

# ARCHIVED REPORT

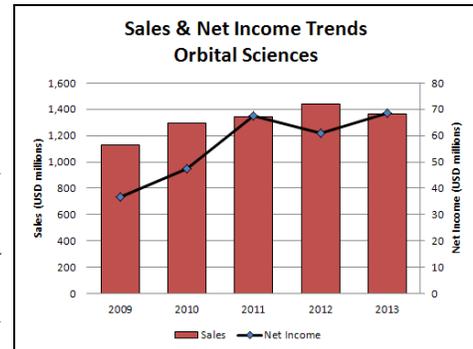
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## Orbital Sciences Corporation

### Outlook

- Orbital Sciences and ATK have agreed to a "merger of equals" combining their aero and defense operations into Orbital ATK
- The transaction is expected to create a solid mid-tier space and missile provider
- The new Orbital ATK is expected to lower costs, saving a forecasted \$70-100 million a year by the end of 2016
- The new firm may have an opportunity to crack into the military launch sector currently dominated by United Launch Alliance



### Headquarters

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Website: <http://www.orbital.com>

Orbital is a space and information systems company that designs, manufactures, operates, and markets a broad range of space infrastructure systems, satellite access products, and satellite services. These include satellites and other space systems, launch vehicles, electronics and sensors, satellite ground systems and software,

satellite-based navigation and communications products, and satellite-delivered communications, Earth imaging, and other information services.

Founded in 1982 with the goal of making space more affordable, accessible, and useful to millions of people on Earth, Orbital is now one of the world's largest space technology and satellite services companies.

In April 2014, Orbital and ATK agreed to merge operations into a new company, Orbital ATK Inc.

At the start of 2014, Orbital had about 3,300 employees at its major facilities.

### Structure and Personnel

David W. Thompson  
Chairman, President, and Chief Executive Officer  
Garrett E. Pierce  
Vice Chairman and Chief Financial Officer  
Antonio L. Elias  
Executive Vice President and Chief Technical Officer  
Ronald J. Grabe  
Executive Vice President and General Manager,  
Launch Systems Group  
Michael E. Larkin  
Executive Vice President and General Manager,  
Space Systems Group

Frank L. Culbertson  
Executive Vice President and General Manager,  
Advanced Programs Group  
Thomas E. McCabe  
Senior Vice President, General Counsel, and  
Secretary  
James B. Judd  
Senior Vice President, Technical Operations  
Emily S. Bender  
Senior Vice President, Human Resources

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### Product Area

Orbital's products and services are grouped into segments believed to be organized as follows:

1. Launch Vehicles
  - 1.1 Space Launch Vehicles
  - 1.2 Interceptor Vehicles
  - 1.3 Target Launch Vehicles
2. Satellites and Space Systems
  - 2.1 Communication Satellites
  - 2.2 Science & Remote Sensing Satellites
  - 2.3 Space Technical Services
3. Advanced Programs
  - 3.1 Human-Rated Space Systems
  - 3.2 National Security Systems
  - 3.3 Advanced Flight Systems

**Launch Vehicles.** This segment consists of three units. The first unit, *Space Launch Vehicles*, produces the air-launched Pegasus as well as the ground-launched Taurus and Minotaur rockets used to place satellites into low-Earth orbit. In 2013, Orbital completed development of the medium-capacity Antares rocket.

The second unit, *Interceptor Vehicles*, designs, manufactures, and operates missile defense-related interceptor boosters and target launch vehicles. This unit is developing an interceptor boost vehicle for the U.S. Missile Defense Agency's Ground-based Midcourse Defense (GMD) system.

The third unit, *Target Launch Vehicles*, supports the GMD program, the Sea-based Mid-Course System, and programs such as PAC 3, U.S. Army Theater High Altitude Air Defense (THAAD), Vandal, and GQM-163 Coyote (Supersonic Sea-Skimming Target, or SSST).

**Satellites and Space Systems.** This unit designs and manufactures spacecraft, including low-orbit and geosynchronous-orbit satellites for communications, remote sensing, and scientific missions. The unit also produces satellite command and data-handling, attitude control, and structural subsystems for a variety of government and commercial customers.

**Advanced Programs.** This segment is involved in developing and producing human-rated space systems, advanced launch systems and satellites, and related subsystems primarily used for national security space programs. Its major program is the Commercial Orbital Transportation Services effort to develop a new space transportation system that has the capability to deliver cargo and supplies to the International Space Station. This system will include a new advanced maneuvering spacecraft called Cygnus, which launched on Orbital's Antares launch vehicle and autonomously rendezvoused with the ISS to deliver cargo in September 2013.

### Facilities

Orbital has several important subsidiaries and related companies that produce space-based systems and space-related applications.

Launch Systems Group (Arizona), 3380 South Price Rd, Chandler, AZ 85248. Telephone: + 1 (480) 899-6000.

Launch Systems Group (Vandenberg AFB), Building 1555, Talo Rd, Vandenberg AFB, CA 93437. Telephone: + 1 (805) 734-5400.

Technical Services Division, 7500 Greenway Center Dr, Suite 700, Greenbelt, MD 20770. Telephone: + 1 (301) 220-5600.

