



**Federal Aviation
Administration**



Commercial Space Transportation: 2010 Year In Review

January 2011

SLOAN
2011

About the Office of Commercial Space Transportation

The Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST) licenses and regulates U.S. commercial space launch and reentry activity, as well as the operation of non-federal launch and reentry sites, as authorized by Executive Order 12465 and Title 49 United States Code, Subtitle IX, Chapter 701 (formerly the Commercial Space Launch Act).

FAA/AST's mission is to ensure public health and safety and the safety of property while protecting the national security and foreign policy interests of the United States during commercial launch and reentry operations. In addition, FAA/AST is directed to encourage, facilitate, and promote commercial space launches and reentries. Additional information concerning commercial space transportation can be found on FAA/AST's web site at <http://www.faa.gov/go/ast>.

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CONTENTS

Introduction	1
Executive Summary	2
2010 Launch Activity	3
WORLDWIDE ORBITAL LAUNCH ACTIVITY	3
Worldwide Launch Revenues	5
Worldwide Orbital Payload Summary	5
Commercial Launches	6
Non-Commercial Launches	7
U.S. AND FAA-LICENSED ORBITAL LAUNCH ACTIVITY	8
FAA-Licensed Orbital Launch Summary	8
U.S. and FAA-Licensed Orbital Launch Activity in Detail	9
FAA Reentry License Summary	11
FAA Suborbital Flight Summary	12
NON-U.S. ORBITAL LAUNCH ACTIVITIES	12
2010 Space Transportation Trends	16
FIVE-YEAR WORLDWIDE SPACE TRANSPORTATION TRENDS	16
COMMERCIAL SATELLITE AND LAUNCH TRENDS	18
INTERNATIONALLY COMPETED LAUNCHES	19
Appendix I: 2010 Worldwide Orbital Launch Events	20
Appendix II: Definitions	24

INTRODUCTION

The *Commercial Space Transportation: 2010 Year in Review* summarizes U.S. and international launch activities for calendar year 2010, and provides a historical look at the past five years of commercial launch activity.

All 74 worldwide orbital launches in 2010, including commercial, civil, and military missions, are shown in Appendix I at the end of this report.

The Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST) licensed four commercial orbital launches in 2010, compared to the five licensed launches in 2009. All four of the orbital licensed launches used U.S.-built vehicles. Two launches were on Delta vehicles (a Delta IV and a Delta II) operated by Boeing Launch Services (BLS), and two launches were on the Falcon 9 rocket by Space Exploration Technologies Corporation (SpaceX).

The definitions used in the *Commercial Space Transportation: 2010 Year in Review* are in Appendix II at the end of the document.

EXECUTIVE SUMMARY

Overall, 23 commercial orbital launches occurred worldwide in 2010, representing 31 percent of the 74 total launches for the year. This marked a decrease from 2009, which saw 24 commercial orbital launches worldwide, out of a total of 78 launches.

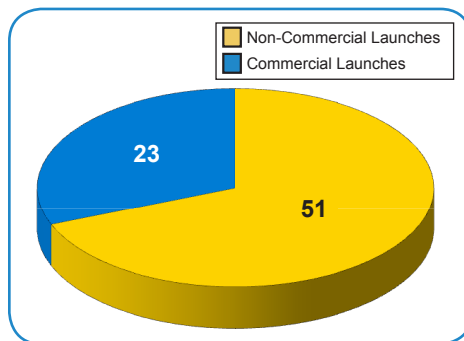


Figure 1. 2010 Total Worldwide Launch Activity

Russia conducted 13 commercial launch campaigns in 2010, bringing its international commercial launch market share to 57 percent for the year. This was an increase from 2009, driven by an additional Soyuz and Proton launch and two more Dnepr launches. There were four FAA/AST-licensed orbital launches, accounting for 17 percent of the worldwide commercial launch market in 2010. Europe attained a 26 percent market share, conducting six commercial Ariane 5 launches.

Of the 74 worldwide orbital launches, there were four launch failures, all of which were non-commercial launches. The first failure of the year was by an Indian GSLV Mark 2 launch vehicle, while attempting to launch the GSAT 4 telecommunications and navigation satellite to geosynchronous orbit (GEO) on April 14. The Korean KSLV 1 failed to launch a Korean low Earth orbit (LEO) atmospheric research satellite, STSAT 2B, on June 8. The third launch failure was a Proton M launch vehicle carrying three Russian Glonass navigation satellites on December 5. Finally, a second attempt by India to launch its GSLV rocket carrying Insat 4D GEO communications satellite also resulted in a failure on December 25.

No suborbital flights were conducted under FAA experimental permits in 2010.

2010 LAUNCH ACTIVITY

WORLDWIDE ORBITAL LAUNCH ACTIVITY

This section highlights worldwide launch activity in 2010. Launches, payloads, and revenue streams are described on a country-by-country basis. Launch providers from the United States, Russia, Europe, China, Japan, India, Israel, and South Korea conducted a total of 74 launch events in 2010, 23 of which were commercial (see Tables 1 and 2, and Figure 3). The following is a summary of all the worldwide 2010 commercial launches by country.

	Commercial Launches	Non-Commercial Launches	Total Launches
United States	4	11	15
Russia	13	18	31
Europe	6	0	6
China	0	15	15
Japan	0	2	2
India	0	3	3
Israel	0	1	1
South Korea	0	1	1
TOTAL	23	51	74

Table 1. 2010 Worldwide Orbital Launch Events

- U.S.-built vehicles conducted four commercial launches in 2010, accounting for 17 percent of the global commercial launch market.
- Russia led with 13 commercial launches, capturing 57 percent of the market. This is three more launches than 2009.
- Europe conducted six Ariane 5 commercial launches in 2010, for a 26 percent market share.

Appendix I at the end of this report shows all 74 orbital launches worldwide in 2010, including commercial, civil, and military missions.

