



**Federal Aviation  
Administration**

# **Quarterly Launch Report 3rd Quarter 2008**

Featuring Launch Results from the 2nd Quarter and  
Forecasts for the 3rd and 4th Quarter 2008

## Introduction

The *Third Quarter 2008 Quarterly Launch Report* features launch results from the second quarter of 2008 (April - June 2008) and forecasts for the third quarter of 2008 (July - September 2008) and the fourth quarter of 2008 (October - December 2008). 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 under 49 United States Code Subtitle IX, Chapter 701 (formerly the Commercial Space Launch Act).

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Cover photo courtesy of United Launch Alliance, Copyright © 2008. An Atlas V lifts off from Cape Canaveral Air Force Station (CCAFS) on April 14, 2008. The launch carried ICO G1, a commercial communications satellite operated by ICO Global Communications, into geosynchronous (GEO) orbit.

## Second Quarter 2008 Highlights

### **EADS Astrium Purchases Majority Stake in Surrey Satellite Technology Ltd.**

In April, EADS Astrium, Europe's largest satellite manufacturer, announced an agreement to purchase a majority stake in Surrey Satellite Technology Ltd. (SSTL), a leading developer of small satellites (smallsats). Under the agreement, EADS Astrium will acquire 80 percent of SSTL for an estimated £40-50 million (US\$80-100 million). SSTL will remain a separate operating entity with access to the greater resources of Astrium.

### **Orbital Sciences Corporation Sells Non-Core Business Unit**

On April 17, Orbital Sciences Corporation announced plans to sell a non-core business unit, its transportation management systems division, to Affiliated Computer Services, Inc. (ACS) for \$42.5 million.

### **New Mexico County Approves Sales Tax to Help Fund Spaceport America**

On April 22, the voters of Sierra County in southern New Mexico overwhelmingly approved a sales tax increase that will help fund the development of the state's commercial spaceport, Spaceport America. The approval of the tax allows the state to create a "tax district" that includes neighboring Doña Ana County, which approved a similar tax in 2007. Revenues from this tax district will be directed toward spaceport development.

### **Land Launch Successfully Stages First Mission**

On April 28, the Land Launch commercial venture carried out its maiden launch successfully. A Zenit-3SLB vehicle used by the company lifted off from Baikonur Cosmodrome in Kazakhstan, placing the Israeli communications satellite Amos-3 into a geosynchronous (GEO) transfer orbit. The launch was the first mission for Land Launch, a joint venture between the Sea Launch Company and the Russian firm Space International Services. The firm's Zenit 3SL-B vehicle is a modified version of Sea Launch's Zenit-3SL designed to serve the market for smaller GEO satellites.

### **Canadian Government Blocks Sale of MDA Space Division**

On May 9, the Canadian government announced it would uphold an earlier decision to block the purchase of the space unit of MacDonald, Dettwiler and Associates (MDA) by the U.S. company Alliant TechSystems (ATK). Canadian regulators said the sale would not provide a "net benefit" to Canada. Both ATK and MDA had sought the transaction in order to better address the North American market, but some in Canada objected to the proposed \$1.3-billion deal due to concerns about control of Canada's leading space company by a non-Canadian corporation.

### **Cause of Soyuz Ballistic Reentry Identified**

On May 21, a Russian review panel concluded that the ballistic reentry of a crewed Soyuz spacecraft on April 19 was caused when the spacecraft's equipment module failed to separate cleanly prior to reentry. The ballistic reentry, during which the Soyuz spacecraft experienced an uncontrollable, steeper-than-intended trajectory on its return to Earth, caused the three-person crew to experience gravity forces (g-forces) in excess of 8 Gs. It was the second consecutive Soyuz reentry to experience an unintended ballistic trajectory. Russian authorities are working to prevent a recurrence of the problem on the next crewed Soyuz flight, scheduled for later in 2008.



## Second Quarter 2008 Highlights

### **Boeing Satellite Division Announces Layoffs**

On May 21, The Boeing Company announced it would lay off 750 workers at two satellite manufacturing facilities in southern California because of a downturn in business. Employees at the facilities in El Segundo and Seal Beach were to receive 60-day layoff notices, although the company said that it would try to transfer as many affected workers as possible to other company facilities. Boeing officials blamed the layoffs on decreased demand for large satellites by commercial customers as well as the stretching out of government contract awards. The announcement came one week after Boeing lost a lucrative contract for the next generation of GPS satellites to Lockheed Martin.

### **NASA Phoenix Lander Touches Down on Mars**

NASA's Phoenix Mars Lander successfully touched down on the northern plains of the Red Planet on May 25. Signals from the spacecraft, relayed through the Mars Odyssey spacecraft orbiting overhead, confirmed that the spacecraft was in good condition and had landed in a region of flat terrain with few rocks. The Phoenix Lander continues to operate successfully, carrying out various scientific missions. The mission has a design life of about 92 days.

### **Krunichev Acquires Majority Share in ILS**

In May, Krunichev State Research and Production Space Center, the Russian venture that manufactures the Proton launch vehicle, acquired a majority interest in the commercial launch company International Launch Services (ILS). Officials said there will be no change in ILS operations, and that the company, based in the Washington, DC area, will continue to sell the Proton to commercial customers worldwide.