### Corporate Overview

Since inception, Orbital Sciences' general strategy has been to develop and expand a core-integrated business of space systems technologies and products focused on designing and manufacturing lightweight rockets, small satellites, and other affordable space systems intended to capitalize on increasing commercial and governmental uses of space. A major part of this strategy has centered on market expansion, including the world's first privately developed space launch vehicle, the first commercial orbit transfer vehicle, and the first operational low-Earth-orbit commercial communications network.

#### New Products and Services

**Iridium NEXT Integration.** In March 2014, Orbital Sciences started production of 81 satellites for the Iridium NEXT program. Orbital originally signed a systems integration and test contract in January 2011 with Thales Alenia Space, the prime contractor for

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Iridium NEXT, the next-generation satellite constellation of Iridium Communications Inc. Orbital will complete the assembly, integration, test, and launch support phases for this second-generation global communications satellite constellation at its satellite manufacturing facility in Gilbert, Arizona. The commencement of production also signifies the opening of a Foreign Trade Zone (FTZ) at the Gilbert facility, which allows Orbital to reduce program costs by importing foreign-sourced hardware from Thales Alenia Space. Scheduled to begin launching in 2015, Iridium NEXT will fully replace Iridium's current satellite constellation of 66 cross-linked low-Earth orbit (LEO) satellites.

**Commercial Resupply Services.** In January 2014, Orbital Sciences completed the first of eight Cygnus operational cargo logistics spacecraft missions to the International Space Station (ISS) as part of the company's \$1.9 billion Commercial Resupply Services (CRS) contract with NASA. Under the CRS program, initially awarded in December 2008, Orbital will provide eight pressurized cargo missions to the ISS through late 2016. For these missions, NASA will manifest a variety of essential items based on ISS program needs, including food, clothing, crew supplies, spare parts and equipment, and scientific experiments. The Commercial Orbital Transportation Services (COTS) program is based on Orbital's Cygnus maneuvering space vehicle and is the anchor customer for the new Antares (formerly called Taurus II) medium-lift launch vehicle. Cygnus is composed of a service module containing the vehicle's propulsion, power systems, and avionics, and one of three types of specialized cargo modules.

**TESS.** In April 2013, NASA selected Orbital to design, manufacture, integrate, and test a new astrophysics satellite that will perform a full-sky search for exoplanets around nearby stars. The Transiting Exoplanet Survey Satellite (TESS) program, which will be based on Orbital's LEOSTar-2 spacecraft platform, will be executed at Orbital's satellite production and testing facility in Dulles, Virginia. The four-year contract is valued at approximately \$75 million. The mission of the TESS spacecraft is to provide prime exoplanet candidates for further characterization in the future by the James Webb Space Telescope (JWST) as well as other large ground-based and space-based telescopes. The planned launch of the TESS spacecraft in mid-2017 is well matched to JWST's scheduled launch in 2018 to maintain momentum in NASA's exoplanet program.

**EAGLE.** In October 2012, Orbital announced that the U.S. Air Force Research Laboratory (AFRL) Space Vehicles Directorate had awarded the company a

\$32 million contract to develop an experimental maneuverable spacecraft platform that will be capable of hosting multiple payloads and operating in low- and geosynchronous orbit. The Evolved Expendable Launch Vehicle (EELV) Secondary Adapter (ESPA) Augmented Geostationary Laboratory Experiment (EAGLE) is AFRL's newest space flight program. It will consist of an ESPA-based spacecraft bus (EAGLE platform) and a suite of payload experiments. Capable of launching aboard any EELV variant, the EAGLE platform will use a six-port standard ESPA ring as part of its structure, thereby improving launch access to geosynchronous orbit as well as providing a cost-effective modular platform that could be used for geostationary transfer orbit (GTO) or enabling payload hosting for low-orbit operations. Orbital expects its EAGLE platform design will be capable of hosting up to six payloads for a period of at least one year in geosynchronous orbit. The EAGLE platform may also carry significant quantities of propellant, depending on the eventual launch vehicle selection and orbit maneuverability requirements.

**ICESat-2.** In September 2011, Orbital announced that NASA's Goddard Space Flight Center had selected the company to design, build, and test the Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) Earth science satellite. Scheduled for launch in 2016, ICESat-2 is the next-generation successor to the original ICESat satellite, which operated from 2003 to 2010. The contract award is valued at \$135 million, including the spacecraft and associated options. Orbital will base the ICESat-2 satellite on its LEOSTar-3 platform.

**Intermediate-Range Ballistic Missile Targets.** In March 2011, Orbital Sciences was awarded a potential \$1.1 billion contract by the U.S. Missile Defense Agency (MDA) to supply intermediate-range ballistic missile (IRBM) target vehicles for use in future tests of missile defense systems. The seven-year contract covers development and production of up to 22 target rockets and related systems over the 2011 to 2018 period. It has a firm value of approximately \$230 million for the first eight vehicles (to be delivered by 2015), with up to \$870 million in contract options for 14 additional vehicles, countermeasures equipment, modeling and simulation support, logistics activities, and launch services to be provided from 2012 to 2018. The rocket to be used for the IRBM target vehicle is derived from Orbital's Pegasus space launch vehicle. The company's IRBM target is a multistage vehicle that will be air-launched from a standard C-17 cargo aircraft via a parachute extraction system, providing MDA with increased flexibility in testing its Ballistic Missile Defense System (BMDS).

