COMMERCIAL SPACE TRANSPORTATION

(111–78)

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

December 2, 2009

Printed for the use of the Committee on Transportation and Infrastructure

U.S. GOVERNMENT PRINTING OFFICE

53–802 PDF WASHINGTON : 2009

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

JAMES L. OBERSTAR, Minnesota, *Chairman*

NICK J. RAHALL, II, West Virginia, *Vice Chair*
PETER A. DEFAZIO, Oregon
JERRY F. COSTELLO, Illinois
ELEANOR HOLMES NORTON, District of Columbia
JERROLD NADLER, New York
CORRINE BROWN, Florida
BOB FILNER, California
EDDIE BERNICE JOHNSON, Texas
GENE TAYLOR, Mississippi
ELIJAH E. CUMMINGS, Maryland
LEONARD L. BOSWELL, Iowa
TIM HOLDEN, Pennsylvania
BRIAN BAIRD, Washington
RICK LARSEN, Washington
MICHAEL E. CAPUANO, Massachusetts
TIMOTHY H. BISHOP, New York
MICHAEL H. MICHAUD, Maine
RUSS CARNAHAN, Missouri
GRACE F. NAPOLITANO, California
DANIEL LIPINSKI, Illinois
MAZIE K. HIRONO, Hawaii
JASON ALTMIRE, Pennsylvania
TIMOTHY J. WALZ, Minnesota
HEATH SHULER, North Carolina
MICHAEL A. ARCURI, New York
HARRY E. MITCHELL, Arizona
CHRISTOPHER P. CARNEY, Pennsylvania
JOHN J. HALL, New York
STEVE KAGEN, Wisconsin
STEVE COHEN, Tennessee
LAURA A. RICHARDSON, California
ALBIO SIRES, New Jersey
DONNA F. EDWARDS, Maryland
SOLOMON P. ORTIZ, Texas
PHIL HARE, Illinois
JOHN A. BOCCIERI, Ohio
MARK H. SCHAUER, Michigan
BETSY MARKEY, Colorado
PARKER GRIFFITH, Alabama
MICHAEL E. MCMAHON, New York
THOMAS S. P. PERRIELLO, Virginia
DINA TITUS, Nevada
HARRY TEAGUE, New Mexico
JOHN GARAMENDI, California

JOHN L. MICA, Florida
DON YOUNG, Alaska
THOMAS E. PETRI, Wisconsin
HOWARD COBLE, North Carolina
JOHN J. DUNCAN, JR., Tennessee
VERNON J. EHLERS, Michigan
FRANK A. LOBIONDO, New Jersey
JERRY MORAN, Kansas
GARY G. MILLER, California
HENRY E. BROWN, JR., South Carolina
TIMOTHY V. JOHNSON, Illinois
TODD RUSSELL PLATTS, Pennsylvania
SAM GRAVES, Missouri
BILL SHUSTER, Pennsylvania
JOHN BOOZMAN, Arkansas
SHELLEY MOORE CAPITO, West Virginia
JIM GERLACH, Pennsylvania
MARIO DIAZ-BALART, Florida
CHARLES W. DENT, Pennsylvania
CONNIE MACK, Florida
LYNN A WESTMORELAND, Georgia
JEAN SCHMIDT, Ohio
CANDICE S. MILLER, Michigan
MARY FALLIN, Oklahoma
VERN BUCHANAN, Florida
ROBERT E. LATTA, Ohio
BRETT GUTHRIE, Kentucky
ANH "JOSEPH" CAO, Louisiana
AARON SCHOCK, Illinois
PETE OLSON, Texas

Subcommittee on Aviation

JERRY F. COSTELLO, Illinois, *Chairman*

RUSS CARNAHAN, Missouri
PARKER GRIFFITH, Alabama
MICHAEL E. McMAHON, New York
PETER A. DeFAZIO, Oregon
ELEANOR HOLMES NORTON, District of Columbia
BOB FILNER, California
EDDIE BERNICE JOHNSON, Texas
LEONARD L. BOSWELL, Iowa
TIM HOLDEN, Pennsylvania
MICHAEL E. CAPUANO, Massachusetts
DANIEL LIPINSKI, Illinois
MAZIE K. HIRONO, Hawaii
HARRY E. MITCHELL, Arizona
JOHN J. HALL, New York
STEVE COHEN, Tennessee
LAURA A. RICHARDSON, California
JOHN A. BOCCIERI, Ohio, *Vice Chair*
NICK J. RAHALL, II, West Virginia
CORRINE BROWN, Florida
ELIJAH E. CUMMINGS, Maryland
JASON ALTMIRE, Pennsylvania
SOLOMON P. ORTIZ, Texas
MARK H. SCHAUER, Michigan
VACANCY
JAMES L. OBERSTAR, Minnesota *(Ex Officio)*

THOMAS E. PETRI, Wisconsin
HOWARD COBLE, North Carolina
JOHN J. DUNCAN, Jr., Tennessee
VERNON J. EHLERS, Michigan
FRANK A. LoBIONDO, New Jersey
JERRY MORAN, Kansas
SAM GRAVES, Missouri
JOHN BOOZMAN, Arkansas
SHELLEY MOORE CAPITO, West Virginia
JIM GERLACH, Pennsylvania
CHARLES W. DENT, Pennsylvania
CONNIE MACK, Florida
LYNN A. WESTMORELAND, Georgia
JEAN SCHMIDT, Ohio
MARY FALLIN, Oklahoma
VERN BUCHANAN, Florida
BRETT GUTHRIE, Kentucky

CONTENTS

Page

Summary of Subject Matter vi

TESTIMONY

Dillingham, Dr. Gerald, Director, Physical Infrastructure Issues, U.S. Government Accountability Office 4
Greason, Jeffrey, CEO, XCOR Aerospace and Vice President, Commercial Spaceflight Federation 4
Nield, George C., Associate Administrator, Office of Commercial Space Transportation, Federal Aviation Administration 4
Stevens, J.P., Vice President, Space Systems, Aerospace Industries Association of America, Inc. 4
Testwuide, James A., Chairman, The Great Lakes Aerospace Science and Education Center at Spaceport Sheboygan, Wisconsin, testifying on Behalf of the Wisconsin Aerospace Authority, accompanied by Mark C. Hanna, Vice President, Wisconsin Aerospace Authority 4

PREPARED STATEMENTS SUBMITTED BY MEMBERS OF CONGRESS

Costello, Hon. Jerry F., of Illinois 21
Johnson, Hon. Eddie Bernice, of Texas 27
Mitchell, Hon. Harry E., of Arizona 31
Oberstar, Hon. James L., of Minnesota 32
Richardson, Hon. Laura, of California 37

PREPARED STATEMENTS SUBMITTED BY WITNESSES

Dillingham, Dr. Gerald 41
Greason, Jeffrey 61
Nield, George C. 67
Stevens, J.P. 81
Testwuide, James A. 86

U.S. House of Representatives
Committee on Transportation and Infrastructure

James L. Oberstar
Chairman

Washington, DC 20515

John L. Mica
Ranking Republican Member

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

James W. Coon II, Republican Chief of Staff

November 30, 2009

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Aviation

FROM: Subcommittee on Aviation Staff

SUBJECT: Hearing on "Commercial Space Transportation"

PURPOSE OF HEARING

The Subcommittee on Aviation will meet on Wednesday, December 2, 2009, at 10:00 a.m., in room 2167 of the Rayburn House Office Building to receive testimony regarding "Commercial Space Transportation."

BACKGROUND

Since the first licensed commercial spaceflight, Starfire, launched in 1989, there has been an increased interest in commercial space[1] transportation. To date, commercial space transportation has utilized private launch vehicles to transport items, such as satellites, into space, and civilian space tourism. Another factor playing into the focus on commercial space transportation is that the U.S. space shuttle fleet is expected to retire in 2010, leaving the United States without vehicles to transport cargo and astronauts.[2] Should this occur, the United States may be forced to rely on other nations, such as Russia, to provide resources to facilitate travel, leaving the security of the United States at risk and causing it to potentially lose its role as the world's leader in space exploration.

While commercial space transportation may be a solution to the problems facing the U.S. space program, it may also be the long-awaited answer for private citizens seeking to travel into space. In 2001, Dennis Tito became the first space tourist when he traveled with the Russians to the

[1] Because it is hard to ascertain where the Earth's atmosphere ends and space begins, the artificial altitude to define the edge of space is 100 kilometers or 62.5 miles above mean sea level.
[2] U.S. Human Spaceflight Plans Report, *Seeking a Human Spaceflight Program Worthy of a Great Nation* (October 2009).

International Space Station (ISS) at a cost of over $20 million.[3] Since this time, private companies have worked to make space tourism more affordable. To date, Virgin Galactic's SpaceShipTwo, and its counterpart launch vehicle, the WhiteKnightTwo, have garnered great interest with their debut at the Oshkosh Air Show in July 2009. According to Virgin Galactic, it has over 300 space tourism reservations for its eight-seat vehicle, which is expected to be unveiled later this month.

While there is excitement surrounding the possibilities for commercial space transportation, the technology and the industry are very new and somewhat untested. According to the Federal Aviation Administration (FAA),[4] since 1989, there have been 19 launch failures (equal to 9.5 percent), meaning a launch that had to be aborted, experienced anomalies, or there were problems that did not justify it proceeding.[5] In the last eight years, the rate has improved significantly with only two failures in 61 launches, or 3.3 percent.[6]

The FAA is responsible for safety, industry promotion, and licensure of operations for commercial space launches and launches sites. As the number of launches is only expected to increase with the development of the U.S. commercial space tourism industry and potential use of private launch vehicles by the National Aeronautics and Space Administration (NASA), it is imperative that the FAA has the proper resources to ensure that the new technologies and programs safely evolve.

I. FAA Safety Oversight

Since 1984, Congress has passed several laws to facilitate commercial space transportation development.[7] Congress gave the Department of Transportation (DOT) the responsibility for regulating and assisting commercial launches in 1984. DOT's mission is to "ensure the protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch and reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation."[8] This function is performed through the FAA Office of Commercial Space Transportation (AST). AST regulates the commercial space transportation industry; ensures compliance with international obligations; protects the public's health and safety, and the safety of property; ensures U.S. national security and foreign policy interests; promotes commercial space launches and reentries by the private sector; and facilitates the strengthening and expansion of space transportation infrastructure. In anticipation of increased commercial space transportation activities, AST recently hired an additional 12 aerospace engineers to meet licensing demands.

---

[3] Seven people have paid millions of dollars to travel to the ISS with the Russians through Space Adventures, a U.S.-based company.

[4] According to the FAA, AST has licensed 200 commercial space launches since the first licensed launch of a Starfire vehicle in 1989. The first commercially-manned launch license was issued in 2004 to Scaled Composites for SpaceShipOne.

[5] Statement of Marion C. Blakey, Former Administrator of the FAA, Hearing before the House Aviation Subcommittee (Feb. 9, 2005).

[6] There have been no fatalities, serious injuries, or significant property damage as result of commercial space launches.

[7] *See* the 1984 Commercial Space Launch Act, the 1988 Commercial Space Launch Act Amendments, the 1998 Commercial Space Act, and the 2004 Commercial Space Launch Amendments Act.

[8] FAA Briefing to Aviation Subcommittee Staff (Nov. 20, 2009).

a. Launch Licensing

An AST license is required for operators seeking launch or to reentry into the United States and for U.S. citizens seeking launch or reentry outside the country. FAA performs its safety oversight function by issuing the following four types of licenses:

- Launch license for an expendable launch vehicle, which is an unmanned, single-use rocket usually used to launch a payload into space;
- Mission license for a reusable launch vehicle, which is a vehicle capable of being launched into space more than once;
- Reentry license, for reentry of the vehicle into the U.S. airspace; and
- Launch or reentry site operator license, which approves spaceport operations.[9]
- Experimental permits are issued for research and development to test new design concepts, new equipment, or new operating techniques; showing compliance with requirements as part of the process for obtaining a license; or crew training prior to obtaining a license for a launch or reentry using the design of the rocket for which the permit would be issued.[10]

AST licenses commercial space transportation launches based on a safety risk assessment of the operations, but does not certify the aircraft as it does with civil aviation. In conducting a launch hazard assessment, AST considers whether the launch is over the ocean or densely populated areas. AST issues a license if it determines, through its review process, that "an applicant's launch or reentry proposal will not jeopardize public health and safety, the safety of property, or conflict with U.S. national security or foreign policy interests and obligations."[11]

b. Spaceport Licensing

To launch a commercial space transportation vehicle in the United States, operations at the launch site, otherwise known as a "spaceport", must be licensed by AST. Currently, there are seven spaceports in the in the United States with an AST launch site operator's license: Kodiak Launch Complex in Alaska, California Spaceport, Mojave Airport in California, Spaceport America in New Mexico, Oklahoma Spaceport, Cape Canaveral Air Force Station in Florida, and the Mid-Atlantic Regional Spaceport in Virginia. There are six Federal launch sites: Vandenberg Air Force Base (AFB), Edwards AFB, White Sands Missile Range, Wallops Flight Facility, Reagan Missile Test Site in the Marshall Islands, and Kennedy Space Center. Lastly, according to the Government Accountability Office (GAO) there are eight proposed spaceports in development.[12] FAA/AST works closely with NASA and the Air Force to establish safety oversight for both government and private launch facilities.

---

[9] A spaceport is a launch site for a commercial space transportation vehicle.

[10] FAA, *Experimental Permits for Reusable Suborbital Rockets* (updated Jun. 3, 2009) available at http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/sub_orbital_rockets/.

[11] *See supra* note 4, at 3.

[12] Spaceport Washington, Wisconsin Spaceport, Spaceport Alabama, South Texas Spaceport, West Texas Spaceport, Cecil Field in Florida, and Shugwater Spaceport in Wyoming.

c. Human Spaceflight Safety Requirements

In 2006, FAA finalized regulations pertaining to commercial space launch and reentry safety requirements for crew and participants (i.e., passengers). Pilots must hold an FAA pilot certificate with an instrument rating; possess aeronautical knowledge, experience, and skills necessary to pilot and control the launch or reentry vehicle; receive vehicle and mission-specific training for each phase of flight; and receive training in procedures to direct the vehicle away from the public in the event of the flight crew abandoning the vehicle.[13] The operator is required to train each crewmember and define standards for successful completion of training. Further, each crew member with a safety-critical role must possess and carry an FAA second-class airman medical certificate. The crew must also receive training on ensuring the vehicle will not harm the public and abort scenarios. Importantly, the flight crew must demonstrate the ability to withstand the stresses of space flight, which may include simulation of spaceflight conditions.

d. Indemnification[14]

The current commercial space insurance relies on a risk-sharing system to address exposure of companies providing AST-licensed commercial launch services to third party liability resulting from launch-related activities. The company pays for liability insurance as required by the DOT up to $500 million.[15] The U.S. government, subject to appropriations, pays up to $1.5 billion (indexed for inflation since 1989) for claims that exceed the insurance coverage.[16] Any additional claims are the responsibility of the licensee or the party found to be liable in the event of an accident.

According to the space industry, commercial space launch indemnification helps protect U.S. commercial launch services providers against catastrophic third-party liability claims resulting from FAA-licensed launch activities. U.S. launch providers also state that indemnification is needed to keep the U.S. industry competitive, since foreign governments provide similar indemnification coverage. However, the U.S. industry has recommended removing the $1.5 billion cap and eliminating the statute's sunset provision. The Aerospace Industries Association states that the "Congress must approve such payment and appropriate funding to implement it only if and when a claim is made."[17]

Current U.S. indemnification expires December 31, 2009; it has been renewed four times since 1988. House Science Committee Chairman Bart Gordon introduced H.R. 3819, to extend indemnity for three years. The House passed it under suspension of the rules by voice vote on October 20, 2009. No Senate action has taken place at this time.

II. Promoting Commercial Space Industry

In addition to safety oversight, AST/FAA is tasked with promoting commercial space transportation. To this end, AST participates in promotional activities such as publishing economic impact studies on the industry, sponsoring an annual industry forecast conference, publishing

---

[13] 14 C.F.R. § 460.5 (2009).
[14] "Indemnification" is catastrophic loss protection in the event of a launch accident.
[15] 49 U.S.C. § 70112 (a)(3).
[16] 49 U.S.C. § 70113 (a)(1).
[17] Aerospace Industries Association, *Continuing U.S. Commercial Space Launch Indemnification* (Oct. 20, 2009).

industry studies, and conducting outreach to potential launch companies. AST also consults with industry through its advisory group, the Commercial Space Transportation Advisory Committee (COMSTAC), which provides advice and recommendations to the FAA Administrator. The Advisory Committee consists of the commercial space industry, government officials, non-profit groups, and trade associations.

In the past, some have expressed concern with the potential conflict between FAA safety oversight and promoting the commercial space industry. In November 2008, the Aerospace Corporation, George Washington University, and the Massachusetts Institute of Technology issued a report to Congress, *Analysis of Human Space Flight Safety (Nov. 11, 2008)*, which asked the question "Should the Federal Government separate the promotion of human space flight from the regulation of such activity?" The GAO previously underscored this point in its 2006 report, and stated, "[B]ecause FAA is a regulatory agency, it is important that its statutory responsibility to promote the commercial space launch industry not interfere with its safety oversight to the industry."[18] However, the 2008 study concluded, "There is no compelling reason to remove promotional responsibilities from FAA/AST at this time. The office is performing these duties adequately and has not yet encountered any conflicts of interest or received complaints on this issue."[19]

III. Future Outlook

a. Tourism

On June 21, 2004, Mike Melvill became the first person to reach space (on a suborbital flight) aboard a privately-funded launch vehicle, SpaceShipOne, designed by Scaled Composites. Mr. Melvill is sometimes referred as the first "commercial astronaut," but several representatives of commercial companies, and other private individuals, have flown in space. Mr. Melvill's flight is notable because SpaceShipOne was developed without government funding, and some hope it will usher in an era of "affordable" space tourism. SpaceShipOne raised the prospect of a U.S. commercial space transportation industry that would make human space travel available to the public. Virgin Galactic, which is planning to fly SpaceShipTwo, is taking reservations online for its proposed two-to-three hour trip. The price is $200,000 and deposits start at $20,000. Virgin Galactic is also proposing a Galactic Suite Space Resort where four guests at a time would be able to see the sun rise fifteen times a day while traveling around the Earth every 80 minutes. Though Virgin Galactic was originally supposed to begin operating by 2009, the intention to unveil its SpaceShipTwo this month is a sign of progress forward toward commercial space transportation human tourism.

To allow the industry to grow, Congress prohibited AST from regulating crew and passenger safety until 2012 except in response to high-risk events.[20] This requirement has caused some concern since the United States may launch a commercial space transportation flight prior to 2012. FAA regulations require that an operator must inform space flight participants prior to the flight in writing about the risks of the launch and reentry, including the safety record of the vehicle(s); the

[18] GAO, *Commercial Space Launches: FAA Needs Continued Planning and Monitoring to Oversee the Safety of the Emerging Space Tourism Industry* (Oct. 2006) at 40.
[19] The Aerospace Corporation, George Washington University, and the Massachusetts Institute of Technology, *Analysis of Human Space Flight Safety*, Report to Congress (Nov. 11, 2008) at viii.
[20] 49 U.S.C. § 70105(c)(2)(C).

potential hazards of death and serious injury; and that the U.S. Government has not certified the launch and reentry vehicles.[21] Regulations require operators to provide spaceflight participants with emergency training to respond to smoke, fire, loss of cabin pressure, and emergency exists.[22] In 2006, the GAO recommended that the FAA assesses its future safety oversight resource needs and identify the circumstances that would trigger passenger safety regulation before 2012.

The *Analysis of Human Space Flight Safety* asked the question of how to include nongovernmental experts in setting standards and regulations concerning human space flight safety. The study concluded that the current safety procedures (i.e., AST licensing) for public, crew, and space flight participants during launch, in-space transit, orbit, and reentry are sufficient at the current time. The report also stated that even though the National Transportation Safety Board has agreements with the FAA and the U.S. Air Force under which it would lead investigations of commercial space launch accidents, it does not explicitly have that authority now, which may cause overlapping jurisdictions in the future.

b. U.S. Human Spaceflight Plans Committee

The White House Office of Science and Technology Policy formed the U.S. Human Spaceflight Plans Committee, headed by Norm Augustine, to examine the future of human spaceflight since there is expected to be a five year gap between the retirements of the U.S. space shuttle fleet and when the next U.S. reusable launch vehicle will be operational. The report recommends a new U.S. capability to support utilization of the ISS and stimulate commercial space flight capabilities. The report observed that a "burgeoning commercial space industry" existed and that "if we craft a space architecture to provide opportunities to this industry, there is the potential . . . that the costs to the government would be reduced."[23] The report also stated that "United States needs a means of launching astronauts to low-Earth orbit, but it does not necessarily have to be provided by the government."[24]

The report continued that commercial space transportation could include, "the supply of cargo to the ISS, and transport of crew and fuel to orbit. Establishing these commercial opportunities could increase launch volume and potentially lower costs to [the National Aeronautics and Space Administration]."[25] To this end, NASA has already awarded two commercial space transportation companies $3.5 billion to develop reusable launch vehicles to take cargo to the ISS. This might be the best opportunity for the commercial space transportation industry to develop and expand in the near future.

CONCLUSION

According to the FAA, in the next two-to-three years, it is likely that the U.S. space shuttle fleet will be retired, commercial cargo will be delivered to the ISS, and commercial human space flight operations will begin. If these predictions are true, there are additional issues that the United States needs to address and consider going forward. One issue is how commercial space flights and

[21] 14 C.F.R. § 460.45 (2009).
[22] 14 C.F.R. § 460.51 (2009).
[23] *Supra* note 2, at 9.
[24] *Supra* note 2, at 13.
[25] *Supra* note 2.

spaceports will impact air traffic control and the safe and effective use of the national airspace system (NAS). Another is ensuring passenger and crew safety. As the U.S. government moves towards the Next Generation Air Transportation System, it is important to consider all space transportation issues that might impact the NAS. Environmental impacts, such as noise and greenhouse gas emissions, will also play a role in commercial space, just as they do at U.S. airports and communities.

