Federal Aviation Administration

Semi-Annual Launch Report

October 2010

Reviewing Launch Results from the 2nd and 3d Quarter 2010, and Forecasting Launches for the 4th Quarter 2010 and 1st Quarter 2011

Special Report: “ITAR-Free” Satellites and Their Impact on the U.S. Launch Industry

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Introduction

The *Semi-Annual Launch Report: Second Half of 2010* features launch results from April 2010 through September 2010 and forecasts the period of October 2010 through March 2011. This report contains information on worldwide commercial, civil, and military orbital and commercial suborbital space launch events. Projected launches have been identified from open sources, including industry contacts, company manifests, periodicals, and government sources. Projected launches are subject to change.

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

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

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

The FAA follows a half-year schedule for publishing this report. The next Semi-Annual Launch Report will be published in April 2011.

Contents

Highlights: April - September 2010

Proton M Successfully Launched SES-1

On April 24, 2010, an International Launch Services (ILS) Proton M lifted off from Baikonur, Kazakhstan, placing SES-1 (formerly known as AMC-4R), a telecommunications satellite operated by SES World Skies, into geostationary orbit (GEO). The satellite, built by Orbital Sciences Corporation, carries 24 C and 24 Ku-band transponders.

Ariane 5 Successfully Launched Astra 3B and COMSAT Bw 2

On May 20, 2010, Ariane 5 successfully placed the Astra 3B satellite into GEO. Astra 3B is a direct broadcast telecommunications satellite operated by SES Astra. The satellite was built by EADS Astrium and carries 60 Ku and 4 Ka-band transponders. The launch of Astra 3B was a dual manifest alongside COMSAT Bw 2, a satellite operated by the German Defense Ministry.

Proton M Successfully Launched BADR-5

On June 3, 2010, an ILS Proton M lifted off from Baikonur, placing BADR-5, a telecommunications satellite operated by Arabsat, into GEO. The satellite was designed and manufactured by EADS Astrium and carries 58 Ku and 4 Ka-band transponders.

Successful Inaugural Launch of Falcon 9

Space Exploration Technologies (SpaceX) Corp.'s Falcon 9 rocket was launched on June 4, 2010, carrying a demo flight Dragon capsule into low Earth orbit (LEO). Falcon 9 is a two-stage rocket fueled with liquid oxygen and kerosene. It lifted off from Cape Canaveral Air Force Station.

Ariane 5 Successfully Launched COMS 1 and Arabsat 5A

On June 27, 2010, Ariane 5 successfully placed COMS 1 into GEO. COMS 1 is a Communication, Ocean and Meteorological Satellite operated by KARI (Korean Advanced Research Institute). The satellite was designed and built by EADS Astrium to accomplish a combined telecommunications and weather mission. The launch of COMS 1 was a dual manifest alongside Arabsat 5A, a telecommunications satellite operated by Arabsat.

Release of the U.S. National Space Policy

On June 28, 2010, the White House released the U.S. National Space Policy, laying out the Administration's vision for continued space exploration. The new policy emphasizes expanding international cooperation in space, extends U.S. participation in the International Space Station through 2020, and calls to "pursue potential opportunities for transferring routine, operational space functions to the commercial space sector where beneficial and cost-effective."

Proton M Successfully Launched EchoStar XV

On July 7, 2010, ILS launched the EchoStar 15 into GEO aboard a Proton M rocket launched from Baikonur. The telecommunications satellite was built by Space Systems/Loral and is operated by EchoStar to serve Dish Network direct broadcast customers in the United States.

Ariane 5 Successfully Launched Rascom 1R and Nilesat 201

On August 4, 2010, Ariane 5 successfully launched Rascom 1R. Rascom 1R is a GEO satellite operated by an African multinational telecommunications organization, RascomStar-QAF. The satellite was designed and built by Thales Alenia Space. The launch of Rascom 1R was a dual manifest alongside Nilesat 201, a telecommunications satellite providing direct broadcast services to Egypt and the Middle East.

Failure of GSLV Mark 2 Launching GSAT 4

On April 14, 2010, the Indian GSLV Mark 2 launch vehicle was scheduled to launch GSAT 4, an Indian hybrid telecommunications and navigation GEO satellite. Following normal operation of the first and second stages, the cryogenic upper stage failed to perform normally after separation and ignition. It performed a ballistic re-entry with GSAT 4 still attached and fell into the Indian Ocean. The results of a subsequent investigation suggested that the failure could have been caused by the liquid hydrogen turbo-pump, which was shut down due to starvation of liquid hydrogen fuel.

Failure of KSLV 1 Launching ST-SAT 2B

On June 8, 2010, the Korean KSLV 1 failed to launch a Korean low Earth orbit (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. Reportedly, the debris from the explosion were recovered by the South Korean Navy.

Vehicle Use

(April 2010 - September 2010; October 2010 - March 2011)

Figure 1: Total Launch Vehicle Use: Last Six Months (April 2010 - September 2010)

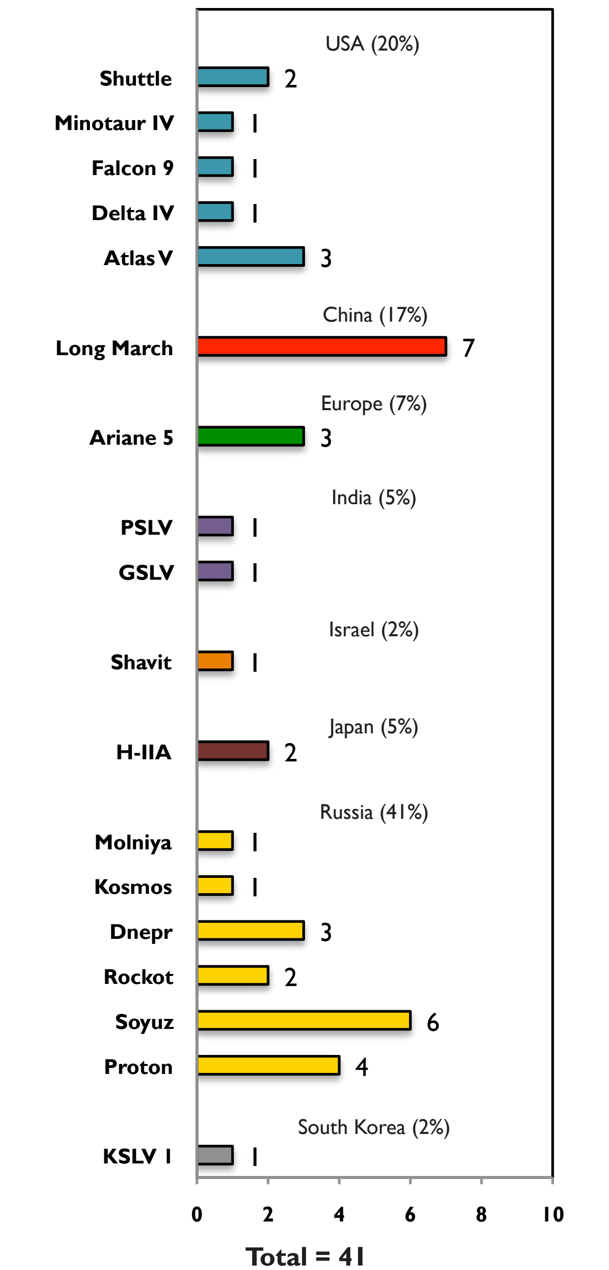


Figure 2: Total Projected Launch Vehicle Use: Next Six Months (October 2010 - March 2011)

