FISCAL NOTE

STATE OF ALASKA
1991 LEGISLATIVE SESSION

BILL NO. C?HB46(ITT

Revision Date:
Title: Creating AK Aerospace Development Corporation
Sponsor: Moyer
Requestor: ITT

Department Affected: University of Alaska
BRU: ALL
Component:
Component Serial No. ALL

Expenditures/Revenues: (Thousands of Dollars)

OPERATING	FY92	FY93	FY94	FY95	FY96	FY97
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0
CAPITAL						
REVENUE	0.0	•	•	•	•	•
FUNDING: (Thousands of Dollars)						
GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0
POSITIONS:						
FULL-TIME						
PART-TIME						
TEMPORARY						

Estimate of current year impact:

ANALYSIS: (Attach a separate page if necessary.)

SEE ATTACHED

Prepared by: Brian Rogers
Division: Vice President for Finance
Phone: 474-7448
Date: 3/7/91

Approved by: Brian Rogers, Vice President for Finance
Agency: University of Alaska
Date: 3/7/91

Distribution (by preparer): Legislative Finance, Legislative Sponsor, Requestor, OMB, & Impacted Agency(ies).

Rev 10/90

Fiscal Note - Bill #CSHB 46 (ITT) Analysis

Creation of the Alaska Aerospace Development Corporation will not entail new costs by the University of Alaska. Any costs of university participation in meetings with the corporation will be borne from existing funds.

Depending on the success of the Alaska Aerospace Development Corporation in attracting new aerospace related businesses to use the Poker Flat Research Range, the university may receive revenues to support operation of the research range in fiscal '93 and thereafter. Until the corporation is operational, however, the university has no way of knowing what those revenues may be.

FISCAL NOTE

STATE OF ALASKA
1991 LEGISLATIVE SESSION

BILL NO. CSHB 46

Revision Date: _____ Department Affected: Commerce & Economic Dev.

Title: Establishing the Alaska Aerospace Development Corporation BRU: Alaska Aerospace Development Corporation

Component: _____

Sponsor: Rep. Moyer

Requestor: Rep. Moyer **COMPONENT SERIAL NO.** | | | | |

Expenditures/Revenues: (Thousands of Dollars)

OPERATING	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97
PERSONAL SERVICES	126.4					
TRAVEL	37.6					
CONTRACTUAL	118.0					
SUPPLIES	1.5					
EQUIPMENT	19.0					
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	302.5	*	*	*	*	*
CAPITAL						
REVENUE						

FUNDING: (Thousands of Dollars)

GENERAL FUND	302.5					
FEDERAL FUNDS						
OTHER Corp. Rec.		*	*	*	*	*
TOTAL	302.5	*	*	*	*	*

POSITIONS:

FULL-TIME	2					
PART-TIME						
TEMPORARY						

Estimate of current year impact: _____

ANALYSIS: (Attach a separate page if necessary.) Assumes the AADC will become effective July 1, 1991. Initial year would be funded from the general fund.

*Subsequent years will be funded from corporate receipts of the AADC revolving fund. Since this is a new organization, it is not possible to predict annual costs beyond FY 92.

Prepared By: Guy Bell, Director Phone: 465-2587

Division: Administrative Services Date: _____

Approved by Commissioner: Glenn A. Olds

Agency: Department of Commerce & Economic Development Date: _____

Distribution (by preparer): Legislative Finance, Legislative Sponsor, Requestor, OMB, & Impacted Agency(ies).

FISCAL NOTE - CSHB 46

ALASKA AEROSPACE DEVELOPMENT CORPORATION

Personal Services:		$126.4
Executive Director (26A)	$ 90.1	
Secretary I (10B)	$ 36.3	
Travel:		$ 37.6
Executive Director	$ 20.0	
Board (4 meetings/year)	$ 12.0	
Honorarium/Stipend	$ 5.6	
Contractual:		$118.0
Office Space (500 sq. ft. @ $2.00/ft)	$ 12.0	
Professional Services (bond counsel engineering, actuarial, etc.)	$100.0	
Utilities (phones, other)	$ 6.0	
Supplies:		$ 1.5
Office Supplies	$ 1.5	
Equipment:		$ 19.0
Telecopier	$ 3.0	
Computer/Word Processing	$ 10.0	
Furniture	$ 6.0	
FY 92 TOTAL		$302.5

9111D

FISCAL NOTE

STATE OF ALASKA
1991 LEGISLATIVE SESSION

BILL NO. HB 46

Revision Date: _____ Department Affected: Administration

Title: An act creating the Alaska Spaceport Authority BRU: Risk Management

Component: _____

Sponsor: Mover, Koponen

Requestor: Labor & Comm. & Ec. Dev. COMPONENT SERIAL NO. [ ][ ][ ][ ]

Expenditures/Revenues: (Thousands of Dollars)

OPERATING	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97
PERSONAL SERVICES	0	0	0	0	0	0
TRAVEL	0	0	0	0	0	0
CONTRACTUAL	0	0	0	0	0	0
SUPPLIES	0	0	0	0	0	0
EQUIPMENT	0	0	0	0	0	0
LAND & STRUCTURES	0	0	0	0	0	0
GRANTS, CLAIMS	0	0	0	0	0	0
MISCELLANEOUS	0	0	0	0	0	0
TOTAL OPERATING	0	0	0	0	0	0
CAPITAL	0	0	0	0	0	0
REVENUE	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0	0	0	0	0	0
FEDERAL FUNDS	0	0	0	0	0	0
OTHER	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0

POSITIONS:

FULL-TIME	0	0	0	0	0	0
PART-TIME	0	0	0	0	0	0
TEMPORARY	0	0	0	0	0	0

Estimate of current year impact: Nil.

ANALYSIS: (Attach a separate page if necessary.)
See following page

Prepared By: Don Hitchcock Phone: 465-2180

Division: Risk Management Date: 2-27-91

Approved by Commissioner: Millett Keller

Agency: Department of Administration Date: 4/1/91

Distribution (by preparer): Legislative Finance, Legislative Sponsor, Requestor, OMB, & Impacted Agency(ies).

Rev 10/90

HOUSE SPECIAL COMMITTEE ON INTERNATIONAL TRADE AND TOURISM

ALASKA STATE LEGISLATURE

P.O. BOX V, JUNEAU 99811
(907) 465-2973

MEMORANDUM

To: Members, House Special Committee on International Trade and Tourism

Feb. 27, 1991

From: Representative Tom Moyer
Chairman

Re: Proposed CSHB46, establishing the Alaska Aerospace Development Corp.

The purpose of this memo is to provide you a general overview of this legislation, of which I am the sponsor.

Alaska has enormous but unrealized potential in a resource too often overlooked - the space above us. This bill is an attempt to take advantage of that resource and to bring to Alaska a share of the rapidly expanding commercial space industry.

Alaska is home to Poker Flat, the nation's only civilian launch facility. Because of its high latitude, Poker Flat is an optimum site to launch rockets into polar orbit. Already, Alaska has been contacted by private companies interested in launching rockets carrying communications equipment. By expanding Poker Flat's current sub-orbital capacity and perhaps developing other launch sites, Alaska could find itself at the forefront of government and private industry research into global warming, land use management and weather patterns and other commercial applications.

Proposed CSHB46 would create a public corporation, the Alaska Aerospace Development Corp., to be managed by a seven-member board of directors appointed by the governor. Affiliated with the University of Alaska, the corporation would promote space and aerospace-related economic development. The vital educational and research functions of the university would be preserved and enhanced.

The corporation would have the authority to issue bonds to improve launch facilities and receive grants or other funds. The Poker Flat range was established in 1969 and about 230 rockets and another 900 smaller weather rockets have been launched from the site.

DIVISION OF LEGAL SERVICES

LEGISLATIVE AFFAIRS AGENCY
STATE OF ALASKA

P.O. Box Y, Juneau, Alaska 99811
(907) 465-3867 or 465-2450
FAX (907) 465-2029

Deliveries to: 240 Main Street
Court Plaza, Room 500
Mail Stop 3101

MEMORANDUM March 6, 1991

SUBJECT: Alaska Aerospace Development Corp. (W.O. 7LS0236\J) (CSHB 46)

TO: Representative Tom Moyer
Attn: David Ramseur

FROM: Jerry Luckhaupt
Legislative Counsel

You have asked several questions concerning the above-reference bill. In particular, you have asked what is the origin of the provisions of the bill relating to eminent domain, bonding (including the issuance of notes and freedom from execution), and sovereign immunity. You have also asked if the corporation could make a profit or, because it is a public corporation, is it limited to non-profit making activities.

EMINENT DOMAIN

The provision of the bill relating to eminent domain, AS 14.40.866(6), was taken from AS 18.55.100(a)(6). That section grants the Alaska State Housing Authority the power to use the state's eminent domain power, when it has purchased or has agreements to purchase at least 50 percent of the properties of a particular site. The 50 percent requirement is an additional impediment to the use of the eminent domain power not normally imposed on the state or its agencies. The Alaska Railroad is an example of another public corporation that has eminent domain powers but without the 50 percent requirement stated above. It does, though, have a requirement of prior approval by the governor. AS 42.40.385.

BONDING

The bonding, financing, and property provisions of the bill, AS 14.40.891-14.40.941, have also been taken from ASHA. AS 18.55.140-18.55.260 provide for the issuance of bonds and notes, that those bonds and notes are tax-exempt, and that those bonds and notes are legal investments. Other provision provide that the roperty of the corporation is not subject to execution (likewise, state property is not subject to execution), AS 18.55.230, and that an obligee of the authority may bring an action for

an injunction to require the corporation to perform its contractual duties. AS 18.55.210.

SOVEREIGN IMMUNITY

The sovereign immunity provision, AS 14.40.846(a), for the most part merely restates state law provided in AS 09.50. The corporation, as a public corporation of the state, would appear to be clothed with the sovereign immunity of the state except as waived by AS 09.50, hence the language of AS 14.40.846(a). AS 14.40.846(b) provides that the corporation may retain actuarial experts to explore potential danger posed by the corporation's activities, presumably so they can be assessed and restricted if found to be too dangerous. AS 14.40.846(c) provides that the corporation shall secure insurance for its activities, to the extent the insurance is available. This provision could be modified to provide that insurance must be obtained to the extent available "and found to be economically feasible." AS 14.40.846(d) waives the corporation's sovereign immunity in those situations where the corporation has been able to and has obtained insurance. This provision is different from existing state law and could be removed to provide uniformity with AS 09.50. AS 14.40.846(e) provides for the establishment of a safety program.

The Florida Spaceport Act also contains a sovereign immunity provision. Fla. Stat. 331.328

PROFIT

I have not discovered any authority that would preclude the corporation from returning a profit to the state. If there was enough demand for its services and facilities the corporation could charge sufficient fees and rents to sufficiently meet its obligations and to return a surplus to the state. Nothing I am aware of in statute would prevent this from occurring. Nonetheless, the reality of the situation is that a great initial capital outlay may be required and without adequate demand and resulting fees, the corporation may not reach a positive cash flow. By virtue of its public corporation status, though, it is not prevented from returning a surplus to the state.

