FAA
Commercial Space
Transportation

Quarterly Launch Report
2nd Quarter 2007

Featuring Launch Results from the 1st Quarter and Forecasts for the 2nd and 3rd Quarter 2007

Special Report: 10th Annual Commercial Space Transportation Conference

Introduction

The *Second Quarter 2007 Quarterly Launch Report* features launch results from the first quarter of 2007 (January-March 2007) and forecasts for the second quarter of 2007 (April-June 2007) and the third quarter of 2007 (July-September 2007). 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 references, 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 under 49 United States Code Subtitle IX, Chapter 701 (formerly the Commercial Space Launch Act).

Contents

Cover (photo courtesy of Carleton Bailie for United Launch Alliance, copyright © 2007): A United Launch Alliance Delta 2 vehicle lifts off from Cape Canaveral Air Force Station (CCAFS) in Florida on February 17, 2007 carrying the five-satellite THEMIS science mission on behalf of NASA.

First Quarter 2007 Highlights

On January 11, China demonstrated a major new military space capability, successfully testing an anti-satellite weapon that destroyed the aging Chinese weather satellite Fengyun 1C with a kinetic "kill vehicle" launched via ballistic missile. The test, which created considerable orbital debris, drew formal protests from the United States, Australia, Canada, Japan, South Korea, and other nations.

On January 22, Indian naval vessels retrieved Space Recovery Experiment (SRE) 1, the first Indian spacecraft designed to return to Earth. The successful operation and recovery of SRE 1, launched on January 10 aboard a Polar Satellite Launch Vehicle (PSLV), marked a significant advance for the Indian space program, since recoverable spacecraft are a prerequisite for manned spaceflight.

In January, Russian military officals announced plans to close the Svobody Cosmodrome, a little-used spaceport located in the Russian Far East. The site, a former missile base, has been in operation as a spaceport since the mid-1990s but has hosted only a handful of launches. It will be closed later in 2007.

On January 30, a Sea Launch Zenit 3SL rocket exploded upon liftoff, destroying the vehicle and its payload, the NSS 8 communications satellite, as well as damaging the Odyssey Launch platform. The failure was Sea Launch's second since commencing commercial launch service in 1999. An investigation by Russian and Ukrainian authorities identified contamination by a foreign object in an engine turbopump as the likely cause of the failure. Sea Launch has begun its own review, but results of this internal investigation have not yet been finalized. In the wake of the failure, several payloads slated for Sea Launch have migrated to other launch providers, including Arianespace. However, Sea Launch expects to resume service later in 2007.

On February 1, the National Aeronautics and Space Administration (NASA) announced the signing of Space Act agreements with two companies, Transformational Space (t/Space) of Virginia and PlanetSpace of Chicago. Although the agreements do not include funding, they provide both companies access to NASA expertise and establish milestones by which each company can gauge its progress. Both t/Space and PlanetSpace are in the early stages of developing orbital transport systems.

In February, Iran reportedly conducted a test launch of a suborbital sounding rocket. Iranian officials have declared their intent to launch a vehicle into space in 2007, but the country's progress toward that goal is unclear.

On February 21, NASA and space tourism company Virgin Galactic signed a memorandum of understanding to cooperate on developing various technologies including spacesuits, thermal protection systems, hybrid propulsion systems, and hypersonic vehicles. The agreement did not provide for joint astronaut training or flights aboard Virgin Galactic's SpaceShipTwo vehicle, which is scheduled to enter service in 2009.

On February 26, a sudden hailstorm damaged the external tank of Shuttle Atlantis, which had been rolled out in anticipation of a March launch. The storm left divots in the foam insulation of the shuttle's external tank and slightly damaged about two dozen shuttle tiles, delaying the launch until at least June.

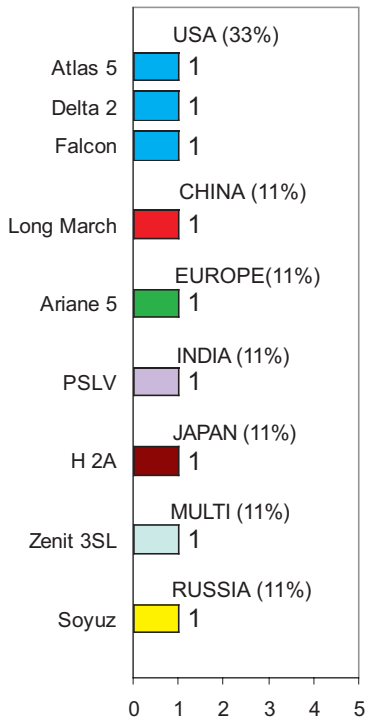
In March, a liquid oxygen leak occurred during a fueling test of a Delta 4 Heavy rocket. The leak caused cracks in the launch pad used by that vehicle and delayed its next launch from April to the summer of 2007.

On March 20, Space Exploration Technologies (SpaceX) conducted the second launch of its Falcon 1 rocket from Kwajalein Atoll in the Pacific Ocean. The vehicle, which carried a test payload, lifted off successfully and climbed to an altitude of approximately 300 kilometers. However, about five minutes into the flight the second stage of the rocket experienced a roll control anomaly and failed to achieve orbit. A SpaceX investigation concluded the anomaly was caused by vibrations in the fuel tank that caused the liquid fuel to slosh back and forth during the second stage burn until it interfered with the trajectory of the vehicle. Although the rocket did not reach orbit, SpaceX considered the flight a success and estimated it had demonstrated the viability of about 90 percent of the technologies used in the vehicle. The company will proceed with its first operational mission, the launch of the TacSat 1 experimental satellite on behalf of the Department of Defense, later this year.