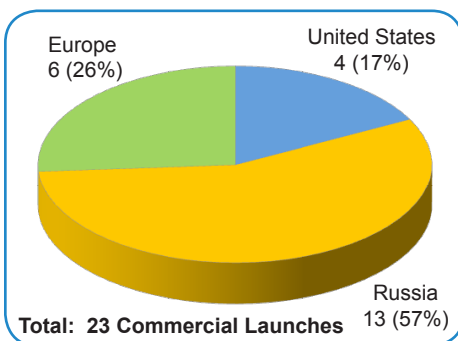


Figure 2. 2010 Worldwide Commercial Launch Activity

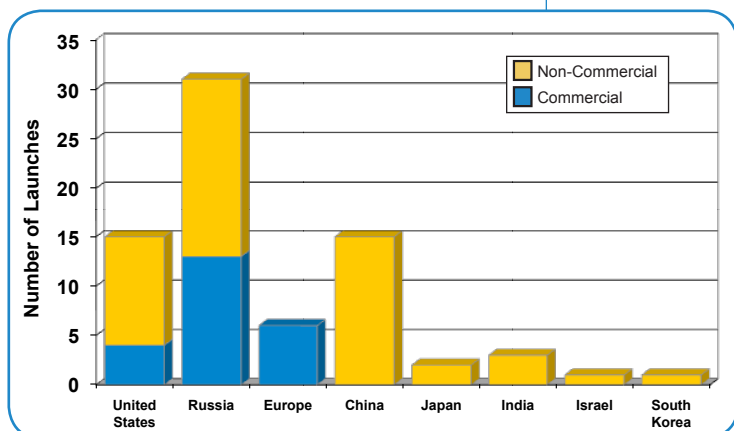


Figure 3. 2010 Total Worldwide Launch Activity

Date	Vehicle	Launching Country/Region	Payload(s)	Orbit	Launch Outcome
11-Feb-10	Proton M	Russia	Intelsat 16	GEO	Success
03-Mar-10	Delta 4 Medium-Plus (4,2)	USA	GOES-P	GEO	Success
19-Mar-10	Proton M	Russia	EchoStar XIV	GEO	Success
07-Apr-10	Dnepr M	Russia	Cryosat 2	NGSO	Success
24-Apr-10	Proton M	Russia	SES-1	GEO	Success
20-May-10	Ariane 5 ECA	Europe	Astra 3B	GEO	Success
			COMSATBw2	GEO	Success
01-Jun-10	Rocket	Russia	SERVIS 2	NGSO	Success
03-Jun-10	Falcon 9	USA	Falcon 9 Demo Flight	NGSO	Success
03-Jun-10	Proton M	Russia	BADR-5	GEO	Success
14-Jun-10	Dnepr M	Russia	Picard Prisma Main Prisma Target	NGSO NGSO NGSO	Success Success Success
20-Jun-10	Dnepr M	Russia	TanDEM X	NGSO	Success
26-Jun-10	Ariane 5 ECA	Europe	Arabsat 5A COMS 1	GEO GEO	Success Success
09-Jul-10	Proton M	Russia	EchoStar XV	GEO	Success
04-Aug-10	Ariane 5 ECA	Europe	Nilesat 201 RASCOM 1R	GEO GEO	Success Success
14-Oct-10	Proton M	Russia	XM 5	GEO	Success
19-Oct-10	Soyuz 2	Russia	Globalstar 2nd Gen 01 Globalstar 2nd Gen 02 Globalstar 2nd Gen 03 Globalstar 2nd Gen 04 Globalstar 2nd Gen 05 Globalstar 2nd Gen 06	NGSO NGSO NGSO NGSO NGSO NGSO	Success Success Success Success Success Success
28-Oct-10	Ariane 5 ECA	Europe	BSAT 3B Eutelsat W3B	GEO GEO	Success Success
05-Nov-10	Delta II Heavy	USA	COSMO-SkyMed 4	NGSO	Success
14-Nov-10	Proton M	Russia	SkyTerra-1	GEO	Success
26-Nov-10	Ariane 5 ECA	Europe	Intelsat 27 HYLAS	GEO GEO	Success Success
08-Dec-10	Falcon 9	USA	Dragon COTS 1 SMDC ONE QbX-1 QbX-2 Perseus 000 Perseus 001 Perseus 002 Perseus 003 Mayflower & CAERUS	NGSO NGSO NGSO NGSO NGSO NGSO NGSO NGSO NGSO	Success Success Success Success Success Success Success Success Success
26-Dec-10	Proton M	Russia	KA-SAT	GEO	Success
29-Dec-10	Ariane 5 ECA	Europe	KoreaSat6 Hispasat 1E	GEO GEO	Success Success

Table 2. 2010 Worldwide Commercial Launch Events

Worldwide Launch Revenues

Revenues from the 23 commercial launch events in 2010 amounted to an estimated \$2.45 billion, an increase of \$43 million from 2009 (see Figure 4). The following are the revenues broken down by country:

- U.S. commercial launch revenues for 2010 were approximately \$307 million.
- Russian revenues were approximately \$826 million.
- European revenues were about \$1.32 billion.

Payments for launch services are typically spread over one to two years prior to launch, but for the purposes of this report, revenue is counted in the year a customer’s payload launches. Launch revenues are attributed to the country in which the primary vehicle manufacturer is based. These revenues are assessed based on commercial launch price estimates for each launch vehicle using publicly available information.

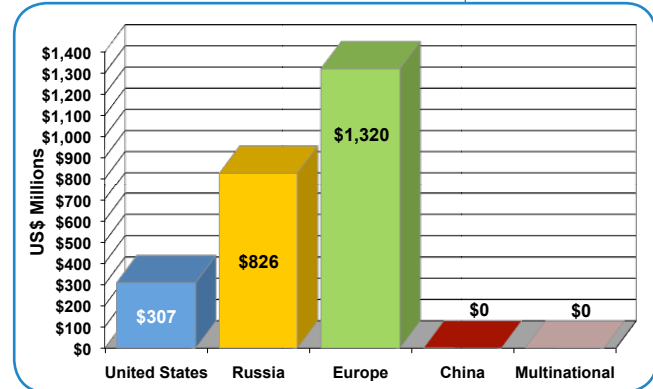


Figure 4. Approximate 2010 Commercial Launch Revenues

Most launch vehicles today are manufactured, sold, and launched by the same organization entirely in one country or, in the case of Europe and the former Soviet Union,¹ within a particular economic region. There were no launches performed by multinational launch service corporations in 2010.

Worldwide Orbital Payload Summary

	Commercial Payloads	Non-commercial Payloads	Total Payloads
United States	3	20	23
Russia	17	27	44
Europe	11	1	12
China	0	15	15
Japan	0	7	7
India	2	5	7
Israel	0	1	1
South Korea	0	1	1
TOTAL	33	77	110

Table 3. Payloads launched by Country in 2010

In 2010, 74 launches carried a total of 110 payloads into orbit (see Figure 5, Figure 6, and Table 3). Of the 110 payloads, 33 provide commercial services, see Figure 7 for a breakdown of these payloads by launch country. The remaining 77 payloads were used for non-commercial civil government, military, or non-profit purposes.

¹ International Launch Services (ILS) constitutes an exception as a Russian-owned company incorporated in the U.S. and selling launches of the Russian Proton vehicles.

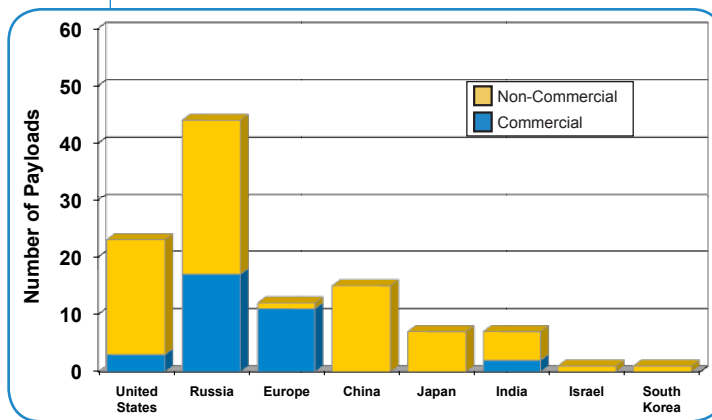


Figure 5. 2010 Total Worldwide Launch Activity by Payload

Commercial Launches

Twenty-three commercial launches carried a total of 44 commercial and non-commercial payloads into orbit.

Of the 44 commercially launched payloads, 31 provide commercial services. Twenty-three of these commercially launched spacecraft are non-geosynchronous orbit (NGSO) satellites and 21 are GEO satellites:

- NGSO payloads: Cryosat 2, SERVIS 2, Falcon 9 Demo Flight test capsule, Picard, Prisma Main, Prisma Target, TanDEM X, Globalstar 2nd Gen 01 through 06 satellites, COSMO-SkyMed 4, and Dragon Commercial Orbital Transportation Services (COTS 1) with eight more small satellites on the same Falcon 9 flight.
- GEO payloads: Intelsat 16, GOES-P (Geostationary Operational Environmental Satellites), EchoStar XIV, SES-1, Astra 3B, COMSATBw 2, BADR-5, Arabsat 5A, COMS 1, EchoStar XV, Nilesat 201, RASCOM 1R, XM 5, BSAT 3B, Eutelsat W3B, SkyTerra-1, Intelsat 27, HYLAS, KA-SAT, Koreasat 6, and Hispasat 1E.

Thirteen payloads were launched commercially to perform civil government, military, or non-profit missions:

- Five civil government satellites were launched on commercial basis in 2010: GOES-P, Picard, Prisma Main, Prisma Target, and COSMO-SkyMed 4.
- Eight military satellites were launched on commercial basis: COMSATBw 2 for German Defense Ministry and seven small satellites on Dragon COTS 1 for the U.S. Army, National Reconnaissance Office (NRO), and Los Alamos National Laboratory.

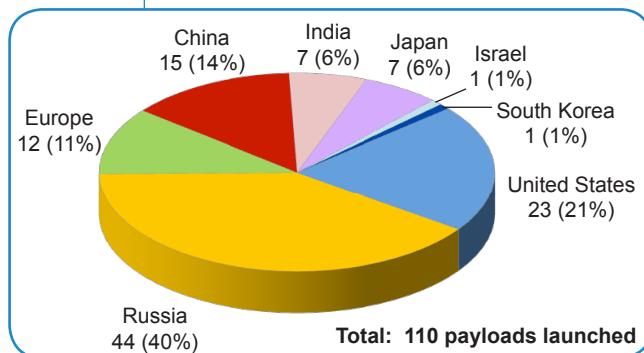


Figure 6. Total Payloads Launched by Country in 2010

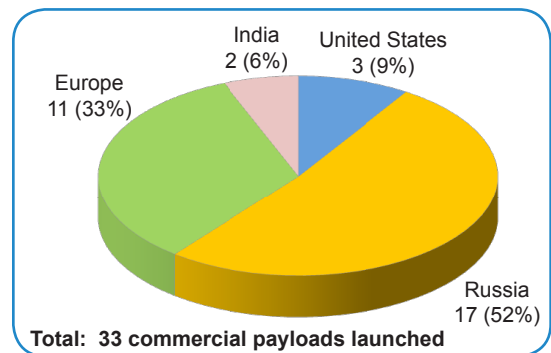


Figure 7. Commercial Payloads Launched by Country in 2010

Non-Commercial Launches

Of the 74 orbital launches, 51 were non-commercial launches carrying a total of 66 commercial and non-commercial payloads.

