

ATLAS V GPS IIF-11 MISSION

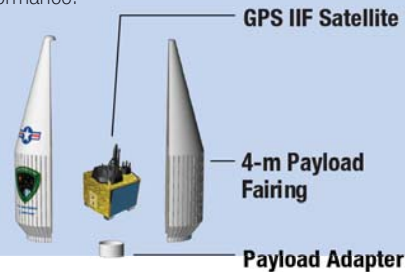
A United Launch Alliance Atlas V 401 launch vehicle will deliver the GPS IIF-11 satellite to semi-synchronous circular orbit. Liftoff will occur from Space Launch Complex 41 at Cape Canaveral Air Force Station, FL.

The Navstar Global Positioning System (GPS) is a constellation of satellites that provides navigation data to military and civilian users worldwide. The system is operated and controlled by the 50th Space Wing, located at Schriever Air Force Base, CO.

GPS utilizes 24 satellites, in six different planes, with a minimum of four satellites per plane, positioned in orbit approximately 11,000 nautical miles above the Earth's surface. The satellites continuously transmit digital radio signals pertaining to the exact time (using atomic clocks) and exact location of the satellites. The GPS IIF series have a design life of 12 years. With the proper equipment, users can receive these signals to calculate time, location, and velocity. The signals are so accurate that time can be measured to within a millionth of a second, velocity within a fraction of a mile per hour, and location to within feet. Receivers have been developed for use in aircraft, ships, land vehicles, and to hand carry.

As a result of increased civil and commercial use as well as experience in military operations, the USAF has added the following capabilities and technologies to the GPS IIF series to sustain the space and control segments while improving mission performance:

- Two times greater predicted signal accuracy than heritage satellites.
- New L5 signals for more robust civil and commercial aviation.
- An on-orbit, reprogrammable processor, receiving software uploads for improved system operation.
- Military signal "M-code" and variable power for better resistance to jamming hostile environments, meeting the needs of emerging doctrines of navigation warfare.



Payload Fairing (PLF)

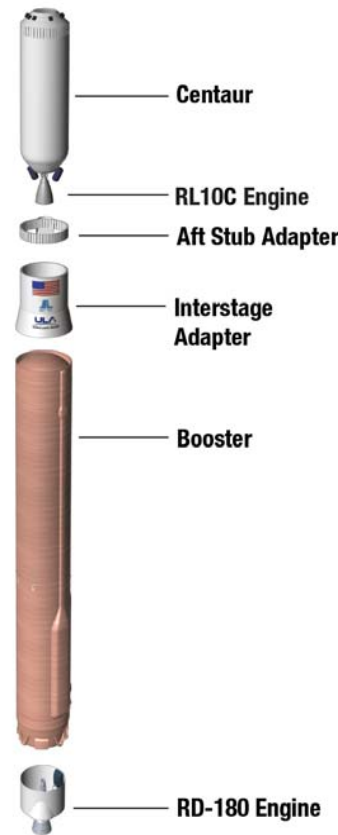
The GPS IIF-11 spacecraft is encapsulated in the 4-m (14-ft) diameter large payload fairing (LPF). The LPF is a bisector (two-piece shell) fairing consisting of aluminum skin/stringer construction with vertical split-line longerons. The vehicle's height with the PLF is approximately 189 ft.

Centaur

The Centaur second stage is 10 ft in diameter and 41.5 ft in length. Its propellant tanks are constructed of pressure-stabilized, corrosion resistant stainless steel. Centaur is a liquid hydrogen/liquid oxygen- (cryogenic-) fueled vehicle. It uses a single RL10C engine producing 22,900 lbf of thrust. The cryogenic tanks are insulated with a combination of helium-purged insulation blankets, radiation shields, and spray-on foam insulation (SOFI). The Centaur forward adapter (CFA) provides the structural mountings for the fault-tolerant avionics system and the structural and electrical interfaces with the spacecraft.

Booster

The Atlas V booster is 12.5 ft in diameter and 106.5 ft in length. The booster's tanks are structurally rigid and constructed of isogrid aluminum barrels, spun-formed aluminum domes, and intertank skirts. Atlas booster propulsion is provided by the RD-180 engine system (a single engine with two thrust chambers). The RD-180 burns RP-1 (Rocket Propellant-1 or highly purified kerosene) and liquid oxygen, and delivers 860,200 lb of thrust at sea level. The Atlas V booster is controlled by the Centaur avionics system, which provides guidance, flight control, and vehicle sequencing functions during the booster and Centaur phases of flight.



The ULA team is proud to be the launch provider for the U.S. Air Force (USAF) Global Positioning System (GPS) Directorate by delivering replenishment satellites aboard Atlas V and Delta IV launch vehicles. GPS IIF-11 is one of the next generation GPS satellites, incorporating various improvements to provide greater accuracy, increased signals, and enhanced performance for users.

The ULA team is focused on attaining Perfect Product Delivery for the GPS IIF-11 mission, which includes a relentless focus on mission success (the perfect product) and also excellence and continuous improvement in meeting all of the needs of our customers (the perfect delivery).

My thanks to the entire ULA team, including our suppliers, as well as our mission partners — the USAF and the Aerospace Corporation — for their hard work and commitment to mission success.

Go Atlas, Go Centaur, Go GPS!

