Federal Aviation Administration

Semi-Annual Launch Report

May 2010

Reviewing Launch Results from the 4th Quarter 2009 and 1st Quarter 2010, and Forecasting Launches for the 2nd and 3rd Quarter 2010

Special Report: The 13th Annual FAA Commercial Space Transportation Conference

Introduction

The *Semi-Annual Launch Report: First Half of 2010* features launch results from October 2009 through March 2010 and forecasts for the period from April through September 2010. This report contains information on worldwide commercial, civil, and military orbital and commercial suborbital space launch events. Projected launches have been identified from open sources, including industry contacts, company manifests, periodicals, and government sources. Projected launches are subject to change.

This report highlights commercial launch activities, classifying commercial launches as one or both of the following:

- Internationally-competed launch events (i.e., launch opportunities considered available in principle to competitors in the international launch services market);

- Any launches licensed by the Office of Commercial Space Transportation of the Federal Aviation Administration (FAA) under 49 United States Code Subtitle IX, Chapter 701 (formerly the Commercial Space Launch Act).

The FAA has changed to a half-year schedule for publishing this report. The next Semi-Annual Launch Report will be published in October 2010.

Contents

Cover photo courtesy of The Boeing Company. Copyright © 2010. A Boeing Delta II vehicle lifts off from Vandenberg Air Force Base (VAFB), on October 8, 2009. The commercial launch carried WorldView 2, a U.S. commercial remote sensing satellite, to low Earth orbit (LEO).

Highlights: October 2009 - March 2010

Successful Launch of Worldview 2

On October 8, 2009, a Boeing Launch Services Delta II lifted off from Vandenberg Air Force Base (VAFB), placing Worldview 2, a remote sensing satellite operated by DigitalGlobe, into low Earth orbit (LEO). The satellite was built by Ball Aerospace and includes an optical telescope that can image objects 46 centimeters (18 inches) in diameter.

Augustine Commission Report Released

NASA released the full text of its Review of Human Spaceflight Plans Committee (also known as the Augustine Commission) findings on October 23, 2009. The committee highlighted that any plan to fly humans beyond LEO would require additional funding of at least $3 billion a year. It also found that the Constellation program (consisting of the Ares 1 rocket and Orion spacecraft) was fundamentally solid from a technical standpoint, but that a lack of funding would likely delay development by several years. The White House considered the options in the report to determine paths forward, and in February 2010 proposed a NASA budget that scaled back the Constellation program.

NASA Centennial Challenges Program Awards Prize Money

On November 5, 2009, the NASA Centennial Challenges program awarded $1.65 million in prize money to Masten Space Systems and Armadillo Aerospace. Masten Space Systems was awarded $1 million for winning Level 2 of the Northrop Grumman Lunar Lander Challenge as well as $150,000 for second place in Level 1. Armadillo Aerospace was awarded $500,000 for second place in Level 2.

Successful Launch of Intelsat 14

A Lockheed Martin Atlas V lifted off from Cape Canaveral Air Force Station (CCAFS) on November 23, 2009, placing Intelsat 14, a communications satellite operated by Intelsat, into geosynchronous orbit (GEO). The satellite was built by Space Systems Loral, based on the LS-1300 bus model, and is positioned at 45 degrees West longitude serving the Americas, Europe, and African markets. Intelsat 14 replaced Intelsat 1R, which was at the end of its design life.

Successsful Launch of Eutelsat W7

On November 25, 2009, an International Launch Services (ILS) Proton-M rocket successfully placed Eutelsat's W7 satellite into orbit. The 5,600-kilogram (12,400-pound) satellite will provide up to 70 Ku-band transponders at Eutelsat's 36 degrees East orbital slot, where it will be co-located with the Eutelsat W4 satellite. The W7 serves markets in Russia, Central Asia, Africa, and the Middle East. Built by Thales Alenia Space, W7 is equipped with five fixed and steerable beams to provide television and telecommunications services to those markets. Eutelsat W7 uses Thales Alenia Space's Spacebus 4000C4 platform and is designed to provide 13.2 kilowatts of power to the payload throughout the satellite's 15-year service life.

Highlights: October 2009 - March 2010

Virgin Galactic Unveils SpaceShipTwo

Virgin Galactic formally unveiled its suborbital piloted spacecraft, SpaceShipTwo, and its carrier aircraft, WhiteKnightTwo, on December 7, 2009, at a ceremony at Mojave Air and Space Port north of Los Angeles. This first SpaceShipTwo is named the Virgin SpaceShip (VSS) Enterprise.

SpaceX and Spacecom Sign Falcon 9 Launch Contract

On January 27, 2010, Space Exploration Technologies (SpaceX) and Space Communication Ltd. (Spacecom) of Israel, operator of the AMOS satellite fleet, signed an agreement for launch of communications satellite AMOS 6 aboard a SpaceX Falcon 9 as early as December 2012. Falcon 9 is slated to insert the satellite into a geosynchronous transfer orbit (GTO), adding to Spacecom's existing satellite fleet.

Eutelsat W2 Satellite Fails in Orbit

Eutelsat's W2 telecommunications satellite suffered an unexplained on-board failure and placed itself into sun-pointing safe mode on January 27, 2010, forcing Eutelsat to offload customers to three satellites at the same location. Eutelsat and the W2 prime contractor, Thales Alenia Space, later determined that the satellite suffered a permanent failure.

Successful Launch of Intelsat 16

ILS launched Intelsat 16 aboard a Proton vehicle lifting off from Baikonur Cosmodrome on February 11, 2010. The satellite was built by Orbital Sciences Corporation and will provide expanded capacity for SKY Mexico's direct-to-home services, including high definition programming. In addition, Intelsat 16 will be available to provide backup capacity for SKY Brazil. Intelsat 16 carries 24 Ku-band transponders and two deployable antennas for its communications mission. The craft will be operated by Intelsat on behalf of SKY Mexico and SKY Brazil. Intelsat 16 will be stationed in an operational orbit over the equator at 58 degrees West longitude, in range of customer ground terminals across North America and South America.

Successful Launch of GOES P

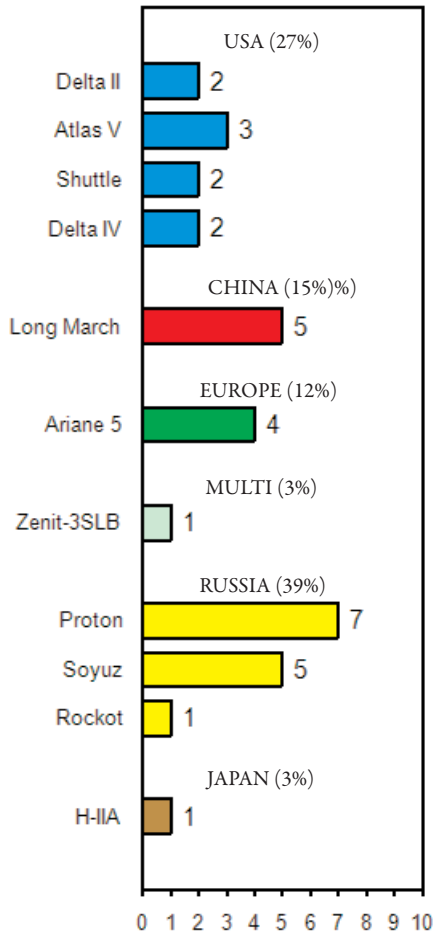
On March 4, 2010, a United Launch Alliance (ULA) Delta IV Medium vehicle lifted off from CCAFS, placing the National Oceanic and Atmopsheric Administration (NOAA) meteorology satellite GOES P into GEO. The satellite supports storm tracking and advanced weather research.