Four of these non-commercial launches failed:

- April 14, the Indian GSLV Mark 2 launch vehicle carrying GSAT 4, an Indian hybrid telecommunications and navigation GEO satellite.
- June 8, the Korean KSLV 1 failed to launch a Korean LEO atmospheric research satellite, STSAT 2B.
- December 5, the Russian Proton M launch vehicle failed to deliver three Russian Glonass M navigation satellites to medium Earth orbit (MEO).
- December 25, the Indian GSLV launch vehicle carrying Insat 4D, an Indian telecommunications GEO satellite.

All 47 of the remaining non-commercial launches were successful.

Two of the total 66 payloads were launched non-commercially to provide commercial services. These payloads were India's GSAT 4 and Insat 4D communications satellites; both launches failed.

Thirty-one payloads were launched non-commercially for civil government purposes:

- Four U.S. missions: STS-130, Solar Dynamics Observatory, STS-131, and STS-132.
- Ten Russian payloads: Progress ISS 36P, Soyuz ISS 22S, Progress ISS 37P, Soyuz ISS 23S, Progress ISS 38P, Gonets M 2, Progress ISS 39P, Soyuz ISS 24S, Progress ISS 40P, and Soyuz ISS 25S.
- Nine Chinese payloads: Yaogan 9, Shijian 12, Yaogan 10, Tian Hui-1, Chinasat 6A, Yaogan 11, Chang'e 2, Shijian 6, and Fengyun 3B.
- Four Japanese payloads: AKATSUKI, Ikaros, Unitec-1, and QZS-1.
- Three Indian payloads: Cartosat 2B, Alsat 2A, and StudSat.
- One South Korean payload: STSAT 2A (launch failure).

Twenty-nine payloads were launched non-commercially for military use:

- Seven U.S. missions: X-37B Orbital Test Vehicle (OTV); Navstar GPS 2F-01, Advanced EHF 1, NRO L-41, Satellite-Based Space Surveillance (SBSS) 1, Space Test Program Satellite 26 (STP 26), and NRO L-32.
- Fourteen Russian payloads: Raduga-1M, Glonass M R19 through M R31, Kosmos 2462, Kosmos 2463, Glonass M36 through M38, Kosmos 2469, Meridian 3, and Glonass M39 through M41 (launch failure).
- Six Chinese payloads: Beidou 3, Beidou 2, Beidou 2-IGS 1, Beidou 2-G4, Shen Tong 1-B, and Beidou 2C/M1.

- One Israeli payload: Ofeq 9.
- One Norwegian payload: AISSat-1.

Finally, four payloads were launched non-commercially for non-profit missions:

- One Swiss payload: TIsat-1.
- Three Japanese payloads: K-Sat, Nagai, and Waseda-Sat 2.

U.S. AND FAA-LICENSED ORBITAL LAUNCH ACTIVITY

FAA-Licensed Orbital Launch Summary

There were four FAA-licensed launches in 2010: one GEO and three LEO. Over the past five years, FAA has typically licensed four or five launches per year. However, in 2008, FAA licensed 11 launches, including five Sea Launch Zenit 3SL launches of commercial GEO communications satellites. The Sea Launch company conducted one launch in 2009 and none in 2010.

All four of the licensed launches in 2010 took place from U.S. ranges. Although historically most FAA-licensed launches have been to GEO, in 2010 three of the four launches were to LEO, and only one to GEO. The LEO launches included the launch of SpaceX Dragon capsule qualification unit in June and the December launch of the first Dragon demonstration unit, both on Falcon 9 vehicles. These launches were part of the National Aeronautics and Space Administration (NASA) COTS program. The remaining LEO launch was of a Delta II launch vehicle which carried an Italian dual-use COSMO-SkyMed satellite from Vandenberg Air Force Base (VAFB) in California. The GEO licensed launch was for a Delta IV vehicle from Cape Canaveral to launch National Oceanic and Atmospheric Administration’s (NOAA) GOES-P satellite. The total cost of the four launches is estimated at \$307 million, a relatively low figure due to the lower per unit cost of the Falcon 9 vehicle.

The four FAA-licensed launches for 2010 are summarized in Table 4. Figures 8 and 9 summarize the number of FAA-licensed orbital launches and revenue from 2006-2010.

Date	Vehicle	Primary Payload	Orbit	Launch Outcome
03-Mar-10	Delta IV Medium-Plus (4,2)	GOES-P	GEO	Success
03-Jun-10	Falcon 9	Falcon 9 Demo Flight	LEO	Success
05-Nov-10	Delta II 7420-10	COSMO-SkyMed 4	LEO	Success
08-Dec-10	Falcon 9	Dragon COTS 1	LEO	Success

Table 4. 2010 FAA-Licensed Orbital Launch Events

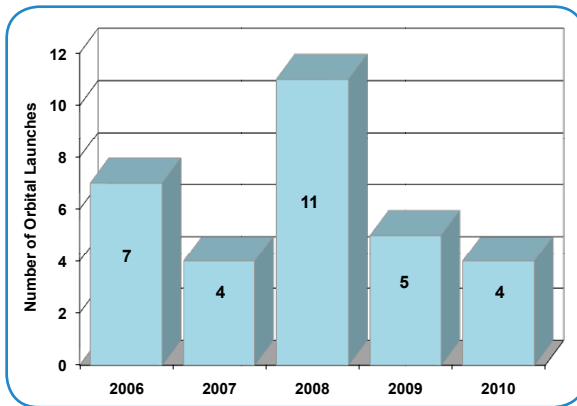


Figure 8. FAA-Licensed Orbital Launch Events, 2006-2010

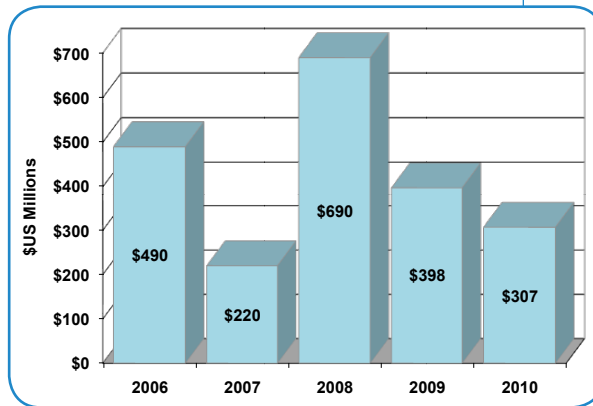


Figure 9. Estimated Revenue for FAA-Licensed Orbital Launch Events, 2006-2010

U.S. and FAA-Licensed Orbital Launch Activity in Detail

U.S. vehicles carried out a total of 15 launches in 2010, four of which were commercial and licensed by FAA/AST. Of the 11 non-commercial U.S. launches, three were Space Shuttle missions, two carried classified NRO payloads, five carried Department of Defense (DoD) payloads or were sponsored by the DoD, and one was a NASA civil government mission.

See Table 5 for a detailed breakdown of U.S. launch activity during 2010 by vehicle.

The following lists U.S.-based launch service providers, highlighting their launch activity in 2010. It includes all companies that launched from the United States or under the regulatory oversight of the FAA/AST.

Boeing Launch Services

BLS provides Delta series rockets for commercial customers.

BLS conducted two commercial launches in 2010, one using the Delta II vehicle and the other using a Delta IV, both for government customers. In March, a Delta IV launched the GOES-P GEO weather satellite. In November, a Delta II 7420-10 was used to place the COSMO-SkyMed 4 satellite into LEO. GOES-P will supplement NOAA's weather coverage, and COSMO-SkyMed 4 will provide Earth observation services for the government of Italy.

Orbital Sciences Corporation

Orbital Sciences Corporation (Orbital) provides the Minotaur, Pegasus, and Taurus vehicles for orbital launch.

Orbital performed two launches in 2010, both using the Minotaur IV vehicle. The inaugural orbital launch of the Minotaur IV vehicle took place on September 26 from VAFB, carrying the SSBS 1 satellite. On November 19, a second Minotaur IV launch took place from the Kodiak Launch Complex (KLC) in Alaska, carrying the STP S26 payload for the DoD's Space Test Program. The latter

marked the second orbital launch from KLC (the first was of an Athena I vehicle in September 2001).

Space Exploration Technologies Corporation

SpaceX is developing the Falcon series of launch vehicles for the commercial market and for government clients.

SpaceX conducted its inaugural Falcon 9 launch in June. The Falcon 9 launched from Cape Canaveral and delivered the Dragon test capsule into LEO. The second Falcon 9 launch was the first NASA COTS demonstration flight, lofting the Dragon spacecraft. Dragon performed two revolutions around the Earth in LEO and successfully reentered the Earth's atmosphere and landed in the Pacific Ocean.

United Launch Alliance

United Launch Alliance (ULA), which was formed on December 1, 2006, conducts launches for the non-commercial U.S. government launch market. ULA manufactures and operates Boeing-heritage Delta vehicles and Lockheed Martin-heritage Atlas vehicles. ULA is a 50-50 joint partnership between Boeing and Lockheed Martin.