WITNESSES

Dr. George C. Nield
Associate Administrator for Commercial Space Transportation
Federal Aviation Administration

Dr. Gerald Dillingham
Director, Physical Infrastructure Issues
U.S. Government Accountability Office

Mr. J.P. Stevens
Vice President, Space Systems
Aerospace Industries Association of America, Inc.

Mr. Jeff Greason
Vice Chairman
Commercial Spaceflight Federation
President and Chief Executive Officer
XCOR Aerospace

Mr. James A. Testwuide
Chairman
The Great Lakes Aerospace Science
and Education Center at Spaceport Sheboygan
Testifying on behalf of the
Wisconsin Aerospace Authority

HEARING ON COMMERCIAL SPACE TRANSPORTATION

Wednesday, December 2, 2009

HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON AVIATION,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 2167, Rayburn House Office Building, the Honorable Jerry F. Costello [Chairman of the Subcommittee] presiding.

Mr. COSTELLO. The Subcommittee will come to order and the Chair will ask all Members, staff, and everyone to turn electronic devices off or on vibrate.

The Subcommittee is meeting today to hear testimony regarding commercial space transportation. I welcome all of our witnesses here today.

I will give a brief opening statement and then recognize the Ranking Member, Mr. Petri, for any remarks he would like to make or an opening statement.

I welcome everyone here to the Subcommittee hearing on commercial space transportation. It has been almost five years since this Subcommittee's last hearing on the topic, so it is important that we get an update from the FAA Safety Oversight on how the industry is evolving to ensure that the FAA has the proper resources.

I am very familiar with the emerging commercial space transportation industry, not only from my work on the House Science and Technology Committee, but also because the X Prize Foundation, which is well known for designing and managing public competitions for aviation and space, is located in St. Louis, Missouri, across the river from my congressional district.

Though commercial space transportation tourism has not led to regularly scheduled manned commercial spaceflights yet, Virgin Galactic is ready to unveil its eight seat SpaceShipTwo by the end of the month. Some Members of this Subcommittee saw its launch vehicle, WhiteKnightTwo, debut at the Oshkosh Air Show this past July.

One factor playing into the future of the commercial space transportation industry is the expectation that the U.S. Space Shuttle fleet will retire in 2010. The United States will be without vehicles to transport cargo and people for at least five years before the next U.S. launch vehicle will be operational. The reality is that the United States may have to rely on other countries to facilitate this

travel unless commercial space transportation is able to fill the gap.

Congress passed several laws to allow commercial space transportation to develop, so we must ensure that the industry has proper Federal safety oversight.

Since 1989, approximately 10 percent of launches have failed. But in the last eight years this number has improved to 3 percent. As the number of launches is expected to increase with commercial space tourism and the potential use of commercial space launch vehicles by NASA, the FAA must have the proper resources to ensure that new technologies and programs evolve safely.

I look forward to hearing from the FAA Associate Administrator for Commercial Space Transportation about the FAA's role in overseeing the commercial space industry to ensure the safety of the public, as well as the crew and spaceflight participants.

Commercial space transportation is also likely to have an impact on our air traffic control system, especially as the United States implements the next generation air transportation system. Today's low number of yearly launches allows the ATC to adjust the national airspace system to accommodate launch and reentry. For instance, if a commercial space transportation vehicle missed its reentry window, the ATC could briefly shut down the affected airspace. However, if the launch is increased in the future, civil aviation traffic may not allow the ATC the same flexibility and may require additional protocols incorporated in NextGen to keep the airspace safe.

As we implement NextGen, it is important to consider all space transportation issues that might impact the airspace. In addition to the impact on our ATC, the environment and our communities will be affected by increased commercial space tourism. Congress must guarantee that FAA has the tools it needs to ensure the safety of flight for both aircraft and launch vehicles, as well as to protect the environment from these activities. Currently, there are seven licensed spaceports in the United States; six federally launched sites and eight proposed spaceports in different degrees of development. Environmental impact such as noise and greenhouse gas emissions will play a role in commercial spaceports just as they do at U.S. airports and communities.

It is important for this Subcommittee to examine the issues associated with licensing these facilities and the role these facilities have in the United States.

With that, I welcome our witnesses here today and look forward to hearing their testimony.

Before I recognize the Ranking Member of the Subcommittee, Mr. Petri, for his remarks or opening statement, I ask unanimous consent to allow two weeks for all Members to revise and extend their remarks and to permit the submission of additional statements and materials by Members and witnesses. Without objection, so ordered.

The Chair now recognizes Mr. Petri for his comments or his opening statement.

Mr. PETRI. Well, Mr. Chairman, thank you for holding this important hearing. I requested this hearing because, although it rarely dominates the headlines, man's commercial space transportation

represents the future of cargo and passenger transportation in the United States and, in fact, around our globe.

A little more than five years ago, Scaled Composites SpaceShipOne became the first private spacecraft to launch more than 62 miles into space and return safely twice in two weeks with a pilot onboard. With this flight, the commercial space launch industry, formally focused on delivery if payloads into outer space, entered the next phase of its development, manned commercial space transportation.

The SpaceShipOne launches altered our vision of what the aviation system of the future will entail, including the development of space tourism, U.S. spaceports, rapid global transportation, and point-to-point commercial spaceflight services. It also raised new issues with regard to safe operations, impact analysis, and infrastructure development.

In 1984, Congress passed the Commercial Space Launch Act, which sought to encourage the development of the emerging commercial space launch industry and to facilitate compliance with Federal safety requirements. This Act gave FAA the authority to license commercial launches carrying crew and spaceflight participants or passengers. The Office of Commercial Spaceflight Transportation within the FAA oversees the safety of the commercial space launch industry through licensing and permitting activities.

Though there were only four commercial space launches in 2009, I suspect a lot of behind the scenes activity has gone into the goal of making manned commercial space transportation both routine and safe. Given that the last hearing on commercial space transportation held by this Subcommittee was, as you pointed out, Mr. Chairman, in 2005, I am very interested to get an update today on this important transportation sector.

As the industry grows and develops, other issues will require this Committee's attention, including, first, the impact of commercial space launches on the management of the air traffic control system; second, the role of the FAA in spaceport development; third, the impact of legal liability on investment opportunities in commercial space transportation; and, fourth, the best approach to ensuring the highest level of safety of commercial space launches.

Some have predicted that within two to three years commercial space tourism could really take off here in the United States. If this prediction proves to be accurate, we will witness a major development in human transportation, and it is vitally important that the FAA and the Congress are prepared.

I am happy to introduce Mr. Jim Testwuide and Mr. Mark Hanna of the Wisconsin Aerospace Authority. I appreciate that they are here to share the views of the spaceport community. The Wisconsin Aerospace Authority was established several years ago through legislation passed by the Wisconsin State legislature, signed into law by the governor to support the development of the space industry in our particular State. Mr. Testwuide will share with us the experience of the ongoing effort to develop spaceport Sheboygan, which is located in my congressional district, as well as other spaceports around the Country.

Welcome, as well, to Mark Hanna of the Authority, who has devoted much time and effort to this project.

I would like to thank all of our witnesses for their participation, and I thank you again, Mr. Chairman, for holding this important hearing.

Mr. COSTELLO. I thank the Ranking Member for his comments and for his opening statement.

Now the Chair will introduce the witnesses here today to testify. The first witness will be Dr. George Nield, the Associate Administrator for the Office of Commercial Space Transportation with the FAA; Dr. Gerald Dillingham, Director, Physical Infrastructure Issues, with the U.S. Government Accountability Office, who has testified before this Subcommittee probably more times than he would like to, but he has been with us many times; Mr. J.P. Stevens is the Vice President, Space Systems, Aerospace Industries Association of America; Mr. Jeffrey Greason, CEO, XCOR Aerospace and Vice Chairman, Commercial Spaceflight Federation; and Mr. James Testwuide, who is the Chairman of The Great Lakes Aerospace Science and Education Center, and he will be testifying on behalf of the Wisconsin Aerospace Authority; and he is accompanied, but I understand will not offer testimony, but may be here to answer questions, if we have questions, by Mr. Mark Hanna, who is the Vice Chair of the Wisconsin Aerospace Authority.

Gentlemen, we appreciate your appearance here today and we look forward to hearing your testimony. I would remind our witnesses that we would ask you to summarize your statement in five minutes or so, and we want you to know that your full statement will appear in the record.

With that, the Chair now recognizes Dr. George Nield.

TESTIMONY OF GEORGE C. NIELD, ASSOCIATE ADMINISTRATOR, OFFICE OF COMMERCIAL SPACE TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION; GERALD DILLINGHAM, DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S. GOVERNMENT ACCOUNTABILITY OFFICE; J.P. STEVENS, VICE PRESIDENT, SPACE SYSTEMS, AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.; JEFFREY GREASON, CEO, XCOR AEROSPACE AND VICE PRESIDENT, COMMERCIAL SPACEFLIGHT FEDERATION; AND JAMES A. TESTWUIDE, CHAIRMAN, THE GREAT LAKES AEROSPACE SCIENCE AND EDUCATION CENTER AT SPACEPORT SHEBOYGAN, WISCONSIN, TESTIFYING ON BEHALF OF THE WISCONSIN AEROSPACE AUTHORITY, ACCOMPANIED BY MARK C. HANNA, VICE PRESIDENT, WISCONSIN AEROSPACE AUTHORITY

Mr. NIELD. Mr. Chairman, Ranking Member Petri, Members of the Subcommittee, thank you for inviting me to participate in this hearing to update you on the activities of the Federal Aviation Administration related to commercial space transportation. This morning I would like to briefly summarize the history, mission, and recent accomplishments of the FAA's Office of Commercial Space Transportation and to highlight some of the challenges we will be facing in the years ahead.

The Office was established through an Executive Order and passage of the Commercial Space Launch Act back in 1984. Originally, it was located in the Office of the Secretary of Transportation.

However, in November of 1995, it was transferred to the FAA, where today it is one of the four lines of business, along with aviation safety, airports, and the air traffic organization.

Our most critical mission is ensuring public safety during commercial launch and reentry activities. We do this in a number of ways. First, we issue launch licenses, experimental permits, and safety approvals. Since the Office was established, there have been 200 licensed launches, with the most recent being an Atlas 5 from Cape Canaveral just last week. During all of those launches, there have not been any accidents resulting in fatalities, serious injuries, or significant property damage to the uninvolved public.

Our Office also issues licenses for the operation of launch sites or spaceports. Since 1996, we have issued launch site operator licenses for seven spaceports, with several others having been proposed.

We also develop and issue regulations that are designed to ensure that commercial launch and reentry activities are conducted safely.

Finally, we perform safety inspections in conjunction with all licensed and permitted launches to see to it that operations are conducted in accordance with those regulations.

Shortly after the X Prize winning flights of SpaceShipOne, Congress passed the Commercial Space Launch Amendments Act of 2004, which gave the FAA additional responsibilities for regulating commercial human spaceflight. Consistent with that legislation, our implementing regulations make clear that individuals participating in human spaceflight will encounter an elevated level of risk and, therefore, must be fully informed of that risk and acknowledge it before climbing aboard the rocket.

In the five years since adoption of the Commercial Space Launch Amendments Act, the commercial space industry has come a long way. At the same time, it is clear that the future will be filled with challenges. For example, NASA is currently in the process of retiring the Space Shuttle, with just five more launches on the schedule.

After the Shuttle's retirement, commercial launches licensed by the FAA will be a key part of the plan for delivery of equipment and supplies to the International Space Station. In fact, we are currently working very closely with both Orbital Sciences Corporation and Space X, the companies that have been selected by NASA to perform these resupply activities, on their planned operations.

A second key challenge involves the start of commercial human spaceflight, and specifically suborbital space tourism. Today, our office is working with a number of different companies, each of which is in the process of designing, building, and testing rocket-powered vehicles capable of carrying people to the edge of space. We know that not all of the companies engaged in this effort will be successful. Some will encounter technical difficulties; others will have financial challenges. But I am quite sure that it will not be long before we will be seeing test flights of a variety of reusable launch vehicle concepts.

As Congress has pointed out, space transportation is inherently risky. At the FAA, safety, helping to safeguard the public during spaceflight operations, is at the very core of our mission, something

that shapes our days and guides our work. This is an exciting time for commercial space transportation and we are committed to doing our part to enable safe and successful operations by the industry.

Mr. Chairman, this concludes my statement. At the appropriate time, I would be pleased to answer any questions that the Subcommittee may have.

Mr. COSTELLO. Thank you, Dr. Nield.

The Chair now recognizes Dr. Dillingham.

Mr. DILLINGHAM. Good morning, Mr. Chairman, Ranking Member Petri, and Members of the Subcommittee. Thank you for inviting me back to appear before the Subcommittee again.

In October 2006, following the completion of a study done at the request of this Committee, we made several recommendations to FAA and proposed the matter for congressional consideration regarding the commercial space launch industry. My testimony today updates the status of those recommendations and looks forward to some key emerging issues.

Regarding our recommendations, based on the forecast in 2006 of potentially significant growth in the commercial space launch industry, especially the development of spaceports and space tourism, we made three recommendations: first, FAA should develop a strategic assessment to determine whether it had enough staff with the right skills to handle the expected workload; second, FAA should be proactive, rather than reactive, in considering how to regulate the safety of space tourism; and, third, we recommended that FAA and the Department of Commerce develop a Memorandum of Understanding that would clearly delineate their respective promotional roles for this industry. We also asked the Congress to consider whether it wanted to revisit the existing mandate for FAA to regulate the safety of the industry, as well as promote it.

FAA has generally been responsive to our recommendations. FAA has added technical staff to the Office of the Commercial Space Transportation and developed an MOU with Commerce. FAA has also taken steps towards being proactive in safety regulations, but has been somewhat limited because of the relatively low level of activity in the industry. For example, since 2006, the annual number of FAA licensed commercial launches has dropped off, from a high of 22 in 1998 to a total of only 20 in the last three years, none of which were manned. New spaceport development has also been limited. Overall, we believe that FAA has taken reasonable steps to ensure that it can fulfill its current safety oversight role.

Turning to the near future, senior FAA officials are predicting significant increases in the number of commercial launches in the relative short term and NASA plans to sponsor commercial launches after it retires the Space Shuttle sometime in 2010. As the space launch industry expands, Congress, FAA, and other stakeholders will need to actively address several issues: first, if the industry expands as predicted, a reassessment of FAA's need for regulatory resources and expertise would be appropriate; second, FAA will also need to ensure that its current regulations on licensing and safety requirements will also be suitable for spaceport operations and for launches from NASA facilities; third, FAA must continue to be proactive in developing safety indicators for the space tourism industry.

Regarding our earlier request to Congress, we see no need for Congress to step in at this time to require separation of FAA's regulatory and promotional activities. However, we would caution that FAA and Congress must continue to guard against any potential conflict of interest between FAA and the space launch industry such as those that were recently raised about FAA and some elements of the airline industry.

With regard to emerging issues, international competition is one such issue. High launch costs and export controls affect the ability of U.S. companies to sell their services and products abroad. Many of the industry experts we spoke with pointed to the continuation of Federal indemnification and a review of the current export licensing requirements as examples of the kinds of Federal involvement needed to support the industry's growth and competitiveness. Another emerging issue in the international arena will be to develop and harmonize safety standards and regulations, particularly those concerning space tourism flights. U.S. leadership in developing standards could boost U.S. R&D and manufacturing outputs, as well as support future joint ventures.

Another key emerging issue that was identified by the Chairman and the Ranking Minority Member in their opening statements is the integration of space transportation into NextGen. Among the issues to be considered are accommodating spacecraft that are traveling to and from space through the National Airspace System, determining controller workload and crew rest requirements for space operations, and assessing potential environmental impacts.

Finally, an overarching issue with implications for U.S. space launch industry is lack of a comprehensive space launch strategy. According to the National Academy of Sciences, such a strategy could leverage resources from various agencies to address such shared challenges as the diminishing space industrial base, the scarcity of available technical workforce, and reduced funding levels.

Thank you, Mr. Chairman.

Mr. COSTELLO. Thank you, Dr. Dillingham.

The Chair now recognizes Mr. Stevens.

Mr. STEVENS. Good morning, Chairman Costello, Ranking Member Petri, Members of the Subcommittee. I am grateful for the opportunity to testify before you today.

AIA is the largest aerospace trade association in the United States. We represent almost 300 manufacturing companies that provide over 631,000 highly skilled jobs and indirectly support another 2 million middle-class jobs and 30,000 suppliers from all 50 States.

I want to start off by saying we appreciate the efforts of Congress to keep our commercial, civil, and national security space programs healthy. We take comfort that Congress recognizes that space has become a part of our daily lives and virtually every part of the U.S. economy is touched by their applications. We would also like to take this opportunity to commend the FAA's Office of Commercial Space Transportation, which has been open to productive discussion on commercial space issues. Their Commercial Space Transportation Advisory Committee includes a wide range of industry experts who provide information, advice, and recommendations to the

FAA Administrator on a regular basis. They also host the Annual Commercial Space Transportation Conference, which industry has found to be an excellent venue for sharing information and expressing our concerns.

AIA believes FAA has struck the right balance on a very difficult issue. On one side of the balance is the need to safeguard the participants of human spaceflight and the general public; on the other side is the need to provide flexibility so that this industry can grow and become viable. Keep in mind that with the success of SpaceShipOne in 2004, there have only been three manned commercial spaceflights to date. We believe the FAA presently has a sound framework in place and understands that, as this new industry evolves, the regulations must also evolve.

There are also outside events that could accelerate the FAA's role in licensing and oversight. As you are aware, the Augustine Committee recently provided the Administration with a series of options regarding NASA's future direction. They include continuing with the program of record, what is called the Constellation Program, and operations that could have commercial space companies flying astronauts to the International Space Station. As Dr. Nield mentioned, the Space Shuttle is also slated to retire after five more flights and the FAA is preparing for commercial cargo flights to the Station.

There are some other commercial space issues that concern us. As space launch capabilities have been developed by other nations, our share has decreased significantly. For example, in 2008, only 6 of the 28 commercial launches were conducted by U.S. companies. Also, with every other nation with commercial space launch capabilities provides their companies with some form of government indemnification against third-party liability.

Our program expires in 29 days. We believe loss of indemnification could drive even more launch business overseas and could impact the launches of U.S. civil and national security payloads. The current regime provides no funds and it requires congressional approval for any payment, so continuing to indemnify commercial launches incurs no additional expense to the U.S. taxpayers. The House recently voted to extend indemnification to the end of 2012, and we hope the Senate will do the same.

Our space industrial base designs, builds, and supports all our space systems. We need to keep this base healthy and competitive. While AIA believes it is important to protect critical U.S. capabilities, many export control policies are counterproductive for our industry. While we must keep sensitive technologies out of the wrong hands, we must also facilitate trade with our friends and allies in a timely manner. Barriers to the export competitiveness of U.S. companies have prompted numerous countries to develop their own aerospace capabilities. Without a cutting-edge space industrial base, our Government could be forced to rely on foreign suppliers for key components, and I don't think we want that to happen.

AIA members believe that most important long-term issues facing our industry is having a trained technical workforce for the future. Currently, we graduate just 74,000 engineers a year. Further, many of those students are foreign nationals who return home shortly after graduating, which drops the number of domestically

employable engineers to less than 60,000 per year. In comparison, India and China respectively graduate 6 and 10 times more engineering students than we do each year.

So what can be done to draw more students into science and engineering? Well, I believe one is expanding human spaceflight. However, the industry that inspires our youth needs to be present and vibrant if we expect them to major in a stem discipline and become a part of our workforce.

In conclusion, our commercial space industry is at a critical juncture; however, commercial spaceflights that will carry humans into space is on the horizon. However, this market is competitive, our share is small, and we have a lot of work to do to ensure that this new industry has the opportunity to grow and compete in a global marketplace.

I thank the Committee for their time and attention. I look forward to answering any of your questions.

Mr. COSTELLO. The Chair thanks you, Mr. Stevens, and now recognizes Mr. Greason.

Mr. GREASON. Thank you. Thank you all for the opportunity to testify before this Committee on the state of the U.S. commercial space transportation industry. As noted, I am speaking today both as CEO of XCOR and as Vice Chairman of Commercial Spaceflight Federation.

In the five years since Congress passed the Commercial Space Launch Amendments Act, the clear and flexible regulatory regime from that bipartisan act has boosted the confidence of investors, entrepreneurs, and customers. The United States is now seen as a leader in this field because of the support of regulatory climate. That has encouraged development of several suborbital reusable vehicles to address scientific research in education markets, as well as spaceflight participants. Also, there have been investments in commercial spacecraft for carriage of cargo and humans to and from earth orbit using expendable launch vehicles.

I believe AST has done a good job implementing the statute, both in new regulations and through developing their skills to work with these new kinds of vehicles. I particularly want to praise the Office's placement of technical staff out in the field, where they can closely observe, develop, and test activities of industry.

In spite of advances in engineering and modeling, no one can predict what the safest designs, technologies, or operating approaches for commercial spacecraft will be. To learn them, we must fly. And after a suitable flight test program, building up the thousands of flights needed to learn what techniques work the best means flying for revenue. The purpose of disclosing our safety record through informed consent, as called for in the Act, is to force companies to compete with each other to improve safety as quickly as possible. This regulatory regime grows out of the twin missions of AST to promote the industry, while protecting the uninvolved public, ,the only workable approach at this stage of development.