Successful Launch of Echostar 14

On March 20, 2010, ILS launched the EchoStar 14 aboard a Proton rocket launched from the Baikonur Cosmodrome in Kazakhstan. The satellite is positioned at 119 degrees West longitude, replacing EchoStar 7. Echostar 14 was built by Space Systems Loral. It is designed to last up to 15 years and carries 103 Ku-band transponders to serve customers across North America.

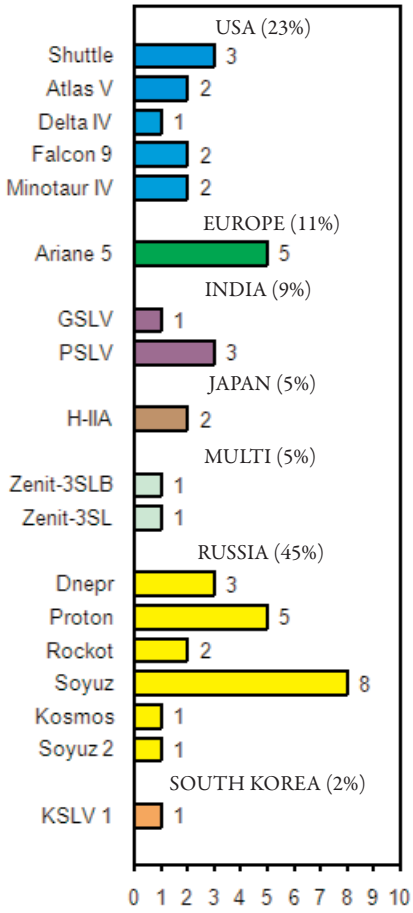
Vehicle Use
(October 2009 – September 2010)

Figure 1: Total Launch Vehicle Use: October 2010 - March 2010



Total = 33

Figure 2: Total Projected Launch Vehicle Use: April - September 2010



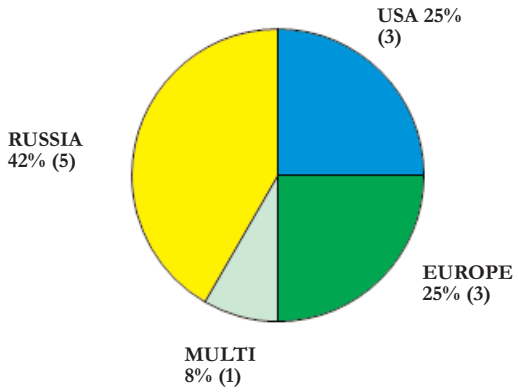
Total = 44

Figure 1 shows the total number of orbital and commercial suborbital launches of each launch vehicle and the resulting market share that occurred from October 2009 through March 2010. **Figure 2** projects this information for the period from April through September 2010. The launches are grouped by the country in which the primary vehicle manufacturer is based. Exceptions to this grouping are launches performed by Sea Launch, which are designated as multinational.

Note: Percentages for these and subsequent figures may not add up to 100 percent due to rounding of individual values.

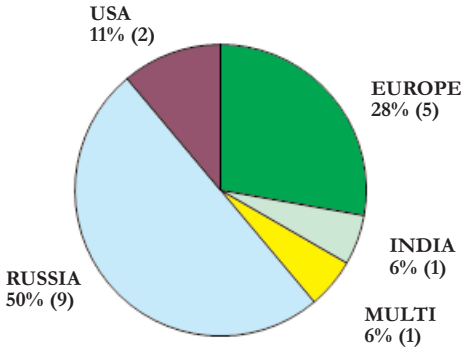
Commercial Launch Events by Country
(October 2009 – September 2010)

Figure 3: Commercial Launch Events by Country: October 2009 - March 2010



Total = 12

Figure 4: Projected Commercial Launch Events by Country: April - September 2010

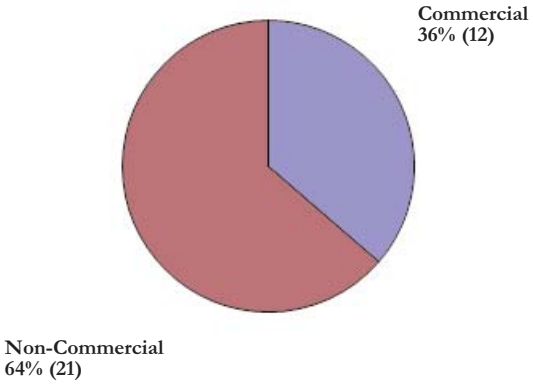


Total = 18

Figure 3 shows all commercial orbital and suborbital launch events that occurred from October 2009 through March 2010. **Figure 4** projects this information for the period from April through September 2010.

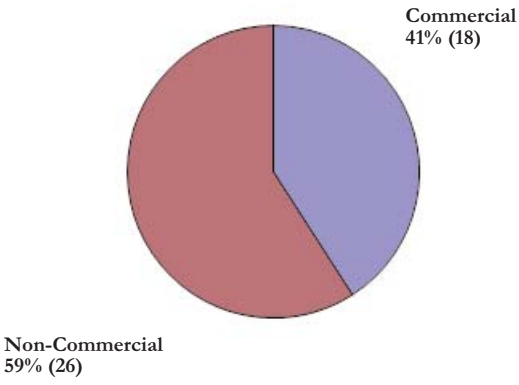
Commercial vs. Non-Commercial Launch Events
(October 2009 – September 2010)

Figure 5: Commercial vs. Non-Commercial Launch Events: October 2009 - March 2010



Total = 33

Figure 6: Projected Commercial vs. Non-Commercial Launch Events: April - September 2010

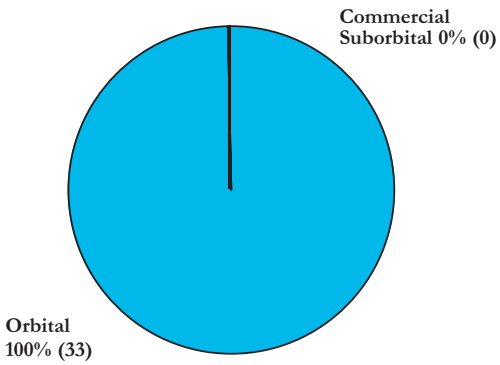


Total = 44

Figure 5 shows commercial vs. non-commercial orbital and suborbital launch events that occurred from October 2009 through March 2010. **Figure 6** projects this information for the period from April through September 2010.