Vehicle Use

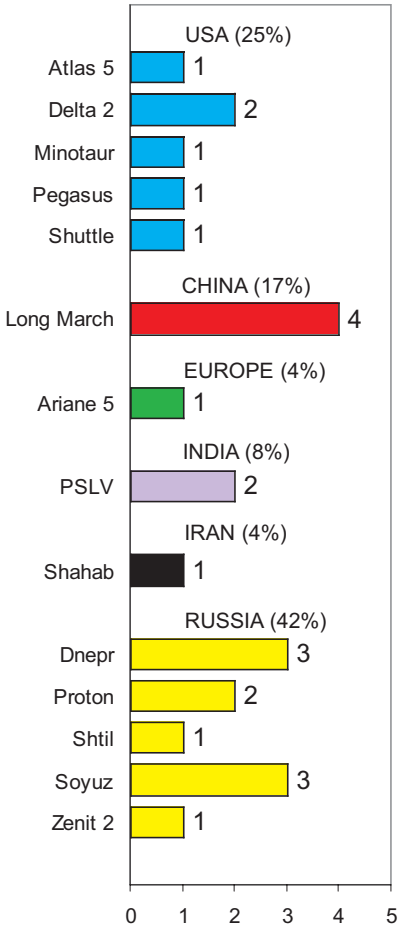
(January 2007 – September 2007)

Figure 1: First Quarter 2007 Total Launch Vehicle Use



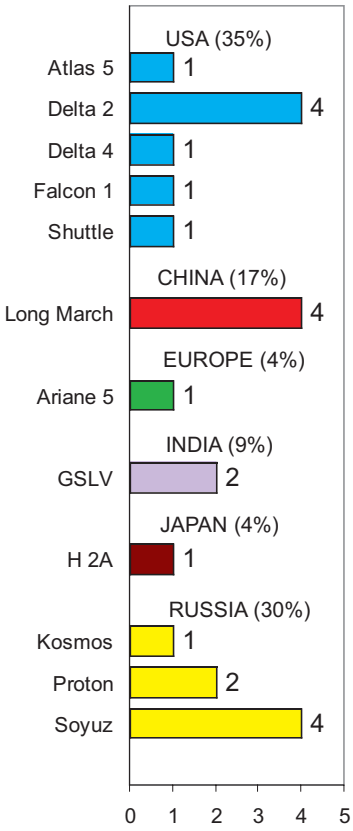
Total = 9

Figure 2: Second Quarter 2007 Total Projected Launch Vehicle Use



Total = 24

Figure 3: Third Quarter 2007 Total Projected Launch Vehicle Use



Total = 23

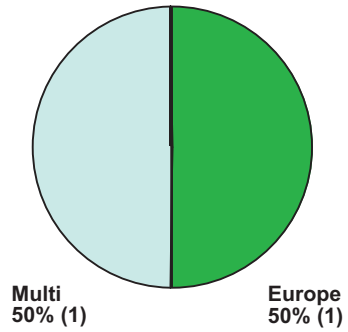
Figures 1-3 show the total number of orbital and commercial suborbital launches of each launch vehicle and the resulting market share that occurred in the first quarter of 2007. They also project this information for the second quarter of 2007 and third quarter of 2007. The launches are grouped by the 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

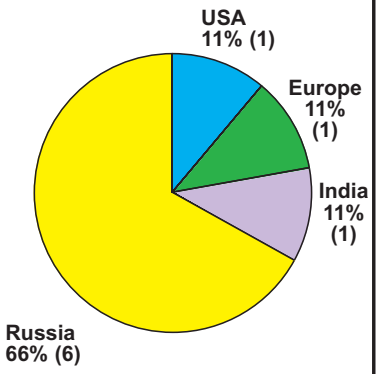
(January 2007 – September 2007)

Figure 4: First Quarter 2007 Commercial Launch Events by Country



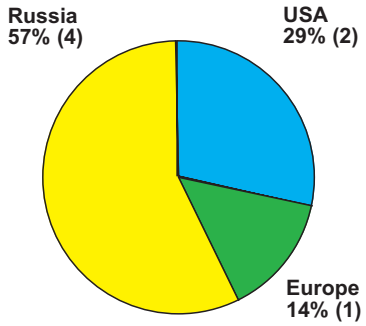
Total = 2

Figure 5: Second Quarter 2007 Projected Commercial Launch Events by Country



Total = 9

Figure 6: Third Quarter 2007 Projected Commercial Launch Events by Country



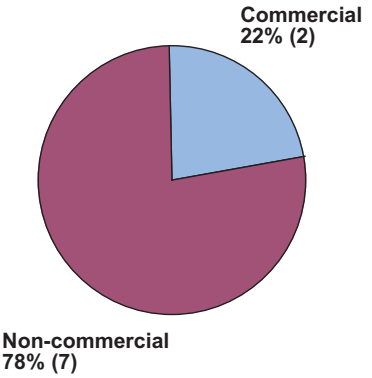
Total = 7

Figures 4-6 show all commercial orbital and suborbital launch events that occurred in the first quarter of 2007 and that are projected for the second quarter of 2007 and third quarter of 2007.

Commercial vs. Non-Commercial Launch Events

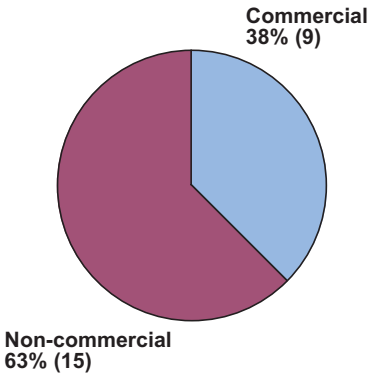
(January 2007 – September 2007)

Figure 7: First Quarter 2007 Commercial vs. Non-Commercial Launch Events



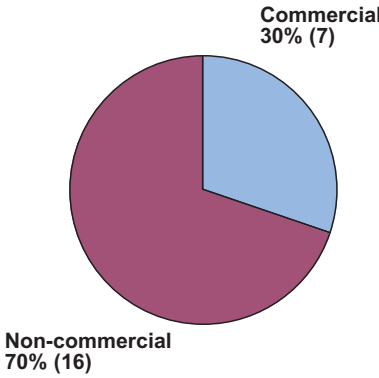
Total = 9

Figure 8: Second Quarter 2007 Projected Commercial vs. Non-Commercial Launch Events



Total = 24

Figure 9: Third Quarter 2007 Projected Commercial vs. Non-Commercial Launch Events