### **Space Shuttle Attaches Japanese Lab Module to ISS**

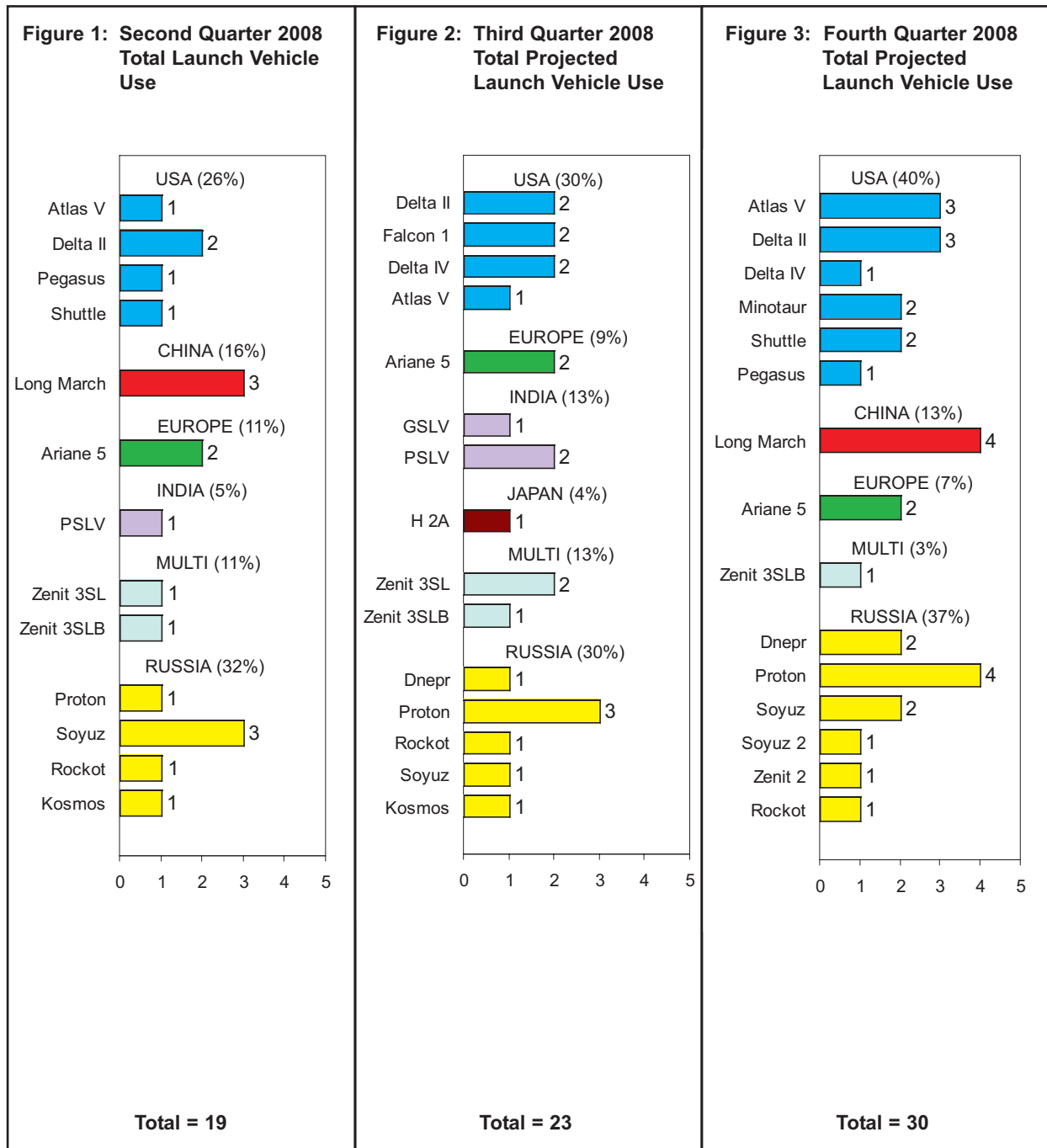
On May 31, Shuttle Discovery mission STS 124 launched from Cape Canaveral. On June 3, the crew successfully attached the advanced Japanese laboratory module known as Kibo to the International Space Station (ISS) at the conclusion of the first spacewalk of the mission. Astronauts Mike Fossum and Ron Garan spent six hours and 48 minutes outside the ISS to install the Kibo module.

### **Google Co-Founder Makes Deposit To Visit ISS, As Space Adventures Announces Dedicated Tourism Flight**

In June, Sergey Brin, a co-founder of Internet search giant Google, put down a \$5-million deposit on a future flight to the ISS through the space tourism company Space Adventures. Brin became the first member of Space Adventures' new Orbital Mission Explorers Circle, a group with preferential access to future commercial flights to the ISS. Brin has not committed to a specific date for his flight. Also in June, Space Adventures announced an agreement with the Russian space agency Roscosmos for the first dedicated commercial Soyuz flight to the station, planned for the second half of 2011; the flight will have two seats available for commercial passengers. Space Adventures has flown five people on regular Soyuz taxi flights to the station, with a sixth, Richard Garriott, scheduled to fly in October.