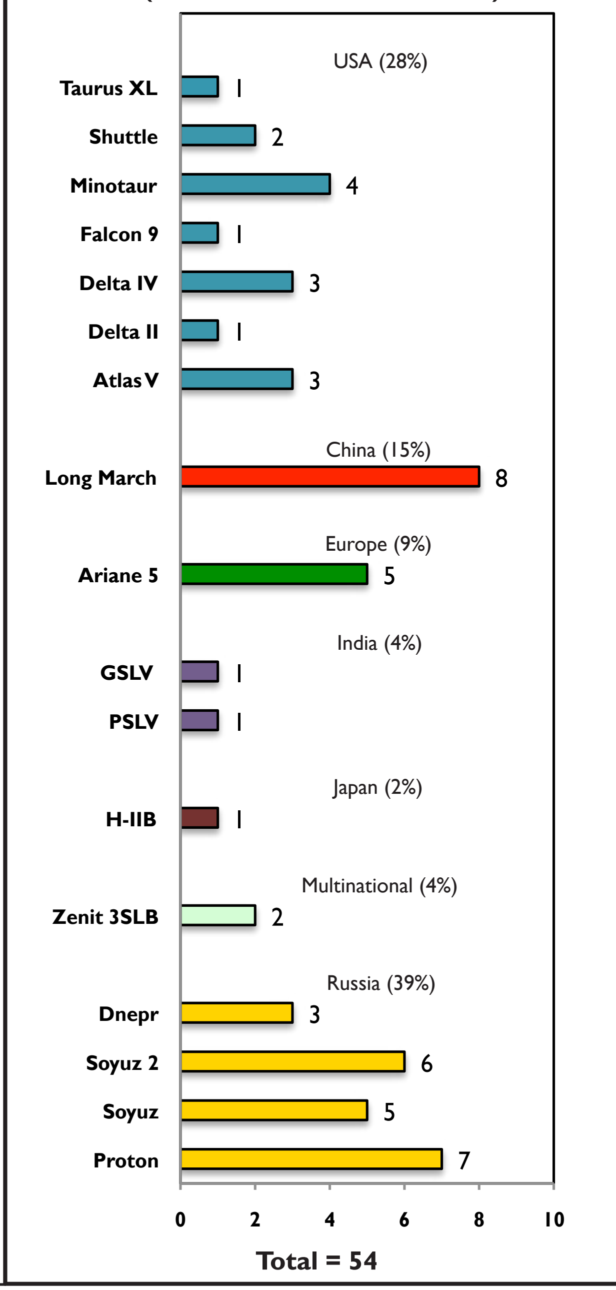


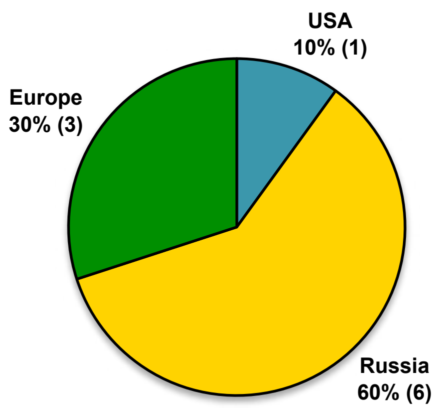
Figure 1 shows the total number of orbital and commercial suborbital launches of each launch vehicle and the resulting market share that occurred from April 2010 through September 2010. **Figure 2** projects this information for the period from October 2010 through March 2011. The launches are grouped by the country in which the primary vehicle manufacturer is based. Exceptions to this grouping are launches performed by Sea Launch, which are designated as multinational.

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

Commercial Launch Events by Country

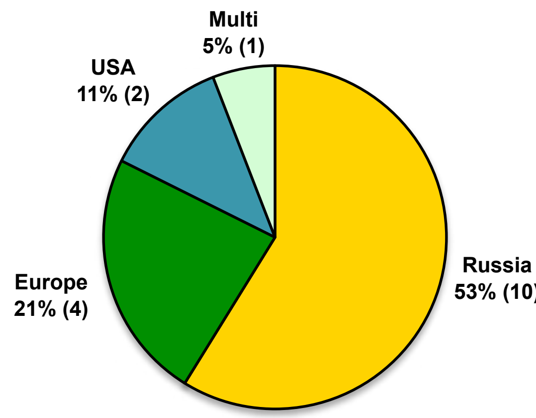
(April 2010 - September 2010; October 2010 - March 2011)

Figure 3: Commercial Launch Events by Country: Last Six Months (April 2010 - September 2010)



Total = 10

Figure 4: Projected Commercial Launch Events by Country: Next Six Months (October 2010 - March 2011)



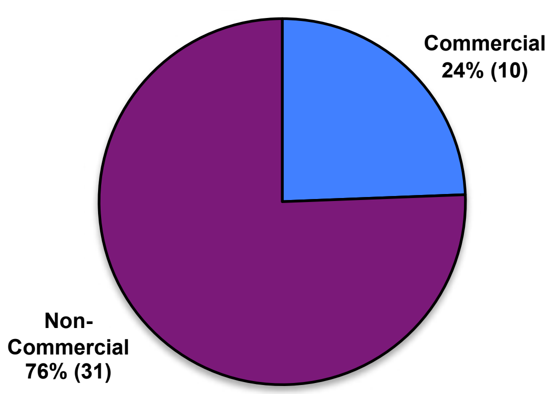
Total = 17

Figure 3 shows all commercial orbital and suborbital launch events that occurred from April 2010 through September 2010. **Figure 4** projects this information for the period from October 2010 through March 2011.

Commercial vs. Non-Commercial Launch Events

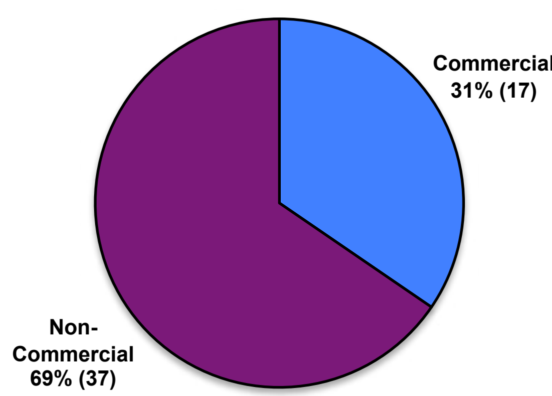
(April 2010 - September 2010; October 2010 - March 2011)

Figure 5: Commercial vs. Non-Commercial Launch Events: Last Six Months (April 2010 - September 2010)



Total = 41

Figure 6: Projected Commercial vs. Non-Commercial Launch Events: Next Six Months (October 2010 - March 2011)



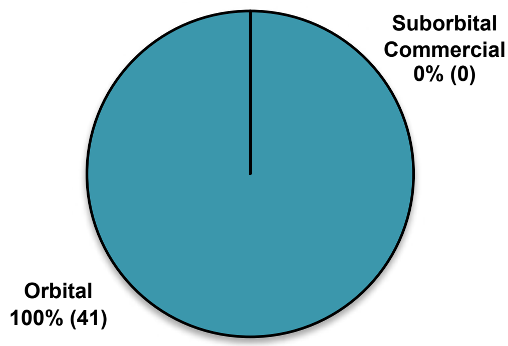
Total = 54

Figure 5 shows commercial vs. non-commercial orbital and suborbital launch events that occurred from April 2010 through September 2010. **Figure 6** projects this information for the period from October 2010 through March 2011.

Orbital vs. Commercial Suborbital Launch Events

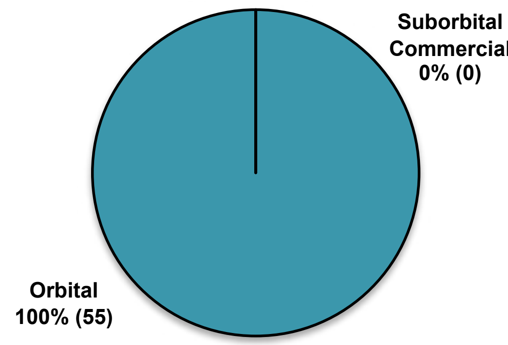
(April 2010 - September 2010; October 2010 - March 2011)

Figure 7: Orbital vs. Suborbital Launch Events: Last Six Months (April 2010 - September 2010)



Total = 41

Figure 8: Projected Orbital vs. Suborbital Launch Events: Next Six Months (October 2010 - March 2011)



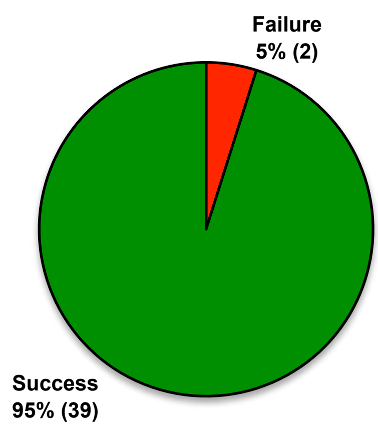
Total = 54

Figure 7 shows orbital vs. FAA-licensed commercial suborbital launch events (or their international equivalents) that occurred from April 2010 through September 2010. **Figure 8** projects this information for the period from October 2010 through March 2011.

Launch Successes vs. Failures

(April 2010 - September 2010)

Figure 9: Launch Successes vs. Failures: Last Six Months (April 2010 - September 2010)



Total = 41

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

Note: see the Hightlights section for details on GSLV Mark 2 and KSLV 1 launch failures.

