Federal Aviation Administration

Commercial Space Transportation

2014 Year in Review

February 2015

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About the FAA 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 51 United States Code, Subtitle V, Chapter 509 (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 website:

http://www.faa.gov/go/ast

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EXECUTIVE SUMMARY

The Commercial Space Transportation: 2014 Year in Review summarizes U.S. and international orbital launch activities for calendar year 2014, including launches licensed by the Federal Aviation Administration's Office of Commercial Space Transportation (FAA AST).

In 2014, the United States, Russia, Europe, China, Japan, India, Israel, and multinational provider Sea Launch conducted a total of 92 orbital launches, 23 of which were commercial (See Figure 1). In 2013 there were 81 launches, including 23 commercial launches. Three of the 92 launches failed; two government launches, Russia's Proton M launch of the Express AM4R communications satellite and Europe's Soyuz 2.1b launch of two Galileo navigation satellites, and one commercial launch, United States' Antares 120 launch of the Cygnus commercial cargo capsule to the International Space Station (ISS).

Highlights of 2014 in the orbital space launch industry:

- The United States performed 11 commercial orbital launches, making 2014 the most active year since the late 1990s.
- NASA continued its ISS Commercial Resupply Services (CRS) program, with the launch of five resupply missions. One CRS mission of a Cygnus cargo spacecraft launched by an Antares vehicle resulted in a launch failure;
- SpaceX continued to successfully launch payloads for commercial clients, including three commercial launches to geosynchronous transfer orbit (GTO) and one to low earth orbit (LEO);
- The U.S. launch provider United Launch Alliance (ULA) exceeded its own record number of 11 launches last year with 14 missions, launching 9 Atlas V, 4 Delta IV, and one Delta II;
- One of these ULA vehicles, a Delta IV Heavy, successfully launched NASA's Orion Multi-Purpose Crew Vehicle on Exploration Flight Test 1 (EFT 1). The launch was licensed by FAA AST;
- Two new orbital launch vehicles were successfully tested. The Russian Angara launch vehicle family was introduced by a suborbital test of Angara 1.1PP in July and a GEO insertion of a dummy payload by Angara A5 in December. India successfully performed a suborbital test of its LVM3 launch vehicle (formerly known as GSLV Mk 3); and
- Orbital launch vehicles deployed 46 CubeSat class satellites launched as piggyback payloads. Sixty seven more CubeSats were delivered to the ISS by the Cygnus, Dragon, and Progress spacecraft and then released into orbit from the ISS. Twenty nine more CubeSats were lost during a failed launch attempt of a Cygnus cargo spacecraft to the ISS.

Revenues from the 23 commercial orbital launches in 2014 were estimated to be about $2.36 billion. These revenues are nearly a half billion dollars higher than in 2013 while consistent with commercial launch revenue in 2009, 2010, and 2012. The estimated commercial orbital launch revenues of $1.1 billion for U.S. providers was the highest in five years (See Figure 2). This is the highest since 1998, when the total was $1.12 billion.

FAA AST licensed 12 commercial orbital launches in 2014, compared to seven licensed launches in 2013. SpaceX's Falcon 9 vehicle had six licensed launches: two in April and September, under NASA's CRS program, and four for commercial satellite operators AsiaSat, ORBCOMM, and Thaicom. Orbital's Antares was used for three FAA-licensed ISS resupply missions in January, July, and October. The October launch attempt of Antares resulted in a failure; its cause is currently being investigated. Atlas V provided by United Launch Alliance (ULA) successfully launched commercial Earth observation satellite WorldView 3 in August. Another ULA successful FAA-licensed mission was that of Delta IV Heavy launching NASA's Orion EFT 1. Sea Launch's Zenit 3SL successful launch of Eutelsat 3B was also an FAA-licensed launch.

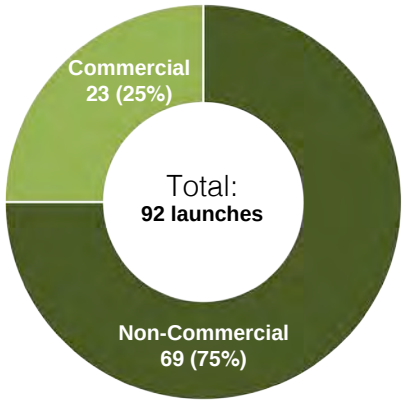


Figure 1. 2014 Total Worldwide Launch Activity

2014 LAUNCH ACTIVITY

WORLDWIDE ORBITAL LAUNCH ACTIVITY

Launch providers from the United States, Russia, Europe, China, Japan, India, Israel, and one multinational provider conducted a total of 92 launches in 2014, 23 of which were commercial (see Figures 2 and 3, Tables 1 and 2). This is higher than the previous five-year average of 79 total launches and 22 commercial launches per year. The following is a summary of worldwide orbital commercial launches in 2014, by country.

- The United States conducted 23 launches in 2014, four more launches than in 2013. Eleven of the 23 launches were commercial, five more than in 2013.
- Russia had the most total launches (32) in 2014, same as in 2013. It performed four commercial launches, down from 12 in 2013. Russia experienced one failure of a Proton M launch vehicle while attempting to launch the Express AM4R GEO communications satellite for the Russian Satellite Communications Company (RSCC).
- Europe conducted 11 launches in 2014, six of which were commercial, rebounding from the low number of seven launches in 2013, including four commercial ones.
- China had 16 orbital launches, all non-commercial, one launch more than in 2013. This is the second year in a row with no commercial launch activity in China.
- India had four successful launches, including one commercial launch in 2014, compared to three non-commercial launches in 2013.
- Israel successfully launched its Shavit vehicle carrying Ofeq 10 reconnaissance satellite, a non-commercial launch. It was the first orbital launch in Israel since 2010.
- Japan performed a total of four non-commercial launches in 2014, up one launch from 2013.
- The multinational Sea Launch Zenit 3SL launch vehicle performed one successful launch in 2014. In 2013, there was one failed commercial launch attempt by Sea Launch.
- There were 10 commercial launches of GEO satellites in 2014, one launch less than in 2013. This year continued the downward trend in commercial launches to GEO with the new lowest number since 2007.

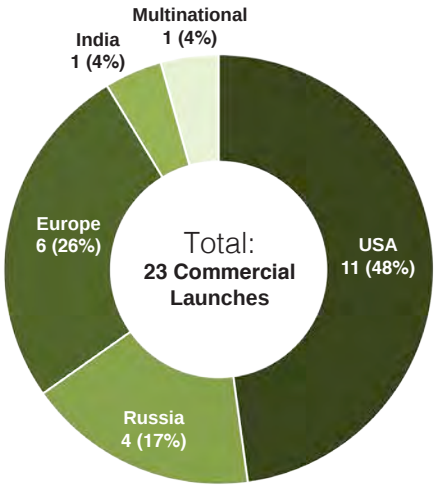


Figure 2. 2014 Worldwide Commercial Launch Activity

Country/Region	Commercial Launches	Non-Commercial Launches	Launches
United States	11	12	23
Russia	4	28	32
Europe	6	5	11
China	0	16	16
Japan	0	4	4
India	1	3	4
Israel	0	1	1
Multinational	1	0	1
TOTAL	***23***	***69***	***92***