GPL:pl
91-131.plm

7-LS0236\J
Luckhaupt
3/11/91

CS FOR HOUSE BILL NO. 46 (ITT)

IN THE LEGISLATURE OF THE STATE OF ALASKA

SEVENTEENTH LEGISLATURE - FIRST SESSION

BY THE HOUSE SPECIAL COMMITTEE ON INTERNATIONAL TRADE AND TOURISM

Offered:
Referred:

Sponsor(s): REPRESENTATIVES MOYER, Koponen

A BILL

FOR AN ACT ENTITLED

"An Act creating the Alaska Aerospace Development Corporation; providing for the lease of state land to the corporation; providing an exemption from municipal sales and use taxes for space-related activities."

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

*** Section 1.** SHORT TITLE. This Act may be known as the Alaska Aerospace Development Corporation Act.

*** Sec. 2.** AS 14.40 is amended by adding new sections to read:

ARTICLE 7. ALASKA AEROSPACE DEVELOPMENT CORPORATION.

Sec. 14.40.821. CREATION OF CORPORATION. The Alaska Aerospace Development Corporation is created as a public corporation of the state. The corporation is a body corporate and politic located for administrative purposes within the Department of Commerce and Economic Development and affiliated with the University of Alaska but with a separate and independent legal existence.

Sec. 14.40.826. BOARD OF DIRECTORS. (a) The board of directors of the corporation

consists of nine members appointed by the governor as follows:

(1) one member of the Board of Regents of the University of Alaska;

(2) the president or the designee of the president of the University of Alaska;

(3) the director of the Geophysical Institute of the University of Alaska;

(4) the executive director of the Alaska Science and Technology Foundation;

(5) the commissioner of commerce and economic development or the commissioner's designee;

(6) an expert with experience and understanding of the aerospace or commercial space industry;

(7) one faculty member of the University of Alaska with research interests involving rockets or satellites

(8) two public members.

(b) The members of the corporation described in (a)(6) and (8) of this section may be nonresidents of the state. The term of the members described in (a)(1), (6), and (8) of this section is four years and those terms shall be staggered.

(c) Members of the corporation described in (a)(6) and (8) of this section receive $100 compensation for each day spent on official business of the corporation.

(d) Members of the corporation are entitled to per diem and travel expenses authorized under AS 39.20.180.

Sec. 14.40.831. CHAIR AND VICE-CHAIR. The president of the University of Alaska or the designee of the president shall be the chair of the corporation. The commissioner of commerce and economic development or the designee of the commissioner shall be vice-chair of the corporation. The vice-chair presides over all meetings in the absence of the chair and has other duties the corporation may direct.

Sec. 14.40.836. MEETINGS; STAFF. (a) A majority of the members of the corporation constitutes a quorum for the transaction of business or the exercise of a power or function at a meeting of the corporation. The corporation shall meet at least every three months. The corporation may meet and transact business by electronic media if (1) public notice of the time and locations where the meeting will be held by electronic media has been given in the same manner as if the meeting were held in a single location; (2) participants and members of the public in attendance can hear and have the same right to participate in the meeting as if the

meeting were conducted in person; and (3) copies of pertinent reference materials, statutes, regulations, and audio-visual materials are reasonably available to participants and the public. A meeting by electronic media as provided in this subsection has the same legal effect as a meeting in person.

(b) The corporation may employ persons as staff it considers advisable, including an executive director, and may employ professional advisors, technical experts, agents, and other employees it considers advisable. The executive director and employees of the corporation are in the exempt service under AS 39.25.

(c) The corporation may retain legal counsel.

(d) The corporation shall keep minutes of each meeting and send a certified copy of the minutes to the governor and to the Legislative Budget and Audit Committee.

Sec. 14.40.841. ALASKA AEROSPACE DEVELOPMENT CORPORATION REVOLVING FUND. The Alaska Aerospace Development Corporation revolving fund is established in the corporation. The revolving fund consists of appropriations made to the revolving fund by the legislature, and rents, fees, or other money or assets transferred to the revolving fund by the corporation. Amounts deposited in the revolving fund may be pledged to the payment of bonds of the corporation or expended for the purposes of the corporation under this chapter.

Sec. 14.40.846. SOVEREIGN IMMUNITY; INSURANCE COVERAGE; SAFETY PROGRAM. (a) Notwithstanding any other provision of law, the corporation retains the sovereign immunity of the state and that immunity is waived only as provided in AS 09.50 and (d) of this section.

(b) The corporation may engage actuarial experts and shall develop probability models to indicate the degree of potential harm to the public and private enterprise from the corporation's activities.

(c) The corporation shall, to the extent available, secure insurance coverage within reasonable limits for liability that may arise as a consequence of its activities and to insure its buildings, structures, and other facilities against loss.

(d) To the extent the corporation is able to obtain insurance coverage, the sovereign immunity of the state is waived to the extent of the insurance coverage.

(e) The corporation shall establish a safety program that includes

(1) the development and implementation of a loss prevention program consisting of a comprehensive corporation wide safety program, including a statement by the board, of safety policy and responsibility and regulations implementing it;

(2) provision for regular and periodic facility and equipment inspections;

(3) investigation of job-related accidents and other accidents occurring on the premises of the corporation or within areas of its jurisdiction;

(4) establishment of a program to promote increased safety awareness among employees, agents, and subcontractors of the corporation;

(5) study of safety operations at other space-related facilities in the United States.

Sec. 14.40.851. SPACE ACTIVITIES LOCATION. The Poker Flat Research Range constitutes the location and launch site for the corporation. Other sites may be developed and utilized if determined by the board to be necessary.

Sec. 14.40.856. FEDERAL AIR SPACE NOTIFICATION. In coordination with the Department of Transportation and Public Facilities, the corporation shall develop and file the federal air space notification required for air space use. To the extent that notification of air space use has already been filed by the University of Alaska, that filing shall, if possible under federal law, be amended to include the corporation.

Sec. 14.40.861. PURPOSE OF THE CORPORATION. The purpose of the corporation is to allow the state to take a lead role in the exploration and development of space, to enhance human and economic development, and to provide a unified direction

(1) for space-related economic growth thereby ensuring a stable and dynamic research and business climate by attracting space-related businesses to locate within and utilize the opportunities provided in the state;

(2) for space-related educational and research development by encouraging and assisting the University of Alaska in developing space-related programs, research, and courses of instruction and to assist the University of Alaska as a member of the Space Grant State Consortia under 42 U.S.C. 2486 (National Space Grant College and Fellowship Program);

(3) to promote the continued utilization of the Poker Flat Research Range as a launch site for launch vehicles and for scientific research both from ground based and rocket or balloon based instrumentation;

(4) to recognize the importance and benefits of and to promote and encourage the

continued utilization of Poker Flat Research Range for the University of Alaska's polar research efforts;

(5) for promotion of space-related tourism activities at Poker Flat Research Range and other space-related facilities or centers that may be utilized or established by the corporation; and

(6) for development of a state strategy for and to implement the acceleration of space-related economic growth and educational and research development in the state by the use of innovative development methods designed to stimulate space-related business and educational and research development and improve the entrepreneurial atmosphere in the state.

Sec. 14.40.866. POWERS AND DUTIES OF THE CORPORATION. (a) In furtherance of its corporate purposes, the corporation has the following powers in addition to its other powers:

(1) to sue and be sued;

(2) to adopt a seal;

(3) to have perpetual succession;

(4) to adopt, amend, and repeal bylaws and regulations;

(5) to make and execute contracts and other instruments;

(6) in its own name to acquire property, lease, rent, convey, or acquire by eminent domain under AS 09.55.240 - 09.55.460, or otherwise, real and personal property; provided that a project site or part of a project site may not be acquired by eminent domain until the corporation has secured, through negotiation, options for the purchase of at least 50 percent of the properties included in the site; in an eminent domain proceeding, the court may, upon motion and after a hearing, fix the time when and the terms upon which the parties in possession are required to surrender possession to the corporation; the Poker Flat Research Range may not be acquired by eminent domain;

(7) to issue bonds and otherwise to incur indebtedness, in accordance with AS 14.40.891, in order to pay the cost of a project or projects to construct or improve launch facilities or other space and aerospace projects or in order to provide money for the corporation's purposes under this chapter; the corporation may also secure payment of the bonds or other indebtedness as provided in this chapter;

(8) to accept gifts, grants, or loans from, and enter into contracts or other

transactions regarding them with, a federal agency or an agency or instrumentality of the state, a municipality, private organization, or other source;

(9) to enter into contracts or agreements with a federal agency, agency or instrumentality of the state, municipality, or public or private individual or entity, with respect to the exercise of its powers, and do all things necessary or convenient to carry out its corporate purposes and exercise the powers granted in this chapter;

(10) to own, acquire, construct, develop, create, reconstruct, equip, operate, maintain, extend, and improve launch sites, launch pads, landing areas, ranges, payload facilities, laboratories, space business incubators, facilities for the construction of rockets and other launch vehicles, and other space facilities and space-related systems, including educational, cultural, tourism, and parking facilities, and space-related initiatives;

(11) to undertake a program of advertising to the public and space-related businesses promoting the space-related projects of the corporation and space-related businesses;

(12) to construct, improve, and operate by itself or in cooperation with the University of Alaska or the Department of Transportation and Public Facilities transportation facilities appropriate to meet the transportation requirements of a facility operated by the corporation;

(13) to construct, improve, and operate water, sewage, and utility service to a facility operated by the corporation;

(14) to construct, provide, or improve public safety facilities for a facility operated by the corporation;

(15) to charge fees, rents, or other charges for the use of a facility or structure developed or operated by the corporation;

(16) to pledge rents, fees, charges, or other revenue from the use of its services or facilities as security for bonds of the corporation;

(17) to undertake to finance or develop a space-related project with any agency or authority of the state, its political subdivisions, agencies or authorities of other states, the federal government, foreign governments, or private entities;

(18) to apply to the federal government for a grant allowing the designation of corporation territory as a foreign trade zone under AS 45.77.010;

(19) to negotiate agreements for the recovery of a space vehicle, rocket, missile,

payload, booster, scientific experiments or other space-related material, debris, or parts with any person or entity, including but not limited to adjacent landowners;

(20) to lease the Poker Flat Research Range or portions of it from the University of Alaska and to lease to the University space-related facilities that the corporation may construct or acquire.