In 2010, ULA conducted six U.S. government non-commercial launches.

Two Delta IV launches placed Navstar GPS 2F-01 and NRO L-32 satellites into MEO and LEO, respectively.

Four ULA Atlas V vehicles launched, placing the following payloads into orbit: Solar Dynamics Observatory for NASA, X-37B OTV,² the Advanced EHF 1 satellite, and the classified NRO L-41 satellite for NRO.

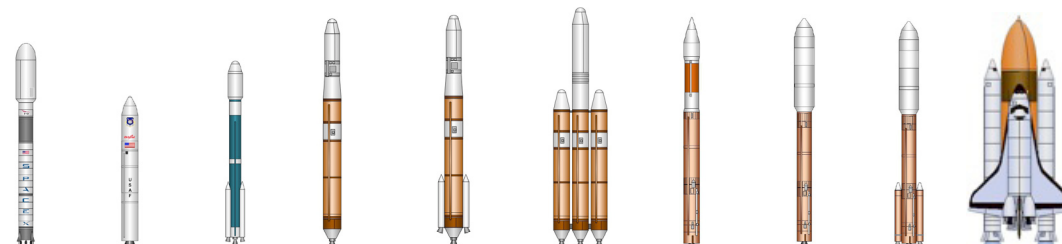
United Space Alliance

United Space Alliance (USA) is the launch services company for non-commercial NASA Space Shuttle missions. Like ULA, USA is jointly owned by Boeing and Lockheed Martin.

USA conducted three successful Space Shuttle launches from the Kennedy Space Center in 2010. Space Shuttles Atlantis, Endeavour, and Discovery all flew to assist in completing the ISS.

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2 The X-37B OTV, or Boeing X-37B OTV, is a reusable unmanned robotic spacecraft. It was launched aboard an Atlas V from Cape Canaveral on April 22, 2010, and operated in LEO till December 3, 2010, when it de-orbited, reentered the Earth's atmosphere, and successfully landed at Vandenberg Air Force Base. This flight is also designated as USA-212.

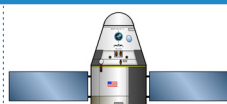
UNITED STATES



Vehicle	Falcon 9	Minotaur IV	Delta II 7420-10	Delta IV Medium	Delta IV Medium+ (4,2)	Delta IV Heavy	Atlas V 401	Atlas V 501	Atlas V 531	Shuttle
2010 Total Launches	2	2	1	1	1	1	1	2	1	3
2010 Licensed Launches	2	0	1	0	1	0	0	0	0	0
Launch Reliability (2010)	2/2 100%	2/2 100%	1/1 100%	1/1 100%	1/1 100%	1/1 100%	1/1 100%	2/2 100%	1/1 100%	3/3 100%
Launch Reliability (Last 10 Years)	2/2 100%	2/2 100%	6/6 100%	4/4 100%	5/5 100%	4/4 100%	10/10 100%	2/2 100%	1/1 100%	35/35 100%
Year of First Launch	2010	2010	2001	2003	2002	2004	2002	2010	2010	1981
Active Launch Sites	CCAFS	VAFB, Kodiak	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	KSC
LEO kg (lbs)	10,450 (22,990)	1,735 (3,822)	6,100 (13,440)	8,120 (17,885)	10,430 (22,974)	22,560 (49,740)	9,797 (21,598)	8,123 (17,908)	15,575 (34,337)	23,435 (51,557)
GTO kg (lbs)	4,680 (10,296)	--	2,170 (4,790)	4,210 (9,273)	5,845 (12,874)	12,980 (28,620)	4,750 (10,470)	3,775 (8,320)	7,475 (16,470)	5,663 (12,459)

Table 5. U.S. and FAA-Licensed Launch Vehicle Performance in 2010

FAA Licensed Reentry Vehicles



Vehicle	SpaceX Dragon
2010 Total Reentries	1
2010 Licensed Reentries	1
Reentry Reliability (2010)	1/1 100%
Reentry Reliability (Last 10 Years)	1/1 100%
Year of First Reentry	2010
Reentry Sites	Pacific Ocean
Payload to LEO, kg (lbs)	6,000 (13,228)
Payload from LEO, kg (lbs)	3,000 (6,614)

Table 6. FAA-Licensed Reentry Vehicle Performance in 2010

FAA Reentry License Summary

In 2010, one reentry was conducted under an FAA reentry license. The SpaceX Dragon Reentry Capsule successfully reentered the Earth's atmosphere from LEO and landed in the Pacific Ocean after the first NASA COTS demonstration flight. It was the first reentry license granted by the FAA.

More NASA COTS demonstration flights are expected to fly in 2011 under FAA reentry licenses.

FAA Suborbital Flight Summary

In 2010, there were no suborbital flights conducted under the authority of FAA experimental permits or licenses. Although there were no experimental permits in 2009, there were five in 2008 and nine in 2007. The primary reason for the drop in experimental-permitted flights was a change in FAA regulations in 2009 that allowed companies to fly their vehicles under amateur rocket regulations, rather than requiring experimental permits.

Unlike FAA-licensed flights, permitted flights are limited to reusable suborbital launch vehicles and intended for technology development, particular testing for crew, or testing prior to obtaining a license. Vehicles cannot carry property or people for compensation or hire. The first permit flights were in 2006, after the U.S. Congress granted authority in 2004.

NON-U.S. ORBITAL LAUNCH ACTIVITIES

The following section of the report highlights non-U.S. launch activity on a country-by-country basis.

Russia

In 2010, there were 31 Russian launches. Of these, 13 were commercial launches.

- ILS launched a record eight Proton M vehicles during the year, carrying one commercial GEO communications satellite each.
- ISC Kosmotras launched three Dnepr rockets, carrying a total of five satellites.
- The Rockot vehicle launched *SERVIS 2*.
- A single Soyuz 2 launch deployed six Globalstar 2 satellites. The launch was marketed jointly with Arianespace, which plans to begin launching Soyuz vehicles from its launch complex in French Guiana in 2011.

See Table 7 for a detailed breakdown of 2010 Russian launch activity by vehicle. Russia conducted 18 non-commercial launches in 2010. Nine of these launches were missions to the ISS. Eight of these launches were for military purposes, and one was a civil mission using the Rockot vehicle to launch the *Gonets M 2* satellite.

The nine dedicated ISS missions were:

- Five Soyuz rockets carrying Progress spacecraft (*ISS 36P* through *40P*).
- Four Soyuz vehicles carrying manned Soyuz spacecraft that ferried individuals to and from the ISS (*ISS 22S* through *25S*).

Russia executed eight additional launches for military purposes in 2010:

- Four Proton M launches carried *Raduga-1 M* and nine *Glonass M* navigation satellites. Three of the nine *Glonass M* satellites were lost on November 30, when the Proton M launch failed.
- Kosmos 3M launched Kosmos 2463.

- Soyuz 2 launched Meridian 3.
- Soyuz U launched Kosmos 2462.
- Molniya-M launched Kosmos 2469.









RUSSIA								
Vehicle								
Vehicle	Kosmos 3M	Dnepr M	Rokot	Molniya	Soyuz	Soyuz 2	Soyuz U	Proton M
2010 Total Launches	1	3	2	1	9	2	1	12
Launch Reliability (2010)	1/1 100%	3/3 100%	2/2 100%	1/1 100%	9/9 100%	2/2 100%	1/1 100%	11/12 92%
Launch Reliability (Last 10 Years)	14/14 100%	3/3 100%	13/14 93%	11/12 92%	100/101 99%	9/9 100%	2/2 100%	44/48 92%
Year of First Launch	2004	2010	1994	1960	1963	2004	2009	2000
Active Launch Sites	Plesetsk	Baikonur	Baikonur, Plesetsk	Baikonur, Plesetsk	Baikonur, Plesetsk	Baikonur, Plesetsk	Plesetsk	Baikonur
LEO kg (lbs)	1,350 (2,970)	4,100 (9,030)	1,850 (4,075)	1,800 (3,960)	6,708 (14,758)	7,800 (17,100)	6,700 (14,740)	21,000 (46,305)
GTO kg (lbs)	--	--	--	--	1,350 (2,975)	1,700 (3,800)	--	5,500 (12,125)

Table 7. Russian Launch Vehicle Activity in 2010

Europe

Europe conducted six commercial Ariane 5 launches of 12 GEO communications satellites in 2010. Eleven satellites were commercial, and one was a military communications satellite.

- All six launches were dual manifests of GEO communications satellites.
- Five satellites were launched for European-based satellite operators (Avanti Screenmedia Group, Eutelsat, Hispasat, SES and Intelsat).
- Six satellites were launched for Asian and African satellite operators, including operators from Egypt, Japan, South Korea, Saudi Arabia, and the African multinational operator RascomStar-QAF.
- COMSATBw 2 was launched for the German Defense Ministry.