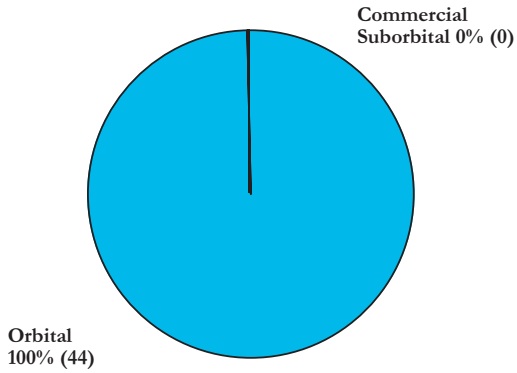
Orbital vs. Commercial Suborbital Launch Events
(October 2009 – September 2010)

Figure 7: Orbital vs. Suborbital Launch Events: October 2009 - March 2010



Total = 33

Figure 8: Projected Commercial Suborbital vs. Orbital Launch Events: April - September 2010

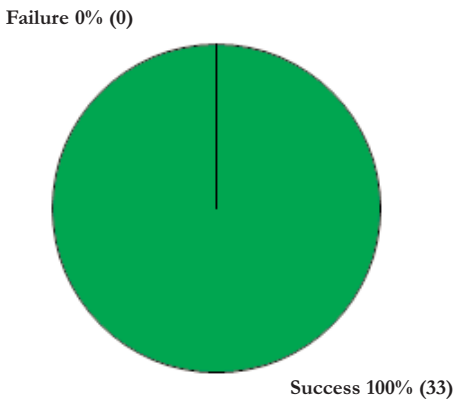


Total = 44

Figure 7 shows orbital vs. FAA-licensed commercial suborbital launch events (or their international equivalents) that occurred from October 2009 through March 2010. **Figure 8** projects this information for the period from April through September 2010.

Launch Successes vs. Failures
(October 2009 – March 2010)

Figure 9: Launch Successes vs. Failures: October 2009 - March 2010

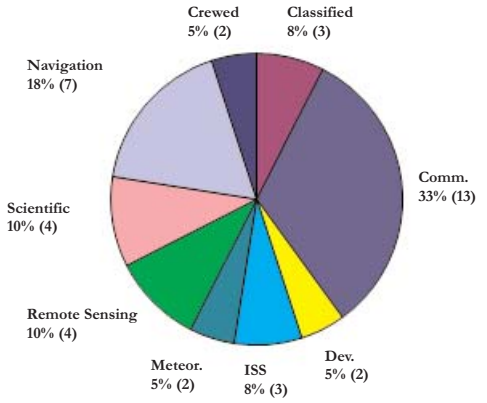


Total = 33

Figure 9 shows orbital and commercial suborbital launch successes vs. failures for the period from October 2009 through March 2010. Partially-successful orbital launch events are those where the launch vehicle fails to deploy its payload to the appropriate orbit, but the payload is able to reach a useable orbit via its own propulsion systems. Cases in which the payload does not reach a useable orbit or would use all of its fuel to do so are considered failures.

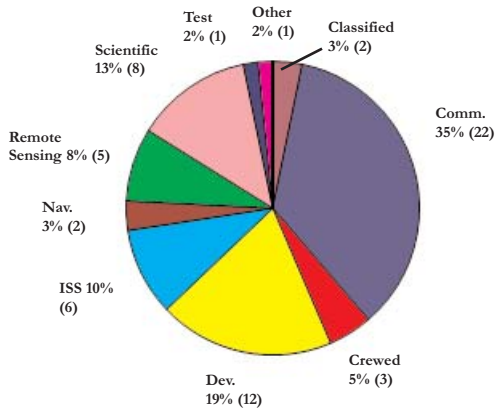
Payload Use (Orbital Launches Only)
(October 2009 – September 2010)

Figure 10: Payload Use: October 2009 - March 2010



Total = 40

Figure 11: Projected Payload Use: April - September 2010

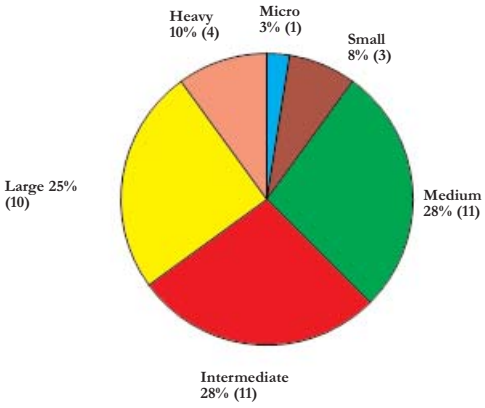


Total = 62

Figure 10 shows actual payload use (commercial and government) for the period from October 2009 through March 2010. **Figure 11** projects this information for the period from April through September 2010. The total number of payloads launched may not equal the total number of launches due to multiple manifesting, i.e., the launching of more than one payload by a single launch vehicle.

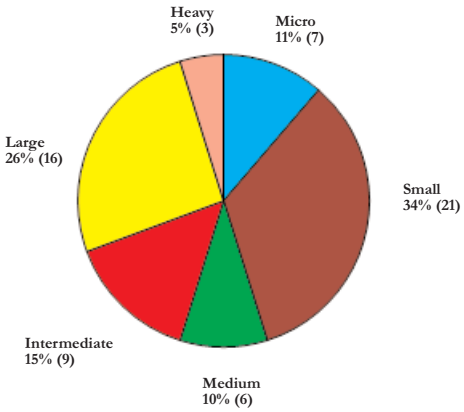
Payload Mass Class (Orbital Launches Only)
(October 2009 – September 2010)

Figure 12: Payload Mass Class: October 2009 - March 2010



Total = 40

Figure 13: Projected Payload Mass Class: April - September 2010

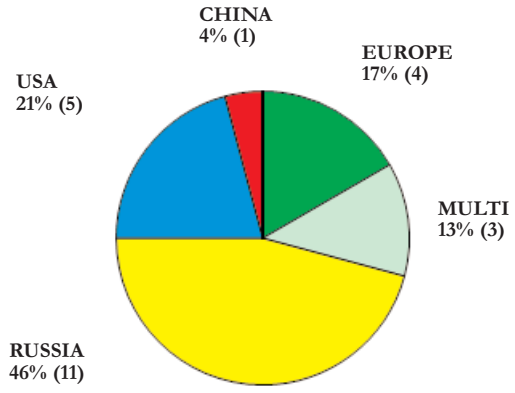


Total = 62

Figure 12 shows actual payloads by mass class (commercial and government) for the period from October 2009 through March 2010. **Figure 13** projects this information for the period from April through September 2010. The total number of payloads launched may not equal the total number of launches due to multiple manifesting, i.e., the launching of more than one payload by a single launch vehicle. Payload mass classes are defined as Micro: 0 to 91 kilograms (0 to 200 lbs.); Small: 92 to 907 kilograms (201 to 2,000 lbs.); Medium: 908 to 2,268 kilograms (2,001 to 5,000 lbs.); Intermediate: 2,269 to 4,536 kilograms (5,001 to 10,000 lbs.); Large: 4,537 to 9,072 kilograms (10,001 to 20,000 lbs.); and Heavy: over 9,072 kilograms (20,000 lbs.).

