National Aeronautics and Space Administration

information summary

NASA's Launch Services Program

The Launch Services Program was established at Kennedy Space Center for NASA's acquisition and program management of Expendable Launch Vehicle (ELV) missions. A skillful NASA/contractor team is in place to meet the mission of the Launch Services Program, which exists to provide leadership, expertise and cost-effective services in the commercial arena to satisfy Agencywide space transportation requirements and maximize the opportunity for mission success.

The principal objectives are to provide safe, reliable, cost-effective and on-schedule processing, mission analysis, and spacecraft integration and launch services for NASA and NASA-sponsored payloads needing a mission on ELVs.

The Launch Services Program is responsible for NASA oversight of launch operations and countdown management, providing added quality and mission

assurance in lieu of the requirement for the launch service provider to obtain a commercial launch license.

Primary launch sites are Cape Canaveral Air Force Station (CCAFS) in Florida, and Vandenberg Air Force Base (VAFB) in California.

Other launch locations are NASA's Wallops Island flight facility in Virginia, the North Pacific's Kwajalein Atoll in the Republic of the Marshall Islands, and Kodiak Island in Alaska.

Since 1990, NASA has purchased ELV launch services directly from commercial providers, whenever possible, for its scientific and applications missions. ELVs can accommodate all types of orbit inclinations and altitudes and are ideal vehicles for launching Earth-orbit and interplanetary missions.

Expendable Launch Vehicles

All Expendable Launch Vehicles use the same basic technology to get into space – two or more rocket-powered stages, which fall away when their engine burns are completed. Whatever a launch vehicle carries above the final discarded stage is considered the payload.

A payload's weight, orbital destination and purpose determine what size launch vehicle is required. A small ELV like Pegasus can place a low-weight spacecraft into near-Earth orbit, while an expendable vehicle like the massive Saturn V was required to send manned Apollo spacecraft to the Moon.

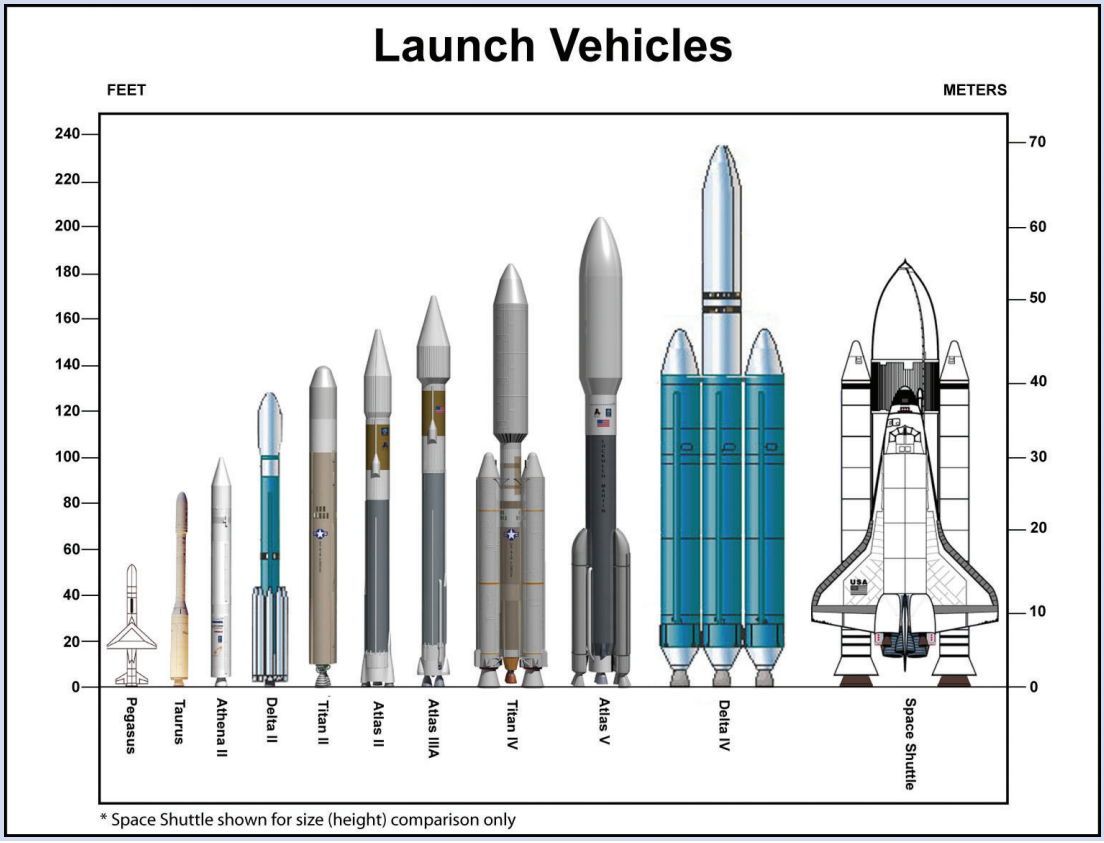
The powerful Titan/Centaur combination carried large and complex robotic scientific explorers, such as the Vikings and Voyagers, to examine other planets in the 1970s. Among other missions, the Atlas/Agena vehicle sent several spacecraft to photograph and then impact the Moon. Atlas/Centaur vehicles launched many of the larger spacecraft into Earth orbit and beyond.