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**NSROC II.** In July 2010, Orbital Sciences was selected by NASA as the prime contractor on the NASA Sounding Rocket Operations Contract II (NSROC II) program. The indefinite delivery/indefinite quantity NSROC II contract carries a maximum value of \$310 million over its five-year term, with a current expected value of at least \$125 million. Under the NSROC II program, which is primarily centered at NASA's Wallops Flight Facility in Virginia, Orbital's Technical Services Division (TSD) will be responsible for planning, coordinating, and carrying out sounding rocket missions from locations in the U.S. and around the world. In addition, Orbital TSD will work with NASA to develop and implement advanced sounding rocket capabilities to be used on the program.

### Plant Expansion/Organization Update

**Chandler Expansion.** In September 2009, Orbital formally opened a new 83,000-square-foot building adjacent to the company's current facilities in Chandler, Arizona. The building houses approximately 300 employees in the company's launch vehicle design, engineering, manufacturing, and program management operations. Orbital's long-term plans for the Chandler campus, subject to future business considerations, include the construction of two additional buildings totaling up to 150,000 square feet. Together with the company's current on-site facilities, the new development would create a 48-acre campus with approximately 650,000 square feet of engineering, industrial, and administrative space that will be capable of accommodating about 2,200 employees. Orbital currently employs approximately 1,450 full- and part-time employees at its Chandler operations.

### Mergers/Acquisitions/Divestitures

**Orbital and ATK Merge.** In April 2014, Orbital Sciences and Alliant Techsystems (ATK) announced the merging of their aerospace and defense (A&D) groups to create a \$4.5 billion space, defense, and aviation systems developer and manufacturer, which will employ approximately 13,000 workers. The new company, to be called Orbital ATK Inc, will serve U.S. and international customers of spacecraft hardware, including launch vehicles and propulsion systems, tactical missiles and defense electronics, satellites and space systems, armament systems and ammunition, and

commercial and military aircraft structures and related components, the company said. As part of the transaction, ATK will spin off its Sporting Group, which focuses on commercial sporting equipment, to its shareholders. Orbital President and CEO David Thompson will lead the new company, with Blake Larson, president of ATK's Aerospace Group, serving as chief operating officer. The combined company will be headquartered at Orbital's existing Dulles, Virginia, campus, with major employee sites in Utah, Missouri, Virginia, Arizona, Maryland, West Virginia, California, and Minnesota. In the merger, ATK shareholders will own about 53.8 percent of the equity of the combined company, and Orbital shareholders will own about 46.2 percent. The transaction is expected to close by the end of 2014.

**GD Satellite Operations Acquired.** In April 2010, Orbital Sciences acquired the spacecraft development and manufacturing business of General Dynamics' subsidiary GD Advanced Information Systems for \$55 million. General Dynamics' spacecraft unit is located in Gilbert, Arizona, 10 miles from Orbital's launch vehicle engineering and manufacturing facilities in Chandler. About 325 new employees were to join Orbital, most of whom are engineers, technicians, and program managers. As part of the transaction, Orbital acquired a state-of-the-art, 135,000-square-foot space systems manufacturing, integration, and test facility. The business was originally founded as Spectrum Astro and was purchased by General Dynamics in 2004.

**TMS Unit Sold.** In June 2008, Orbital completed the sale of its non-core Transportation Management Systems unit to Affiliated Computer Systems for approximately \$43 million. TMS is an integrator of software-based systems that combine satellite navigation and wireless communications to enable municipal transit and other fleet operators to better manage and dispatch public transit and highway service vehicles and commuter light rail systems. The deal was first announced in April 2008.

### Teaming/Competition/Joint Ventures

No recent teamings, competitions, or joint ventures have been reported concerning Orbital Sciences in the past year.

