Congressional mandate to integrate UAV's into commercial airspace by 2015.

Critical Issues

- FAA –Creation of a five-year UAS roadmap
- Commercial Airspace – Full integration of UAS into national airspace by 2015
- Test Sites – Federal selection of six test sites nationally
- Certification – Need to develop standards and air traffic requirements for UAS
- Training – Need to develop training programs for civil and public UAS

UAS Opportunities

In the next 10 years, the Department of Defense (DoD) plans to purchase about 730 new medium-sized and large unmanned aircraft systems, based on designs currently in operation, while also improving the unmanned aircraft already in service. By Congressional Budget Office (CBO's) estimates, completing the investments in systems for which there are detailed plans will require about $36.9 billion through 2020. To do so will require $4.6 billion in annual procurement, compared to the current DoD budget for 2011 of $1.9 billion.

The Department of Defense's (DoD's) 2012 plan calls for purchasing more of the existing unmanned aircraft systems for current operations, improving the system already in service, and designing more-capable unmanned aircraft systems for the future.

Currently DoD is using their 6000 plus unmanned aircraft system to perform; reconnaissance missions; light attack; electronic warfare; search and rescue; mapping; bomb detection and destruction; firefighting; reconnaissance for nuclear; chemical; or biological weapons of mass destruction; support special operations; marine interdiction; emplacement of obstacles; such as mines; and psychological warfare. Because of these special technological needs for UAS by the DoD, the demand for the multiple of capabilities of each aircraft will increased over time.

UAS Consortium Strategic Objectives

The Center has established five strategic objectives for the UAS consortium:

Research, Development & Commercialization:

- Seek funding for research and product development to support the technology needs of the UAS industry;
- Enable efforts to commercialize new technologies;
- Expedite the transition of UAS technologies from federal agencies/labs into the commercial sector, as well as UAS technologies from the private and academic sectors.

Industry Sector Development:
- Provide support for prototype design and development;
- Create access to testing airspace for government, academic, and corporate research;
- Serve as a catalyst to develop the manufacturing capacity of unmanned aircraft solutions needed to meet emerging markets demand;
- Establish prototype supply chain, inclusive of suppliers and service providers.

Access to Capital
- Establish access to venture capital;
- Establish access to debt equity capital;
- Establish access to state and federal funding.

Education, Workforce Development & Training:
- Develop the curriculum necessary to support workforce development;
- Develop the training capacities and capabilities necessary to train the needed workforce in manufacture, repair and maintenance of UAS.

Policy & Standards Development:
- Actively seek and propose solutions for the safe and effective operation between manned and unmanned aircraft systems;
- Provide recommendations for public policy and standards development.

Consortium Partners (As of August, 2012)
Consortium partners include:

Industry Sector
- Adastral, LLC
- Aerial Specialties
- Bell Helicopter
- Legion Training & Simulation, LLC
- Lockheed Martin
- L-3 Unmanned Systems
- Process Data Control Corp
- Raytheon
- Sagan & Associates
- Unmanned Aviation Public Safety Association

Educational Sector
- Kaplan College
- Tarrant County College
- The University of Texas at Arlington

Federal Agency Advisors Include:

- Federal Aviation Administration (FAA)
- U.S. Department of Defense (DoD)
- U.S. Department of Homeland Security (DHS)
- U.S. Department of Agriculture (USDA)

Government Sector

- City of Arlington Police Department
- City of Mineral Wells
- DFW Airport
- Enid Regional Development Alliance
- North Central Texas Council of Governments
- North Texas Regional Airport
- Texas Emerging Technology Fund
- Texas Workforce Commission
- Wills Point Economic Development Corporation

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Notification of Proprietary Information

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Resolution in Support of Safe and Effective Usage of Unmanned Aircraft Systems (UAS) in the State of Alaska.

WHEREAS, the advance of technologies for Unmanned Aircraft Systems has made it possible for Alaskans to use these tools to replace manned aircraft in a number of "dull, dirty and dangerous" tasks necessary to monitor the environment, respond to natural disasters, conduct research, advance public safety, and support natural resource development; and

WHEREAS, the State of Alaska, the University of Alaska, Alaska Aerospace Development Corporation, the Alaska Aviation Safety Project and other public and private institutions have developed cooperation with NASA, the FAA, the Department of Interior, the Department of Defense and others to further advance the research, development and use of technology to benefit and support Alaskans and Americans with the safe use of Unmanned Aircraft Systems; and

WHEREAS, The State of Alaska has embraced the use of Science Technology Engineering and Math programs (STEM) in schools and in extracurricular activity with our states' youth to help our next generation of leaders compete with greater literacy of math, science and engineering; and .

