

**12/05/14
Task Force
Meeting:
Presen-
tations**

<TARGET><BILL></BILL><SUBJECT>12-05-14 Task Force Meeting
Presentations</SUBJECT><COMM><TARGET></COMM></TARGET>



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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/EQ 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
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UNIVERSITY OF ALASKA FAIRBANKS

UAF is an AA/EO employer and educational institution.

Pan Pacific UAS Test Range Complex

Wainwright
Corridor

North Slope
Range

Alaska
Test Ranges

Oliktok Corridor

Poker Flat

PARC Range Complex

Kodiak
Range

Tillamook
Coastal

Warm
Springs

Pendleton

Oregon
Test Ranges

Juniper MOA
Complex

Hawaii
Test Ranges

Medium-Speed / Medium-Altitude

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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.

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Serving the Research Community

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Geophysical Institute
907-474-7558
info@gi.alaska.edu



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



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UNIVERSITY OF ALASKA FAIRBANKS

UAF is an AA/EEO 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 IntroductionsRepresentative 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 Itemsas 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 Doas 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

AdjournRepresentative 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 IntroductionsRepresentative 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

Highlights:

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:
600 E. Railroad Ave.
Wasilla, AK 99654
(907) 376-3725
Toll Free 1-800-565-3743

housemajority.org

HOUSE OF REPRESENTATIVES District 8 - Greater Palmer

December 5, 2014

Michael Toscano
Director of AUVSI
2700 S Quincy St, Ste, 400
Arlington, VA 22202

send to Wynn also

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

Task Force:

- Is there anything additional that needs to be included in this request?
- How should the header read?

cc: (PO will provide name)

*1st commerial operations took place in AK
importance of aviation in AK
% of pilots in AK population*

ALASKA STATE LEGISLATURE

REPRESENTATIVE
SHELLEY HUGHES

Economic Development
Trade and Tourism Committee
Chairman
Energy Committee
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University Finance Subcommittee
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housemajority.org

HOUSE OF REPRESENTATIVES District 8 - Greater Palmer

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?

ALASKA STATE LEGISLATURE

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



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HOUSE OF REPRESENTATIVES
District 8 - Greater Palmer

~~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



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
domestic drone use in the national air
Administration so I could get a full se
data from your staff that corroborated

*adopt
Know Before You Fly
with date on it*

gers posed by expanded
in the Federal Aviation
. Last week, I received
led domestic drone use.

According to this data, 1
over the last nine months. Sin
day. These numbers include n
with other aircraft and more th
aircraft. In addition, the repor
and a power plant, and unlawf

Military update

reported to the FAA
e more than one incident per
ear mid-air collisions
in proximity to other
, overflights of stadiums
om this year include:

*FAA - Jay Skaggs
-enforcement
-certification of pilots
exemption
9 more co exempt*

e and took evasive action
na City.

- October 12: an aircraft came v
to avoid collision at 4,800 feet
- 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;

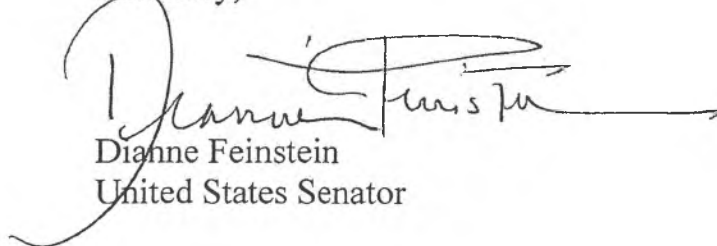
It is clear that we have a serious potential safety problem which could cause a serious threat to life. Yet, very few of these incidents resulted in FAA enforcement actions, according to reports, even though the drones’ operations appear to have been plainly illegal. For example, many reports indicate 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

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

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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 are 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 \$3.4bn	Annual Growth 09-14 2.7%	Annual Growth 14-19 3.7%
Profit \$392.9m	Wages \$683.8m	Businesses 63

Market Share

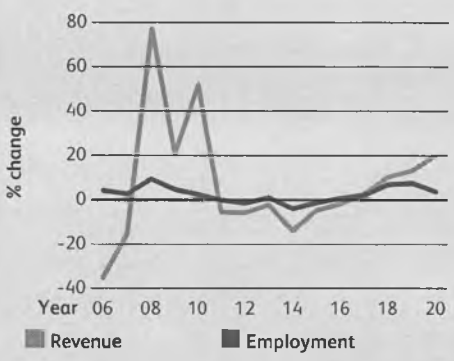
General Atomics Aeronautical Systems
24.1%

Northrop Grumman Corporation
15.9%

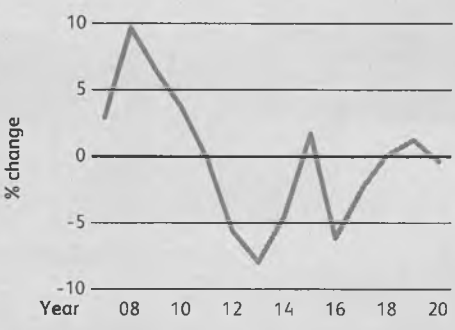
Textron Inc.
11.8%

p. 24

Revenue vs. employment growth



Federal funding for defense



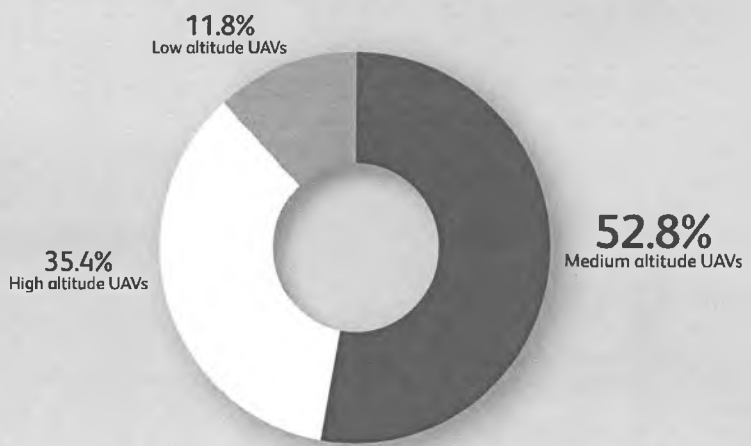
SOURCE: WWW.IBISWORLD.COM

Key External Drivers

- Federal funding for defense
- Price of semiconductor and electronic components
- World price of aluminum
- Federal funding for homeland security

p. 4

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

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.

Conflicts in the Middle East and the need for homeland security have bolstered revenue

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.

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

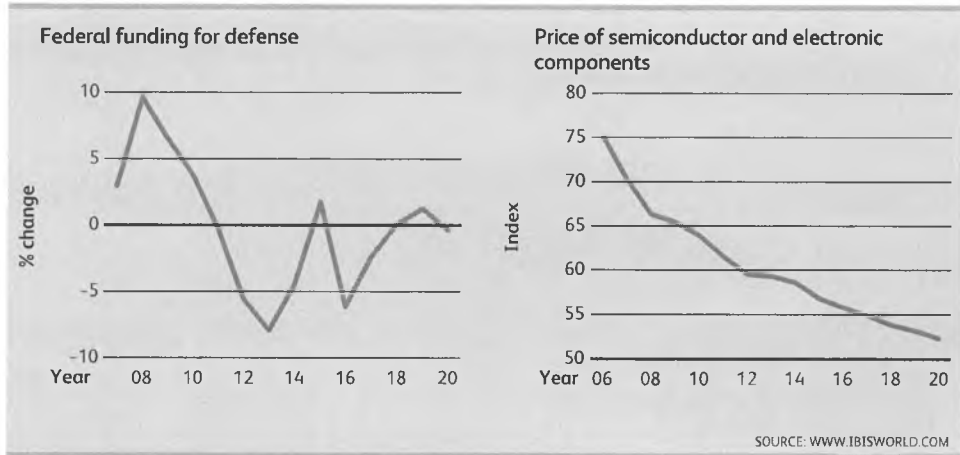
Key External Drivers continued

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

Defense funding skyrocketed, creating a boon for industry establishments

and procurement of the high altitude Global Hawk surveillance UAV.

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 drones, 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

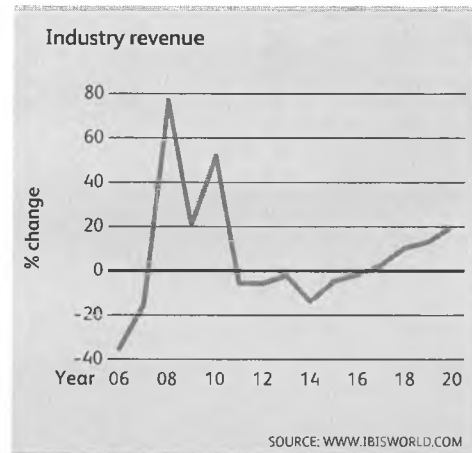
Profitability and other trends continued

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. Northrup 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

The highest growth area for the industry is projected to be the commercial and domestic markets.

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.

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.