(b) The corporation shall

(1) prepare an annual report of operations to include a balance sheet, an income statement, a statement of changes in financial position, a reconciliation of changes in equity accounts, a summary of significant accounting principles, an auditor's report, comments regarding the year's business, and prospects from the next year; the report shall be provided by the third day of each regular session of the legislature to the governor, the presiding officers of each house of the legislature, the University of Alaska, and the Legislative Budget and Audit Committee;

(2) establish a personnel management system for hiring employees and setting employee-benefit packages;

(3) establish procedures, rules, and rates governing per diem and travel expenses of the employees of the corporation in substantial conformity to statutes, procedures, rules, and rates governing state employees.

Sec. 14.40.871. REGULATIONS. (a) The corporation shall adopt regulations to carry out the purposes of this chapter.

(b) Except for AS 44.62.310 and 44.62.312 regarding public meetings, the provisions of AS 44.62 (Administrative Procedure Act) regarding the adoption of regulations do not apply to the corporation. The corporation shall make available to members of the public copies of the regulations adopted under this section. Within 45 days after adoption of a regulation under this section, the chair of the corporation shall submit the regulation adopted to the chair of the Administrative Regulation Review Committee under AS 24.20.400 - 24.20.460.

(c) The corporation may adopt regulations by motion or by resolution or in another manner permitted by its bylaws.

(d) Except as provided in (e) of this section, at least 15 days before the adoption of a regulation, the corporation shall give public notice of the proposed action by publishing the notice in at least three newspapers of general circulation in the state and by mailing a copy of the notice to every person who has filed a request for notice of proposed regulations with the corporation.

The public notice must include a statement of the time, place, and nature of the proceedings for the adoption of the regulation and must include an informative summary of the subject of the proposed action. On the date and at the time and place designated in the notice, the corporation shall give each interested person or an authorized representative of the person, or both, the opportunity to present statements, arguments, or contentions orally or in writing and shall give members of the public an opportunity to present oral statements, arguments, or contentions for a total period of at least one hour. The corporation shall consider all relevant matter presented to it before taking the proposed action on the regulation. At a hearing under this subsection, the corporation may continue or postpone the hearing to a time and place determined by the corporation and announced at the hearing before taking the action to continue or postpone the hearing. A regulation adopted by the corporation may vary from the informative summary specified in this subsection if the subject matter of the action taken on the regulation remains the same and if the original notice of the proposed action was written so as to assure that members of the public are reasonably notified of the subject matter of the proposed action in order for them to determine whether their interests could be affected by the corporation's proposed action on that subject.

(e) The adoption of a regulation may be made as an emergency regulation if, in the order of adoption, the corporation states the facts constituting the emergency and makes a finding that the adoption of the regulation is necessary for the immediate preservation of the orderly operation of the corporation's programs. The requirements of (d) of this section do not apply to the initial adoption of an emergency regulation; however, upon adoption of an emergency regulation under this subsection, the corporation shall, within 10 days after that adoption, publish notice of the adoption in accordance with the notice procedures specified in (d) of this section. An emergency regulation adopted under this subsection may not remain in effect for more than 120 days unless, before the expiration of that period, the corporation adopts that regulation as a permanent regulation in accordance with the procedures specified in (d) of this section.

(f) A regulation adopted under this section takes effect immediately upon its adoption by the corporation or at another time specified by the corporation in its order of adoption.

Sec. 14.40.876. EXERCISE BY CORPORATION OF POWERS WITHIN MUNICIPALITIES. The corporation may exercise any of its powers in all portions of a space-related facility or territory lying within the boundaries of a municipality to the same extent and

in the same manner as in areas of the space-related facility or territory not within the boundaries of a municipality.

Sec. 14.40.881. TRADE SECRETS CONFIDENTIAL. The corporation shall maintain the confidentiality of a trade secret, or other proprietary technical information, supplied by a public or private person or entity or other proprietary information for purposes related to this chapter unless the owner of the trade secret authorizes its release or a court orders its release. Information covered by this section is not a public record for purposes of AS 09.25.110 - 09.25.140. The corporation shall adopt regulations implementing this section.

Sec. 14.40.886. APPROVAL OF PROJECTS BY LEGISLATURE. Notwithstanding any other provision of this chapter, a proposed building project shall be submitted by the corporation to the legislature for review at a regular session of the legislature. If the proposed project is submitted before the 75th day of a regular session, the corporation may proceed with the proposed project if it is not disapproved by law at that session. If the proposed project is submitted after the 75th day of a regular session or in the interim between regular sessions, the corporation may proceed with the project if it is not disapproved by law at the next regular session. A proposed project is considered submitted under this section upon written notification of the proposed project to the presiding officers of each house of the legislature and the Legislative Budget and Audit Committee.

Sec. 14.40.891. ISSUANCE OF BONDS, NOTES, AND REFUNDING BONDS. The corporation may issue bonds and notes from time to time in its discretion for any of its corporate purposes and may issue refunding bonds for the purpose of paying or retiring bonds previously issued by it.

Sec. 14.40.896. SECURITY FOR BONDS. The corporation may issue bonds including but not limited to bonds on which the principal and interest are payable (1) exclusively from the income and revenue of the space-related project financed with the proceeds of the bonds, (2) exclusively from the income and revenue of designated space-related projects whether or not they are financed in whole or in part with the proceeds of the bonds, (3) from its revenue generally, or (4) exclusively from rents, fees, charges, or other revenue collected or received by the corporation. Bonds may be additionally secured by a pledge of a grant or contribution from the federal government or from another source, or by a pledge of income or revenue of the corporation, or by a mortgage of a space-related project or other property of the corporation.

Sec. 14.40.899. LIMITATION OF LIABILITY ON BONDS. The members of the corporation and a person executing the bonds are not liable personally on the bonds by reason of their issuance. The bonds of the corporation are not a debt of the state or a political or municipal corporation or other subdivision of the state, including the University of Alaska, and each bond must so state on its face. Neither the state nor a political or municipal corporation or other subdivision of the state, including the University of Alaska, other than the corporation is liable on the bonds, nor are the bonds payable out of funds or properties other than those of the corporation. The corporation may not pledge the faith of the people of the state for a loan or obligation. Bonds of the corporation are not a debt, indebtedness, or the borrowing of money within the meaning of a limitation or restriction on the issuance of bonds contained in the constitution or laws of the state.

Sec. 14.40.902. ISSUANCE AND SALE OF BONDS AND NOTES. Bonds and notes of the corporation are authorized by adoption of a resolution prescribing the date of issuance and maturity, interest rate, denomination, form, conversion privilege, rank or priority, execution, terms of redemption, medium, and place of payment. Bonds and notes may be sold in the manner, on the terms, and at the price the corporation determines. Each bond and note is negotiable. The signature of a member or an officer upon a bond or note or coupon is not invalidated by that person's ceasing to hold office before the delivery of the bond or note. The recitation of a bond or note that it has been issued in the financing of a space-related project or purpose under this chapter is conclusive as to the issuance of the bond or note and the character of the project in a challenge of the validity of the bond or note or the security for it.

Sec. 14.40.906. BONDS EXEMPT FROM TAXES. Bonds and other obligations of the corporation are issued for an essential public and governmental purpose and are public instrumentalities and, together with interest on them and income from them, are exempt from taxes.

Sec. 14.40.908. INDEPENDENT FINANCIAL ADVISOR. In negotiating the private sale of bonds or bond anticipation notes to an underwriter, the corporation shall retain a financial advisor who is independent from the underwriter. The financial advisor may not bid on the bonds or notes if offered at public sale or negotiate for their purchase if sold at private sale.

Sec. 14.40.912. ADDITIONAL POWERS TO SECURE BONDS OR OBLIGATIONS UNDER LEASES. In connection with the issuance of bonds or the incurring of obligations

under leases and in order to secure the payment of bonds or lease obligations, the corporation, in addition to its other powers, may

(1) pledge all or a part of its gross or net rents, fees, or revenues to which its right exists or may exist;

(2) mortgage or encumber all or a part of its real or personal property, owned or later acquired;

(3) covenant against pledging all or a part of its rents, fees, and revenue, or against mortgaging all or a part of its real or personal property, to which its right or title exists or may come into existence or against permitting or suffering any lien on the revenues or property;

(4) covenant with respect to limitations on its right to sell, lease, or otherwise dispose of a space-related project or a part of a space-related project;

(5) covenant as to what other, or additional debts or obligations may be incurred by it;

(6) covenant as to the bonds to be issued and as to the issuance of the bonds in escrow or otherwise, and as to the use and disposition of the proceeds of bonds;

(7) provide for the replacement of lost, destroyed, or mutilated bonds;

(8) covenant against extending the time for the payment of its bonds or interest on the bonds;

(9) redeem the bonds, and covenant for their redemption and to provide the terms and conditions of redemption;

(10) covenant as to the rents and fees to be charged in the operation of a space-related project, the amount to be raised each year or other period of time by rents, fees, and other revenue, and as to the use and disposition of this revenue;

(11) create or authorize the creation of special funds for money held for construction or operating costs, debt service, reserves, or other purposes, and covenant as to the use and disposition of this money;

(12) prescribe the procedure by which the terms of a contract with bondholders may be amended or abrogated, the amount of bonds the holders of which must consent thereto and the manner in which the consent may be given;

(13) covenant as to the rights, liabilities, powers, and duties arising upon the

breach by it of a covenant, condition, or obligation, and covenant and prescribe as to events of default and terms and conditions upon which any or all of its bonds or obligations shall become or may be declared due before maturity, and covenant as to the terms and conditions upon which this declaration and its consequences may be waived;

(14) vest in a trustee or trustees or the holders of bonds or a specified proportion of them, the right to enforce the payment of the bonds or covenants securing or relating to the bonds;

(15) vest in one or more trustees the right, in the event of a default by the corporation, to take possession of a space-related project or a part of the project, and so long as the corporation continues in default to retain possession and to use, operate, and manage the project, and to collect the rent and revenue from the project, and to dispose of the money according to the agreement between the corporation and the trustees;

(16) provide for the powers and duties of the trustees, and limit the liability of the trustees; and

(17) provide the terms and conditions upon which the trustee or trustees or the holders of bonds, or portions of bonds, may enforce a covenant or right securing or relating to the bonds.

Sec. 14.40.916. RIGHT OF OBLIGEE OF CORPORATION TO BRING INJUNCTION. An obligee of the corporation may, in addition to all other rights that may be conferred and subject only to contractual restriction binding upon the obligee, seek an injunction or an action in nature of an action for mandamus against the members, the corporation, its officers, agents, or employees.

Sec. 14.40.921. POWER OF CORPORATION TO CONFER UPON OBLIGEE RIGHT TO BRING ACTION OR PROCEEDING. The corporation may by resolution, trust indenture, mortgage, lease, or other contract confer upon an obligee holding or representing a specified amount in bonds, or holding a lease, the right upon a default as defined in the resolution or instrument by suit, action or proceeding

(1) to have possession of a space-related project or part of one surrendered to the obligee, with possession retained by the obligee as long as the corporation continues in default;

(2) to obtain the appointment of a receiver of a space-related project or part of one and its rents and profits, who may enter, take possession, and for the duration of the default

operate and maintain it, collect and receive all fees, rents, revenues, or other charges thereafter arising, and keep the money in a separate account or accounts to be applied in accordance with the obligations of the corporation as the court directs;

(3) to require the corporation and its members to account as if they were the trustees of an express trust.