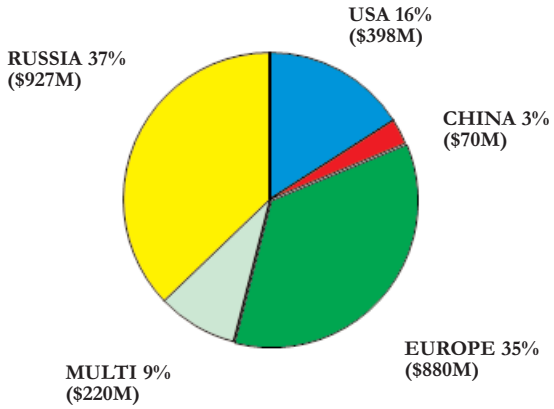
Commercial Launch Trends (Orbital Launches Only)
(April 2009 – March 2010)

Figure 14: Commercial Launch Events, Last 12 Months



Total = 24

Figure 15: Estimated Commercial Launch Revenue, Last 12 Months (US$ millions)



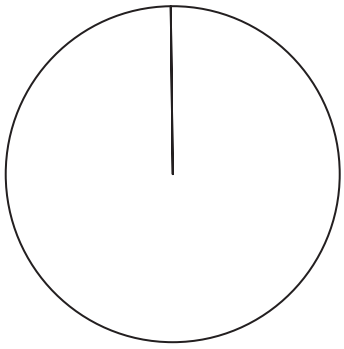
Total = $2,495M

Figure 14 shows commercial orbital launch events for the period from April 2009 through March 2010 by country.

Figure 15 shows estimated commercial launch revenue for orbital launches for the period from April 2009 through March 2010 by country.

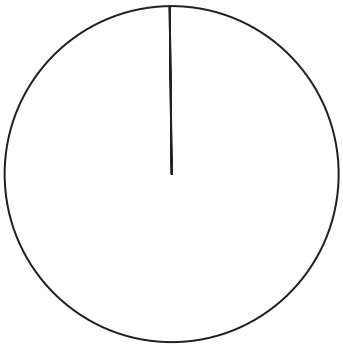
Commercial Launch Trends (Suborbital Launches and Experimental Permits)
(April 2009 – March 2010)

Figure 16: FAA-Licensed Commercial Suborbital Launch Events (or Their International Equivalents), Last 12 Months



Total = 0

Figure 17: FAA Experimental Permit Flights, Last 12 Months



Total = 0

Figure 16 shows FAA-licensed commercial suborbital launch events (or their international equivalents) for the period from April 2009 through March 2010 by country.

Figure 17 shows suborbital flights conducted under FAA experimental permits for the period from April 2009 through March 2010 by country.

Commercial Launch History
(January 2005 – December 2009)

Figure 18: Commercial Launch Events by Country, Last Five Years

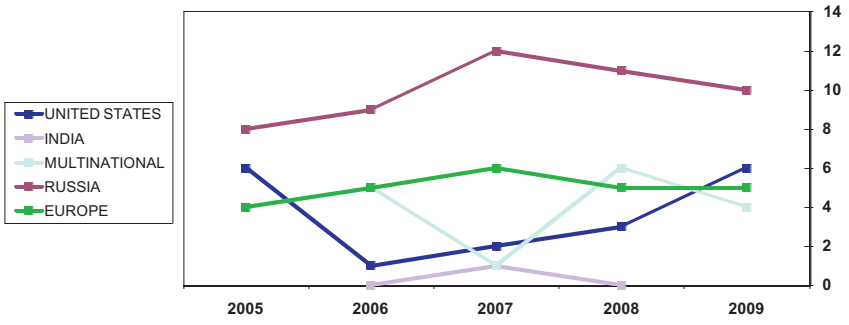


Figure 18 shows commercial launch events by country for the last five full calendar years.

Figure 19: Estimated Commercial Launch Revenue (in US$ millions) by Country, Last Five Years

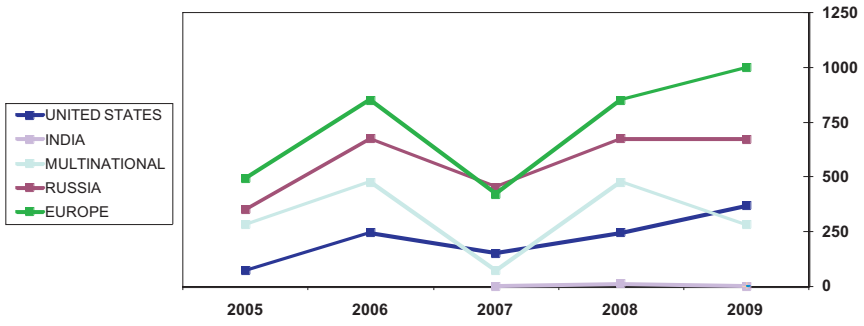


Figure 19 shows estimated commercial launch revenue by country for the last five full calendar years.

Special Report on the 13th Annual FAA Commercial Space Transportation Conference

Introduction: It Was a Dark and Stormy Night…

Four days before the 13th annual FAA Commercial Space Transportation Conference was scheduled to be held, a newspaper flashed a headline that read "Washington DC prepares to shut down for massive snowfall," and included the following snippets of text: "Washington DC was grinding to a halt on Saturday as the US capital prepared for its heaviest snowfall in nearly a century, dubbed 'snowpocalypse' and 'snowmageddon'"; "The Washington DC area is expecting possibly the worst snowstorm in recorded history."; "Transport networks were preparing to shut down and residents were warned they could be forced to spend up to five days indoors."; and "The forecast was for 2.5 feet (0.76 meters) of snow to fall, and for blizzard conditions."

The weekend storm forced the closure of all three Washington metropolitan airports for extended periods of time, and shut down the Federal Government on Monday.

On Monday, after the first storm had passed and only two days before the conference, the Reuters News Agency announced "Another big snowstorm forecast for East Coast" with the article stating: "Another big winter storm was forecast on Monday for the U.S. mid-Atlantic still struggling to dig out from a blizzard that dumped two feet (half a meter) of snow and closed the Federal Government. The National Weather Service issued a winter storm warning for

Washington, D.C., beginning at noon (1700 GMT) on Tuesday and continuing into Wednesday, with projected snow totals of 10 to 20 inches. It would only add to the 32 inches of snow that had fallen in suburban Washington in the biggest snowfall to hit the city in decades."