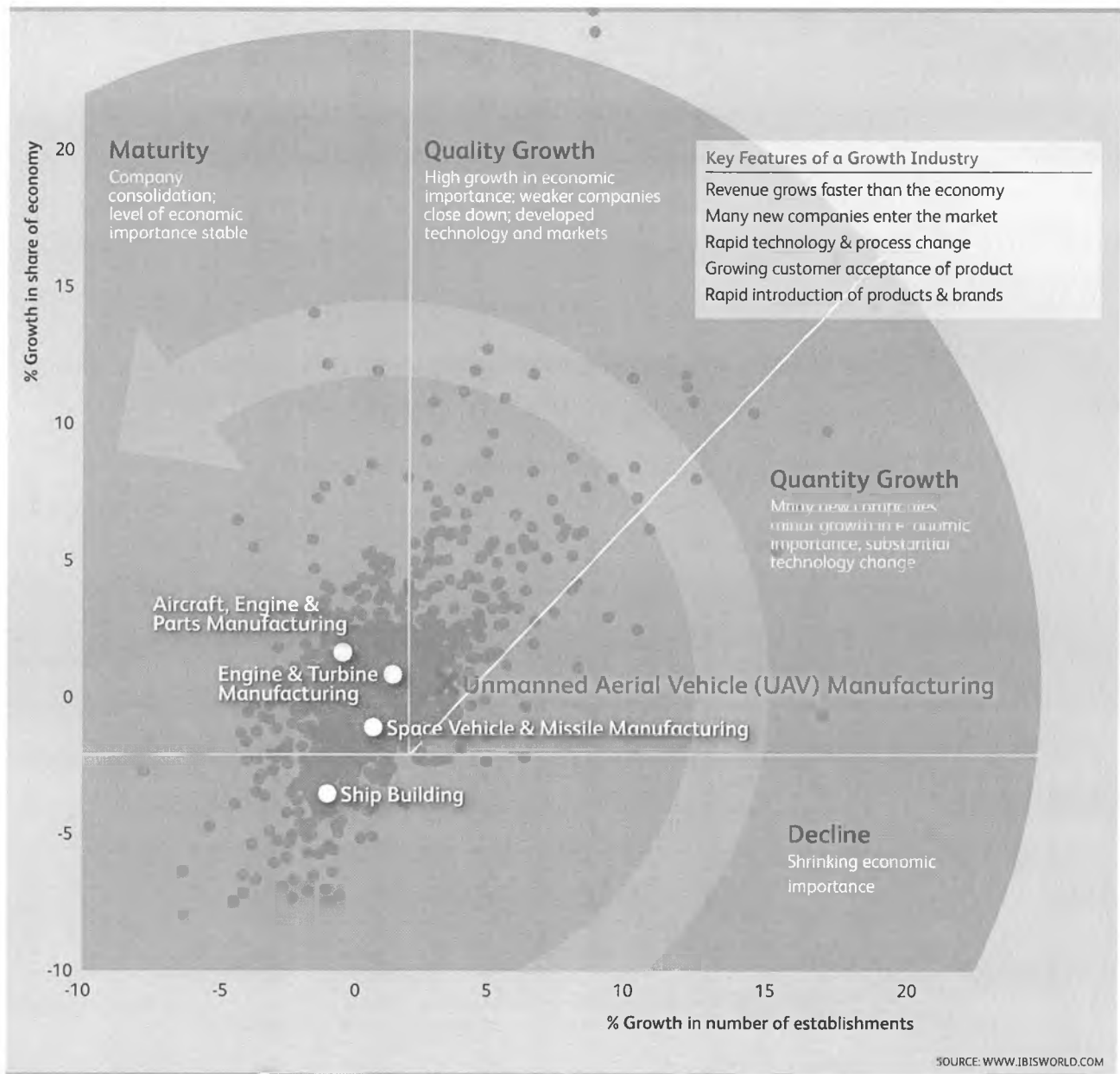
Industry Performance

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).

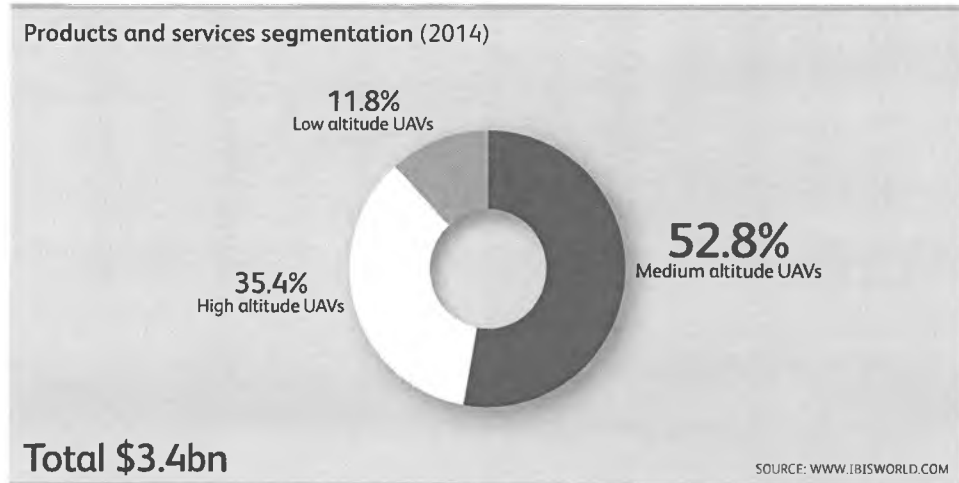
IBISWorld estimates that about 43.2% of the government's modernization spending on UAVs goes towards research development, testing and evaluation, while 56.8% goes towards procurement. Moreover, industry products can be broken down by systems components. For instance, according to Congressional Research 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)

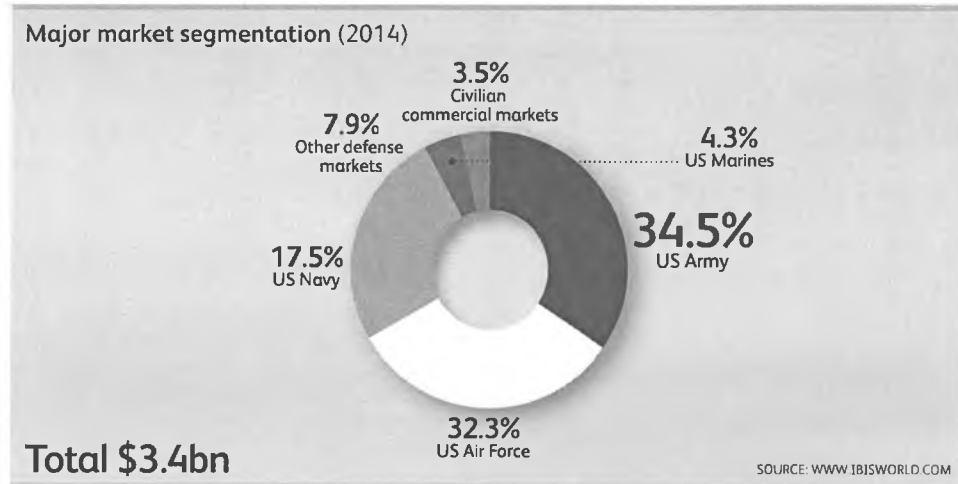
The DoD accounts for the vast majority of spending on US Unmanned aerial vehicle (UAV) research and development (R&D) and procurement. Slightly over half of DoD spending goes on procurement, with the rest going towards R&D projects. Unmanned aerial vehicle (UAVs) are considered a key component of US 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-altitude 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).

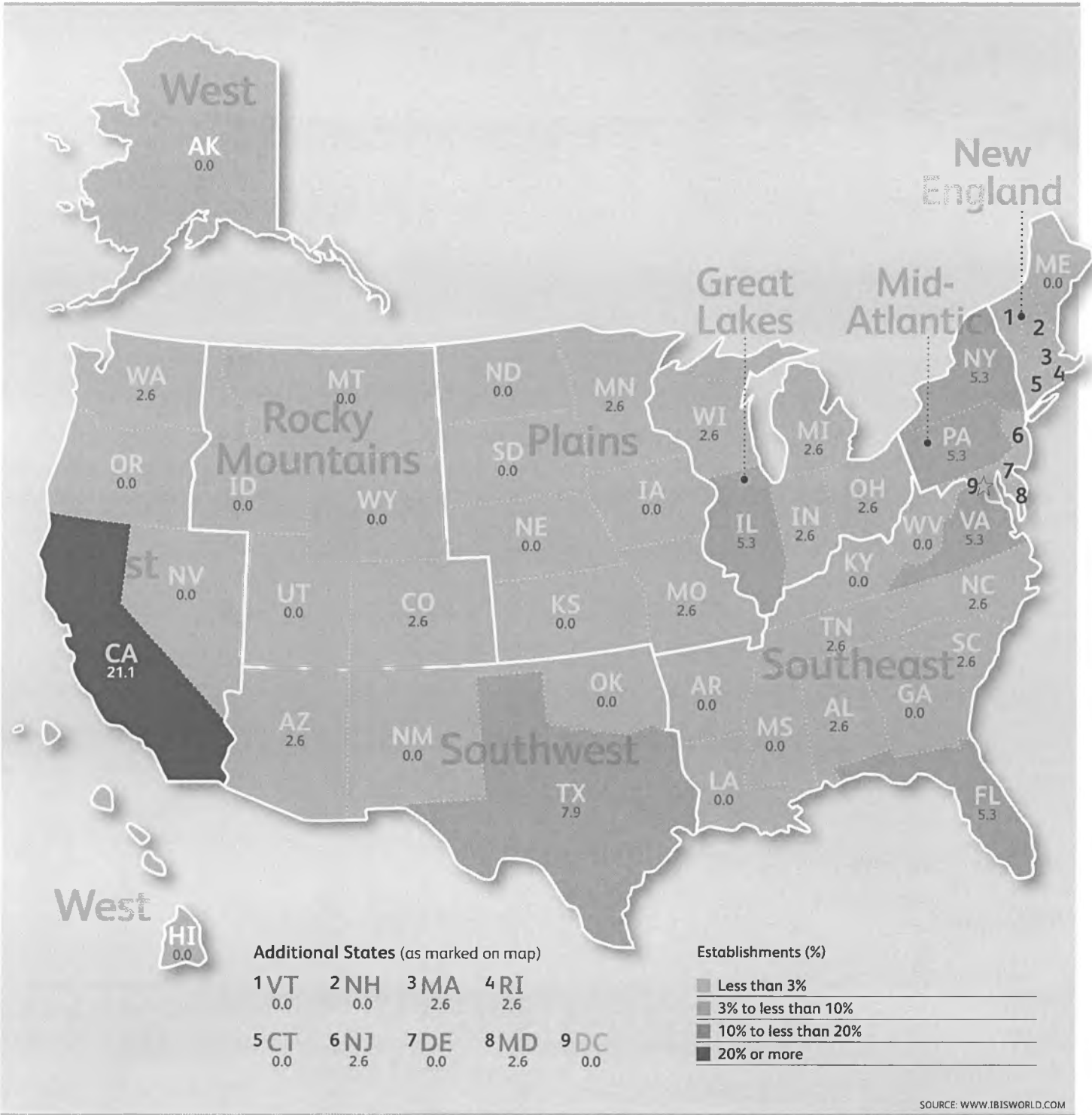
International Trade

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



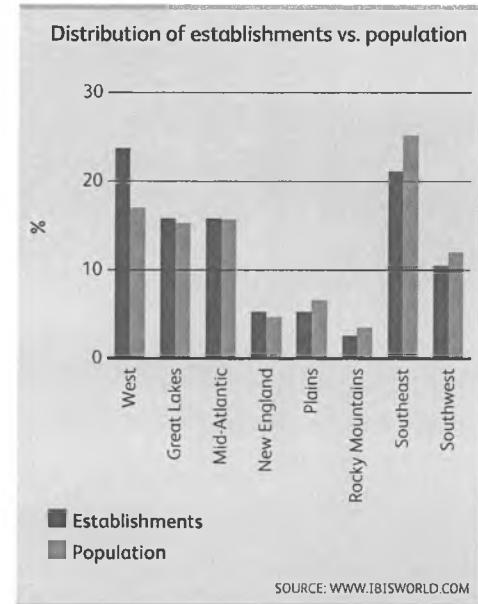
Products & Markets

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.