Table 8 summarizes the 2010 European, as well as Chinese, Japanese, Indian, Israeli, and South Korean launch activity organized by country and vehicle.














	EUROPE	CHINA						JAPAN	INDIA			ISRAEL	SOUTH KOREA
													
Vehicle	Ariane 5 ECA	Long March 2D	Long March 3A	Long March 3B	Long March 3C	Long March 4B	Long March 4C	H-IIA	GSLV	GSLV Mark 2	PSLV	Shavit I	KSLV-I
Country/Region	Europe	China	China	China	China	China	China	Japan	India	India	India	Israel	South Korea
2010 Total Launches	6	3	3	1	4	1	3	2	1	1	1	1	1
Launch Reliability (2010)	6/6 100%	3/3 100%	3/3 100%	1/1 100%	4/4 100%	1/1 100%	3/3 100%	2/2 100%	0/1 0%	0/1 0%	1/1 100%	1/1 100%	0/1 0%
Launch Reliability (Last 10 Years)	28/29 97%	12/12 100%	16/16 100%	8/8 100%	6/6 100%	12/12 100%	6/6 100%	17/18 94%	4/6 67%	0/1 0%	17/17 100%	6/9 67%	0/2 0%
Year of First Launch	2002	1992	1994	1996	2008	1999	2007	2001	2001	2010	1993	1988	2009
Active Launch Sites	Kourou	Jiuquan	Taiyuan, Xichang	Xichang	Xichang	Taiyuan	Taiyuan	Tanegashima	Satish Dhawan	Satish Dhawan	Satish Dhawan	Palmachim AFB	Naro
LEO kg (lbs)	17,250 (37,950)	3,500 (7,700)	7,200 (15,859)	13,562 (29,900)	3,700 (8,200)	2,500 (5,512)	4,595 (10,130)	11,730 (25,860)	5,000 (11,013)	--	3,700 (8,150)	225 (496)	100 (220)
GTO kg (lbs)	10,500 (23,127)	1,250 (2,750)	2,500 (5,506)	4,491 (9,900)	--	--	1,500 (3,300)	5,800 (12,800)	2,500 (5,506)	2,500 (5,506)	800 (1,760)	--	--

Table 8. European, Chinese, Japanese, Indian, Israeli, and South Korean Launch Vehicle Activity in 2010

China

China conducted 15 orbital launches in 2010, all of which were non-commercial. This is nine more launches than China conducted in 2009. Six of these launches were to GEO. Eight launches were conducted from the Xichang launch site, four from Jiuquan, and three from the Taiyuan launch site. There were no Chinese human missions in 2010.

- Nine Long March vehicle launches carried payloads with government civil missions (communications, meteorological, remote sensing, and scientific): Yaogan 9, Shijian 12, Yaogan 10, Tian Hui-1, Chinasat 6A, Yaogan 11, Chang'e 2, Shijian 6, and Fengyun 3B.
- Six launches delivered six military satellites into orbit: Beidou 3, Beidou 2, Beidou 2-IGS 1, Beidou 2-G4, Shen Tong 1-B, and Beidou 2C/M1. The Beidou satellites were launched to operate as part of the Chinese national satellite navigation system.

Japan

Japan had two successful launches of the H-IIA rocket in 2010.

- On May 20, the first launch carried four LEO and two interplanetary spacecraft.
- On September 11, the second launch carried a GEO satellite.

Both launches were performed from the government site at Tanegashima. A deal with Japan's fishing unions was announced this year, allowing year-round launches from Tanegashima starting in April 2011. Previously, launches from the site were limited to a constrained window of 190 days a year.

India

The Indian Space Research Organization (ISRO) performed three launches in 2010. All launches were non-commercial.

- On April 14, a GSLV Mark 2 launch vehicle attempted to launch GSAT 4, an Indian hybrid telecommunications and navigation GEO satellite. This launch resulted in a failure and the satellite was lost.
- On July 11, a single PSLV launch carried five satellites for Indian and international missions to LEO and Sun synchronous orbit (SSO).
- On December 25, another GSLV launch failed. It was intended to place the GEO telecommunications satellite Insat 4D (GSAT 5) into orbit to perform commercial telecommunications and broadcast services.

All Indian launches were from the Satish Dhawan Space Center.

Israel

Israel's Shavit launch vehicle placed the Israeli Ministry of Defense satellite Ofeq 9 into LEO on June 21. This is the fourth successful launch of an operational satellite by the Shavit launch vehicle. In total, Shavit has launched nine times, and three launches resulted in failures; the first two launches carried experimental payloads. The Shavit vehicle launches from Palmachim Air Force Base.

South Korea

On June 8, the Korean KSLV 1 failed to launch the Korean LEO atmospheric research satellite STSAT 2B. The loss of the launch vehicle and the satellite is believed to have been caused by an explosion of the rocket first stage. This is the second KSLV launch attempt and the second failure of this launch vehicle. The KSLV first stage uses Russian technology and is based on the liquid oxygen/kerosene universal rocket module designed for the Russian Angara rocket, and the solid-fueled second stage is built by South Korea.

2010 SPACE TRANSPORTATION TRENDS³

FIVE-YEAR WORLDWIDE SPACE TRANSPORTATION TRENDS

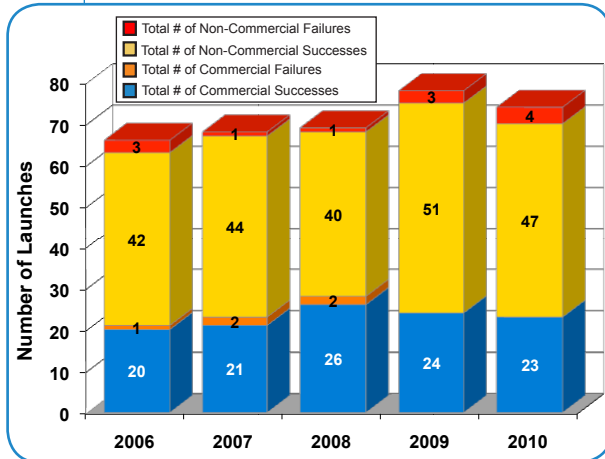


Figure 10. Five-Year Summary of Orbital Launch Events and Launch Failures, 2006-2010

Figure 10 presents a five-year trend of orbital launch successes and failures. In the last five years there has been at least one launch failure each year. The most launch failures that occurred in a single year was four, that happened in 2006 and 2010. The 2010 launch failures included two Indian GSLV vehicles, a Korean rocket and a Russian rocket. Commercial launches suffered between one and two failures per year in 2006 through 2008. The definition of a launch failure is presented in Appendix II.

worldwide (see Figure 11). A total of 355 orbital launches have been conducted in the past five years.

Between 2006 and 2010, there was an average of 71 orbital launches per year

Russia and the United States have conducted the most orbital launches, followed by China and Europe (see Figure 12). From 2006 to 2010, there were 120 commercial orbital launches, with the number of launches increasing from 21 in 2006 to a high of 28 in 2008 and dropping to 23 in 2010 (see Figures 13 and 14).

- Russia had the most with 56 commercial launches.
- Europe followed with 27 commercial launches.
- The United States had 19 commercial launches.
- The multinational Sea Launch company performed 16 commercial launches. This includes one vehicle launched by Land Launch from Baikonur, Kazakhstan in 2009.
- China had two and India had one launch.

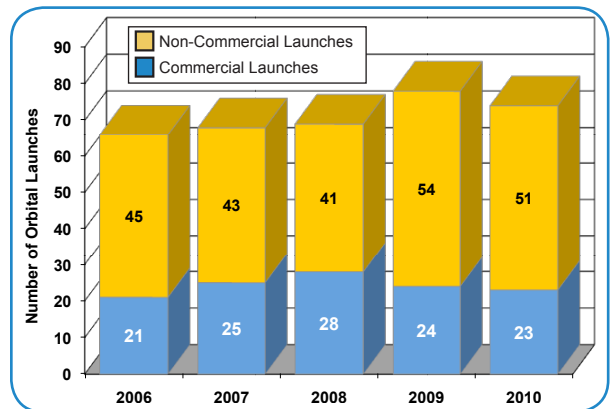


Figure 11. Five-Year Summary (2006-2010) of Commercial and Non-Commercial Launch Events

³ The historical commercial launch and payload numbers presented in this section conform with the analyses presented in 2010 Commercial Space Transportation Forecasts, prepared by FAA/AST and the Commercial Space Transportation Advisory Committee (COMSTAC), May 2010.