Vehicle Use

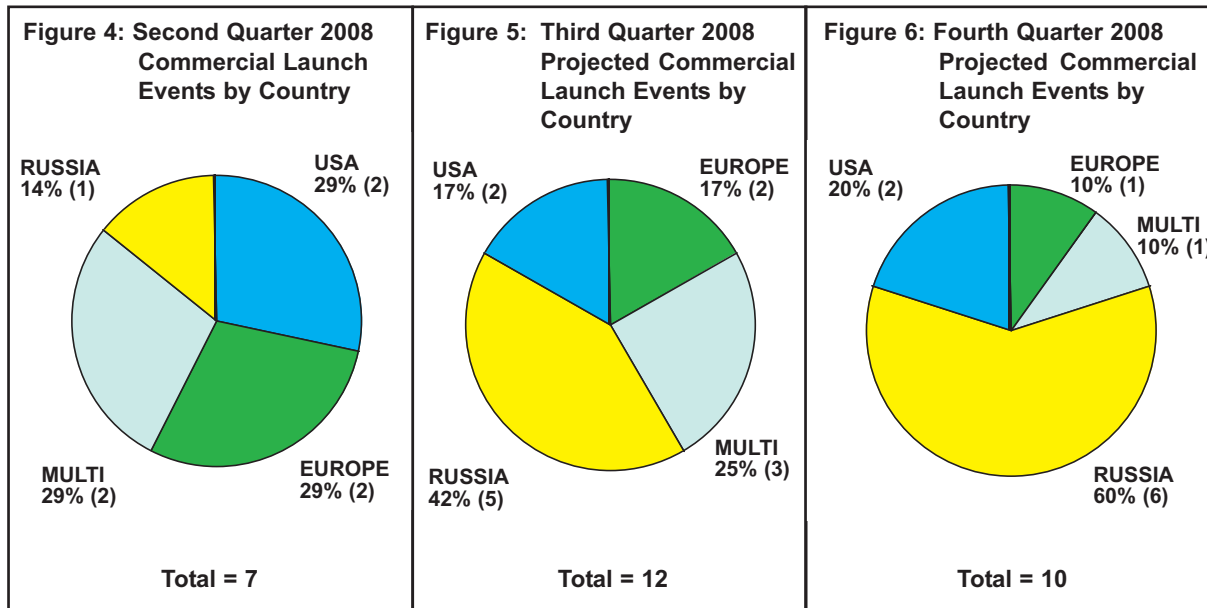
(March 2008 – December 2008)



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 second quarter of 2008. They also project this information for the third quarter of 2008 and fourth quarter of 2008. 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.

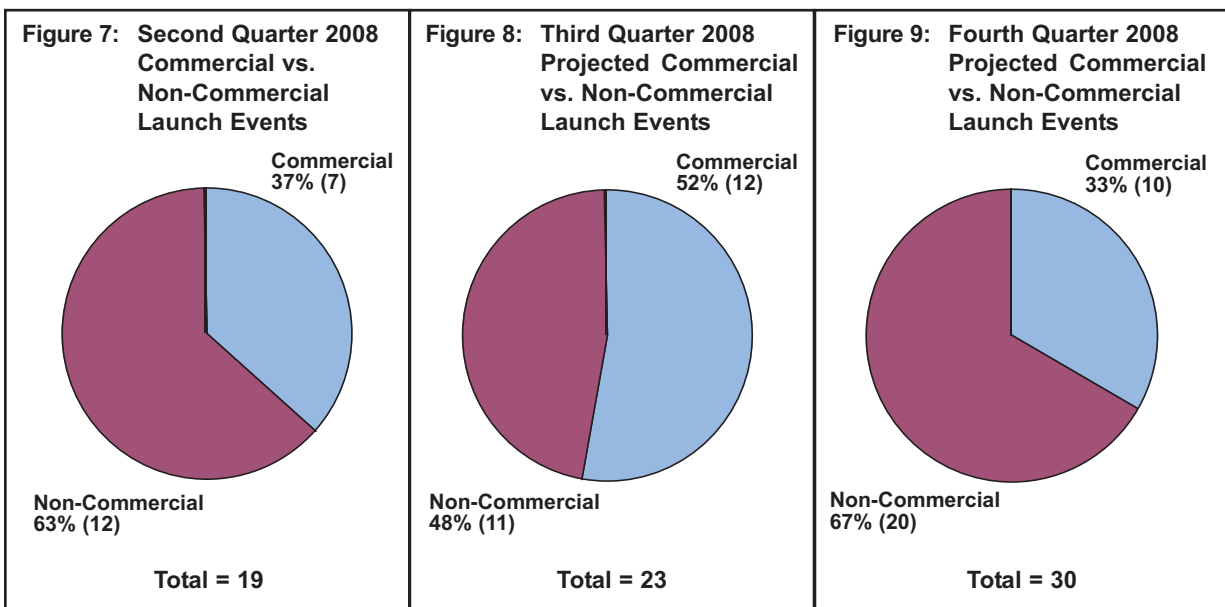
Note: Percentages for these and subsequent figures may not add up to 100 percent due to rounding of individual values.

**Commercial Launch Events by Country**  
(March 2008 – December 2008)



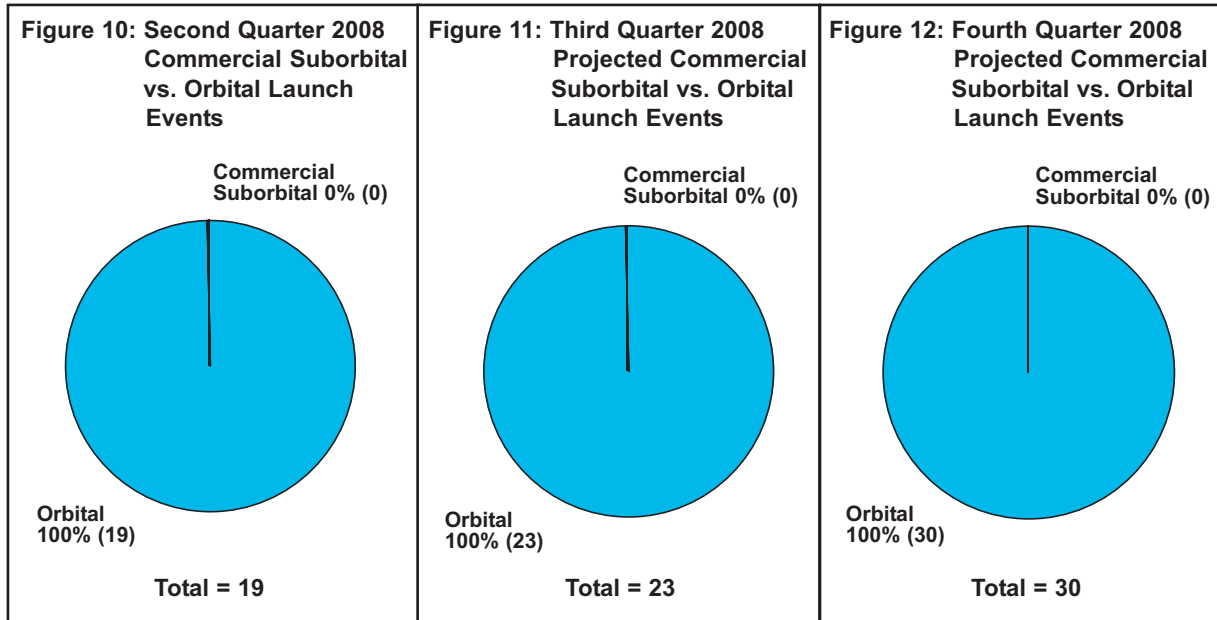
Figures 4-6 show all commercial orbital and suborbital launch events that occurred in the second quarter of 2008 and that are projected for the third quarter of 2008 and fourth quarter of 2008.