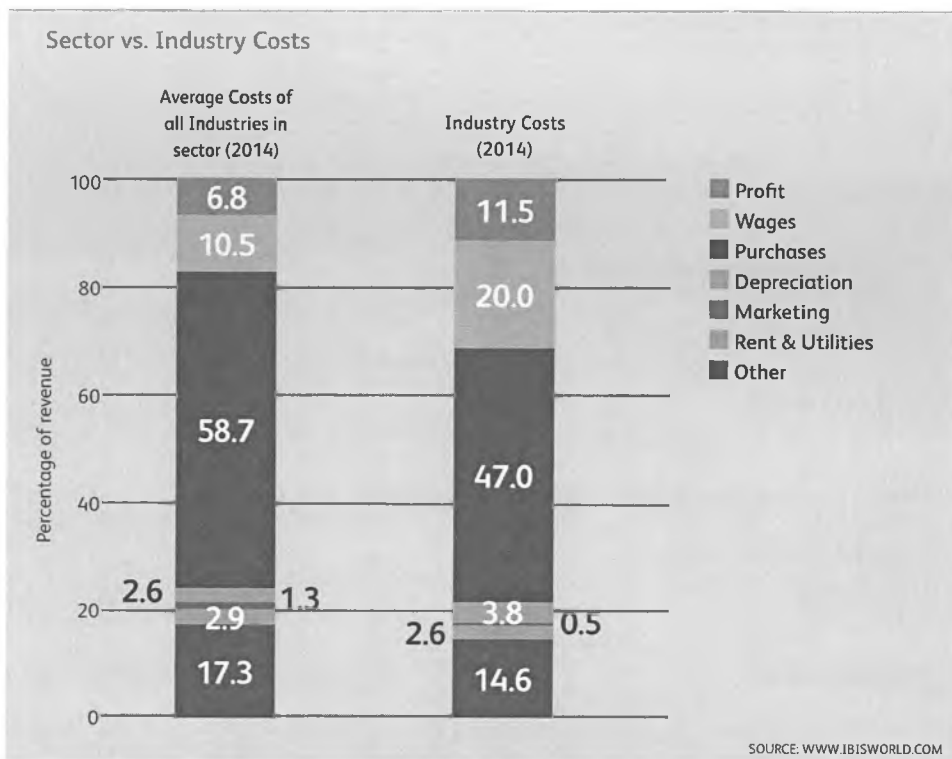
Purchases

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 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,

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

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.

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

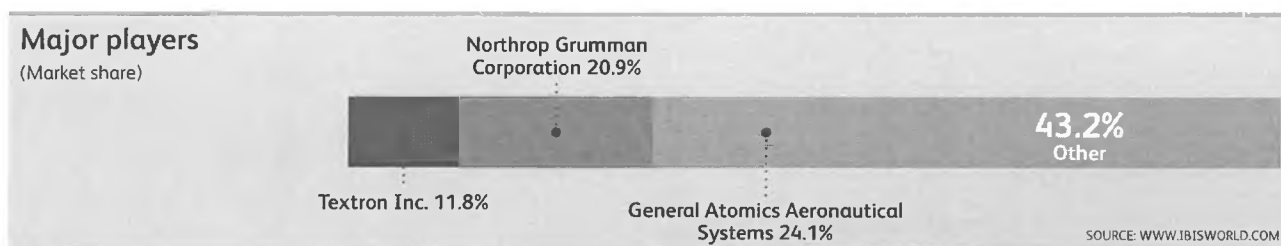
Industry
Globalization
continued

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 Atomic Aeronautical Systems | Northrop Grumman Corporation
Textron Inc. | Other Companies



Player Performance

General Atomic 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 Atomic Aeronautics (industry-specific) – financial performance*

Year	Revenue		Operating Income	
	(\$ million)	(% change)	(\$ 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, Northrop 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. Northrop 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. Northrop 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, Northrop 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		Operating Income	
	(\$ million)	(% change)	(\$ 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.

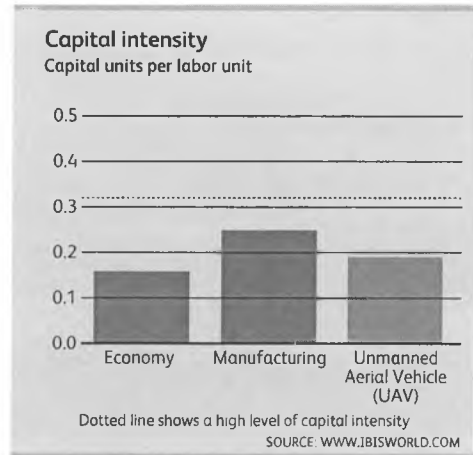
Operating Conditions

Capital Intensity | Technology & Systems | Revenue Volatility
 Regulation & Policy | Industry Assistance

Capital Intensity

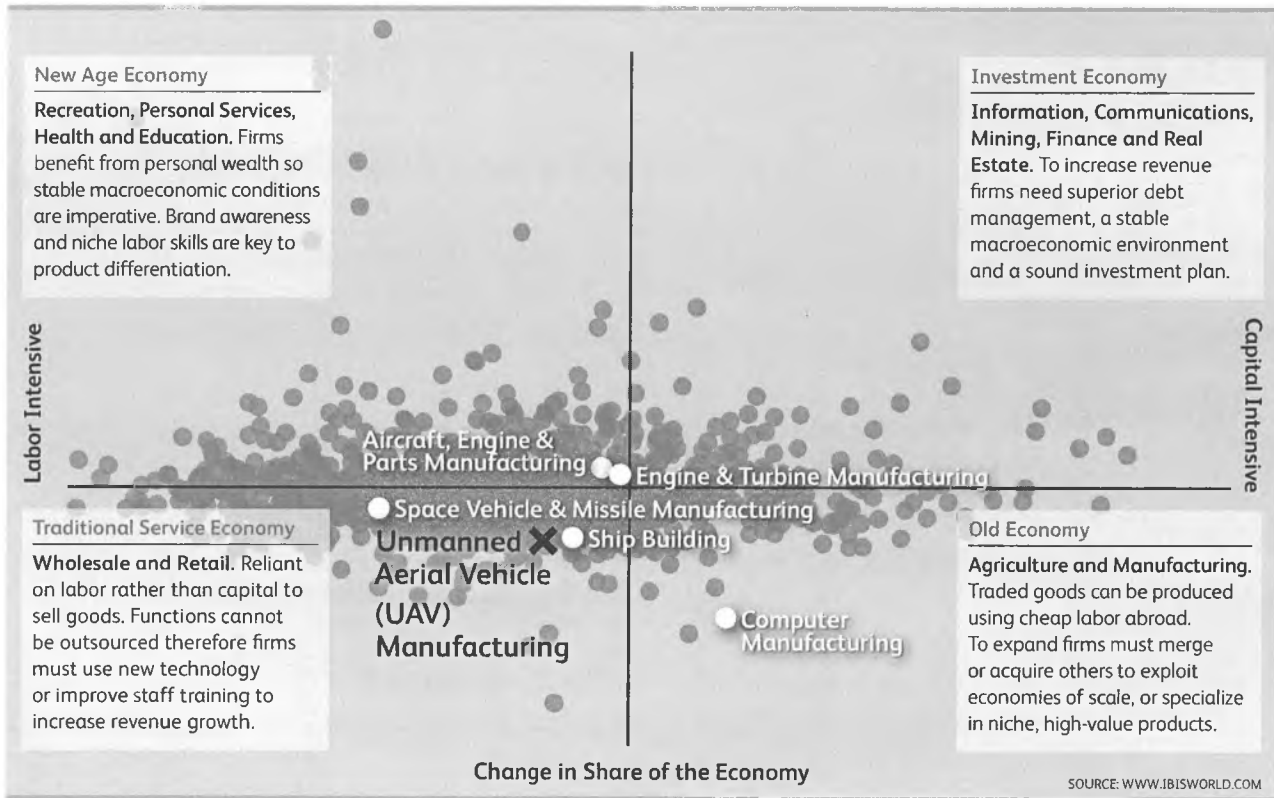
Level
 The level of capital intensity is **Medium**

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 be 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 developed that can monitor weather, act as communication relays (also used for the military), deliver cargo and carry out 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 Lockheed 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

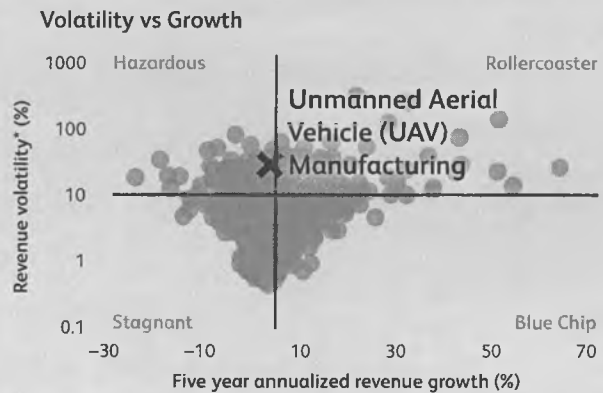
IBISWorld analysis reveals the Unmanned Aerial Vehicle (UAV) Manufacturing industry exhibits a very high level of revenue volatility. Revenue is most closely linked to changes in federal funding for defense and congressional budget allocations to the Department of Homeland Security. As a result, the 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.