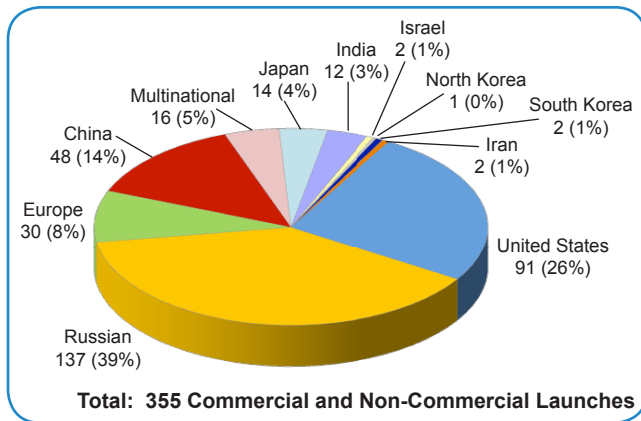


Figure 12. Five-Year Worldwide Total Orbital Launch Market Share (2006-2010)

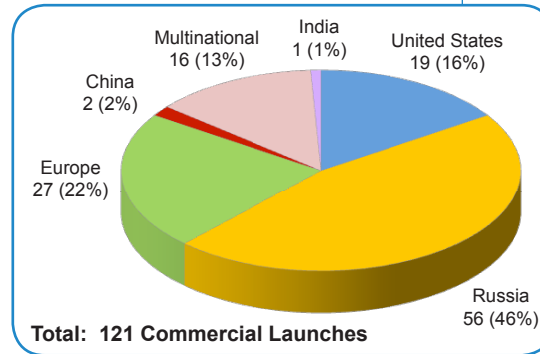


Figure 13. Five-Year Worldwide Commercial Orbital Launch Market Share (2006-2010)

The demand for commercial NGSO launches, which reached its maximum in the late 1990s, was low in the four years before 2007. The number of commercial NGSO launches sharply increased in 2007 and 2008, and then increased again in 2010 after a slow year in 2009. These high levels are mostly driven by the launch of replacement satellites for the existing constellations, such as ORBCOMM and Globalstar, and by the launch of new constellations, such as SAR-Lupe and COSMO-SkyMed. See Figure 14 for a breakdown of commercial launches by orbit type for the last five years.

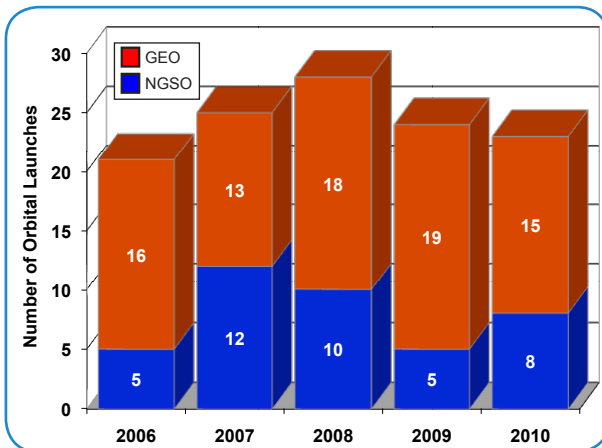


Figure 14. Five-Year Global Commercial Launch Events by Orbit (2006-2010)

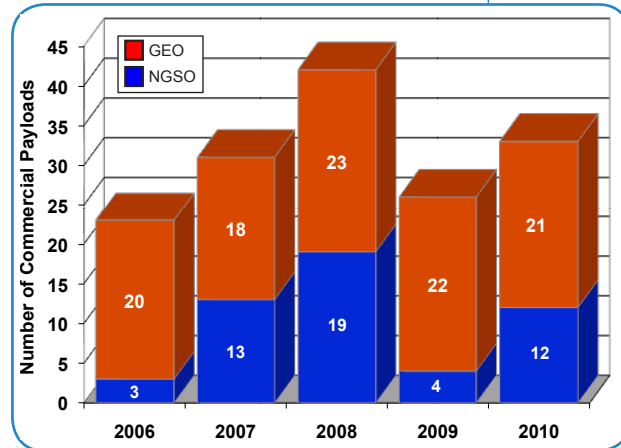


Figure 15. Five-Year Global Commercial Payloads by Orbit (2006-2010)

Figure 15 shows the number of payloads providing commercial services launched on commercial and non-commercial vehicles over the past five years. The number of commercial NGSO satellites launched per year fluctuates significantly year to year. Frequently several of this type of satellite is launched on a single vehicle giving rise to a fluctuation in the number of total payloads launched per year. The launch of Globalstar (six in 2010), ORBCOMM (six in 2008) and RapidEye constellation (five in 2008) satellites explain why there are significantly more payloads launched in 2008 and 2010.

Commercial launch revenues steadily increased from 2006 to 2010. Revenues almost doubled between 2006 and 2010, from \$1.4 billion to about \$2.5 billion (see Figure 16 and Table 9).

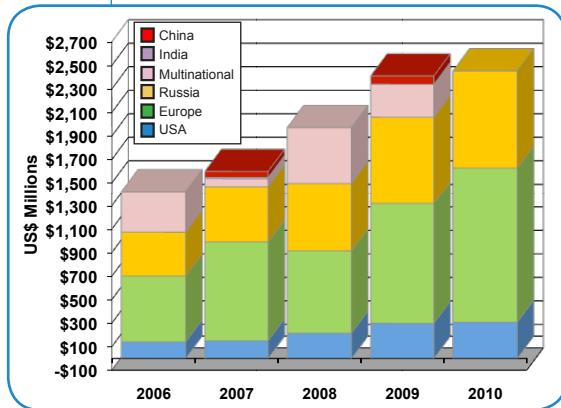


Figure 16. Approximate Launch Revenues for Commercial Launch Events (2006-2010)

	2006	2007	2008	2009	2010
United States	\$140	\$150	\$215	\$298	\$307
Russia	\$374	\$477	\$581	\$742	\$826
Europe	\$560	\$840	\$700	\$1,020	\$1,320
China	\$0	\$50	\$0	\$70	\$0
India	\$0	\$11	\$0	\$0	\$0
Multinational	\$350	\$70	\$475	\$280	\$0
TOTAL	\$1,424	\$1,598	\$1,971	\$2,410	\$2,453

Table 9. Estimated Commercial Launch Revenues, 2006–2010 (US\$Millions)

COMMERCIAL SATELLITE AND LAUNCH TRENDS

The commercial space transportation market is driven largely by the demand for launches of GEO telecommunications satellites, and to a lesser (but growing) extent, a variety of NGSO satellites.

Since 2006, about 65 percent of commercial launches have been to GEO, which generates more revenue than the NGSO market and generally deploys larger payloads. The GEO launch rate has increased slightly in the last few years. However, this share of GEO payloads is decreasing and more NGSO payloads have been launched recently.

The supply of launch vehicle options continues to increase, despite only a marginal increase in demand for launches. Competition remains strong between U.S., European, multinational, and Russian providers, while new entrants are joining, re-joining, or advancing toward the commercial market. For example, the Land Launch version of the Zenit, the Dnepr, the Soyuz (launched and marketed by Arianespace), and the Falcon 9 are all competing for commercial launches. The Japanese are marketing the H-IIA commercially, while the Indians and Chinese, although limited by the U.S. export policies, are also targeting commercial launch customers.

INTERNATIONALLY COMPETED LAUNCHES

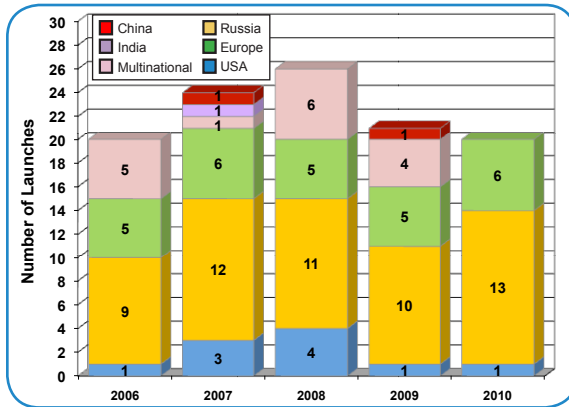


Figure 17. Five-Year Worldwide Internationally Competed Launch Events (2006-2010)

The chart reflects only launch service providers competing in the international marketplace for open-bid launch service contracts.

From 2006 to 2010, there were 108 internationally competed launch events.

As commercial space business increases and replaces various forms of traditionally government-operated activities, the definitions of “commercial payload” and “commercial launch” become more complex and open to interpretation. See Appendix II for definitions of these terms.