Sec. 14.40.926. EXEMPTION OF REAL PROPERTY OF CORPORATION FROM EXECUTION OR OTHER PROCESS. All real property of the corporation is exempt from levy and sale by execution, and an execution or other judicial process may not issue against it. A judgment against the corporation may not be a charge or lien upon its real property. However, this section does not limit the right of an obligee to foreclose or otherwise enforce a mortgage of the corporation or to pursue any remedy for the enforcement of a pledge or lien given by the corporation on its rents, fees, or revenues.

Sec. 14.40.931. POWER OF CORPORATION TO OBTAIN FEDERAL AID AND COOPERATION. The corporation may borrow, accept contributions, grants, or other financial assistance from the federal government in aid of a space-related project and for this purpose may comply with conditions and enter into the mortgages, trust indentures, leases, or agreements that are necessary, convenient, or desirable in order to obtain financial aid or cooperation from the federal government in the undertaking, construction, maintenance, or operation of a space-related project.

Sec. 14.40.936. EXEMPTION FROM TAXES AND ASSESSMENTS. The property of the corporation is public property used for essential public and governmental purposes and this property and the corporation are exempt from all taxes and special assessments of a municipality, the state, or a political subdivision of the state. However, instead of taxes, the corporation may make payments to the municipality or political subdivision for improvements, services, and facilities furnished by it for the benefit of a space-related project.

Sec. 14.40.941. DISPOSAL OF SURPLUS PROPERTY. (a) The corporation may convey real or personal property that it determines is in excess of its needs. Except as provided in (b) of this section, the sale shall be by public auction or by sealed bids. Public notice shall be given by publishing notice of the sale at least once a week for two consecutive weeks in a newspaper of general circulation within the area in which the property to be sold is located and by posting notice of sale in at least two public places in the area. In no event may the auction

be held less than 30 days after the last day of publication. If an acceptable bid is not received, the corporation may sell the property at negotiated sale within six months after the date of the auction. A negotiated sale may not be made on an appraisal made more than nine months before the date of sale. The price at a negotiated sale may not be less than the appraised value.

(b) Real or personal property of the corporation may be conveyed to a state or federal agency or political subdivision or the University of Alaska for less than the appraised value without competitive bidding, upon a determination by the board that the terms are fair and proper and in the best interests of the state. The board shall consider both the nature of the agency's or political subdivision's public services or functions and the terms under which the property was acquired by the corporation.

Sec. 14.40.946. PUBLIC LOANS OR DONATIONS TO OR COOPERATION WITH CORPORATION. (a) A public body or agency of the state may

(1) lend or donate money or property to the corporation;

(2) cooperate with it in the planning, construction, or operation of a project;

(3) transfer to it an interest in property, grant an easement, undertake otherwise authorized construction of facilities adjacent to a project;

(4) furnish or improve otherwise authorized roads, streets, alleys, and sidewalks;

(5) contract to exercise its powers relating to repair, elimination, or closing of unsafe, insanitary, or unfit dwellings;

(6) purchase bonds of the corporation;

(7) incur the entire expense of improvements made under this chapter;

(8) agree with the corporation that a certain sum or that no sum shall be paid by the corporation to it instead of taxes;

(9) enter into agreements respecting exercise of the powers granted in this chapter that shall be approved and executed by the public body or municipality in or adjacent to the project before the project may be constructed; and

(10) in general do all things necessary or convenient to cooperate in the planning, construction, or operation of a project.

(b) Except as required under AS 44.62.310 and 44.62.312, a sale, conveyance, lease, or agreement under this section may be made without appraisal, public notice or advertisement, or bidding. A public body may exercise the powers granted in this section by resolution or

ordinance by a majority of the members of the governing body present at the meeting at which it is introduced, and the resolution or ordinance takes effect immediately without publishing or posting.

Sec. 14.40.951. RESERVE FUND. (a) The corporation shall establish and maintain a special fund called the Alaska Aerospace Development Corporation reserve fund in which there shall be deposited or transferred

(1) all money appropriated by the legislature for the purpose of the fund in accordance with the provisions of (g) of this section;

(2) all proceeds of bonds required to be deposited in the fund by terms of a contract between the corporation and its bondholders or a resolution of the corporation with respect to the proceeds of bonds;

(3) all other money appropriated by the legislature to the reserve fund; and

(4) any other money or funds of the corporation that it decides to deposit in the fund.

(b) Subject to the provisions of (h) of this section, money in the reserve fund shall be held and applied solely to the payment of the interest on and principal of bonds of the corporation as the interest and principal become due and payable and for the retirement of bonds; and the money may not be withdrawn if a withdrawal would reduce the amount in the reserve fund to an amount less than the required debt service reserve except for payment of interest then due and payable on bonds and the principal of bonds then maturing and payable and for the retirement of bonds in accordance with the terms of a contract between the corporation and its bondholders and for which payments of other money of the corporation is not then available. In this subsection, "required debt service reserve" means, as of the date of computation, the amount required to be on deposit in the reserve fund as provided by resolution of the corporation.

(c) Money in the reserve fund in excess of the required debt service reserve as defined in (b) of this section, whether by reason of investment or otherwise, may be withdrawn at any time by the corporation and transferred to another fund or account of the corporation subject to the provision of (h) of this section.

(d) Money in the reserve fund may be invested in the same manner and on the same conditions as permitted for investment of funds belonging to the state or held in the treasury under AS 37.10.070; however, the corporation may agree with the bondholders to further limit

these investments.

(e) For purposes of valuation, investments in the reserve fund shall be valued at par or if purchased at less than par, at cost unless otherwise provided by resolution of the corporation. Valuation on a particular date shall include the amount of interest then earned or accrued to that date on the money or investments in the reserve fund.

(f) Notwithstanding any other provision of this chapter, bonds may not be issued by the corporation unless there is in the reserve fund the required debt service reserve for all bonds then issued and outstanding and for the bonds to be issued; however, the corporation may satisfy this requirement by depositing as much of the proceeds of the bonds to be issued, upon their issuance, as is needed to meet the required debt service reserve. The corporation may at any time issue its bonds or notes for the purpose of increasing the amount in the reserve fund to the required debt service reserve, or to meet whatever higher or additional reserve that may be fixed by the corporation with respect to the fund.

(g) In order to assure the maintenance of the required debt service reserve in the reserve fund, the legislature may appropriate annually to the corporation for deposit in the fund the sum, certified by the chair of the corporation to the governor and to the legislature, that is necessary to restore the fund to an amount equal to the required debt service reserve. The chair annually, before January 30, shall make and deliver to the governor and to the legislature a certificate stating the sum required to restore the fund to that amount, and the certified sum may be appropriated and paid to the corporation during the then current state fiscal year. Nothing in this subsection creates a debt or liability of the state.

(h) All amounts received on account of money appropriated to the reserve fund referred to in (a)(3) of this section shall be held and applied in accordance with (b) of this section; however, at the end of each fiscal year, if the amount in the reserve fund is in excess of the required debt service reserve, any amount representing earnings or income received on account of money appropriated to the reserve fund that exceeds the operating expenses of the corporation for that fiscal year shall be transferred to the general fund of the state.

(i) All references to the reserve fund in this section include special accounts within the reserve fund that may be created by the corporation to secure the payment of particular bonds. The commissioner of revenue may lend surplus money in the general fund to the corporation for deposit to any account in the reserve fund in an amount equal to the required debt service

reserve. The loans shall be made on the terms and conditions that may be agreed upon by the commissioner of revenue and the corporation, including, without limitation, terms and conditions providing that the loans need not be repaid until the obligations of the corporation secured and to be secured by the account in the reserve fund are no longer outstanding.

Sec. 14.40.956. COOPERATION WITH OTHER AUTHORITIES. In issuing a bond, the corporation may request the assistance of and work with the Alaska Industrial Development and Export Authority and the Alaska Municipal Bond Bank Authority. The Alaska Industrial Development and Export Authority may invest in and issue bonds for space-related projects of the Alaska Aerospace Development Corporation. The Alaska Industrial Development and Export Authority and the Alaska Municipal Bond Bank Authority may purchase and market bonds of the Alaska Aerospace Development Corporation.

Sec. 14.40.961. INVESTMENT OF REVENUE. The revenue and receipts of the corporation, to the extent they are not needed to pay bonds or other obligations of the corporation shall be invested by the commissioner of revenue in cooperation with the corporation.

Sec. 14.40.966. LEGALITY OF CORPORATION BONDS AS INVESTMENTS. Bonds of the corporation are legal and proper investments and security for public and private banking, insurance, and trust funds.

Sec. 14.40.990. DEFINITIONS. In AS 14.40.821 - 14.40.990,

(1) "board" means the board of directors of the Alaska Aerospace Development Corporation;

(2) "corporation" means the Alaska Aerospace Development Corporation;

(3) "landing site" means a site or facility designed, intended, or used for the landing or recovery of space vehicles, aircraft, or balloons;

(4) "launch site" means a site or facility designed, intended, or used for the launching of space vehicles, sounding rockets, aircraft, or balloons;

(5) "payload" means property or cargo, including people or animals, to be transported aboard a vehicle launched by the corporation;

(6) "recovery" means the retrieval and recovery of space vehicles, payloads, and parts that have been launched from the corporation's facilities;

(7) "space vehicle" means a rocket, missile, booster, or other vehicle designed, intended, or used to reach high altitude.

* **Sec. 3.** AS 24.20.201(a) is amended to read:

(a) The Legislative Budget and Audit Committee has the power to:

(1) organize, adopt rules for the conduct of its business, and prescribe procedures for the comprehensive fiscal analysis, budget review, and post-audit functions;

(2) hold public hearings, administer oaths, issue subpoenas, compel the attendance of witnesses and production of papers, books, accounts, documents, and testimony, and have the deposition of witnesses taken in a manner prescribed by court rule or law for taking depositions in civil actions;

(3) require all state officials and agencies of state government to give full cooperation to the committee or its staff in assembling and furnishing requested information;

(4) review revenue projections, state agency appropriation requests, the expenditure of state funds, including the relationship between state agency program accomplishments and legislative intent, and the fiscal policies and procedures of state government;

(5) review and approve proposed changes to agency authorized budgets as provided in the Executive Budget Act (AS 37.07);

(6) make recommendations concerning appropriations, their expenditure and the fiscal policies and procedures of state government to the governor when appropriate, and to the legislature;

(7) prepare and distribute reports, memoranda, or other necessary materials;

(8) sue in the name of the legislature during the interim between sessions if authorized by majority vote of the full membership of the committee;

(9) hold public hearings on the confirmation of the members of the Board of Trustees of the Alaska Permanent Fund Corporation;

(10) make recommendations to the legislature and to agencies of the state **that** [WHICH] perform lending or investment functions concerning the structure and operating practices of the agencies;

(11) enter into and enforce all contracts necessary or desirable for the functions of the committee;

(12) provide for annual post audits of the Alaska Housing Finance Corporation, **the Alaska Aerospace Development Corporation,** and the Alaska Industrial Development and

Export Authority.