Payload Use (Orbital Launches Only)

(April 2010 - September 2010; October 2010 - March 2011)

Figure 10: Payload Use: Last Six Months (April 2010 - September 2010)

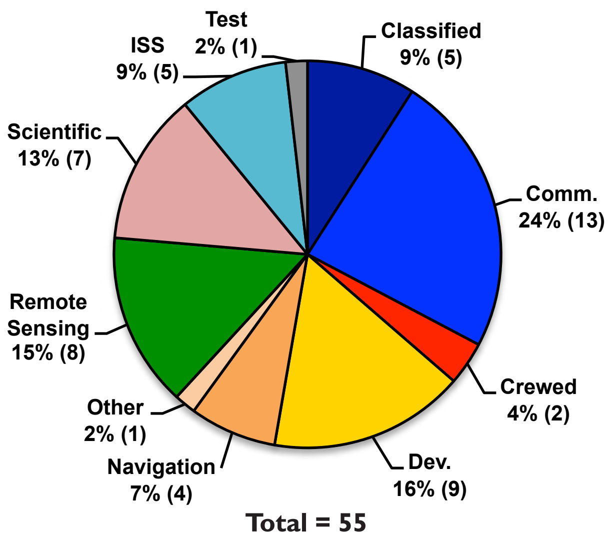


Figure 11: Project Payload Use: Next Six Months (October 2010 - March 2011)

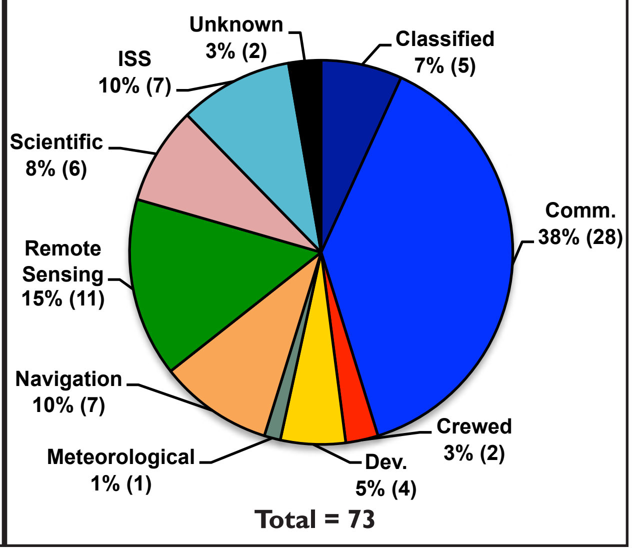


Figure 10 shows actual payload use (commercial and government) for the period from April 2010 through September 2010. **Figure 11** projects this information for the period from October 2010 through March 2011. The total number of payloads launched may not equal the total number of launches, due to multiple manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Payload Mass Class (Orbital Launches Only)

(April 2010 - September 2010; October 2010 - March 2011)

Figure 12: Payload Mass Class: Last Six Months (April 2010 - September 2010)

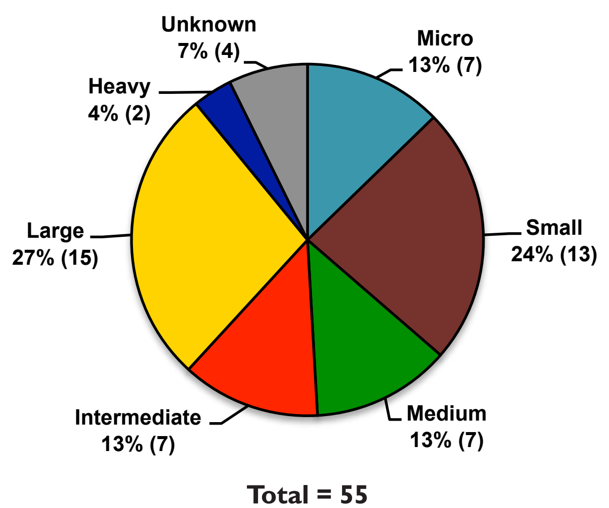


Figure 13: Projected Payload Mass Class: Next Six Months (October 2010 - March 2011)

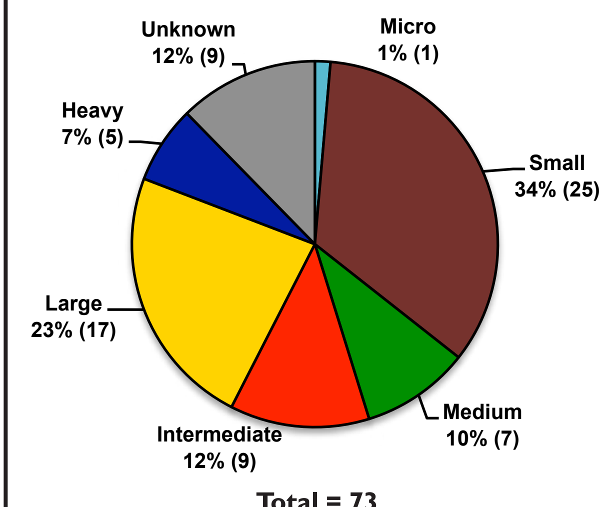
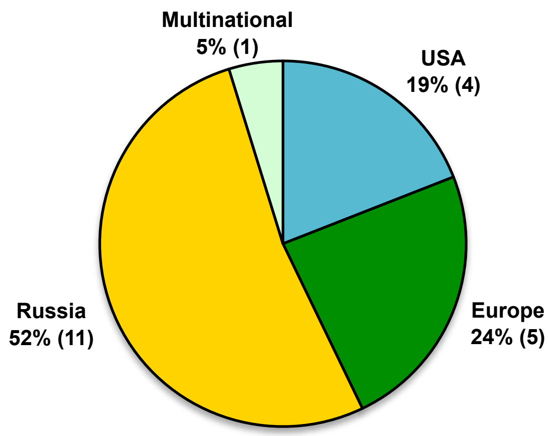


Figure 12 shows actual payloads by mass class (commercial and government) for the period from April 2010 through September 2010. **Figure 13** projects this information for the period from October 2010 through March 2011. The total number of payloads launched may not equal the total number of launches, due to multiple manifesting, i.e., the launching of more than one payload by a single launch vehicle.

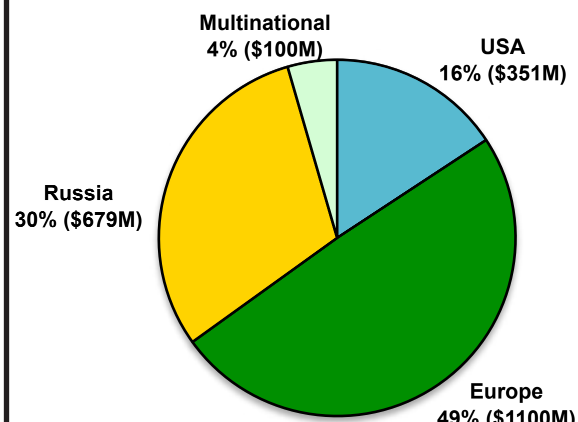
Commercial Launch Trends (Orbital Launches Only)
(October 2009 - September 2010)

Figure 14: Commercial Launch Events, Last 12 Months



Total = 21

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



Total = $2,230M

Figure 14 shows commercial orbital launch events for the period from October 2009 through September 2010 by country. **Figure 15** shows estimated commercial launch revenue for orbital launches for the period from October 2009 through September 2010 by country.

Commercial Launch Trends (Suborbital Launches and Experimental Permits)
(October 2009 - September 2010)

There were no FAA-licensed commercial suborbital launch events (or their international equivalents) or FAA Experimental Permit flights during the last 12 months.

Commercial Launch History

(January 2005 - December 2009

Figure 16: Commercial Launch Events by Country, Last Five Years

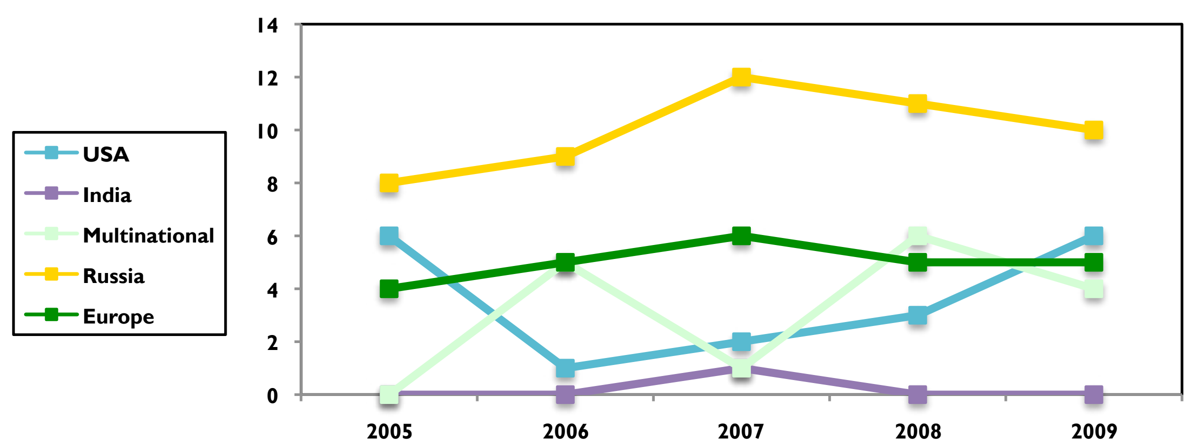


Figure 16 shows commercial launch events by country for the last five full calendar years.