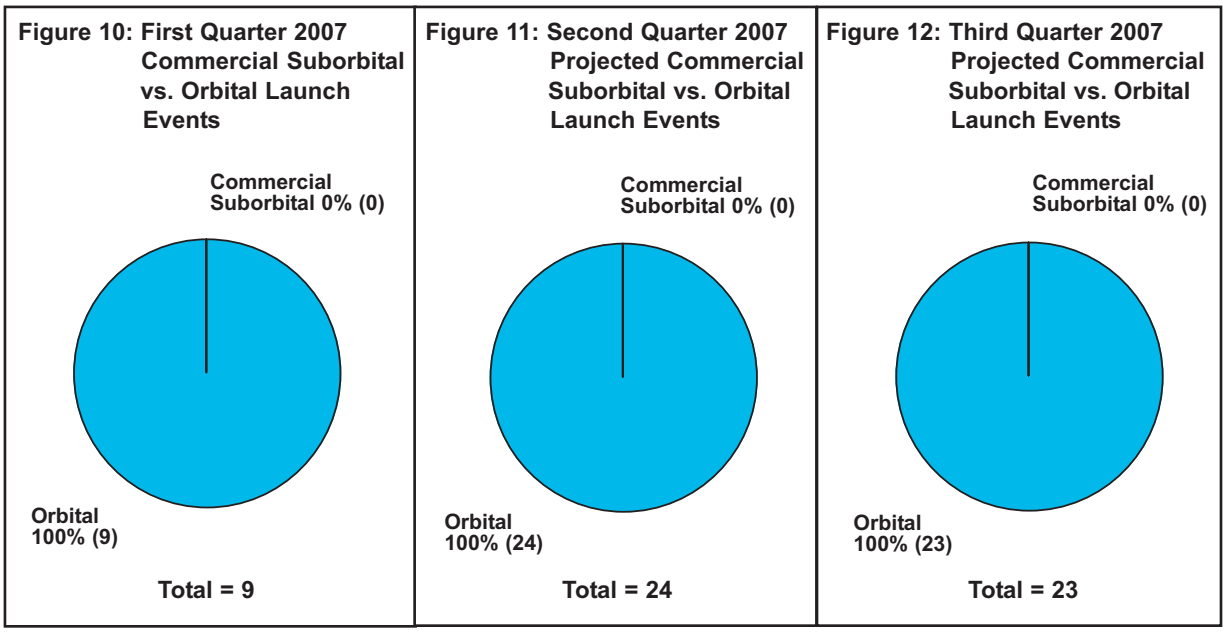


Total = 23

Figures 7-9 show commercial vs. non-commercial orbital and suborbital launch events that occurred in the first quarter of 2007 and that are projected for the second quarter of 2007 and third quarter of 2007.

Orbital vs. Commercial Suborbital Launch Events

(January 2007 – September 2007)



Figures 10-12 show orbital vs. FAA-licensed commercial suborbital launch events (or their international equivalents) that occurred in the first quarter of 2007 and that are projected for the second quarter of 2007 and third quarter of 2007.

Launch Successes vs. Failures

(January 2007 – March 2007)

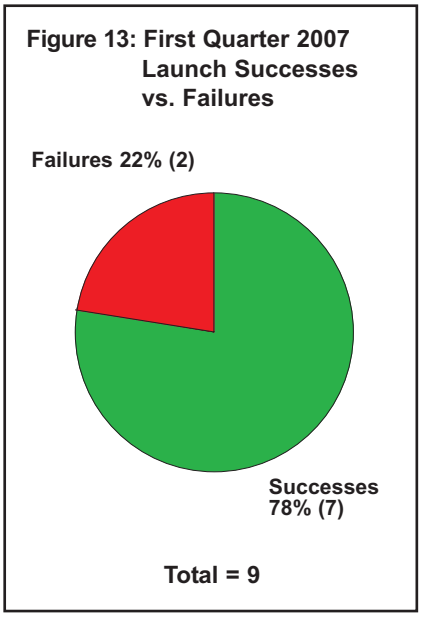


Figure 13 shows orbital and commercial suborbital launch successes vs. failures for the period from January 2007 to March 2007. Partially-successful orbital launch events are those where the launch vehicle fails to deploy its payload to the appropriate orbit, but the payload is able to reach a useable 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)

(January 2007 – September 2007)

Figure 14: First Quarter 2007 Payload Use

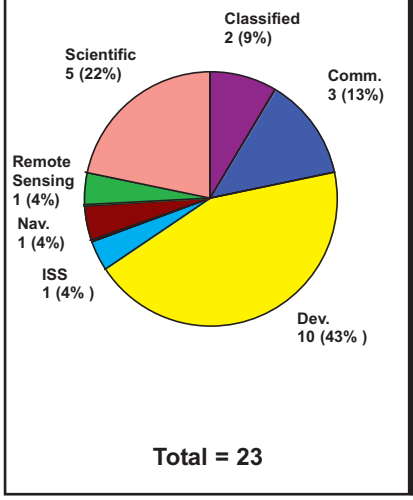


Figure 15: Second Quarter 2007 Projected Payload Use

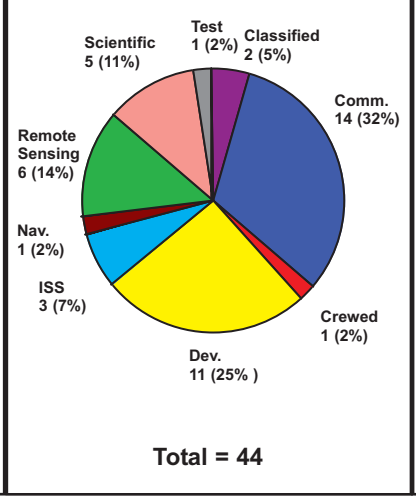
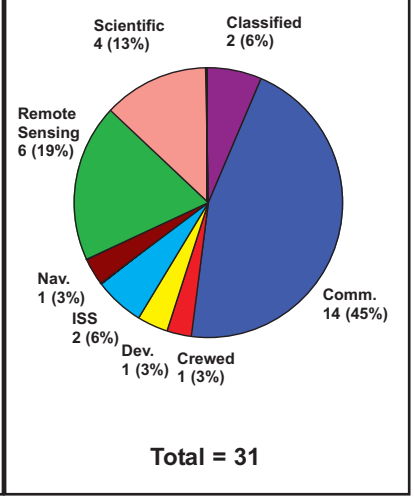


Figure 16: Third Quarter 2007 Projected Payload Use



Figures 14-16 show total payload use (commercial and government), actual for the first quarter of 2007 and projected for the second quarter of 2007 and third quarter of 2007. The total number of payloads launched may not equal the total number of launches due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Payload Mass Class (Orbital Launches Only)

(January 2007 – September 2007)