Table 1. 2014 Worldwide Orbital Launch Events

Date	Launch Vehicle	Launching Country/ Region	Primary Payload Name	Orbit	Launch Outcome
1/6/14	Falcon 9	USA	Thaicom 6	GEO	Success
1/9/14	Antares 120	USA	Orb 1	LEO	Success
2/14/14	Proton M	Russia	Turksat 4A	GEO	Success
3/22/14	Ariane 5 ECA	Europe	Astra 5B	GEO	Success
4/18/14	Falcon 9	USA	Spx 3	LEO	Success
5/26/14	Zenit 3SL	Multinational	Eutelsat 3B	GEO	Success
6/19/14	Dnepr	Russia	KazEOSat 2	GEO	Success
6/30/14	PSLV CA	India	SPOT 7	SSO	Success
7/10/14	Soyuz 2.1b	Europe	O3b 05-08	MEO	Success
7/13/14	Antares 120	USA	Orb 2	LEO	Success
7/14/14	Falcon 9	USA	ORBCOMM FM103, 104, 106, 107, 109, 111	LEO	Success
8/5/14	Falcon 9	USA	AsiaSat 8	GEO	Success
8/13/14	Atlas V 401	USA	WorldView 3	SSO	Success
9/7/14	Falcon 9	USA	AsiaSat 6	GEO	Success
9/11/14	Ariane 5 ECA	Europe	MEASAT 3B	GEO	Success
9/21/14	Falcon 9	USA	Spx 4	LEO	Success
10/16/14	Ariane 5 ECA	Europe	Intelsat 30	GEO	Success
10/28/14	Antares 120	USA	Orb 3	LEO	Failure
11/6/14	Dnepr	Russia	ASNARO 1	SSO	Success
12/5/14	Delta IV Heavy	USA	EFT 1	LEO	Success
12/6/14	Ariane 5 ECA	Europe	DirecTV 14	GEO	Success
12/18/14	Soyuz 2.1b	Europe	O3b 09-12	MEO	Success
12/27/14	Proton M	Russia	Astra 2G	GEO	Success

Table 2. 2014 Worldwide Commercial Launch Events

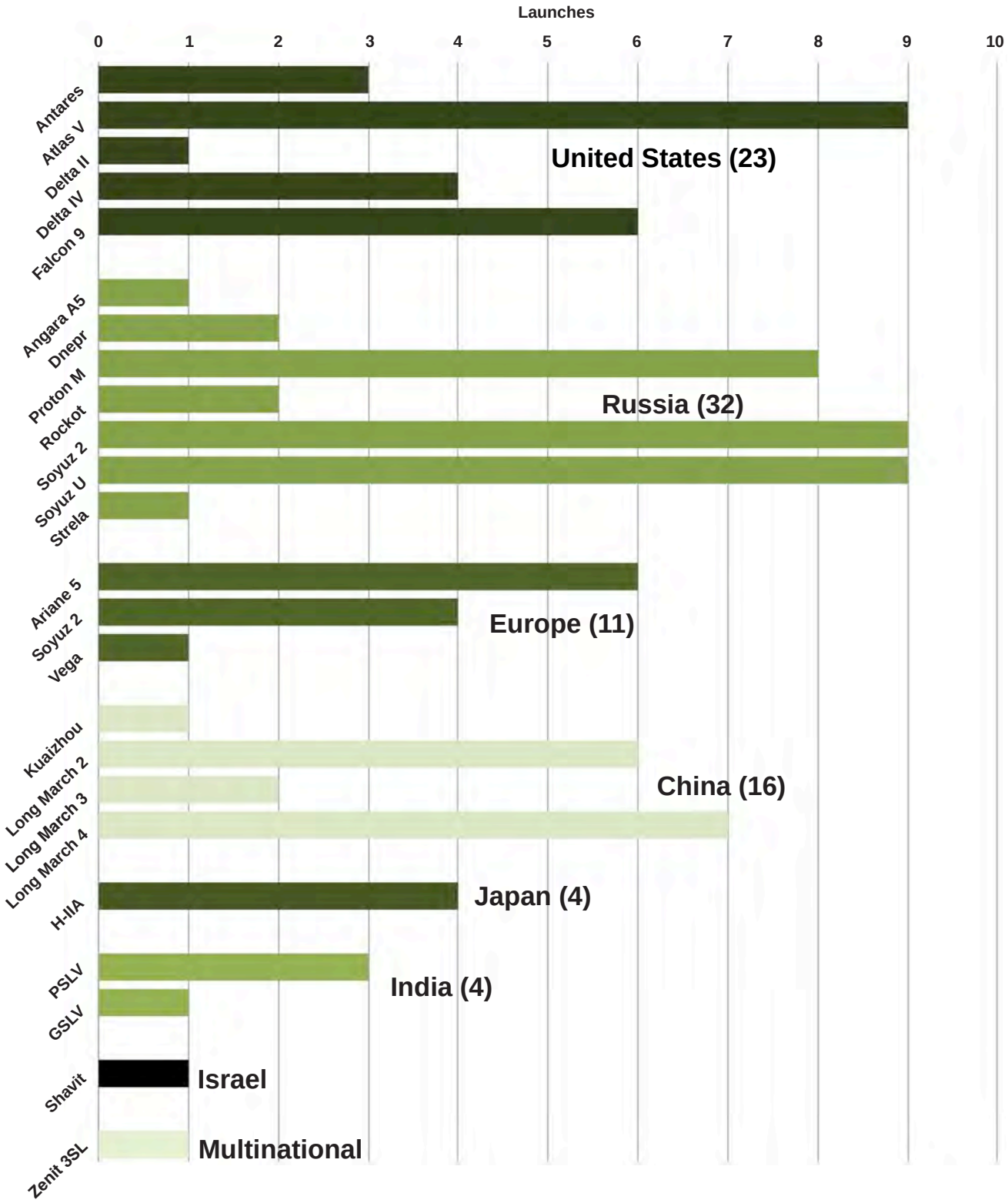


Figure 3. 2014 Launch Vehicle Use

Worldwide Launch Revenues

Estimated revenues from the 23 commercial launch events in 2014 amounted to approximately $2.36 billion (Figure 4). These revenues are nearly a half billion dollars higher than in 2013 while consistent with commercial launch revenue in 2009, 2010, and 2012. The following are 2014 revenues by country:

- Commercial launch revenues in the United States amounted to $1.1 billion, the highest since 1998. Estimated commercial launch revenue for 2013 was $339.5 million.
- Russian commercial launch revenues were approximately $218 million, 30 percent of the last year's $759 million. The delay caused by a civil government Proton failure in May resulted in only two commercial Proton launches in 2014. The other two Russian commercial launches this year were performed by the low cost Dnepr vehicle.
- European commercial launch revenues were approximately $920 million, a 30 percent increase from 2013.
- China did not perform any commercial launches in 2014, same as in 2013. It earned an estimated total of $90 million for two commercial launches in 2012.
- Multinational (Sea Launch) revenues from the single 2014 launch were estimated at $95 million, on par with the 2013 results.

Payments for launch services are typically spread over one to two years before the 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 or region where the primary vehicle manufacturer is based. These revenues are assessed based on commercial launch price estimates for each launch vehicle using publically available information.

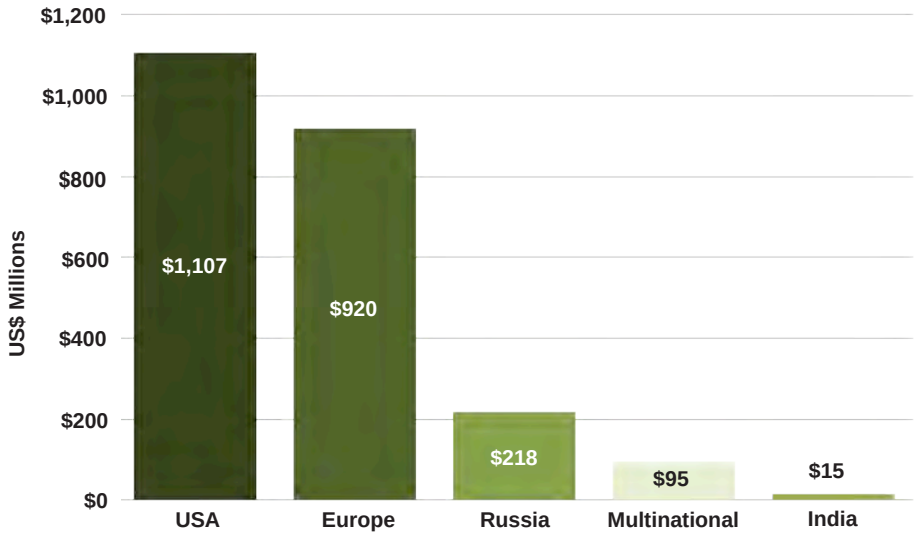


Figure 4. Estimated 2014 Commercial Launch Revenues

[1] International Launch Services (ILS) and Arianespace constitute an exception. ILS is a Russian-owned company incorporated in the United States and selling launches of the Russian Proton vehicles. Arianespace markets launches of a Russian-manufactured Soyuz 2 vehicle from the Kourou launch site in French Guiana.