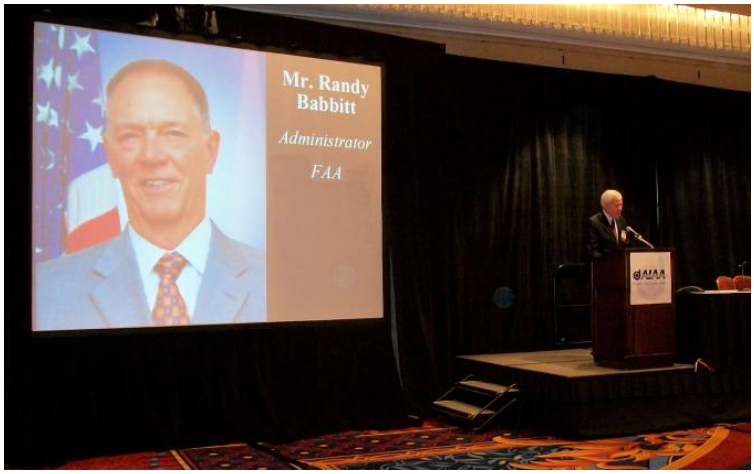
The remnants of the first storm closed the Federal Government for a second day, Tuesday, and the second storm hit the city as forecast.

The two storms combined for a total accumulation of almost 30 inches of snow in a city that is not accustomed to snowfalls of this magnitude in rapid succession. Ultimately, the Federal Government was shut down through Thursday of that week, and the vast majority of commuting Federal employees and Washington residents stayed home. Most visitors from out of town who had flown into the city over the weekend were stuck here because their flights were cancelled, and those planning to fly in couldn't for the same reason.

Despite all this—the snowy weather, cancellations, impassable roads, public transportation shutdowns, and government office closures—the 13th annual FAA Commercial Space Transportation Conference was held at the Crystal Gateway Marriott in Arlington, Virginia, across the frozen Potomac River from the nation's capital city.

The conference hotel had scores of guest room cancellations from people who were unable to get into the city, and those losses were mildly offset with last-minute reservations of conference attendees who decided to move their reservations from some other hotel that would require trekking through the snow before and after both conference days.

The first day of the conference, Wednesday, February 10, was attended by approximately 100 people who had flown into the city or commuted to the site during the calm between the two storms. Many had come early to attend a public meeting that was held on the day before the conference regarding the FAA's newly announced Center of Excellence for Commercial Space Transportation. Due to the extenuating circumstances, many keynote speakers, session moderators, and panelists were required to participate via a speaker phone, including FAA Administrator, Randy Babbitt.



Highlighting the activities of the first day was the in-person appearance by Department of Transportation Secretary Ray LaHood to give a luncheon address to the conference attendees.

The weather on the second day Thursday, February 11, was not as windy or snowy, but the city was still paralyzed from the snowfall accumulation. The conference ranks swelled to over 140 attendees on the second day of the event and the most prominent in-person speaker of the day was again featured during the lunch hour (to allow time for her driveway to be cleared that morning), NASA Deputy Administrator Lori Garver.

In all, the event was successful in meeting its goals of providing a forum for policy makers, scientific and technical experts, and other key stakeholders from government, industry, and academia. Despite overwhelming meteorological barriers and difficulties, they assembled to share insights and discuss developments in the U.S. commercial space transportation industry.

The following are a listing and descriptions of the panels that were conducted during the two-day conference. Pictures of moderators and panelists who were able to attend in person are provided. Where available, brief descriptions by the panel moderators have also been included.

The FAA is greatly appreciative of the sacrifices and energies provided by all participants, whether they were at the event in person or via telephone. Without everybody's help, this event could not have taken place or been as successful as it was.

Panel 1: Safety-Related Enabling Technologies

Panel Description

Launch, on-orbit operations, and re-entry are risky activities. Panelists discussed emerging technologies that can enable safer space launch, on-orbit operations, and re-entry or enable safer launches in remote locations that have no infrastructure. Panelists brought hardware (at various Technology Readiness Levels) to augment their presentations.

The moderator of the panel was Nick Demidovich, from AST (shown above, left). Panelists included:

- Richard Birr, from NASA KSC Cape Canaveral, FL.
- Joseph Mazur, from Aerospace Corporation Chantilly, VA.
- Jennifer Murray, from NASA KSC Cape Canaveral, FL.
- Jerome Pearson, from STAR, Inc. Mount Pleasant, SC (shown above, right).
- James Simpson, NASA KSC Cape Canaveral, FL.

Moderator's Synopsis

The Safety Related Enabling Technologies Panel consisted of four presentations. Jerome Pearson of STAR, Inc. discussed the increasing hazard space debris poses to all operations in Low Earth Orbit including commercial satellites and proposed commercial space activities, such as

space hotels and micro-gravity factories/processing facilities. Jennifer Murray and Rick Birr of NASA/KSC presented animated graphics on their flight test activities at KSC that use high performance manned aircraft and UASs as test beds for various payloads, including lightweight low cost Iridium and TDRSS transceivers they have prototyped. Joe Mazur of Aerospace Corporation discussed a small lightweight dosimeter for space radiation developed by his organization. It has flown in space and could be useful to assess the total dose of radiation that an RLV's avionics or crew members have been exposed to over time for both liability and safety reasons. Finally, Jim Simpson of NASA KSC gave a presentation on developing the Autonomous Flight Safety System (AFSS) equipment by NASA and DOD. AFSS will replace the current flight termination systems for both ELVs and ballistic missiles at CCAFS and VAFB by 2018.

Panel 2: Investment by Innovation

Panel Description

To ignite the space economy, and keep the flame burning brightly, entrepreneurs must attract private investment. Panelists explored key issues in gaining and holding investor interest, with a focus on customer needs, managing risk exposure, and differentiating a new venture from its existing and anticipated competitors.



The moderator of the panel was Paul Eckert, of the Boeing Co. in Arlington, VA (shown above, left). Panelists included:

- David Masten, Masten Space Systems Mojave, CA (shown above, center).
- Andrew Nelson, XCOR Aerospace Mojave, CA.
- Tim Pickens, Dynetics Huntsville, AL.
- Larry Williams, Space Exploration Technologies Washington, DC (shown above, right).

Moderator's Synopsis

As panel chair, Paul Eckert, International and Commercial Strategist in the Space Exploration division of The Boeing Company, opened the panel by emphasizing the importance of entrepreneurial innovation. Here innovation is not primarily the creation of new technology but rather the application of existing technology to meet customers' needs in the marketplace, at a profit. Although Eckert noted that the panel would focus on the success of startup companies, he observed that previous AIAA and FAA events had also clearly demonstrated that large established companies could be equally "entrepreneurial." Andrew Nelson, Chief Operating Officer for XCOR Aerospace, outlined key considerations in attracting investor financing, noting the importance of pricing in attracting customers—a key investor priority. Dave Masten, founder and CEO of Masten Space Systems, elaborated on the challenges of raising funds, describing the diversity of public and private sector sources of contracts and financing. Larry Williams, Vice President for Strategic Relations at Space Exploration Technologies (SpaceX), highlighted the importance of government investment in infrastructure that enables private economic expansion—as in the past with the Internet and today with space transportation. Tim Pickens rounded out the panel presentations, describing the value of a diversified government/commercial customer base. Effective diversification was evident after his founding of Orion Propulsion, prior to assuming the post of Chief Propulsion Engineer and Senior Space Adviser for Commercial Development, when Dynetics acquired Orion. Like Pickens, other speakers provided concrete examples drawn from their companies, to illustrate general principles of business success. Panel discussion and an audience question and answer period explored the potential for synergy between government and industry in developing new markets that yield business success while also supporting public policy objectives.