Figure 17: First Quarter 2007 Payload Mass Class

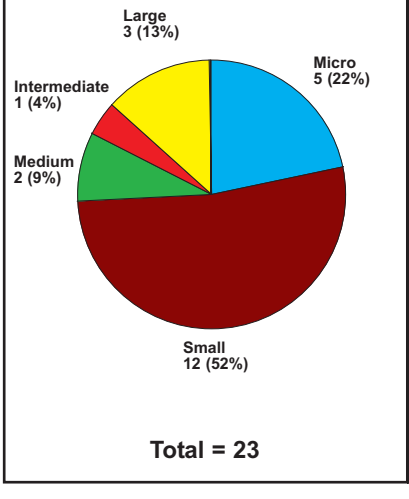


Figure 18: Second Quarter 2007 Projected Payload Mass Class

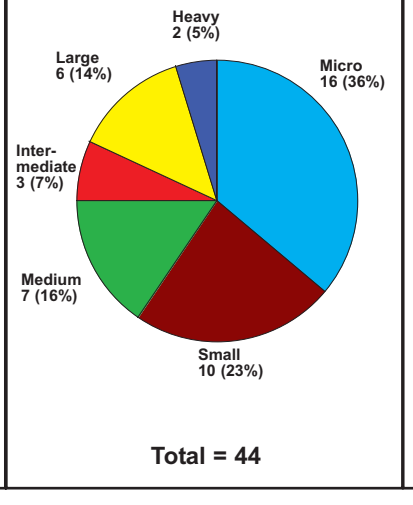
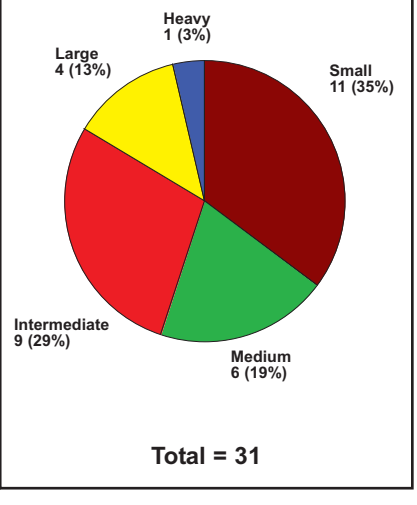


Figure 19: Third Quarter 2007 Projected Payload Mass Class

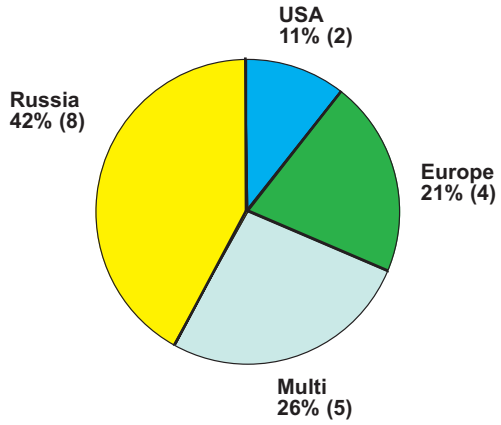


Figures 17-19 show total payloads by mass class (commercial and government), actual for the first quarter of 2007 and projected for the second quarter of 2007 and third quarter of 2007. The total number of payloads launched may not equal the total number of launches due to multi-manifesting, i.e., the 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)

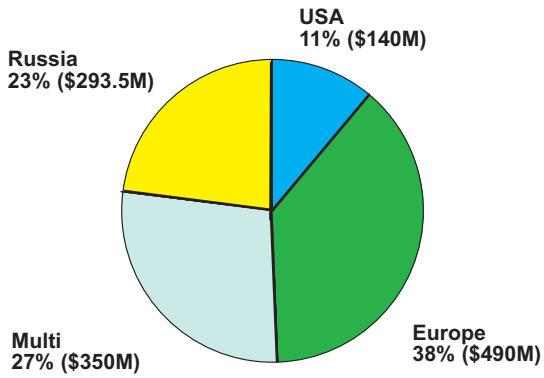
(April 2006 – March 2007)

Figure 20: Commercial Launch Events, Last 12 Months



Total = 19

Figure 21: Estimated Commercial Launch Revenue, Last 12 Months



Total = $1,273.5M

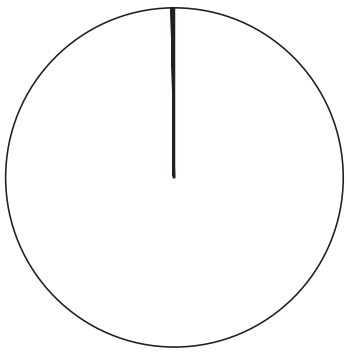
Figure 20 shows commercial orbital launch events for the period of April 2006 to March 2007 by country.

Figure 21 shows estimated commercial launch revenue for orbital launches for the period of April 2006 to March 2007 by country.

Commercial Launch Trends (Suborbital Launches and Experimental Permits)

(April 2006 – March 2007)

Figure 22: FAA-Licensed Commercial Suborbital Launch Events, Last 12 Months



Total = 0

Figure 22 shows FAA-licensed commercial suborbital launch events for the period of April 2006 to March 2007 by country.

Figure 23: FAA Experimental Permit Flights, Last 12 Months

Flight Date	Operator	Vehicle	Launch Site
10/19/2006	Armadillo Aerospace	Pixel	Las Cruces International Airport, NM
10/20/2006	Armadillo Aerospace	Pixel	Las Cruces International Airport, NM
10/21/2006	Armadillo Aerospace	Pixel	Las Cruces International Airport, NM
10/21/2006	Armadillo Aerospace	Pixel	Las Cruces International Airport, NM
10/21/2006	Armadillo Aerospace	Pixel	Las Cruces International Airport, NM
11/13/2006	Blue Origin	Goddard	West Texas Launch Site, TX
3/22/2007	Blue Origin	Goddard	West Texas Launch Site, TX

Figure 23 shows suborbital flights conducted under FAA experimental permits for the period of April 2006 to March 2007.

Commercial Launch History
(January 2002 – December 2006)

Figure 24: Commercial Launch Events by Country, Last Five Years

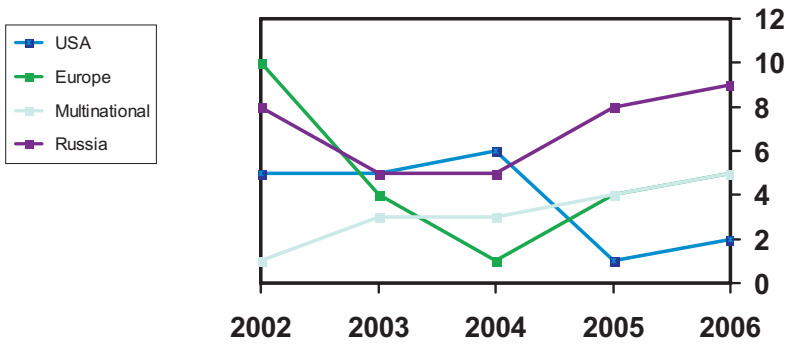


Figure 24 shows commercial launch events by country for the last five full calendar years.