To date, Delta launch vehicles have carried more than 200 NASA scientific, wind and communications payloads into orbit, or to other planets. NASA used the Athena I and II vehicles to launch scientific satellites from VAFB, CCAFS and Kodiak Island. The Pegasus, an Orbital Sciences fleet vehicle, is the only airborne launch vehicle in the ELV fleet. The Taurus vehicle, also built by Orbital Sciences, may be used for future NASA launches.

ELV Services Fleet

Atlas/Centaur

The Atlas/Centaur vehicles first became operational in 1966. Lockheed Martin used the Atlas II and III vehicles to launch military, commercial and scientific payloads into space from Space Launch Complex 36 at CCAFS and Space Launch Complex 3E at



VAFB. More than 580 Atlas flights have taken place, including 170 flights with the Centaur stage added to create the Atlas/Centaur vehicle.

When launched by NASA through 1989, the Atlas/Centaur was the standard vehicle for intermediate payloads that carried about 8,200 pounds (3,700 kilograms) to Geosynchronous Transfer Orbit (GTO). The Centaur was the first high-energy, liquid-hydrogen/liquid-oxygen launch vehicle stage, and it provided the most power for its weight of any proven stage then in use.

The Atlas/Centaur was the launch vehicle for Surveyor I, the first U.S. spacecraft to soft-land on the Moon. Other spacecraft launched by Atlas/Centaurs include the Orbiting Astronomical Observatories; Applications Technology Satellites; the Intelsat IV, IV-A and V series of communications satellites; Mariner Mars orbiters; a Mariner spacecraft that made a flyby of Venus and three flybys of Mercury; Pioneers, which accomplished flybys of Jupiter and Saturn; and Pioneers that orbited Venus and sent probes plunging through its atmosphere to the surface. Most recently, NASA launched the Tracking Data and Relay Satellite-J communication satellite Dec. 4, 2002, on an Atlas IIA from CCAFS.

Lockheed Martin developed the Atlas III launch system that debuted in 2000. This vehicle can carry more than 8,819 pounds (4,000 kilograms) to geosynchronous transfer orbit. The Atlas V system, the newest of Lockheed Martin's fleet, first launched Aug. 21, 2002, carrying a commercial communications satellite. The Atlas V can carry from 8,700 pounds (3,946 kilograms) to 19,100 pounds (8,663 kilograms) to GTO from Space Launch Complex 41 at CCAFS.