U.S. AND FAA-LICENSED ORBITAL LAUNCH AND REENTRY ACTIVITY

FAA-Licensed Orbital Launch Summary

There were 12 FAA-licensed orbital launches in 2014 (see Table 3) from four different launch sites.

SpaceX's Falcon 9 vehicle made six licensed launches: two CRS missions to the ISS and four launches for commercial communications satellite operators, all from Cape Canaveral Air Force Station (CCAFS).

Orbital's Antares had three FAA-licensed launch attempts, two successful CRS missions to the ISS and one failed CRS launch attempt, from the Mid-Atlantic Regional Spaceport (MARS) in Virginia. ULA performed two FAA-licensed launches, one by Atlas V of the WorldView 3 commercial remote sensing satellite from Vandenberg Air Force Base (VAFB) and the other by Delta IV Heavy of NASA's EFT 1 from CCAFS.

Date	Vehicle	Primary Payload	Orbit	Launch Outcome
1/6/14	Falcon 9	Thaicom 6	GEO	Success
1/9/14	Antares 120	Orb 1	LEO	Success
4/18/14	Falcon 9	Spx 3	LEO	Success
5/26/14	Zenit 3SL	Eutelsat 3B	GEO	Success
7/13/14	Antares 120	Orb 2	LEO	Success
7/14/14	Falcon 9	ORBCOMM FM103, 104, 106, 107, 109, 111	LEO	Success
8/5/14	Falcon 9	AsiaSat 8	GEO	Success
8/13/14	Atlas V 401	WorldView 3	SSO	Success
9/7/14	Falcon 9	AsiaSat 6	GEO	Success
9/21/14	Falcon 9	Spx 4	LEO	Success
10/28/14	Antares 120	Orb 3	LEO	Failure
12/5/14	Delta IV Heavy	EFT 1	LEO	Success

Table 3. 2014 FAA-Licensed Orbital Launch Events

Sea Launch's Zenit 3SL vehicle performed one FAA-licensed launch of a commercial telecommunications satellite Eutelsat 3B.

Over the past five years (in 2010–2014), FAA has on average licensed about six launches per year. However, in 2014 the number of FAA-licensed launches exceeded the 11 launches FAA licensed in 2008. At that time, five of the 11 FAA-licensed launches were Sea Launch's Zenit 3SL carrying commercial GEO communications satellites. With the Zenit 3SL launches effectively put on hold after this year's single launch, the increase in licensed orbital launches is predominantly driven by U.S. launch organizations. SpaceX and Orbital (teamed with ULA) plan 10 to 15 licensed launches in 2015. Figures 5 and 6 summarize the number of FAA-licensed orbital launches and revenue in 2010-2014.

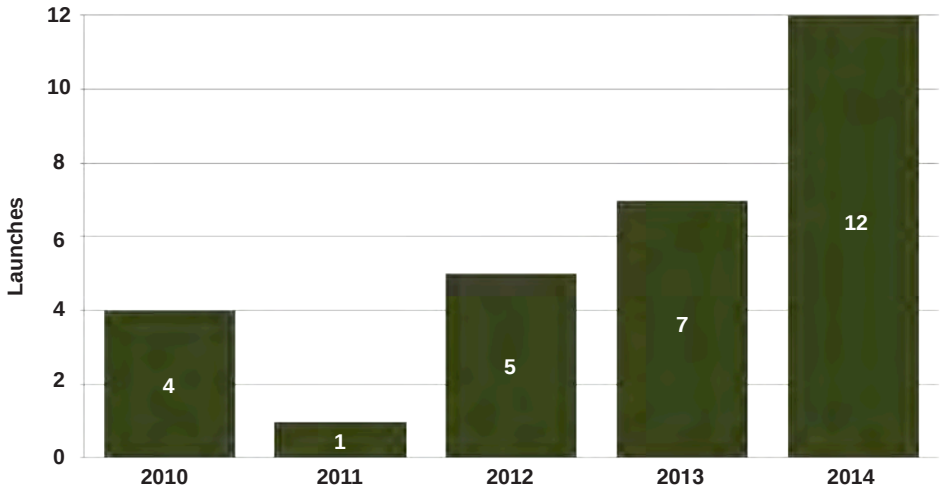


Figure 5. FAA-licensed Orbital Launch Events, 2010-2014

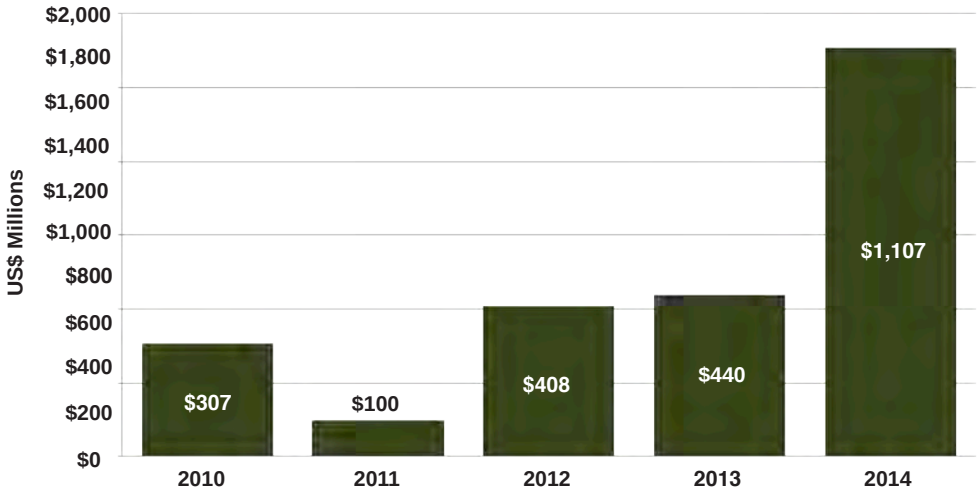


Figure 6. Estimated Revenue for FAA-licensed Orbital Launch Events, 2010-2014

United States

U.S. launch vehicles provided 12 U.S. government launches and 11 commercial launches in 2014. Of the 12 government launches, two were for NASA and 10 were for the Department of Defense (DoD), including the Air Force. Six launches for NASA, including five SpaceX and Orbital launches to the ISS and the ULA launch of EFT 1 were all licensed by the FAA and therefore counted as commercial launches. Table 4 on page 16 summarizes U.S. and FAA-licensed launch vehicles active in 2014.

The following is a list of U.S.-based launch service providers, highlighting their launch activity in 2014. It includes all companies that launch from the United States or under the regulatory oversight of the FAA AST.

Orbital Sciences Corporation

Orbital provides the Antares, Minotaur, and Pegasus vehicles for orbital launch.

Orbital launched two successful Cygnus resupply missions to the ISS in January and July. The third launch attempt of Antares in October resulted in a failure and the loss of the Cygnus spacecraft and the cargo it was carrying to the ISS; its cause is currently being investigated.

Space Exploration Technologies Corporation

SpaceX performed six commercial Falcon 9 launches in 2014. In April and September, two Falcon 9 v1.1 rockets launched the Dragon capsules carrying supplies to the ISS. These vehicles were performed under NASA's CRS program. In January, Falcon 9 deployed a commercial telecommunications satellite Thaicom 6 to GTO. In July, six second generation ORBCOMM commercial telecommunications satellites were launched into LEO by one Falcon 9 vehicle, and in August and September two more Falcon 9 launches delivered two AsiaSat commercial satellites to GTO: AsiaSat 8 and AsiaSat 6.