* Axis is in logarithmic scale

SOURCE: WWW.IBISWORLD.COM

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 is an informal grouping of 34 countries designed to prevent the proliferation of systems capable of delivering weapons of mass destruction. The regimes require State and Commerce 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)	Establishments	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 (%)	Establishments (%)	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 $\pm 20\%$; high volatility is $\pm 10\%$ to $\pm 20\%$; moderate volatility is $\pm 3\%$ to $\pm 10\%$; and low volatility is less than $\pm 3\%$.

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 DONT SAY DRONES 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](#)



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Posted in [News](#) on [October 13, 2014](#) by [The Editor](#). [2 Comments](#)

– HAWK ATTACKS QUADCOPTER IN CAMBRIDGE PARK

BELORUSSIA OFFERS UAS PRODUCTION WITH TURKMENISTAN –

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 of 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.





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."

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>

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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.

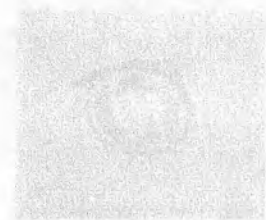
The use of unmanned technology by Russia is prevalent. This is demonstrated by the reported Russian use of UAVs over Ukraine, as observed by the Organization for Security and Co-operation in Europe's special monitoring mission (SMM) to the country.

According to the OSCE, the SMM visited Strelkov on the Arbat 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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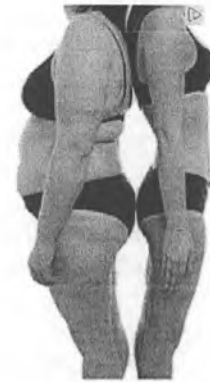
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FAA says Air Traffic Control isn't Ready for UAS

The Federal Aviation Administration is facing significant problems with integrating UAS into 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

— NIXIE, THE QUADCOPTER THAT FITS ON YOUR WRIST

MICRO SYSTEMS GETS \$5M US NAVY CONTROL SYSTEM ORDER —

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.

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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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Posted in Regulatory Matters on December 3, 2014 by The Editor. [Leave a comment](#)

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Advisory Circular

Subject: Guidance Material for Operating Unmanned Air Vehicle Systems under an Exemption

Issuing Office:	Civil Aviation, Standards	Document No.:	AC 600-004
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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/reqserv/affairs/exemptions/docs/en/2879.htm> and <http://www.tc.gc.ca/civilaviation/reqserv/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 5 nautical mile 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 contaminants 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 it 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 **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 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.

Advisory Circular – Guidance Material for Operating Unmanned Air Vehicle Systems Under an 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.
- 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

- 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:

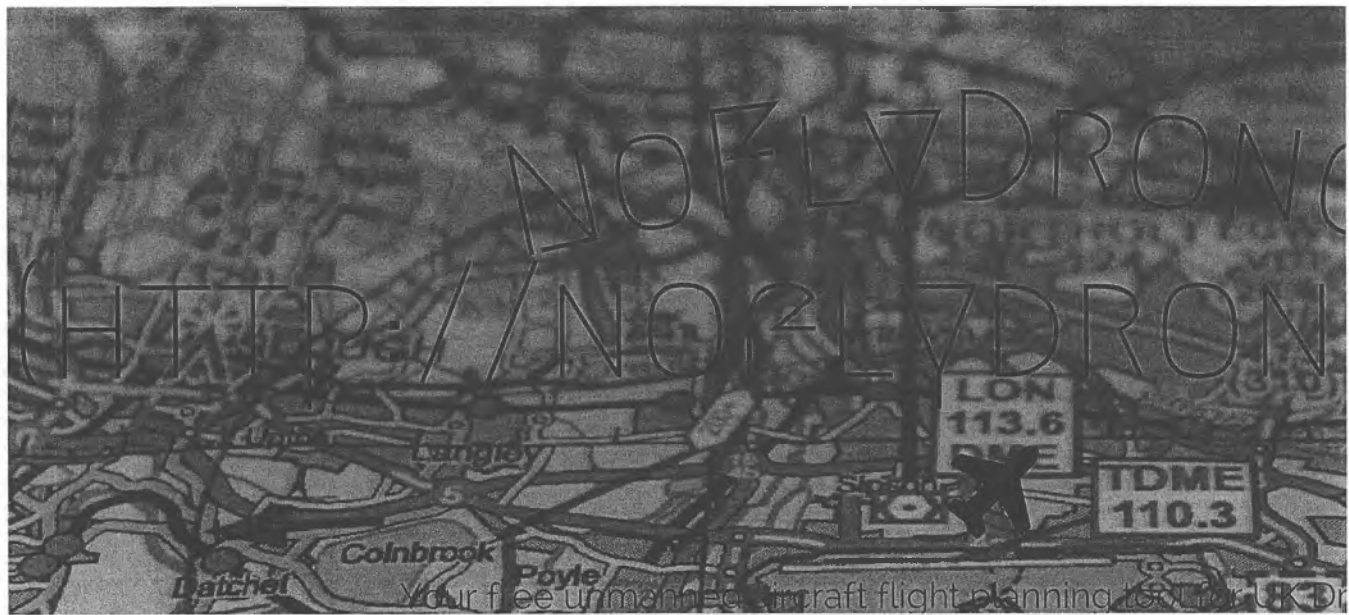
[...]

(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*.



Map of No Fly Zones

Tweet 29

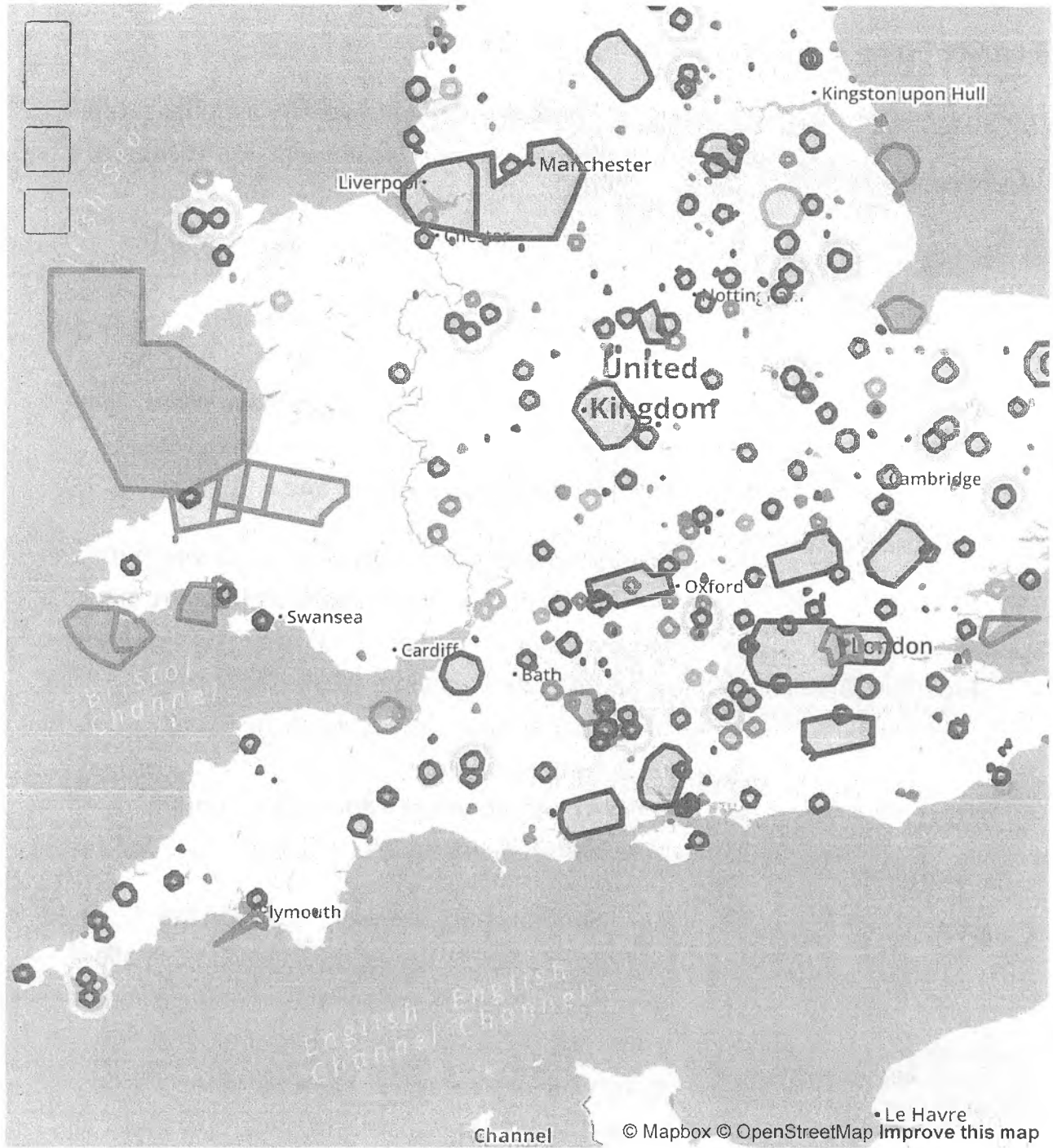
g+1 2

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.



