

Commercial Space

The commercial space sector is mainly composed of a few companies that provide launch services and manufacture commercial communications satellites. Commercial remote sensing satellites continue to emerge within this market, but have seen limited growth internationally. The companies comprising this market are also major suppliers to U.S. Government (USG) programs, where demand has remained stable.

Table 1: Major U.S. and Foreign Commercial Launch Providers

Launch Company	Vehicles/Products	2010 Commercial Launches	2010 Total Launches
Boeing	Delta II, Delta IV	2	4
Sea Launch (Multinational)	Sea Launch Zenit-3SL Land Launch Zenit-3SL	0	0
Lockheed Martin	Atlas V	0	4
Arianespace	Ariane 5	6	6
Russia and International Launch Services (ILS)	Proton, Rockot, Soyuz	13	31
Orbital Sciences Corporation	Pegasus, Taurus (light- weight), Minotaur	0	2
SpaceX	Falcon 1, Falcon 9	2	2

Source: "2010 Year in Review", Federal Aviation Administration, Office of Commercial Space Transportation, January, 2011.

Historically, four major companies have dominated the international commercial launch market: Boeing, Lockheed Martin, Arianespace (Europe) and International Launch Services (Russia). Boeing and Lockheed Martin also provide launch services to USG customers on their Delta and Atlas rockets through the United Launch Alliance (ULA), a 50-50 joint venture. ULA uses the same Atlas 5 and Delta 4 rockets that are marketed commercially. 2010 saw a decrease in commercial launches from 2009 (23 vs. 24).

International Launch Services (ILS) commercially offers Russian-built Proton launches, which are launched from the Russian government launch site in Kazakhstan. ILS performed 13 commercial launches, which accounted for 57 percent of the market. Proton rockets are also widely used by the Russian government to launch government spacecraft.

In June 2009 Sea Launch filed for Chapter 11 bankruptcy resulting from a number of debts and damages to critical launch infrastructure during a launch failure.¹ On October 27, 2010 Sea Launch Company emerged from Chapter 11, after having successfully completed its reorganization process. Part of that plan included a majority ownership arrangement for Russia's Energia Overseas Limited. Sea Launch plans to return to launch operations in 2011, and has several satellites included on its manifest. Sea Launch's Land Launch also has several launches slated for 2011, including the launch of the Intelsat-18 communications satellite.

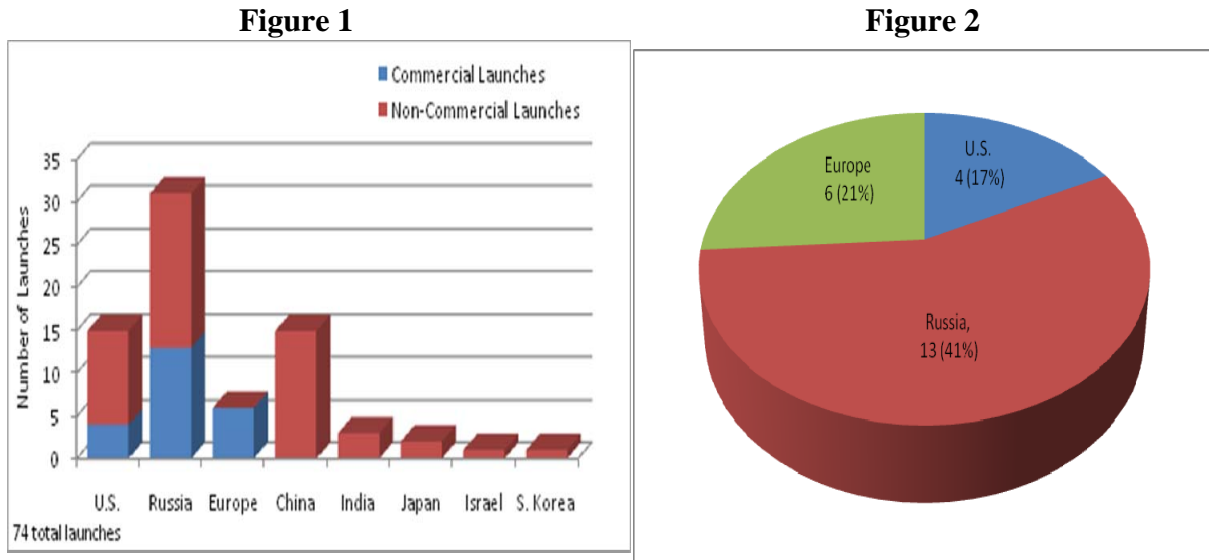
Orbital Sciences provides launch services for lighter-weight satellites, but also has carved out a strong niche in the small to medium-sized communications satellite sector and attracts mid-range customers who do not require the power and capability of a large, state-of-the-art satellite. This market niche has seen steady growth and will continue to grow over the next few years. In April 2010, Orbital Sciences acquired the satellite manufacturing business of General Dynamics for \$55 million, adding advanced medium-class defense and scientific spacecraft to the company's existing satellite product lines. The company experienced both highs and lows this year with the first successful launch of its Minotaur IV rocket for the U.S. Air Force in April 2010, successful test fires of the first stage engines of its Taurus II rocket, and the unsuccessful launch of the Taurus XL rocket for NASA in March 2011.