Panel 3: Spaceport Planning and Developments

Panel Description

This panel was a series of presentations about activities at some of the emerging commercial spaceport facilities.



The moderator of the panel was Herb Bachner, of CSSI Inc. in Washington, DC (shown above, left). Panelists included:

- Mark Bontrager, Space Florida Cape Canaveral, FL (shown above, center).
- Todd Lindner, Jacksonville Aviation Authority Jacksonville, FL (shown above, right).
- Aaron Prescott, New Mexico Spaceport Authority Las Cruces, NM (in attendance, but no photo available).

Panel 4: Commercial Space Product Development

Panel Description

This industry creates products that are saleable and generate profit from unique elements related to commercial space flight. For example, developing products and activities for the family like training, space orientation, and team building, including custom made space suits, jackets, hats, and other accessories, with team logos, and individual's embroidered name, etc. Additionally, there is the development of travel (to the launch facilities, test sites, etc.) and events (family team briefings), and a steady run of related events (going to other launches, control center visit) that add to the experience. The entire care and feeding of the commercial space ticket holder as well as all associated glitz has expanded the number of potential revenue streams. Commercial space has created products from whole cloth that are not only profitable, but are becoming valued and important parts of the entire space package. Each of the different companies come into this in different ways and with different products, all with the goal of realizing profits.

The moderator of the panel was Eleanor Aldrich, of AIAA in Reston, VA (shown above, left). Panelists included:

- Carissa Christensen, of the Tauri Group, in Alexandria, VA (shown above, second from left).
- Jeff Manber, of NanoRacks in Houston, TX (shown above, second from right).
- Misuzu Onuki, of NEWSPACE Consultants, Ltd. In Tokyo, Japan (shown above, right).
- Charles Walker, former Mission Specialists, from Oro Valley, AZ.

Moderator's Synopsis

Charlie Walker, the first commercial scientist in space, reviewed the storied path that has brought us here. Starting with the Space Act of 1958, which enabled NASA to encourage industry, entrepreneurs sought to create business opportunity from small comsats to industrial space laboratories. But federal policies, budgets, and space access ended many efforts. From the 1990, as entrepreneurs joined with NASA, partnerships began to get traction. The first fare paying passengers were flown to space by Russia, while new launch vehicles and human-habitable spacecraft were being designed by small firms. The Federal Government began to be involved in a productive way via enduring Space Act Agreements and flexible regulations. Federal policies are seeking to intermix private sector created capabilities with Federal assets.

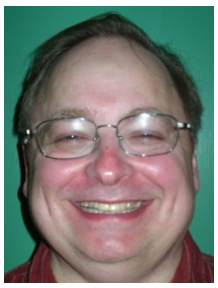
Jeff Manber presented specific examples of commercially-provided equipment with NanoRacks which will be an open source research platform installed in the U. S. National Lab enabling low-cost operational space station research. Carissa Bryce Christensen of the Tauri Group, showed, with compelling figures, the promise of real profit in commercial space. Specific numbers reported sobering costs as well as a potential future in launch vehicles, payloads, and space tourists. Misuzu Onuki, with sparkling videos, showed the real and current commercial profits produced in space-related events, weddings, fashion, and music. Misuzu is currently

publishing books, magazines, and a column for a major Japanese website. Space today is truly commercial, international and profitable.

Panel 5: Bridging the Gap: Future Technologies

Panel Description

What future technologies will enable cheaper, faster, and better access to space? This panel looked into potential advancements that could be achieved in the next 5 to 20 years to overcome the technological obstacles and move the commercial space industry into the next era.



The moderator of the panel was Jim Duffy (in attendance, but no photo available), of AST. Panelists included:

- David Huntsman, of the NASA GRC in Cleveland, OH (shown right).
- Jess Sponable, of DARPA in Arlington, VA.
- Alan Stern, of Southwest Research Institute in Boulder, CO.

Panel 7: COTS/ISS CRS: Launching Into The Future

Panel Description

The important NASA COTS initiative has moved from design, build, test into development and leading to the operations phase. This panel discussed how the progress to date, issues encountered, and the pathway forward to accomplish full implementation of ISS CRS provide a major impetus to drive the Space Economy.

The moderator of the panel was Ken Gidlow, of AST (shown above, left). Panelists included:

- Frank Culbertson, of Orbital Sciences Corp. in Chantilly, VA (shown above, second from left).
- Alan Lindenmoyer, of NASA JSC in Houston, TX (shown above, second from right).
- Kathryn Lueders, of NASA JSC in Houston, TX.
- Max Vozoff, of Space Exploration Technologies in Hawthorne, CA (shown above, right).

Moderator's Synopsis

The NASA panelists described the approach, successes, challenges and benefits from managing the COTS and CRS programs toward delivering cargo to and from the International Space Station after the Space Shuttle retirement. The SpaceX and Orbital COTS and CRS panelists described the vehicle development and partnership progress and how this fits into their company business and the industry. The significant industry investment in commercial space transportation activities appreciates the $500 million NASA COTS investment, which provides confidence toward the $3.5 billion NASA CRS contract awards for 20 flights to and from the ISS. The new 2010 NASA Recovery Act $50 million awards of the Commercial Crew Development (CCDev) Projects to five companies were also described. Topics during the Question and Answer portion discussed these subjects further and explored an optimistic future for the commercial space transportation industry partnership with NASA.

Panel 8: Overview of the Human Spaceflight Training Market

Panel Description

This panel explored the current state of human spaceflight training facilities and discussed future developments and opportunities for this emerging commercial space market. The moderator will open the panel session giving a 20-min presentation on human spaceflight training facilities at the FAA Civil Aerospace Medical Institute (CAMI) including ideas about future developments and opportunities.



The moderator of the panel was Robert Johnson, of the FAA CAMI in Oklahoma City, OK (shown above, left). Panelists included:

- Brienna Henwood, of NASTAR in Philadelphia, PA (shown above, center).
- Vernon McDonald, of Wyle Laboratories in Houston, TX (shown above, right).
- Tom Shelley, of Space Adventures in Vienna, VA. (in attendance, but no photo available).

Panel 9: The Regulatory Role of Enabling the Space Economy

Panel Description

AST's development of the RLV and Human Space Flight rules are two examples that enable the space economy by establishing a regulatory framework for licensing RLV and human space flight operations. The ability for industry to obtain capital investment or conduct launches economically can be affected if there is regulatory uncertainty or if the regulations are too burdensome. This panel discussed how the regulatory role has an impact on the space economy from the perspective of government and industry representatives. This included a discussion on regulatory issues we see and that are of concern to industry now and in the future, as well as what has worked in terms of enabling the space economy while protecting the public, property, and the national security and foreign policy interests of the U.S.