Figure 25: Estimated Commercial Launch Revenue (in $ millions) by Country, Last Five Years

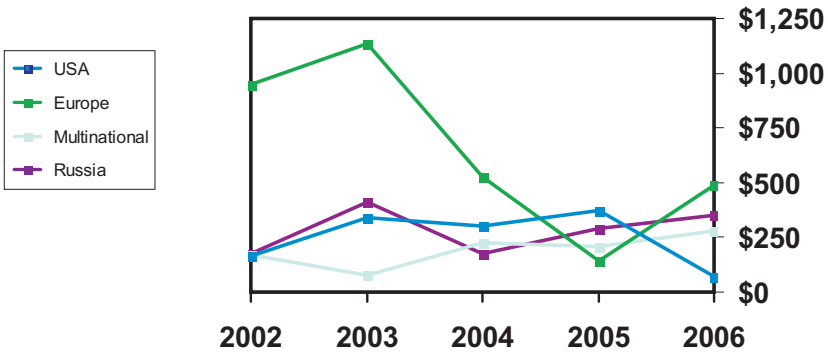


Figure 25 shows estimated commercial launch revenue by country for the last five full calendar years.

10th Annual Commercial Space Transportation Conference
Space Transporation: Competing in a Global Market

Introduction

On February 6 and 7, 2007, the Federal Aviation Administration Office of Commercial Space Transportation (FAA/AST) held its 10th Annual Space Transportation Conference at the Sheraton Crystal City Hotel just outside Washington DC in Northern Virginia. The conference brought together industry leaders, policy makers, and scholars to discuss the opportunities, challenges, and trends shaping the commercial space industry.

Much has changed since the first commercial space transportation conference was held in 1998. That year, introductory remarks by FAA Associate Administrator for Commercial Space Transportation Patricia Grace Smith discussed new agreements to jointly market U.S. and Russian vehicles following the Cold War, and highlighted the role of the booming telecom sector in driving the commercial launch market.[1]

FAA Associate Administrator for Commercial Space Transportation Patricia Grace Smith opens the conference

Ten years later, international partnerships and communications satellite launch demand remain key subjects. However, they have been joined by other important topics: government initiatives to commercialize space, the emergence of commercial space tourism, new approaches to vehicle design, and the growth of commercial spaceports.

These themes and their global implications were the focus of this year's event. In her opening remarks this year, Associate Administrator Patricia Grace Smith reflected on how the past year had taken her to Asia, Europe, and South America to survey the worldwide space industry. "[Here] in the United States," she said, "we believe space is surely not the final frontier," but rather "the front door to…a future with private human spaceflight as an economic driver, a future with some of the most astute business persons coming from the industry sector."[2]

In the past decade, the commercial space transportation industry has broadened to include not only launch services, but also space tourism, technology competitions, and the ability to address government civil and military imperatives through entrepreneurship. Having grown in scope, the commercial space transportation sector is seeking business models, regulatory frameworks, and mission definitions worthy of its competitive international horizons. The 10th Annual Space Transportation Conference provided a forum to discuss

these needs and other issues relevant to the future of the industry.

Major Themes

Innovation: A Path to Accessibility

A keynote address by Dr. Antonio Elias kicked off the conference by framing commercial space transportation alongside similarly high-tech global industries. Dr. Elias, Executive Vice President and General Manager of the Advanced Programs Group at Orbital Sciences Corporation, observed that innovation in space has not kept pace with, for example, innovation in the computer industry. Over the past several decades, worldwide competition and demand for higher performance have powered the phenomenon known as Moore's Law, whereby computing power—as measured by the number of transistors in a given circuit—doubles every 18 to 24 months. While the computer industry has steadily advanced beyond limits once thought impossible to exceed, the launch industry has struggled against its own physical barriers for decades without comparable breakthroughs.

Dr. Antonio Elias delivers the keynote address

Dr. Elias said it was necessary to overcome fundamental hurdles, such as improving specific impulse and mass-to-propellant ratios, before the industry could achieve order-of-magnitude decreases in launch costs. These technical obstacles keep price elasticity near zero, limiting demand by making launches prohibitively expensive for many potential customers. Dr. Elias contended that although new vehicles developed for space tourism might offer a stepping-stone toward lower launch costs, greater economic incentives were needed to make space access more affordable in the international commercial marketplace.

Perspectives from Established and New Players Alike

The first panel discussion following Dr. Elias' speech featured respondents from international companies and organizations, including Mr. Clay Mowry of Arianespace; Dr. Jurgen Drescher of the German Aerospace Center (DLR); Dr. Yoshifumi Inatani of the Japan Aerospace Exploration Agency (JAXA); and Ms. Janice Starzyk of International Launch Services (ILS). Respondents discussed their launch schedules and profiled their business activities, which serve a mix of government and corporate clients.

As a counterpoint to these longtime players, Mr. Lon Levin, Chief Strategic Officer of Transformational Space LLC (t/Space)—a company formed in 2004—addressed attendees over lunch. He praised the National Aeronautics and Space Administration (NASA) plan to privatize re-supply flights to the International Space Station (ISS) through the agency's Commercial Orbital Transportation Services (COTS) initiative. Mr. Levin, whose company was a finalist in the 2006 COTS

competition, said that COTS is "the right way to commercialize space" and expected the initiative to be "the template for how we will commercialize space now and in the future." Mr. Levin also assessed American space competitiveness more generally. While "we have a great economic system that can assure our dominance," he said, U.S. companies should use "this system to get into space as quick as possible" by setting aside "the grandeur of space" and focusing "a bit more on the business."[3]