* **Sec. 4.** AS 29.45.650(a) is amended to read:

(a) Except as provided in AS 04.21.010(c) and in (f) **and (h)** of this section, a borough may levy and collect a sales tax on sales, rents, and on services provided in the borough. The sales tax may apply to any or all of these sources. Exemptions may be granted by ordinance.

* **Sec. 5.** AS 29.45.650 is amended by adding a new subsection to read:

(h) A borough may not levy or collect a sales tax on sales, rents, and services, or a use tax on the storage, use, or consumption of personal property on the following activities:

(1) the sale, lease, rental, storage, consumption, or distribution in this state of or the provision of services relating to an orbital space facility, space propulsion system, or space vehicle, satellite, or station of any kind possessing space flight capacity, including the components of them;

(2) the sale, lease, rental, storage, consumption, or use of tangible personal property placed on or used aboard an orbital space facility, space propulsion system, or space vehicle, satellite, or station of any kind, regardless of whether the tangible personal property is returned to this state for subsequent use, storage, or consumption; an exemption under this paragraph is not affected by the failure of a launch to occur, or the destruction of a launch vehicle or a component of a launch vehicle.

* **Sec. 6.** AS 36.30.015(f) is amended to read:

(f) The board of directors of the Alaska Housing Finance Corporation, notwithstanding AS 18.56.088, [AND] the board of directors of the Alaska State Housing Authority**, and the board of directors of the Alaska Aerospace Development Corporation, notwithstanding AS 14.40.871(b),** shall adopt regulations under the Administrative Procedure Act (AS 44.62) to govern the procurement of supplies, services, professional services, and construction for the respective public corporations. The regulations must

(1) reflect competitive bidding principles and provide vendors reasonable and equitable opportunities to participate in the procurement process; and

(2) include procurement methods to meet emergency and extraordinary circumstances.

* **Sec. 7.** AS 36.30.990(1) is amended to read:

(1) "agency"

(A) means a department, institution, board, commission, division, authority, public corporation, the Alaska Pioneers' Home, or other administrative unit of the executive branch of state government;

(B) does not include

(i) the University of Alaska;

(ii) the Alaska State Housing Corporation;

(iii) the Alaska Railroad Corporation;

(iv) the Alaska Housing Finance Corporation;

(v) a regional Native housing authority created under AS 18.55.996, or a regional electrical authority created under AS 18.57.020;

(vi) the Alaska Aerospace Development Corporation;

*** Sec. 8.** AS 37.05.146 is amended to read:

Sec. 37.05.146. DEFINITION OF PROGRAM RECEIPTS. In AS 37.05.142 - 37.05.146 and AS 37.07.080 "program receipts" means fees, charges, income earned on assets, and other state money received by a state agency in connection with the performance of its functions; all program receipts except the following are general fund program receipts:

(1) federal receipts;

(2) University of Alaska receipts (AS 14.40.491);

(3) individual, foundation, or corporation gifts, grants, or bequests that by their terms are restricted to a specific purpose;

(4) receipts of the following funds:

(A) highway working capital fund (AS 44.68.210);

(B) correctional industries fund (AS 33.32.020);

(C) loan funds;

(D) international airport revenue fund (AS 37.15.430);

(E) funds managed by the Alaska State Housing Authority (AS 18.55.020), the Alaska Housing Finance Corporation (AS 18.56.020), the Medical Indemnity Corporation of Alaska (AS 21.88.020), the Alaska Railroad Corporation (AS 42.40.010), the Municipal Bond Bank Authority (AS 44.85.020), **the Alaska Aerospace Development Corporation (AS 14.40.821),** or the Alaska Industrial Development and Export Authority (AS 44.88.020);

(F) fish and game fund (AS 16.05.100);

(G) school fund (AS 43.50.140);

(H) training and building fund (AS 23.20.130);

(I) retirement funds (AS 14.25, AS 22.25, AS 26.05.222, AS 39.35, and former AS 39.37);

(J) permanent fund (art. IX, sec. 15, Alaska Constitution);

(K) public school fund (AS 37.14.110);

(L) second injury fund (AS 23.30.040);

(M) fishermen's fund (AS 23.35.060);

(N) FICA administration fund (AS 39.30.050).

*** Sec. 9.** AS 38.05.810 is amended by adding a new subsection to read:

(h) The commissioner shall lease land to the Alaska Aerospace Development Corporation for purposes of down range space vehicle or payload overflight, booster retrieval, and recovery at no charge. The commissioner shall lease land to the Alaska Aerospace Development Corporation for other space-related purposes at no more than 10 percent of the appraised fair market value.

*** Sec. 10.** AS 39.25.110(11) is amended to read:

(11) the officers and employees of the following boards, commissions, and authorities:

(A) Alaska Gas Pipeline Financing Authority;

(B) Alaska Permanent Fund Corporation;

(C) [REPEALED,

(D)] Alaska Industrial Development and Export Authority;

(D) [(E)] Alaska Commercial Fisheries Entry Commission;

(E) [(F)] Alaska Commission on Postsecondary Education;

(F) Alaska Aerospace Development Corporation;

*** Sec. 11.** AS 39.50.200(b) is amended by adding a new paragraph to read:

(52) Alaska Aerospace Development Corporation (AS 14.40.821).

*** Sec. 12.** AS 44.99.200(b) is amended to read:

(b) The determination under (a) of this section shall be made by the

(1) commissioner of administration for a state agency in the executive branch,

except as provided in (4) - (6) of this subsection;

(2) administrative director of the judicial branch for an agency in the judicial branch;

(3) Alaska Legislative Council for an agency in the legislative branch;

(4) Board of Regents or president of the University of Alaska for the university;

(5) board of directors of the Alaska State Housing Authority for the authority; [AND]

(6) board of directors of the Alaska Railroad Corporation for the corporation; **and**

(7) board of directors of the Alaska Aerospace Development Corporation for the corporation.

*** Sec. 13.** AS 44.99.400 is amended to read:

Sec. 44.99.400. COPYRIGHTS. A state agency may hold the copyright for software created by the agency or developed by a private contractor for an agency, and may enforce its rights to protect the copyright. In this section, "state agency" means a department, institution, board, commission, division, authority, public corporation, committee, or other administrative unit of the executive, judicial, or legislative branch of state government, including the University of Alaska, the Alaska State Housing Authority, **the Alaska Aerospace Development Corporation,** and the Alaska Railroad Corporation.

*** Sec. 14.** INITIAL APPOINTMENTS. The initial appointments of the members of the board under AS 14.40.826(a)(1), (6), and (8) shall be staggered under AS 39.05.055(2).

1991 LEGISLATION
POSITION PAPER
DEPARTMENT OF ADMINISTRATION

Division Risk Management **Bill Number** HB 46

Bill Title An act creating the Alaska Spaceport Authority

Position Statement: Explain briefly what bill does, its impacts and Department's position, i.e. a) support, b) do not support, c) neutral or d) oppose.

This act creates a new public corporation of the State, with a board of directors, executive director and support staff. It is unclear as to the extent of the increased staffing involved with inherent workers' compensation, general and professional liability exposures.

It is mentioned that the authority will procure and maintain insurance coverage for liability that may arise as a consequence of its activities, and its buildings, structures and other facilities against loss. Again there is no indication of the extent of such facilities, although we would presume they would approach Risk Management for such coverages as it is more economical to participate in the self insurance program operated by Risk Management.

Casualty risks (workers' compensation, general, auto and professional liability) could be picked up as part of the standard assessment on the Department of Commerce's monthly payroll. All other coverages would be billed on a direct RSA basis (property, aviation, etc.)

Our position is neutral — this is only a reminder that insurance costs could be involved depending on Alaska Space Port Authority activity.

APPROVED:

Director Donald Hitchcock **Division** Risk Management
print name

Signature [signature] **Date** 3/27/91

Commissioner Millert Keiler

Signature _____ **Date** _____

(For more information, call Barbara Pritchett 465-2200) Rev. 1/23/91

Brian Rogers
Vice President for Finance
(907) 474-7448

University of Alaska
Fairbanks, Alaska 99775-6360

February 27, 1991

Representative Tom Moyer
PO Box V
Juneau AK 99811

VIA Telefax

Dear Representative Moyer:

Thanks to you and your staff for providing the University of Alaska with a copy of the 2/26/91 work draft for Sponsor Substitute for House Bill No. 46. The draft has been briefly reviewed by the university, and we have several suggestions for amendments. I will be prepared this afternoon to testify to each suggested amendment, and the importance of each to the university.

The following references are to work draft 7-LS0236\D:

Page 1, line 14: delete "seven" insert "nine"

page 2, line 9: delete "one public member" insert "two public members"

page 2, after line 9: insert
"(8) one University of Alaska faculty member with research interests in rocket- or satellite-born scientific instrumentation."

page 2, lines 17-18. delete "The members . . . themselves."
insert "The president of the University of Alaska shall serve as chair of the corporation. The commissioner of commerce and economic development shall serve as vice-chair."

page 2, line 20: delete "ATTORNEY . . . COUNSEL"

page 3, line 4: delete "The attorney . . . corporation."
insert "The corporation may retain legal counsel."

page 3, line 5: delete "shall" insert "may"

page 4, line 5: delete "TERRITORY" insert "LOCATION"

page 4, line 6: delete "territory and"
delete "Additional territory may be added and"

page 4, line 12: delete "transferred to the" insert "amended to include the"

page 5, line 13-19: Question: how does an entity obtain personal property by eminent domain? Question: does the state wish to give this corporation eminent domain powers?

page 5, line 14: after "site" insert "and further provided that the Poker Flat Rocket Range and other University of Alaska aerospace-related facilities may not be acquired by eminent domain"

page 7, line 4: after "legislature," insert "the University of Alaska,"

page 8, line 28: after "person" insert "or entity"
after "secret" insert "or other proprietary technical information"

page 10, line 28: Question: Should "mortgage" be replaced by "encumber" ?

page 12, lines 9-13: Question: What is the purpose of this section?

page 13, lines 18-21: Note: it may be difficult to find an appraiser qualified to appraise aerospace-related personal property. It may be appropriate to end the sentence after "or by sealed bids"

page 13, line 30: after "subdivision" insert ", including the University of Alaska"

page 21, line 5: after "booster retrieval," insert "launch operations,"

page 22, lines 10-20: delete all language. Replace with:
*Sec. 14. EFFECTIVE DATE. This Act takes effect immediately in accordance with AS 01.10.070(c).