**Commercial vs. Non-Commercial Launch Events**  
(March 2008 – December 2008)



Figures 7-9 show commercial vs. non-commercial orbital and suborbital launch events that occurred in the second quarter of 2008 and that are projected for the third quarter of 2008 and fourth quarter of 2008.

**Orbital vs. Commercial Suborbital Launch Events**  
(March 2008 – December 2008)



Figures 10-12 show orbital vs. FAA-licensed commercial suborbital launch events (or their international equivalents) that occurred in the second quarter of 2008 and that are projected for the third quarter of 2008 and fourth quarter of 2008.

**Launch Successes vs. Failures**  
(March 2008 – June 2008)

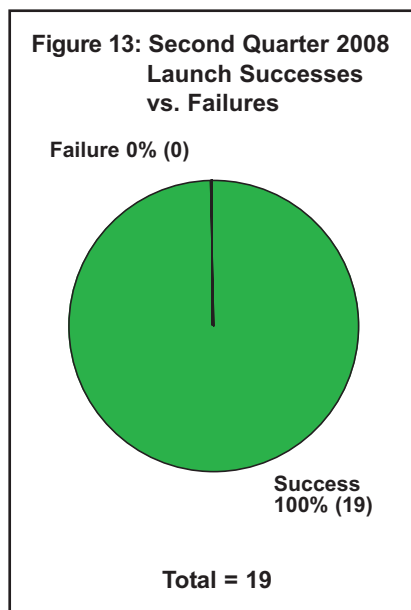
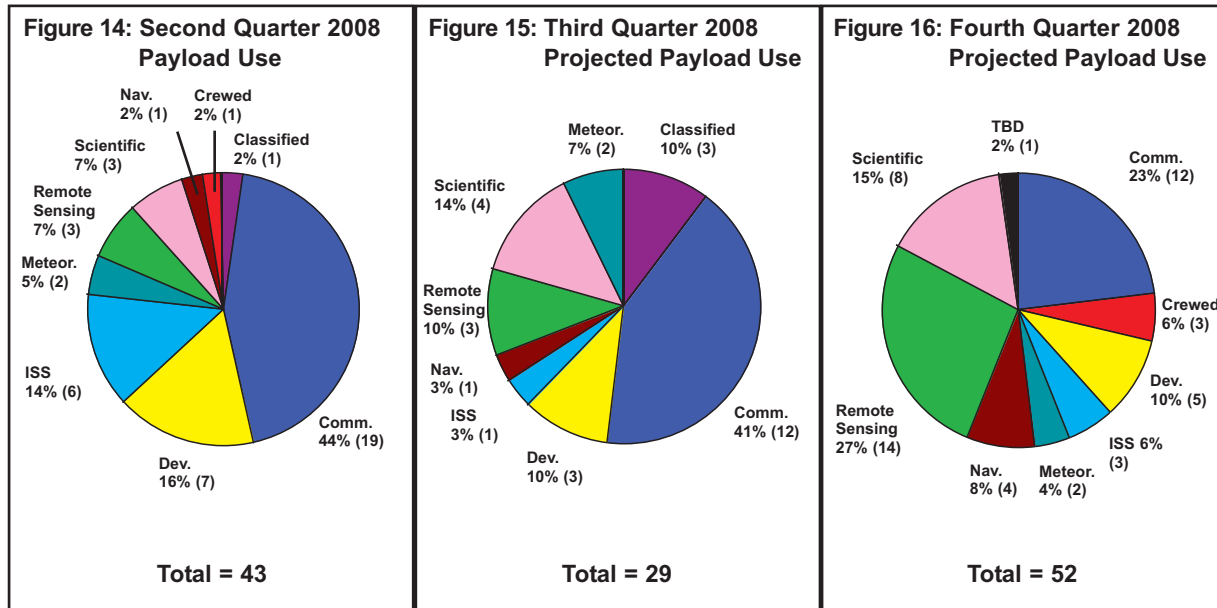