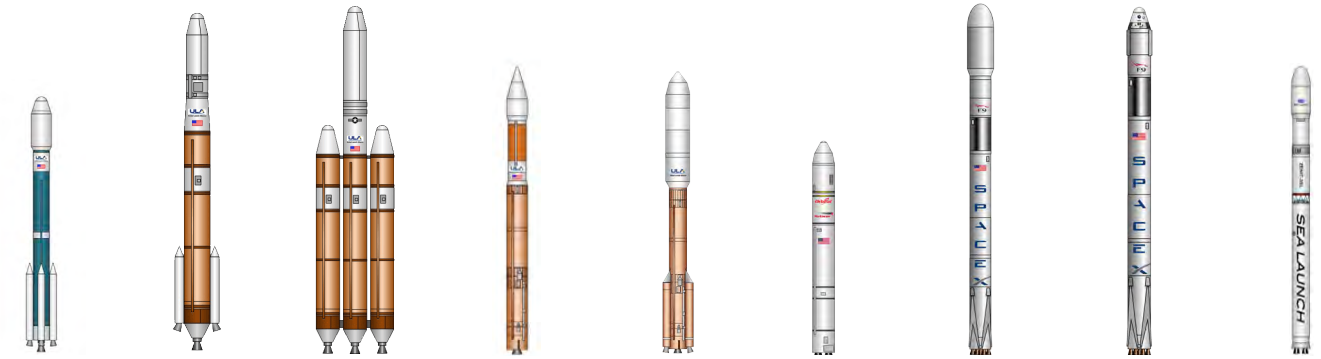
United Launch Alliance

ULA, a joint company between Boeing and Lockheed Martin, manufactures and operates Boeing-heritage Delta vehicles and Lockheed Martin-heritage Atlas vehicles. In 2014, ULA conducted a record number of 14 launches, two of them commercial.

A Delta II 7320-10 deployed Orbiting Carbon Observatory (OCO 2) for NASA. Delta IV vehicles placed three Air Force payloads into orbit: Navstar GPS 2F-05, Navstar GPS 2F-06, and GSSAP 1. A Delta IV Heavy commercial FAA-licensed launch deployed NASA's EFT 1. Atlas V vehicles performed eight non-commercial missions, seven for the DoD, Air Force, and one for NASA: DMSP 19, NRO L-67, NRO L-33, Navstar GPS 2F-07, CLIO, Navstar GPS 2F-08, NRO L-35, and TDRS L. A commercial FAA-licensed Atlas V launch deployed WorldView 3, a commercial remote sensing satellite for DigitalGlobe.

FAA-Licensed Multinational Launches: Sea Launch AG

Zenit 3SL, a launch vehicle operated by multinational commercial launch provider Sea Launch AG, deployed one commercial GEO communications satellite for commercial operator Eutelsat.



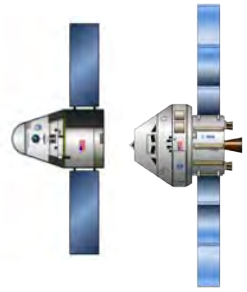
Vehicle	Delta II 7320-10	Delta IV Medium+ (4,2)	Delta IV Heavy	Atlas V 401	Atlas V 541	Antares 120	Falcon 9	Falcon 9 (Dragon)	Zenit 3SL
2014 Total Launches	1	3	1	7	2	3	4	2	1
2014 Licensed Launches	0	0	0	1	0	3	4	2	1
Launch Reliability (2014)	1/1 100%	3/3 100%	1/1 100%	7/7 100%	2/2 100%	2/3 67%	4/4 100%	2/2 100%	0/1 0%
Launch Reliability (Last 10 Years)	6/6 100%	12/12 100%	7/8 88%	25/25 100%	3/3 100%	4/5 80%	6/6 100%	7/7 100%	24/26 92%
Year of First Launch*	1999	2002	2004	2002	2011	2013	2013	2010	1999
Active Launch Sites	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	MARS	CCAFS, VAFB	CCAFS	Odyssey Pacific Ocean Platform
LEO kg (lbs)	2,703 (5,958)	12.240 (26,980)	22,560 (49,740)	9,797 (21,598)	17,443 (38,476)	4,900 (10,780)	13,150 (28,991)	9,000 (19,842)	--
GTO kg (lbs)	--	6,267 (13,817)	14,420 (31,791)	4,750 (10,470)	8,290 (18,270)	--	4,850 (10,692)	--	6,160 (13,580)

** The year the respective variant of a launch vehicle was launched for the first time.*

Table 4. U.S. and FAA-Licensed Launch Vehicles Active in 2014

FAA Reentry License Summary

There were three reentries conducted under an FAA reentry license in 2014. Two SpaceX's Dragon spacecraft performed the licensed reentries, in May and October 2014, completing its third and fourth CRS missions to the ISS. A test version of Lockheed Martin's Orion multi-purpose crew vehicle was successfully recovered in the Pacific Ocean following an FAA-licensed reentry (See Table 5 for details.)



Vehicle	SpaceX Dragon	Orion (EFT 1)
2014 Total Reentries	2	1
2014 Licensed Reentries	2	1
Reentry Reliability (2014)	2/2 100%	1/1 100%
Reentry Reliability (Last 10 Years)	6/6 100%	1/1 100%
Year of First Reentry	2010	2014
Reentry Sites	Pacific Ocean	Pacific Ocean
Payload to LEO, kg (lbs)	6,000 (13,228)	N/A
Payload from LEO, kg (lbs)	3,000 (6,614)	N/A

Table 5. FAA-Licensed Reentry Vehicles Active in 2014

FAA Suborbital Launch Summary

Suborbital launches carried out under FAA licenses or experimental permits are listed in Table 6.

- SpaceX performed five suborbital launches of its Falcon 9R Dev 1 experimental rocket from SpaceX's McGregor Test Site authorized under an FAA Experimental Permit. Four flights were successful and the fifth launch conducted on August 22 resulted in an on-board anomaly and vehicle self-destruction commanded by flight control. These flights were part of the development program of a reusable first stage for the Falcon 9 orbital launch vehicle.
- Virgin Galactic's SpaceShipTwo performed two powered flight tests from Mojave Air and Space Port authorized under an FAA experimental permit issued to Scaled Composites, the vehicle manufacturer. The second flight on October 31st resulted in a catastrophic failure and death of one of the pilots. The second pilot survived but suffered injuries. The cause of the crash is currently being investigated.

Operator	Type of FAA Authorization	Launch Date	Vehicle
Scaled Composites	Experimental Permit (EP 12-007)	1/10/14	SpaceShipTwo
SpaceX	Experimental Permit (EP 14-010)	4/18/14	Falcon 9R Dev 1
SpaceX	Experimental Permit (EP 14-010)	5/2/14	Falcon 9R Dev 1
SpaceX	Experimental Permit (EP 14-010)	6/17/14	Falcon 9R Dev 1
SpaceX	Experimental Permit (EP 14-010)	8/1/14	Falcon 9R Dev 1
SpaceX	Experimental Permit (EP 14-010)	8/22/14	Falcon 9R Dev 1
Scaled Composites	Experimental Permit (EP 12-007)	10/31/14	SpaceShipTwo

Table 6. FAA 2014 Suborbital License and Permit Flight Summary

NON-U.S. ORBITAL LAUNCH ACTIVITY

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

Russia

In 2014, there were 32 Russian launches. Thirty-one of these were successful, one Proton M failed. Eight launches were with Proton vehicles and 18 with Soyuz vehicles. Dnepr and Rockot performed two launches each. One mission was launched with Strela. The new Angara A5 heavy class launch vehicle performed a successful test launch of a dummy payload to GEO from a northern Russia launch site Plesetsk; this test flight was preceded by a suborbital test launch of a lighter Angara version. Twenty-one of the missions launched from Baikonur Cosmodrome, and nine missions launched from Plesetek. Two Dnepr launches were condicted from Dombarovskiy Air Base. Four launches were commercial and 28 were non-commercial. The non-commercial missions are detailed below.