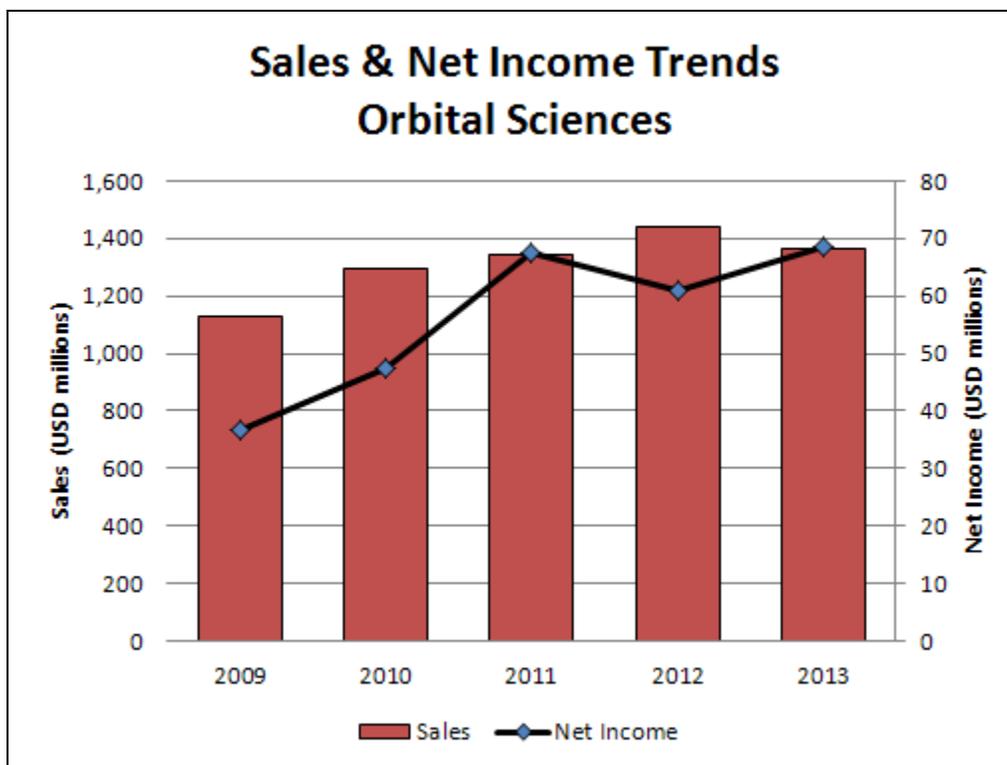
## Financial Results/Corporate Statistics

Orbital Sciences' revenues for 2013 fell almost 5 percent to \$1.36 billion compared with 2012 sales of \$1.44 billion. The company posted net income of \$68.4 million compared with \$61.0 million for 2012. The increase in research and development expenses is primarily related to Taurus II launch vehicle development. For 2013, Orbital completed 53 operational events, most notably the flight of the new Antares medium-class rocket and the initial mission of the Cygnus cargo spacecraft, launched on the second Antares. In addition, the company had three small-

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class space launches, three commercial and scientific satellite deployments, two missile defense interceptor flights, 10 target vehicle launches, and 20 small research rocket operations. Debt/equity ratio is calculated from the company's long-term debt divided by shareholder equity. The latest full-year statistics are reported below.

Y/E December 31	2008	2009	2010	2011	2012	2013
(USD millions)						
Net Sales	1,168.6	1,125.3	1,294.6	1,345.9	1,436.8	1,365.3
Net Income	58.5	36.6	47.5	67.4	61.0	68.4
Percent Government	73.0	78.0	74.0	71.0	79.0	83.0
R&D Expenditures	51.4	109.7	122.3	102.8	114.2	89.2
Backlog	2,110.0	1,890.0	2,030.0	2,390.0	2,200.0	2,150.0
Debt/Equity Ratio	.24	.23	.22	.20	.20	.16



Industry Segments

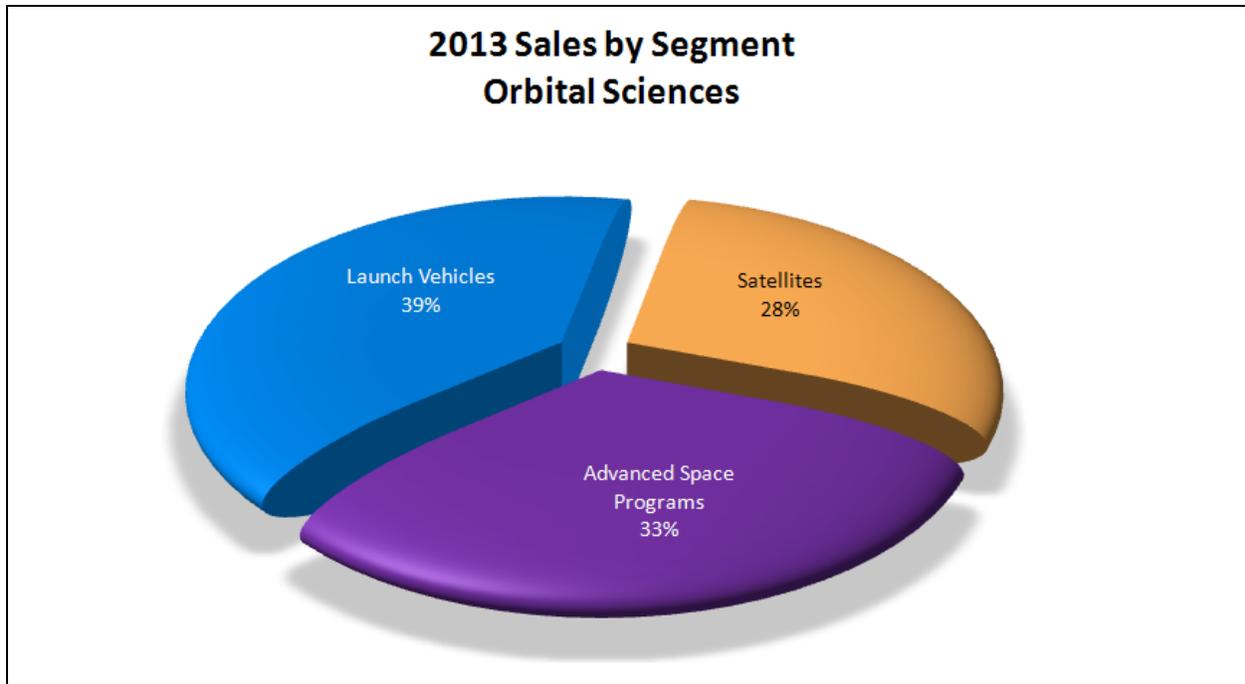
A breakdown of the firm's sales by business group is given below. Totals may have been rounded.