Delta

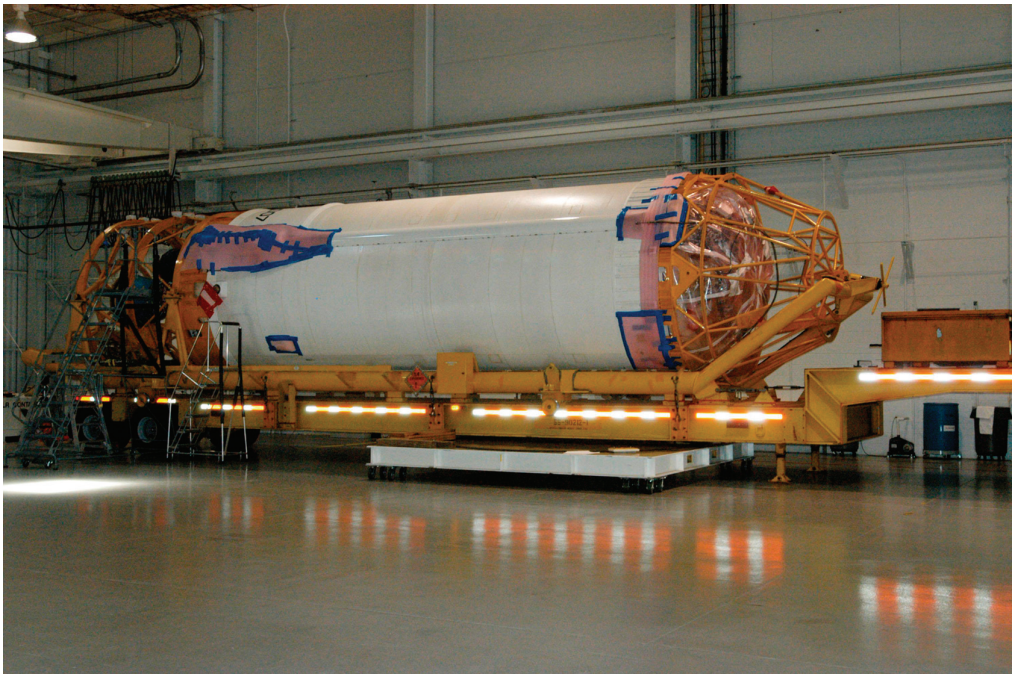
From 1960 to 1989, NASA was the responsible agency in the launch of 170 scientific, weather and communications spacecraft, along with some military satellites, aboard Delta launch vehicles from CCAFS and VAFB. These spacecraft include NASA's TIROS, Nimbus, ITOS, LANDSAT and Westar series, and more than 30 scientific Explorers. Numerous international satellites were also launched by NASA.

The Delta family of vehicles has been upgraded several times over the years. The Delta, produced by Boeing, currently has solid strap-on motors, liquid-fueled first and second stages, and a solid-propellant third stage.

The Delta III launch vehicle was built as a transitional vehicle and launched only three times. The Delta IV system, the newest in Delta's fleet, will launch the Geostationary Operational Environmental Satellite (GOES) series of spacecraft and other future NASA missions. The Delta IV can carry from 9,285 pounds (4,211 kilograms) to 28,950 pounds (13,132 kilograms) to GTO and from 17,900 pounds (8,119 kilograms) to 50,800 pounds (23,043 kilograms) into low-Earth orbit, depending on vehicle configuration. Space Launch Complex 37, formerly a Saturn I launch pad, was reconstructed to launch the Delta IV.

Pegasus

The Pegasus XL vehicle, attached beneath an Orbital Sciences carrier aircraft, a converted Lockheed L-1011, is carried to an altitude of 39,000 feet, and then released for launch. Pegasus has successfully placed more than 70 satellites into orbit. Its three-stage solid motors can deliver up to a 970-pound (440-kilogram) payload into low-Earth orbit. Because of its unique launch platform, this vehicle can be launched from almost any location in the world. There have been successful launches from VAFB, CCAFS, Wallops Island , Kwajelein Atoll, and the Canary Islands in the Atlantic. Pegasus launched NASA's Solar Radiation and Climate (SORCE) experiment Jan. 25, 2003, and the Galaxy Evolution Explorer (GALEX) April 28, 2003, both from CCAFS.