At the present time, questions of safety are foremost in the minds of potential customers, both participants and payload developers. To achieve a viable industry, we must innovate in safety. That means achieving a superior record to what has been done in the past. Innovation requires change, and to achieve superior safe-

ty in the future, we have to try new safety technologies and practices. The reality is that some of those changes will be improvements and some will not, and without the freedom to try, we can't improve.

This need to find a better, safer way to operate is what motivates the industry, and the best way for the FAA to promote the industry is to aid us in identifying best practices and encouraging their swift adoption. That makes it critical that we and the FAA collaborate and share knowledge freely. I can't state strongly enough that at the present time the industry faces irresistible economic pressure to strive for the safest possible operation that is economically achievable, and the FAA's mandate to promote the growth of the industry is therefore a mandate to foster continuous safety improvement.

There is simply no conflict today between regulation and promotion, and there will not be the chance for conflict until industry has a demonstrated safety record in which multiple operators have shown themselves safe enough that customers stop shopping for safety and come to expect it as a given. We are certainly not at that point today and don't expect to be for many years.

Space vehicles transition through the airspace for launch and reentry. Historically, space launches were so infrequent that you cleared all the air traffic away from their launch. That is not how suborbital reusable launch vehicles will operate; a spaceflight will become one of many users of the shared airspace in the remote regions where we fly. In Mojave, we have recently been demonstrating elements of that airspace coordination with XCOR's recent rocket-powered aircraft operations.

Looking to the future for objects in orbit, space traffic management is a very complicated issue. Orbital space is inherently a global domain and the physics of the environment make it very different from air traffic. That is an area where there is a lot of policy development at the national and international level that is required, and what agencies of the U.S. Government will wind up playing what roles in the eventual system is far from clear.

Any discussion of issues facing the commercial space industry would be incomplete without repeating the need to reform U.S. export control practices. I will not belabor the problems that others have alluded to, but experience shows that, regardless of the intent, the actual effect is to ensure that bright aerospace engineers educated here go to work overseas and that foreign investors invest in foreign competitors instead of U.S. companies.

While commercial spaceflight, human spaceflight, and the vehicles that produce it are still in their early days, we can already see opportunities for industry to provide services needed by the Department of Defense and NASA. The market of serving these needs will stimulate further development of the industry, as well as strengthens the Nation's space capabilities.

Four promising areas include small satellite launch, suborbital research payloads, transport of NASA astronauts to the International Space Station, and launch a propellant to orbit for exploration missions. The combined promise of these various markets strengthens my belief in a bright future for the commercial space

transportation industry operating within a stable regulatory and policy framework.

Thank you for the opportunity to be here today, and I look forward to your questions.

Mr. COSTELLO. The Chair thanks you for your testimony and now recognizes Mr. Testwuide.

Mr. TESTWUIDE. Thank you, Mr. Chairman, Ranking Member Petri, and Subcommittee.

I would like to first state that the FAA AST has successfully executed its mission as far as we can tell. FAA integrates years of experience in aviation and airport operation into its commercial spaceflight oversight. The commercial space community must be self-constraining with expert and experiential-based mentoring from the FAA and others, providing guidelines for licensing and achieving safety and environmental goals.

The U.S. needs to maintain its competitive edge and develop an economically sustainable commercial space model. Industry, State governments, and the FAA need to identify and mentor the licensing of operators. Spaceport assets need to be identified, and implementation plans and viability studies need to be completed. Spaceport and vehicle developer/operators need to continue the current collaborative environment among themselves and the FAA.

The nurturing of spaceport assets provides efficient growth. Efficiencies of a multiuse facility can be utilized. Horizontal takeoff space planes can coexist at conventional airports with proper attributes. Identification of current assets that can be utilized by both conventional aviation and space activities can dramatically reduce costs of the creation of space infrastructure and spaceport creation. The earlier the potential spaceport identifies the goal of launch licensing, the sooner a spaceport development plan can be created and, with that plan, the spaceport has greater potential for savings through cooperative multiuse infrastructure planning.

Case study of Spaceport Sheboygan. We have restricted airspace over low population density safety zone, Lake Michigan; currently used by the Coast Guard and the Air National Guard approximately 30 days a year; previously, has received numerous FAA waivers to launch rockets up to 35 miles, or 200,000 feet; home of Great Lakes Aerospace Science and Education Center; close proximity to an active airport allowing flight profile similar to other tourist profiles of other spaceports; exclusive tourist destination, the American Club at Kohler, already attracting visitors of that class; close proximity to Wisconsin's Experimental Aircraft Association.

We have created the Wisconsin Aerospace Authority, whose mission is to promote, stimulate, and facilitate aerospace-related educational and economic opportunities, capabilities, and activities within our State, including the development of Spaceport Sheboygan.

And point-to-point suborbital transportation is on the horizon. Eventually, suborbital spaceflight will evolve to include point-to-point transportation opportunities. Suborbital velocities outside the friction of the atmosphere bring the entire world within a two hour flight. Spaceports that start as space tourism centers will eventually become regional suborbital hubs.

Wisconsin is trying to do its part. Wisconsin is doing its part to capitalize on the opportunity presented by the restricted airspace to help our Nation participate in the next global transportation revolution. We ask that the Committee and Subcommittee support approaches, actions, and licensing processes currently used by the FAA. We at Wisconsin Aerospace Authority and Spaceport Sheboygan look forward to engaging in the next steps with the FAA.

We also ask the Committee to consider reintroducing Federal funding for initial spaceport development planning. This type of seed capital can assure the proper design of the spaceport from its inception. With early recognition, the effective utilization of existing attributes, the spaceport can utilize its capital more effectively. Early and thorough planning reduces risks—the risk to the environment, the economic risk to the operator and its community—it increases the safety of the uninvolved public and the operators; and it increases the long-term economic viability and sustainability of the space transportation industry in the U.S. for the foreseeable future.

Thank you very much for the opportunity to testify. I look forward to answering your questions.

Mr. COSTELLO. And the Chair thanks you.

Dr. Nield, we will start with you. Let me ask you. As you know, our Subcommittee usually deals with certification of aircraft, and since commercial space transportation is not certified, but it is licensed, can you walk us through the process of the licensing process with the FAA?

Mr. NIELD. Certainly. The launch licensing process actually involves five separate reviews. We conduct a policy review to ensure that the intended activity is consistent with our national policy and foreign policy objectives; we look at the payload involved to ensure that there is nothing unusual or inappropriate concerning the purpose of the launch. Of course, the most important review is the safety review, where we are looking at possible hazards involved and how they can be mitigated.

We also conduct an environmental review in compliance with NEPA, the National Environmental Policy Act. There is, finally, a financial responsibility review, which involves the analysis of the maximum probable loss—not the worst case, but the most likely bad day during a launch, and that information is used by us to establish the insurance requirements for the launch operators.

So with those reviews complete, that allows us to make a determination on the issuance of a launch license. We have 180 days, through our statute, in order to come up with that determination.

Mr. COSTELLO. Thank you.

Mr. Greason, would you like to comment as to your experience in dealing with the licensing process?

Mr. GREASON. I think I would characterize it as we and the FAA together, both us as an operator and us in the industry, are still working out together exactly how to handle these new class of vehicles. Every new vehicle right now, of the reusable category, that comes to the FAA is essentially the first of its kind, because we don't have standardization in the industry at about how we are going to approach these problems.

Given that, it is a collaborative process and it takes time. But I also think it is a value-added process; it is very—any honest engineer appreciates having someone knowledgeable looking over their shoulder and asking tough question, so it is a challenging process sometimes to get through, but I think it is a worthwhile one.

Mr. COSTELLO. Thank you.

Dr. Dillingham, you state in your testimony that the FAA needs to develop safety indicators and collect data to help determine when to begin regulating crew and passenger safety. I wonder if you might elaborate on that.

Mr. DILLINGHAM. Thank you, Mr. Chairman. As was mentioned by some of the witnesses, and also as a result of the legislation that said FAA shouldn't start to regulate until after 2012, the points that we wanted to make is that due to the relatively low activity in the industry, FAA has not been able to actually do the kind of collection of safety data that it has done or has done in the aviation area.

The point that we wanted to make was that FAA should continue to be proactive in this area, doing the things that it is currently doing like taking lessons learned and sharing information. Those are some preliminary steps that they can continue to take. But as soon as is feasible, when the experience base is there, they should in fact be collecting safety indicators so that they can be proactive in developing needed regulations, as opposed to reactive.

Mr. COSTELLO. Thank you.

Mr. Stevens, you indicate in your testimony that there are issues that the FAA obviously needs to look at surrounding integrated commercial spaceflight into the air traffic control system. I wonder if you might elaborate on some of those issues.

Mr. STEVENS. Well, I think I would add to what I said in my testimony by saying that it is a complex issue and, as we look at NextGen moving forward, we need to take into account all those issues and, as we develop that policy, make sure they are incorporated into it.

Mr. COSTELLO. Mr. Greason or Mr. Testwuide, any specifics that you would like to add?

Mr. TESTWUIDE. I would like to amplify and extend some of the things that Mr. Dillingham was saying about the need for tracking safety indicators. I think it is a misconception of the state of the current Act, the Commercial Space Launch Amendments Act, that the FAA is currently constrained from regulating. Instead, they are constrained only to regulate for the safety of the participants where there is data, in the sense of a series of incidents or an accident, that shows that there is a problem that needs regulating.

And I, wearing my hat as a member of the industry trade association, couldn't be more in favor of that. In fact, if anything, I completely agree we need to work together very hard to make sure that we have as much advanced data as possible so that we can spot trends and take action, whatever action might be, as early as we can; and that is a collaborative thing between us and the FAA.

Mr. GREASON. And I would just like to reiterate what Mr. Stevens said about education and encouraging our youth. I firmly believe that the space program had a very large bias in creating a large number of engineers 20, 30 years ago, and I think if we can

engage the youth today in our further exploration of space, we can reinvigorate the education on the stem situation and get our Country back in a more engineering and scientific methodology in education.

Mr. COSTELLO. Dr. Nield, the senior FAA officials in the past have predicted that commercial airspace transportation, the industry, will expand not 200 to 300 annual launches. Not only a question for you, but a question for others on the panel, if you would like to answer it. How soon do you think that we would begin to see increases and reach the level of 200 launches a year?

Mr. NIELD. Well, that is an excellent question. Of course, it is hard to predict the future, but as I look at the kinds of activities that we are likely to see, I anticipate three different kinds. We will see a continuation of the current expendable launches of telecommunication satellites and so forth that we have had for a number of years, and that will continue on into the indefinite future.

We will also see, shortly, with the retirement of the Space Shuttle, a new kind of commercial activity designed to take cargo to the International Space Station. I believe that activity will be on the order of six to eight launches per year and will start in the next couple of years.

But the prime driver for the kinds of flight rates that you mentioned will, in all likelihood, be a result of suborbital space tourism and the commercial human space flight. I believe that within the next five years we will see several companies that are conducting regular and frequent launches up to the edge of space, and that will, of course, greatly change how we think about space transportation.

Mr. COSTELLO. Mr. Stevens?

Mr. STEVENS. I agree with Dr. Nield on all those accounts. The one thing I would bring up is that I am very concerned, as I mentioned in my testimony, that the number of commercial launches done by the United States is very low, and we need to really take a look at ITAR reform. As I mentioned, that is hurting our industry. And we definitely need to pass, get the Senate to approve indemnification before the end of this year.

Mr. COSTELLO. Anyone else on the panel?

Mr. DILLINGHAM. Mr. Chairman?

Mr. COSTELLO. Yes, Dr. Dillingham.

Mr. DILLINGHAM. I think it is important to point out that, to the extent that the industry does expand, that FAA will need to match the resources and skill mix that will be needed to oversee that industry, collaboratively or otherwise. And I think it is important to note that, in addition to the pipeline not being what the pipeline should be for math and science, there is also the potential difficulty with FAA attracting those people, those kinds of skilled people to skew it to the agency.

We recently issued a report that indicated that FAA had some work to do in order to make itself a place where those kinds of skills would be inclined to go to, and, to their credit, Administrator Babbitt has made that a focus, but this could take time, and FAA, right now, they are in fact able to match the size of the industry and its activity, but it is something that needs to be kept on the radar screen.

Mr. COSTELLO. Very good. Thank you, Dr. Dillingham.

The Chair now recognizes the Ranking Member, Mr. Petri.

Mr. PETRI. Well, thank you all for your testimony. I, first of all, want to say that I am happy to hear, in Dr. Nield's and other members of the panel's testimony, somewhat of a measure of sensitivity to the relationship between a very high-tech, very emerging industry and what can be the deadening hand of government regulation. If we can protect ourselves from success if we are not careful. And yet, at the other hand, we do have some obligation to make sure that things are being done responsibly and risks are taken.

I was sensitized to that myself at the EAA several years ago, when I was invited to have lunch with a giant in this field, Burt Routan, who was pleading with the FAA to classify SpaceShipOne as a spaceship, not as an airplane, because, if it had to go through certification for airplanes, it would have, he thought, had a very adverse effect on his long-term success. He has developed cutting-edge planes for the intelligence industry and defense industry for a generation, and very successfully.

But he said the mentality of his team is to continually challenge the design and look for further ways to improve it; and if they suddenly had to switch to defending the design, that would have a psychologically deadening effect on innovation and, he thought, on safety, actually. And he has had a very wonderful safety record given what he has been attempting to do over the years. So this is an interesting balance and I am happy to hear that you are sensitive to that.

Maybe one question for Mr. Testwuide. Working in a midwestern community on this whole cutting-edge industry, what is really in it at the end of the day for a local community or State that participates in this program? Could you discuss why people should be interested in and trying to participate in this whole effort?

Mr. TESTWUIDE. Thank you, Mr. Petri. Yes. I think for a small town like Sheboygan, Wisconsin and a State that is not typically thought of as a cutting-edge technology State—I would have exception to that, but I don't think in the general Nation people get much beyond bratwurst and cheese. I would say that there are lots of things that it brings, including, as I mentioned before, the awe of space travel to the midwest and to a local region. But the industrial impact of having regular spaceflights just for tourism, then possibly a midwest point-to-point hub, have long-term financial ramifications for the region, and I think that would be very good economically long-term.

In the short-term, I think you get back to the psychological realization that we are on the cutting edge, that if you come from Wisconsin, you can go to Madison and get some very fancy engineering experience, if you choose to. You will be with, unfortunately, right now, an awful lot of foreigners, but I would love to see a lot more Badgers there becoming engineers and going to work for Mr. Greason and or the FAA and developing this area in the future.

So I think there is a great opportunity and a missed opportunity by most of rural America, or central America, I should say, in the space world. We have recognized it because we have that asset out in Lake Michigan that is clearly a low population density area, a couple fishermen, and it is restricted and it has been used, so we

intend to capitalize on that asset and see if we can move forward with this prospect.

Mr. PETRI. You mentioned cheese and bratwurst, and probably beer would be appropriate as well.

Mr. TESTWUIDE. I think so.

Mr. PETRI.—although it is not as much as it was. But I think people aren't aware our biggest employer, at least for many years, has been General Electric, and part of that is making missile guidance systems.

Mr. TESTWUIDE. Correct.

Mr. PETRI. We had a tremendous industrial infrastructure for everything from lattice, making the big castings that are vital for the airplane industry, to many of the key components that support our Navy around the world. The subcontractors are very intense in our region. So we have nothing to apologize for in terms of contributing to the space effort in our part of the world.

Thank you very much.

Mr. COSTELLO. The Chair thanks the Ranking Member and now recognizes the gentlelady from Texas, Ms. Johnson.

Ms. JOHNSON. Thank you very much, Mr. Chairman and Ranking Member, for having this hearing.

I have been interested in this area since we had one citizen to go into space and came and gave his overview of what it meant. What I would like to ask Dr. Nield is you stated that the FAA identifies policies which may have an unintended adverse impact on commercial space transportation efforts. Could you go into that a little bit more?

Mr. NIELD. Certainly. As part of our statutory charge, we are encouraged to work with other Government agencies to do exactly what you have described, and I think an excellent example of that would be our partnership with the United States Air Force on the eastern launch range. We have worked together for a number of years to try and develop common launch safety standards so that whether a rocket is being launched in order to put a defense satellite into orbit or for a commercial communications satellite, the basic safety standards would be the same.

So that is not an issue of being hard or easy on safety, it is a question of can we come together and have common standards so that these launch providers do not have to keep a separate set of books depending on who the customer is for the launch. So that would be one example of the kinds of things that we are trying to do in order to streamline and make the system more effective.

Ms. JOHNSON. Thank you.

Mr. Dillingham, were you intending to imply that the FAA would be prepared to handle this increased commercial launch activity after NASA retires the Space Shuttle?

Mr. DILLINGHAM. Thank you, Ms. Johnson. Yes, I think that FAA is taking the steps that will allow it to in fact handle the extra activities that will take place when the Space Shuttle is retired sometime in 2010. What I also meant to say is not only as NASA turns over those kinds of responsibilities, as the other part of the space launch industry expands, FAA will also need to expand its resources to be able to handle that.

Ms. JOHNSON. Has anyone given any thought to what it would cost just a regular American citizen who wants to pay to go into space for a vacation?

Mr. GREASON. For suborbital flights, which is the area where commercial human spaceflight is likely to start, different providers are charging different prices. The high-end mark is at about $200,000 right now. I think the lower announced price is about $90,000 or $95,000. But everyone expects that, as with all other areas of high technology, once you enter into service and there is more than one company operating, there will be a great deal of competitive pressure on those prices and they will come down home, we all hope, fairly quickly.

Ms. JOHNSON. One final question. There had been a couple of delegations to my office asking about space to put a launch pad for a commercial space visits. Is that still in action? I haven't heard from them for a while now. Anywhere. It doesn't have to be Texas, although that is the premier place to do it.

Mr. NIELD. We would be happy to work with your staff to arrange those types of tours. We know they are very inspirational to those who take part.

Ms. JOHNSON. Thank you, Mr. Chairman.

Mr. COSTELLO. The Chair thanks the gentlelady and would say that I think Illinois would be a perfect location. I think Mr. Petri thinks that Wisconsin would be a good location as well. He suggests maybe we can do a Committee trip to space.

[Laughter.]

Mr. COSTELLO. The Chair now recognizes the gentleman from Pennsylvania, Mr. Altmire.

Mr. ALTMIRE. Thank you, Mr. Chairman.

I want to start with Dr. Dillingham. The Chairman asked Dr. Nield a question about the 200 to 300 annual launches that were expected, and in your testimony, Dr. Dillingham, you state that if senior FAA official predictions are correct, that that is the number. A reassessment of FAA's resources in areas of expertise would at that point be appropriate. I was wondering if you could expand upon what you meant by that.

Mr. DILLINGHAM. Thank you, Mr. Altmire. I predicated that by saying if those numbers turn out to be, as we all have said this morning, this is an industry in its very beginning stages and it is not clear how this is all going to play out in terms of this is very technical, this is new, and we have had predictions before. You will recall when we talked about the very light jet industry, there were going to be thousands in the skies in the next few years. It hasn't turned out to be that way. So to the extent that we do get this expansion, then, again, we would say FAA needs to expand as well in order to carry out its mission.

Mr. ALTMIRE. Thank you.

Mr. Stevens, in your testimony, you describe some important issues facing the future of U.S. space policy, such as funding U.S. reusable launch vehicles versus relying on commercial space transportation. I was wondering if you could expand upon what you meant by that.

Mr. STEVENS. Could you ask that question——

Mr. ALTMIRE. The difference between the two, the funding of U.S. reusable launch vehicles versus relying on commercial space transportation.

Mr. STEVENS. Well, I think the issue is, when you are talking about the Government program or the Constellation Program to supply the International Space Station and the competition that is going on with the commercial companies, what we believe is that there is no competition, that they are two different programs. In fact, the Constellation Program is designed to take us out of low earth orbit, and that is where we need to head. The commercial companies will pick up the slack and take care of all the logistical requirements of supplying the International Station.

Why I think this is a great way to do business is that, if we get to that point where that is happening, we will have at least two different rocket systems, United States rocket systems, to supply our International Space Station, and we won't be in the situation we are today by paying $50 million per U.S. astronaut to send them up on a Russian vehicle.

And something that I read today was also that we will be paying—because we have an agreement with other countries—European and Japanese astronauts, we will be paying for them too. So I don't see any sort of competition among the both; they are two separate programs, they both overlap and they both, I think, will be very supportive of keeping the United States in the position that it needs to be in the future.

Mr. ALTMIRE. Thank you.

Mr. Greason, in response to the last questioner, you talked about suborbital would be the place where we would start, but then perhaps more thereafter. Can you explain with regard to the duration of the flight and when you say we may go beyond suborbital, what are we talking about? What are we looking at?

Mr. GREASON. Suborbital flights, because we are all using the same physics, we are all using the same air, it can take some time to reach the point where you turn on the rocket engine; that varies by system. But once you turn on the rocket engine, the flight typically lasts about half an hour from that point, most of that being coming back home through the atmosphere.

There certainly are roadmaps out there and technological plans out there—my own company is among them—for how these systems will evolve over timed orbital systems, where you can talk about days or weeks or longer. The likely progress is that suborbital human service will begin—that you will begin a small volume of commercial human spaceflight with capsules on expendable rockets, where commercial and Government customers might both be users of the same system; and that it will take some time beyond that for fully reusable orbital systems to come along which will take us to a whole new level.

Mr. ALTMIRE. Thank you.

Thank you, Mr. Chairman.

Mr. COSTELLO. The Chair thanks the gentleman and now recognizes the gentleman from Ohio, Mr. Boccieri.

Mr. BOCCIERI. Thank you, Mr. Chairman.

Dr. Nield states in his testimony that the Air Force and the FAA and NTSB have a Memorandum of Understanding regarding com-

mercial space accidents and incidents. I notice also that Mr. Stevens states that, as space launch capabilities have been developed by other nations, U.S. commercial launches have decreased significantly, mainly because they have government indemnification.

What recommendations do you have for improving the competitiveness of the commercial space travel with respect to indemnification? Do you think this is a policy that we should continue?