Space Commercialization Initiatives

Both large and small companies generally view the idea of transitioning certain NASA functions to the private sector with favor; they see it as a potential source of business and an incentive to innovate. For its part, NASA is content to play the role of investor, said panelist Dennis Stone, Assistant Manager of the Commercial Crew and Cargo Program Office at the Johnson Space Center. One caveat, Stone said, is that the agency must adhere to what he informally called "the Griffin Doctrine" in sponsoring private enterprise: the condition that "when a government undertakes a mission it has to be able to control its destiny to achieve that mission." If that condition is satisfied, Stone said, "We will consider purchasing services from the commercial sector if they are available. NASA will consider helping fund the development of those commercial services so that they will be available to buy."[4]

Already through COTS, NASA has awarded nearly $500 million to Rocketplane Kistler (RpK) and Space Exploration Technologies (SpaceX) to foster the development of vehicles that could service the ISS once the Space Shuttle is retired. NASA is also providing technical support (though not funds) to other companies that are developing orbital transport systems, such as PlanetSpace and t/Space. Stone said discussions of similar agreements with additional companies are ongoing.[5]

COTS and other commercialization efforts are earning attention from large industry players as well. The United Launch Alliance (ULA), a joint venture between Lockheed Martin and Boeing to provide launch services to the U.S. government, is studying how to human-rate its Atlas 5 booster by 2010 "in the event a passenger vehicle becomes available," said George Sowers, the company's Vice President for Business Development and Advanced Programs.[6]

Space Tourism

Ms. Anousheh Ansari receives recognition from Associate Administrator Patricia Grace Smith

The second day of the conference dawned with a thought-provoking presentation by Ms. Anousheh Ansari, the fourth—and first female—space tourist. Ms. Ansari flew to the ISS aboard a Soyuz rocket on September 18, 2006, and remained in orbit blogging, videoconferencing, and experiencing life as an astronaut until returning to the Earth on September 29. Two years prior

to her spaceflight, Ms. Ansari sponsored the Ansari X Prize, which awarded $10 million to Scaled Composites for successfully performing two private manned spaceflights aboard its SpaceShipOne vehicle within a two-week period in 2004. Ms. Ansari reiterated the importance of prizes in stimulating entrepreneurship in space. She concluded her remarks with reflections on how her time in orbit had given her greater perspective on our shared destiny as common inhabitants of planet Earth, and inspired her to devote herself to solving global problems.

Safety and Risk in Vehicle Design

Space tourism was a recurring theme throughout the conference. Mr. Alex Tai, Vice President of Operations at Sir Richard Branson's Virgin Galactic, discussed plans to commence space tourism flights aboard SpaceShipTwo—an adaptation of SpaceShipOne for commercial use—beginning in 2009. XCOR Aerospace President Jeff Greason reported on the progress of that company's planned Xerus suborbital space tourism vehicle, while RpK Vice President John Herrington reviewed the development of the Rocketplane XP vehicle.

Mr. John Herrington discusses the Rocketplane XP vehicle

Panelists noted that the conversation about commercial space tourism has shifted in recent years from questions of technical and commercial viability to concerns about public perceptions of risk. Spaceflight remains an inherently risky venture whose safety has not been tested and improved over decades of constant trial and error, as is true for commercial aviation. Although the public is supportive of private spaceflight, its confidence could be shaken by an accident, which would likely impact not merely the company responsible but the space tourism industry as a whole. "The first time we hurt somebody on board, we're done," cautioned Mr. Herrington.[7]

This raised the question: when can a launch vehicle be considered safe enough to fly commercial passengers? Each panelist had a slightly different answer. Mr. Tai said that Virgin Galactic didn't have a specific milestone for number of flights SpaceShipTwo would need to conduct before entering commercial service. Virgin does not want to pressure "engineers to react to unnecessary time scales," he said. "This vehicle will come out when it's absolutely ready to provide a safety level which is suitable for investment and for the public."[8]

Mr. Herrington noted that RpK's business plan calls for a 1-in-10,000 chance of vehicle failure. Herrington faced more daunting odds in his previous career as a NASA astronaut, where his odds of dying in a shuttle accident were 1-in-400. "To me, that was an acceptable risk to do something I had been dreaming about since I was a kid," he said. "Is that acceptable to us from a

business perspective? The answer to that is no."[9]

Mr. Greason agreed that one failure per ten thousand flights was a minimal benchmark for any passenger vehicle out of "simple economic self-interest." Without that level of safety, he noted, "the vehicle doesn't pay for itself before it crashes." For practical reasons as well as an inherent desire for safety, Greason said, XCOR Aerospace engineers are doing their "very, very best to get the vehicle that safe, and to do enough tests to convince ourselves that it is that safe."[10]

In the end, though, panelists concluded that safety metrics alone may not be enough to win over the public. Mr. George Whitesides, Executive Director of the National Space Society, commented on the tendency of customers to use "proxy judgments" in deciding whether to fly. "Will the owner fly? Will they fly their kids? Will the project engineers fly?" asked Mr. Whitesides, who has signed up to be among the first passengers aboard SpaceShipTwo. These are the qualitative grounds on which passengers are likely to base their final decisions to fly, regardless of a vehicle's numeric safety odds.[11]

Spaceport Developments

As commercial space tourism has evolved into a reality, so have commercial spaceports. In June 2006, the Oklahoma Spaceport received an FAA license. Also in 2006, Spaceport America received $100 million from the New Mexico legislature on the heels of an agreement with Virgin Galactic to serve as that company's operations base. And in April 2007, two months after the 10th Annual Commercial Space Transportation Conference, voters in Doña Ana County in southern New Mexico approved a sales tax increase to pay for improvements to Spaceport America—another sign that commercial spaceports have arrived in the economic mainstream.[12]

While these developments are encouraging, the conference's spaceport panelists cautioned about the potential for launch sites to become victims of their own success. As spaceports prosper, respondents explained, so do their adjacent residential and business areas. But as these nearby homes and businesses multiply, they begin to encroach on the spaceport, crowding airspace, complicating operations, and creating safety issues.