SALES	2009	2010	2011	2012	2013
(USD millions)					
Launch Vehicles	440.2	434.5	483.2	527.3	551.7
Satellites and Related Space Systems	352.3	497.0	553.8	496.2	387.5
Advanced Space Programs	344.8	423.6	434.0	470.1	469.4
Corporate and Other	-11.9	-60.6	-125.1	-56.8	-43.3
<b>TOTAL</b>	<b>1,125.4</b>	<b>1,294.5</b>	<b>1,345.9</b>	<b>1,436.8</b>	<b>1,365.3</b>

OPERATING INCOME	2009	2010	2011	2012	2013
(USD millions)					
Launch Vehicles	14.2	21.2	14.1	36.1	48.8
Satellites and Related Space Systems	27.3	33.8	37.6	46.2	33.9
Advanced Space Programs	10.8	21.0	28.0	32.3	30.8
Corporate and Other	0.0	-2.9	0.0	-2.1	0.0
<b>TOTAL</b>	<b>52.3</b>	<b>73.1</b>	<b>79.7</b>	<b>112.5</b>	<b>113.5</b>

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## Strategic Outlook

In what will likely be a very strong merger, Orbital Sciences and ATK will join their aerospace and defense operations into the new Orbital ATK. The transaction is expected to create a solid mid-tier space and missile provider when completed in late 2014.

With budgets tightening at NASA, the move creates a balanced company with a strong space and defense portfolio. The merger-of-equals transaction will combine Orbital's small- and medium-class satellite and launch vehicle product lines with ATK's A&D rocket propulsion, composite structures, and space power systems to produce more capable and affordable space and missile defense products.

In addition, the deal will enhance ATK's strong production capabilities with Orbital's systems design, engineering, and integration acumen to provide greater value to current and future customers.

"This merger-of-equals combination of Orbital and ATK Aerospace and Defense brings together two of the space and defense industry's most innovative developers and cost-efficient manufacturers who have worked closely together for over 25 years," CEO David W. Thompson said. "By building on complementary technologies, products and know-how, and highly-compatible cultures, the new Orbital ATK will deliver even more affordable space, defense, and aviation systems to our existing customers and be strongly positioned to expand into adjacent areas."

The new Orbital ATK is expected to lower costs and risks through the combination, saving a forecasted \$70-100 million a year by the end of 2016. In turn, this will help the nascent firm increase its competitive edge in future procurements, especially with a cash-strapped NASA. Company officials believe an additional \$100-200 million in annual revenue could also be generated through increased federal contracting opportunities brought on by the combination and its increased synergy.

With its increased critical mass, the new firm may have an opportunity to crack into the military launch sector currently dominated by the Boeing and Lockheed Martin joint venture, United Launch Alliance. Under the current procurement, rockets would be bought in bulk lots rather than individually in order to reduce costs and support the industrial base. Such a system would commit the government to buying between six and 10 rockets per year for up to five years.

ULA benefits strongly from such a system, as its Evolved Expendable Launch Vehicles (EELVs) are the most proven and low-risk. However, competitors including Orbital, SpaceX, and ATK would dearly love to have a chance to compete. SpaceX has been the most aggressive in this regard, filing a protest against the Air Force in 2014 for its decision to award a block-buy contract for 36 launches to ULA, a sole source deal that corporate officials derided as wasteful for taxpayers. Whether or not the protest stands, a middle ground

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might be found to allow the new players a better chance to gain a share of this narrow market.

Orbital for its part is currently enjoying the success of its Antares/Cygnus combo. In early 2014, the Antares medium-class rocket carried the first of eight Cygnus cargo logistics spacecraft missions to the ISS as part of its \$1.9 billion Commercial Resupply Services (CRS) contract with NASA. The program will run through 2016.