Mr. NIELD. Yes. As was previously mentioned by Mr. Stevens and others, we believe that the action by the House to extend the current indemnification process is very appropriate. We certainly encourage the Senate to act on that. However, in the long term, we think there is merit to looking at a more extended period, to allow companies to do long-range strategic planning, investment and so forth, knowing with some certainty what indemnification regime they would be subject to. So that would be an excellent example of what the Government could do in order to provide some certainty and support for the industry.

Mr. BOCCIERI. At the space launch sites—I guess there are several of them between NASA and the military, Cape Canaveral, et cetera—how do they work with the commercial launch, the vehicles, in the sense to promote the most expeditious trajectory, one that is not going to damage satellites or hurt any of our military/commercial capabilities to communications?

Mr. NIELD. We work very well together. Again, I mentioned the partnership with the Air Force. We have an office at Patrick Air Force Base to have a person on the scene and interact on a daily basis with the range there so that we understand the issues. I mentioned the common safety standards.

We also have an excellent relationship with NASA. And that will become even more important as the Shuttle is retired and various commercial rockets are considered by NASA for their use as well. So I think, in general, the Government agencies involved work very well together and we are all looking to industry to try and understand how they can bring their capabilities to the table to support our national interests.

Mr. BOCCIERI. Do you find that our international competitors—I know China is very aggressive in trying to put an astronaut on the moon. Do you find that there is a lot of international competitiveness in relaying—in addition to that question, do you think that we can do a better job of promoting more engineers into the field?

Mr. NIELD. Certainly workforce is a key issue for the entire industry. We need to pay attention to that and that is something that you cannot fix immediately; it is a long-term process to have people studying the math and science and engineering early in their educational process.

In terms of the international relationships, it is interesting because there certainly is a competitive environment in terms of the prices that are being offered by other nations to launch rockets into space. Many of those countries subsidize their programs and they make it very difficult for our companies to compete.

But in terms of the suborbital space tourism industry, I think it is generally acknowledged that the United States is in the lead in that particular area for a number of reasons. We tend to have a

much more innovative population and corporate culture that is trying these new and different ideas with advanced technologies, so we have seen more developments, more planning, more testing in this Country than anywhere else.

I have also been told, as I participate in international conferences, that our regulatory regime that Congress has put in place in this Country is something that is envied, frankly, to enable us to concentrate on protecting public safety while allowing the acceptance of risk during some of these more dangerous activities. That is something that is not universally shared, and the companies in other countries, frankly, would love to have a level playing field, as they describe it, in terms of how they treat those things.

Mr. BOCCIERI. One last question to the panel. Right now this seems as if it is a millionaire's or a billionaire's endeavor. Do you anticipate that the average Bob and Betty Buckeye from Ohio might someday climb in a rocket ship? And how far away do you think that is?

Mr. GREASON. Anybody who buys a cell phone or a computer or a flat screen TV to put on their wall ought to be very thankful that there are all these high net worth early adopters who paid to bring the volume up and the technology to the point where everybody else can use it. I don't think spaceflight is ever going to be, even suborbital spaceflight, is ever going to be quite as cheap as air travel is today.

But I can easily see it getting down to the point where, at some point in the future, and, no, I am not going to predict how soon that is because it is too many steps ahead. But I can see it getting down to the price of a cruise; and that is not something that is reserved for billionaires.

Mr. BOCCIERI. Well, I haven't been on a cruise yet, sir.

Mr. GREASON. I haven't either, but I understand that they do quite well.

Mr. BOCCIERI. Thank you.

Mr. COSTELLO. The Chair thanks the gentleman.

Any other Members have additional questions?

[No response.]

Mr. COSTELLO. If not, let me thank the witnesses for testifying here today. This has been a very productive and useful hearing. Our number one priority in this Subcommittee is safety and, as space transportation and tourism increases in the future, we want to make certain that the FAA has the resources to go forward to ensure that space transportation and tourism in fact goes forward and is as safe as it possibly can be.

So we will be monitoring the activities in space transportation, working closely with the FAA and, when necessary, we will be holding additional hearings and providing aggressive oversight. So we thank you for your testimony today and the Subcommittee stands adjourned.

[Whereupon, at 11:10 a.m., the Subcommittee was adjourned.]

OPENING STATEMENT OF
THE HONORABLE JERRY F. COSTELLO
AVIATION SUBCOMMITTEE
HEARING ON COMMERCIAL SPACE TRANSPORTATION
December 2, 2009

- I want to welcome everyone to this Subcommittee hearing on Commercial Space Transportation. It has been almost five years since our Subcommittee's last hearing on this topic and it is important to get an update of the Federal Aviation Administration's (FAA) safety oversight and how the industry is evolving to ensure that the FAA has the proper resources.

- I am very familiar with the emerging commercial space transportation industry, not only from my work on the House Science and Technology Committee, but also because the X-Prize Foundation, which is most well know for designing and managing public competitions for aviation and space, is located in St. Louis, Missouri – across the river from my Congressional district.

- Though commercial space transportation tourism has not led to regularly scheduled, manned commercial space flights yet, Virgin Galactic is ready to unveil its eight-seat SpaceShipTwo by the end of the month. Many on the Subcommittee saw its launch vehicle, WhiteKnightTwo, début at the Oshkosh Air Show in July.

- One factor playing into the future of the commercial space transportation industry is the expectation that the U.S. space shuttle fleet will retire in 2010. The United States will be without vehicles to transport cargo and people for at least five years before the next U.S. launch vehicle will be operational. The reality is that the United States may have to rely on other countries to facilitate this travel unless commercial space transportation is able to fill the gap.

- Congress passed several laws to allow commercial space transportation to develop and we must ensure the industry has proper federal safety oversight. Since 1989, approximately ten percent of launches have failed. But in the last eight years, this number has improved to three percent. As the number of launches is expected to increase with commercial space tourism and the potential use of commercial space launch vehicles by National Aeronautics and Space Administration (NASA), it is imperative that the FAA has the proper resources to ensure new technologies and programs evolve safely.

- I look forward to hearing from the FAA Associate Administrator for Commercial Space Transportation, Dr. George Nield, about FAA's role in overseeing the commercial space industry to ensure the safety of the public, as well as crew and space flight participants.

- Commercial space transportation is also likely to have an impact on our air traffic control (ATC) system, especially as the United States implements the Next Generation Air Transportation System (NextGen). Today's low number of yearly launches (five in 2009 and eight on average) allows the ATC to adjust the national airspace system (NAS) to accommodate launch and re-entry. For instance, if a commercial space transportation vehicle missed its re-entry window the ATC could briefly shut down the affected airspace. However, future increases of launches and civil aviation traffic will not allow ATC the same flexibility and may require additional protocols incorporated into NextGen to keep the NAS safe. As we implement NextGen, it is important to consider all space transportation issues that might impact the NAS.

- In addition to the impact on our ATC, the environment and our communities will be effected by increased commercial space tourism. Congress must guarantee that FAA has the tools it needs to ensure the safety of flight for both aircraft and launch vehicles, as well as to protect the environment from these activities. Currently, there are seven licensed spaceports in the United States, six Federal launch sites, and eight proposed spaceports in different degrees of development. Environmental impacts such as noise and greenhouse gas emissions will play a role in commercial spaceports, just as they do at U.S. airports and communities. It is important for this Subcommittee to examine the issues associated with licensing these facilities and the role these facilities have in the United States.

- With that, I want to again welcome our witnesses and I look forward to their testimony.

- Before I recognize Mr. Petri for his opening statement, I ask unanimous consent to allow 2 weeks for all Members to revise and extend their remarks and to permit the submission of additional statements and materials by Members and witnesses. Without objection, so ordered.

SENIOR DEMOCRATIC WHIP

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
CHAIRWOMAN, SUBCOMMITTEE ON WATER RESOURCES & ENVIRONMENT
SUBCOMMITTEE ON AVIATION
SUBCOMMITTEE ON RAILROADS

COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION
SUBCOMMITTEE ON INVESTIGATION AND OVERSIGHT

CHAIR, TEXAS DEMOCRATIC DELEGATION

CONGRESSIONAL BLACK CAUCUS
CHAIR, 107TH CONGRESS

Eddie Bernice Johnson
Congress of the United States
30th District, Texas

PLEASE RESPOND TO:
WASHINGTON OFFICE:
1511 LONGWORTH BUILDING
WASHINGTON, DC 20515-4330
(202) 225-8885

DALLAS OFFICE:
3102 MAPLE AVENUE
SUITE 600
DALLAS, TX 75201
(214) 922-8885

WWW.HOUSE.GOV/EDJOHNSON/

STATEMENT
CONGRESSWOMAN EDDIE BERNICE JOHNSON
SUBCOMMITTEE ON SCIENCE AND TECHNOLOGY

COMMERCIAL SPACE TRANSPORTATION

WEDNESDAY, DECEMBER 2, 2009
10:00 A.M.
2167 RAYBURN HOUSE OFFICE BUILDING

Good morning, Mr. Chairman. Welcome, distinguished witnesses.

The American public has been inspired by manned space flight since the space program was created, in the 1950s.

PRINTED ON RECYCLED PAPER

Generations of young people have seen video footage of a man walking on the moon and have said to themselves, "I want to do that!"

Thousands of American children aspire to go to Space Camp. Others take professional paths toward engineering to work in the space industry.

I strongly encourage today's youth to pursue their goals, especially those related to science and technology, as these fields offer a broad array of opportunity, including in aeronautics and commercial space.

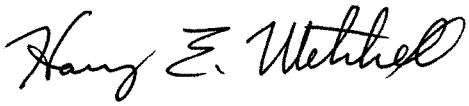
As we move forward with commercial space transportation, it is critical that the proper regulations and oversight is in place to ensure safety.

I am encouraged that the FAA's Office of Commercial Space Transportation recently hired a dozen additional aerospace engineers to meet commercial space licensing demands.

However, I am aware of the GAO's earlier concern that the FAA may face a conflict in its statutory responsibility to promote the commercial space industry and its safety oversight responsibilities.

I look forward to this hearing addressing some of these issues.

Thank you, Mr. Chairman.



Statement of Rep. Harry Mitchell
House Transportation and Infrastructure Committee
Subcommittee on Aviation
12/2/09

--Thank you Mr. Chairman.

--The use of satellites alone has literally transformed the way we live, and this transformation would not have been possible without commercial space transportation.

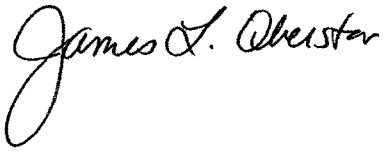
--In addition to satellites, we continue to see great interest in space tourism. Virgin Galactic, for example, is expected to unveil and 8-seat vehicle later this month.

--As technology improves, the benefits of commercial space transportation will undoubtedly improve as well.

--However, we must ensure that transportation is conducted safely, and that the Federal Aviation Administration has the resources it needs.

--I look forward to hearing from today's witnesses.

--At this time I yield back.



OPENING STATEMENT OF
THE HONORABLE JAMES L. OBERSTAR
AVIATION SUBCOMMITTEE
HEARING ON COMMERCIAL SPACE TRANSPORTATION
DECEMBER 2, 2009

I want to thank Chairman Costello and Ranking Member Petri for calling today's hearing on Commercial Space Transportation.

Many predict that commercial space transportation and tourism will lead to regularly scheduled, manned commercial space flights, which could generate upwards of $700 million a year in revenues in the years to come. While the value of commercial space travel is not in question, I continue to have concerns about its safety. As with any emerging industry, we must ensure that it is receiving the proper Federal safety oversight without discouraging development.

The Commercial Space Launch Amendments Act of 2004, (P.L. 108-492) prohibited the Secretary of Transportation from regulating crew and passenger safety except in response to serious injuries or fatalities or an event that poses a high risk of causing a serious or fatal injury before 2012. The statutory language amounts to, in essence, the codification of what has come to be known in aviation safety parlance as the "Tombstone Mentality." For years, this Subcommittee has criticized the Federal

Aviation Administration (FAA) for waiting until after a disaster to take safety actions, and has urged upon the FAA a more proactive safety oversight role.

In 2005, I introduced legislation that would have required the FAA to mandate minimum standards to protect the health and safety of crews and space flight participants, while taking into account the "inherently risky nature of human space flight." This safety authority would not have precluded innovation nor, would it have required FAA to impose the same degree of regulation on the developing space travel industry that is imposed on the mature air transportation industry.

Though my legislation was not passed, I requested that the Government Accountability Office (GAO) review my concerns, which it did in 2006. At that time, the GAO noted that the FAA should proactively assess its future safety oversight resource needs and indentify circumstances that would trigger passenger safety regulation. GAO also raised concern that since the FAA is a regulatory agency; the statutory responsibility to promote the commercial space launch industry may interfere with its safety oversight of the industry. I look forward to any updates Dr. Dillingham of the GAO may be able to provide on these issues.

The Act also mandated that an independent study be conducted to address several areas of concern, such as the FAA's ability to ensure the safety of the public,

crew, and space flight participants. Although the 2008 report, *Analysis of Human Space Flight Safety* -- completed for DOT by the Aerospace Corporation, George Washington University and the Massachusetts Institute of Technology, found that the current FAA licensing is "sufficient at the current time," it is difficult to evaluate the adequacy of FAA's safety regulation since there have not been any commercial space manned launches since the legislation became law.

Though manned commercial space transportation was anticipated after the SpaceShipOne flights in 2004, it has yet to materialize. Some have argued that the lack of manned commercial space transportation and the decrease in commercial space launches in recent years is because there has been a steady build up of research and development efforts to transition from expendable launch vehicles to reusable launch vehicles, capable of being launched into space more than once. A decline in the telecommunication services industry, a major user of commercial space launch services, has contributed to the limited number of U.S. launches. In addition, some have argued that extensive foreign governmental support given to foreign commercial space launch industries has made the U.S. industry less competitive.

Although the FAA is prohibited from regulating crew and passenger safety before 2012, the FAA has been able to give some protection to passengers and crew by broadly interpreting its responsibility to protect the uninvolved public (e.g., the

public on the ground). For example, since 2005, the FAA has protected the public on the ground by adopting regulations to prevent crashes. These regulations include performance requirements for crew training and require basic conditions adequate to sustain life and consciousness for all inhabited areas within a vehicle. They also require smoke detection and fire suppression and the crew's ability to perform safety-critical roles in-flight. Of course these regulations protect passengers and crew as well as persons on the ground. Though I support these rulemakings, I continue to be concerned that the FAA has not developed a way to monitor precursors to accidents of commercial space tourism to determine when to intercede and regulate human space flight. My hope is that before the commercial space transportation industry "takes off," the FAA will move forward with regulations to better protect space flight participants.

To that end, I look forward to hearing from the FAA Associate Administrator for Commercial Space Transportation, Dr. George Nield, about FAA's role in overseeing the commercial space industry to guarantee the safety of the uninvolved public, as well as crew and space flight participants.

Commercial space launch activities are also likely to have an impact on the air traffic control system as well as the environment. The FAA must have the tools and procedures it needs to ensure the safety of flight through the navigable airspace for

both aircraft and launch vehicles, while protecting the environment from these activities.

As this Subcommittee continues its oversight of this emerging commercial space transportation industry, I look forward to working together to protect the safety of passengers on space flights, without placing unreasonable limitations on the development of commercial space travel.

I look forward to hearing from the witnesses.

LAURA RICHARDSON
37TH DISTRICT, CALIFORNIA

1725 LONGWORTH BUILDING
WASHINGTON, DC 20515-0537
(202) 225-7924 – PHONE
(202) 225-7926 – FAX

100 WEST BROADWAY
WEST TOWER, SUITE 600
LONG BEACH, CA 90802
(562) 436-3828 – PHONE
(562) 437-6434 – FAX

http://www.house.gov/richardson

Congress of the United States
House of Representatives
Washington, DC 20515

COMMITTEE ON
TRANSPORTATION AND
INFRASTRUCTURE
SUBCOMMITTEES ON
AVIATION
HIGHWAYS, TRANSIT
AND PIPELINES
COAST GUARD AND
MARITIME TRANSPORTATION
RAILROADS, PIPELINES AND
HAZARDOUS MATERIALS

COMMITTEE ON
HOMELAND SECURITY
SUBCOMMITTEES ON
ENERGY THREATS, CYBERSECURITY
AND SCIENCE AND TECHNOLOGY
EMERGENCY COMMUNICATIONS,
PREPAREDNESS, AND RESPONSE

Laura Richardson

COMMITTEE ON TRANSPORTATION
SUBCOMMITTEE ON AVIATION

HEARING:
"Commercial Space Transportation"

WEDNESDAY, DECEMBER 2, 2009
10:00 A.M.
2167 RAYBURN

Mr. Chairman, thank you for convening this very important hearing today to review the issues surrounding commercial space transportation. I would also like to thank our witnesses for taking the time to appear before Congress today.

NASA and the FAA are facing a number of important concerns that surround commercial space flight, including

PRINTED ON RECYCLED PAPER

the retirement of the U.S. space shuttle fleet, commercial cargo delivery to the International Space Station (ISS), and the beginning of commercial human tourism space flight operations. We can look to commercial space flights as a potential solution to these issues. For example, once a dream for many people, commercial space tourism is now looming on the horizon as a reality. And if this happens, new regulatory, environmental, and safety issues need to be addressed.

Air traffic controller training and lack of funding has been an issue that this subcommittee has addressed in the past. The recent hearing on NEXTGEN examined some of these problems. The system is deeply flawed, and in need of vital changes to make it more effective. Our hardworking air traffic controllers already have a lot on their plate with flights traffic continually growing, and we have to be careful

before we begin regulating this industry to understand how commercial space flights will impact their work.

I am a proud representative of the 37th Congressional District of California and a member of the General Aviation Caucus. There are 11 airports in my region, including the Los Angeles airport, which handles the sixth most passengers of any airport in the world annually. Two of the seven spaceports with a license to launch a commercial space transportation vehicle are located in California. We need a clear understanding of how these launch site activities this will impact the already very busy air space in the region, especially as the industry grows over the years.

I am worried that our already over taxed air traffic control system will be unable to handle the added traffic and complications of commercial space flight. Before Congress makes any further commitments to this industry, I would

hope that there will be studies and planning for how the beginning and growth of space flight will affect our local airports and air traffic control.

Commercial space transportation, although the possibilities for research and tourism are intriguing, brings up a whole host of potential challenges for the FAA and NASA, such as the issue with air traffic control that I mentioned. I look forward to hearing from our distinguished panel of witnesses regarding commercial space transportation and these challenges.

Thank you again, Mr. Chairman, for convening this hearing. I yield back the balance of my time.

United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

For Release on Delivery
Expected at 10:00 a.m. EST
Wednesday, December 2, 2009

COMMERCIAL SPACE TRANSPORTATION

Development of the Commercial Space Launch Industry Presents Safety Oversight Challenges for FAA and Raises Issues Affecting Federal Roles

Statement of Gerald L. Dillingham, Ph.D., Director
Physical Infrastructure Issues

GAO
Accountability * Integrity * Reliability

GAO-10-286T

GAO
Accountability·Integrity·Reliability

Highlights

Highlights of GAO-10-286T, a testimony before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

Since GAO reported on the commercial space launch industry in 2006, the industry has evolved and moved further toward space tourism. Commercial space tourism promises to make human space travel available to the public for the first time. The Federal Aviation Administration (FAA) oversees the safety of commercial space launches, licensing and monitoring the safety of such launches and of spaceports (sites for launching spacecraft), and FAA promotes the industry. FAA is also responsible for overseeing the safety of space tourism, but it may not regulate crew and passenger safety before 2012 except in response to high-risk incidents, serious injuries, or fatalities.

This testimony addresses (1) recent trends in the commercial space launch industry, (2) challenges that FAA faces in overseeing the industry, and (3) emerging issues that will affect the federal role. This statement is based on GAO's October 2006 report on commercial space launches, updated with information GAO gathered from FAA, the Department of Commerce, and industry experts in November 2009 on industry trends and recent FAA actions.

In past work, GAO recommended that FAA take several actions to improve its oversight of commercial space launches, including assessing its future resource needs. FAA has taken some steps to address the recommendations.

View GAO-10-286T or key components. For more information, contact Gerald L. Dillingham at (202) 512-2834 or dillinghamg@gao.gov.

December 2, 2009

COMMERCIAL SPACE TRANSPORTATION

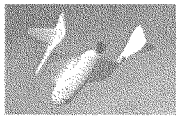
Development of the Commercial Space Launch Industry Presents Safety Oversight Challenges for FAA and Raises Issues Affecting Federal Roles

What GAO Found

Recent Trends. Historically, the commercial space launch industry focused primarily on putting payloads, such as satellites, into orbit, using launch vehicles that did not return to earth. Such launches have, however, dropped off, and the industry is increasing its focus on space tourism. Since five manned commercial flights demonstrated the potential for commercial space tourism in 2004, companies have pursued research and development and are further developing reusable vehicles for manned flights. Concurrently, companies and states are developing additional spaceports to accommodate anticipated increases in commercial space launches. States have provided economic incentives, and FAA has provided some funding for development.

Oversight Challenges. In overseeing the commercial space launch industry, including the safety of space tourism, FAA faces several challenges. These include maintaining a sufficient number of staff with the necessary expertise to oversee the safety of launches and spaceport operations; determining whether FAA's current safety regulations are appropriate for all types of commercial space vehicles, operations, and launch sites; developing information to help FAA decide when to regulate crew and passenger safety after 2012; and continuing to avoid conflicts between FAA's regulatory and promotional roles.