Figure 17: Estimated Commercial Launch Revenue (in US$ millions) by Country, Last Five Years

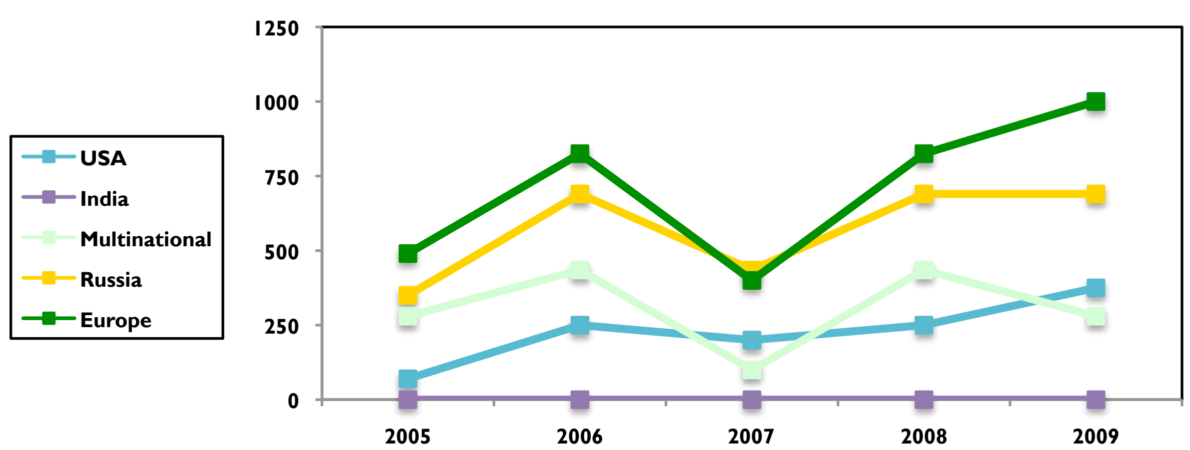


Figure 17 shows estimated commercial launch revenue by country for the last five full calendar years.

Special Report on "ITAR-Free" Satellites and Their Impact on the U.S. Launch Industry

The purpose of this report is to provide a brief introduction to the background of commercial geostationary (GEO) communications satellites that are not subject to U.S. export control regulations (sometimes referred to with the marketing term "ITAR-Free"). This introduction is enhanced by launch and payload information regularly tracked by FAA/AST. This report also provides a brief history of ITAR regulations and sanctions that restrict export of U.S. satellite technology to specific countries. Finally, this report describes some of the impacts and potential effects of "ITAR-free" satellites on the commercial launch industry.

Background

ITAR, or the International Traffic in Arms Regulations, regulates exports of defense-related hardware and technologies. The ITAR regime makes and enforces rules that restrict exporting U.S. commercial satellites and satellite components, including exporting satellites for launch. The ITAR rules were first applied to U.S. commercial satellites in 1999, when Congress moved satellite technology from the Department of Commerce's Commerce Control List to the State Department's Munitions List.

In addition to ITAR restrictions, a set of U.S. sanctions also limits exporting U.S.-built satellite technology for launch on Chinese and Indian vehicles. For China, these sanctions[1] include the Tiananmen Square sanctions and those imposed on Chinese organizations for exporting missile technology to countries such as Pakistan and Iran.[2] In 1998, the U.S. imposed sanctions on cooperation with India in the field of space and missile technology, following the underground nuclear tests conducted in India in the same year. Those sanctions were eased following the 2008 U.S.-India civilian nuclear deal[3] that allowed for more cooperation in space science and technology. However, restrictions on launching commercial satellites from India remain.[4] According to the ITAR rules and above sanctions, U.S.-built satellites and components are not approved for export to launch on Chinese or Indian vehicles.

In addition to limiting where U.S.-built satellites (and those with U.S. components) can be launched, the new ITAR regime added regulatory reviews to the process of exporting satellites to all countries, which could extend the

[1] "China: Economic Sanctions," CRS Report for Congress, May 18, 2005 (http://www.au.af.mil/au/awc/awcgate/crs/rl31910.pdf).

[2] "China Missile Milestones - 1956-2008," *The Risk Report*, Volume 14 Number 6 (November-December 2008). Wisconsin Project on Nuclear Arms Control (http://www.wisconsinproject.org/countries/china/missile-miles.htm).

[3] "The U.S.-India Nuclear Deal," Council on Foreign Relations (http://www.cfr.org/publication/9663/usindia_nuclear_deal.html).

[4] "DDTC Issues Policy Guidance Regarding Exports of ITAR Components Destined for Satellites Launched From India," *International Trade Law News*, July 2009 (http://www.djacobsonlaw.com/2009/07/ddtc-issues-policy-guidance-regarding.html).

time between satellite order and launch. The ITAR rules also increased limitations on the information that can be shared between satellite manufacturers, insurers, and foreign customers, limiting technical discussions.

The Introduction of "ITAR-Free" GEO Satellites

Because of restrictions on exporting U.S.-built satellites for launch, in 2001 a European satellite manufacturer announced that it would market versions of its GEO commercial communications satellites made without U.S. components subject to ITAR regulations, thus hoping to expand its share in the market of commercial GEO communications satellites, the most developed of international space markets. Thales Alenia Space (then Alcatel Alenia Space) called these versions of its Spacebus satellite models "ITAR-free."

What are ITAR-Free Satellites?

"ITAR-free" was originally introduced as a marketing term by Thales, although it is frequently used to describe all satellites manufactured without U.S.-made satellite components. The move to develop and market modern European-built commercial communications GEO satellites manufactured without U.S. components pursued two goals. First, it offered customers the flexibility to launch spacecraft on any launch vehicle, including those (such as Long March) that are restricted for U.S.-built satellites or satellites with U.S. components. Second, it addressed satellite buyers' concerns that ITAR might slow them down or that permits and licenses might not be granted, leading to launch delays and potential loss of revenue by satellite operators. One other type of satellite marketed internationally also pursues these goals, GEO commercial communications satellites developed and manufactured in China. Chinese-built ITAR-free satellites are marketed to Chinese commercial satellite operators and to customers (mostly governments) seeking cheaper telecommunications solutions and sometimes having political reasons to avoid buying U.S. technology.

For the purposes of this report, the term "ITAR-free satellite" refers to commercial GEO communications satellites built without any U.S. components and designed for launch on a restricted vehicle.

Some other GEO commercial satellites, such as those manufactured and launched in Russia, although free from U.S.-manufactured components, are not intended for launch on a restricted vehicle and are not considered in this report.

India also has a space industry that includes domestically built satellites. They build and launch their own domestic GEO commercial communications satellites but have not yet provided a launch for a foreign commercial GEO communications satellite.

Similar to Thales' development of ITAR-free satellites, some European and other countries' space industries pursued developments that would decrease their dependence on U.S.-built components and related U.S. export regulations. European governments encouraged their space industries to develop and advance European-built spacecraft component technologies, in which U.S. manufacturers are currently leaders, to increase autonomy of the European space industry. Since the Canadian Government blocked the takeover of Canadian aerospace company MacDonald, Dettwiler and Associates (MDA) by U.S. firm Alliant Techsystems (ATK), there has been a national discussion on whether the Canadian space and defense industry should be less dependent on U.S. technology export restrictions.[5] This discussion in Canada is not limited exclusively to the space industry and includes, for instance, the Canadian Navy.[6] Although similar in nature, these developments were not specifically intended to gain access to restricted launch vehicles or to satisfy specific concerns of commercial customers and, therefore, will not be further discussed herein.

It is also worth noting that other foreign commercial satellite manufacturers (including another major European aerospace company EADS) appear less focused on the perceived demand for ITAR-free satellites or following Thales' example.

For the purposes of this report, unless publicly declared as free of U.S. components, all commercial GEO communications satellites other than the ITAR-free satellites as defined above (Thales built and Chinese ITAR-free satellites), the domestically-built Indian and Russian commercial GEO communications satellites, and those not intended for launch on a restricted vehicle are assumed to be built using U.S. components.