As the program proves its reliability, it could open up additional opportunities. Already, the Antares is

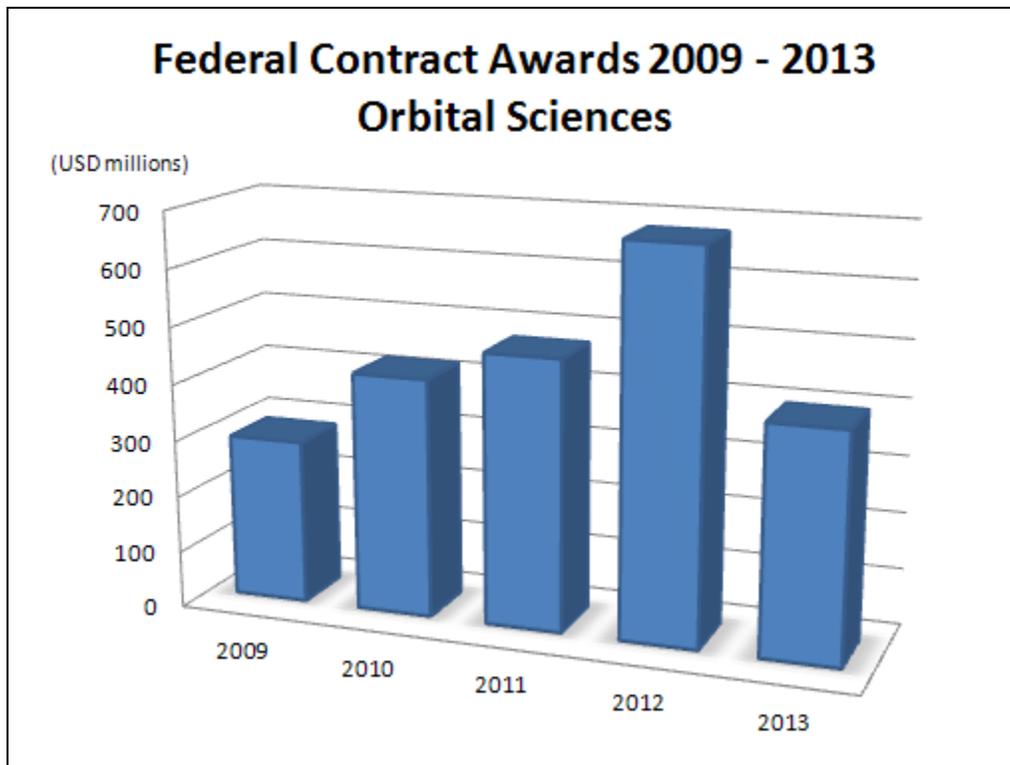
currently on-ramped to both the NASA Launch Services-2 and the U.S. Air Force's Orbital/Suborbital Program-3 contracts, enabling the two largest U.S. government space launch customers to order Antares for "right-size and right-price" launch services for medium-class spacecraft.

In the meantime, Orbital and ATK will look to combining their expertise to best capitalize on the respective strengths of each organization.

## Prime Award Summary

The following chart and table show the dollar volume of Orbital Sciences' federal prime contract awards relative to the top 100 companies receiving the largest dollar volume of prime contract awards for 2009 through 2013. For more information, refer to Appendix I, "Recipients of Federal Contract Awards."

<b>Orbital Sciences</b> (USD millions)	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Rank	–	–	–	94	–
<b>Total Federal Awards</b>	<b>289.8</b>	<b>421.4</b>	<b>475.9</b>	<b>679.1</b>	<b>399.4</b>



Source: www.usaspending.gov

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### Program Activity

Some important aerospace and government programs currently underway at Orbital Sciences are listed below. The briefs are intended to provide a list of programs of major importance to the company. For detailed information on or analysis of specific aerospace and defense programs or equipment, please refer to the applicable Forecast International binder (for example, *Military Aircraft*, *Military Vehicles*, *Warships*, *Missiles*, *Electronic Systems*, and *Aviation Gas Turbines*). The following are the company's business interests:

- Defense Electronics
- Sensors
- Space Systems
- Systems Integration

#### Electronics Programs

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##### Kwajalein Atoll

The U.S. Army Kwajalein Atoll Missile Test Range is a remote range and test facility located in the Republic of the Marshall Islands. Orbital provides Ballistic Missile Defense Organization support.

#### Missile Programs

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##### GQM-163A SSST

In June 2000, Orbital Sciences was awarded an engineering and manufacturing development contract for the Supersonic Sea-Skimming Target (SSST) system. The Navy awarded Orbital the contract to meet its requirement for an affordable SSST to simulate anti-ship cruise missiles for fleet training and weapon systems research, development, test, and evaluation. Production is ongoing. In February 2006, Orbital Sciences received the first full-production order from the U.S. Navy for 19 GQM-163A Coyote SSST missiles. The Naval Air Systems Command (NAVAIR), based at Patuxent River Naval Air Station in Maryland, awarded Orbital the program's first full-rate production contract following a successful two-year development and flight test program.

#### Space System Programs

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##### Launch Vehicles & Manned Platforms

##### Antares

Antares is a medium-class space launch vehicle formerly known as Taurus II. Antares' primary mission will be to launch Cygnus transfer vehicles to the International Space Station. Orbital will also market the launch vehicle to carry remote sensing satellites to low-Earth orbit. The Antares program has been beset by

delays. Originally planned to launch in 2010, the launch vehicle made its first launch in April 2013. Flights will ramp up to a level of two to three per year beginning in 2014.