See something missing? For all enquiries and suggestions please contact info@noflydrones.co.uk

Airspace Type

Description

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.

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.

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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



Scenario #1

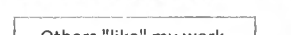
Invest in GoPro camera
Film the kids and dog



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



real estate agent uses images
to sell property; boundary
line images used in property



I am still a

Commercial enterprise
needs FAA approval with
pilot and aircraft

NEW YORK

nymag.com

Wode
Tullo

Introducing



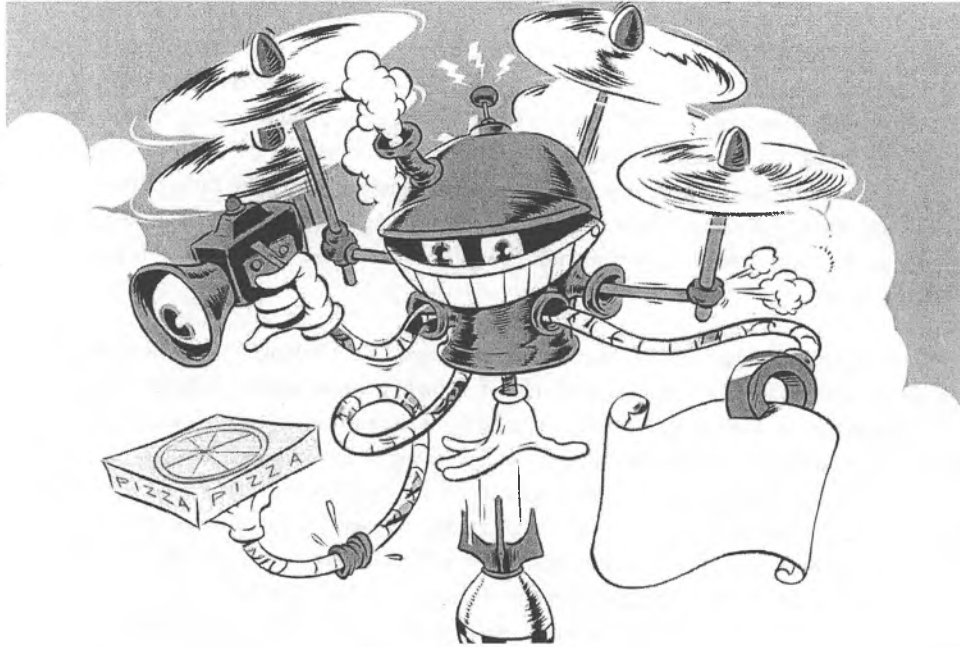
birdcage

SHOP NOW

Daily Intelligencer | the future | October 5, 2014 9:05 p.m.

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.

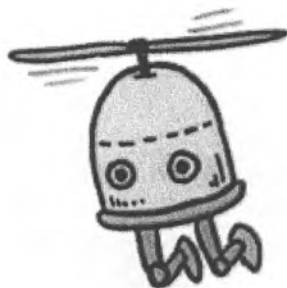
Late one afternoon in December, a drone armed with Hellfire missiles was flying low over the Yemeni desert, an audible buzzing presence, tracking a convoy of cars and trucks that were caterpillaring along a route between villages. Within the convoy were the members of two large families, escorting a 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.



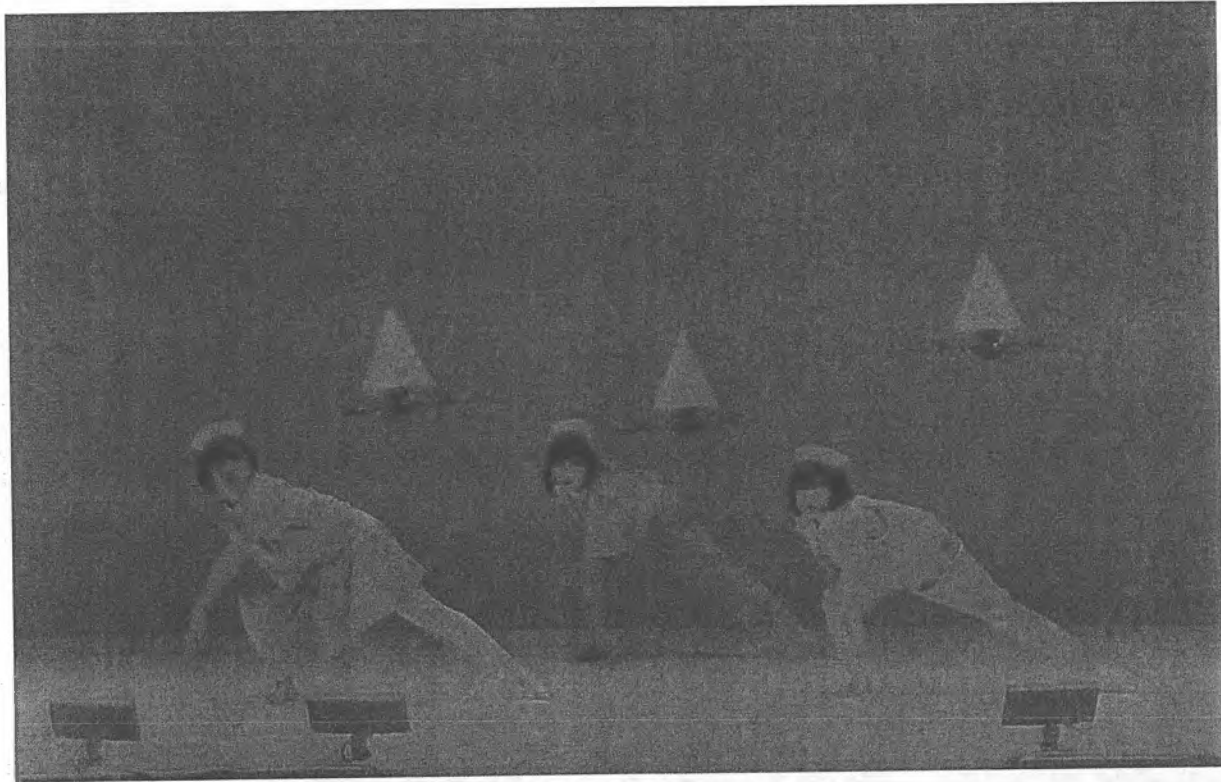
Where the Drone Flies



Through a Volcano That erupted in Iceland last month. Photo: Eric Cheng



Over Bernal Hill Where Amit Gupta shot his famous drone selfie.



Onstage With 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?"



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

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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 movie Following 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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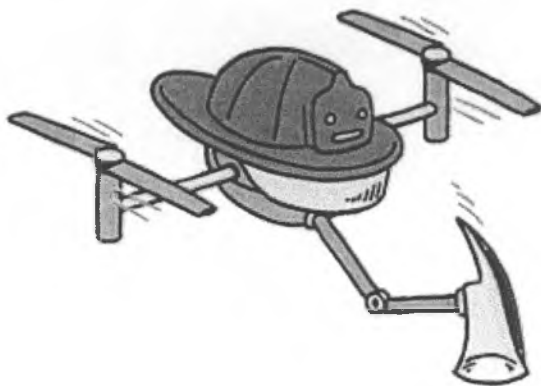
There is something uncanny about the drone perspective that creeps up on you, the more videos like this you watch. The drone's point of view emphasizes the mass scale over the individual. One of the early drone videos that got around, enough to collect nearly 2 million views, is a vision of last year's 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 desert Documenting 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.



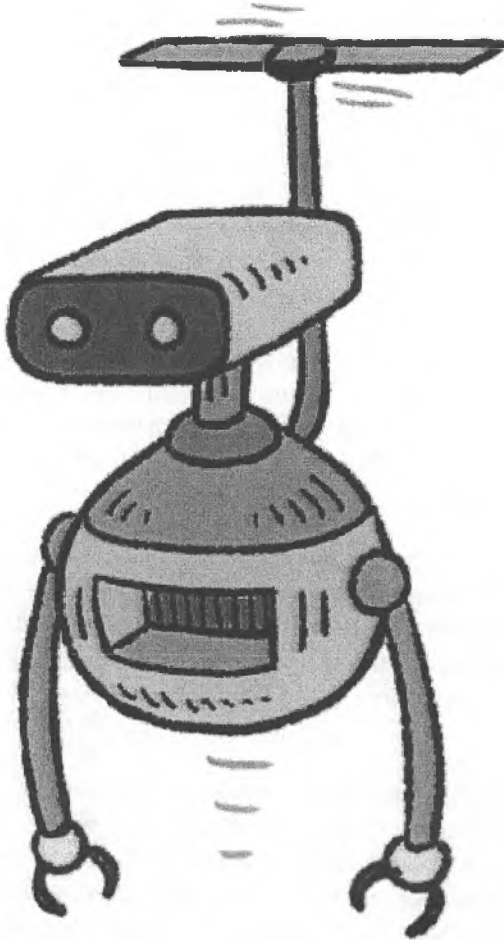
There are villages in the most remote tribal areas of Pakistan in which these context machines are such a constant, noisy presence that drones are sometimes called *bangana*, a Pashto word for wasp. While they linger, no one on the ground knows whether their mission is surveillance or assassination. 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.”

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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.

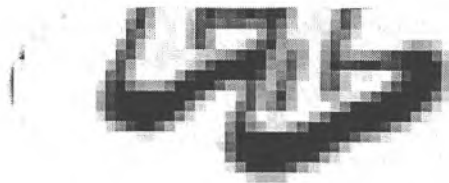
The great Silicon Valley TacoCopter Hoax kicked off with an announcement of a new product just futuristic enough, and just fratty enough, to drive tech websites into a state. "It's an unmanned drone shooting a taco from space down at you and your colleagues during lunchtime!" the Huffington Post's Jason 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."