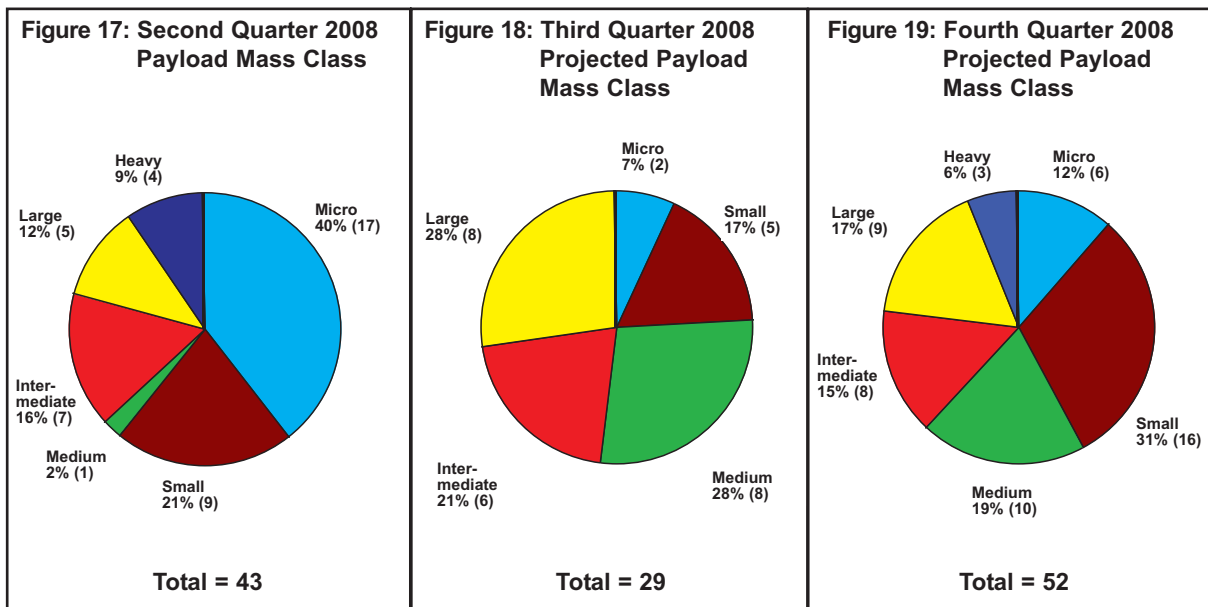
Figure 13 shows orbital and commercial suborbital launch successes vs. failures for the period from March 2008 to June 2008. Partially-successful orbital launch events are those where the launch vehicle fails to deploy its payload to the appropriate orbit, but the payload is able to reach a useable orbit 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)**  
(March 2008 – December 2008)



Figures 14-16 show total payload use (commercial and government), actual for the second quarter of 2008 and projected for the third quarter of 2008 and fourth quarter of 2008. 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)**  
(March 2008 – December 2008)



Figures 17-19 show total payloads by mass class (commercial and government), actual for the second quarter of 2008 and projected for the third quarter of 2008 and fourth quarter of 2008. 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)**  
(July 2007 – June 2008)

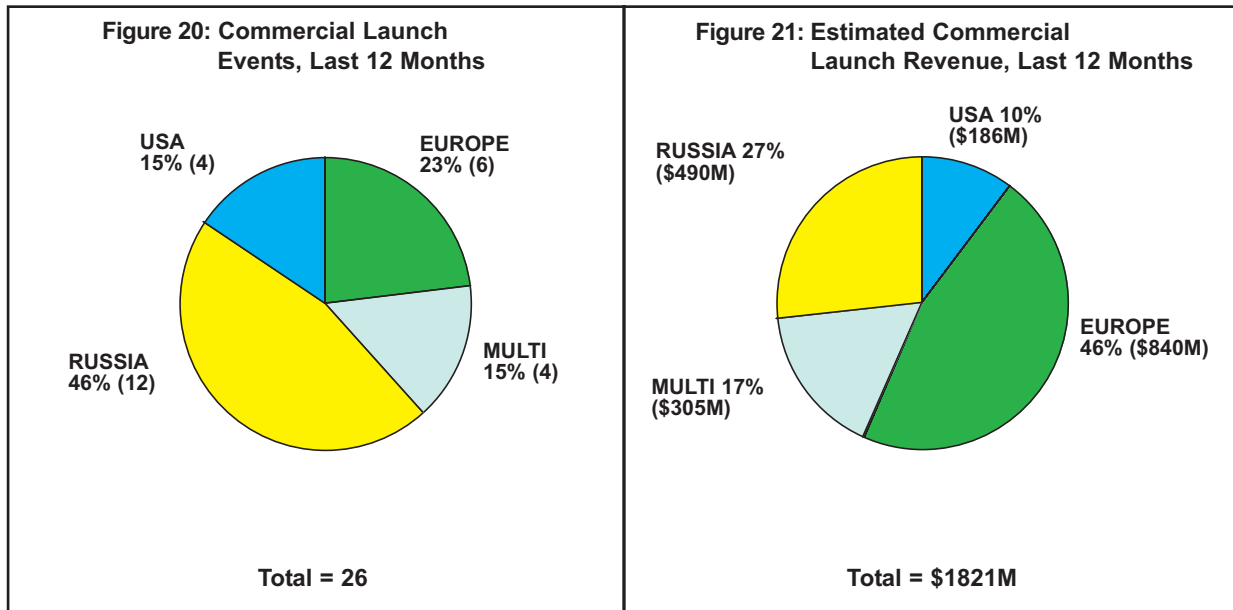


Figure 20 shows commercial orbital launch events for the period of July 2007 to June 2008 by country.

Figure 21 shows estimated commercial launch revenue for orbital launches for the period of July 2007 to June 2008 by country.

**Commercial Launch Trends (Suborbital Launches and Experimental Permits)**  
(July 2007 – June 2008)

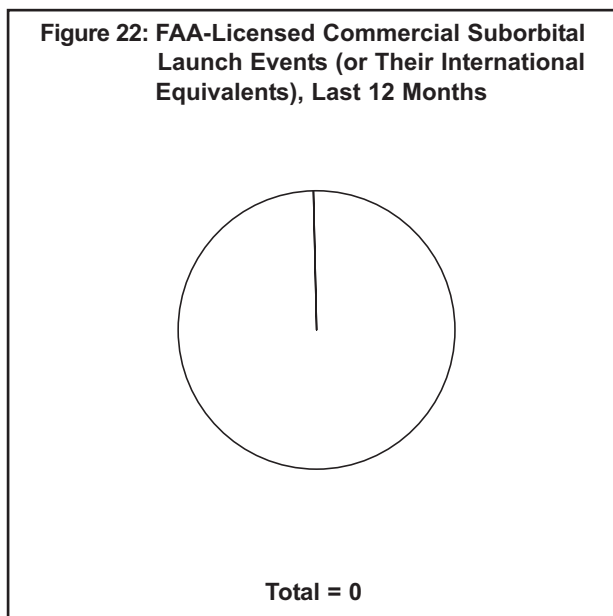


Figure 22 shows FAA-licensed commercial suborbital launch events (or their international equivalents) for the period of July 2007 to June 2008 by country.