Mr. Stu Witt discusses the status of Mojave Airport and Spaceport

According to Mr. Stu Witt, manager of Mojave Airport and Spaceport, encroachment is a growing concern at that site. Several commercial space ventures have invested in facilities at Mojave thanks partly to its sparse population and uncongested airspace. Now, however, economic growth fueled by these ventures is bringing more

development to the surrounding area, which could compromise the very qualities that attracted companies to Mojave in the first place. “As ridiculous as it sounds, houses kill airports, and businesses kill airports,” said Mr. Witt, citing the experiences of small urban airports like the one in Santa Monica, California. “Everyone wants to be near the economic engine, which is the airport, and if you allow that to happen, over 50 or 100 years, you don’t have an airport. Someone will close you down.”[13]

Mr. Rick Homans, Director of Economic Development for the state of New Mexico, said that Spaceport America is seeking to avoid the encroachment problem by placing limits on development around to the spaceport out to a radius of 32 kilometers (20 miles). “We don’t want to see a whole lot of commercial development around the spaceport,” he said. “From our perspective what that does is take away one of our strong assets, which is the lack of population, the lack of development. We want to keep it really focused on operations and on experimental flights, and have the economic development take place in the communities.”[14]

Conclusion

The themes of the 10th Annual Space Transportation Conference—technical innovation, space commercialization, space tourism, vehicle safety, and smarter spaceport development—underscored an industry that has matured in the past decade. Whereas ten years ago, commercial space transportation was mainly about satellite launches, today it has broadened to include new markets, initiatives, technologies, and infrastructure needs.

Attendees listen to a panel discussion

As a sign of this maturity, dialogue within the industry overall has shifted from questions of commercial viability to issues of practical implementation. Now that commercial space transportation is an established business, conference panelists and attendees were focused on how to pursue that business in the most successful ways. As Deputy Associate Administrator for Commercial Space Transportation Dr. George Nield put it, referencing earlier remarks by Associate Administrator Smith: “After generations of hope, we are now doing what we hoped for.”[15]

Endnotes

[1] Remarks by Patricia Grace Smith, Acting Associate Administrator for Commercial Space Transportation, at the 1st Annual Commercial Space Transportation Forecast Conference. Federal Aviation Administration, 2/10/1998. Viewable at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/98feb10-11.htm. Last accessed 5/3/2007.
[2] "The Excellent Question of *Passarola Rising*: Remarks by Patricia Grace Smith, Associate Administrator, Office of Commercial Space Transportation, Federal Aviation Administration, at the Tenth Annual FAA Commercial Space Transportation Conference." Federal Aviation Administration, 2/6/2007. Viewable at http://www.faa.gov/about/office_org/headquarters_offices/ast/about/media/PGSAST2007single.pdf. Last accessed 5/3/2007.
[3] Foust, Jeff. "Current Issues in NewSpace." *The Space Review*, 3/5/2007. Viewable at http://www.thespacereview.com/article/823/1. Last accessed 5/3/2007.
[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] Ibid.
[10] Ibid.
[11] Ibid.
[12] Kaufman, Marc. "N.M. County Passes Tax Increase to Fund Spaceport." *The Washington Post*, 4/6/2007. Viewable at http://www.washingtonpost.com/wp-dyn/content/article/2007/04/05/AR2007040501905.html
[13] Foust, Jeff. "Current Issues in NewSpace." *The Space Review*, 3/5/2007. Viewable at http://www.thespacereview.com/article/823/1. Last accessed 5/3/2007.
[14] Ibid.
[15] "Space Travelers Attend FAA Conference." FAA press release, 2/2007. Viewable at http://www.faa.gov/news/conferences_events/commercial_space/10/media/2007%20Post%20Conference%20Information.doc. Last accessed 5/3/2007.

First Quarter 2007 Orbital and Suborbital Launch Events

Date			Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price	L	M
1/10/2007			PSLV	Satish Dhawan Space Center		Cartosat 2	ISRO	Remote Sensing	$20M	S	S
						LAPAN-TUBSAT	LPAN	Development			S
						PehuenSat	Universidad Nacional del Comahue	Development			S
						SRE 1	ISRO	Development			S
1/18/2007			Soyuz	Baikonur		Progress ISS 24P	Roscosmos	ISS	$40M	S	S
1/30/2007	√	+	Zenit 3SL	Odyssey Launch Platform	*	NSS 8	SES New Skies	Communications	$70M	F	F
2/3/2007			Long March 3A	Xichang		Beidou 2A (Compass 1)	CNSA	Navigation	$50M	S	S
2/17/2007			Delta 2 7925-10	CCAFS		THEMIS 1	NASA	Scientific	$50M	S	S
						THEMIS 2	NASA	Scientific			S
						THEMIS 3	NASA	Scientific			S
						THEMIS 4	NASA	Scientific			S
						THEMIS 5	NASA	Scientific			S
2/24/2007			H 2A TBA	Tanegashima		IGS 3B	Japanese Defense Agency	Classified	$85M	S	S
						IGS Optical 3 Verification	Japanese Defense Agency	Classified			S
3/8/2007			Atlas 5 401	CCAFS		Orbital Express 1A	DARPA	Development	$75M	S	S
						CFESat	USAF	Development			S
						FalconSat 3	USAF Academy	Development			S
						MIDSTAR 1	US Naval Academy	Development			S
						Orbital Express 1B	DARPA	Development			S
						Space Test Program Satellite 1	USAF	Development			S
3/11/2007	√		Ariane 5 ECA	Kourou		Skynet 5A	UK MoD	Communications	$140M	S	S
					*	Insat 4B	ISRO	Communications			S
3/20/2007			Falcon 1	Kwajalein Island		Falcon Demosat	DARPA	Development	$7M	F	F

√ 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 multi-manifested, but the pairing of satellites scheduled for each launch is sometimes undisclosed for proprietary reasons until shortly before the launch date.

Second Quarter 2007 Projected Orbital and Suborbital Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
4/7/2007		Soyuz	Baikonur		Soyuz ISS 14S	Roscosmos	ISS	$40M
4/10/2007	√	Proton M	Baikonur	*	Anik F3	Telesat Canada	Communications	$70M
4/11/2007		Long March 2C	Taiyuan		Haiyang 1B	CNSA	Remote Sensing	$22.5M
4/14/2007		Long March 3A	Xichang		Beidou 2B	CNSA	Navigation	$50M
4/17/2007	√	Dnepr 1	Baikonur		Egyptsat	National Authority for Remote Sensing and Space Sciences	Remote Sensing	$9.5M
					AeroCube 2	Aerospace Corporation	Development	
					CAPE-1	University of Louisiana	Development	
					CTSB 1	Boeing	Development	
					Libertad 1	Universidad de Sergio Arboleda	Development	
				*	MAST	Stanford University	Development	
					Polysat 3	Cal Poly Aerospace Engineering	Development	
					Polysat 4	Cal Poly Aerospace Engineering	Development	
					SaudiComsat 3	Space Research Institute	Communications	
					SaudiComsat 4	Space Research Institute	Communications	
					SaudiComsat 5	Space Research Institute	Communications	
					SaudiComsat 6	Space Research Institute	Communications	
					SaudiComsat 7	Space Research Institute	Communications	
					Saudisat 3	Space Research Institute	Scientific	
4/23/2007	√	PSLV	Satish Dhawan Space Center		AGILE	Agenzia Spaziale Italiana (ASI)	Scientific	$20M
					AAM	ISRO	Development	
4/24/2007		Minotaur	Wallops Flight Facility		NFIRE	Missile Defense Agency	Development	$14.5M
4/25/2007		Pegasus XL	VAFB		AIM Explorer	NASA	Scientific	$16M