- Eight Soyuz launches were dedicated ISS missions, involving four Progress M cargo missions and four Soyuz spacecraft crew exchange missions.
- Nine launches were performed in the interest of the Russian military. A Proton vehicle launched a GEO communications satellite Olymp K. Six Soyuz vehicles launched three Glonass series navigation satellites and three intelligence satellites. A Rockot vehicle launched three Cosmos series store-and-forward communications satellites. One Strela launch vehicle launched Kondor E1, an imagery intelligence satellite.
- Russia conducted 10 launches for civil purposes, that were not related to the ISS. Four Proton vehicles launched six GEO communications satellites (two of the launches were dual manifest), one launch, intended to deploy Express AM4R, resulted in a failure. Four Soyuz vehicles launched four primary payloads, including two remote sensing satellites, a weather, and a science payload. The launch of the Meteor 3M N2 weather satellite also carried five microsats as piggyback payloads. Rockot launched three Gonets series store-and-forward communications satellites. The new Angara A5 heavy class launch vehicle performed a successful test launch of a dummy payload to GEO
- International Launch Services (ILS) facilitated two commercial launches of Proton M. Both missions were telecommunications satellites to GEO, Turksat 4A for Turk Telekom and Astra 2G for SES.
- Two Dnepr commercial vehicles provided by JSC Kosmotras launched primary payloads KazEoSat 2 for Kazakhstan and ASNARO 1 for the Japanese Government. KazEoSat 2 was launched with 36 secondary payloads, including Deimos 2 remote sensing satellite for Spain and 35 microsatellites, most of them cubesats. ASNARO 1 was launched with four Japanese university microsatellites.

Europe

Europe conducted 11 launches in 2014 from its spaceport in French Guiana. Six were with Ariane 5 vehicles, four with Soyuz vehicles, and one with the Vega rocket. Four of the Ariane 5 and two of the Soyuz launches were commercial. The other five European launches were non-commercial, carrying payloads for the European Space Agency (ESA), European Commission, Italian Space Agency, and government of Kazakhstan. More details on European launches are below:

- Five Ariane 5 ECA launch vehicles placed 10 satellites in GEO, including seven commercial telecommunications satellites, one military communications satellite, and two civil government communications satellites. All Ariane 5 ECA launches were dual manifests of GEO satellites.
- An Ariane 5 ES launched the fifth and the last Automated Transfer Vehicle (ATV) bringing cargo to the ISS.
- Two Soyuz 2 launches were commercial launching a total of eight satellites to medium earth orbit (MEO) for the O3b commercial communications constellation.
- Two more Soyuz 2 launches launched Sentinel 1A for ESA and two Galileo navigation satellites for the European Commission. The Galileo satellites were deployed in a useless orbit due to an in-flight anomaly in the Fregat upper stage; the launch was declared a failure.
- Vega launched KazEOSat 1 for Kazakhstan.

China

China conducted 16 orbital launches, all of them for the Chinese government. Two launches were conducted from the Xichang Satellite Launch Center, eight from the Jiuquan Satellite Launch Center, and six from the Taiyuan Satellite Launch Center. More details on Chinese launches are below.

- Eleven launches were for China's military. These launches deployed a total of 16 satellites, all to low earth (LEO) and sun-synchronous (SSO) orbits. Twelve of these satellites are believed to be for signal and image intelligence purposes, three for remote sensing, one for early warning, and one development payload.

- Five launches were for China's civil government agencies and a university. They deployed seven satellites, including two remote sensing, two development and test payloads, one meteorological satellite, one communications satellite, and one science payload.

India

The Indian Space Research Organization (ISRO) performed four orbital launches in 2014. GSLV Mk II launched GSAT 14 geostationary communications satellite, and two PSLV launches deployed two navigation satellites for ISRO.

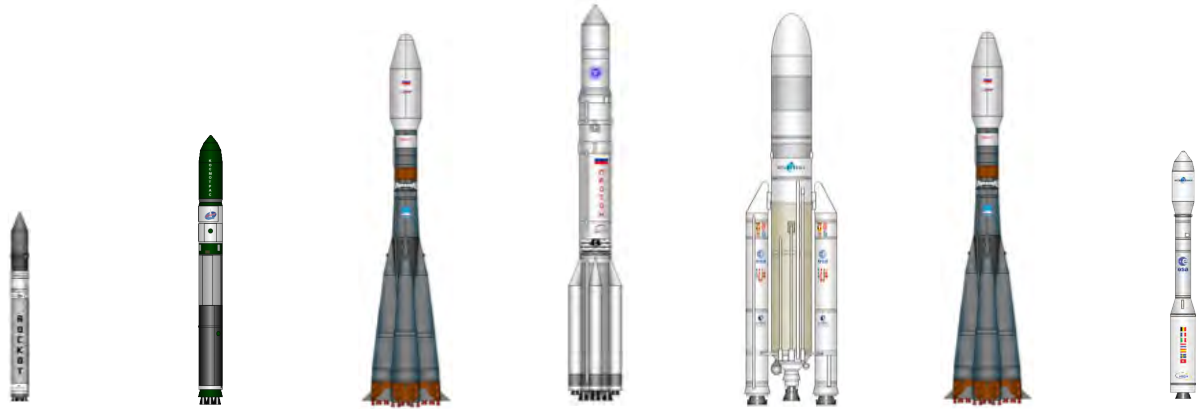
One PSLV launch was a commercial deployment of SPOT 7 for SPOT Image (since sold to Azercosmos), accompanied by four civil and university microsatellites.

Israel

Israel launched Ofeq 10 military observation satellite using Shavit 1 vehicle.

Japan

Japan had four H-IIA launches this year, launching GPM-Core remote sensing payload built by NASA Goddard Space Flight Center, Himawari 8 meteorological satellite, Hayabusa 2 scientific probe, and ALOS 2 remote sensing payload. ALOS 2 was launched with four microsatellites as secondary payloads.



Vehicle	Rockot	Dnepr	Soyuz 2	Proton M	Ariane 5 ECA	Soyuz 2	Vega
Country/Region	Russia	Russia	Russia	Russia	Europe	Europe	Europe
2014 Total Launches	2	2	9	8	5	4	1
Launch Reliability (2014)	2/2 100%	2/2 100%	9/9 100%	7/8 88%	5/5 100%	3/4 75%	1/1 100%
Launch Reliability (Last 10 Years)	19/20 95%	8/8 100%	26/28 92%	72/81 89%	43/44 98%	9/10 90%	3/3 100%
Year of First Launch*	1994	2010	2004	2001	2002	2011	2012
Active Launch Sites	Baikonur, Plesetsk	Baikonur, Dombarovsky	Baikonur, Plesetsk	Baikonur	Kourou	Kourou	Kourou
LEO kg (lbs)	2,150 (4,740)	3,700 (8,157)	4,850 (10,692)	23,000 (50,706)	21,000 (46,297)	4,850 (10,692)	2,300 (5,071)
GTO kg (lbs)	--	--	1,700 (3,800)	6,920 (15,256)	9,500 (20,944)	3,250 (7,165)	--

** The year the respective variant of a launch vehicle was launched for the first time.*

Table 7. Non-U.S. Commercially Available Launch Vehicles Active in 2014

Vehicle	Long March 2C	Long March 2D	Long March 3A	Long March 3C	H-IIA	PSLV CA	PSLV XL	GSLV Mk. II
Country/Region	China	China	China	China	Japan	India	India	India
2014 Total Launches	4	2	1	1	4	1	1	1
Launch Reliability (2014)	4/4 100%	2/2 100%	1/1 100%	1/1 100%	4/4 100%	1/1 100%	1/1 100%	1/1 100%
Launch Reliability (Last 10 Years)	17/18 94%	17/17 100%	15/15 100%	11/11 100%	24/25 96%	4/4 100%	4/4 100%	1/2 50%
Year of First Launch*	1975	1992	1994	2008	2001	2009	2012	2010
Active Launch Sites	Jiuquan, Taiyuan, Xichang	Jiuquan	Xichang	Xichang	Tanegashima	Satish Dhawan	Satish Dhawan	Satish Dhawan
LEO kg (lbs)	3,850 (8,488)	1,300 (2,866)	--	--	10,000 (23,046)	2,100 (4,630)	1,800 (3,968)	5,000 (11,023)
GTO kg (lbs)	1,250 (2,756)	--	2,600 (5,732)	3,800 (8,378)	6,000 (13,228)	--	1,140 (2,513)	2,500 (5,516)