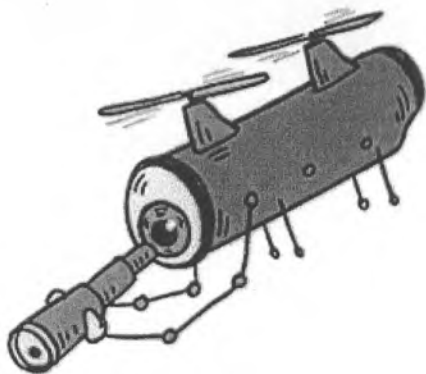
"Drone operators aren't really like pilots, and they certainly aren't like artillerymen. The better analogy is to snipers." The interesting thing about projects like Matternet is that they suggest how a single human operator might control an entire system of drones. Vijay Kumar, a roboticist at the University 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
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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

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

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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

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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

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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

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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 rewrite 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

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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

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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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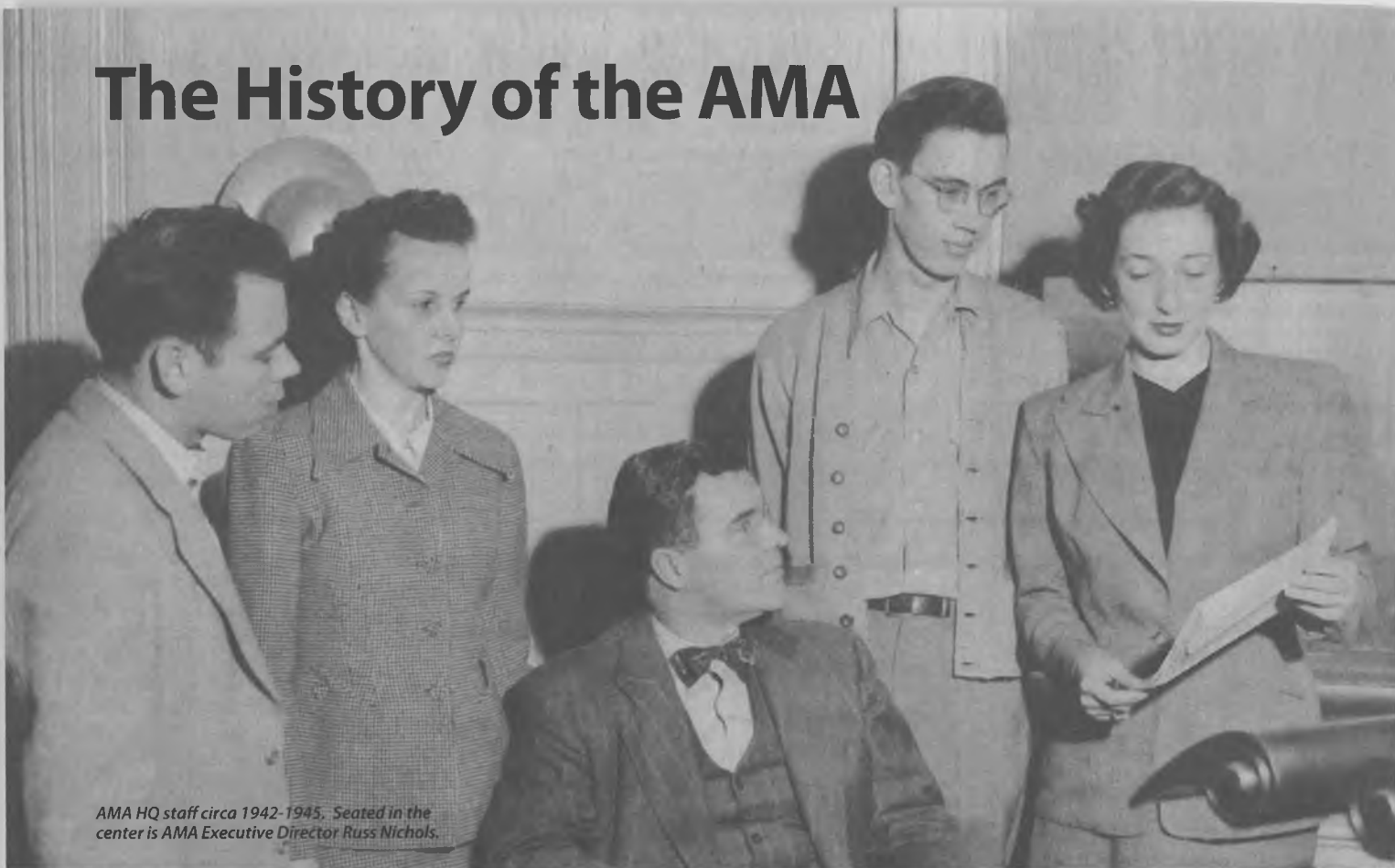
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The History of the AMA



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-powered 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 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.

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, February 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*

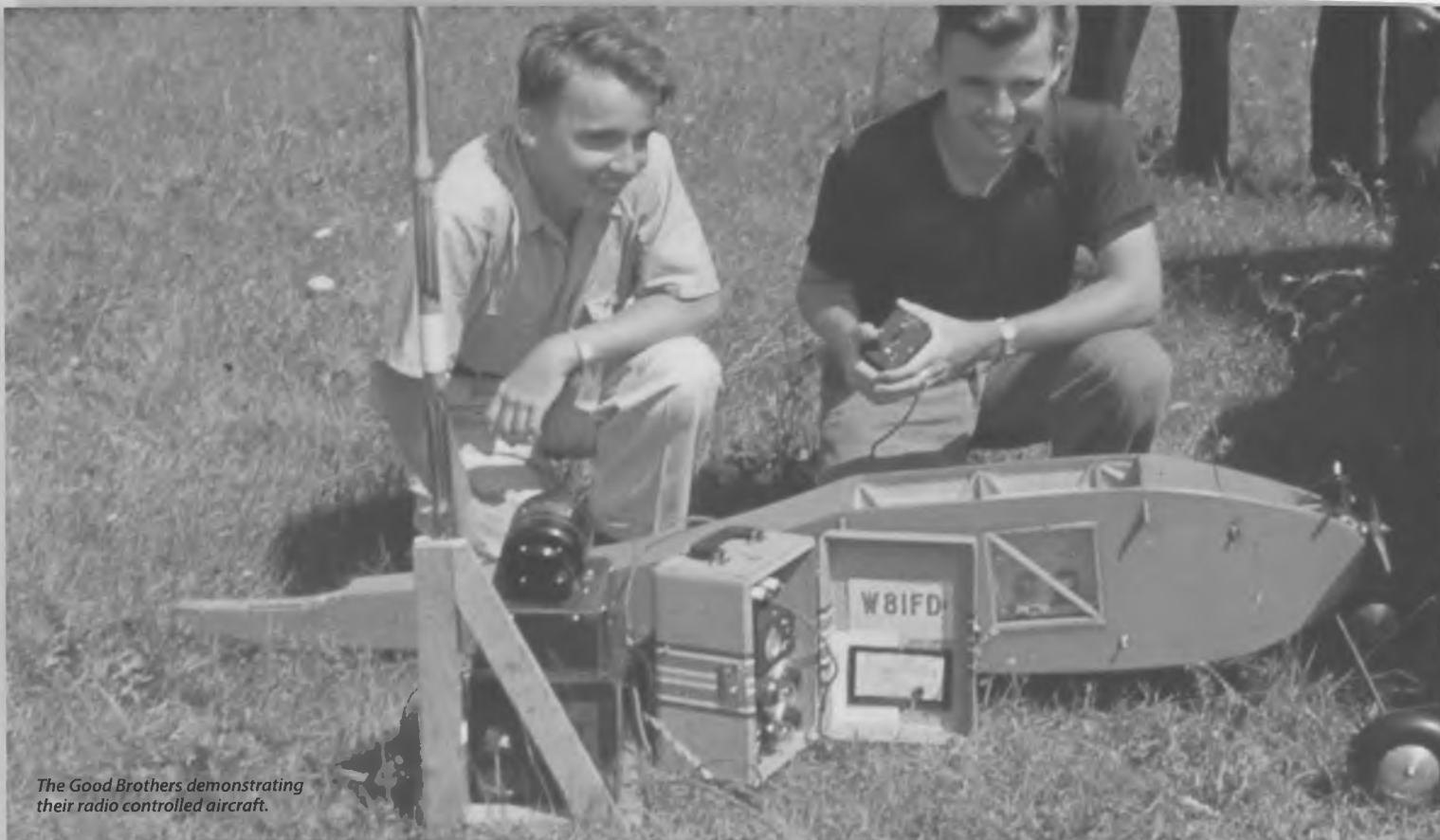
—Maria VanVreede
Museum Registrar



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-cylinder 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



Washington D.C.
1942-1965

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



The National Free Flight Society (NFFS) is committed to the preservation and promotion of FF model aviation in all of its 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.

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.



1960

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.



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.

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.