Emerging Issues. The U.S. commercial space launch industry is expected to expand as space tourism develops and the National Aeronautics and Space Administration starts to rely on the commercial sector for space transportation. This expansion will affect the federal role. For example, FAA will face increases in its licensing and regulatory workload, and federal agencies and Congress will face decisions about whether to support the U.S. industry by continuing to provide liability indemnification to lower its costs. Additionally, FAA will face policy and procedural issues when it integrates the operations of spacecraft into its next generation air transportation system. Finally, coordinating the federal response to the commercial space industry's expansion is an issue for the federal government in the absence of a national space launch strategy for setting priorities and establishing federal agency roles.



Source: Scaled Composites.
SpaceShipOne

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to testify today on the Federal Aviation Administration's (FAA) oversight of the commercial space launch industry. Historically, commercial space launches carried payloads, generally satellites, into orbit using expendable launch vehicles—that is, vehicles that are only used once. These launches took place primarily at federal launch sites. In recent years, the industry has changed significantly—most notably, the successful launches of SpaceShipOne in 2004 raised the possibility of an emerging commercial space tourism industry that would make human space travel available to the public for the first time. Now, several companies are developing reusable launch vehicles for commercial space tourism and plan to test them within the next few years.[1] In addition, the National Aeronautics and Space Administration (NASA) plans to retire the space shuttle around 2010 and begin using commercial launches to carry cargo and possibly astronauts to the International Space Station. To support an expected growth in commercial space launches, commercial spaceports—which are sites used for launching spacecraft—are being developed by private companies and states. FAA's Office of Commercial Space Transportation is responsible for licensing and monitoring the safety of commercial space launches and spaceports and promoting the industry. The Commercial Space Launch Amendments Act of 2004[2] gave FAA the specific responsibility of regulating commercial human space flight, but, to allow the industry to experiment and mature, the act prohibits FAA from regulating crew and passenger safety before 2012 except in response to high-risk incidents, serious injuries or fatalities, or an event that poses a high risk of causing a serious or fatal injury.[3]

My testimony today focuses on (1) recent trends in the commercial space launch industry, (2) challenges that FAA faces in overseeing the industry, and (3) emerging issues that will affect the federal role. This statement is based on our October 2006 report on commercial space launches[4] and is

[1]A reusable launch vehicle is one that is capable of being launched into space more than once and takes off and returns to the original launch site.

[2]Pub. L. No. 108-492, 118 Stat. 3974 (2004).

[3]49 U.S.C. §70105(c).

[4]GAO, *Commercial Space Launches: FAA Needs Continued Planning and Monitoring to Oversee the Safety of the Emerging Space Tourism Industry*, GAO-07-16 (Washington, D.C.: Oct. 20, 2006).

updated with information we gathered from FAA, the Department of Commerce, and industry experts in November 2009 on industry trends and recent FAA actions. Our work on the October 2006 report included reviewing FAA's safety oversight processes and interviewing federal government officials and industry representatives to assess FAA's response to emerging industry issues. Appendix I provides an update of the actions that FAA has taken in response to our previous recommendations.

We conducted our work in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Recent Trends in the Commercial Space Launch Industry

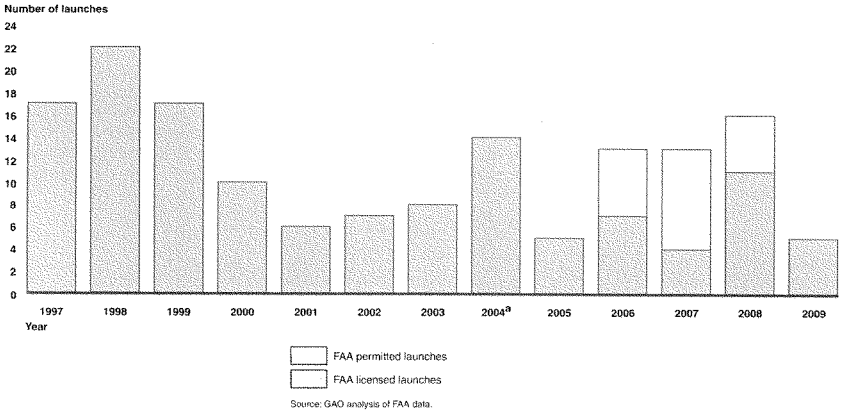
To date, the commercial space launch industry has primarily focused on putting payloads, such as satellites, into orbit, using launch vehicles that are used only once. The number of launches for this purpose has, however, dropped off, and the industry appears to be increasing its focus on space tourism. Apart from the five manned flights in 2004, efforts thus far have consisted of tests for research and development purposes, but companies are continuing to develop vehicles for manned flights. Concurrently, companies and states are developing additional spaceports to accommodate anticipated commercial space tourism flights, with states providing economic incentives for development. As part of FAA's mission to promote the commercial space industry, federal funds have also supported infrastructure development at one spaceport.

Launch Trends

There are three main types of space launches—national security, civil, and commercial. National security launches are by the Department of Defense for defense purposes, and civil launches are by NASA for scientific and exploratory purposes. Commercial launch companies compete domestically and internationally for contracts to carry payloads, such as satellites, into orbit using expendable launch vehicles, which are unmanned, single-use vehicles. Except for the launches of SpaceShipOne in 2004, U.S. commercial space launches have been unmanned. Designed to carry crew and one passenger, SpaceShipOne was the first commercial reusable launch vehicle mission licensed by FAA.

After reaching a peak of 22 launches in 1998 (see fig. 1), the number of commercial space launches began to fluctuate and generally decline following a downturn in the telecommunications services industry, which was the primary customer of the commercial space launch industry. In the last several years, two trends have emerged. First, there has been a drop-off in U.S. commercial orbital launches. In part, this may be because the U.S. commercial space launch industry is not price competitive with foreign companies, some of which receive extensive government support, according to Department of Commerce officials. Second, FAA began issuing experimental permits in 2006 to companies seeking to conduct test launches of reusable launch vehicles. According to industry experts that we spoke with, over the past 3 years the commercial space launch industry has experienced a steady buildup of research and development efforts, including ground tests and low-altitude flight tests of reusable rocket-powered vehicles that are capable of takeoffs and landings.

Figure 1: U.S. Commercial Launches, 1997 to November 2009



Source: GAO analysis of FAA data.

[a]Includes licensed suborbital launches by Scaled Composites.

Manned commercial space launches took place for the first and only time with the five manned flights of SpaceShipOne in 2004. Although additional

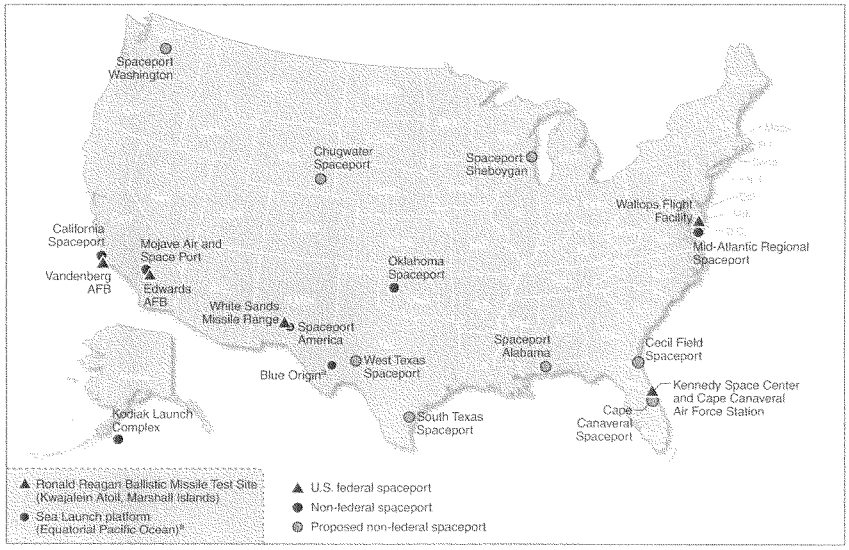
manned flights were anticipated, they have not materialized since we issued our report in 2006. A number of companies—including Scaled Composites, which is developing SpaceShipTwo—are continuing to develop vehicles for manned flights, but they are not yet developed to a testing stage, which would require a launch license or experimental permit.[5]

The Number of Spaceports Is Increasing

Since we reported in 2006, private companies and states are developing additional spaceports to accommodate anticipated commercial space tourism flights and to expand the nation's launch capacity. In 2006, there were six FAA-licensed spaceports and eight proposed spaceports. Since then, one of the proposed spaceports (Spaceport America in New Mexico) has begun operating and one (Gulf Coast Regional Spaceport) has terminated its plans. Two new spaceports in Florida have applied for FAA licenses. Figure 2 shows the existing and proposed spaceports and federal launch sites used for commercial launches.

[5]FAA issues four types of licenses: a launch license (for expendable launch vehicles), a reusable launch vehicle mission license, a reentry license, and a launch or reentry site operator license. The first three types of licenses are issued to the operator of a launch vehicle, and the fourth is issued to the operator of a spaceport. FAA also issues experimental permits for test flights of reusable launch vehicles.

Figure 2: Existing and Proposed Spaceports in the United States as of November 2009



Source: FAA and GAO.

*Private facility with a sole site operator.

States have provided economic incentives to developers—including passing legislation to decrease liability and lower the tax burden for developers, according to FAA—to build spaceports to attract space tourism and provide economic benefits to localities; FAA has provided funding assistance for infrastructure development. For example, New Mexico provided $100 million to construct Spaceport America. According to an official from the Oklahoma spaceport, Oklahoma provides approximately $500,000 annually to the spaceport for operations, and the state paid for the environmental impact statement and the safety analysis needed to apply for an FAA license. The Florida Space Authority, a state agency, invested over $500 million in new space industry infrastructure

development, including upgrades to the launch pad, a new space operations support complex, and a reusable launch vehicle support complex. The Mid-Atlantic Regional Spaceport receives half of its funding from Virginia and Maryland, with the remainder coming from revenue from operations. According to FAA, Florida and Virginia also passed bills that grant an exemption from state income tax for either launch services or gains achieved from providing services to the International Space Station. In addition, the Mojave Spaceport in California received an FAA Airport Improvement Program grant of $7.5 million to expand an existing runway to allow for the reentry of horizontally landing reusable vehicles.

Challenges Facing FAA in Overseeing the Commercial Space Launch Industry

FAA faces challenges in ensuring that it has a sufficient number of staff with the necessary expertise to oversee the safety of commercial space launches and spaceport operations. In addition, FAA will need to determine whether its current safety regulations are appropriate for all types of commercial space vehicles, operations, and launch sites. FAA will also need to develop safety indicators and collect data to help it determine when to begin to regulate crew and passenger safety after 2012. Continuing to avoid conflicts between its dual roles as a safety regulator and an industry promoter remains another issue to consider as the space tourism industry develops.

FAA Resources and Workload

In 2006, we raised concerns that if the space tourism industry developed as rapidly as some industry representatives suggested, FAA's responsibility for licensing reusable launch vehicle missions would greatly expand. FAA's experience in this area is limited because its launch safety oversight has focused primarily on unmanned launches of satellites into orbit using expendable launch vehicles. Many companies are developing space hardware of different designs that are being tested for the first time, requiring that FAA have a sufficient level of expertise to provide oversight. In addition, FAA has to have an adequate number of staff to oversee the anticipated growth in the number of launches at various locations. We recommended that FAA assess the levels of expertise and resources that will be needed to oversee the safety of the space tourism industry and the new spaceports under various scenarios and timetables. In response to our recommendations, FAA's Office of Commercial Space Transportation hired 12 aerospace engineers, bringing its total staff to 71 full-time employees. In addition, since our report, FAA has established field offices at Edwards Air Force Base and NASA's Johnson Space Center in anticipation of increased commercial space launches.

We believe FAA has taken reasonable steps to ensure that it has adequate resources to fulfill its safety oversight role. However, if the industry begins to expand, as senior FAA officials predict, to 200 to 300 annual launches, a reassessment of FAA's resources and areas of expertise would be appropriate. Moreover, as NASA-sponsored commercial space launches increase, FAA's need for regulatory resources and expertise may change, according to industry experts we spoke with.

Suitability of Safety Regulations to Cover Both Federal Launch Sites and Commercial Spaceports

FAA faces the challenge of ensuring that its regulations on licensing and safety requirements for launches and launch sites, which are based on safety requirements for expendable launch vehicle operations at federal launch sites, will also be suitable for operations at spaceports. We reported that the safety regulations for expendable launch vehicles may not be suitable for space tourism flights because of differences in vehicle types and launch operations, according to experts we spoke with. Similarly, spaceport operators and experts we spoke with raised concerns about the suitability of FAA safety regulations for spaceports. Experts told us that safety regulations should be customized for each spaceport to address the different safety issues raised by various types of operations, such as different orbital trajectories and differences in the way that vehicles launch and return to earth—whether vertically or horizontally. To address these concerns, we reported that it will be important to measure and track safety information and use it to determine if the regulations should be revised. We did not make recommendations to FAA concerning these issues because the Commercial Space Launch Amendments Act of 2004 required the Department of Transportation (DOT) to commission an independent report to analyze, among other things, whether expendable and reusable vehicles should be regulated differently from each other, and whether either of the vehicles should be regulated differently if carrying passengers. The report, issued in November 2008, concluded that the launch of expendable vehicles, when used to lift reusable rockets carrying crew and passengers, as well as the launch and reentry of reusable launch vehicles with crew and passengers, should be regulated differently from the launch of expendable vehicles without humans aboard.[6] Similar to our finding, the report noted that the development of a data system to monitor the development and actual performance of commercial launch systems and to better identify different launch risk factors and criteria would

[6]The Aerospace Corporation, et al., *Analysis of Human Space Flight Safety, Report to Congress* (El Segundo, Calif.: Nov. 11, 2008).

greatly assist the regulatory process. FAA has not developed such a data system because so few commercial launches have occurred.

Regulation of Crew and Passenger Safety after 2012

Although FAA is prohibited from regulating crew and passenger safety before 2012 except in response to serious injuries or fatalities or an event that poses a high risk of causing a serious or fatal injury, FAA is responsible for the protection of the uninvolved public, which could be affected by a failed mission. FAA has interpreted this limited authority as allowing it to regulate crew safety in certain circumstances and has been proactive in issuing a regulation concerning emergency training for crews and passengers.[7] However, FAA has not developed indicators that it would use to monitor the safety of the developing space tourism sector and determine when to step in and regulate human space flight. To allow the agency to be proactive about safety, rather than responding only after a fatality or serious incident occurs, we recommended that FAA identify and continually monitor indicators of space tourism industry safety that might trigger the need to regulate crew and passenger safety before 2012. According to agency officials, FAA has not addressed our recommendation because there have been no launches with passengers. When such launches occur, those same officials told us, they intend to collect and analyze data on safety-related anomalies, safety-critical system failures, incidents, and accidents. Those officials also told us that they intend to develop a means to share information with and assess lessons learned from the private spaceflight industry.

It is unclear when FAA will or should begin regulating crew and passenger safety, since data for evaluating risk do not exist. A senior FAA official told us that the agency does not plan to issue new regulations even after the 2012 prohibition is lifted and that they would like to see how the current procedures, which require passengers to sign an acknowledgement of informed consent, operates before deciding to issues new regulations. Nonetheless, FAA is taking steps that will enable it to be prepared to regulate. Space tourism companies that we spoke with stated that they now informally collect lessons learned and share best practices with each other and with FAA, which eventually could lead to industry standards. Senior FAA officials also told us that FAA is reviewing NASA's human rating of space launch vehicles as well as FAA's Office of Aviation Safety aircraft certification process as they consider possible future

[7] 71 Fed. Reg. 75616, December 15, 2006.

regulations on human spaceflight standards. In addition, FAA's Office of Commercial Space Transportation expects to work closely with its industry advisory group—the Commercial Space Transportation Advisory Committee—on the issue. We believe FAA is taking reasonable preliminary steps to regulate crew and passenger safety.

Distinguishing FAA's Dual Role of Industry Promotion and Safety

In 2006, we reported that FAA faced the potential challenge of overseeing the safety of commercial space launches while promoting the industry. While we found no evidence that FAA's promotional activities—such as sponsoring an annual industry conference and publishing industry studies—conflicted with its safety regulatory role, we noted that potential conflicts may arise as the space tourism sector develops. We reported that as the commercial space launch industry evolves, it may be necessary to separate FAA's regulatory and promotional activities. Recognizing the potential conflict, Congress required the 2008 DOT-commissioned report to discuss whether the federal government should separate the promotion of human space flight from the regulation of such activity. We suggested as a matter for congressional consideration that, if the report did not fully address the potential for a conflict of interest, Congress should revisit the granting of FAA's dual mandate for safety and promotion of human space flight and decide whether the elimination of FAA's promotional role is necessary to alleviate the potential conflict. The 2008 commissioned report concluded there was no compelling reason to remove promotional responsibilities from FAA in the near term (through 2012). Moreover, the report noted that the Office of Commercial Space Transportation's estimated resource allocation for promotional activities was approximately 16 percent of the office's budget in fiscal year 2008, which was significantly less than what the office allocated for activities directly related to safety. However, the report noted that the commercial space launch industry will experience significant changes in its environment in the coming decades; therefore, periodic review of this issue is warranted. We concur with the commissioned report's assessment and see no need for Congress to step in at this time to require a separation of regulatory and promotional activities. However, FAA and Congress must remain vigilant that any inappropriate relationship between FAA and industry—such as was alleged in 2008 between FAA and the airline industry—does not occur with the commercial space launch industry.

Emerging Issues

The expected expansion of the U.S. commercial space launch industry due to anticipated events such as the development of space tourism and the retirement of NASA's space shuttle and the agency's shift to using the

commercial sector to provide space transportation will affect the federal role in various ways such as increasing FAA's licensing and regulatory workload. To assist in the expansion of the industry, other issues will emerge for federal agencies and Congress to consider, such as whether to assist the industry in lowering costs by extending existing liability indemnification and how to enhance the global competitiveness of the U.S. industry. Another issue that will emerge as the industry grows is how FAA will integrate space flights with aircraft traffic as part of efforts to develop the next generation air transportation system (NextGen). A national space launch strategy, which is currently lacking, could provide a cohesive framework for addressing such issues and establishing national priorities.

Expected Industry Expansion

Industry experts that we spoke with and senior officials at FAA expect that the number of commercial space launches will increase over the next several years because of the continued development of vehicles for human space flight and in response to prize competitions. Starting in the next 3 to 5 years, senior FAA officials expect several companies to begin offering paying customers the opportunity to fly onboard suborbital space flights,[8] with numerous launches taking place each year. Virgin Galactic is among the companies that are undertaking research and development for launch vehicles designed to serve the anticipated space tourism market. FAA reported in 2008 that the company had sold 250 seats for its flights. Scaled Composites and Virgin Galactic formed a joint venture to develop SpaceShipTwo for Virgin Galactic. Other companies, such as XCOR Aerospace and Armadillo Aerospace, have announced plans to develop vehicles to serve the personal spaceflight market. In addition, prize competitions are expected to spur the growth of the space launch industry. For example, the Northrop Grumman Lunar Lander Challenge featured $1.65 million in prizes for vehicles that can simulate the liftoff and landing of a lunar spacecraft; prizes were awarded to Masten Space Systems and Armadillo Aerospace in November 2009. Both companies told us that they intend to apply for FAA experimental permits soon. In addition, the $30 million Google Lunar X PRIZE is offered to those who can safely land a robot on the surface of the moon, travel 500 meters, and send video images and data to earth by December 2014. Such competitions

[8]A suborbital flight is one in which the launch vehicle ascends and descends close to the launch site. An orbital flight is one that has an orbital trajectory over the earth. The difference between orbital and suborbital flights is based on the trajectory of the flight rather than altitude.

spur research and development and require FAA licensing or permitting to ensure the safety of the uninvolved public.

Senior FAA officials also expect the agency's licensing and oversight responsibilities to increase as NASA begins to rely on foreign partners and private industry to deliver cargo, and eventually crewmembers, to the International Space Station after it retires the space shuttle in 2010 or shortly thereafter. Two companies—SpaceX and Orbital Sciences—have received NASA contracts to develop new launch vehicles that will service the International Space Station. According to FAA officials and industry experts, test flights for the new vehicles are expected to begin next year with SpaceX at the beginning of the year and Orbital Sciences near the end of the year. FAA is working with SpaceX on its launch license application and Orbital Sciences is in the pre-application phase. FAA has established a field office at the Johnson Space Center in response to the anticipated increase in launches.

Maintaining an International Competitive Position for the U.S. Commercial Space Launch Industry

We reported in 2006 that as the commercial space launch industry expands, it will face key competitive issues concerning high launch costs and export controls that affect its ability to sell its services abroad. Foreign competitors have historically offered lower launch prices than U.S. launch providers, and the U.S. industry has responded by merging launch companies, forming international partnerships, and developing lower-cost launch vehicles. For example, Boeing and Lockheed Martin merged their launch operations to form United Launch Alliance, and SpaceX developed a lower-cost launch vehicle. The U.S. government has responded to the foreign competition by providing the commercial space launch industry support, including research and development funds, government launch contracts, use of its launch facilities, and third-party liability insurance through which it indemnifies launch operators.

The continuation of such federal involvement will assist industry growth, according to industry experts that we spoke with. For example, industry players have called for the continuation of indemnification to support U.S. competitiveness. Indemnification secures another party against risk or damage. The U.S. government indemnifies launch operators by providing catastrophic loss protection covering third-party liability claims in excess of required launch insurance in the event of a commercial launch incident. Currently, launch operators are required to buy third-party liability insurance for up to $500 million in addition to insurance for their vehicle and its operations, and the U.S. government provides up to $1.5 billion in indemnification. The law that allows for indemnification expires in

December 2009.[9] Some industry experts have said that it is important that the law be extended because the cost of providing insurance for launches could be unaffordable without indemnification. According to a space insurance expert, as there has not been an incident requiring the U.S. government to pay out third-party claims, the cost to the government of providing indemnification has been only for administrative purposes. Nonetheless, according to a senior Commerce official, there is always a possibility of a launch mishap that could invoke indemnification. FAA has asked for the law's extension as a means to promote the growth of the industry, and the Department of Commerce supports this position. A senior Commerce official told us that without federal indemnification, smaller launch companies may go out of business.