** The year the respective variant of a launch vehicle was launched for the first time.*

Table 7. Non-U.S. Commercially Available Launch Vehicles Active in 2014 (continued)

2014 Worldwide Orbital Launch Events

Date			Vehicle	Site		Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
5-Jan-14			GSLV	Satish Dhawan		GSAT 14	GEO	ISRO	ISRO	Communications		S	S
6-Jan-14	√	+	Falcon 9	CCAFS	*	Thaicom 6	GEO	Thaicom	Orbital Sciences Corp.	Communications	$61.2M	S	S
9-Jan-14	√	+	Antares 120	MARS		Orb 1 (plus 33 satellites internally for ISS deployment)	LEO	Orbital Sciences Corp.	Orbital Sciences Corp.	Cargo	$80M	S	S
23-Jan-14			Atlas V 401	CCAFS		TDRS L	GEO	NASA	Boeing	Communications		S	S
5-Feb-14			Soyuz U	Baikonur		Progress 54P	LEO	Roscosmos	RSC Energia	Cargo		S	S
6-Feb-14	√		Ariane 5 ECA	Guiana Space Center	*	Athena Fidus	GEO	Itsalian Space Agency	Thales Alenia Space	Communications	$190M	S	S
						ABS 2	GEO	Asia Broadcast Satellite	Space Systems Loral	Communications			S
14-Feb-14	√		Proton M	Baikonur	*	Turksat 4A	GEO	Türksat A.Ş.	MELCO	Communications	$85M	S	S
20-Feb-14			Delta IV Medium+(4,2)	CCAFS		Navstar GPS 2F-05	MEO	USAF	Boeing	Navigation		S	S
27-Feb-14			H-IIA 202	Tanegashima		GPM-Core	LEO	JAXA/NASA	NASA, JAXA, Ball Aerospace, NICT	Remote Sensing			S
						Ginrei	LEO	Shinshu University	Shinshu University	Development			S
						STARS II	LEO	Kagawa University	Kagawa University	Development			S
						TeikyoSat 3	LEO	Teikyo University	Teikyo University	Scientific			S
						KSAT 2	LEO	Kagoshima University	Kagoshima University	Scientific		S	S
						OPUSAT	LEO	Osaka Prefecture University	Osaka Prefecture University	Development			S
						INVADER	LEO	University of Tokyo	University of Tokyo	Development			S
						ITF 1	LEO	Tsukuba University	Tsukuba University	Development			F
15-Mar-14			Proton M	Baikonur		Express AT1	GEO	RSCC	ISS Reshetnev	Communications		S	S
						Express AT2	GEO	RSCC	ISS Reshetnev	Communications			S
22-Mar-14	√		Ariane 5 ECA	Guiana Space Center	*	Astra 5B	GEO	SES	Airbus	Communications	$190M	S	S
					*	Amazonas 4A	GEO	Hispasat	Orbital Sciences Corp.	Communications			S
23-Mar-14			Soyuz 2.1b	Plestesk		Cosmos 2494 (Glonass M)	MEO	Russian Aerospace Defence Forces	ISS Reshetnev	Navigation		S	S
25-Mar-14			Soyuz FG	Baikonur		Soyuz TMA 12M	LEO	Roscosmos	RSC Energia	Crew		S	S
31-Mar-14			Long March 2C	Jiuquan		Shijian 11-06	SSO	PLA	CALT	Development		S	S
3-Apr-14			Atlas V 401	VAFB		USA 249 (DMSP-5D3-F19)	LEO	USAF	Lockheed Martin	Meteorological		S	S
3-Apr-14			Soyuz 2.1a	Guiana Space Center		Sentinel 1A	SSO	ESA	Thales Alenia Space	Scientific		S	S
4-Apr-14			PSLV XL	Satish Dhawan		IRNSS 1B	GEO	ISRO	ISRO	Navigation		S	S
9-Apr-14			Soyuz U	Baikonur		Progress 23M	LEO	Roscosmos	RKK Energia	Cargo		S	S
9-Apr-14			Shavit	Palmachim		Ofeq 10	LEO	IDF	IAI	IMINT		S	S
10-Apr-14			Atlas V 541	CCAFS		USA 250 (NRO L-67)	TBD	NRO	Classified	Classified		S	S
16-Apr-14			Soyuz U	Baikonur		EgyptSat 2	LEO	NARSS	RSC Energia	Remote Sensing		S	S
18-Apri-14	√	+	Falcon 9	CCAFS	*	Spx 3	LEO	SpaceX	SpaceX	Cargo	$61.2M	S	S
						KickSat	LEO	Cornell University	Cornell University	Communications			F
						ALL-STAR THEIA	LEO	CoSGC	CoSGC	Development			S
						SporeSat 1	LEO	Purdue University	Purdue University	Scientific			S
						TestSat-Lite	LEO	Taylor University	Taylor University	Development			S
						PhoneSat 2.5	LEO	NASA	NASA	Development			S