**Figure 23: FAA Experimental Permit Flights, Last 12 Months**

Flight Date	Operator	Vehicle	Launch Site
4/19/2007	Blue Origin	Goddard	West Texas Launch Site, TX
6/2/2007	Armadillo Aerospace	Pixel	Oklahoma Spaceport, OK
6/2/2007	Armadillo Aerospace	Pixel	Oklahoma Spaceport, OK
10/20/2007	Armadillo Aerospace	MOD 1	Oklahoma Spaceport, OK
10/27/2007	Armadillo Aerospace	MOD 1	Holloman AFB, NM
10/27/2007	Armadillo Aerospace	MOD 1	Holloman AFB, NM
10/28/2007	Armadillo Aerospace	MOD 1	Holloman AFB, NM
10/28/2007	Armadillo Aerospace	MOD 1	Holloman AFB, NM

Figure 23 shows suborbital flights conducted under FAA experimental permits for the period of July 2007 to June 2008 by country.

### Commercial Launch History (January 2003 – December 2007)

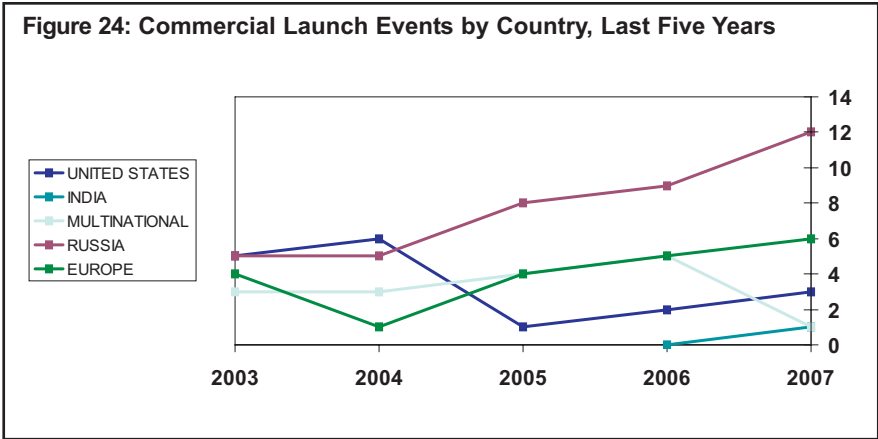


Figure 24 shows commercial launch events by country for the last five full calendar years.

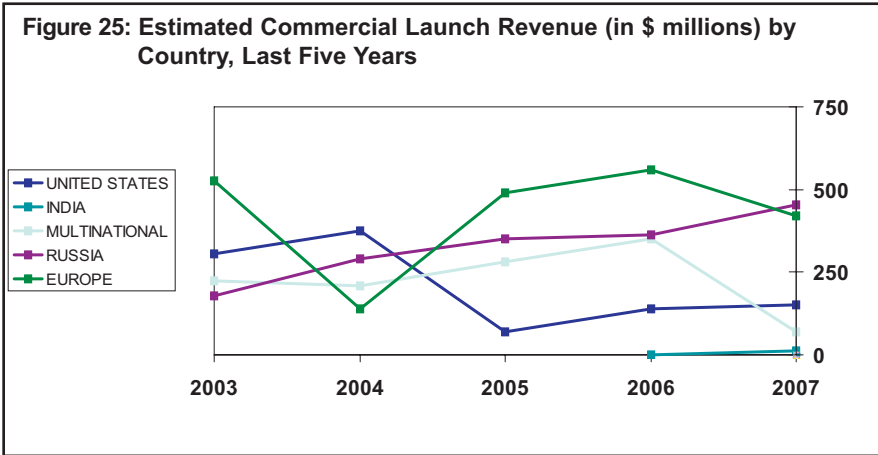


Figure 25 shows estimated commercial launch revenue by country for the last five full calendar years.