The moderator of the panel was Michelle Murray, of AST's West Coast Operations Office at Edwards AFB, CA (shown right). Panelists included:

- Dave Berkey, of David M. Berkey & Associates in Crownsville, MD.
- Mike Gold, of Bigelow Aerospace in Silver Springs, MD.
- Jeff Greason, of XCOR Aerospace in Mojave, CA.
- Laura Montgomery, of the FAA in Washington, DC.

Panel 10: Space Traffic Management

Panel Description

This panel engaged in a discussion on critical issues and challenges that affect our ability to continue to use outer space effectively. The panel discussed topics such as space debris, space situational awareness, and space traffic management.



The moderator of the panel was Jim van Laak, of AST (shown above, left). Panelists included:

- William Ailor, of Aerospace Corporation in El Segundo, CA.
- Guinevere Leeder, of U.S. Strategic Command at Offutt AFB, NE.
- Eugene Stansbery, of NASA JSC in Houston, TX (shown above, center).
- Carl Walz, of Orbital Sciences Corp. in Dulles, VA (shown above, right).

Panel 11: Managing The Mishap

Panel Description

Accidents can and will happen leading to a loss of life either on the ground or in-flight. It is essential that government organizations and launch operators are prepared to manage the immediate and longer-term consequences, including having plans in place with clearly defined responsibilities and authorities. This panel addressed some of the many dimensions of this complex issue.

The moderators of the panel were Bob Dickman, of AIAA in Reston, VA (shown below, left) and Dave Gerlach, of AST (shown below, second from left). Panelists included:




- Bob Drake, from the FAA Accident Investigation Division in Washington, DC (shown above, second from right).
- Cassie Kloberdanz, of Denver, CO.
- Gregg Kraver, of the U.S. Air Force 45th Space Wing at Cape Canaveral, FL.
- Joe Sedor, of the National Transportation Safety Board in Washington, DC (shown above, right).

Moderator's Synopsis

The session provided an overview of the processes the FAA and NTSB will use in the event of a accident involving a commercial spaceflight with humans on-board. The details remain to be worked out, but both organizations are planning for the time when commercial flights with non-crew passengers occur. From the perspective of the commercial operator, beyond maintaining safety as the essential parameter, planning ahead for the "unthinkable" is critical. An accident that involves injury or death is inevitable – hopefully not anytime soon, but just as accidents happen with commercial air travel, train travel, bus and auto travel, accidents will happen with space travel. The better prepared all parties involved are, the more successful the industry will be in returning to flight with a trusting public and an approving regulatory system.

October 2009 - April 2010 Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price	L	M
10/1/2009	√	Ariane 5 ECA	Kourou	*	Amazonas 2	Hispasat	Communications	$220M	S	S
					COMSATBw 1	German Ministry of Defense (MoD)	Communications			S
10/8/2009	√ +	Delta II 7920	VAFB	*	WorldView 2	DigitalGlobe	Remote Sensing	$65M	S	S
10/15/2009		Soyuz	Baikonur		Progress ISS 35P	Roscosmos	ISS	$60M	S	S
10/18/2009		Atlas V 401	VAFB		DMSP 5D-3-F18	DoD	Meteorological	$125M	S	S
10/29/2009	√	Ariane 5 ECA	Kourou	*	NSS 12	SES World Skies	Communications	$220M	S	S
10/29/2009	√	Ariane 5 ECA	Kourou	*	Thor 6	Telenor AS	Communications	$220M	S	S
11/2/2009	√	Rockot	Plesetsk		SMOS	ESA	Scientific	$15M	S	S
					Proba 2	ESA	Development			S
11/10/2009		Soyuz	Baikonur		Mini Research Module 2	Roscosmos	Scientific	$60M	S	S
11/12/2009		Long March 2C	Jiuquan		Shijian 11-01	China Aerospace Corporation	Development	$25M	S	S
11/16/2009		Shuttle Atlantis	KSC		STS 129	NASA	Crewed	N/A	S	S
11/20/2009		Soyuz-U	Plesetsk		Kosmos 2455	Russian MoD	Classified	$60M	S	S
11/23/2009	√ +	Proton M	Baikonur	*	Eutelsat W7	Eutelsat	Communications	$100M	S	S
11/23/2009	√ +	Atlas V 431	CCAFS	*	Intelsat 14	Intelsat	Communications	$125M	S	S
11/28/2009		H-IIA 2024	Tanegashima		IGS Optical 3	Japanese Defense Agency	Classified	$100M	S	S
12/1/2009	√	Zenit 3SLB	Baikonur	*	Intelsat 15	Intelsat	Communications	$60M	S	S
12/5/2009		Delta IV Medium-Plus (5,4)	CCAFS		WGS 3	DoD	Communications	$170M	S	S
12/9/2009		Long March 2D	Jiuquan		Yaogan 7	China Association of Space Technology (CAST)	Remote Sensing	TBA	S	S
12/14/2009		Proton M	Baikonur		Glonass M R22	Russian MoD	Navigation	$90M	S	S
					Glonass M R23	Russian MoD	Navigation			S
					Glonass M R24	Russian MoD	Navigation			S
12/14/2009		Delta II 7320	VAFB		WISE	JPL	Scientific	$65M	S	S
12/15/2009		Long March 4C	Taiyuan		Yaogan 8	CAST	Remote Sensing	$60M	S	S
					Hope 1	CAST	Communications			S
12/18/2009		Ariane 5 GS	Kourou		Helios 2B	DGA	Classified	$220M	S	S
12/21/2009		Soyuz	Baikonur		ISS 21S	Roscosmos	ISS	$60M	S	S
12/29/2009	√	Proton M	Baikonur	*	DirecTV 12	DIRECTV	Communications	$100M	S	S
1/17/2010		Long March 3C	Xichang		Beidou 3	CAST	Navigation	$70M	S	S
1/28/2010		Proton M	Baikonur		Raduga-1M	Russian MoD	Communications	$90M	S	S
2/3/2010		Soyuz	Baikonur		Progress ISS 36P	Roscosmos	ISS	$60M	S	S
2/8/2010		Shuttle Endeavour	KSC		STS 130	NASA	Crewed	N/A	S	S
2/11/2010		Atlas V 401	CCAFS		Solar Dynamics Observatory	NASA GSFC	Scientific	$125M	S	S
2/12/2010	√	Proton M	Baikonur	*	Intelsat 16	Intelsat	Communications	$100M	S	S
3/2/2010		Proton M	Baikonur		Glonass M R19	Russian MoD	Navigation	$90M	S	S
					Glonass M R20	Russian MoD	Navigation			S
					Glonass M R21	Russian MoD	Navigation			S
3/4/2010	√ +	Delta IV Medium-Plus (4,2)	CCAFS		GOES P	NOAA	Meteorological	$100M	S	S
3/5/2010		Long March 4C	Jiuquan		Yaogan 9	Chinese National Space Agency (CNSA)	Remote Sensing	$60M	S	S
3/20/2010	√	Proton M	Baikonur	*	Echostar XIV	Echostar	Communications	$100M	S	S

√ Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed. For multiple manifested launches, certain secondary payloads whose launches were commercially procured may also constitute a commercial launch. Appendix includes suborbital launches only when such launches are commercial.

