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
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.

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Cover photo courtesy of Space Exploration Technologies Corp. Copyright © 2010. A SpaceX Falcon 9 lifts off from Cape Canaveral during its inaugural launch on June 4, 2010 carrying a demo flight Dragon capsule into low Earth orbit.
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)

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

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)

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

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 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 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 Highlights 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)

- Test: 2% (1)
- Classified: 9% (5)
- Scientific: 13% (7)
- Remote Sensing: 15% (8)
- Other: 2% (1)
- Navigation: 7% (4)
- Crewed: 4% (2)
- Dev.: 16% (9)
- Comm.: 24% (13)

Total = 55

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

- ISS: 10% (7)
- Unknown: 3% (2)
- Classified: 7% (5)
- Scientific: 8% (6)
- Remote Sensing: 15% (11)
- Navigation: 10% (7)
- Meteorological: 1% (1)
- Dev.: 5% (4)
- Crewed: 3% (2)
- Comm.: 38% (28)

Total = 73

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)

- Heavy: 4% (2)
- Large: 27% (15)
- Medium: 13% (7)
- Small: 24% (13)
- Unknown: 7% (4)
- Micro: 13% (7)

Total = 55

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

- Heavy: 7% (5)
- Large: 12% (9)
- Medium: 10% (7)
- Small: 34% (25)
- Unknown: 12% (9)
- Micro: 1% (1)

Total = 73

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>52% (11)</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>24% (5)</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>19% (4)</td>
<td></td>
</tr>
<tr>
<td>Multinational</td>
<td>5% (1)</td>
<td></td>
</tr>
</tbody>
</table>

Total = 21

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>30% ($679M)</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>49% ($1100M)</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>16% ($351M)</td>
<td></td>
</tr>
<tr>
<td>Multinational</td>
<td>4% ($100M)</td>
<td></td>
</tr>
</tbody>
</table>

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

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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. This discussion in Canada is not limited exclusively to the space industry and includes, for instance, the Canadian Navy.

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.”

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

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-free W3B 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. 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. 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).

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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\textsuperscript{10}

<table>
<thead>
<tr>
<th>ITAR-Free Satellite</th>
<th>Owner/Operator</th>
<th>Prime Contractor</th>
<th>Bus Type</th>
<th>Launch Date</th>
<th>Launch Vehicle</th>
<th>Mass at Launch (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>APStar 6</td>
<td>APT Satellite (China - Hong Kong)</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>April 12, 2005</td>
<td>Long March 3B</td>
<td>4,680</td>
</tr>
<tr>
<td>Sinosat 2</td>
<td>Sinosat (China)</td>
<td>China Academy of Space Technology (CAST)</td>
<td>DFH-4</td>
<td>October 29, 2006</td>
<td>Long March 3B</td>
<td>5,100</td>
</tr>
<tr>
<td>Nigcomsat 1</td>
<td>National Space Research and Development Agency (Nigeria)</td>
<td>CAST</td>
<td>DFH-4</td>
<td>May 14, 2007</td>
<td>Long March 3B</td>
<td>5,200</td>
</tr>
<tr>
<td>Sinosat 3</td>
<td>Sinosat (China)</td>
<td>CAST</td>
<td>DFH-3A</td>
<td>June 1, 2007</td>
<td>Long March 3A</td>
<td>2,200</td>
</tr>
<tr>
<td>Chinasat 6B</td>
<td>ChinaSat (China)</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>July 5, 2007</td>
<td>Long March 3B</td>
<td>4,600</td>
</tr>
<tr>
<td>Rascom-QAF 1</td>
<td>Regional African Satellite Communication Organization (RascomStar-QAF)</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>December 21, 2007</td>
<td>Ariane 5</td>
<td>3,200</td>
</tr>
<tr>
<td>Chinasat 9</td>
<td>ChinaSat (China)</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>June 9, 2008</td>
<td>Long March 3B</td>
<td>4,500</td>
</tr>
<tr>
<td>Venesat 1</td>
<td>Ministry of Science and Technology (Venezuela)</td>
<td>CAST</td>
<td>DFH-4</td>
<td>October 30, 2008</td>
<td>Long March 3B</td>
<td>5,200</td>
</tr>
<tr>
<td>Palapa-D</td>
<td>PT Indosat Tbk (Indonesia)</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>August 31, 2009</td>
<td>Long March 3B</td>
<td>4,100</td>
</tr>
<tr>
<td>Chinasat 6A (Sinosat 6)</td>
<td>ChinaSat (China)</td>
<td>CAST</td>
<td>DFH-4</td>
<td>September 4, 2010</td>
<td>Long March 3B</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Planned Launches (October 2010-2013)