In addition, industry representatives that we interviewed told us that export licensing requirements affect the ability of the U.S. commercial space launch industry to sell its services abroad. These regulations are designed to establish controls to ensure that arms exports are consistent with national security and foreign policy interests include launch vehicles because they can deliver chemical, biological, and nuclear weapons. A senior Department of Commerce official told us that the U.S. industry has asked Congress to consider changing the statute that restricts space manufacturing items for export. A change in statute would allow for the Departments of State and Defense to review individual items, as they do for other industries.

As the space tourism industry develops, the issue will arise of establishing a foundation for a common global approach to launch safety. According to senior FAA officials, space tourism operations are planned to be international, with takeoffs and landings from U.S. spaceports to United Arab Emirates and Singapore spaceports, among others. Thus, the development, interoperability, and harmonization of safety standards and regulations, particularly concerning space tourism flights, will be important for the safety of U.S. and international space operations. In the future, if suborbital point-to-point space travel becomes a reality, entirely new issues will have to be addressed, including bilateral and international interoperability, air and space traffic integration, existing treaty and law implications, national security issues (such as friend or foe identification), customs, international technical standards, and other transportation issues. In response, FAA has established an international outreach

[9] 49 U.S.C. §70113(f).

program to promote FAA commercial space transportation regulations as a model for other countries to adopt. The outreach program includes establishing initial contacts with interested countries and introductory briefings about FAA regulations.

Integrating Space Transportation into NextGen

NextGen—FAA's efforts to transform the current radar-based air traffic management system into a more automated, aircraft-centered, satellite-based system—will need to accommodate spacecraft that are traveling to and from space through the national airspace system. As the commercial space launch industry grows and space flight technology advances, FAA expects that commercial spacecraft will frequently make that transition and the agency will need tools to manage a mix of diverse aircraft and space vehicles in the national airspace system. In addition, the agency will need to develop new policies, procedures, and standards for integrating space flight operations into NextGen. For example, it will have to define new upper limits to the national airspace system to include corridors for flights transitioning to space; establish new air traffic procedures for flights of various types of space vehicles, such as aircraft-ferried spacecraft and gliders; develop air traffic standards for separating aircraft and spacecraft in shared airspace; and determine controller workload and crew rest requirements for space operations. FAA has begun to consider such issues and has developed a concept of operations document.

Lack of an Overarching National Space Launch Policy

Finally, an overarching issue that has implications for the U.S. commercial space launch industry is the lack of a comprehensive national space launch strategy, according to federal officials and industry experts. Numerous federal agencies have responsibility for space activities, including FAA's oversight of commercial space launches, NASA's scientific space activities, the Department of Defense's national security space launches, the State Department's involvement in international trade issues, and the Department of Commerce's advocacy and promotion of the industry. According to the National Academy of Sciences, aligning the strategies of the various civil and national security space agencies will address many current issues arising from or exacerbated by the current uncoordinated, overlapping, and unilateral strategies.[10] A process of

[10]Committee on the Rationale and Goals of the U.S. Civil Space Program, National Research Council, *America's Future in Space: Aligning the Civil Space Program with National Needs* (Washington, D.C.: 2009).

alignment offers the opportunity to leverage resources from various agencies to address such shared challenges as the diminished space industrial base, the dwindling technical workforce, and reduced funding levels, according to the Academy report. A national space launch strategy could identify and fill gaps in federal policy concerning the commercial space launch industry, according to senior FAA and Commerce officials.

Our research has identified several gaps in federal policy for commercial space launches. For example, while FAA has safety oversight responsibility for the launch and re-entry of commercial space vehicles, agency officials told us that no federal entity has oversight of orbital operations, including the collision hazard while in orbit posed by satellites and debris (such as spent rocket stages, defunct satellites, and paint flakes from orbiting objects). Another issue that has not been resolved is the role of the National Transportation Safety Board (NTSB) in investigating any accidents that occur. NTSB does not have space transportation explicitly included in its statutory jurisdiction, although it does have agreements with FAA and the Air Force under which it will lead investigations of commercial space launch accidents.[11] The 2008 commissioned report on human space flight suggested that Congress may want to consider explicitly designating a lead agency for accident investigations involving space vehicles to avoid potential overlapping jurisdictions. According to senior officials we spoke with at FAA and Commerce, the need for an overall U.S. space launch policy that includes commercial space launches is being discussed within DOT and across departments, as part of the administration's review of national space activities, but the development of a national policy has not yet begun.

Mr. Chairman, this concludes my prepared statement. I would be pleased to respond to any questions from you or other Members of the Subcommittee.

[11] S. 2768, 111th Congress (2009), would give NTSB authority to investigate accidents involving commercial space launch vehicles.

GAO Contact and Staff Acknowledgments

For further information on this testimony, please contact Dr. Gerald L. Dillingham at (202) 512-2834 or dillinghamg@gao.gov. Individuals making key contributions to this testimony include Teresa Spisak, Maureen Luna-Long, Rosa Leung, Erica Miles, David Hooper, and Elizabeth Eisenstadt.

Appendix I: Status of GAO's Recommendations to the Federal Aviation Administration Concerning Commercial Space Launches

Recommendation	Action taken
The Federal Aviation Administration (FAA) needs to assess the level of expertise and resources that will be needed to oversee the safety of the space tourism industry and the new spaceports under various scenarios and timetables.	FAA has assessed resources and hired 12 additional aerospace engineers.
FAA's Office of Commercial Space Transportation should develop a formal process for consulting with the Office of Aviation Safety about licensing reusable launch vehicles.	FAA has not developed a formal process, but the two offices signed a formal agreement for the licensing of SpaceShipTwo, which delineates the responsibilities for each office. Agency officials expect that a similar process will be used as future applications are received.
FAA should identify and continually monitor space tourism safety indicators that might trigger the need to regulate crew and flight participant safety before 2012.	No action has been taken on monitoring safety indicators because commercial human space flights have not occurred since the SpaceShipOne launches in 2004. When commercial human space flights occur, FAA plans to monitor key safety indicators including safety-related anomalies, safety-critical system failures, incidents, and accidents. FAA officials plan to track these indicators, precursors, trends, or lessons learned that would warrant additional FAA regulation.
FAA should develop and issue guidance on the circumstances under which it would regulate crew and flight participant safety before 2012.	No action has been taken to issue guidance. However, senior FAA officials say that the agency has held internal discussions on the circumstances under which it would regulate crew and space flight participant safety before 2012 in the event of a casualty or close call. The officials noted that launch vehicle operators are required to report to FAA mishaps and safety-related anomalies and failures and take appropriate corrective actions prior to the next launch.
As long as it has a promotional role, FAA should work with the Department of Commerce to develop a memorandum of understanding that clearly delineates the two agencies' respective promotional roles in line with their statutory obligations and larger agency missions.	FAA's Office of Commercial Space Transportation and Commerce's Office of Space Commercialization signed a memorandum of understanding in September 2007. FAA has no agreement with Commerce's International Trade Administration, which also has responsibilities for promoting the commercial space industry and its competitiveness.

This is a work of the U.S. government and is not subject to copyright protection in the United States. The published product may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.

GAO's Mission	The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.
Obtaining Copies of GAO Reports and Testimony	The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site (www.gao.gov). Each weekday afternoon, GAO posts on its Web site newly released reports, testimony, and correspondence. To have GAO e-mail you a list of newly posted products, go to www.gao.gov and select "E-mail Updates."
Order by Phone	The price of each GAO publication reflects GAO's actual cost of production and distribution and depends on the number of pages in the publication and whether the publication is printed in color or black and white. Pricing and ordering information is posted on GAO's Web site, http://www.gao.gov/ordering.htm. Place orders by calling (202) 512-6000, toll free (866) 801-7077, or TDD (202) 512-2537. Orders may be paid for using American Express, Discover Card, MasterCard, Visa, check, or money order. Call for additional information.
To Report Fraud, Waste, and Abuse in Federal Programs	Contact: Web site: www.gao.gov/fraudnet/fraudnet.htm E-mail: fraudnet@gao.gov Automated answering system: (800) 424-5454 or (202) 512-7470
Congressional Relations	Ralph Dawn, Managing Director, dawnr@gao.gov, (202) 512-4400 U.S. Government Accountability Office, 441 G Street NW, Room 7125 Washington, DC 20548
Public Affairs	Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548

Please Print on Recycled Paper

Testimony of Jeff Greason
CEO, XCOR Aerospace
and
Vice Chairman, Commercial Spaceflight Federation

Before the Subcommittee on Aviation
House Committee on Transportation & Infrastructure

Wednesday, December 2, 2009

Thank you, Mr. Chairman, for the opportunity to testify before this Committee on the state of the U.S. commercial space transportation industry. I am speaking today not only as CEO of XCOR Aerospace, an entrepreneurial developer of rocket propulsion and reusable launch vehicles, but also as Vice Chairman of the Commercial Spaceflight Federation, an association of 20 businesses and organizations working to make commercial human spaceflight a safe, dependable reality. CSF's mission is to promote the development of commercial human spaceflight, pursue ever higher levels of safety, and share best practices and expertise throughout the industry.

The Current CSLAA Regime is Working Well

It was nearly five years ago that the Congress demonstrated bipartisan leadership by enacting the Commercial Space Launch Amendments Act (CSLAA) of 2004. Since then, Congress' foresight has been validated in several ways.

First and foremost, the regulatory regime made possible by the CSLAA has allowed for the privately-funded development of several different competing suborbital reusable launch vehicles to address scientific research and education markets as well as private individuals seeking a spaceflight experience. Beyond suborbital flights, the CSLAA regime has also enabled significant investments in commercial spacecraft capable of carrying humans to and from low Earth orbit using proven expendable launch vehicles.

Clarity of regulatory jurisdiction and approach has given confidence to investors, entrepreneurs, and customers alike, and the U.S. is seen as a world leader because we have created a supportive regulatory climate.

The Office of the Associate Administrator for Commercial Space Transportation has done an excellent job of implementing the letter and spirit of the statute, both in new regulations and through transformation of its internal staff to focus on these new kinds of vehicles. Of particular value has been the office's placement of technical staff out in the field, where they can more closely observe development and test activities of industry.

At the same time, industry has taken a deliberate, step-by-step, safety-conscious approach to developing new vehicles, rather than rushing into service since Congress acted in 2004. Companies have conducted research and development, including low-altitude flight tests. Thanks to the CSLAA, we are not attempting to learn things via computer analysis that can only be learned by building and flying real hardware; but neither are we putting our own employees or customers, let alone the uninvolved public, at casual risk.

This is 2009, not 1909, and the public and therefore Congress will not endure the devil-may-care attitude of early aviators. Fortunately we are more advanced in terms of engineering as well as safety expectations, but still no one can predict what will be the safest designs, technologies, or operating approaches for routine, safe commercial spaceflight. To learn them we must fly, including large numbers of test flights and, when ready, flying, for revenue.

Every single operator, and I feel confident speaking for all of my friendly competitors, knows that we all bear the burdens of our collective safety performance. On the one hand, we are all attempting to do things never done before, and we know that mishaps will occur and, sadly, lives may be lost. But we also know that our goal is to learn quickly from tiny mistakes so that we can avoid larger ones, while at the same time revolutionizing America's access to space, with all of its attendant benefits to our fellow citizens and our economy.

I believe that our judicious progress over five years, as witnessed by both GAO and Aerospace Corporation independent reviews, as well as the growing signs of confidence that policymakers are showing in this industry's capabilities, is a sign that no major change in legislation or regulation is necessary at this time, or is likely to be in the near future. As an industry we are still pecking our way out of our shell. It will be years before we will know what might be useful improvements or refinements to our regulatory regime, let alone to legislation.

Safety and Promotion are Aligned

Of course, I appreciate that there is some discussion as to how an agency like the FAA can be asked both to regulate and promote the commercial human spaceflight industry, when it no longer has a mandate to promote the aviation industry?

First of all, spaceflight is not air travel. We are not a mature, 100+ year old industry. That said, aviation benefitted from several decades, starting with the passage of the Air Commerce Act in 1926, of a single federal agency that both regulated and promoted the industry.

Second, the FAA already regulates us stringently to protect the uninvolved public, because after all the public at large are not choosing to take the risks of human spaceflight. Beyond this, it is actually FAA's promotional authority that gives them the power to regulate demonstrably unsafe practices or providers, or to encourage the adoption of best practices.

It was only twenty five years ago that Congress enacted the original Commercial Space Launch Act, and granted the Department of Transportation the power to be a one-stop shop for licensing of launch activities. Indeed, the purpose of Congress granting this licensing authority was clearly not limited to protecting the public but also included promoting the industry, since before that time companies had to ask some 40 different agencies for permission to conduct a single launch. Today, the FAA's mandate to promote, within the limits of maintaining overall public safety, allows the agency to lower the barriers to conducting R&D and flight tests, resulting in greater safety sooner.

Safety and Business Success are Aligned

At the present time, questions of safety are foremost in the minds of potential customers, both participants and payload developers. To achieve a viable industry we must innovate in safety; we must achieve a superior record to that of the past. Innovation requires change; and to achieve superior safety we must try new safety technologies and practices. The reality is that some changes will be improvements over past practice and some will not; but without the freedom to try, we cannot improve.

This need to find a better, safer way to operate is what motivates the industry; and the best way for the FAA to promote the industry is to aid us in identifying best practices and encouraging their swift adoption. The experimental permit regime is a good start on that. I cannot state strongly enough that at the present time the industry faces irresistible economic pressures to strive for the safest possible operation that is economically achievable. The mandate to promote the growth of the industry is therefore a mandate to foster continuous safety improvement.

In the view of my colleagues and myself, there is simply no conflict today between regulation and promotion. Furthermore, there will not be any conflict in the future until industry has a demonstrated safety record in which multiple operators have shown themselves safe enough that customers no longer "shop for safety," but come to expect it as a given. We are certainly not at that point today, and may not be for many years hence.

Space and Air Traffic Management

Space vehicles transition through the National Air Space at the beginning and end of their journey. Historically, however, space launches were so infrequent that a paradigm of clearing all air traffic away from the launch of large expendable rockets, typically from one of the national ranges, seemed to make sense. That will not work for fully reusable commercial suborbital vehicles this industry is developing.

Fortunately, the FAA has been planning for this new era. The goal for future development of the airspace has been to have space flight become just one of many uses of shared airspace. It appears that ADS-B technology plus GPS is sufficient to provide the tracking capabilities our industry will need for transition through the NAS.

Even today, however, all the various launch site operators have procedures in place or in development to manage the integration of space and air traffic. Each spaceport has different issues depending on the nature of their proposed space operations and the local features of the air traffic and air space.

For example, in Mojave, the spaceport operator has worked out procedures by which the local civilian and military air traffic authorities will be notified of our launches in a manner analogous to filing a flight plan. We will make use of the existing transition corridors used for high altitude military aircraft descending in to the National Air Space. XCOR has already tested elements of this system with our rocket-powered experimental aircraft. We have worked out procedures by which, when we request permission to take off from the control tower, the tower notifies the military traffic control authorities so that they are not surprised by the fast-climbing vehicle appearing on their radar screens. Also, they have the opportunity to inform our tower of any conflicting traffic should such ever occur.

The FAA's Office of the Associate Administrator for Commercial Space Transportation is aware of these procedures and, through their new field office in the Mojave area, will now have opportunities to watch them first hand and draw lessons from them for application elsewhere.

Management of, and jurisdiction over, traffic in orbit, sometimes called space traffic control, is a very complex issue. Orbital space is inherently a global domain and the physics of the environment make it inherently very different from air traffic control. Orbiting objects have very little ability to maneuver. Today, the tracking is primarily done by the U.S. Air Force, but the collision avoidance prediction technique, the method of communicating collision hazards to satellite operators, and the reaction by satellite operators, proved inadequate on February 11, 2009, when an Iridium satellite and Cosmos 2251 collided.

Since then, procedures have been somewhat improved. Unfortunately, the bulk of objects in space are not active satellites but derelict hazards to navigation. Yet there is no equivalent to maritime salvage law to encourage removal of such hazards, and such removal is technically difficult. This is an area where policy development at the national and international level is needed, and there are many stakeholders. Developing an appropriate multinational regime for space traffic awareness, control, and debris clearance is an effort worth starting; but which agency or agencies of the U.S. government will play which roles in an eventual system is far from clear.

Other challenges: Export Control

Another reason not to separate promotion from regulation is the abundance of issues relating to commercial space transportation where we need the FAA to be a strong advocate in the interagency process on behalf of industry's needs.

First and foremost remains the "broken record" of America's aerospace industry: reforming ITAR (International Traffic in Arms Regulations) and MTCR (Missile Technology

Control Regime). These are not just an issue for the U.S. commercial satellite industry, which export control practices have nearly destroyed, but for my industry as well.

I will not choose to belabor the problems of treating all technology pertaining to rocket engines, pressure suits, or any related issue in the most restrictive category of arms control, as if technology available in libraries around the world posed the same security issues as the latest advances in missile defense. Commission after commission has pointed that out. I do not question the usefulness of export controls in principle; but the practice of it is very different from the theory. Current experience shows that the actual effect is to ensure that bright aerospace engineers go to work overseas for our competitors rather than to come to this country and build our industries; to ensure that foreign investors are forced to invest in foreign competitors even when they might prefer to invest in U.S. companies, and generally to squander whatever technological advantage we might have over potential adversaries.

In summary, we need to get vehicles, pressure suits, and other non-sensitive items relating to commercial human spaceflight off the munitions list and instead regulate their export like we do aircraft.

Opportunities for greater partnership with DOD and NASA

While commercial human spaceflight and the vehicles that produce it are still in their early days, we can already see opportunities for the industry to provide services needed by DoD and NASA. The market of serving these needs will stimulate further development of the industry. Four promising areas are: small satellite launch, suborbital research payloads, transport of NASA astronauts to the International Space Station, and launch of propellant to orbit for exploration missions.

U.S. government entities continue to develop smaller and smaller satellites, exploiting advancing electronics technology; but such satellites currently lack a cost-effective dedicated launcher, being launched as secondary payloads. While such launches have served the early experimental phase for these satellites, operational use will require dedicated launch. Furthermore, one driver of such smaller satellites is the need to launch constellations of small satellites quickly, in response to a military need, disaster relief, or because of the unexpected loss of existing satellites - sometimes called "operationally responsive" space launch. That calls for launchers with the same characteristics the industry needs for a profitable business; high flight rate at affordable cost, with short call-up times.

Another growth area for partnership with NASA, as well as other scientific agencies, lies in the burgeoning interest in suborbital research and education missions (REM). Commercial suborbital vehicles will provide low-cost, frequent access to suborbital space for scientific, engineering, and educational payloads. Fly-on-demand, rapid-turnaround, and human-in-the-loop capabilities will enable new types of previously impossible research. By providing lower cost access to the space environment than existing expendable sounding rockets, diverse areas of research from earth science to microgravity physics will benefit, and provide a new avenue for student involvement and hands-on-training with science

experiment hardware. NASA has already recognized the scientific potential of these commercial reusable vehicles through creation of the Commercial Reusable Suborbital Research Program (CRuSR). As NASA Administrator Charles Bolden stated in October, "We are engaged in a new program... that will buy space transportation services from the emerging reusable spaceflight companies to conduct science research, technology development, with a keen focus on education." These new markets will help to diversify and strengthen the commercial spaceflight industry.

Third, NASA's human space flight efforts, as noted in the recent report of the Augustine Committee, in which I participated, has major opportunities to benefit from collaboration with industry. One such area of opportunity is the carriage of crew to Earth orbit in simpler "crew taxi" capsules; such capsules are in development or under serious consideration by a number of private companies ranging from newer entrants to long-established traditional firms. Here is opportunity for both private and government customers to benefit from pooling their demand for such flights. The beginning of commercial human space flight using Russian capsules helped to open people's eyes to what could be done in space. Moving that capability back to U.S. companies would be another important step.

Finally, the carriage of propellant for U.S. exploration missions on private launch capacity could be a transformative opportunity. This allows for much larger missions to be flown for a given size booster; or alternatively, a much smaller booster to be used for a given mission, at substantial savings to the taxpayers. It is difficult to overstate the significance of such a capability to both NASA and the launch industry. The greatest barrier to the introduction of new orbital launch technology has been the limited volume of launch traffic, its unpredictable nature year to year, and the understandable desire of launch customers not to risk high value payloads on new launch technology. Propellant can be launched on any size launcher. It is a low-value payload that we can afford to risk on new technology launch vehicles, and as long as NASA has exploration missions they will need propellant. I can conceive of no other step besides transitioning exploration to a "on orbit refueling" architecture which would have as powerful stimulating effect on the U.S. launch industry, analogous to the effect that the Air Mail had did on U.S. aviation.

The combined promise of these various markets strengthens my belief in a bright future for the commercial space transportation industry, operating within a stable regulatory and policy framework. Thank you for the opportunity to be here today and I look forward to your questions.

# # #

STATEMENT OF DR. GEORGE C. NIELD, ASSOCIATE ADMINISTRATOR FOR THE OFFICE OF COMMERCIAL SPACE TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE OF REPRESENTATIVES, COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE, SUBCOMMITTEE ON AVIATION, ON COMMERCIAL SPACE TRANSPORTATION, DECEMBER 2, 2009.

Chairman Costello, Ranking Member Petri, and Members of the Subcommittee:

Good morning. Thank you for inviting me to participate in this hearing to update the subcommittee on the activities of the Federal Aviation Administration (FAA) related to commercial space transportation. Today I will briefly summarize the history, mission, and range of responsibilities assigned to the organization I oversee, the FAA's Office of Commercial Space Transportation (AST). I will then review some of our major accomplishments since the enactment of the Commercial Space Launch Amendments Act of 2004, which established a framework for the future of commercial spaceflight as it continues to evolve in this country. It is important to point out that the work the FAA does today is clearly the direct result of the forward-looking action of Congress, and the leadership and support of senior management at both the Department of Transportation and the FAA, under the current direction of Administrator Randy Babbitt. Finally, I will mention two key challenges that we expect to face in the years ahead.