Date			Vehicle	Site		Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
28-Apr-14			Proton M	Baikonur		Luch 5V	GEO	Roscosmos	ISS Reshetnev	Communications			S
						KazSat 3	GEO	JSC KazSat	ISS Reshetnev, Thales Alenia Space	Communications		S	S
30-Apr-14			Vega	Guiana Space Center		KazEOSat 1	SSO	Kazakhstan Gharysh Sapary	Airbus	Remote Sensing		S	S
6-May-14			Soyuz 2.1a	Plesetsk		Cosmos 2495 (Kobalt M)	LEO	Russian Aerospace Defence Forces	TsSKB Progress	IMINT		S	S
15-May-14			Proton M	Baikonur		Express AM4R	GEO	RSCC	ISS Reshetnev	Communications		F	F
17-May-14			Delta IV Medium+(4,2)	CCAFS		USA 251 (Navstar GPS 2F-6)	MEO	USAF	Boeing	Navigation		S	S
22-May-14			Atlas V 401	CCAFS		USA 252	TBD	NRO	Classified	Classified		S	S
23-May-14			Rockot	Plesetsk		Cosmos 2496 (Strela 3M 10)	LEO	Russian Aerospace Defence Forces	NPO PM	Communications			S
						Cosmos 2497 (Strela 3M 11)	LEO	Russian Aerospace Defence Forces	NPO PM	Communications		S	S
						Cosmos 2498 (Strela 3M 12)	LEO	Russian Aerospace Defence Forces	NPO PM	Communications			S
24-May-14			H-IIA 202	Tanegashima		ALOS 2 (Daichi 2)	SSO	JAXA	JAXA	Remote Sensing			S
						RISING 2 (Raijin)	SSO	Tohoku University	Tohoku University	Remote Sensing			S
						UNIFORM 1	SSO	Wakayama University	Wakayama University	Remote Sensing		S	S
						SOCRATES	SSO	NICT	AES	Remote Sensing			S
						SPROUT	SSO	Nihon University	Nihon University	Development			S
26-May-14	√	+	Zenit 3SL	Odyssey Platform	*	Eutelsat 3B	GEO	Eutelsat	Airbus	Communications	$95M	S	S
28-May-14			Soyuz FG	Baikonur		Soyuz TMA 13M	LEO	Roscosmos	RSC Energia	Crew		S	S
14-Jun-14			Soyuz 2.1b	Plesetsk		Cosmos 2500 (Glonass M)	MEO	Russian Aerospace Defence Forces	ISS Reshetnev	Navigation		S	S
19-Jun-14	√		Dnepr	Dombarovsky	*	Deimos 2	SSO	Deimos Space	Satrec Initiative	Remote Sensing	$24M	S	S
						ANTELSAT	SSO	Uruguayan Facultad de Ingeniería de la Universidad de la República	Uruguayan Facultad de Ingeniería de la Universidad de la República	Development			S
						Aerocube 6	SSO	The Aerospace Corp.	The Aerospace Corp.	Development			S
					*	AprizSat 9 and 10	SSO	ExactEarth	Space Quest	Communications			S
						BRITE CA 1 and 2	SSO	UTIAS	UTIAS	Scientific			S
						BugSat 1	SSO	Satellogic S.A.	Satellogic S.A.	Remote Sensing			S
						DTUSat 2	SSO	Danmarks Tekniske Universitet	Danmarks Tekniske Universitet	Development			S
						Duchifat 1	SSO	Space Laboratory of the Herzliya Science Center	Space Laboratory of the Herzliya Science Center	Scientific			S
					*	Flock 1c 1-11	SSO	Planet Labs	Planet Labs	Remote Sensing			S
						Hodoyoshi 3 and 4	SSO	University of Tokyo	University of Tokyo	Remote Sensing			S
						KazEOSat 2	SSO	Kazakhstan Gharysh Sapary	Kazakhstan Gharysh Sapary	Remote Sensing			S
					*	Lemur 1	SSO	Spire	Spire	Development			S
						Nanosat C BR-1	SSO	INPE	INPE	Scientific			S
						PACE	SSO	National Cheng Kung University	National Cheng Kung University	Development			S
					*	Perseus M1 and 2	SSO	Dauria Aerospace	Dauria Aerospace	Remote Sensing			S
						PolyITAN 1	SSO	National Technical University of Ukraine	National Technical University of Ukraine	Development			S
					*	POPSAT HIP 1	SSO	Microspace	Microspace	Development			S
						QB50 P1 and P2	SSO	von Karman Institute	ISIS	Scientific			S
						SaudiSat 4	SSO	KACST	KACST	Development			S
					*	TableSat Aurora	SSO	SPUTNIX	SPUTNIX	Development			S
						Tigrisat	SSO	University of Rome	University of Rome	Remote Sensing			S
						UniSat 6	SSO	University of Rome	University of Rome	Development			S

Date			Vehicle	Site		Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
30-Jun-14	√		PSLV CA	Satish Dhawan	*	SPOT 7 (Azersky)	SSO	Azercosmos	Airbus	Remote Sensing			S
						AIsat	SSO	DLR	DLR	Development			S
						CanX-4 and 5	SSO	UTIAS	UTIAS	Development	$15M	S	S
						VELOX I	SSO	Nanyang Technological University	Nanyang Technological University	Development			S
2-Jul-14			Delta II 7320-10	VAFB		OCO 2	SSO	NASA	Orbital Sciences Corp.	Remote Sensing		S	S
3-Jul-14			Rockot	Plesetsk		Gonets M8	LEO	Roscosmos	NPO PM	Communications			S
						Gonets M9	LEO	Roscosmos	NPO PM	Communications		S	S
						Gonets M10	LEO	Roscosmos	NPO PM	Communications			S
8-Jul-14			Soyuz 2.1b	Baikonur		Meteor M2	SSO	Hydrometeorological Center of Russia	NPP VNIIEM	Meteorological			S
						AISat 2	SSO	UTIAS	UTIAS	IMINT			S
					*	DX 1	SSO	Dauria Aerospace	Dauria Aerospace	Development			S
						MKA PN2 (Relek)	SSO	Roscosmos	Lavotchkin	Scientific		S	S
					*	SkySat 2	SSO	Skybox Imaging	Skybox Imaging	Remote Sensing			S
					*	TechDemoSat 1	SSO	SSTL	SSTL	Development			S
						UKube 1	SSO	UK Space Agency	Clyde Space	Development			S
10-Jul-14	√		Soyuz 2.1b	Guiana Space Center	*	O3b FM3, FM6, FM7, FM8	MEO	O3b	Thales Alenia Space	Communications	$80M	S	S
13-Jul-14	√	+	Antares 120	MARS	*	Orb 2 (plus 33 satellites internally for ISS deployment)	LEO	Orbital Sciences Corp.	Orbital Sciences Corp.	Cargo	$80M	S	S
14-Jul-14	√	+	Falcon 9	CCAFS	*	ORBCOMM 2 F3, F4, F6, F7, F9, F11	LEO	ORBCOMM	Sierra Nevada Corp.	Communications	$61.2M	S	S
18-Jul-14			Soyuz 2.1a	Baikonur		Foton M4	LEO	Roscosmos	TsSKB Progress	Scientific		S	S
23-Jul-14			Soyuz U	Baikonur		Progress M24	LEO	Roscosmos	RSC Energia	Cargo		S	S
28-Jul-14			Delta IV Medium+(4,2)	CCAFS		USA 253 (GSSAP 1)	GEO	USAF	Orbital Sciences Corp.	IMINT			S
						USA 254 (GSSAP 2)	GEO	USAF	Orbital Sciences Corp.	IMINT		S	S
						USA 255 (ANGELS)	GEO	AFRL	Lockheed Martin	Development			S
29-Jul-14			Ariane 5 ES	Guiana Space Center		ATV 5 (Georges Lemaître)	LEO	ESA	Airbus	Cargo		S	S
2-Aug-14			Atlas V 401	CCAFS		USA 256 (Navstar GPS 2F-7)	MEO	USAF	Boeing	Navigation		S	S
5-Aug-14	√	+	Falcon 9	CCAFS	*	AsiaSat 8	GEO	AsiaSat	Space Systems Loral	Communications	$61.2M	S	S
9-Aug-14			Long March 4C	Jiuquan		Yaogan 20A, 20B, 20C	LEO	PLA	CAST	IMINT		S	S
13-Aug-14	√	+	Atlas V 401	VAFB	*	WorldView 3	SSO	DigitalGlobe	Ball Aerospace	Remote Sensing	$150M	S	S
19-Aug-14			Long March 4B	Taiyuan		Gaofen 2	SSO	CNSA	CAST	Remote Sensing			S
						Heweliusz	SSO	Polish Academy of Sciences	Space Research Center	Scientific		S	S
22-Aug-14			Soyuz 2.1b	Guiana Space Center		Galileo FOC 1 (Doresa)	MEO	European Global Navigation Satellite Systems Agency	OHB System GmbH	Navigation			F
						Galileo FOC 2 (Milena)	MEO	European Global Navigation Satellite Systems Agency	OHB System GmbH	Navigation		P	F
4-Sep-14			Long March 2D	Jiuquan		Chuangxin 1-04	SSO	Chinese Academy of Sciences	Chinese Academy of Sciences	Communications		S	S
						Lingqiao	SSO	Tsinghua University	Tsinghua University	Development			S
7-Sep-14	√	+	Falcon 9	CCAFS	*	AsiaSat 6	GEO	AsiaSat	Space Systems Loral	Communications	$61.2M	S	S
8-Sep-14			Long March 4B	Taiyuan		Yaogan 21	SSO	Chinese National Space Agency	CAST	IMINT			S
						Tiantuo 2	SSO	National University of Defense Technology	National University of Defense Technology	Development		S	S
11-Sep-14	√		Ariane 5 ECA	Guiana Space Center	*	MEASAT 3B	GEO	MEASAT Satellite Systems	Airbus	Communications	$190M	S	S
					*	Optus 10	GEO	SingTel Optus	Space Systems Loral	Communications			S
17-Sep-14			Atlas V 401	CCAFS		USA 257 (CLIO)	TBD	NRO	Classified	Classified		S	S