Other Aspects of Building ITAR-Free Satellites

The early ITAR-free GEO satellites built by Thales were reported to be about six percent more expensive to manufacture, because U.S. component manufacturers' production lines were not used. Although moving to a fully ITAR-free satellite product line could reduce this cost, Thales maintains both the ITAR-free and "conventional" satellite product lines, citing "difficulty [for the ITAR-free supply chain to increase] throughput in the short term."[7]

Chinese-built ITAR-free satellites have experienced a series of problems in recent years. The DFH-4, the latest GEO satellite bus model marketed by China, has suffered repeated solar array failures over the last several years. Two of the launched DFH-4 satellites are no longer operating, and another has suffered an anomaly potentially reducing its orbit life by five years. One more DFH-4 satellite remains significantly underused in orbit, causing rumors of a

[5] "The Future of Canada in Space," *The Space Review*, December 2008 (http://www.thespacereview.com/article/1261/1).
[6] "Canadian Forces Looks For Equipment Free Of U.S. Controls," *Ottawa Citizen*, January 26, 2010 (http://communities.canada.com/ottawacitizen/blogs/defencewatch/archive/2010/01/26/canadian-forces-eyes-equipment-free-of-u-s-controls.aspx).
[7] "China Launches New Communications Satellite," *Space.com*, 6 July 2007 (http://www.space.com/missionlaunches/070706_chinasat6b_lnch.html).

similar solar power subsystem anomaly (albeit denied by its owner). Replacement or follow-on satellites are currently under construction in China.

Shortly before this report was released, the ITAR-freeW3B satellite, manufactured by Thales was successfully launched by the Ariane 5 rocket but was declared a total loss soon after separation following a discovery of a propellant tank leak. The satellite was originally intended for launch on a Long March rocket but switched to Ariane 5 in the beginning of 2010.[8] *The failure of W3B may cause delays in the manufacturing schedule of a "nearly identical" Eutelsat satellite W3C planned for a Long March launch in 2011 if additional time is required for the failure cause investigation.*

Potential Impact of ITAR-Free Satellites on the Commercial Launch Industry

Before the changes in ITAR regulations between 1996 and 1998, GEO satellites manufactured by non-Chinese companies launched on Long March vehicles at a rate of about two to three per year.[9] In the first few years after the regulatory change, this number dropped to zero. As mentioned above, one of the original goals for developing ITAR-free non-U.S.-built satellites was to regain access to less expensive launch options aboard the Chinese (and potentially in the future, Indian) launch vehicles. However, the impact of ITAR-free GEO commercial communications satellites on the commercial launch industry has been complex.

Launches of Existing and Planned ITAR-Free Satellites

Ten GEO telecommunications satellites that can be considered ITAR-free were launched between 2005 and the end of September in 2010 (detailed in table SR1). All ten spacecraft were originally scheduled to be launched by Chinese Long March vehicles (one spacecraft was eventually transferred to Ariane 5). This has enabled China to reenter and gain experience in the international commercial launch market. The satellites were manufactured for the Chinese, Indonesian, Venezuelan, Nigerian, and multinational African operators. Five satellites were manufactured by Thales Alenia Space and five satellites by the Chinese spacecraft manufacturer CAST.

Launches of nine more satellites considered to be ITAR-free are scheduled for the remainder of 2010 to 2013. All these spacecraft, listed in Table SR1, were originally scheduled for launch aboard Long March rockets, and one was subsequently moved to Ariane 5. They are being manufactured for the European operator Eutelsat and Chinese, Laotian, Bolivian, and Nigerian operators by Thales Alenia Space (four satellites) and CAST/DFH Satellite Co. of China (five satellites).

[8] "Eutelsat W3B Declared Total Loss Shortly After Launch Aboard Ariane 5," *Space News*, October 29, 2010 (http://spacenews.com/launch/101029-eutelsat-w3b-declared-total-loss.html).
[9] Four Chinese commercial launches of Iridium NGSO satellites took place in the same period.

Table SR1 - Launches of Commercial GEO Communications Satellites Considered to be ITAR-Free[10]

ITAR-Free Satellite	Owner/Operator	Prime Contractor	Bus Type	Launch Date	Launch Vehicle	Mass at Launch (kg)
APStar 6	APT Satellite (China - Hong Kong)	Thales Alenia Space	Spacebuss 4000	April 12, 2005	Long March 3B	4,680
Sinosat 2	Sinosat (China)	China Academy of Space Technology (CAST)	DFH-4	October 29, 2006	Long March 3B	5,100
Nigcomsat 1	National Space Research and Development Agency (Nigeria)	CAST	DFH-4	May 14, 2007	Long March 3B	5,200
Sinosat 3	Sinosat (China)	CAST	DFH-3A	June 1, 2007	Long March 3A	2,200
Chinasat 6B	Chinsat (China)	Thales Alenia Space	Spacebus 4000	July 5, 2007	Long March 3B	4,600
Rascom-QAF 1	Regional African Satellite Communication Organization (RascomStar-QAF)	Thales Alenia Space	Spacebus 4000	December 21, 2007	Ariane 5	3,200
Chinasat 9	Chinasat (China)	Thales Alenia Space	Spacebus 4000	June 9, 2008	Long March 3B	4,500
Venesat 1	Ministry of Science and Technology (Venezuela)	CAST	DFH-4	October 30, 2008	Long March 3B	5,200
Palapa-D	PT Indosat Tbk (Indonesia)	Thales Alenia Space	Spacebus 4000	August 31, 2009	Long March 3B	4,100
Chinasat 6A (Sinosat 6)	Chinasat (China)	CAST	DFH-4	September 4, 2010	Long March 3B	5,000
Planned Launches (October 2010-2013)						
W3B[11]	Eutelsat	Thales Alenia Space	Spacebus 4000	October 28, 2010	Ariane 5	5,400
Paksat 1R	SUPARCO (Pakistan)	CAST	DFH-4	August 2011	Long March 3B	5,200
W3C	Eutelsat	Thales Alenia Space	Spacebus 4000	3Q/2011	Long March 3B	5,400
Nigcomsat 1R	National Space Research and Development Agency (Nigeria)	CAST	DFH-4	2011	Long March 3B	5,200
APStar 7	APT Satellite Holdings, Ltd.	Thales Alenia Space	Spacebus 4000	1Q/2012	Long March 3B	4,600
APStar 7B	APT Satellite Holdings, Ltd.	Thales Alenia Space	Spacebus TBA	2012	Long March 3B	4,000
Nigcomsat 2	National Space Research and Development Agency (Nigeria)	CAST	DFH-4	2012	Long March 3B	5,200
Laosat 1	Government of Laos	DFH Satellite Co., Ltd.	DFH-4	3Q/2012	Long March 3B	5,000
Tupac Katari	Government of Bolivia	DFH Satellite Co., Ltd.	DFH-4	2013	Long March 3B	5,000

[10] More recent satellites built on the basis of the DFH family of buses are manufactured by Dongfanghong Satellite Company (DFH Satellite Co. Ltd.), a subsidiary of the Chinese Academy of Space Technology (CAST). In some international satellite sale transactions, Chinese Academy of Space Technology (CAST) and DFH Satellite Co Ltd are represented by China Great Wall Industries Corp., also the manufacturer and launch provider of the Long March family of launch vehicles.

[11] W3B was launched before the release of this report, but after the September 30 cut-off for the Semi-Annual Launch Report, so it is shown as a planned launch in Table SR1. See "Other Aspects of Building ITAR-Free Satellites" in this report for an update on the W3B launch and subsequent failure.

Potential Impacts on Launch Competition

Of the launched ITAR-free satellites, only a few were not captive to Long March. Of the nine ITAR-free satellites launched aboard Long March, only one satellite was not captive, enabling competition for launch among other international launch providers (Palapa D operated by PT Indosat of Indonesia). Of the eight more Long March launches carrying ITAR-free satellites planned for the remaining months of 2010 through 2013, one more (W3C) could be competed among other commercial launch providers. Two more ITAR-free satellites, Rascom-QAF 1 (launched in 2007[12]) and W3B (scheduled for launch in October 2010), although originally scheduled for a Long March launch, were eventually moved to Ariane 5.

Besides the four satellites mentioned above, launches of fifteen others appear to be captive to the Chinese Great Wall Industry Corporation (CGWIC), the Long March manufacturer and launch provider. Some of the satellites are owned by commercial Chinese satellite operators that can only use the Long March launch vehicles, and others were purchased as part of packaged satellite/launch deals by foreign customers (often part of an intergovernmental agreement).

For the non-captive ITAR-free satellites mentioned above, the price of a GEO launch on a Chinese vehicle is approximately $55 to $70 million, significantly (between $15 and $45 million) less than the price of an Ariane 5 or Proton. Most of the Chinese-built ITAR-free satellites are considered captive and were sold as part of a launch/satellite package deal, which can potentially further reduce the overall cost for a satellite operator. In addition to low launch prices, China also offers aggressive financing and incentives for customers.