##### Minotaur

The Minotaur is a lightweight launch vehicle designed to take payloads into low-Earth orbit. It is a four-stage system based on retired Intercontinental Ballistic Missile (ICBM) components and Orbital Sciences-built components. The Air Force typically relies on its Atlas V and Delta IV Evolved Expendable Launch Vehicles to launch its spacecraft. However, many payloads are too small to justify the large and expensive EELVs. The Minotaur family of launch vehicles fills the lower gap and is primarily used to launch light- and medium-weight U.S. Air Force payloads. The new Minotaur V has been selected to launch NASA LADEE mission. The Minotaur has launched 25 times with a 100 percent success rate.

##### Pegasus XL

Pegasus XL is a winged, air-launched, expendable launch vehicle. The vehicle can carry small payloads to low-Earth polar or equatorial orbits. While the Pegasus XL launch market has not been exactly booming, its flight record is outstanding. The Pegasus XL is the only small launch vehicle to have earned NASA's coveted Category 3 certification, which allows NASA's most valuable payloads to be launched aboard the rocket. Orbital has produced approximately 50 Pegasus launch vehicles. With the launch of NASA's IRIS spacecraft in June 2013, there are no more missions on the Pegasus launch manifest. Orbital Sciences is focusing on other platforms such as the Antares, Minotaur family, and the Air Launch Vehicle (ALV) for Stratolaunch Systems.

##### Suborbital Rockets

Orbital claims to be the world's leading supplier of suborbital launch vehicles, providing a wide variety of booster configurations to customers with a range of performance and cost requirements. Orbital's largest customer for suborbital vehicles is the U.S. Department of Defense, which uses the vehicles as targets to test defensive missile systems.

##### Taurus

Taurus is a four-stage, solid-propellant expendable launch vehicle. Taurus was developed as part of DARPA's Advanced Space Technology Program (ASTP), involved in developing the technology to enable production of Lightsats – smaller and more

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capable satellites – for military commanders. The Standard Small Launch Vehicle, or SSLV (the official name for the new booster), developed for this program has commercial and scientific applications. The Taurus has launched nine times, with three failures. Because of these setbacks, NASA has decided not to use the Taurus XL for its launch needs until Orbital Sciences creates an acceptable return-to-flight plan. NASA is one of the primary customers of the Taurus XL, so a reduction in use by the space agency will hurt the launch vehicle's sales prospects. Taurus faces competition from the likes of the Falcon 9 and the Antares.

### Manned Platforms

#### Cygnus

The Cygnus spacecraft is being developed by Orbital Sciences Corp to deliver cargo to the International Space Station under a NASA Commercial Orbital Transportation Services (COTS) agreement. Orbital Sciences will also develop a Taurus II launch vehicle to carry the Cygnus as part of the COTS program. Total cost of the COTS program will be \$320 million. NASA will supply \$170 million, and Orbital will fund the rest of the development costs. In December 2008, NASA awarded Orbital Sciences a contract to provide cargo services to the ISS under the Commercial Resupply Services program. The contract could be worth up to \$1.88 billion through 2016 if all options are exercised. Orbital Sciences will use the Cygnus transfer vehicle developed under the COTS program to deliver up to 20 metric tons of supplies to the space station by the end of the contract period. The first Cygnus flight occurred in September 2013, clearing the way for the start of the CRS program. In January 2014, Orbital Sciences completed the first of eight Cygnus CRS flights to the ISS.

#### Orion Crew Exploration Vehicle

The Orion Crew Exploration Vehicle (CEV), while resembling a larger version of the Apollo crew capsule, was designed to be a replacement for the Space Shuttle, and was expected to eventually take humans back to the moon and to Mars. Orbital Sciences was part of the Lockheed Martin team that was selected in August 2006 to develop the Orion manned spacecraft. Orbital's principal role on the Lockheed Martin team was to design, develop, build, and test a new Launch Abort System (LAS) that would allow the astronaut crew to safely escape in the event of an emergency during launch pad operations and through the atmospheric ascent of the Orion vehicle into Earth's orbit. The company was also to perform system-level safety and reliability analyses in support of the entire project. The LAS design, using Orbital's small rocket technology, was a key element in vastly improving the safety of the

flight crew as compared to current human space systems. However, as part of the Constellation program, Orion was terminated in the fiscal year 2011 budget proposal that NASA submitted to Congress in February 2010. Despite the cancellation, Congress ordered NASA to resurrect its effort to develop an in-house spacecraft to carry crew into orbit under the Multipurpose Crew Vehicle (MPCV) program. The Orion will continue development under the MPCV program. Orion was powered on for the first time in October 2013; first flight is expected in late 2014 or early 2015.

### Satellites & Spacecraft

#### GEOStar

The GEOStar is a modular satellite platform designed specifically to support low- to medium-power payloads. It primarily serves the fixed satellite services (FSS) and broadcast satellite services (BSS) markets. However, it can be adapted to serve other markets, such as mobile satellite services (MSS), Earth and space science applications, and technology demonstration. Current missions are the Thaicom 8 and SKYM-1.

#### ICESat-2

In September 2011, Orbital announced that NASA's Goddard Space Flight Center had selected the company to design, build, and test the Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) Earth science satellite. Scheduled for launch in 2016, ICESat-2 is the next-generation successor to the original ICESat satellite, which operated from 2003 to 2010. The contract award is valued at \$135 million, including the spacecraft and associated options. Orbital will base the ICESat-2 satellite on its LEOStar-3 platform. Launch is planned for 2017.