Date			Vehicle	Site		Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
21-Sep-14	√	+	Falcon 9	CCAFS	*	Spx 4 (plus 1 satellite internally for ISS deployment)	LEO	SpaceX	SpaceX	Cargo	$61.2M	S	S
25-Sep-14			Soyuz FG	Baikonur		Soyuz TMA-14M	LEO	Roscosmos	RSC Energia	Crew		S	S
27-Sep-14			Proton M	Baikonur		Olymp K	GEO	Russian Aerospace Defence Forces	ISS Reshetnev	Communications		S	S
28-Sep-14			Long March 2C	Jiuquan		Shijian 11-07	SSO	PLA	Dongfanghong Satellite Co.	Development		S	S
7-Oct-14			H-IIA 202	Tanegashima		Himawari 8	GEO	Japan Meteorological Agency	MELCO	Meteorological		S	S
15-Oct-14			PSLV XL	Satish Dhawan		IRNSS 1C	GEO	ISRO	ISRO	Navigation		S	S
16-Oct-14	√		Ariane 5 ECA	Guiana Space Center	*	Intelsat 30	GEO	Intelsat	Space Systems Loral	Communications	$190M	S	S
					*	ARSAT 1	GEO	AR-SAT	INVAP	Communications			S
20-Oct-14			Long March 4C	Taiyuan		Yaogan 22	SSO	PLA	CAST	IMINT		S	S
21-Oct-14			Proton M	Baikonur		Express AM6	GEO	RSCC	ISS Reshetnev	Communications		S	S
23-Oct-14			Long March 3C	Xichang		Chang'e 5	EXT	Chinese National Space Agency	CAST	Development		S	S
27-Oct-14			Long March 2C	Jiuquan		Shijian 11-08	SSO	PLA	Dongfanghong Satellite Co.	Development		S	S
28-Oct-14	√	+	Antares 120	MARS	*	Orb 3 (plus 29 satellites internally for ISS deployment)	LEO	Orbital Sciences Corp.	Orbital Sciences Corp.	Cargo	$80M	F	F
29-Oct-14			Soyuz 2.1a	Baikonur		Progress M25	LEO	Roscosmos	RSC Energia	Cargo		S	S
29-Oct-14			Atlas V 401	CCAFS		USA 258 (Navstar GPS 2F-8)	MEO	USAF	Boeing	Navigation		S	S
30-Oct-14			Soyuz 2.1a	Plesetsk		Meridian 7	ELI	Russian Aerospace Defence Forces	ISS Reshetnev	Communications		S	S
6-Nov-14	√		Dnepr	Dombarovsky		Asnaro 1	SSO	J-spacesystems	NEC	Development	$24M	S	S
						Chubusat 1	SSO	Nagoya University	Nagoya University	Development			S
						Hodoyoshi 1	SSO	University of Tokyo	University of Tokyo	Remote Sensing			S
						QSAT-EOS	SSO	Kyushu University	Kyushu University	Development			S
						TSUBAME	SSO	Tokyo Institute of Technology	Tokyo Institute of Technology	Scientific			S
14-Nov-14			Long March 2C	Taiyuan		Yaogan 23	SSO	PLA	CAST	IMINT		S	S
20-Nov-14			Long March 2D	Jiuquan		Yaogan 24	SSO	PLA	CAST	IMINT		S	S
21-Nov-14			Kuaizhou	Jiuquan		Kuaizhou 2	LEO	Chinese Academy of Sciences	Chinese Academy of Sciences	Development		S	S
23-Nov-14			Soyuz FG	Baikonur		Soyuz TMA-15M	LEO	Roscosmos	RSC Energia	Crew		S	S
30-Nov-14			Soyuz 2.1b	Plesetsk		Cosmos 2502 (Glonass K1)	MEO	Russian Aerospace Defence Forces	ISS Reshetnev	Navigation		S	S
3-Dec-14			H-IIA 202	Tanegashima		Hayabusa 2	EXT	JAXA	NEC	Scientific		S	S
						DESPATCH	EXT	Tama Art University	Tama Art University	Development			S
						PROCYON	EXT	JAXA	NEC	Scientific			S
						Shin'en 2	EXT	Kagoshima University	Kagoshima University	Development			S
5-Dec-14	√	+	Delta IV Heavy	CCAFS		EFT 1	LEO	NASA	Lockheed Martin	Development	$350M	S	S
6-Dec-14	√		Ariane 5 ECA	Guiana Space Center	*	DirecTV 14	GEO	DirecTV	Space Systems Loral	Communications	$190M	S	S
					*	GSAT 16	GEO	ISRO	ISRO	Communications			S
7-Dec-14			Long March 4B	Taiyuan		CBERS 4	SSO	INPE/CASC	CASC	Remote Sensing		S	S
10-Dec-14			Long March 4C	Jiuquan		Yaogan 25A, 25B, 25C	SSO	PLA	CAST	IMINT		S	S
13-Dec-14			Atlas V 541	VAFB		USA 259 (NRO L-35)	TBD	NRO	Classified	Classified		S	S
15-Dec-14			Proton M	Baikonur		Yamal 401	GEO	Gazprom	Thales Alenia Space	Communications		S	S
18-Dec-14	√		Soyuz 2.1b	Guiana Space Center		O3b FM9, FM10, FM11, FM12	MEO	O3b	Thales Alenia Space	Communications	$80M	S	S
19-Dec-14			Strela	Baikonur		Kondor E	LEO	Roscosmos	NPO PM	Remote Sensing		S	S
23-Dec-14			Angara A5	Plesetsk		Dummy Payload	LEO	Khurnichev	Khrunichev	Test		S	S
25-Dec-14			Soyuz 2.1b	Plesetsk		Cosmos 2503 (Lotos S)	LEO	Russian Aerospace Defence Forces	TsSKB Progress, KB Arsenal	ELINT		S	S

Date		Vehicle	Site		Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
26-Dec-14		Soyuz 2.1b	Baikonur		Resurs P2	SSO	Roscosmos	TsSKB Progress	Remote Sensing		S	S
27-Dec-14		Long March 4B	Taiyuan		Yaogan 26	SSO	PLA	CAST	IMINT		S	S
27-Dec-14	√	Proton M	Baikonur	*	Astra 2G	GEO	SES	Airbus	Communications	$85M	S	S
31-Dec-14		Long March 3A	Xichang		Fengyun 2G	GEO	China Meteorological Administration	SAST	Meteorological		S	S

√ Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed, or privately financed launch activity. For multiple manifested launches, certain secondary payloads whose launches were commercially procured may also constitute a commercial launch.
+ Denotes FAA-licensed launch.
* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity.
L and M refer to the outcome of the Launch and Mission: S=Success, P=Partial Success, F=Failure.
Notes: All prices are estimates.
All launch dates are based on local time at the launch site.

DEFINITIONS

Commercial Suborbital or Orbital Launch

A commercial suborbital or orbital launch has one or more of these 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

A launch failure happens when the payload does not reach a usable orbit (an orbit where some portion of the mission can be salvaged) or is 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 has one or both of these 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 telecommunications satellites whose transponders are partially or totally leased to a variety of organizations, some or all of which generate revenues. Examples include Russia's Express and Ekran series of spacecraft.

All other payloads are classified as non-commercial (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. Geosynchronous (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., near or on 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), SSO (Sun Synchronous Orbit), and all other orbits or trajectories. ELI ("elliptical") describes a highly elliptical orbit (such as those used for Russian Molniya satellites), and EXT ("external") describes trajectories beyond GEO (such as interplanetary trajectories).

Vehicle Mass Class

Small launch vehicles are defined as those with a payload capacity of less than 2,268 kilograms (5,000 pounds) at 185 kilometers (100 nautical miles) altitude and a 28.5-degree inclination. Medium to heavy launch vehicles are capable of carrying more than 2,269 kilograms at 185 kilometers altitude and a 28.5-degree inclination.

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Federal Aviation Administration
Office of Commercial Space Transportation

800 Independence Avenue SW
Washington, DC 20591

http://www.faa.gov/go/ast