The most recent successful commercial market entrant is SpaceX, with its Falcon 1 and the larger Falcon 9 rockets. Privately funded, SpaceX's products are intended to lower launch costs and support NASA's Space Exploration Program. SpaceX currently has contracts or options for over 30 launches, which include a wide mix of commercial and civil customers.² The President's 2010 National Space Policy and subsequent budget proposals continue to encourage NASA's use of commercial services, especially for cargo delivery to the International Space Station. Both the Falcon 1 and Falcon 9 rockets performed successful launches in 2010, including a Falcon 9 launch that carried the Dragon re-entry capsule. The F-9 and Dragon capsule have been developed for the future transport of astronauts. On April 5, 2011, SpaceX revealed details on the Falcon Heavy rocket, whose design would make it the world's largest. It is planned to be able to launch 53 metric tons (117,000 lbs) to orbit. First launch is planned for late 2012.

¹ <http://www.boeing.com/special/sea-launch/>

² <http://www.spacex.com/>

Figure 1: 2010 Total Worldwide Launch Activity
Figure 2: 2010 Worldwide Commercial Market Share



Source: FAA Commercial Space Transportation 2010 Year In Review
 Note: a “commercial launch” here is defined as an FAA-licensed launch

Market Trends

In 2010, 74 total orbital launches took place globally, of which 23 were commercial launches.³ Four of the commercial launches were performed by U.S. ventures: Boeing’s U.S.-built Delta II and Delta IV each had one launch, and Space X’s Falcon 9 conducted two (including one demonstration flight). Arianespace launched 12 satellites on 6 commercial launches.⁴ Russia launched 20 commercial satellites on 13 launch vehicles, of which eight were Proton M vehicles, three were Dnepr rockets, and one was a Rockot vehicle. Included in this figure is one Soyuz 2 launch that carried six Globalstar 2 commercial communications satellites. These figures demonstrate the stiff competition between European- and Russian-manufactured rockets in the commercial market and the recent focus on U.S. government launches for U.S.-built rockets. Recent data from a number of sources throughout the industry indicates that increases in Russian and European commercial launch prices are nearly high enough to make U.S. commercial launch prices competitive again internationally. Worldwide revenues from the 23 commercial launch events in 2010 are estimated at \$2.45 billion, an increase of \$43 million (2 percent) from 2009.⁵

The 74 total global launches carried 110 spacecraft into orbit in 2009. Of those 110 spacecraft, 33 provide commercial broadcast and communications services, while the remaining spacecraft

³ “2010 Year in Review”, Federal Aviation Administration, Office of Commercial Space Transportation, January, 2011.

⁴ Ibid.

⁵ Ibid.

were used for non-commercial civil government, military or non-profit services.⁶ This is an increase in the share of commercial spacecraft launched.