Satellite Operators as Customers for ITAR-Free

So far, there has been one major Western commercial satellite operator, Eutelsat that decided to take advantage of the option to launch on a Long March and ordered ITAR-free satellites from Thales Alenia Space. This decision was met with criticism from the European launch provider Arianespace, whose CEO in a letter to the French President in 2009 characterized this move as throwing "into question [France's] entire space policy… especially since Eutelsat uses [French government-licensed] orbital positions." He said that Eutelsat's choice, if confirmed, "would lead to a considerable weakening of our commercial position while giving credibility to Chinese rockets, with an obvious risk of technology transfer that the United States has tried to prevent with its ITAR rules."[13] Quoting some of the reasons the Chinese launch provider was chosen, the Eutelsat CEO mentioned in an interview with Space News that the Chinese "will clear their [launch manifest] to assure that our satellite is launched on time. That kind of guarantee I cannot get from

[12] Follow-on satellite Rascom-QAF 1R was launched in August 2010 aboard Ariane 5 and was not reported as ITAR-free.
[13] "Eutelsat Chief Unapologetic About Use of Chinese Launch Services," *Space News*, March 16, 2009.

Arianespace." He said that to stay within the satellite deployment schedule is "absolutely crucial" to Eutelsat.[14] Eutelsat W3B,[15] originally scheduled for a Long March launch, was eventually transferred to Arianespace for launch in late October 2010. However, the other ITAR-free spacecraft, W3C, is still scheduled for launch aboard a Chinese rocket in 2011. Other large, international satellite operators remain cautious and have refrained from ordering ITAR-free satellites intended for launch on a Long March vehicle. This may be to avoid potential negative attention or concerns from their government and commercial customers.

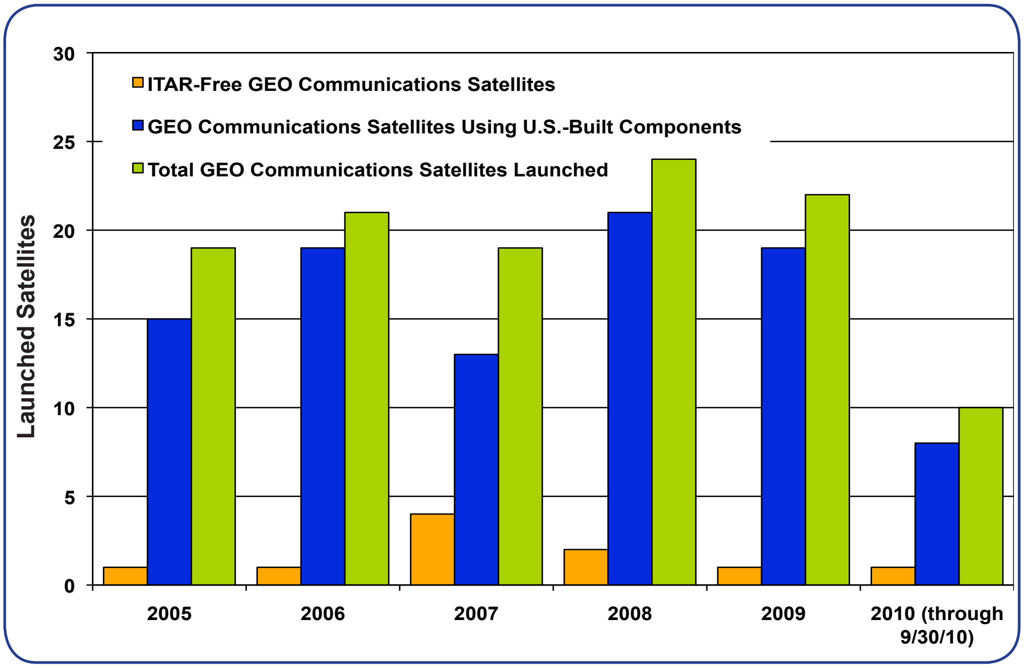
Potential Impacts of ITAR-Free Satellites on Non-Chinese and Non-Indian Launch Providers

In addition to the potential market share impacts on the launch industry, there are some more subtle effects of ITAR-free satellites on the international launch market. Because the U.S. currently only limits China and India from launching U.S. commercial satellites or satellites with U.S. components, the dynamics of ITAR-free satellites on the commercial launch market will be similar for both U.S. launch providers and non-Chinese and non-Indian launch providers.

- Majority of commercial GEO satellites require launch on a non-Chinese and a non-Indian vehicle.
    - For the period beginning in 2005, the cumulative market share of GEO communications satellites built using U.S. components was 83 percent of all GEO communications satellites launched. In contrast, ITAR-free satellites made up nine percent of this total.[16] Figure SR2 demonstrates the market breakout on year by year basis.
    - This and the U.S. sanctions against China and export policies against India provide some benefit to other launch providers, marginalizing Long March and GSLV in the competition for most commercial launches.
- Some customers refrain from acquiring ITAR-free satellites or launching on Long March for various reasons, including:
    - Technical failures of satellites manufactured in China, specifically the DFH-4 systemic failures
    - Chinese launch vehicle failures, specifically the partial launch failure of Palapa-D

[14] "Eutelsat Chief Unapologetic About Use of Chinese Launch Services," *Space News*, March 16, 2009.
[15] See "Other Aspects of Building ITAR-Free Satellites" for an update on the W3B launch and subsequent failure.
[16] These percentages are based on the FAA/AST annual launch data. The combined market share of the satellites built using U.S. components (as defined in "What are ITAR-Free Satellites?") and the ITAR-free satellites does not add up to 100 percent because commercial GEO communications satellites manufactured in India and Russia are not included in either of these categories. These Indian and Russian satellites do not contain U.S. components and are not considered ITAR-free for the purposes of this report (see definition in "What are ITAR-Free Satellites?").

Figure SR2 - World Market Share of GEO Communications ITAR-Free Satellites and Satellites Built Using U.S. Components (Source: FAA AST)[17]



    - Concerns of political or public relations backlash from buying ITAR-free satellites and choosing to launch on a Chinese vehicle
- ITAR-free satellites can increase the competition among launch providers.
    - Except when packaged with a Chinese launch vehicle specifically or otherwise captured, ITAR-free satellites can open the door for launch on any vehicle, giving buyers of those satellites more options and thus increasing the competition. However, practice to date has skewed ITAR-free satellites made by CAST and Thales mostly to lower priced Long March launch vehicles.
    - Although most ITAR-free satellites are often intended to launch on the Long March, two of the ITAR-free satellites manufactured by Thales have eventually been transferred to an Ariane 5 launch (Rascom-QAF 1 and W3B).
- Cost drives decisions of some ITAR-free buyers.
    - Because European-built ITAR-free satellites have been reported to cost about six percent more, buyers are often motivated to get a lower launch price.
    - Marketing of ITAR-free satellites based on cost might be limited to customers that can use low launch cost to offset the satellite cost and insurance coverage (or the cost of self-insuring the satellite).

[17] These totals are based on FAA/AST annual launch data. Total GEO communications satellites includes ITAR-free satellites, satellites built using U.S. components (as defined in "What are ITAR-Free Satellites"), and satellites manufactured in India and Russia which do not use U.S. components. The ITAR-free totals are the numbers of satellites defined as ITAR-free in this report (see definition in "What are ITAR-Free Satellites?").

   - In contrast, some ITAR-free customers are politically driven or express an interest in avoiding potential or perceived ITAR-related delays.

Potential Impacts of ITAR-Free Satellites on Chinese Launch Providers

The Chinese have benefited somewhat from increased opportunities to launch commercial communications satellites because of the introduction of ITAR-free satellites. These increased opportunities come from both ITAR-free satellites built by Thales and from the increase in inherently ITAR-free Chinese-built commercial GEO satellites that have thus far always been bundled with Chinese launches. These benefits have been tempered first of all by the systemic failures of the Chinese built communications satellite bus, the DFH-4, and secondly by the 2009 partial failure of the Palapa D launch by Long March. ITAR-free satellites have introduced other market dynamics for Chinese launch services, beyond just market share:

- ITAR-free satellites provide launch options to cost-focused and politically driven customers.
   - Some customers are willing to overlook potential public relations risks in pursuit of less expensive launch services. Providers such as Eutelsat and PT Indosat have communicated an interest in China's less expensive launches. Other Western satellite operators have expressed concern over launch prices, with the hope of changing ITAR restrictions to allow access to less expensive Chinese launches.
   - Some international satellite operators prefer to avoid dealing with U.S. satellite manufacturers, citing potential ITAR-related bureaucratic difficulties (perceived or real) and subsequent schedule delays. At different times, such operators as Arabsat and Telesat Canada mentioned that ITAR was a driver in their procurement decisions.[18]
- Bundled satellite and launch services can provide an opportunity to build China's reputation.
   - The Chinese could use bundled launches as an opportunity to grow their reputation as a mainstream option for launch. Their experience grows through launching both the satellites that are part of packaged deals (such as Venesat and Nigcomsat) and Western-manufactured ITAR-free satellites.
   - The Chinese have had limited success. Three of four DFH-4 satellites listed in Table SR1 failed, and the launch of the Thales-built Palapa D was a partial launch failure. The Chinese will have to overcome these new issues to improve their international reputation.
- Lower prices provide new opportunities to some non-traditional satellite customers.