\+ Denotes FAA-licensed launch.

* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity

Notes: All prices are estimates, and vary for every commercial launch. Government mission prices may be higher than commercial prices.
Ariane 5 payloads are usually multiple manifested, but the pairing of satellites scheduled for each launch is sometimes undisclosed for proprietary reasons until shortly before the launch date.

April - September 2010 Projected Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
4/2/2010		Soyuz	Baikonur		Soyuz ISS 22S	Roscosmos	ISS	$60M
4/5/2010		Shuttle Discovery	KSC		STS 131	NASA	Crewed	N/A
4/8/2010	√	Dnepr M	Baikonur		Cryosat 2	ESA	Remote Sensing	$12M
4/15/2010		GSLV Mark 2	Satish Dhawan Space Center		GSAT 4	ISRO	Communications	$45M
4/16/2010		Soyuz-U	Plesetsk		Kosmos 2462	Russian MoD	Classified	$60M
4/22/2010		Atlas V 501	CCAFS		X-37B OTV	USAF	Development	$125M
4/24/2010	√	Proton M	Baikonur	*	SES-1	SES World Skies	Communications	$100M
4/27/2010		Kosmos 3M	Plesetsk		Kosmos 2463	Russian MoD	Classified	$15M
4/28/2010		Soyuz	Baikonur		Progress ISS 37P	Roscosmos	ISS	$60M
5/14/2010		Shuttle Atlantis	KSC		STS 132	NASA	Crewed	N/A
5/18/2010		H-IIA 202	Tanegashima		Ikaros	JAXA	Development	$100M
					K-sat	Kagoshima University	Scientific	
					Nagai	Soka Unversity	Development	
					Unitec-1	JAXA	Scientific	
					Waseda-Sat2	Waseda University	Scientific	
					AKATSUKI	JAXA	Scientific	
5/20/2010		Delta IV Medium	CCAFS		Navstar GPS 2F-01	USAF	Navigation	$170M
5/23/2010	√	+ Falcon 9	CCAFS	*	Falcon 9 Demo Flight	SpaceX	Test	$40M
5/2010		PSLV	Sriharikota		AISSat-1	Norwegian Defense Research Establishment	Development	$25M
					Alsat 2A	National Center for Space Technology	Remote Sensing	
					StudSat	ISRO	Development	
					TIsat-1	University of Applied Sciences of Southern Switzerland	Development	
					Cartosat 2B	ISRO	Remote Sensing	
6/2/2010	√	Rockot	Plesetsk	*	SERVIS 2	USEF	Development	$15M
6/3/2010		Dnepr 1	Dombarovskiy		Picard	CNES	Scientific	$12M
					Prisma Target	Swedish Space Corporation	Development	
					Prisma Main	Swedish Space Corporation	Development	
6/3/2010	√	Proton M	Baikonur	*	BADR-5	Arabsat	Communications	$100M
6/9/2010		KSLV 1	Naro Space Center		STSAT 2b	KAIST	Scientific	TBD
6/16/2010		Soyuz	Baikonur		Soyuz ISS 23S	Roscosmos	ISS	$60M
6/21/2010	√	Dnepr 1	Baikonur	*	TanDEM X	Infoterra	Remote Sensing	$12M
6/28/2010		Soyuz	Baikonur		Progress ISS 38P	Roscosmos	ISS	$60M
6/2010	√	PSLV	Satish Dhawan Space Center		X-Sat	Government of Singapore	Remote Sensing	$25M
6/2010	√	Ariane 5 ECA	Kourou	*	Arabsat 5A	Arabsat	Communications	$220M
					COMS 1	KARI	Other	
6/2010	√	Proton M	Baikonur	*	Sirius FM-6	Sirius Satellite Radio	Communications	$100M
6/2010		Rockot	Plesetsk		Gonets M 2	Roscosmos	Communications	$15M
6/2010	√	Ariane 5 ECA	Kourou		COMSATBw 2	German MoD	Communications	$220M
				*	Astra 3B	SES World Skies	Communications	

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April - September 2010 Projected Launches (Continued)

7/21/2010	√	+	Falcon 9	CCAFS		Dragon COTS Demo 1	SpaceX	Development	$40M
7/30/2010			Atlas V 531	CCAFS		Advanced EHF 1	USAF	Communications	$140M
8/31/2010			Soyuz	Baikonur		Progress ISS 39P	Roscosmos	ISS	$60M
8/2010			Proton M	Baikonur		Glonass TBA	Russian MoD	Navigation	$90M
8/2010			H-IIA 202	Tanegashima		QZS-1	JAXA	Communications	$100M
9/5/2010			Minotaur 4	Kodiak Launch Complex		Space Test Program Satellite 2	USAF	Development	$20M
9/16/2010			Shuttle Discovery	KSC		STS 133	NASA	Crewed	N/A
9/30/2010			Soyuz	Baikonur		Soyuz ISS 24S	Roscosmos	ISS	$60M
9/2010			Minotaur IV	VAFB		TacSat 4	USAF	Development	$20M
9/2010	√		Soyuz 2 1A	Kourou	*	HYLAS	Avanti Group	Communications	$100M
9/2010	√		Soyuz	Baikonur	*	Globalstar 2nd Gen 02	Globalstar	Communications	$70M
					*	Globalstar 2nd Gen 03	Globalstar	Communications	
					*	Globalstar 2nd Gen 04	Globalstar	Communications	
					*	Globalstar 2nd Gen 05	Globalstar	Communications	
					*	Globalstar 2nd Gen 06	Globalstar	Communications	
					*	Globalstar 2nd Gen 01	Globalstar	Communications	
9/2010	√	+	Ariane 5 ECA	Kourou	*	KoreaSat 6	Korea Telecom	Communications	$220M
9/2010	√		Ariane 5 ECA	Kourou	*	Insat 4G	ISRO	Communications	$220M
9/2010	√		Proton M	Baikonur	*	MSV 1	Mobile Satellite Ventures	Communications	$100M
9/2010	√		Zenit 3SLB	Baikonur	*	AMC 1R	SES World Skies	Communications	$60M
9/2010			PSLV	Satish Dhawan Space Center		Astrosat	ISRO	Scientific	$25M
9/2010	√		Ariane 5 ECA	Kourou	*	Nilesat 201	Nilesat	Communications	$220M
9/2010		+	Zenit 3SL	Baikonur		Spektr R	Russian Academy of Sciences	Scientific	$90M

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