Figure 17 shows trends for each country whose launch providers compete in the

APPENDIX I: 2010 WORLDWIDE ORBITAL LAUNCH EVENTS

Date	Vehicle	Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
16-Jan-10	Long March 3C	Xichang	Beidou 3	GEO	CAST	CAST	Navigation		S	S
27-Jan-10	Proton M	Baikonur	Raduga-1M	GEO	Russian MoD	ISS Reshetnev	Communications		S	S
02-Feb-10	Soyuz	Baikonur	Progress ISS 36P	LEO	Roscosmos	RSC Energia	ISS		S	S
07-Feb-10	Shuttle Endeavour	KSC	STS 130	LEO	NASA	Rockwell International	Crewed		S	S
10-Feb-10	Atlas V 401	CCAFS	Solar Dynamics Observatory	GEO	NASA/GSFC	NASA/GSFC	Scientific		S	S
11-Feb-10	V Proton M	Baikonur	* Intelsat 16	GEO	Intelsat	Orbital Sciences Corp.	Communications	\$100M	S	S
01-Mar-10	Proton M	Baikonur	Glonass M R19	MEO	Russian MoD	ISS Reshetnev	Navigation		S	S
			Glonass M R20	MEO	Russian MoD	ISS Reshetnev	Navigation		S	S
			Glonass M R21	MEO	Russian MoD	ISS Reshetnev	Navigation		S	S
03-Mar-10	V + Delta IV Medium-Plus (4,2)	CCAFS	GOES-P	GEO	NOAA	Boeing	Meteorological	\$100M	S	S
04-Mar-10	Long March 4C	Jiuquan	Yaogan 9	LEO	CNSA	SAS	Remote Sensing		S	S
19-Mar-10	V Proton M	Baikonur	* Echostar XIV	GEO	Echostar Communications Corporation	Space Systems/Loral	Communications	\$100M	S	S
01-Apr-10	Soyuz	Baikonur	Soyuz ISS 22S	LEO	Roscosmos	RSC Energia	ISS		S	S
04-Apr-10	Shuttle Discovery	KSC	STS 131	LEO	NASA	Rockwell International	Crewed		S	S
07-Apr-10	V Dnepr M	Baikonur	* Cryosat 2	LEO	ESA	EADS Astrium	Remote Sensing	\$12M	S	S
14-Apr-10	GSLV Mark 2	Satish Dhawan Space Center	* GSAT 4	GEO	ISRO	ISRO	Communications		F	F
15-Apr-10	Soyuz-U	Plesetsk	Kosmos 2462	LEO	Russian MoD	TsSKB Progress	Classified		S	S
21-Apr-10	Atlas V 501	CCAFS	X-37B OTV	LEO	USAF	Boeing	Development		S	S
24-Apr-10	V Proton M	Baikonur	* SES-1	GEO	SES World Skies	Orbital Sciences Corp.	Communications	\$85M	S	S
26-Apr-10	Kosmos 3M	Plesetsk	Kosmos 2463	LEO	Russian MoD	ISS Reshetnev	Classified		S	S
27-Apr-10	Soyuz	Baikonur	Progress ISS 37P	LEO	Roscosmos	RSC Energia	ISS		S	S
13-May-10	Shuttle Atlantis	KSC	STS 132	LEO	NASA	Rockwell International	Crewed		S	S
20-May-10	V Ariane 5 ECA	Kourou	Astra 3B	GEO	SES Astra	EADS Astrium	Communications	\$220M	S	S
			COMSATBw 2	GEO	German Defense Ministry	EADS Astrium	Communications		S	S
20-May-10	H IIA 202	Tanegashima	AKATSUKI	EXT	JAXA	JAXA	Scientific		S	S
			Ikaros	LEO	JAXA	JAXA	Development		S	S
			K-Sat	LEO	Kagoshima University	Kagoshima University	Scientific		S	S
			Nagai	LEO	Soka University	Soka University	Development		S	S
			Unitec-1	EXT	JAXA	JAXA	Scientific		S	S
			Waseda-Sat 2	LEO	Waseda University	JAXA	Scientific		S	S
26-May-10	Delta IV Medium	CCAFS	Navstar GPS 2F-01	MEO	USAF	Boeing	Navigation		S	S
01-Jun-10	Long March 3C	Xichang	Beidou 2	GEO	CAST	CAST	Navigation		S	S
01-Jun-10	V Rockot	Plesetsk	* SERVIS 2	SSO	USEF	USEF	Development	\$30M	S	S
03-Jun-10	V Proton M	Baikonur	* BADR-5	GEO	Arab Satellite Communications Org.	EADS Astrium	Communications	\$85M	S	S
03-Jun-10	V + Falcon 9	CCAFS	* Falcon 9 Demo Flight	LEO	Space Exploration Technologies	Space Exploration Technologies	Test	\$56M	S	S
08-Jun-10	KSLV 1	Naro Space Center	STSAT 2b	SSO	KARI	KARI	Scientific		F	F

V Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed, or privately-financed launch activity.

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

See Appendix II for definitions of payload orbits.

L and M refer to the outcome of the Launch and Mission: S=Success, P=Partial Success, F=Failure.

Note: All launch dates are based on local time at the launch site.

Note: All prices are estimates.

APPENDIX I (CONT'D)

Date	Vehicle	Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L M	
									L	M
14-Jun-10	V Dnepr M	Dombarovskiy	Prisma Main	SSO	Swedish Space Corp.	Swedish Space Corp.	Development	\$12M	S	S
			Picard	SSO	CNES	CNES	Scientific		S	S
			Prisma Target	SSO	Swedish Space Corp.	Swedish Space Corp.	Development		S	S
14-Jun-10	Long March 2D	Jiuquan	Shijian 12	LEO	China Aerospace Corporation	SAS	Scientific		S	S
15-Jun-10	Soyuz	Baikonur	Soyuz ISS 23S	LEO	Roscosmos	RSC Energia	ISS		S	S
20-Jun-10	V Dnepr M	Baikonur	* TanDEM X	SSO	Infoterra Ltd.	EADS Astrium	Remote Sensing	\$12M	S	S
21-Jun-10	Shavit	Palmachim AFB	Ofeq 9	LEO	Israel MoD	IAI	Remote Sensing		S	S
26-Jun-10	V Ariane 5 ECA	Kourou	* Arabsat 5A	GEO	Arab Satellite Communications Org.	EADS Astrium	Communications	\$220M	S	S
			* COMS I	GEO	KARI	EADS Astrium	Other		S	S
29-Jun-10	Soyuz	Baikonur	Progress ISS 38P	LEO	Roscosmos	RSC Energia	ISS		S	S
09-Jul-10	V Proton M	Baikonur	* EchoStar XV	GEO	Echostar Communications Corporation	Space Systems/Loral	Communications	\$85M	S	S
11-Jul-10	PSLV	Satish Dhawan Space Center	Cartosat 2B	SSO	ISRO	ISRO	Remote Sensing		S	S
			AISSat-1	SSO	Norwegian Defense Research Establishment	University of Toronto	Development		S	S
			Tlsat-1	SSO	University of Applied Sciences of Southern Switzerland	University of Applied Sciences of Southern Switzerland	Development		S	S
			Alsats 2A	SSO	National Center for Space Technology	EADS Astrium	Remote Sensing		S	S
			StudSat	LEO	ISRO	ISRO	Development		S	S
01-Aug-10	Long March 3A	Xichang	Beidou 2-IGS 1	GEO	China	CAST	Navigation		S	S
04-Aug-10	V Ariane 5 ECA	Kourou	* Nilesat 201	GEO	Nilesat	Thales Alenia Space	Communications	\$220M	S	S
			* RASCOM 1R	GEO	RascomStar-QAF	Thales Alenia Space	Communications		S	S
10-Aug-10	Long March 4C	Taiyuan	Yaogen 10	LEO	China	SAS	Remote Sensing		S	S
14-Aug-10	Atlas V 531	CCAFS	Advanced EHF 1	GEO	USAF	Lockheed Martin Corp.	Communications		S	S
24-Aug-10	Long March 2D	Jiuquan	Tian Hui-1	LEO	China	CAST	Remote Sensing		S	S
02-Sep-10	Proton M	Baikonur	Glonass M36	MEO	Russian MoD	ISS Reshetnev	Navigation		S	S
			Glonass M37	MEO	Russian MoD	ISS Reshetnev	Navigation		S	S
			Glonass M38	MEO	Russian MoD	ISS Reshetnev	Navigation		S	S
04-Sep-10	Long March 3B	Xichang	Chinasat 6A	GEO	SINO - Satellite Communication Co. Ltd.	CAST	Communications		S	S
08-Sep-10	Rockot	Plesetsk	Gonets M 2	LEO	Roscosmos	ISS Reshetnev	Communications		S	S
10-Sep-10	Soyuz	Baikonur	Progress ISS 39P	LEO	Roscosmos	RSC Energia	ISS		S	S
11-Sep-10	H IIA 202	Tanegashima	QZS-1	GEO	JAXA	JAXA	Communications		S	S
20-Sep-10	Atlas V 501	VAFB	NRO L-41	LEO	NRO	USA	Classified		S	S
21-Sep-10	Long March 2D	Jiuquan	Yaogan 11	SSO	China	SAS	Remote Sensing		S	S
26-Sep-10	Minotaur IV	VAFB	SBSS 1	SSO	USAF	Boeing	Classified		S	S
30-Sep-10	Molniya-M	Plesetsk	Kosmos 2469	ELI	Russian Space Forces	NPO Lavotchkin	Classified		S	S
01-Oct-10	Long March 3C	Xichang	Chang'e 2	EXT	China National Space Administration	CAST	Scientific		S	S
06-Oct-10	Long March 4B	Taiyuan	Shijian 6	SSO	China National Space Administration	CAST	Scientific		S	S

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

See Appendix II for definitions of payload orbits.