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Owner/Operator</th>
<th>Prime Contractor</th>
<th>Bus Type</th>
<th>Launch Date</th>
<th>Launch Vehicle</th>
<th>Mass at Launch (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3B\textsuperscript{11}</td>
<td>Eutelsat</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>October 28, 2010</td>
<td>Ariane 5</td>
<td>5,400</td>
</tr>
<tr>
<td>PakSat 1R</td>
<td>SUPARCO (Pakistan)</td>
<td>CAST</td>
<td>DFH-4</td>
<td>August 2011</td>
<td>Long March 3B</td>
<td>5,200</td>
</tr>
<tr>
<td>W3C</td>
<td>Eutelsat</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>3Q/2011</td>
<td>Long March 3B</td>
<td>5,400</td>
</tr>
<tr>
<td>Nigcomsat 1R</td>
<td>National Space Research and Development Agency (Nigeria)</td>
<td>CAST</td>
<td>DFH-4</td>
<td>2011</td>
<td>Long March 3B</td>
<td>5,200</td>
</tr>
<tr>
<td>APStar 7</td>
<td>APT Satellite Holdings, Ltd.</td>
<td>Thales Alenia Space</td>
<td>Spacebus 4000</td>
<td>1Q/2012</td>
<td>Long March 3B</td>
<td>4,600</td>
</tr>
<tr>
<td>APStar 7B</td>
<td>APT Satellite Holdings, Ltd.</td>
<td>Thales Alenia Space</td>
<td>Spacebus TBA</td>
<td>2012</td>
<td>Long March 3B</td>
<td>4,000</td>
</tr>
<tr>
<td>Nigcomsat 2</td>
<td>National Space Research and Development Agency (Nigeria)</td>
<td>CAST</td>
<td>DFH-4</td>
<td>2012</td>
<td>Long March 3B</td>
<td>5,200</td>
</tr>
<tr>
<td>Laasat 1</td>
<td>Government of Laos</td>
<td>DFH Satellite Co., Ltd.</td>
<td>DFH-4</td>
<td>3Q/2012</td>
<td>Long March 3B</td>
<td>5,000</td>
</tr>
<tr>
<td>Tupac Katari</td>
<td>Government of Bolivia</td>
<td>DFH Satellite Co., Ltd.</td>
<td>DFH-4</td>
<td>2013</td>
<td>Long March 3B</td>
<td>5,000</td>
</tr>
</tbody>
</table>

\textsuperscript{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.

\textsuperscript{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\(^\text{12}\)) 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.”\(^\text{13}\) 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.

Arianespace.” He said that to stay within the satellite deployment schedule is “absolutely crucial” to Eutelsat.\textsuperscript{14} Eutelsat W3B,\textsuperscript{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.\textsuperscript{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


\textsuperscript{15} See “Other Aspects of Building ITAR-Free Satellites” for an update on the W3B launch and subsequent failure.

\textsuperscript{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?”).
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.

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

<table>
<thead>
<tr>
<th>Date</th>
<th>Comm. Launch</th>
<th>Vehicle</th>
<th>Site</th>
<th>Payload or Mission</th>
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<th>Use</th>
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✓ 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)

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√ 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 B: October 2010 - March 2011 Projected Launch Events

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+ Denotes FAA-licensed launch.

* Denotes all flights, 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)

<table>
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<th>Date</th>
<th>Vehicle</th>
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### Appendix B: October 2010 - March 2011 Projected Launch Events (Continued)

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