Second Quarter 2008 Orbital and Suborbital Launch Events							
Date	Vehicle	Site	Payload or Mission Operator		Use	Vehicle Price	L M
4/8/2008	Soyuz	Baikonur	Soyuz ISS 16S	Russian Space Agency (Roscosmos)	ISS	\$40M	S S
4/14/2008	✓ + Atlas V 421	Cape Canaveral Air Force Station (CCAFS)	* ICO G1	ICO Global Communications	Communications	\$70M	S S
4/16/2008	✓ + Pegasus XL	Kwajalein Island	C/NOFS	United States Air Force (USAF)	Scientific	\$16M	S S
4/18/2008	✓ Ariane 5 ECA	Kourou	Vinasat	Vietnamese MPT	Communications	\$140M	S S
			* Star One C2	Star One	Communications		S
4/25/2008	Long March 3C	Xichang	Tianlian 1	Chinese National Space Agency (CNSA)	Communications	TBA	S S
4/27/2008	Soyuz	Baikonur	GIOVE B	European Space Agency (ESA)	Navigation	\$40M	S S
4/28/2008	PSLV	Satish Dhawan Space Center	Cartosat 2A	Indian Space Research Organization (ISRO)	Remote Sensing	\$20M	S S
			AAUsat 2	Aalborg University	Development		S
			CanX-2	University of Toronto	Development		S
			Compass 1	Aachen University	Development		S
			Cute 1.7 + APD 2	Tokyo Institute of Technology	Development		S
			Delfi C3	Delft University	Development		S
			IMS 1	ISRO	Remote Sensing		S
			NLS-5	University of Toronto	Remote Sensing		S
			* Rubin-8	Cosmos International GmbH	Communications		S
			SEEDS 2	Nihon University	Development		S
4/28/2008	✓ Zenit 3SLB	Baikonur	* Amos 3	SpaceCom Limited	Communications	\$50M	S S
5/15/2008	Soyuz	Baikonur	Progress ISS 29P	Roscosmos	ISS	\$40M	S S
5/21/2008	✓ + Zenit 3SL	Odyssey Launch Platform	* Galaxy 18	Intelsat	Communications	\$85M	S S
5/23/2008	Rocket	Plesetsk	* Gonets D1M 2	Roscosmos	Communications	\$13.5M	S S
			* Gonets D1M 3	Roscosmos	Communications		S
			* Gonets D1M 4	Roscosmos	Communications		S
			* Yubileiny	Roscosmos	Communications		S
5/27/2008	Long March 4C	Taiyuan	Fengyun 3A	China Meteorological Administration	Meteorological	\$50M	S S
5/31/2008	Shuttle Discovery	Kennedy Space Center (KSC)	STS 124	National Aeronautics and Space Administration (NASA)	Crewed	N/A	S S
			Cupola 1	NASA	ISS		S
			JEM RMS	NASA	ISS		S
			Port Rails 1	NASA	ISS		S
			Solar Arrays SPP	NASA	ISS		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.

Second Quarter 2008 Orbital and Suborbital Launch Events (Continued)							
Date	Vehicle	Site	Payload or Mission Operator		Use	Vehicle Price	L M
6/9/2008	Long March 3B	Xichang	* Chinasat 9	Chinese Telecommunications Broadcasting Satellite Corporation	Communications	\$60M	S S
6/11/2008	Delta II 7920H	CCAFS	GLAST	NASA	Scientific	\$50M	S S
6/12/2008	√ Ariane 5 ECA	Kourou	Skynet 5C	Paradigm Secure Communications	Communications	\$140M	S S
6/19/2008	√ Kosmos 3M	Kapustin Yar	* Turksat 3A	Turkish Telecom	Communications	\$12M	S
			* Orbcomm CDS 3	ORBCOMM	Development		S S
			* Orbcomm Replacement 1	ORBCOMM	Communications		S
			* Orbcomm Replacement 2	ORBCOMM	Communications		S
			* Orbcomm Replacement 3	ORBCOMM	Communications		S
			* Orbcomm Replacement 4	ORBCOMM	Communications		S
			* Orbcomm Replacement 5	ORBCOMM	Communications		S
6/20/2008	Delta 2 7320	VAFB	Jason 2	Eumetsat	Meteorological	\$50M	S S
6/27/2008	Proton (SL-12)	Baikonur	Kosmos 2440	Russian Ministry of Defense (MoD)	Classified	\$72.5M	S S

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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.

Third Quarter 2008 Projected Orbital and Suborbital Launch Events						
Date	Vehicle	Site	Payload or Mission	Operator	Use	Vehicle Price
7/7/2008	√ Ariane 5 ECA	Kourou	* BADR-6 * Protostar 1	Arabsat Protostar Ltd.	Communications Communications	\$140M
7/15/2008	√ + Zenit 3SL	Odyssey Launch Platform (Pacific Ocean)	* Echostar XI	Echostar	Communications	\$85M
7/22/2008	√ Kosmos 3M	Plesetsk	SAR Lupe 5	German Ministry of Defense (MoD)	Classified	\$12M
7/29/2008	Falcon 1	Kwajalein Island	* Jumpstart D-sat	Operationally Responsive Space (ORS) Office Astronautic Technology Malaysia	Development Scientific	\$7M
7/1/2008	√ Dnepr 1	Dombarovskiy	THEOS	Geo-Informatics and Space Technology Development Agency (GISTDA)	Remote Sensing	\$9.5M
8/12/2008	√ Ariane 5 ECA	Kourou	* AMC 21 * Superbird 7	SES Americom Space Communications Corporation	Communications Communications	\$140M
8/14/2008	√ Proton M	Baikonur	* Inmarsat-4 F3	Inmarsat	Communications	\$70M
8/21/2008	√ Zenit 3SLB	Baikonur	* Measat 3A	MEASAT	Communications	\$50M
8/22/2008	√ + Delta II 7420-10	VAFB	* GeoEye 1	GeoEye	Remote Sensing	\$50M
8/1/2008	Delta IV Medium Plus (5, 2)	VAFB	NRO L-25	U.S. National Reconnaissance Office (NRO)	Classified	\$77.5M
8/1/2008	Proton (SL-12)	Baikonur	* Express AM44 * Express MD 1	Russian Satellite Communications Company (RSCC) RSCC	Communications Communications	\$72.5M
9/10/2008	Soyuz	Baikonur	Progress ISS 30P	Roscosmos	ISS	\$40M
9/10/2008	√ Rocket	Plesetsk	GOCE	ESA	Scientific	\$13.5M
9/10/2008	Atlas V 401	VAFB	DMSP 5D-3-F18	U.S. Department of Defense (DoD)	Meteorological	\$75M
9/26/2008	Delta IV Heavy	CCAFS	NRO L-26	NRO	Classified	\$155M
9/1/2008	√ Proton M	Baikonur	* Nimiq 4	Telesat Canada	Communications	\$70M
3Q/2008	√ + Falcon 1	Kwajalein Island	RazakSAT	Malaysia National Space Agency	Development	\$7M
3Q/2008	PSLV	Sriharikota	Oceansat 2	ISRO	Remote Sensing	\$20M
3Q/2008	H 2A TBA	Tanegashima	GOSAT SDS-1	Japan Aerospace Exploration Agency (JAXA) JAXA	Scientific Development	\$85M
3Q/2008	√ + Zenit 3SL	Odyssey Launch Platform	* Galaxy 19	Intelsat	Communications	\$85M
3Q/2008	GSLV Mark 2	Satish Dhawan Space Center	Insat 3D Gsat 4	ISRO ISRO	Meteorological Communications	\$40M
3Q/2008	PSLV	Satish Dhawan Space Center	Chandrayaan 1	ISRO	Scientific	\$20M
3Q/2008	Delta II 7925	CCAFS	Navstar GPS 2RM-7	USAF	Navigation	\$50M