L and M refer to the outcome of the Launch and Mission: S=Success, P=Partial Success, F=Failure.

Note: All launch dates are based on local time at the launch site.

Note: All prices are estimates.

APPENDIX I (CONT'D)

Date	Vehicle	Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M				
07-Oct-10	Soyuz	Baikonur	Soyuz ISS 24S	LEO	Roscosmos	RSC Energia	ISS		S	S				
14-Oct-10	V Proton M	Baikonur	* XM 5	GEO	XM Satellite Radio, Inc.	Space Systems/Loral	Communications	\$85M	S	S				
19-Oct-10	V Soyuz 2 1A	Baikonur	* Globalstar 2nd Gen 01	LEO	Globalstar, Inc.	Thales Alenia Space	Communications	\$50M	S	S				
			* Globalstar 2nd Gen 02	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	S				
			* Globalstar 2nd Gen 03	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	S				
			* Globalstar 2nd Gen 04	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	S				
			* Globalstar 2nd Gen 05	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	S				
			* Globalstar 2nd Gen 06	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	S				
27-Oct-10	Soyuz	Baikonur	Progress ISS 40P	LEO	Roscosmos	RSC Energia	ISS		S	S				
28-Oct-10	V Ariane 5 ECA	Kourou	* BSAT 3B	GEO	Broadcasting Satellite System Corp.	Lockheed Martin Corp.	Communications		S	S				
			* Eutelsat W3B	GEO	Eutelsat	Thales Alenia Space	Communications		S	F				
31-Oct-10	Long March 3C	Xichang	Beidou 2-G4	GEO	CAST	CAST	Navigation		S	S				
02-Nov-10	Soyuz 2	Plesetsk	Meridian 3	ELI	Russian MoD	ISS Reshetnev	Communications		S	S				
05-Nov-10	V + Delta II 7420-10	VAFB	COSMO-SkyMed 4	LEO	Italian Space Agency (ASI)	Thales Alenia Space	Remote Sensing	\$95M	S	S				
05-Nov-10	Long March 4B	Taiyuan	Fengyun 3B	SSO	China Meteorological Administration	SBA	Meteorological		S	S				
14-Nov-10	V Proton M	Baikonur	* SkyTerra-1	GEO	SkyTerra Communications	Boeing	Communications	\$85M	S	S				
19-Nov-10	Minotaur IV	Kodiak Launch Complex	Space Test Program Satellite 26	LEO	USAF	Ball Aerospace	Development		S	S				
21-Nov-10	Delta IV Heavy	CCAFS	NRO L-32	LEO	NRO	USA	Classified		S	S				
24-Nov-10	Long March 3A	Xichang	Shen Tong 1-B	GEO	China MoD	CAST	Communications		S	S				
26-Nov-10	V Ariane 5 ECA	Kourou	* Intelsat 17	GEO	Intelsat	Orbital Sciences Corp.	Communications	\$220	S	S				
			* HYLAS	GEO	Avanti Screenmedia Group	EADS Astrium	Communications		S	S				
05-Dec-10	Proton M	Baikonur	Glonass M39	MEO	Russian MoD	ISS Reshetnev	Navigation		F	F				
			Glonass M40	MEO	Russian MoD	ISS Reshetnev	Navigation		F	F				
			Glonass M41	MEO	Russian MoD	ISS Reshetnev	Navigation		F	F				
08-Dec-10	V + Falcon 9	CCAFS	* Dragon COTS Demo 1	LEO	SpaceX	SpaceX	Development	\$56M	S	S				
			SMDC ONE	LEO	U.S. Army	U.S. Army	Classified		S	S				
			QbX-1	LEO	NRO	NRO	Classified		S	S				
			QbX-2	LEO	NRO	NRO	Classified		S	S				
			Perseus 000	LEO	Los Alamos National Lab.	Los Alamos National Lab.	Classified		S	S				
			Perseus 001	LEO	Los Alamos National Lab.	Los Alamos National Lab.	Classified		S	S				
			Perseus 002	LEO	Los Alamos National Lab.	Los Alamos National Lab.	Classified		S	S				
			Perseus 003	LEO	Los Alamos National Lab.	Los Alamos National Lab.	Classified		S	S				
			* Mayflower & CAERUS	LEO	Northrup Grumman	Northrup Grumman	Development/Communications		S	S				
			15-Dec-10	Soyuz	Baikonur	Soyuz ISS 25S	LEO		Roscosmos	RSC Energia	ISS		S	S
			16-Dec-10	Long March 3A	Xichang	Beidou 2C/M1	MEO		China	CAST	Navigation		S	S
25-Dec-10	GSLV	Satish Dhawan Space Center	* Insat 4D	GEO	ISRO	ISRO	Communications		S	S				
26-Dec-10	V Proton M	Baikonur	* KA-SAT	GEO	Eutelsat	EADS Astrium	Communications	\$85M	S	S				
29-Dec-10	V Ariane 5 ECA	Kourou	* KoreaSat 6	GEO	Korea Telecom	Thales Alenia Space	Communications	\$220M	S	S				
			* Hispasat 1E	GEO	Hispasat	Space Systems/Loral	Communications		S	S				

V Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed, or privately-financed launch activity.

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

See Appendix II for definitions of payload orbits.

L and M refer to the outcome of the Launch and Mission: S=Success, P=Partial Success, F=Failure.

Note: All launch dates are based on local time at the launch site.

Note: All prices are estimates.

ACRONYMS FOR APPENDIX I

CAST – China Academy for Space Technology
CCAFS – Cape Canaveral Air Force Station
CNSA – China National Space Administration
ESA – European Space Agency
GSFC – Goddard Space Flight Center
IAI – Israel Aerospace Industries Ltd.
ISRO – Indian Space Research Organization
ISS – International Space Station
JAXA – Japan Aerospace Exploration Agency
KARI - Korean Advanced Institute of Science and Technology
KSC – NASA Kennedy Space Center
NASA – National Aeronautics and Space Administration
NOAA – United States National Oceanic and Atmospheric Administration
NRO – National Reconnaissance Office
Russian MoD – Ministry of Defense of the Russian Federation
SAS – Shanghai Academy of Space Technology, China
SBA - Shanghai Bureau of Astronautics, China
USAF – United States Air Force
USEF - Institute for Unmanned Space Experiment Free Flyer (USEF), Japan
VAFB – Vandenberg Air Force Base

APPENDIX II: DEFINITIONS

COMMERCIAL SUBORBITAL OR ORBITAL LAUNCH

A commercial suborbital or orbital launch has one or more of the following characteristics:

- The launch is licensed by FAA/AST.
- The primary payload's launch contract was internationally competed (see definition of internationally competed below). A primary payload is generally defined as the payload with the greatest mass on a launch vehicle for a given launch.
- The launch is privately financed without government support.

LAUNCH FAILURE

The payload did not reach a usable orbit (an orbit where some portion of the mission could be salvaged) or was destroyed as the result of a launch vehicle malfunction.

INTERNATIONALLY COMPETED

An internationally competed launch contract is one in which the launch opportunity was available in principle to any capable launch service provider. Such a launch is considered commercial.

COMMERCIAL PAYLOAD

A commercial payload is described as having one or both of the following characteristics:

- The payload is operated by a private company.
- The payload is funded by the government, but provides satellite service partially or totally through a private or semi-private company. This distinction is usually applied to certain telecommunication satellites whose transponders are partially or totally leased to a variety of organizations, some or all of which generate revenues. Examples are Russia's Express and Ekran series of spacecraft. All other payloads are classified as noncommercial (government civil, government military, or non-profit).

ORBITS

- A spacecraft in geostationary Earth orbit (GSO) is synchronized with the Earth's rotation, orbiting once every 24 hours, and appears to an observer on the ground to be stationary in the sky. GEO is a broader category used for any circular orbit at an altitude of 35,852 kilometers (22,277 miles) with a low inclination (i.e., over the equator).

- Non-geosynchronous orbit (NGSO) satellites are those in orbits other than GEO. They are located in low Earth orbit (LEO, lowest achievable orbit to about 2,400 kilometers, or 1,491 miles), medium Earth orbit (MEO, 2,400 kilometers to GEO), and all other high or elliptical orbits or trajectories. ELI (“elliptical”) is used to describe a highly elliptical orbit (such as those used for Russian Molniya satellites), and EXT (“external”) is a designation used for trajectories beyond GEO (such as interplanetary trajectories).