WHEREAS, many Alaskan hobbyists, aviators, and educators have had a long standing relationship with the Academy of Model Aeronautics, a national organization which has, for more than 75 years, promoted safe and effective operation of model aircraft through self-regulation, self-insurance, and development of its own safety and operations procedure; and

WHEREAS, through model aviation AMA has touched and inspired the lives of many young Alaskans and Americans to become scientists, engineers , astronauts and professional aviators; and AMA's has made a continuing contribution to Alaska's youth through Model Aviation School Clubs (MASC) around our state; and

WHEREAS, Alaskan officials play active and leading roles in the Aerospace States Association, the Council of State Governments, the National Emergency Management Association, and other interstate groups which promote the protection of privacy, the advancement of aviation and UAS technologies, and the provision of STEM education programs such as ASA's Real World Design Challenge; and

WHEREAS, the State of Alaska, under Governor Parnell in 2010, entered into a cooperative Space Act agreement with NASA AMES Research Center to address many needs statewide that can benefit from applications of NASA research, use of NASA education programs, or cooperation to advance our aerospace and aviation industries, including development of small "cubesat" affordable satellites, aviation technology information and communication systems to improve inflight systems and knowledge; aviation air traffic management research to improve the routing and scheduling systems for air cargo planes at Alaska's international airports, access and delivery of NASA STEM programs to Alaska schools, and help for rural Alaskans with onsite training, education, and technology transfer for clean water and sanitation; and

WHEREAS, Alaska's state government and Alaska's business and research community continue to work with the Federal Aviation Administration to promote the establishment of safe UAS ranges onshore on offshore Alaska, which will help set procedures for the safe UAS use in the National Airspace System.

WHEREAS, Alaska has the highest per capita use of general aviation activity in our nation, and Alaskan aviation organizations have helped the FAA develop the next generation of air traffic control for the nation and the world, while making major gains for Alaska's aviation safety in the process; and

WHEREAS, Alaska's "highways in the skies" are the lifeblood to many rural communities., and improving aviation safety in Alaska has been at the forefront of transportation planning efforts and coordination between Alaska user groups.

NOW THEREFORE LET IT BE RESOLVED, that the Alaska State Legislature is bound by the Constitution of the State of Alaska to defend the privacy rights of Alaska's citizens, and, accordingly, urges the Governor and State law enforcement officials to uphold the privacy of Alaskans under existing laws, and not to allow for the unauthorized use of UAS technology for unlawful activities that will compromise basic privacy or safety or civil rights; and

BE IT FURTHER RESOLVED, that the Alaska State Legislature encourages the aviation, UAS and Research Communities, University of Alaska, the Federal Aviation Administration, NASA AMES and Academy of Model Aeronautics and the Aerospace States Associations to cooperatively develop Model Rules and Operational Procedures for the integration of Unmanned Aircraft Systems (including model aviation) within the National Airspace System that this legislature and others can consider to adopt that will further protect the privacy, safety, and civil rights of Americans while promoting the advancement of this technology.

COPIES OF THIS RESOLUTION SHALL BE SENT TO the Honorable Sean Parnell, Governor of Alaska, the Honorable Mead Treadwell, Lt. Governor of Alaska and Chair of the Aerospace States Association; Sen. Gary Stevens, chair of the Council of State Governments; Government Affairs Division of AMA, ...

Ginger Blaisdell

From: Steve Colligan <scolligan@e-terra.com>
Sent: Friday, March 08, 2013 10:51 AM
To: Ginger Blaisdell
Cc: Eric Feige
Subject: UAS Legislation - Resolution
Attachments: UAS Alaska Resolution v0.9.docx

Ginger, Attached is a rough draft of resolution we are looking at to be passed .vs legislation that is too preliminary

I am waiting for comments back from UAF and Greg Walker, but I wanted to let you know where we are at and where we are headed. I think, Greg is working on a stronger closing resolve that may benefit them in their application for UAS airspace project with the FAA.