1973

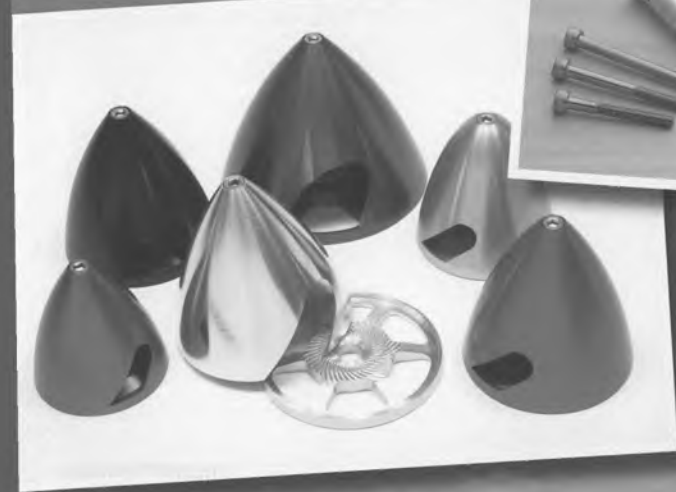
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1977



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



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



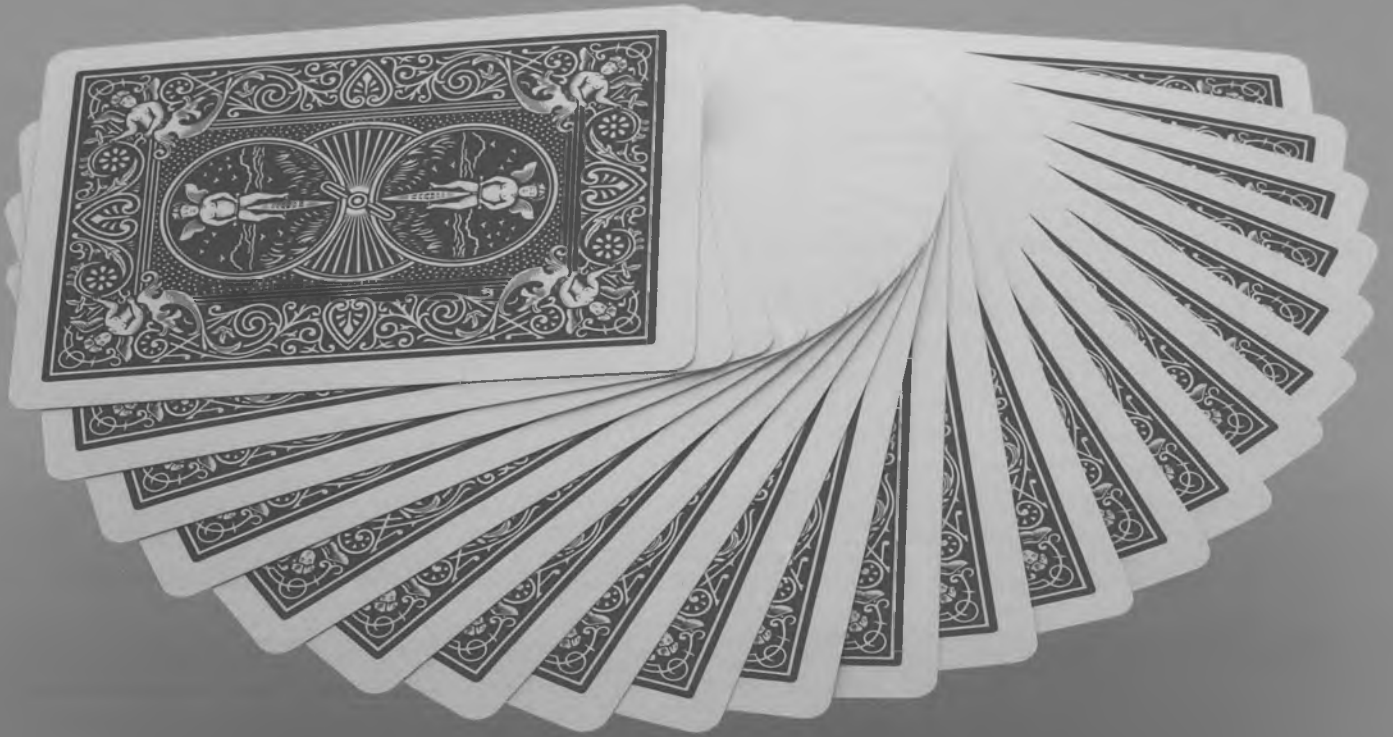
The North American Speed Society (NASS) is the special interest group of Control Line Speed and is associated with the Academy of Model Aeronautics.

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 comingling 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.

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.

1989





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 Association (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-flies.

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.



1991

The National Control Line Racing Association (NCLRA) is an association for persons interested in the construction and operation of Control Line Racing aircraft.



1992



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.

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.



1997

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.



1998

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.)

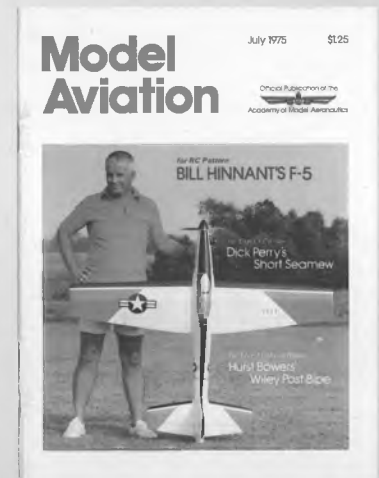
With only two months to prepare, advertisers were located and contributing editors and columnists were approached. As result of this hard work, the first issue of the new *Model Aviation* magazine was published in July of 1975.

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-March 1993: Ross McMullen (Managing Editor)

April 1993-May 1993: Nancy Green (Managing Editor)

June 1993-October 2000: Jim Haught

January 2001-December 2007: Bob Hunt

January 2008-April 2011: Michael Ramsey

May 2011-current: Jay Smith

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A Life Lived Well, A Gift Much Appreciated



Gil in his workshop.

Gil testing one of his workshop CL creations.



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

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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.

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*



AMA is engaging classrooms across the country.

—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 communication 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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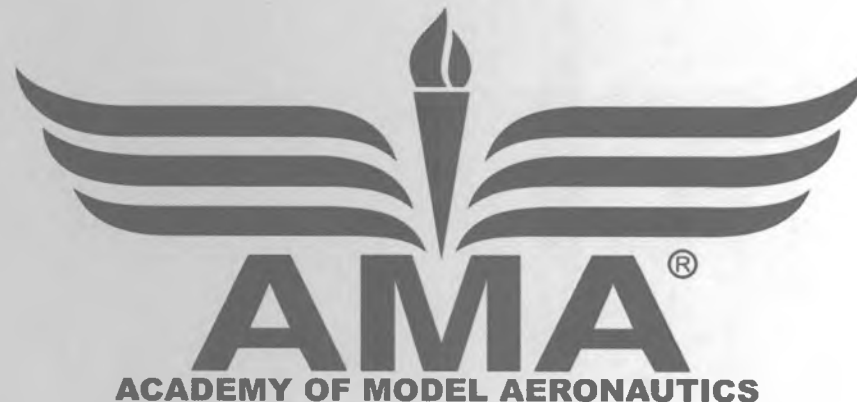
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Academy of Model Aeronautics



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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

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Members are required and agree to comply with AMA's safety guidelines as a condition of membership.

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- Marketing Outreach
- STEM Ed

The screenshot displays the AMA (Academy of Model Aeronautics) website. At the top, there is a navigation bar with the AMA logo and links for Home, Contact AMA, AMA Documents, and About AMA. Below this is a secondary menu with links for join/renew, members & clubs, publications, education, museum, competition & events, shop, and Support AMA. A search bar is also present.

The main content area features a large video player titled "sUAS Broadcast" with a play button and a timestamp of "Tuesday, November 25, 2014 1pm EST". Below the video player are several promotional banners for "PROTECT YOUR UAV!", "HITEC ENERGY SPORT ESC SERIES", and "LEARN MORE MODEL AVIATION DIGITAL".

On the right side, there is a "Blog Posts" section with several articles:

- Safety first with hobby group Topsail Electric Flying**
By Bill Walsh. Breaknews@StarNewsOnline.com. [caption id="attachment_1264" align="right" width="445"] Joe Niagouk has ...
- CIAM Flyer - Control Line Electric Speed Flying**
Control Line Electric Speed Flying - a category for all those keen to try something new in most modeling disciplines where ...
- MEET THE TEAM: Outdoor Free Flight team chosen for the 2015 World Championship in Mongolia**
The Team Selection event was held October 24-27, 2014 at the El Dorado Dry Lake site in Boulder City, Nevada. The event was ...
- World Championship results F2 Control Line - Wloclawek, Poland**
Control Line - Wloclawek, Poland - August 9 - 17, 2014 FCA - Speed Team - 2nd Place Individual - 1st Place - Car Dodge ...
- The Drone Guys: Going Above And Beyond**
SCRANTON — Drones are small, unmanned aircraft. Think of them as mini-helicopters that can take pictures from hundreds of feet ...
- Academy of Model Aeronautics recognizes Powell, Jackson County solid waste director**
Jackson County solid waste director Ronda Powell was awarded a certificate of appreciation from the Academy of Model ...
- Henry County Indiana receives FAA approval for UAV**
The Henry County Office of Emergency Management-Unmanned Aerial Corps has received FAA approval for the use of a Smart Unmanned ...
- New Addition: MP Jet .061 Diesel**
The MP Jet .061 diesel engine was recently donated in Memory of Raymond E. Theobald. [caption id="attachment_2055" ...]
- ARUP S2**
Article by Timothy Dawson. Bonus photos to supplement the full article. Full build article in the December 2014 issue. When ...
- Air Ace Models Born Loser P.6E**

At the bottom of the page, there are buttons for "media releases >", "news items >", and "blog items >".