In the commercial communications satellite manufacturing sector, U.S. companies have regularly maintained approximately 50 percent of the commercial market over the past five years.⁷ Boeing, Lockheed Martin, Orbital Sciences, Alcatel Espace, Astrium, and Loral Space and Communications dominate the market, with European companies continuing to strive for additional market share. U.S. market share could continue to decline due to export control concerns and European technological advancements. In response to export control concerns, Europe's Thales manufactures satellites that contain no U.S. components, thereby avoiding U.S. export control regulations, and allowing launches from China at a price lower than current Western market prices. While the United States maintains a small production cost advantage, aided in part by a weak dollar, this advantage has been shrinking as Europe produces a greater number of satellites and gains more technological expertise. Several factors will impact the demand for telecommunications services over the next 5-10 years including overall economic conditions, new market applications, competition with other non-space-based services (such as cable television), data compression technology, regulatory barriers, emerging competitors and the new trend towards investment firms' ownership of services companies.⁸

In the commercial remote sensing satellite sector, the major communications satellite manufacturers listed above as well as Ball Aerospace and Northrop Grumman have the capability to build state-of-the-art imaging satellites. Even though the 2004 national policy on remote sensing encourages trade in this sector, no U.S. company has sold one of these satellites to an international customer. Export control concerns and/or a lack of funding from foreign customers are the main reasons for the slow emergence of this market.

Domestically, two U.S. companies--GeoEye and Digital Globe--own and operate imaging satellite systems and sell their data commercially. While the companies' success still hinges on purchases from their main customer, the USG, there is growing commercial demand for satellite imagery. The historical government-customer focus will not change in the near term, but it will slowly diminish as new applications are developed for commercial use, such as commercial mapping, mineral exploration, insurance appraisals, journalism/news media, and agriculture. Recent disasters, such as the Japanese earthquake and tsunami, highlight the value of such imagery for news organizations, disaster relief, insurance and infrastructure development.

The satellite radio sector saw steady growth over the past few years, but the global economic downturn and competition from other sources has slowed subscriptions. Satellite radio subscription revenues increased to an estimated \$2.54 billion in 2010 compared to \$2.45 billion in 2009.⁹ Market growth is closely tied to U.S. economic growth, especially to declining auto sales in the U.S. Headquartered in Washington, D.C., Sirius XM is a global leader in satellite radio. Following bankruptcy rumors in early 2009, media conglomerate Liberty Media purchased a 40 percent stake in Sirius XM in March 2009. Industry analysts are closely

⁶ Ibid.

⁷ Satellite Industry Association.

⁸ "2010 Year in Review", Federal Aviation Administration, Office of Commercial Space Transportation, January, 2011.

⁹ The Space Foundation, The Space Report 2010: The Authoritative Guide to Global Space Activity. <http://www.thespacereport.org>.

monitoring Liberty Media's statements which often indicate a desire to take a controlling interest in the company. Through the current agreement, Sirius XM Liberty cannot purchase more than 49.9 percent until early 2011, but can make an offer for the entire company in 2012.

China conducted fifteen orbital launches in 2010, but none were commercial.¹⁰ Due to Tiananmen Square sanctions, U.S. satellites shipped to China for launch must receive a waiver from the President before shipment. When faced with such a difficult requirement, satellite customers have typically chosen other launch providers instead. New European satellites that are not subject to the export licenses under the International Trade in Arms Regulations (ITAR), called "ITAR-free" satellites, are allowing China to re-enter the commercial market, and several contracts have already been signed. With the appearance of these satellites, China likely will link low-cost launches with its satellite sales in Asia. Given the continued strong competition in the satellite market, China will only win these contracts with extremely low prices, thus negatively impacting U.S. manufacturers. China has also worked with Brazil and Europe to develop advanced satellite technology and is expected to begin offering low-cost, mid-size satellites on the international market within five years.

India continues its strong interest in entering the commercial launch services market. In 2010, India performed one successful launch of its Polar Satellite Launch Vehicle (PSLV), but suffered two failures of its larger GSLV launch vehicle.¹¹ The GSLV is intended to capture commercial market share for India, but these failures will delay its entry into the global market. Once in the commercial market, India is likely to win an average of one launch per year for a few years, mainly through promotional pricing, package deals, partnership programs with Europe, etc. Because of Indian launch vehicles' limited capabilities and size, India likely will not gain a significant portion of the market in the short term. India also intends to enter the commercial communications satellite market.

Japan conducted two successful launches of its H-2A rocket in 2010 for the Japanese government. Reliability problems with the H-2A rocket and high costs of production have kept Japan from being competitive in this market to date, but Japan hopes to commercialize its H-2B rocket in the future. The need to lower costs may create opportunities for U.S. companies to supply some parts for these vehicles. Additionally, a recent compromise with Japan's fishing unions will allow launches soon to take place year round, which could create additional opportunities for Japan to enter the commercial market.