Inside the Atlas Space Operations Center at Cape Canaveral Air Force Station sits the second-stage Centaur for a Lockheed Martin Atlas V, designated AV-007. The Atlas V is the launch vehicle for the Mars Reconnaissance Orbiter (MRO). The MRO is designed for a series of global mapping, regional survey and targeted observations from a near-polar, low-altitude Mars orbit.

Taurus

The Taurus vehicle is a four-stage solid motor vehicle that can launch up to a 2,200-pound (1,000 kilogram) payload into low-Earth orbit. The Taurus was designed to operate from a wide range of launch facilities and geographic locations. The Taurus launch vehicle has successfully sent six satellites into orbit with six launches, all from VAFB. It was used to launch NASA's Active Cavity Radiometer Irradiance Monitor (ACRIMSAT) spacecraft Dec. 20, 1999. NASA planned to launch at least five Taurus vehicles, carrying primary payloads, beginning in 2005.

Titan

The Titan was used by NASA to launch interplanetary missions from CCAFS. An earlier version of the Titan vehicle, the Titan III-E/Centaur, built by Martin Marietta and General Dynamics, was used to launch two Helios missions to the Sun, two Viking missions to Mars, and two Voyager missions to Jupiter and Saturn beginning in the 1970s. One of the Voyagers also continued on to Uranus and Neptune. All of the missions provided remarkable new scientific data about our Solar System and spectacular color photographs of the planets they explored, as well as some of their moons.

A Boeing Delta II rocket launches June 10, 2003, with the Mars Exploration Rover "Spirit" aboard.

The L-1011 carrier aircraft is in flight with its cargo of the Pegasus launch vehicle and SciSat-1 spacecraft underneath.

The Titan IV launched NASA's Cassini spacecraft to Saturn in 1997. The Titan III sent NASA's Mars Observer on its journey in 1992. The Titan II was used to launch many National Oceanic and Atmospheric Administration (NOAA) weather satellites. Most recently, a Titan II launched NASA's NOAA-M satellite June 24, 2002, from VAFB.

Historic Missions

Mars Exploration Rovers (MER-A & B) (Delta II)

NASA's Mars Exploration Rovers were launched aboard Delta II vehicles from CCAFS. MER-A Spirit launched June 10, 2003, and MER-B Opportunity launched July 7 that same year. Both rovers reached Mars in January 2004. Information sent from the rovers back to Earth revealed the existence of water in the red planet's past. Previous Mars missions include the 2001 Mars Odyssey spacecraft that launched from Space Launch Complex 17A at CCAFS April 7, 2001.

The Mars Pathfinder began its journey to Mars atop a Delta II that launched Dec. 4, 1996, from Launch Complex 17-B.

NASA's first return to Mars after the Viking mission began with the launch of the Mars Global Surveyor atop a Delta II Nov. 7, 1996, from CCAFS Launch Complex 17-A. The Surveyor traveled to the red planet and spent approximately two years mapping the Martian surface to achieve a global portrait.

Stardust, Genesis, Deep Impact (Delta II)

On Feb. 7, 1999, a Delta II launched from Launch Complex 17-A at CCAFS carrying the Stardust spacecraft. Stardust collected comet dust and volatile samples during a planned close encounter

This Titan IVB/Centaur rocket launches Oct. 15, 1997, carrying the Cassini spacecraft.

with the comet Wild 2 in January 2004. Stardust also collected samples of interstellar dust, including the recently discovered dust streaming into our Solar System. This launch was unusual in that it was the first U.S. mission dedicated solely to the study of a comet.

NASA's Genesis spacecraft launched aboard a Delta II Aug. 8, 2001, from Launch Complex 17-A at CCAFS. Genesis collected samples of solar wind — invisible, charged particles that flow outward from the Sun. The particles will be studied by scientists to search for answers to fundamental questions about the exact composition of our star and the birth of our Solar System.