AMA Foundation

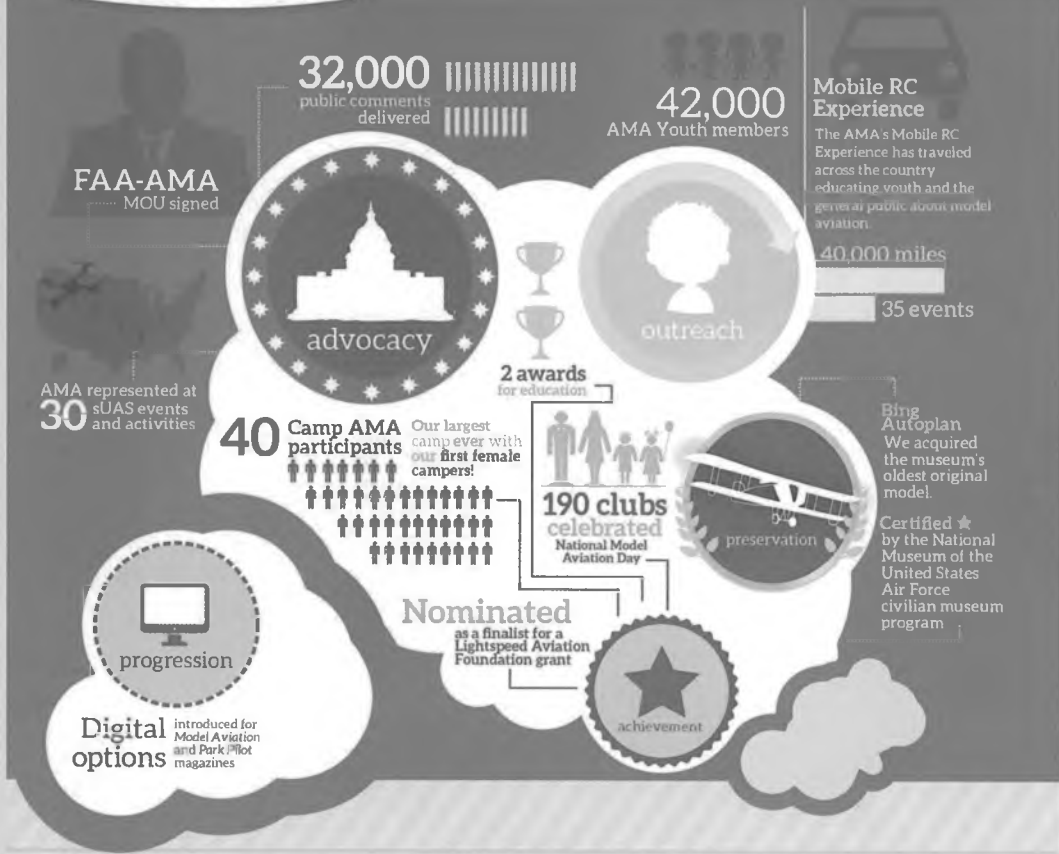
What the AMA Foundation is About

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



Your support has made an impact.



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

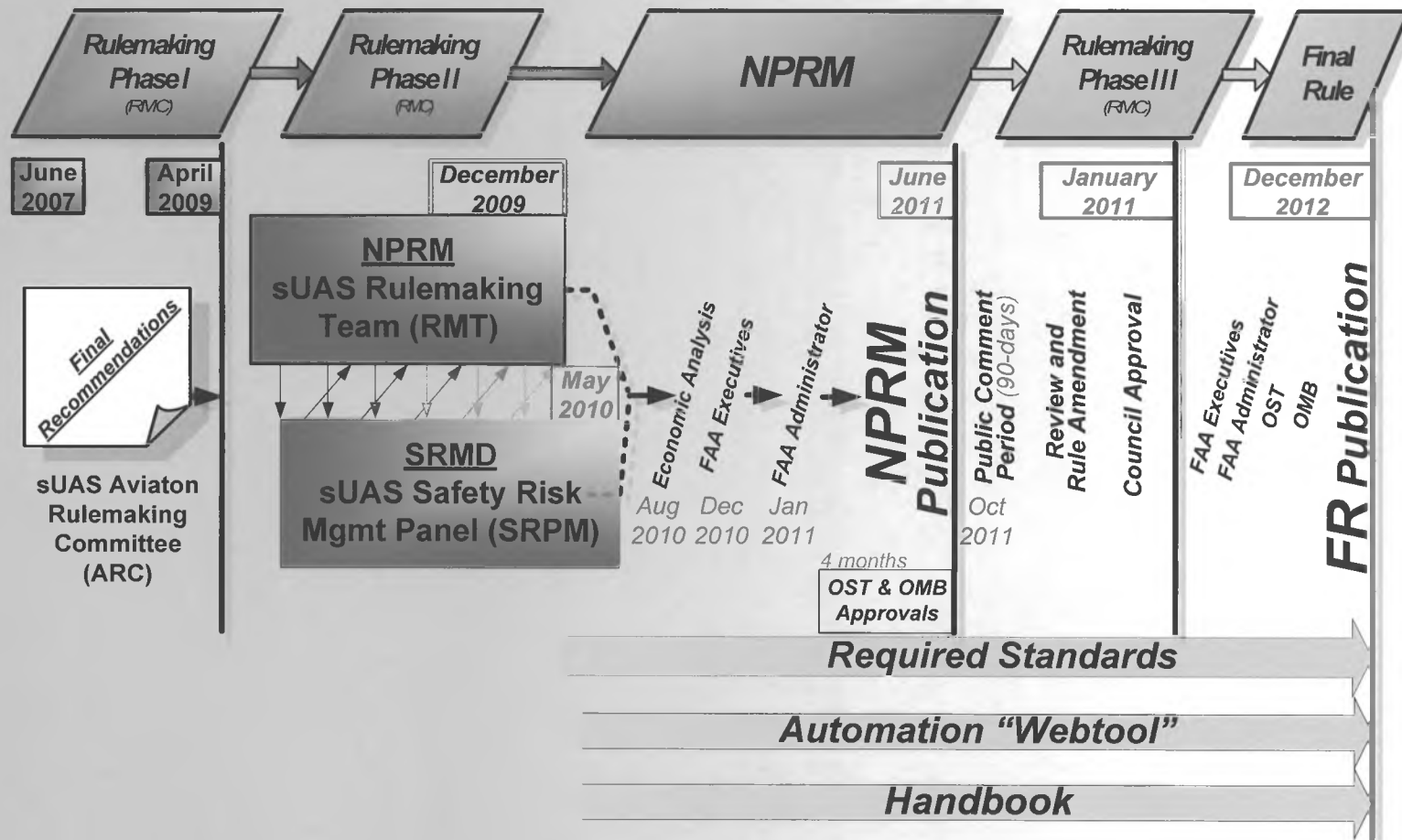
- * FAA Modernization and Reform Act 2012
- * Limits FAA Regulatory Oversight...
 - *Hobby and Recreational Purposes*
 - *Operating Within a Community-Based Safety Prgm*
 - *Allows for UAS up to 55 lbs, and 'Certified' LMA*
 - *Must Not Interfere with and Yields Right of Way to Manned A/C*
 - *Criteria 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

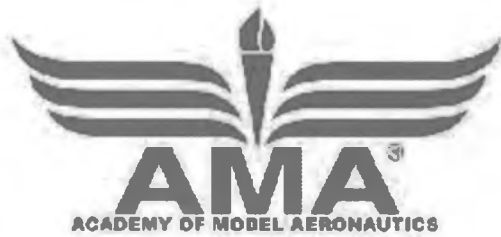
NPRM – Dec 2014 / Jan 2015



Hot Issues

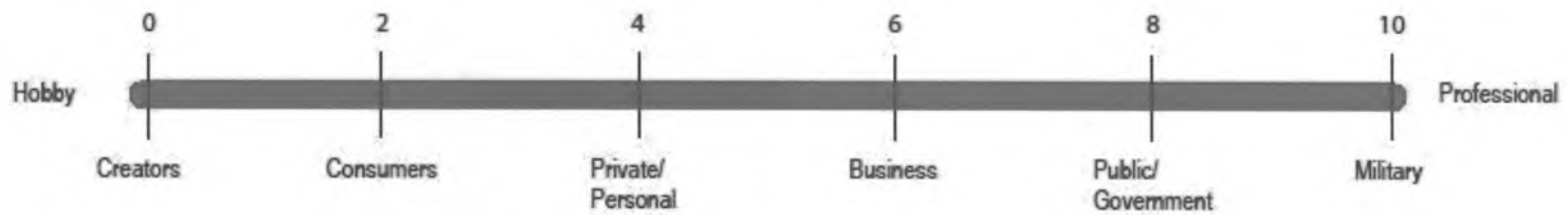
- sUAS Rulemaking
- Post 9/11 Security
- UAS Integration
Safety - Seamless
- Privacy...
Surveillance...
(4th Amendment)





AMA 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?



Where FPV and SAF Fit Into Current AMA Programming



AMA Guidelines for Radio Controlled
Model Aircraft Operations Utilizing
First Person View, Failsafe, Stabilization
and Autopilot Systems

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 ($\leq 400'$). 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



AMA Guidelines for Radio Controlled Model Aircraft Operations Utilizing First Person View, Failsafe, Stabilization and Autopilot Systems

“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

ACADEMY OF MODEL AERONAUTICS

2014 MEMBER

expires: **12/31/2014**

YOUR NAME HERE

000000



AMA
ACADEMY OF MODEL AERONAUTICS



**sUAS MEMBER
MULTIROTOR**

ADULT

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?



National Conference of State Legislatures | The Forum for America's Ideas
Robocops: From Phones to Drones | Thursday, Aug. 21, 2014

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 Policies - 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.

States With Police Cell Phone Surveillance Laws



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 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 of sight of the operator.

July 2014

For more information about safety training and guidelines, visit www.modelaircraft.org

For more information, visit



Federal Aviation

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).*

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.



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.



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.



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.



For more information, go to www.faa.gov/UAS.

For more information visit
WWW.KNOWBEFOREYOUFLY.ORG

Founding Members



Campaign Partner



Unmanned Flight Safety Guidance

LEGISLATIVE TELECONFERENCE NETWORK

SPONSOR: Rep Hughes

SUBJECT: UAS LTF

DATE: Dec 5, 2014

PLEASE PRINT CLEARLY!!!

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	DMWA		
Rob Mulford	Fairbanks	Alaska Peace Center	YES	Pat Martin
Dot Hagen	Kasilof	Gallery Lodge	NO	Wasilla
MSG DAVE MEEKER	Eagle River	US ARMY	NO	YES
Anthony Pennino	Anchorage	Exxon Mobil	NO	
SCOTT T. EASTEPP	CHUGIAK	SELF	NO	
Tommy W Baker	JBER	USAF	NO	
Christi Bell	Anchorage	UA	YES	
Elwood Bohmer	Anchorage	AK Journal of Commerce	NO	
Katie Reeves	Anchorage	State of Alaska DED	NO	
Robbie McGowan	Anchorage	FAA		
Richard Merculief	Anchorage	SELF		
Eric Bleakney	JBER	ALCOM	NO	
Carol Anderson	Anch	CAA Student	NO	