Several U.S. states continue to explore building commercial "spaceports" for commercial launches and space tourism flights. The FAA is currently reviewing safety factors impacting such facilities. States such as California, Florida and New Mexico have received licenses from the FAA. Several other states, such as Alabama, Washington, Hawaii, Wisconsin and Texas, have proposed the development of such sites, but are not yet licensed to conduct launches. These sites hope to become an alternative to U.S. federal launch sites in order to provide private or state-operated launch and re-entry, mostly likely in support of the space tourism business.

¹⁰ Ibid.

¹¹ "2010 Year in Review," Federal Aviation Administration, Office of Commercial Space Transportation, January 2011.

Trends

In 2009, President Obama signed a directive calling for a review of the existing Bush Administration federal space policies, which were signed in 2003-2006. The Bush Administration policies aimed to improve the health of the U.S. space industry and included four sector-focused policies covering the satellite remote sensing industry, global navigation satellite services, space exploration, and the space transportation industry. Those policies were followed by an “umbrella” National Space Policy (NSP) that addressed overarching issues impacting all commercial space sectors.

Signed in June 2010, the Obama Administration’s new National Space Policy aims to improve the competitiveness of U.S. industry, increase U.S. jobs and address issues such as workforce training, standards and regulations and acquisition management. In accordance with the President’s 2010 National Space Policy and the subsequent budget proposals, the Administration is encouraging increased reliance on commercial space products and services by the U.S. government. Another change in policy direction included the recommendation for increased international cooperation on government space programs. The new policy strongly encourages U.S. exports and coordination with international partners—something that previously policies shied away from in favor of the promotion of national security.

Satellite manufacturers are benefiting from a sudden turnaround in the market, which has included a return to historic satellite order levels. To meet customers’ increasing demand for all types of satellite services, satellites are being built larger and heavier in order to provide greater capability and longer satellite lifetime. In turn, these satellites require larger, heavier launch vehicles. Greater size reduces the likelihood of launching two satellites on one launch vehicle, a practice that was more common in the 1990s. However, the greater size has initiated a resurgence of demand for heavy launch vehicles—which are now developing backlogs and increased prices. Prices for intermediate to heavy class launches on several recent competitions have increased from approximately \$50 million to nearly \$100 million in the last four years. On the other hand, Orbital Sciences has carved out a niche market providing small- to medium-sized satellites to customers requiring a smaller amount of capacity.

Even though the commercial market is recovering, USG satellite and launch purchases will remain very important for U.S. companies who rely upon government business to balance the highs and lows of the commercial sector. However, the unreliable schedule associated with government launches and the 2006 move from “lot buy” purchases to annual awards for launches will negatively impact second and third-tier suppliers. The result is that the overall price associated with those launch vehicles will be higher because of an inability to take full advantage of rate and quantity discounts from critical suppliers. Additionally, the merger between Pratt & Whitney and Rocketdyne, the country’s major suppliers of rocket engines, limits the ability of U.S. launch vehicle manufacturers to negotiate better prices for propulsion unless a lot buy is arranged.

There are several factors that may stimulate growth in the launch market. For instance, NASA’s decision to rely mainly upon the use of commercial suppliers to deliver cargo and supplies to the International Space Station should supply a significant annual boost. The recently signed

National Space Policy (June 2010) instructs NASA and all U.S. government departments and agencies to rely upon commercial providers to a much greater extent than in the past. This direction, if fully supported through Congressional appropriations, should lead to a more competitive commercial space industry, which is built upon new and more efficient technologies.

During the early to mid 1990s, the telecommunications boom encouraged a large number of entities around the globe to enter the market, but the late 1990s downturn created large oversupplies in the launch and satellite sectors which in turn eliminated normal profit margins through 2005 and resulted in reduced launch prices. Over the past four years, those prices have nearly returned to the mid-1990s prices due to a resurgence of demand for satellite telecommunications services. Prices are expected to continue to rise slightly before stabilizing. Prices could continue to increase sharply if another launch failure were to occur and/or Russia limits access to its vehicles (Proton, Zenit for Sea Launch and Land Launch, and Soyuz).