#### ICON

The Ionospheric Connection Explorer (ICON) will study the interface between the upper reaches of the Earth's atmosphere and outer space in response to recent scientific discovery that the ionosphere, positioned at the edge of space where the sun ionizes the air to create charged particles, is significantly influenced by storms in Earth's lower atmosphere. Launch is planned for 2017.

#### LEOStar

Originally designed for the Pegasus XL launch vehicle, Orbital's LEOStar-2 spacecraft bus provides a flexible, high-performance platform for space and Earth scientific, remote sensing, and other commercial applications on a variety of launch vehicles (Pegasus, Minotaur, and Delta). The LEOStar-3 is featured in NASA Goddard's Rapid Spacecraft Development Office (RSDO) catalog. It is optimized for LEO missions but

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can be configured to support deep-space/interplanetary, MEO, HEO, or GEO applications.

### MicroStar

This is Orbital Sciences' standard small satellite platform. Designed to be launched in multiple-spacecraft "stacks" on a single launch vehicle for constellation deployments, Orbital's MicroStar satellite platform supports instruments up to 140 kg/600 W and provides a three- to five-year mission life. The bus design is optimally compatible with Pegasus, Taurus, Minotaur I, and Falcon launch vehicles to support dedicated launches, multi-satellite constellation launches, and co-manifested launches. The MicroStar platform was originally developed to support the ORBCOMM wireless data communications system. Orbital produced a total of 35 ORBCOMM spacecraft.

### Orbiting Carbon Observatory-2

The Orbiting Carbon Observatory spacecraft is built on the Orbital Sciences LEOStar-2 platform. The Orbiting Carbon Observatory-2 (OCO-2) satellite is designed to make the first space-based measurements of atmospheric carbon dioxide (CO<sub>2</sub>). Launch is slated for 2014.

### TESS

In association with NASA and MIT, Orbital is designing the Transiting Exoplanet Survey Satellite (TESS) spacecraft to identify exoplanet candidates for further characterization in the future by the James Webb Space Telescope (JWST) as well as other large ground-based and space-based telescopes. The TESS mission will perform an all-sky survey using a unique array of telescopes to discover exoplanets orbiting nearby stars and will seek to identify habitable, Earth-like planets. The planned launch of the TESS spacecraft is in mid-2017.

## U.S. Contract Awards

Below is a listing of major recent contracts awarded to Orbital Sciences from the U.S. government (contracts as of press date). Note that the Description section is excerpted directly from U.S. DoD listings. For full details on individual contracts and their associated modifications, visit: <http://www.defense.gov/contracts> and enter the contract number in the "Search Contracts" box.

Date	Award (USD millions)	Contract #	Description
2/19/08	7.4	HR0011-08-C-0031	Support for DARPA's Future, Fast, Flexible, Fractionated, Free-Flying Spacecraft United by Information Exchange (System F6) program.
3/18/08	250.0	FA8523-07-C-0008	Engineering technical services to support the Sounding Rocket Program Three.
7/21/08	15.0	?	One medium-range target missile, with an option for one additional medium-range target missile.
4/27/09	10.0	N00164-09-D-GP07	Support of Ground-based Midcourse Defense (GMD) system.
5/28/09	41.8	N00019-07-C-0031	Production of 14 GQM-163A SSST vehicles.
1/7/10	10.8	HQ0147-08-C-0003	Medium-range target system integration, mission planning, and launch services in support of the AEGIS Flight Target Mission Event 16E2.
1/12/10	10.4	N68936-10-D-0012	GQM-163A SSST vehicle operations and maintenance services.
4/27/10	94.7	N00017-10-C-2026	Spacecraft and airborne systems research, analysis, and prototype development.
6/28/10	26.4	N00019-10-C-0063	Seven GQM-163A Coyote SSST vehicles.
3/8/11	1,100.0	HQ0147-11-C-0006	Manufacture of IRBM targets, associated objects, and integrated logistics support to include inventory storage and maintenance management, pre- and post-mission analysis, launch preparation and execution, engineering services, and modeling and simulation support. The total value of the base award is \$217 million. Total value of the contract is \$1.1 billion if all options are exercised.
3/31/11	26.2	N00019-11-C-0050	Full-rate production 5 of seven GQM-163A Coyote SSST vehicles.

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<b>Date</b>	<b>Award (USD millions)</b>	<b>Contract #</b>	<b>Description</b>
8/23/12	32.6	FA9453-12-C-0128	Develop a maneuverable, augmented, geostationary platform spacecraft bus for laboratory experiments.
8/29/12	26.4	N00019-12-C-0061	Full-rate production 6 of the GQM-163A Coyote SSST.
9/28/12	?	FA8808-12-C-0014	Study of specifications for protected MILSATCOM waveform.
3/18/13	150.0	W9124Q-08-D-0803	Contract among three vendors. The award will provide theoretical studies and engineering research support for Army, Navy and Air Force R&D programs.
9/5/13	29.8	N00019-13-C-0145	Full-rate production 7 of eight GQM-163A Coyote SSST base vehicles.

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