Thank you for your consideration of the University's interests.

Sincerely,

Brian Rogers
Vice President for Finance

cc: President Jerome Komisar
J. Mark Neumayr, Associate General Counsel
Merritt Helfferich, Associate Director, Geophysical Institute

MicroSat Launch Systems

CIT Tower, Suite 200 • 2214 Rock Hill Road • Herndon, VA 22070
(703) 733-2819 (703) 733-2827 (fax)

TELEFAX COVER PAGE

PLEASE DELIVER TO ADDRESSEE AS SOON AS POSSIBLE.

DATE: March 11, 1991
TIME: 8:00 p.m.

TO: Larry Galloway
FAX: (907) 463-3841
VOICE: (907) 465-2500

FROM: Bruce D. Kraselsky

NUMBER OF PAGES (INCLUDING THIS COVER PAGE): 10

IF YOU HAVE ANY TROUBLE RECEIVING THIS TRANSMISSION, PLEASE CALL (703) 733-2819.

MESSAGE:

Hope this serves its intended purpose. Please let me know how things go and if I can be of any further assistance. Hard copy and appendices to this document will be sent by Fed. Ex.

Additional Material

MicroSat Launch Systems

CIT Tower, Suite 200
2214 Rock Hill Road
Herndon, VA 22070
(703) 733-2819 (voice)
(703) 733-2827 (fax)

Domestic and International Competition among Spaceports

There are approximately 20 spaceports worldwide that have operational capability to launch small class launch vehicles such as MicroSat's *Orbital Express™* Additional launch sites, such as Andoya, Netherlands; Churchill, Canada; Poker Flat, Alaska; that currently support sub-orbital missions are planning or contemplating an expansion to orbital capability. The accompanying Appendices identify most of these facilities and provide a selected comparison of their attributes.

CHAPTER V

COMPETITION

A. EXISTING/PROPOSED LAUNCH SITES

Several operational launch sites in the world currently have the capability to launch orbital vehicles. The major sites and their current statuses are identified in Table V-1; the capabilities to launch equatorial and/or polar orbits, and to service the previously identified market segments, are also indicated in the Table. To provide a perspective of the relative frequency of launches, the number of orbital launches from 1957 through 1985 is indicated. Some of these sites could be considered as competition to Spaceport Florida, depending on the launch services and financial packages that they can provide.

The major launch sites that would probably be in competition (at various levels) with Spaceport Florida for commercial launch services are discussed below:

- Guiana Space Center, Kourou, French Guiana -- This facility is located five degrees north of the equator, which makes it advantageous for equatorial launches. The Space Center can now support two parallel launch campaigns, with a capacity of ten launches per year. A further planned expansion will increase capacity to fifteen launches per year. Launches are occasionally delayed because of heavy winds.

- Tanegashima, Japan -- The National Space Development Agency's (NASDA's) principal launch facility has capacity for only two launches per year, due to restrictions protecting the Japanese fishing industry. The H-2 rocket, under development, will increase this capacity to four launches per year. The H-2 could be operational by 1992/93. Although the location at 28° north requires twelve percent more energy than launches from the Guiana Space Center to achieve geostationary orbit, the location is well-suited to serve the

proposed Space Station, which is planned to have a 28.5° inclined orbit. Proposed locations for Spaceport Florida are at a similar latitude.

- Kagoshima Space Center, Japan -- This facility, at 31° north of the equator, serves the Institute for Space and Astronautical Science (ISAS). In addition to balloons and sounding rockets, a few small orbital rockets could be launched from the facilities.

- Kennedy Space Center and Cape Canaveral Air Force Station -- This facility provides most of the current U.S. launch capacity. Launch capacity, with existing facilities and operations, totals roughly 20-25 launches per year. Further renovations and modifications to existing launch complexes could permit an additional 10-15 launches per year.

- Vandenberg Air Force Base, California -- This facility is used almost entirely for military payloads and launch vehicles. Annual capacity is estimated at ten launches, with expansion capabilities to 15.

- Wallops Island, Virginia -- The Wallops Flight Facility on Wallops Island, Virginia, administered by the Goddard Space Center, has been used for an extensive sounding rocket program, as well as for launches of the Scout launch vehicle.

- San Marco, Kenya -- This facility, developed by NASA and the Italian government, with technical support by LTV-Vought Corporation, consists of two offshore platforms in the Indian Ocean. Since its establishment, eight Scout vehicles have been launched from these platforms, through 1987.

- Xi Chang, Peoples Republic of China -- Recent expansion provides capability for six or seven launches annually, some of which are for other countries. China is marketing its Long March vehicle.

- Sriharikota, India -- These launch facilities have been used solely to launch Indian payloads, to date. By 1993, India plans to develop a polar launch vehicle that supposedly will be technically competitive with those of the space leaders.

Table V-1
WORLDWIDE LAUNCH SITES

Launch Sites	Lattitude	Expendable Launch Vehicle Capability	Orbit*	Status	Number of Oribital Launches 1957–1985
Cape Canaveral (USA)	28.5N	All	E	Operational	371
Vandenberg (USA)	34.7N	All	P	Operational	469
Wallops (USA)	37.9N	Suborbital/Small	E	Operational	19
Palima Point (USA)	19.0N	All	E/P	Planning Stage	–
Kourou (French Guiana)	5.2N	All	E/P	Operational	20
Kagoshima (Japan) (1)	31.1N	Suborbital/Small	E/P	Operational (1)	16
Tanegashima (Japan)	30.4N	All	E/P	Operational	15
Shuang Cheng–Tzu (PRC)	40.6N	Suborbital/Small	E	Operational	14
Xi Chang (PRC)	28.1N	All	E	Operational	3
San Marco (Kenya)	2.9S	Suborbital/Small	E	Operational	8
Hammaguir (Algeria)	–	–	–	Not Operational	4
Plesetsk (USSR)	62.8N	All	E/P	Operational	1111
Baykonur (USSR)	45.6N	All	E/P	Operational	728
Kapustin Yar (USSR)	48.4N	Suborbital/Small	E/P	Operational	82
Woomera (Australia)	31.1S	Suborbital/Small	E	Operational	2
Cape York (Australia)	11.0S	All	E/P	Planning Stage	–
Sriharikota (India)	13.9N	Suborbital/Small	E/P	Operational	3
Thumba (India)	8.0N	Suborbital/Small	E	Operational	–
Alcantara (Brazil)	2.0S	Suborbital/Small	E/P	Construction	–
Esrange (Sweden)	68.0N	Suborbital	–	Operational	–

*E = Equatorial, P = Polar

(1) Proposed Range At Hokkaido To Be Operational By 2000

Sources: United States Department of Commerce, 1986; Congressional Research Service, "Space Activities of the United States, Soviet Union and Other Launching Countries, 1957–1986," February 1987.

TABLE I-2

COMPARATIVE ELEMENTS OF SELECTED LAUNCH LOCATIONS

Selected Launch Locations/ Sponsors (Existing And Potential)	Status	Operating Performance and Down Range Characteristics			Supporting Resources				Local Land Conditions				
		Position For Equatorial Launcher	Position For Polar Launch	Range Safety Concerns	Access to Sea Lanes & Air Service	In-Place Communications Network	Available Skilled Labor & Training Facilities	Infrastructure--Power, Roads, Sewer, Etc.	Unpopulated Areas	Available Land For Expansion	Reliable Weather	Geologic Stability	Quality Living/ Working Environment
Hawaii	Feasibility Study Evaluated	Favorable (18-22° N. Lat.)	Favorable	Localized Mitigatable	Favorable	Highly Favorable	Highly Favorable	Location-dependent, Requires development	Available, location-specific	Adequate with some growth limits	Temperate climates	Neutral/ Unfavorable	Highly Favorable
Kourou (French)	Guyana Space Center	Highly Favorable (5° N. Lat.)	Favorable	Negligible	Some limitations; improving	In-place	Adequately staffed to meet current needs	In-place	Available	Available	Favorable	Neutral	Remote location
Japan	Space Center (NASDA) Tanegashima	Unfavorable (30° N. Lat.)	Unfavorable	Limitations: overfly fishing grounds	Nearby port	In-place	Adequately staffed to meet current needs	In-place	Limited	Limited	In typhoon corridor	N.A.	Remote location
	Proposed range at Hokkaido (operation by 2000)	Unfavorable (42-44° N. Lat.)	Favorable	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Available		Unknown	Unknown
	Kagoshima Space Ctr. and Operational (ISAS)	Unfavorable (31° N. Lat.)	Favorable	Limitations: overfly fishing grounds	Nearby port	In-place	Adequately staffed to meet current needs	In-place	Limited	Limited	In typhoon corridor	N.A.	Remote location
Australia	Proposed Cape York Int'l Space-port	Favorable (11° S. Lat.)	Unknown	Favorable	Nearby airport and seaport	Limited	Limited	Limited	Highly Favorable	Highly Favorable	Favorable	N.A.	Unfavorable

TABLE I-2 (Continued)

COMPARATIVE STRENGTHS OF SEA/LAND LAUNCH LOCATIONS

Selected Launch Locations/ Sponsors (Existing And Potential)	Status	Operating Performance And Down Range Characteristics			Supporting Resources				Local Land Conditions				
		Position For Equatorial Launches	Position For Polar Launch	Range Safety Concerns	Access To Sea Lanes & Air Service	In-Place Communications Network	Available Skilled Labor & Training Facilities	Infrastructure--Power, Roads, Sewer, Etc.	Unpopulated Areas	Available Land for Expansion	Reliable Weather	Geologic Stability	Quality Living/ Working Environment
Indonesia	Java Launch Site	ADDITIONAL INFORMATION TO BE INCLUDED IN FINAL REPORT											
Singapore	No current plans for launch facilities												
India	Sriharikota launch site												
China	East wind range operational	Unfavorable (40° N. Lat.)	Unknown			In-place/being developed	Adequate to meet current needs	In-place/being developed	Favorable	Favorable	Unknown	Unknown	Unknown
Brazil	Interested in cooperative development of Space Port	Favorable	Unknown										
Christmas Island	Launch site considered in past	Highly Favorable	Favorable	Highly Favorable	Limited	Limited	Limited	Limited	Favorable	Limited	Favorable	Unknown	Unfavorable

TABLE I-2 (Continued)

COMPARATIVE STRENGTHS OF SELECTED LAUNCH LOCATIONS

Selected Launch Locations/ Sponsors (Existing And Potential)	Status	Operating Performance And Down Range Characteristics: Position For Equatorial Launches	Position For Polar Launch	Range Safety Concerns	Supporting Resources: Access To Sea Lanes & Air Service	In-Place Communications Network	Available Skilled Labor & Training Facilities	Infrastructure--Power, Roads, Sewer, Etc.	Local Land Conditions: Unpopulated Areas	Available Land for Expansion	Reliable Weather	Geologic Stability	Quality Living/ Working Environment
United Ctr.	Kennedy (28° N. (Operational)	Some limits (at.)	Unfavorable	Favorable	Favorable	Favorable Favorable	Highly	In-place self-contai	Large site: ned	Favorable ture,	Tempera- lightening, hurricane limitations	Favorable	Favorable States Space
	Vandenburg AFB	Unfavorable (34° N. lat.)	Favorable	Some limitations	Favorable	Favorable	Highly Favorable	In-place	Large site: self-contai ned	Favorable	Favorable	Class 4 Seismic Risk Zone	Favorable
	Wallops Island	Unfavorable	Unfavorable	Limitation	Favorable	Favorable	Favorable	In-place	Near tourist resort	Limited	Lightening, temperature	Favorable	Favorable

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Jan. 18, 1991

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MOYER PROPOSES EXPANSION OF ALASKA'S ROLE IN SPACE EXPLORATION

JUNEAU--Fairbanks Rep.-elect Tom Moyer today introduced a measure designed to enable Alaska, and especially the Interior, to take advantage of the growing international space industry and develop new jobs for Alaskans in science and research, applied technology, telecommunications, construction and tourism.