Spaceflight is changing. Once the exclusive province of two nations and managed by their governments, other nations are now active in space at the same time that new, entrepreneurial efforts are complementing the work of existing commercial launch operators. Suborbital flights and low-Earth orbit operations have attracted the interest of

new space entrants with designs on both payload services and access to space for private citizens. Collectively, the commercial space industry represents a diverse, dedicated, and innovative group of men and women who make the science of launching rockets their daily work, with safety the rule that guides them.

While all this amounts to a new day in spaceflight, it follows on the heels of more than two decades of commercial space transportation development and activity. AST was established by Executive Order in 1984 and was originally located in the Office of the Secretary of Transportation. In November of 1995, AST was transferred to the FAA, where today it is one of four lines of business, along with Aviation Safety, Airports, and the Air Traffic Organization.

Our most critical mission is carrying out our statutory charge of ensuring public safety during commercial launch and reentry activities. We do this in a number of ways. First, we issue launch licenses, experimental permits, and safety approvals. Since March of 1989, there have been 200 licensed launches, with the most recent being the launch of an Atlas V from Cape Canaveral on November 23, 2009. During all of those launches, there have been no accidents that have resulted in fatalities or significant property damage to the public. However, in the event of a serious accident, we are prepared. There is a memorandum of understanding (MOU) among the FAA, the United States Air Force, and the National Transportation Safety Board regarding commercial space accidents and incidents. This MOU outlines agreed-upon matters between the agencies, including

notification procedures, accident/incident definitions, investigation primacy, and shared training opportunities.

AST also issues licenses for the operation of launch sites, or "spaceports." Since 1996, AST has issued site operator licenses for seven spaceports: California Spaceport at Vandenberg Air Force Base; Spaceport Florida at Cape Canaveral Air Force Station; the Mid-Atlantic Regional Spaceport at Wallops Flight Facility in Virginia; Mojave Air and Space Port in California; Kodiak Launch Complex on Kodiak Island, Alaska; the Oklahoma Spaceport, in Burns Flat, Oklahoma; and Spaceport America, near Las Cruces, New Mexico.

Second, we develop and issue regulations that are designed to ensure that commercial launch and reentry activities are conducted safely. Finally, we perform safety inspections in conjunction with all licensed and permitted launches, to ensure that operations are conducted in accordance with those regulations.

As a result of the Commercial Space Launch Amendments Act of 2004, the FAA has acquired additional responsibilities for regulating commercial human spaceflight. There were two main rulemaking efforts to implement that Act. The first involved setting standards for testing new space vehicles. As Congress directed, the FAA on April 6, 2007 issued a Final Rule on Experimental Permits for Reusable Suborbital Rockets. The regulations establish an experimental permit regime modeled on the experimental airworthiness certificates that are issued for aircraft. Experimental permits may be used

for reusable suborbital rockets involved in testing, training, and data gathering missions. The aim is to streamline the approval process for research and development activities. A vehicle operating under a permit may not carry people or property for compensation or hire.

The second rulemaking involved standards for rocket launches carrying people. On February 13, 2007, the FAA Final Rule on Human Space Flight Requirements for Crew and Space Flight Participants became effective. It treats the crew as part of the flight safety system, which means that operators are required to protect the crew in order to protect the general public. It identifies performance requirements for environmental control and life support systems, smoke detection and fire suppression, and human factors, as well as the need for a verification program. In accordance with the statute, the regulations also use the term "space flight participant" rather than "passenger," to underscore the fact that private citizens making suborbital flights will encounter an elevated level of risk and, therefore, will fly under a policy of informed consent. Participants must be briefed verbally and in writing about the risks involved; be required to sign a document indicating that the risks have been communicated and understood; and then, and only then, board the craft.

These regulations were cornerstone results of the 2004 legislation, but not the only important outcomes. Congress also mandated an independent study on Human Space Flight Safety. The final report for that effort was issued on November 11, 2008. Among other conclusions reached in that report, it said: "Initial regulation must strike a balance

between establishing a regulatory regime that allows and encourages private risk taking and investment, while still protecting the uninvolved public ..." It is challenging work, but we give it everything we have every day.

Over the last 25 years, the FAA has developed a strong and supportive partnership with the United States Air Force, which is responsible for leading our nation's national security space activities. In August 2006, after the completion of a multi-year process involving telecons, working group sessions, and public meetings, the FAA issued a final rule establishing common launch safety standards with the Air Force. The rule was designed to make sure that whether a rocket is carrying a telecommunications satellite or a payload for the Department of Defense, the same basic requirements for public safety will still apply.

More recently, in August of 2009, Administrator Babbitt approved the creation of a Commercial Space Transportation Center of Excellence to conduct research in the areas of Space Traffic Management and Operations; Launch Vehicle Systems; Human Space Flight; and Space Commerce. We hope that the Center will allow students and faculty members from all over the country to become involved in space-related research that will benefit both industry and the government.

In the five years since adoption of the Commercial Space Launch Amendments Act, the commercial space industry has come a long way. But we know the way ahead is filled with challenges and unknowns. For example, the National Aeronautics and Space

Administration (NASA) is currently in the process of retiring the Space Shuttle, with just five more launches on the schedule. After the Shuttle's retirement, commercial launches licensed by the FAA will be a key part of the plan for delivery of equipment and supplies to the International Space Station. In fact, we are currently working very closely with both Orbital Sciences Corporation and Space X, the companies that have been selected to perform these resupply activities, on their planned operations.

A second key challenge is based on the fact that we are currently on the threshold of a new era in space transportation: commercial human space flight, and specifically, suborbital space tourism. The X-Prize winning flight of SpaceShipOne in 2004 awakened the nation to the potential for both a new space-related market and a new way of doing space business. Today, our office is working with a number of different companies, each of which is in the process of designing, building, and testing rocket-powered vehicles capable of carrying people to the edge of space, where they will be able to look out at the black sky above, see the curvature of the Earth below, and experience the magic of weightlessness. We know that not all of the companies engaged in this effort will be successful. Some will encounter technical difficulties. Others will have financial challenges. But I am quite confident that we will soon be seeing both test flights and operations involving a variety of reusable launch vehicle concepts.

America's spaceflight effort is not a monolith. It involves NASA, the Air Force, the FAA and the commercial space transportation industry. Likewise, the industry itself is not a monolith. It is a blend of established operators and entrepreneurial newcomers. Its

aims involve both payloads and people, both suborbital flights and missions to low-Earth orbit. And it is important to note that interest in space transportation is not just limited to the United States. Although only a handful of countries have demonstrated the ability to successfully launch rockets into space, many others have begun voicing their aspirations to reap the very same national security benefits, technological spin-offs, economic rewards, and public inspiration that we have enjoyed in the U.S. since the beginning of the space age more than 50 years ago.

With the potential for vigorous competition emerging among commercial space transportation providers around the world, the FAA appreciates the recent action taken by the House in passing H.R. 3819, a three-year extension to what is often referred to as "indemnification authority." We would strongly support similar action in the Senate before the December 31st expiration of the current regime. While a three-year extension is needed now to prevent a lapse in the program, we believe that a longer-term extension in the future would be extremely beneficial. It would facilitate long-term planning and investment by the industry during what is expected to be a significant growth period, without interfering with Congress' ability to revisit this issue at a later time to determine whether the current policy is still appropriate.

The Office of Commercial Space Transportation has a two-fold mission consistent with both enabling the industry and keeping it operating safely. In addition to our safety role, as our governing statute directs, our office is charged with the responsibility to encourage, facilitate, and promote the commercial space industry. We do that in a variety

of ways. For example, we develop market forecasts, launch reports, and economic impact assessments. Additionally, we conduct pre-application consultations, host workshops, and publish guides and advisory circulars to assist launch operators in understanding our regulations and how to comply with them. We also work with other government agencies to identify policies which may have an unintended adverse impact on commercialization efforts.

At the FAA, safety -- helping to safeguard the public during launch operations -- is the core of our mission that shapes our days and guides our work. As the Commercial Space Launch Amendments Act of 2004 directs, the Secretary of Transportation "shall encourage, facilitate, and promote the continuous improvement of the safety of launch vehicles designed to carry humans…." With that in mind, I want to conclude today by briefly sharing our perspective on safety in commercial human spaceflight.

First, much as I wish it were, safety is not an absolute. Climbing aboard a rocket carries with it the potential for unfavorable results. So safety must override assumptions, shortcuts and the potentially false and dangerous sense that "what has always worked before is bound to work again." Safety is a mindset, a professional tension where all the people involved in providing a rocket trip are constantly on alert, determined to get it right this time, next time, all the time.

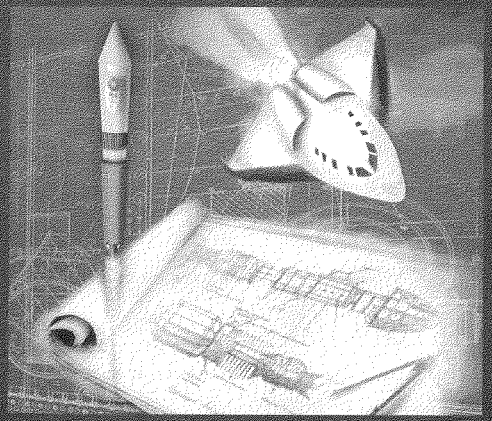
Second, even at that high order of readiness, safety does not, nor can it ever, immunize anyone against unforeseen harm. Misfortune will always be an uninvited possibility

whenever a rocket launches. At the FAA, we never forget that. It is a compelling fact that reinforces our commitment to safety, and leads us to check and recheck, and if necessary, even re-think what we do and how we do it.

Third, and finally, I want to assure you that the people of the FAA are passionate about safety and are always aware of the hazards associated with the serious work for which we are responsible. It is a thrill to be part of safely expanding the frontiers of spaceflight, a challenge to excel at it, and an honor to have the chance.

Chairman Costello, Ranking Member Petri, Members of the Subcommittee, this concludes my prepared remarks. At the appropriate time, I would be pleased to answer any questions you might have.

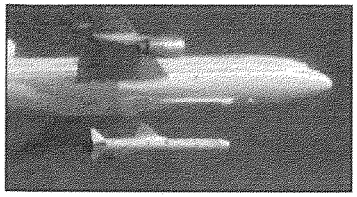
Commercial Space Transportation Update



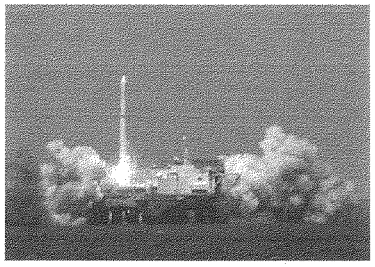
December 2, 2009

Federal Aviation Administration

Examples of Licensed Operations

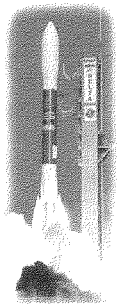


Air Launch

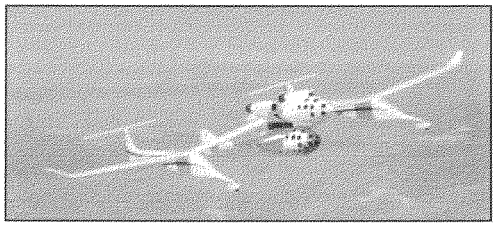


Sea Launch

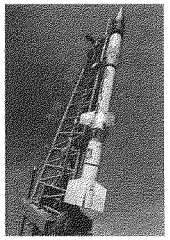
Launch Sites



Ground Launch

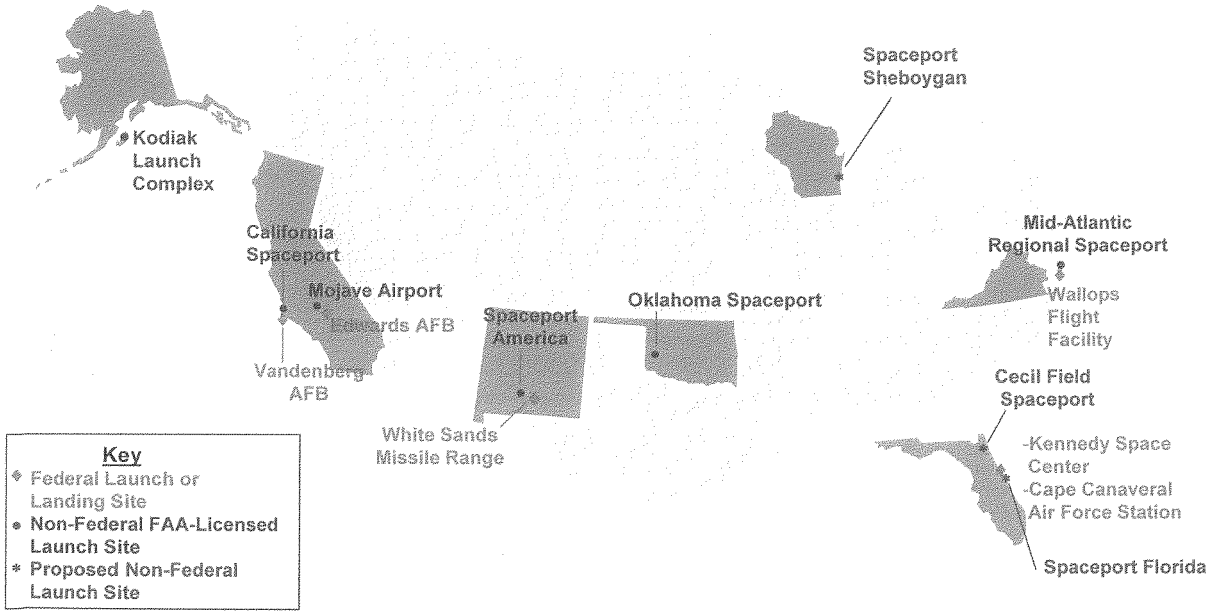


Reusable Launch Vehicles

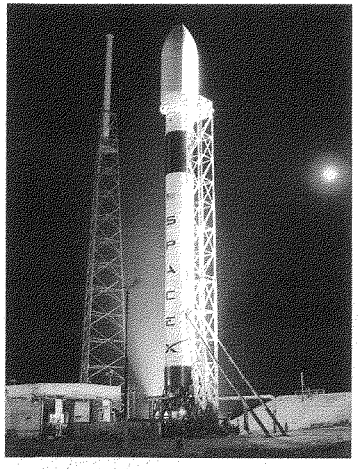


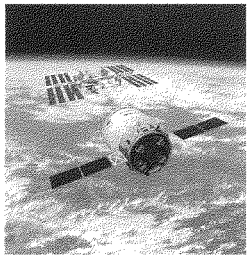
Suborbital Rockets

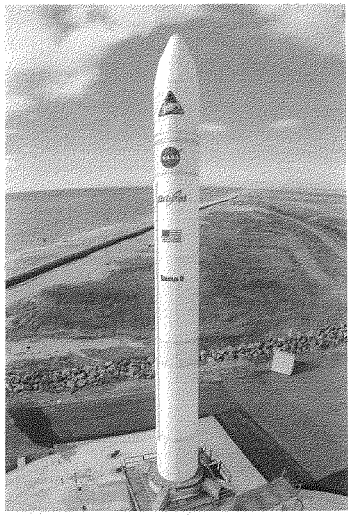
U.S. Spaceports



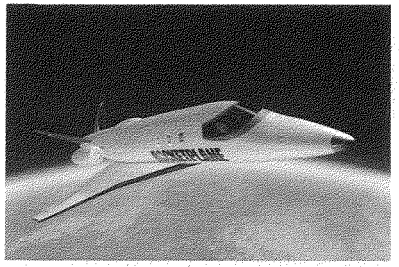
Commercial Resupply Services for the International Space Station

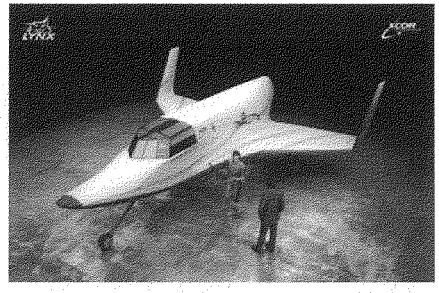


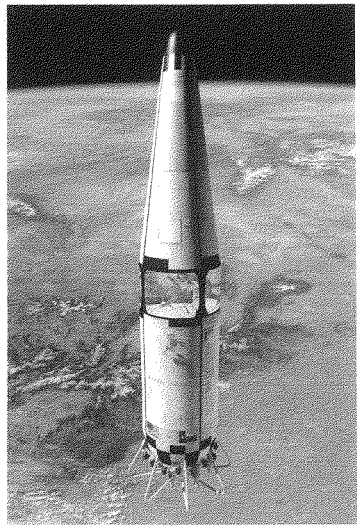


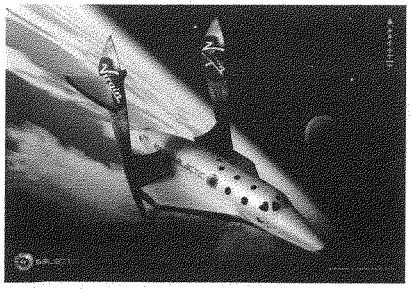


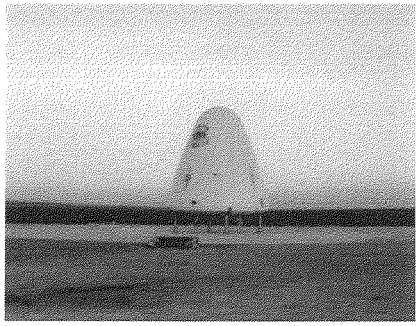
Suborbital Space Tourism











Committee on Transportation and Infrastructure
Subcommittee on Aviation
U.S. House of Representatives
December 2, 2009

Written Testimony by J.P. Stevens
Vice President, Space Systems
Aerospace Industries Association

Good morning Chairman Costello, Ranking Member Petri and members of the Subcommittee. I am grateful for the opportunity to testify before you today on the changing events related to commercial space.

As the largest aerospace trade association in the United States, the Aerospace Industries Association (AIA) represents nearly 300 manufacturing companies with over 631,000 high-wage, highly skilled aerospace employees across the three sectors: civil aviation, space systems and national defense. This includes over 140,000 workers who make the satellites, space sensors, spacecraft, launch vehicles and ground support systems employed by NASA, DoD, NOAA, NRO and other civil, military and intelligence space efforts. Our member companies export 40 percent of their total output, and we routinely post the nation's largest manufacturing trade surplus, which was over $57 billion in 2008. Aerospace indirectly supports 2 million middle class jobs and 30,000 suppliers from all 50 states. The aerospace industry continues to look to the future, investing heavily in research and development, spending more than $100 billion over the last 15 years.

We appreciate the efforts of Congress to keep our commercial, civil and national security space programs healthy. And we are pleased that Congress recognizes that space technologies have increasingly become a part of our daily lives and that virtually every part of the U.S. economy has been touched by their applications.

Commercial interests such as banking transactions, business and personal communications, and precise location for our emergency responders, airliners and automobiles all depend on communications and GPS satellites.

Essential national security information and support of our troops' military operations are all dependent upon space assets.

Unpublished work © 2009 Aerospace Industries Association of America, Inc.

Weather and climate satellites give us life saving warnings and provide us recurring, global wide data on climate change.

Observing, monitoring and exploring space relies on incredibly robust equipment functioning in extremely hostile and demanding environments.

Additionally our space programs, particularly NASA's, remain an excellent source of inspiration for our youth to study science, technology, engineering and mathematics and to enter our aerospace workforce on which much of our nation's transportation, security and economic infrastructure depend. Certainly the exciting work by private companies in expanding the availability of space flight is also a draw for young people - one we hope will increase over the next few years.

We would also like to take this opportunity to commend the FAA's Office of Commercial Space Transportation, which has been very open to thoughtful discussion on issues related to space launch. Their Commercial Space Transportation Advisory Committee (COMSTAC) includes a wide range of industry experts who provide information, advice and recommendations to the Administrator of the FAA on a regular basis. The FAA also hosts an annual Commercial Space Transportation conference. The aerospace industry has found both COMSTAC and the conference to be excellent venues for sharing information and expressing concerns.

AIA believes the FAA has struck the right balance on a difficult issue: how to properly regulate and oversee human commercial spaceflight. On one side of the balance is the need to safeguard the participants and the public. On the other side, this industry is very young and the systems and proceedures that fledgling companies are developing are still taking shape. Keep in mind that with the success of SpaceShipOne in 2004, there have been only three human rated commercial space flights to date. We believe the FAA has found a good middle ground in their oversight.

In short, the human commercial launch industry is developing and taking shape. The FAA has developed a sound set of regulations and understands that as this new part of the space and launch industries evolve, the regulations will similarly need to evolve.

There are outside events that could increase and accelerate the FAA's role in licensing and oversight. As you know, the Review of U.S. Human Space Flight Plans Committee, or Augustine Committee, recently provided the administration with a series of options regarding NASA's future direction. One option is continuing with the current "program of record" and proceeding with the development of both the Ares-I human rated launch system and a larger unmanned heavy lift vehicle which would launch equipment bound for the moon. There are options considering different types of heavy lift vehicles which could be human rated. But the committee also considered an approach where commercial launch companies ferry astronauts to and from the International Space Station, thus freeing NASA to focus on its Orion spacecraft flights beyond low Earth orbit to the moon or other destinations of interest.

Unpublished work © 2009 Aerospace Industries Association of America, Inc.