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Second Quarter 2007 Orbital and Suborbital Launch Events (Continued)

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
5/3/2007	√	Ariane 5 ECA	Kourou	*	Astra 1L	SES Astra	Communications	$140M
				*	Galaxy 17	Intelsat	Communications	
5/12/2007		Soyuz	Baikonur		Progress ISS 25P	Roscosmos	ISS	$40M
5/19/2007		Long March 3B	Xichang		Nigcomsat 1	China Aerospace Corporation	Communications	$60M
5/21/2007	√	Soyuz	Baikonur	*	Globalstar Replacement 1	Globalstar	Communications	$40M
				*	Globalstar Replacement 2	Globalstar	Communications	
				*	Globalstar Replacement 3	Globalstar	Communications	
				*	Globalstar Replacement 4	Globalstar	Communications	
5/24/2007	√ +	Delta 2 7420	VAFB		Cosmo-Skymed 1	ASI	Remote Sensing	$50M
5/2007		Long March 4B	Taiyuan		CBERS/Ziyuan 2B	CAST	Remote Sensing	$50M
5/2007	√	Dnepr 1	Baikonur	*	Genesis 2	Bigelow Aerospace	Development	$9.5M
5/1/2007	√	Dnepr 1	Baikonur	*	TerraSAR X	Infoterra	Remote Sensing	$9.5M
6/8/2007		Shuttle Atlantis	KSC		STS 117	NASA	Crewed	N/A
					ISS 13A	NASA	ISS	
6/14/2007		Atlas 5 401	CCAFS		NRO L-30	NRO	Classified	$75M
6/20/2007		Shtil	Barents Sea		Kompass 3	Izmiran and Lebedev Physical Institute	Scientific	$1.5M
					Sumbandila	University of Stellenbosch	Development	
6/30/2007		Delta 2 7925H	CCAFS		Dawn	JPL	Scientific	$50M
6/30/2007		PSLV	Satish Dhawan Space Center		Oceansat 2	ISRO	Remote Sensing	$20M
6/2007	√ +	Proton M	Baikonur	*	DirecTV 10	DirecTV	Communications	$70M
2Q/2007		Zenit 2	Baikonur		Kosmos TBA 2	Russian MoD	Classified	$37.5M
2Q/2007		Shahab 3	Iran - TBA		Safir	Iran - TBA	Test	TBA

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Third Quarter 2007 Projected Orbital and Suborbital Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
7/1/2007	√	Kosmos 3M	Plesetsk		SAR Lupe 2	German MoD	Classified	$12M
7/2/2007		Atlas 5 421	CCAFS		WGS 1	US Department of Defense (DoD)	Communications	$75M
7/7/2007	√	Proton M	Baikonur	*	Sirius 4	SES Sirius	Communications	$70M
7/2007		GSLV	Satish Dhawan Space Center	*	Insat 4C R	ISRO	Communications	$40M
7/2007		Soyuz	Baikonur	*	Globalstar Replacement 5	Globalstar	Communications	$40M
				*	Globalstar Replacement 6	Globalstar	Communications	
				*	Globalstar Replacement 7	Globalstar	Communications	
				*	Globalstar Replacement 8	Globalstar	Communications	
8/3/2007		Delta 2 7925H	CCAFS		Mars Phoenix Lander	UA Department of Planetary Sciences	Scientific	$50M
8/9/2007		Shuttle Endeavour	KSC		STS 118	NASA	Crewed	N/A
					JEM RMS	NASA	ISS	
8/16/2007		Soyuz	Baikonur		Progress ISS 26P	Roscosmos	ISS	$40M
8/2007		H 2A 202	Tanegashima		Selene 1	Japan Aerospace Exploration Agency (JAXA)	Scientific	$85M
8/2007	√	Ariane 5 ECA	Kourou	*	Spaceway 3	Hughes Communications	Communications	$140M
				*	BSAT 3A	Broadcasting Satellite System Corporation (BSAT)	Communications	
9/14/2007		Soyuz	Baikonur		Foton M3	European Space Agency (ESA)	Scientific	$40M
9/2007		Long March 3A	Xichang		Chang'e 1	CNSA	Scientific	$50M
9/2007		GSLV Mark 2	Satish Dhawan Space Center		Gsat 4	ISRO	Communications	TBA
				*	Insat 4D	ISRO	Communications	
9/2007		Delta 2 7925-10	CCAFS		Navstar GPS 2RM-4	USAF	Navigation	$50M
9/2007		Falcon 1	VAFB		TacSat 1	DoD	Development	$7M
				*	Celestis 5	Celestis	Other	
3Q/2007		Delta 4 Heavy	CCAFS		DSP 23	USAF	Classified	$155M
3Q/2007	√	+ Delta 2 7420	VAFB	*	GeoEye 1	GeoEye	Remote Sensing	$50M
3Q/2007	√	Proton M	Baikonur	*	JCSAT 11	Japan Satellite Systems (JSAT)	Communications	$70M
3Q/2007	√	Soyuz	Baikonur		Radarsat 2	MacDonald, Dettwiler, and Associates	Remote Sensing	$40M
3Q/2007	√	+ Delta 2 7925-10	VAFB	*	Worldview 1	DigitalGlobe	Remote Sensing	$50M
3Q/2007		Long March 3A	Xichang	*	Sinosat 3	Sino-Satellite Communications	Communications	$50M
3Q/2007		Long March 3B	Xichang		Zhongxing 6B	Chinese Telecommunications Broadcasting Satellite Corporation	Communications	$60M
3Q/2007		Long March 2C	Xichang		HJ 1A	CNSA	Remote Sensing	$22.5M
					HJ 1B	CNSA	Remote Sensing	
					HJ 1C	CNSA	Remote Sensing	

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