Moyer's bill would create an Alaska Spaceport Authority to encourage space-related development, such as attracting to Alaska new businesses that supply and depend on commercial and government launches, expand tourist interest in space exploration and solicit federal grants and projects. The bill also calls for improvement of the Poker Flat Research Range north of Fairbanks and recognizes the key role it, as the nation's only high-latitude and auroral zone rocket launch facility, plays in U.S. space research.

"Alaska already is a recognized leader in several scientific fields and we could be in new space commerialization as well," Moyer said. "This bill proposes a focused approach to developing Alaska's potential in space. It would create immediate jobs and help establish a permanent new industry in Alaska."

-MORE-

THE NEW YORK TIMES **SCIENCE** TUESDAY, MAY 23, 1989

For Cheap, Versatile Spacecraft, Designers Discover Less Is More

By WILLIAM J. BROAD

Swarms of flexible mini-satellites could replace behemoths in orbit.

The bigger the better, a law of satellite design for more than three decades, is being challenged as advances in miniaturization allow engineers to build unmanned spacecraft that are smaller, lighter, cheaper and smarter than ever before.

A dozen of the pint-sized satellites are to be launched in the next few years, mainly to test the promise of the miniaturized approach. If the work is judged successful, experts say, hundreds of small satellites could dot the heavens by the end of the 1990's, providing new benefits to science, industry and the military.

Although they are usually of more limited use than their larger cousins, small satellites are seen as attractive because of their low cost, flexibility and ease of construction.

"This is a revolution in the making," said Scott Webster, vice president of the Orbital Sciences Corporation, a rocket company based in Fairfax, Va., that has orders to loft six small satellites and is negotiating contracts to fire a dozen more into space.

The new satellites typically weigh 500 pounds or less, measure two to five feet long, and cost from $1 million to $8 million. Conventional satellites are bigger in every way. They can weigh up to 15 tons, cost hundreds of millions of dollars and be the size of a city bus, with solar panels and antennas extending 100 feet or more.

Mini-satellites are being built or have been proposed to photograph the Earth, to relay data, to process materials in space, to hunt for sources of radio interference, and to map the Sun's magnetic field.

The switch to small satellites is being fueled by advances in the miniaturization of parts, the availability of new low-cost rocket launchers, and basic changes in the philosophy that has guided satellite design since the dawn of the space age.

The military, for instance, is questioning its reliance on giant satellites, which are now being seen as tempting targets for anti-satellite weapons during war.

Jerry Grey, director of science and technology policy for the American Institute for Aeronautics and Astronautics, a professional society based in Washington, said the Pentagon's concern was crystallized in recent years by Milstar, a five-ton communications satellite now under development that is scheduled to be launched in the 1990's.

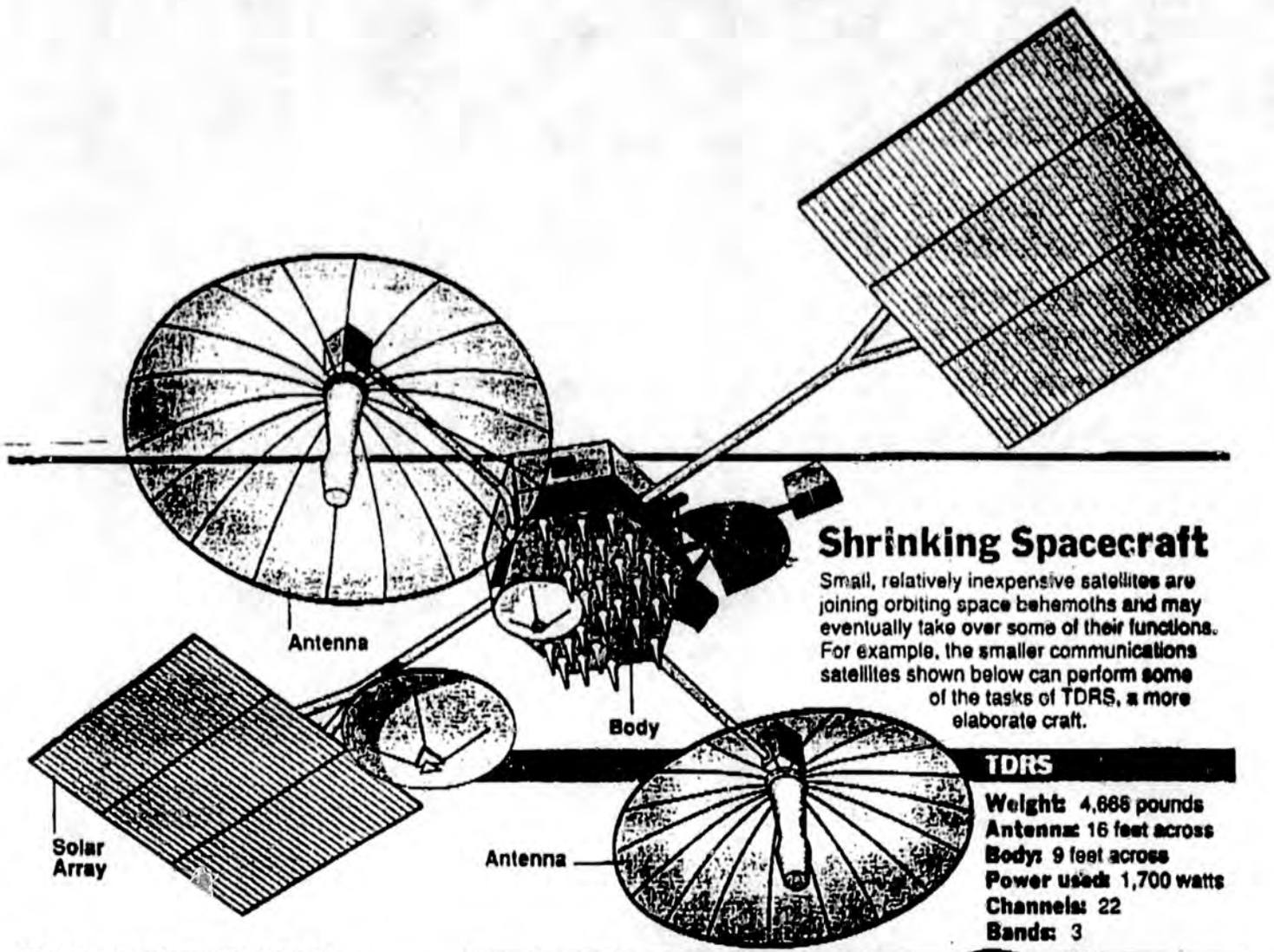
"They said, 'My God! We're putting all this capability into a satellite that can be shot down,'" Mr. Grey recalled. The military now says it is investigating small satellites to com-

plement, not replace, its larger craft.

In a different philosophical shift, the National Aeronautics and Space Administration has embraced small satellites partly out of frustration with billion-dollar behemoths that can take a decade or more to get into space. Some NASA scientists now envision a not-so-distant future in which experiments would be performed by swarms of tiny satellites, each the size of a coffee can, all working on the same experiment.

The bigger-is-better ethic began in the early days of the space age. The world's first artificial satellite, Sputnik 1, launched by the Soviet Union on Oct. 4, 1957, weighed 184 pounds. Sputnik 2 weighed 1,120 pounds and Sputnik 3 weighed 2,926 pounds. Because the costs of launching any object into space were usually

Continued on Page 22



Shrinking Spacecraft

Small, relatively inexpensive satellites are joining orbiting space behemoths and may eventually take over some of their functions. For example, the smaller communications satellites shown below can perform some of the tasks of TDRS, a more elaborate craft.

TDRS

Weight: 4,666 pounds
Antenna: 16 feet across
Body: 9 feet across
Power used: 1,700 watts
Channels: 22
Bands: 3

BGS-400 SATELLITE

Weight: up to 1,000 pounds
Antenna: 10.5 feet across
Body: 6 feet across
Power used: 400 watts
Channels: up to 10
Bands: 1

BGS-100 SATELLITE

Weight: up to 400 pounds
Antenna: 10.5 feet across
Body: 6 feet across
Power used: 400 watts
Channels: up to 10
Bands: 1

Source: TRW Inc., Ball Space Systems

The New York Times/Steve Hart/May 23, 1989

In Spacecraft Less Becomes More

Continued From Page 21

very large, the tendency was to try to pack as much payload as possible atop a rocket and to develop even larger rockets so economies of scale would help lower launching costs.

The United States followed the trend, albeit more slowly than the Soviet Union. Its first satellite, Explorer 1, launched on Jan. 31, 1958, weighed 10 pounds. In 1960, the first American weather satellite weighed 268 pounds. In the 1970's, American satellites regularly began to weigh more than a ton, including probes to distant planets. By the 1980's, some military spy satellites were said to weigh 15 tons and have antennas nearly as large as a football field.

Today, experts say, American and Soviet satellites are generally similar in size, with the exception of some American military satellites, which tend to be bigger and more costly than Soviet models. In addition, American satellites are often more capable than Soviet craft because of advanced components.

Lower Power Demands

The continuing advance of Western technology has allowing the move to smaller satellites, particularly in electronics, where computer chips are doing more in smaller areas. All the main operations on a satellite — guidance, communications and data storage — can now be achieved with electronic parts that are rapidly shrinking in size and drawing less electricity.

"Advanced electronics allow you to do things in a much smaller satellite that previously you couldn't do at all or do only on a much larger vehicle," said Eric J. Hoffman, a small-satellite designer at the Applied Physics Laboratory of Johns Hopkins University. So too, Dr. Hoffman added, arrays of solar-electric cells can now put out twice the power they originally did, allowing smaller arrays to be used.