The Space Shuttle is slated to retire after five more flights. At that time the U.S. will face a human spaceflight "gap" of at least five years. Currently plans to transport American astronauts to the ISS during this break in U.S. human space flight consist of riding aboard the Russian Soyuz spacecraft. Augustine Committee options are currently being considered by the administration. Depending on the response to the various options set forth by the committee it is possible that along with licensing commercial cargo flights to the ISS the FAA could see an accelerated effort for human commercial carriage.

There are other issues related to commercial space launch that are of concern to us, affecting both human flight and cargo payload delivery.

As space launch capabilities have been developed by other nations the U.S. share of commercial launches has decreased significantly. In 2008 only 6 of the 28 worldwide commercial launches were conducted by U.S. companies.

Every other nation with commercial space launch capabilities provides some form of government indemnification against third-party liability. The current third party indemnification regime in the U.S expires this December 31. Elimination of U.S. government indemnification would drive even more launch business overseas and could also impact launches of U.S. civil and national security payloads because the same companies also launch under government contracts.

The current regime sets aside no funds and requires Congressional approval for any payment, so continued indemnification imposes no additional costs to the U.S. taxpayer. We are very pleased that the House recently extended this regime until the end of 2012. It is our hope that the Senate will follow suit before the end of the year. However, while a three year extension prevents the immediate end of this critical regime it is not sufficient because launch manifests can extend out for several years.

Maintaining the regime helps provide a level playing field and strengthens U.S. international competitiveness in a very competitive global space launch market. For our companies it maintains continuity in the business environment. It encourages new entries by U.S. companies into the launch market.

A Congressionally-mandated FAA study of the subject was conducted by The Aerospace Corporation. They and COMSTAC both have endorsed the continuation of the regime. AIA believes the indemnification of U.S. commercial space launch should be made permanent, and the $1.5 billion tier 2 cap should be lifted.

Space will play a critical role in the infrastructure of the Next Generation Air Transportation System (NextGen). It will surprise no one on this committee that while the aerospace industry is building 21st century aircraft, they navigate our skies using a system that largely dates back to the 1960s. The role of satellites to NextGen, for communication and GPS position, navigation and timing will be a critical component. It

Unpublished work © 2009 Aerospace Industries Association of America, Inc.

is important Congress recognize the crucial link space currently plays and will continue to play in coordinating air traffic.

It will also be important to make plans to integrate human commercial spaceflights into the air traffic control system sooner rather than later. The impacts of these flights during the next few years will be modest, but they will grow over time.

Space Situational Awareness will play a similar role to air traffic control in Earth's orbit. In February two satellites collided, destroying the satellites and creating debris fields. On several occasions the crews aboard the International Space Station have had to take precautions against possible collisions with "space junk." 18,000 larger objects are being tracked in Earth's orbit and 600,000 smaller pieces of debris too small to be tracked pose a serious danger to our space assets.

Collision projections can be made in advance but they are only good for several days, and the current monitoring system must assign priorities. Tracking of human commercial space flights will be necessary and will need to be a priority just as the ISS and Space Shuttle flights are today. Additionally, it has become clear that efforts will be needed to reduce the time objects stay in orbit once their function has come to an end.

We want America's commercial space industry to be vibrant. Our space industrial base designs, develops, produces and supports our spacecraft, satellites, launch systems and supporting infrastructure. We need to keep this base healthy and globally competitive.

One critical aspect of maintaining a healthy base is to reform export controls. While AIA believes it is important to protect critical U.S. capabilities, many U.S. export control policies are counterproductive for our industry, negatively impacting our security interests. While we must keep sensitive technologies out of the wrong hands, we also must facilitate technology trade and cooperation critical to U.S. interests with our friends and allies in a timely manner. Barriers to the export competitiveness of U.S. companies have prompted numerous countries to develop their own indigenous aerospace capabilities, leveraging their own R&D and innovation. Without a cutting edge U.S. space industrial base, our government could also be forced to rely on foreign suppliers for key components.

We also face challenges with our future workforce. AIA members have identified that a "lack of trained technical workforce for the future" is one of the most important long-term issues facing our industry. Currently the U.S. annually graduates just 74,000 engineers in total – covering all fields in the discipline. Further, many of these students are foreign nationals who return home shortly after graduating – which drops the number of new domestically employable engineers under 60,000. In comparison, India and China respectively graduate six and ten times more engineering students each year. The U.S. runs the real risk of losing its skilled engineering lead over other nations.

Unpublished work © 2009 Aerospace Industries Association of America, Inc.

What can draw more engineering minded students into the discipline of aerospace engineering? I believe the opportunity to expand human spaceflight is exactly the type of project they want to work on, and it is important that the industry that inspires them when they begin high school is present, vibrant and hiring as they leave college.

In conclusion, our commercial space launch industry is at a critical juncture. Commercial spaceflights that can carry humans into space is on the horizon. This launch market is competitive and our share is small. We have a lot of work to do to ensure that this fledgling industry has the opportunity to grow and compete in a global marketplace.

I thank the committee for their time and attention and would be happy to answer any questions.

Unpublished work © 2009 Aerospace Industries Association of America, Inc.

House Committee on Transportation and Infrastructure

Subcommittee on Aviation

Hearing on

Commercial Space Transportation

December 2, 2009

Testimony by Mr. James Testwuide

Representing the Wisconsin Aerospace Authority

Wisconsin Spaceport in Sheboygan, WI

Rep. Jerry Costello, Chairman

Rep. Tom Petri, Ranking Member

FAA ROLE IN COMMERCIAL SPACE

- FAA provides confidence to the community that the industry is run in a safe and sound manner
- FAA/AST has successfully executed it's mission "to ensure protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation"
- FAA integrates years of experience in aviation and airport operations into it's commercial space flight oversight
- FAA provides support aiding in the orderly expansion of the commercial space flight industry
- The commercial space community must be self constraining with expert and experiential based mentoring from the FAA and others providing guidelines for licensing and achieving safety and environmental goals.

USA needs to maintain its competitive edge and develop an economically sustainable commercial space model

- Industry ,state governments, and FAA need to identify and mentor the licensing of operators
- Spaceport assets need to be identified and implementation plans and viability studies need to be completed
- Spaceport and vehicle developers/operators need to continue the current collaborative environment among themselves and the FAA
- Combining these developments with public education, tourism, and high technology interactive experiences will motivate interest in science, technology, engineering and math careers

Nurturing of spaceports assets provides efficient growth

- Efficiencies of a multi use facility can be utilized
  - Horizontal take off of space "planes " can coexist at conventional airports with the proper attributes
  - Identification of the current assets that can be utilized by both conventional aviation and space activities can dramatically reduce cost of the creation of space infrastructure and spaceport creation
  - The earlier a potential spaceport identifies the goal of launch licensing , the sooner a spaceport development plan can be created and with that plan the spaceport has greater potential for savings through cooperative multiuse infrastructure planning

Case study:

Spaceport Sheboygan

Proposed :License not applied for

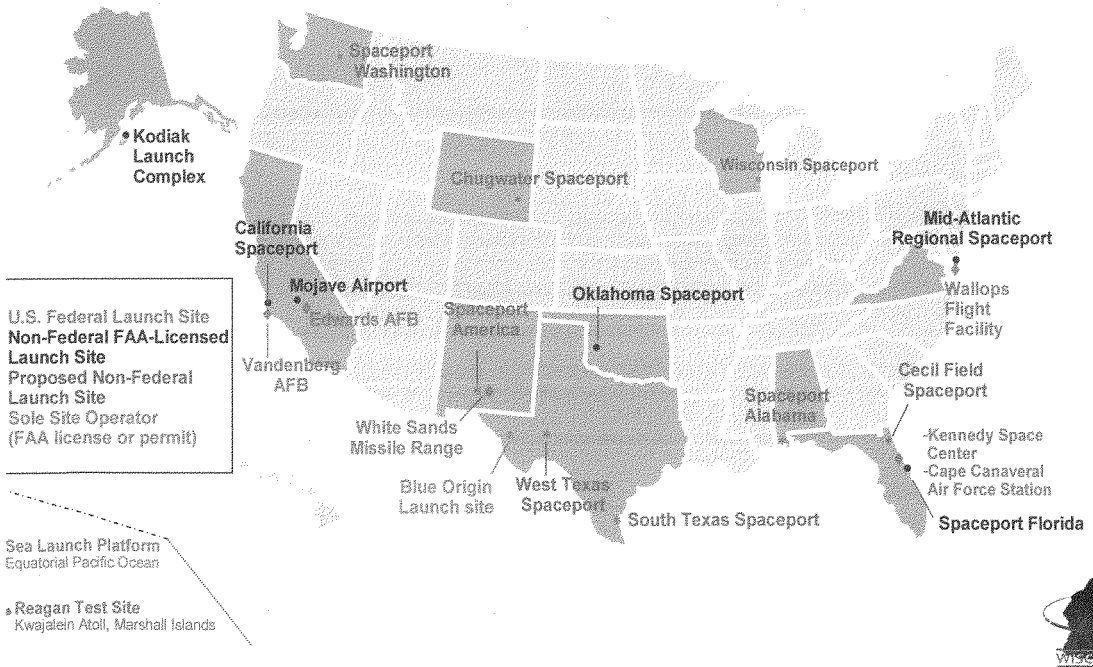
Spaceport Sheboygan Attributes

- Restricted air space over low population density "safety zone"
- Currently utilized by Coast Guard
- Previously received numerous FAA waivers to launch Super Loki sounding rockets to over 35 miles in altitude during annual Rockets for schools launch event
- Home of Great Lakes Aerospace Science and Education Center an interactive STEM education center witch utilizes space exploration as a catalyst to learn Science,Technonogy,Engineering and Math
- Close proximity to active airport allowing flight profile similar to space tourism profiles of other spaceports
- Exclusive tourist destination The American Club at Kohler, already attracting visitors of the Space tourism class
- Close proximity to Oshkosh Wisconsin's EAA-Experamental Aircraft association and it annual Airventure fly-in
- Wisconsin Aerospace Authority created to support and nurture development ofthe budding space industry in the state

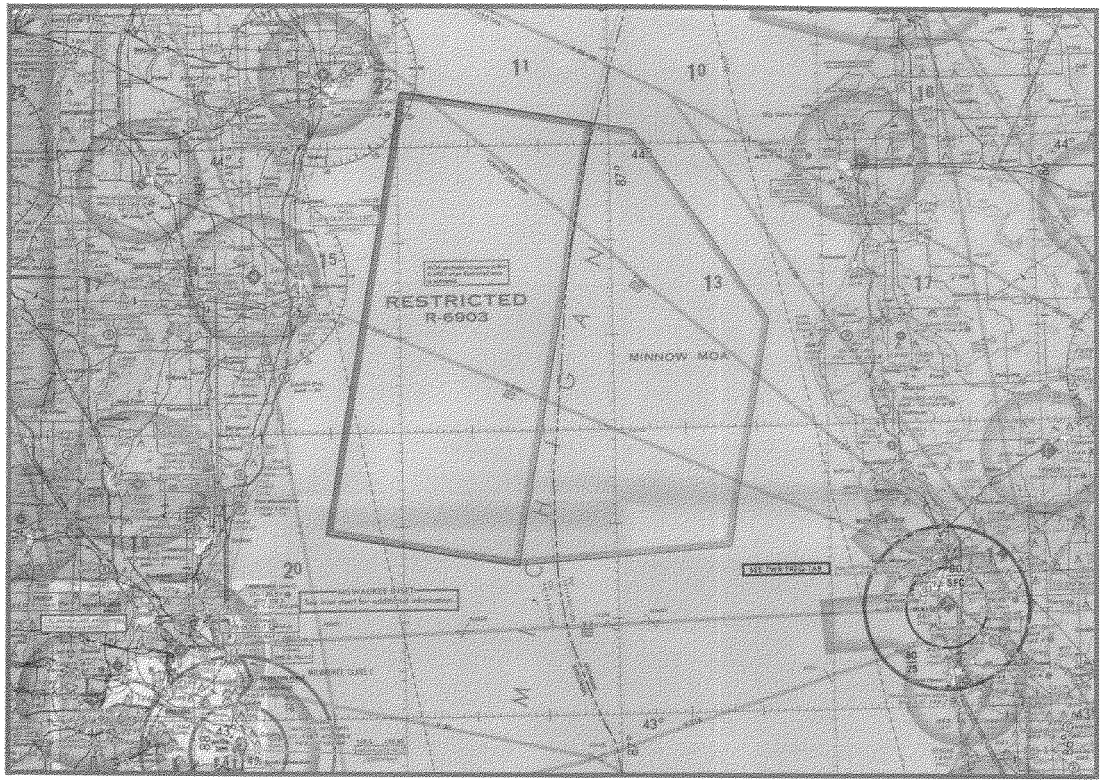
Commercial SpacePort; Spaceport in Wisconsin would be the only one in the great lakes region

U.S. Spaceports

Commercial and Government Active and Proposed Launch Sites



Restricted air space



FAA Reference January 09

State	Non-federal	Federal	Proposed
Alabama			x
Alaska	x		
California	x	x	
Florida		x	x
Kwajalein		x	
New Mexico	x	x	
Oklahoma	x		
Texas	x		x
Virginia	x	x	
Washington			x
Wisconsin			x
Wyoming			x

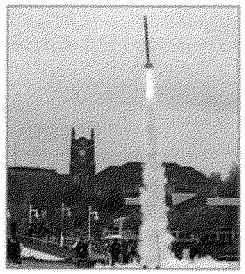
Spaceport Sheboygan

On August 29, 2000, the Wisconsin Department of Transportation officially approved creating the Spaceport Sheboygan, located on Lake Michigan in Sheboygan, Wisconsin. The city of Sheboygan owns the spaceport, which strives to support space research and education through suborbital launches for student projects.

Spaceport Sheboygan	
Location	Sheboygan, Wisconsin
Owner/Operator	Owner: City of Sheboygan; Operator: Rockets for Schools
License Status	Have not applied
Description	Spaceport Sheboygan conducts suborbital sounding rocket launches for the purpose of educating students and the general public.
Infrastructure	Portable launch pads, equipment, and facilities, including mission control. Proposed for renovation adjacent to the launch pads, the proposed Great Lakes Aerospace Science and Education Center will serve as a hands-on space travel-oriented center focusing on math and science-oriented education and tourism. Plans for developing additional launch infrastructure are ongoing and include creation of a development plan that includes support for additional suborbital and future orbital RLV operations.

Suborbital sounding rocket launches to altitudes of up to 55 kilometers (34 miles) have been conducted at the site. Additionally, Rockets for Schools, a student program founded in Wisconsin by Space Explorers, Inc., and developed by the Aerospace States Association, has conducted suborbital launches at Spaceport Sheboygan since its inception in 1995. Each year, hundreds of students from Wisconsin, Illinois, Iowa, and Michigan participate in these launches, which took place most recently in May 2008. Currently, Rockets for Schools is a volunteer run program of the Great Lakes Spaceport Education Foundation.

Over 1,500 schoolchildren toured the Great Lakes Aerospace Science and Education Center and 1,000 members of the general public took part in educational sessions, including a teacher education session. Approximately 50 rockets were launched as part of the Rockets for Schools annual event including high power specialty rockets reaching up to 3,048 meters (10,000 feet) altitude. The Wisconsin Aerospace Authority met in late 2008 to discuss updates on the Great Lakes Aerospace Science and Education Center and to identify aerospace industries established throughout Wisconsin.[71]

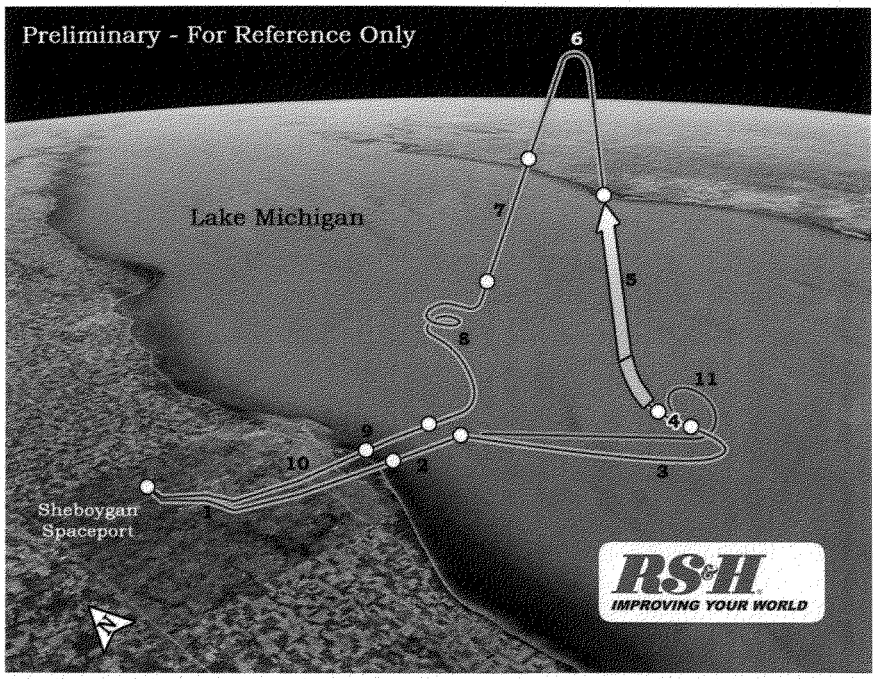


Rocket launch from Spaceport Sheboygan

Sheboygan County Airport

- Less than seven miles from lake Michigan

Possible flight profile



WISCONSIN

AEROSPACE + AUTHORITY

Logo 2009 Orbital Technologies Corporation

WAA MISSION STATEMENT

The overall mission of the WAA is to promote, stimulate and facilitate aerospace-related educational and economic opportunities, capabilities and activities in our state, including the development of a spaceport in Sheboygan, WI.

The WAA has 3 core elements:

1.) Encourage and support existing and new economic development and job creation in the aerospace-related industry in our state, and create a business environment and climate that lures new aerospace-related development into Wisconsin.

2.) Use aerospace to motivate students in science, math and engineering disciplines with exciting programs and activities from elementary school through post-high school education.

3.) Protect and mature Wisconsin's access to the space corridor by supporting a long-term future spaceport for suborbital and orbital transportation for tourism, commercial and government markets.

WISCONSIN AEROSPACE AUTHORITY

- The Wisconsin Aerospace Authority (WAA) was created in 2006 by legislation authored by Senator Joe Leibham & Representative Steve Kestell and signed into law by Governor Jim Doyle.

- Provisions in Wisconsin law relating to the WAA may be found in Chapter 114.60.

WAA BOARD MEMBERS

- Thomas Crabb: A Wisconsin native with engineering and business degrees from the University of Wisconsin – Madison, Tom leads the growth of aerospace technology and product commercialization in Wisconsin as a co-founder of Orbital Technologies Corporation (ORBITEC) and founder of PLANET LLC.

- Mark Hanna: Having lived in the Sheboygan area for 15 years, Mark is serving his second term on Sheboygan's Common Council, where he has served as President. Mark is a co-owners of Maritime Insurance Group and is Vice President of Maritime Financial Group.

- Steve Kestell: Steve serves as the State Representative of the 27th District, which includes parts of Sheboygan County. Representative Kestell co-authored the legislation that created the Wisconsin Aerospace Authority. Steve has served as a local school board member and on the Assembly Committee on Education.

- Mark Lee: With a civil engineering degree from the United States Air Force Academy and a Master's degree in mechanical engineering from the Massachusetts Institute of Technology, Mark has been working in the aerospace industry for over 35 years. As a retired Air Force Colonel and Astronaut with four space shuttle flights and four space walks, Mark is currently the Director of Special Projects at Affiliated Engineers, Inc, as well as a manager for NASA projects.

WAA Board, continued

- Joe Leibham: Joe is the State Senator of the 9th Senate District, which includes parts of Sheboygan, Manitowoc, Calumet and Fond du Lac Counties. Senator Leibham co-authored the legislation that created the Wisconsin Aerospace Authority. Joe has also been a active supporter and volunteer for the Rockets for Schools program.

- Tom Mullooly: As a partner with Foley & Lardner LLP, Tom is the vice chair of the firm's Energy Industry Team and works on energy and telecommunications matters. Tom has had a long interest in the space industry and has worked in the past to help secure funding for Wisconsin aerospace projects while working for United States Senator Herb Kohl.

- Judy Schieble: In addition to being employed as a high school science teacher, Judy is also extensively involved in the organization of Rockets for Schools in Sheboygan as the Sheboygan County Elementary Rockets for Schools Chairperson. Judy is also a Teacher Liaison for NASA, as well as a Spaceport Sheboygan committee member.

- Ed Wagner: Ed earned a political science degree from the University of Central Florida in Orlando, Florida and grew up in close proximity to the space program. Ed spent most of his career in local government, where he participated in many projects requiring public/private partnerships.

- Aileen Yingst: With a Bachelor's degree in astronomy and physics from Dartmouth College, as well as a Master's and Doctorate degree from Brown University, Aileen currently serves as the Director of NASA's Wisconsin Space Grant Consortium. Aileen served the Galileo mission to Jupiter and its moons, and is also a participating scientist with the Mars Exploration Rovers Spirit and Opportunity.

Point to point sub orbital transportation

- Eventually suborbital space flight will evolve to include point to point transportation opportunities
- At sub orbital velocities outside of the friction of the atmosphere the entire world is within a two hour flight
- Spaceports that start as space tourism centers will become regional sub orbital hubs

Wisconsin is trying to do our part!

- Wisconsin is doing its part to capitalize on the opportunity presented by the restricted air space, to help our nation participate in the next global transportation revolution
- We ask that the committee and subcommittee support approaches, actions, and licensing process current utilized by the FAA
- We at the Wisconsin Aerospace Authority and Spaceport Sheboygan look forward to engaging in the next steps with the FAA

"The earth is the cradle of mind, but one cannot forever live in a cradle."

– Konstantin Tsiolkovsky, 1896