Oversupply and extremely low launch prices also pushed some U.S. manufactured launch vehicles out of the commercial launch business. As launch prices returned to higher levels, U.S.-built rockets have again become more competitive internationally. This may provide Boeing an opportunity to offer its Delta 4 rocket in commercial competitions. Following the telecom market crash, only two telecommunications behemoths (composed of many entities) remained: SES Astra-GE Americom-New Skies and Intelsat-PanAmSat-Loral Satellite Services. Moreover, this sector continues to compete with non-space based solutions which can meet the same high-technology needs, such as cellular phones, cable television and other information technologies.

Investors generally remain leery of space due in part to the sector's high risk and low returns on investment. However, investments in telecommunications satellite systems in 2009 pointed towards a return in investor confidence in this sector, and investment in some systems is increasing. As demand for these services increases, emerging launch providers such as India, China and small entrepreneurial ventures may find opportunities to enter the launch and satellite markets.

Another trend having an impact on the market is the increased interest from entrepreneurial manufacturers to develop low-cost alternatives to the established launch providers and/or opportunities for space tourism. This sector has been reenergized as a result of the successful flight of Virgin Galactic's Space Ship One and its 2008 release of Space Ship Two (which made its first captive-carry flight test on March 22, 2010), and the ongoing competitions sponsored by the FAA and private organizations to develop new technologies. However, huge investments are still required to turn these demonstration launches into successful suborbital and/or orbital space tourism operations. The sector will also require the development of new safety and operational guidelines and the ability to use new technologies regularly and at a reasonable cost. With Virgin Galactic's space tourism flights currently priced at \$200,000 per person per flight, space tourism is quickly becoming accessible to more than just millionaires.¹² This market will remain small for several years, but advances in innovation will spur further research and development.

The more stringent enforcement of U.S. export control policies in the late 1990s and the international perception that U.S. export licensing laws would negatively impact a customer's

¹² <http://www.virgingalactic.com/overview/space-tickets/>

ability to acquire a U.S. satellite appears to have hurt the ability of U.S. satellite manufacturers to compete internationally. This is mainly due to export control concerns and the development of satellites that contain no U.S. components. Even though larger companies have learned to manage export control requirements, they remain a heavy burden for smaller companies and entrepreneurial ventures that lack expertise in this area. As mentioned above, Europe's response to U.S. export control policies has been to develop communications satellites that do not contain any U.S. components. Several of these satellites have been sold, highlighting international concern about buying from the United States. Europe's response has probably had the greatest impact on second- and third-tier suppliers who are no longer supplying to European customers while simultaneously watching U.S. market share decline.

Another factor influencing the industry is the desire for national security spacecraft to have the ability to be launched "on demand". The Department of Defense and the commercial industry are working together to develop guidelines that would encourage "operationally responsive launch". Given that manufacturing a launch vehicle and/or a satellite requires 12-18 months, this goal will not be achieved for at least 10 years and will take substantial investments in inventories and production lines, which is unlikely in the near term given the current limited investment climate.

Outlook

Due to the limited size of the launch market, and the small nature of contracts, there are no individual ongoing competitions that would have a fundamental impact upon the international commercial market. However, within the civil space sector, NASA plans to use commercial providers to resupply the International Space Station with cargo and possibly people, following the planned 2011 retirement of the Space Shuttle. Depending upon how NASA decides to work with U.S. and foreign industry partners on this and other aspects of its Space Exploration program, U.S. companies could receive a large amount of work, which would have a substantial impact on the health of the sector, though not the "commercial" market.

Arianespace is expected to remain the leader in the commercial launch services sector, due to competitive pricing and a reliable service. In 2009, Arianespace began conducting launches of the medium-lift Russian Soyuz rocket. In 2011, Arianespace has six planned launches for its heavy-lift Ariane 5 vehicle, two with its medium-lift Soyuz rocket from French Guiana (and three more from Russia's Baikonur launch site) and the maiden flight of its light-weight Vega rocket.¹³ The Soyuz project is co-funded by the European Space Agency, the European Union, Arianespace and Russia.

The space tourism continues to move closer to reality. The sector's front runner, Virgin Galactic, held test flights of its VSS Enterprise in March 2010. The VSS Enterprise is the world's first manned commercial spaceship. The company will offer commercial flights to private citizens from the New Mexico spaceport, Spaceport America, in coming years.

¹³ <http://www.nasaspaceflight.com/2010/04/live-ariane-5-eca-launch-with-astra-3b-comsatbw-2-satellites>

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