Another technical factor fueling the move to small satellites is the advent of low-cost rocket launchers that are specifically designed to carry lightweight payloads. The most innovative is Pegasus, a winged rocket designed to be launched from an airplane. It is a joint venture of Orbital Sciences and the Hercules Aerospace Company of Magma, Utah.

The winged rocket's use of lightweight graphite rocket casings and wings, as well as miniaturized electronics, allow it to lift payloads of up to 900 pounds into low orbits.

Its first flight is set for August. The rocket will be dropped from a B-52 bomber and then speed into space with three payloads: a Defense Department satellite weighing 90 pounds, a NASA instrument package weighing about 40 pounds, and a 320-pound NASA experiment in which the satellite will release chemicals so scientists can study how they react with the ionosphere.

"The beauty of the small satellite concept is that it opens doors," said Mr. Webster of Orbital Sciences. "A university or company can put a payload into orbit for $10 million or less, including launch. Suddenly, space isn't an exclusive game any more."

Possible Military Uses

Although commercial and university users are exploring small satellites, the main player has been the military, particularly the Defense Advanced Research Projects Agency, which sponsors innovative research for the armed forces. The agency's "lightsat" program, which began in 1987, is envisioned as a five-year effort to demonstrate lightweight satellite technology for a variety of possible military uses.

> 'Space isn't an exclusive game any more,' a rocket executive said.

The defense agency, the first paying customer for the Pegasus rocket, is a pioneer in the development of small satellites. Last year it awarded a $7.4 million contract to Defense Systems Inc., based in McLean, Va., to build a constellation of eight "microsats," extremely small ultra-high-frequency communication satellites meant to relay data. These are to be launched on the second Pegasus flight, now scheduled for October.

More recently, the Navy has joined the field, starting construction of four 150-pound satellites scheduled to be launched this fall. The craft are to explore the feasibility of small-scale telecommunications, data recording, reconnaissance, and pinpointing of radio frequency interference.

Like the military, commercial users are starting to explore small satellites for communications, remote sensing of the Earth and the processing of materials like space crystals.

For instance, Ball Aerospace is working on a new generation of small communication satellites that would orbit 22,300 miles above the earth. One version, the BGS-100 satellite, would weigh about 300 pounds and cost as little as $5 million. Conventional communication satellites can weigh tons and cost $100 million or more.

Responding to Customer Demand

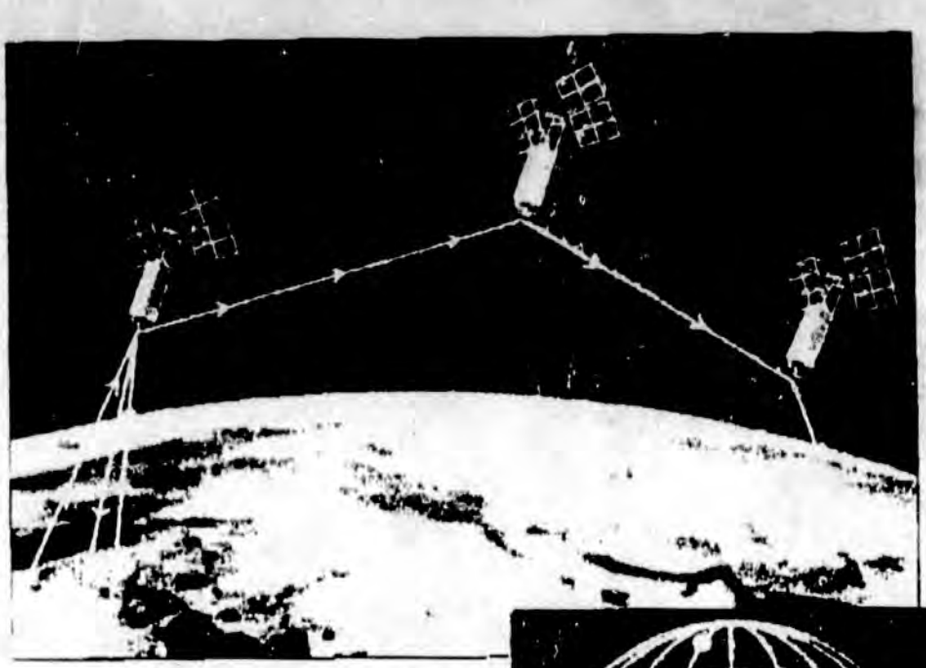
The small satellite, although it could not achieve the long lifetimes or economies of scale of larger craft, would have increased flexibility to meet changing markets, said James R. Stuart, chief scientist for the space systems division of Ball Aerospace, based in Boulder, Colo.

Large satellites with lifetimes of 10 or 15 years often go only partly used. For example, some use frequencies that were up to date when they were launched but later became outdated. Others cover areas like Europe, which has so many satellites over it that communication channels go unused; meanwhile, some countries without the money to launch large satellites have inadequate communication facilities. Further, smaller satellites can better respond to rapid shifts in technology and customer demand.

NASA has also recently entered the field, last year calling for proposals for scientific satellites in a program known as the small explorer. The goal is to develop and launch the craft within three years of project approval, a rapid pace compared with big NASA projects.

Ross M. Jones, a spacecraft systems engineer at NASA's Jet Propulsion Laboratory in Pasadena, Calif., said that in the near future "very advanced technology" will allow the construction of even tinier satellites, perhaps weighing 25 pounds or less. Clusters of four of these satellites, he said, could map the charged particle environment around Earth, while a fleet of 24 could exhaustively map the magnetic fields and charged particles around the sun.

"The technology isn't available yet," Dr. Jones said, "but it's around the corner."



Motorola Inc.

The Iridium 77 system from Motorola Inc. will consist of 77 small satellites — lightsats — which will be boosted into low earth orbit.

because of improvements in electronics, he said.

One drawback to small satellites is that they must typically be used in low earth orbit — about 400 miles up, compared with 22,000 for a large satellite — because their size limits the broadcast power they can carry. So unlike a large satellite that remains in place on an orbit synchronized with the earth's rotation, small satellites travel from horizon to horizon in about 10 minutes.

"They come and go like streetcars, and you have to track each one," said Mr. Moore. "That's a whole lot more complex than having a bird up in geosynch where you can have one big antenna keeping track," he said. But he added that the lower cost and the spreading of risk across multiple satellites compensate for the increased complexity.

Another advantage is the reduced time from design to orbit. Whereas a large satellite can take 10 to 15 years to reach completion, lightsats make the journey from initial concept to outer space in three to four years. The military likes the reduced time to space too, and, through the Defense Advanced Research Projects Agency has been a major proponent of light satellites. DARPA officials say that the tactical use of very small satellites during ground-based conflicts in places like Panama or the Middle East, could be possible within three or four years. DARPA will launch seven 47-pound "microsats," made by Defense Systems Inc. of McLean, Va., on the next Pegasus, scheduled for January.

"Our perspective is that small satellites have a role in our overall space architecture," said Air Force Lt. Col. Edward D. Nicastri, the director of DARPA's Advanced Space Technology Program. "But we need to really get the technology moving to make that role a significant one," he said.

While microprocessors and custom integrated circuits have dramatically reduced the size and power consumption of satellite components, further advances are necessary, he said. "I need to put a Cray in a soup can," he said, referring to the most powerful of supercomputers.

In DARPA's concept, small tactical satellites could provide reconnaissance to individual commanders in the field, sending images and information via portable computers.

BUT the most significant boost to the small satellite business could come from Brilliant Pebbles, a proposal of the Strategic Defense Initiative which would place thousands of small satellites in orbit to act as interceptors of enemy missile fire. In addition, the Los Alamos National Laboratory is studying the use of a network of small satellites carrying sensors to verify arms control agreements.

While most small satellites have been low orbit devices, some scientists are now considering their use for planetary missions, perhaps even as delivery vehicles for "minirovers" to explore the surface of Mars or other planets. One NASA project will send mice into a high orbit to study long-term effects of radiation and weightlessness.

"It is now possible to think about doing some really intriguing science with very small projects," said David Thompson, president and chief executive of Orbital Sciences. "Small satellites can go any place a big satellite can go." ■

Technology

The Lure of Small Satellites

By LAWRENCE M. FISHER

SAN FRANCISCO

INCREASED demand from the telecommunications industry, the military and meterologists is fueling a rebirth of the small satellite. Less costly and quicker from drawing board to orbit than large satellites, "lightsats" are scheduled to be launched in record numbers over the next ten years.

Lightsats typically weigh less than 500 pounds, compared with 5,000 pounds for a large satellite. Typical costs are an order of magnitude lower as well, about $20 million against $200 million. The trade-off is capability: lightsats simply cannot do as many things as large satellites can. But lightsats are gaining in capability all the time, and for many applications they offer increased flexibility and lower cost, scientists say.

In the early days of space exploration all satellites were lightsats. Sputnik 1, launched by the Soviet Union on Oct. 4, 1957, weighed 184 pounds; the United States' first satellite, Explorer 1, launched on Jan. 31, 1958, weighed just 10 pounds. But, given the high cost of any launching, the temptation was always to include as many functions in one satellite as possible; launch vehicles got bigger and so did satellites.

Launching small satellites with large rockets is not financially practical, unless each rocket carries several at once, which presents its own set of problems. Until the birth of the commercial space-launch industry and the development of new, smaller launch rockets, small satellite developers had only limited access to space.

After years in the shadow of their behemoth kin, diminutive 'lightsats' are back.

"There's always been a latent desire to get some small things into space," said Robert B. Pincus, head of the systems development office at the National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Md. "The problem was there weren't any viable vehicles to do the job at a reasonable rate," he said. "The successful launching of the Pegasus in April jump-started the rebirth of the small sats and the lightsats," he said.

Pegasus, which was jointly developed by the Orbital Sciences Corporation of Fairfax, Va., and the Hercules Aerospace Company of Magma, Utah, is a winged rocket which is launched from an airplane. At $7 million to $8 million per launching, compared with $60 million to $70 million for a Delta rocket launching, Pegasus provides "a relatively low-cost vehicle to launch relatively low-cost satellites," Mr. Pincus said.

If Pegasus provided the means, science and industry rapidly found the motivation for putting small objects in space. Perhaps the greatest boost to the burgeoning lightsat field has come from Motorola Inc., which has proposed putting a constellation of 77 lightsats in orbit to relay telephone calls to and from mobile phone users. Motorola plans to produce the satellites for this network, dubbed Iridium, on what it calls the "world's first high-volume satellite production line."

Most of the manufacturers of lightsats are small entrepreneurial companies, which are more geared to producing low-cost devices than are the traditional aerospace concerns. Even if these companies do not realize any revenue from Iridium, they expect it to lend their efforts new of credibility.

IRIDIUM "is the first big evidence of faith in small spacecraft. It will drive the field," said R. Gilbert Moore, an adjunct professor of physics at the University of Utah and program chairman of the 4th Annual Conference on Small Satellites, held late last month in Logan. "The small spacecraft today has enormous capabilities compared with similar size birds of 20 years ago," primarily