This has been vetted by the Academy of Model Aeronautics, NASA and should have UAF comments back later today.

-Steve Colligan 907.230.3422

Resolution in Support of Safe and Effective Usage of Unmanned Aerial Systems (UAS) in the State of Alaska.

WHEREAS, The State of Alaska, the University of Alaska and Alaska education system has enacted several agreements with science based organizations and community based organization focused on the research, development and use of technology that will great benefit and support Alaskans and Americans including the use of Unmanned Aerial Systems.

WHEREAS, The State of Alaska has embraced the use of Science Technology Engineering and Math programs (STEM) in the classrooms to increase the interest and literacy of math and science in Alaska Schools.

WHEREAS, The Alaska community has had a long standing relationship with the Academy of Model Aeronautics which is a community based organization of more than 75 years, providing for safe and effective model aviation operation through its self-regulating, self-insured and development of its own safety and operations procedure. Through model aviation AMA has touched and inspired the lives of many young Americans to become scientists, engineers and professional aviators. Many Alaskans and American have become notable scientists, aviators and astronauts through their original interest in model aviation. AMA has been working as a community based organization with the Alaska Education system to deliver its STEM education programs and Model Aviation School Club (MASC) program for the benefit of Alaska's next generation of innovators.

WHEREAS, The State of Alaska has been involved with NASA for many years to solve scientific issues and cooperate on research missions. The State of Alaska, through Governor Parnell entered into a cooperative Space Act agreement with NASA AMES research center to address many needs in matters of science research and education to benefit Alaskans and our nation. NASA AMES has been working with Alaska science community to develop Small Cube Sat's the next generation of small affordable satellites; aviation technology information and communication systems to improve inflight systems and knowledge; Aviation Air traffic management research to improve the routing and scheduling systems for air cargo planes at Ted Stevens international Airport, access and delivery of NASA STEM program to Alaska schools, exciting the next generations of scientist about technology innovation, SPACE operations and exploration. NASA AMES has specifically included rural Alaskans by providing onsite training and curriculum and science camp and internship opportunities to rural Alaskans. NASA AMES has been the leader in safe use of unmanned aerial systems working with Alaska Science community on the operations of UAS for many research missions from volcano monitoring, wildlife and habitat research, to Arctic missions on Alaska's northern coast.

WHEREAS, Alaska legislature and State Government has invested in the Research and Development of UAS technology for support of many science based missions coordinated through the University of Alaska Fairbanks's, Geophysical Institute in areas of, search and rescue, environmental and resource monitoring, and exploration of the artic. These efforts continue to demonstrate the positive benefits of UAS operations, while reinforcing the use of UAS technology as a viable and cost effective tool. The

Alaska research community continues to work with the FAA, NASA AMES and aviation community on regulations and procedures for the safe UAS use in the National Airspace System.

WHEREAS, Alaska has the highest per capita use of general aviation activity in our nation. Alaskan aviation organizations in cooperation with the FAA have developed leading technology and innovations for navigation and aviation safety using Alaska as an effective testing and development grounds for the benefit the rest of the nation and the world.

WHEREAS, Aviation in Alaska and the "highways in the skies" are the lifeblood to many rural communities. Improving aviation safety in Alaska has been at the forefront of transportation planning efforts and coordination between Alaska user groups. To address these needs Alaska state government in cooperation with the FAA, NASA and other agencies are addressing aviation safety through a variety of means including but not limited to: Education and Training, Technology and Research, Improving of infrastructure and the development of terrain data and information with accuracy to support modern navigation systems.

RESOLVED, that the Alaska State Legislature supports the privacy rights of American citizens as provided for by the US constitution and will uphold the rights of Alaskans by enforcing existing laws and not allow for the unauthorized use of UAS technology for unlawful activities that will compromise basic privacy or safety.

RESOLVED, that the Alaska State Legislature encourages the aviation, UAS and Research Communities, the Federal Aviation Administration, NASA AMES and Academy of Model Aeronautics to cooperatively develop Model Rules and Operational Procedures for the integration of Unmanned Aerial Systems (including model aviation) within the NAS while maintaining the priority for manned aircraft systems.