[18] Export Controls and the U.S. Defense Industrial Base, Institute for Defense Analyses, January 2007 (http://www.acq.osd.mil/ip/docs/ida_study-export_controls_%20us_def_ib.pdf).

- Further opportunities might exist to find customers among emerging satellite operators who are non-traditional customers for launch. In the past, China has made deals involving intergovernmental agreements with countries producing natural resources.

Looking Forward

Today the absolute and relative number of ITAR-free satellites is low, serving several niches of the commercial GEO satellite market. The future of ITAR-free satellites depends greatly on their demand by satellite operators. Currently only one European manufacturer offers an ITAR-free satellite. It is unclear if other manufacturers will begin offering more ITAR-free options. It is also unclear what will happen with ITAR reform, which has been discussed significantly in recent years. A significant reform in ITAR rules, with or without allowing launches on Chinese vehicles, could cancel most of the demand for ITAR-free satellites.

Regardless of the future of ITAR-free satellites, the systemic and long-term impacts on the global launch industry are likely to continue. These impacts address the core issues for all commercial launch providers: launch prices, increased competition, and introduction of new customer segments. The experience and vehicle reliability gained by CGWIC launching ITAR-free satellites could be an opportunity for China to build the reputation for Long March and could be a selling point for future international customers. Some existing satellite operators have decided to opt for lower launch costs using ITAR-free satellites and, after trying them, may decide to habitually choose Long March over other launch providers. New customers have entered the market interested in low prices for bundled launch and satellites offered by China. Those new customers may expand their fleets or may entice new, small players into the marketplace. Growth in the market for ITAR-free satellites or the introduction of new niches for these satellites could have more wide-reaching implications for the launch market. The launch industry would do well to continue close monitoring of the developments in manufacturing and marketing of ITAR-free satellites.

Appendix A: April - September 2010 Launch Events

Date	Comm. Launch	FAA-Licensed	Vehicle	Site	Comm. Payload	Payload or Mission	Operator	Use	Vehicle Price	L	M
4/1/2010			Soyuz	Baikonur		Soyuz ISS 22S	Roscosmos	ISS	$60M	S	S
4/4/2010			Shuttle Discovery	KSC		STS 131	NASA	Crewed	N/A	S	S
4/7/2010	√		Dnepr M	Baikonur	*	Cryosat 2	ESA	Remote Sensing	$12M	S	S
4/14/2010			GSLV Mark 2	Satish Dhawan Space Center		GSAT 4	ISRO	Communications	$45M	F	F
4/15/2010			Soyuz-U	Plesetsk		Kosmos 2462	Russian MoD	Classified	$60M	S	S
4/21/2010			Atlas V 501	CCAFS		X-37B OTV	USAF	Development	$100M	S	S
4/24/2010	√		Proton M	Baikonur	*	SES-1	SES World Skies	Communications	$85M	S	S
4/26/2010			Kosmos 3M	Plesetsk		Kosmos 2463	Russian MoD	Classified	$10M	S	S
4/27/2010			Soyuz	Baikonur		Progress ISS 37P	Roscosmos	ISS	$60M	S	S
5/13/2010			Shuttle Atlantis	KSC		STS 132	NASA	Crewed	N/A	S	S
5/20/2010			H 2A 202	Tanegashima		AKATSUKI	JAXA	Scientific	$100M	S	S
						Ikaros	JAXA	Development			S
						K-sat	Kagoshima University	Scientific			S
						Nagai	Soka Unversity	Development			S
						Unitec-1	JAXA	Scientific			S
						Waseda-Sat2	Waseda University	Scientific			S
5/20/2010	√		Ariane 5 ECA	Kourou	*	Astra 3B	SES Astra	Communications	$220M	S	S
					*	COMSATBw 2	German Defense Ministry	Communications			S
5/26/2010			Delta IV Medium	CCAFS		Navstar GPS 2F-01	USAF	Navigation	$100M	S	S
6/1/2010	√		Rockot	Plesetsk	*	SERVIS 2	USEF	Development	$30M	S	S
6/1/2010			Long March 3C	Xichang		Beidou 2	CAST	Navigation	TBD	S	S
6/3/2010	√	+	Falcon 9	CCAFS	*	Falcon 9 Demo Flight	Space Exploration Technologies	Test	$56M	S	S
6/3/2010	√		Proton M	Baikonur	*	BADR-5	Arab Satellite Communications Organization (Arabsat)	Communications	$85M	S	S
6/8/2010			KSLV 1	Naro Space Center		STSAT 2b	Korean Advanced Institute of Science and Technology	Scientific	TBD	F	F
6/14/2010			Dnepr M	Dombarovskiy		Picard	CNES	Scientific	$12M	S	S
						Prisma Main	Swedish Space Corp.	Development			S
						Prisma Target	Swedish Space Corp.	Development			S
6/14/2010			Long March 2D	Jiuquan		Shijian 12	China Aerospace Corporation	Scientific	$25M	S	S
6/15/2010			Soyuz	Baikonur		Soyuz ISS 23S	Roscosmos	ISS	$60M	S	S
6/20/2010	√		Dnepr M	Baikonur	*	TanDEM X	Infoterra Ltd.	Remote Sensing	$12M	S	S
6/21/2010			Shavit 1	Palmachim AFB		Ofeq 9	Israel MoD	Remote Sensing	$20M	S	S
6/22/2010	√		Ariane 5 ECA	Kourou	*	Arabsat 5A	Arab Satellite Communications Organization (Arabsat)	Communications	$220M	S	S
					*	COMS 1	KARI	Other			S
6/29/2010			Soyuz	Baikonur		Progress ISS 38P	Roscosmos	ISS	$60M	S	S

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

\+ Denotes FAA-licensed launch.

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

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

Appendix A: April - September 2010 Launch Events (Continued)

Date	Comm. Launch FAA-Licensed	Vehicle	Site	Comm. Payload	Payload or Mission	Operator	Use	Vehicle Price	L	M
7/9/2010	√	Proton M	Baikonur	*	EchoStar XV	Communications Corporation	Communications	$85M	S	S
7/11/2010		PSLV	Satish Dhawan Space Center		Cartosat 2B	ISRO	Remote Sensing	$25M	S	S
					AISSat-1	Norwegian Defense Research Establishment	Development			S
					TIsat-1	University of Applied Sciences of Southern Switzerland	Development			S
					Alsat 2A	National Center for Space Technology	Remote Sensing			S
					StudSat	ISRO	Development			S
8/1/2010		Long March 3A	Xichang		Bei Dou 2-IGS 1	China	Navigation	$60M	S	S
8/4/2010	√	Ariane 5 ECA	Kourou	*	Nilesat 201	Nilesat	Communications	$220M	S	S
				*	RASCOM 1R	RascomStar-QAF	Communications			S
8/10/2010		Long March 4C	Taiyuan		Yaogan 10	China	Remote Sensing	TBD	S	S
8/14/2010		Atlas V 531	CCAFS		Advanced EHF 1	USAF	Communications	$100M	S	S
8/24/2010		Long March 2D	Jiuquan		Tian Hui-1	China	Remote Sensing	$25M	S	S
9/2/2010		Proton M	Baikonur		Glonass M36, M37, M38	Russian MoD	Navigation	$85M	S	S
9/4/2010		Long March 3B	Xichang		Chinasat 6A	SINO - Satellite Communications Co. Ltd.	Communications	$70M	S	S
9/8/2010		Rockot	Plesetsk		Gonets M 2	Roscosmos	Communications	$30M	S	S
9/10/2010		Soyuz	Baikonur		Progress ISS 39P	Roscosmos	ISS	$60M	S	S
9/11/2010		H 2A 202	Tanegashima		QZS-1	JAXA	Communications	$100M	S	S
9/20/2010		Atlas V 501	V AFB		NRO L-41	NRO	Classified	$100M	S	S
9/21/2010		Long March 2D	Jiuquan		Yaogan 11	China	Remote Sensing	$25M	S	S
9/26/2010		Minotaur IV	VAFB		SBSS 1	USAF	Classified	$20M	S	S
9/30/2010		Molniya-M	Plesetsk		Kosmos 2469	Russia Space Forces	Classified	$40M	S	S