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Date	Vehicle	Site	Payload or Mission	Operator	Use	Vehicle Price
10/5/2008	Pegasus XL	Kwajalein Island	Interstellar Boundary Explorer	NASA	Scientific	\$16M
10/8/2008	Shuttle Atlantis	KSC	Hubble Servicing Mission 4	NASA	Other	N/A
10/10/2008	Atlas V 421	CCAFS	WGS 2	DoD	Crewed	\$75M
10/12/2008	Soyuz	Baikonur	Soyuz ISS 17S	Roscosmos	ISS	\$40M
10/22/2008	✓ + Delta II 7420-10	VAFB	Cosmo-Skymed 3	Agenzia Spaziale Italiana (ASI)	Remote Sensing	\$50M
10/31/2008	Ariane 5 ECA	Kourou	Herschel Space Observatory	ESA	Scientific	\$140M
			Planck Surveyor	ESA	Scientific	
10/2008	Zenit 2	Baikonur	RadioAstron	Russian Academy of Sciences	Scientific	\$37.5M
10/2008	Long March 2F	Jiuquan	Shenzhou 7	CNSA	Crewed	\$60M
10/2008	Long March 3B	Xichang	VENESAT 1	Venezuelan Ministry of Science and Technology	Communications	\$60M
10/1/2008	✓ / Rockot	Plesetsk	SMOS	ESA	Remote Sensing	\$13.5M
			Proba 2	ESA	Development	
10/1/2008	Minotaur	Wallops Flight Facility	TacSat 3	USAF	Development	\$14.5M
			GeneSat 2	NASA	Scientific	
			PharmaSat 1	NASA	Scientific	
11/10/2008	Shuttle Endeavour	KSC	STS 126	NASA	Crewed	N/A
			MPLM 5	NASA	ISS	
11/20/2008	Delta II 7920	CCAFS	STSS Demo 1	USAF	Development	\$50M
			STSS Demo 2	USAF	Development	
11/24/2008	Atlas V 401	VAFB	Lunar Reconnaissance Orbiter	NASA	Remote Sensing	\$75M
			LCROSS	NASA	Scientific	
11/26/2008	Soyuz	Baikonur	Progress ISS 31P	Roscosmos	ISS	\$40M
12/1/2008	Atlas V 401	CCAFS	Solar Dynamics Observatory	NASA	Scientific	\$75M
12/16/2008	✓ / + Delta IV Medium Plus (4, 2)	CCAFS	GOES O	National Oceanic and Atmospheric Administration (NOAA)	Meteorological	\$70M

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Fourth Quarter 2008 Projected Launch Events (Continued)						
Date	Vehicle	Site	Payload or Mission	Operator	Use	Vehicle Price
4Q/2008	Proton M	Baikonur	* Express AM4 * Express MD 2	RSCC RSCC	Communications Communications	\$75M
4Q/2008	✓ Dnepr 1	Dombrovskiy	* AprizeStar 3 DubaiSat-1	Aprize Satellite Emirates Institution for Advanced Science and Technology	Communications Remote Sensing	\$9.5M
			* AprizeStar 4 DEIMOS Nanosat 1B UK DMC 2	Aprize Satellite Deimos Imaging Instituto Nacional de Técnica Aeroespacial (INTA)	Communications Remote Sensing Communications Remote Sensing	
4Q/2008	✓ Ariane 5 ECA	Kourou	* Satellite TBA	TBA	Communications	\$140M
4Q/2008	✓ Zenit 3SLB	Baikonur	* Telstar 11N	Loral Skynet	Communications	\$50M
4Q/2008	✓ Proton M	Baikonur	* Astra 1M	SES Astra	Communications	\$70M
4Q/2008	Delta II 7925	CCAFS	Navstar GPS 2RM-8	USAF	Navigation	\$50M
4Q/2008	✓ Soyuz 2 TBA	Kourou	* Meteor M1	VNII Elektromekhaniki	Meteorological	\$40M
4Q/2008	Minotaur IV	VAFB	TacSat 4	USAF	Development	TBA
4Q/2008	✓ Dnepr 1	Baikonur	* RapidEye 1 * RapidEye 2 * RapidEye 3 * RapidEye 4 * RapidEye 5	RapidEye AG RapidEye AG RapidEye AG RapidEye AG RapidEye AG	Remote Sensing Remote Sensing Remote Sensing Remote Sensing Remote Sensing	\$9.5M
4Q/2008	Long March 2C	Xichang	HJ 1A HJ 1B HJ 1C	CNSA CNSA CNSA	Remote Sensing Remote Sensing Remote Sensing	\$22.5M
4Q/2008	✓ Proton M	Baikonur	* Echostar XIII	Echostar	Communications	\$70M
4Q/2008	Long March 3B	Xichang	* APStar 6B	APT Satellite	Communications	\$60M
4Q/2008	Proton (SL-12)	Baikonur	Glonass M R13 Glonass M R14 Glonass M R15	Russian MoD Russian MoD Russian MoD	Navigation Navigation Navigation	\$72.5M

✓ 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.