The Deep Impact mission launched Jan. 12, 2005, from CCAFS and will reach Comet Tempel 1 in July 2005. The "flyby" spacecraft will collect images of the comet before its "impactor" spacecraft reaches the comet and after the impact to study the pristine interior of one of its craters.

Solar and Heliospheric Observatory (SOHO) (Atlas IIAS)

The SOHO spacecraft, a joint venture between NASA and the European Space Agency, was launched aboard an Atlas IIAS Dec. 2, 1995, from Space Launch Complex 36 at CCAFS. The SOHO spacecraft gathered data to study the internal structure of the Sun, its extensive outer atmosphere and the origin of solar wind, as well as the stream of highly ionized gas that blows continuously through the Solar System. The information SOHO provided helped scientists better understand the interactions between the Sun and the Earth's environment.

Cassini (Titan IV)

Cassini is a NASA Jet Propulsion Laboratory spacecraft with international partners from the Italian Space Agency. Its seven-year journey to Saturn began Oct. 15, 1997, from Launch Complex 40 on a Titan IV at CCAFS. Cassini made observations of at least one asteroid and the planet Jupiter on its way to Saturn. Cassini arrived

A Boeing Delta II rocket launches the Genesis spacecraft from Cape Canaveral Air Force Station on Aug. 8, 2001.

at Saturn in July 2004, and will spend four years exploring the planet, its rings and 18 known moons. Cassini deployed the Huygens probe Jan. 14, 2005, to study the surface of Titan, one of Saturn's moons, and has sent important information back to Earth.

TERRA (Atlas IIAS)

The Terra (Latin for Earth) satellite launched on an Atlas IIAS Dec. 16, 1999, from VAFB, Space Launch Complex 3E. Terra was the first Earth Observing System scientific research satellite. The five Terra instruments on the satellite operate by measuring the sunlight reflected by the Earth and heat emitted by the Earth. Terra will spend 15 years orbiting the Earth and collecting data.

GOES and TDRS Fleet of Satellites (Atlas II)

NASA uses the Atlas to launch the NOAA GOES weather satellites and the TDRS communications series of satellites into orbit. GOES-M, launched July 23, 2001, aboard an Atlas IIA from CCAFS, was the fifth spacecraft to be launched in the current advanced series of environmental satellites for NOAA and the first to have a Solar X-ray Imager. The most recent TDRS launch was the TDRS-J launched Dec. 4, 2002, from CCAFS.

Kodiak Star (Athena I) and Lunar Prospector (Athena II)

The Athena I vehicle carried NASA's Kodiak Star mission into orbit from the Kodiak Launch Complex in Alaska Sept. 29, 2001. NASA's Starshine 3 and three U.S. Department of Defense satellites were launched into different orbits. Starshine 3 provided data on satellite orbit decay. The first successful launch of an Athena II carried NASA's Lunar Prospector spacecraft on a mission to search for traces of water or ice on the Moon. It was launched Jan. 6, 1998, from Complex 46 at CCAFS.

Launch of the SOHO spacecraft Dec. 2, 1995, aboard an Atlas rocket.

NASA's Lunar Prospector spacecraft launches successfully on its way to the Moon from Launch Complex 46 at Cape Canaveral Air Force Station on Jan. 6, 1998. It was the inaugural launch of Lockheed Martin's Athena II launch vehicle and the first launch from the complex, operated by Spaceport Florida Authority.

PHOTO ON COVER: Emerging through the smoke and steam, a Boeing Delta II rocket carrying NASA's Deep Impact spacecraft lifts off Jan. 12, 2005, from Launch Pad 17-B, Cape Canaveral Air Force Station, Fla. A NASA Discovery mission, Deep Impact is heading for space and a rendezvous 83 million miles from Earth with Comet Tempel 1 in July 2005.

The launch team inside the blockhouse on Launch Complex 36-A, Cape Canaveral Air Force Station, makes final checks before launch of the GOES-M satellite atop an Atlas rocket on July 23, 2001.

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John F. Kennedy Space Center

Kennedy Space Center, Fla.

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