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+ Denotes FAA-licensed launch.
* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity

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

Appendix B: October 2010 - March 2011 Projected Launch Events

Date	Comm. Launch	FAA-Licensed	Vehicle	Site	Comm. Payload	Payload or Mission	Operator	Use	Vehicle Price
10/2/2010			Long March 3A	Xichang		Chang'e 2	China National Space Administration	Scientific	$60M
10/6/2010			Long March 4B	Taiyuan		Shijian 6	China National Space Administration	Scientific	$60M
10/7/2010			Soyuz	Baikonur		Soyuz ISS 24S	Roscosmos	ISS	$60M
10/15/2010	√		Proton M	Baikonur	*	XM 5	XM Satellite Radio, Inc.	Communications	$85M
10/19/2010	√		Soyuz 2 TBA	Baikonur	*	Globalstar 2nd Gen 01	Globalstar, Inc.	Communications	$50M
					*	Globalstar 2nd Gen 02	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 03	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 04	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 05	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 06	Globalstar, Inc.	Communications	
10/26/2010			Soyuz	Baikonur		Progress ISS 40P	Roscosmos	ISS	$60M
10/28/2010	√		Dnepr M	Dombarovskiy	*	Nigeriasat 2	National Space Research and Development Agency (NASRDA)	Remote Sensing	$12M
					*	NX	National Space Research and Development Agency (NASRDA)	Remote Sensing	
					*	RASAT	Space Technologies Research Institute (TUBITAK-UZAY)	Scientific	
					*	Sich 2	National Space Agency of Ukraine	Remote Sensing	
10/28/2010	√		Ariane 5 ECA	Kourou	*	BSAT 3B	Broadcasting Satellite System Corp. (BSAT)	Communications	$220M
					*	Eutelsat W3B	Eutelsat	Communications	
10/29/2010	√		Delta II 7420-10	VAFB	*	Cosmo-Skymed 4	Italian Space Agency (ASI)	Remote Sensing	$95M
10/31/2010			Shuttle Discovery	KSC		STS 133	NASA	Crewed	N/A
11/4/2010			Delta IV Heavy	CCAFS		NRO L-32	NRO	Classified	$250M
11/8/2010	√	+	Falcon 9	CCAFS	*	Dragon COTS Demo 1	SpaceX	Development	$56M
11/16/2010			Atlas V 401	CCAFS		Navstar GPS 2F-02	USAF	Navigation	$100M
11/19/2010			Minotaur IV	Kodiak Launch Complex		Space Test Program Satellite 26	USAF	Development	$20M
11/21/2010			Taurus XL	VAFB		GLORY	NASA	Scientific	$25M
11/30/2010			Proton M	Baikonur		Glonass M39, M40, M41	Russian MoD	Navigation	$85M
11/2010	√		Ariane 5 ECA	Kourou	*	Intelsat 17	Intelsat	Communications	$220M
					*	HYLAS	Avanti Screenmedia Group	Communications	
11/2010	√		Proton M	Baikonur	*	SkyTerra-1	SkyTerra Communications	Communications	$85M
12/13/2010			Soyuz	Baikonur		Soyuz ISS 25S	Roscosmos	ISS	$60M

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+ Denotes FAA-licensed launch.
* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity

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

Appendix B: October 2010 - March 2011 Projected Launch Events (Continued)

Date	Comm. Launch	FAA-Licensed	Vehicle	Site	Comm. Payload	Payload or Mission	Operator	Use	Vehicle Price
12/2010	√		Proton M	Baikonur	*	KA-SAT	Eutelsat	Communications	$85M
12/2010	√		Proton M	Baikonur	*	MSV 1	Mobile Satellite Ventures	Communications	$85M
3Q/2010	√		Ariane 5 ECA	Kourou	*	KoreaSat 6	Korea Telecom	Communications	$110M
3Q/2010	√		Ariane 5 ECA	Kourou	*	Insat 4G	ISRO	Communications	$110M
3Q/2010			Long March 4B	Taiyuan		Fengyun 3B	China Meteorological Administration	Meteorological	$60M
3Q/2010			Long March 3A	Xichang		Beidou 2C/M1	China	Navigation	$60M
4Q/2010			Zenit 3SLB	Baikonur		Spektr R	Russian Academy of Sciences	Scientific	$60M
4Q/2010			PSLV	Satish Dhawan Space Center		Resourcesat 2	ISRO	Remote Sensing	$25M
						YOUTHSAT	ISRO	Scientific	
					*	X-Sat	Singapore - TBA	Remote Sensing	
4Q/2010			Proton TBA	Plesetsk		Luch 5B	Roscosmos	Communications	$85M
4Q/2010			Long March 3B	Xichang		Nigcomsat 1R	Nigerian Communication Satellite Ltd.	Communications	$70M
4Q/2010			GSLV	Satish Dhawan Space Center	*	Insat 4D	ISRO	Communications	$45M
2010	√		Proton M	Baikonur	*	MSV 2	Mobile Satellite Ventures	Communications	$85M
2010	√		Dnepr M	Baikonur	*	Israeli Cubesat 2	Israel	Unknown	$12M
2010	√		Dnepr M	Baikonur	*	Israeli Cubesat 1	Israel	Unknown	$12M
2010			Long March TBA	Xichang		Hai Yang 2A	China	Remote Sensing	TBD
2010			Long March 2C	Xichang		Hai Yang 2B	China	Remote Sensing	$25M
2010			Long March 2D	Xichang		FSW 23	China	Remote Sensing	$25M
2010			Minotaur IV	Kodiak Launch Complex		TacSat 4	USAF	Development	$20M
1/2011			Minotaur I	Wallops Flight Facility		ORS 1	USAF	Development	$15M
1/15/2011			Delta IV Heavy	VAFB		NRO L-49	NRO	Classified	$250M
1/20/2011			H 2B	Tanegashima		HTV 2	JAXA	ISS	$100M
1/28/2011			Soyuz	Baikonur		Progress ISS 41P	Roscosmos	ISS	$60M
2/26/2011			Shuttle Endeavour	KSC		STS 134	NASA	Crewed	N/A
2/2011	√		Soyuz 2 TBA	Kourou	*	Globalstar 2nd Gen 07	Globalstar, Inc.	Communications	$50M
					*	Globalstar 2nd Gen 08	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 09	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 10	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 11	Globalstar, Inc.	Communications	
					*	Globalstar 2nd Gen 12	Globalstar, Inc.	Communications	
2/2011			Atlas V 531	CCAFS		Advanced EHF 2	USAF	Communications	$100M
1Q/2011	√		Zenit 3SLB	Baikonur	*	Intelsat 18	Intelsat	Communications	$60M

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

\+ Denotes FAA-licensed launch.

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Appendix B: October 2010 - March 2011 Projected Launch Events (Continued)

Date	Comm. Launch	FAA-Licensed	Vehicle	Site	Comm. Payload	Payload or Mission	Operator	Use	Vehicle Price
3/30/2011			Soyuz	Baikonur		Soyuz ISS 26S	Roscosmos	ISS	$60M
3/2011			Delta IV Medium+(4.2)	CCAFS		NRO L-27	NRO	Classified	$100M
3/2011			Minotaur I	VAFB		NRO L-66	NRO	Classified	$15M
3/2011			Atlas V	VAFB		NRO L-34	NRO	Classified	$100M
Early 2011			Soyuz 2 1A	Kourou		Pleiades HR 1	Centre National d'Etudes Spatiales (CNES)	Remote Sensing	$50M
Early 2011			Soyuz 2 1A	Kourou		Pleiades HR 2	Centre National d'Etudes Spatiales (CNES)	Remote Sensing	$50M
Early 2011			Soyuz 2 1B	Kourou		Galileo Validation 1	ESA	Navigation	$50M
						Galileo Validation 2	ESA	Navigation	
Early 2011			Soyuz 2 1B	Kourou		Galileo Validation 3	ESA	Navigation	$50M
						Galileo Validation 4	ESA	Navigation	
2011			Ariane 5 ES-ATV	Kourou		ATV 2	ESA	ISS	$220M

√ Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed. For multiple manifested launches, certain secondary payloads whose launches were commercially procured may also constitute a commercial launch. Appendix includes suborbital launches only when such launches are commercial.
\+ Denotes FAA-licensed launch.
* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity

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