Jim Spornick
Vice President, Atlas and Delta Programs



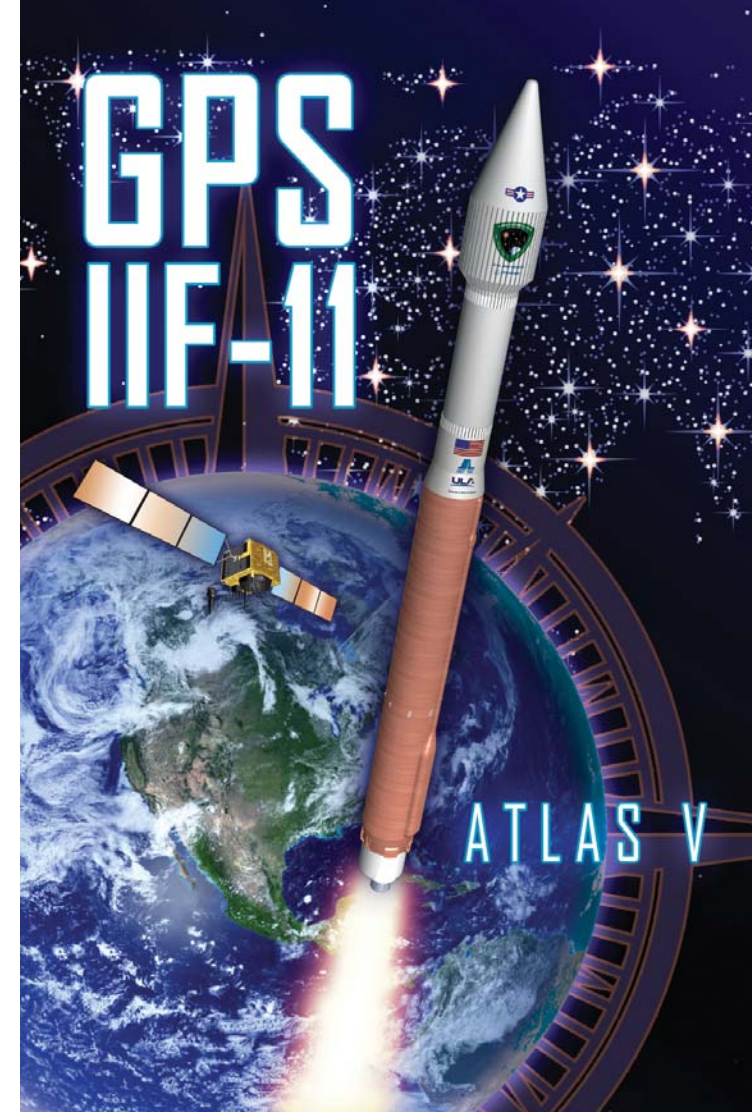
America's Ride to Space

With more than a century of combined heritage, United Launch Alliance is the nation's most experienced and reliable launch service provider. ULA has successfully delivered more than 100 satellites to orbit that provide critical capabilities for troops in the field, aid meteorologists in tracking severe weather, enable personal device-based GPS navigation and unlock the mysteries of our solar system.

Join the conversation:



ULALaunch.com



MISSION OVERVIEW

- 59th Operational GPS Satellite to Launch on a ULA Rocket
- 59th Atlas V Launch
- 29th Atlas V 401 Configuration Launch
- 11th GPS Block IIF Satellite



America's Ride to Space

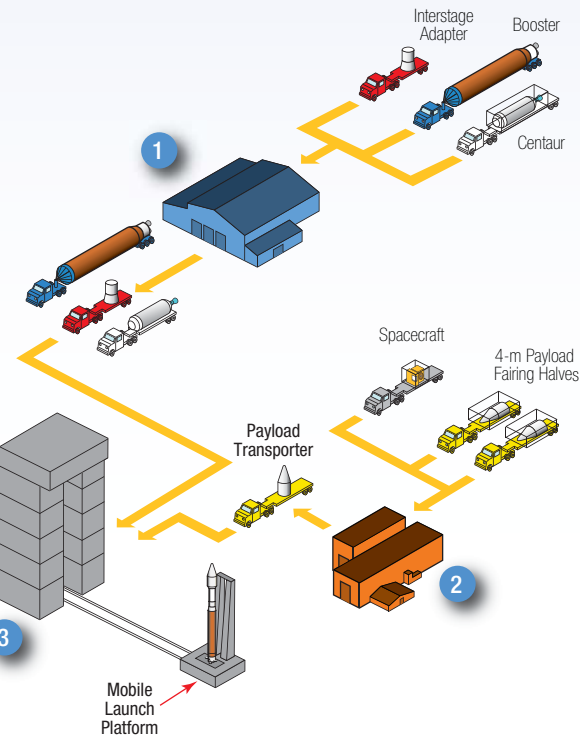
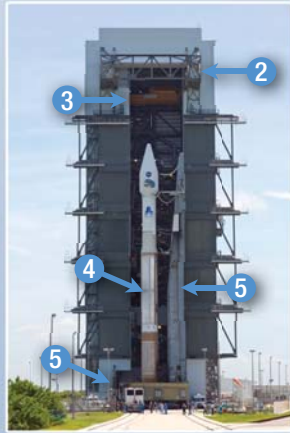
ATLAS V PRODUCTION AND LAUNCH

- 1 Denver, CO**
– ULA Headquarters & Design Center Engineering
- 2 Harlingen, TX**
– Payload Fairing, Boattail, Centaur Forward Adapter, Aft Stub Adapter, & Launch Vehicle Adapter Fabrication
- 3 Decatur, AL**
– Booster Fabrication & Final Assembly, Centaur Tank Fabrication & Centaur Final Assembly
- 4 West Palm Beach, FL**
– RL10C Engine Fabrication at Aerojet Rocketdyne
- 5 Khimki, Russia**
– RD-180 Engine Fabrication at NPO Energomash

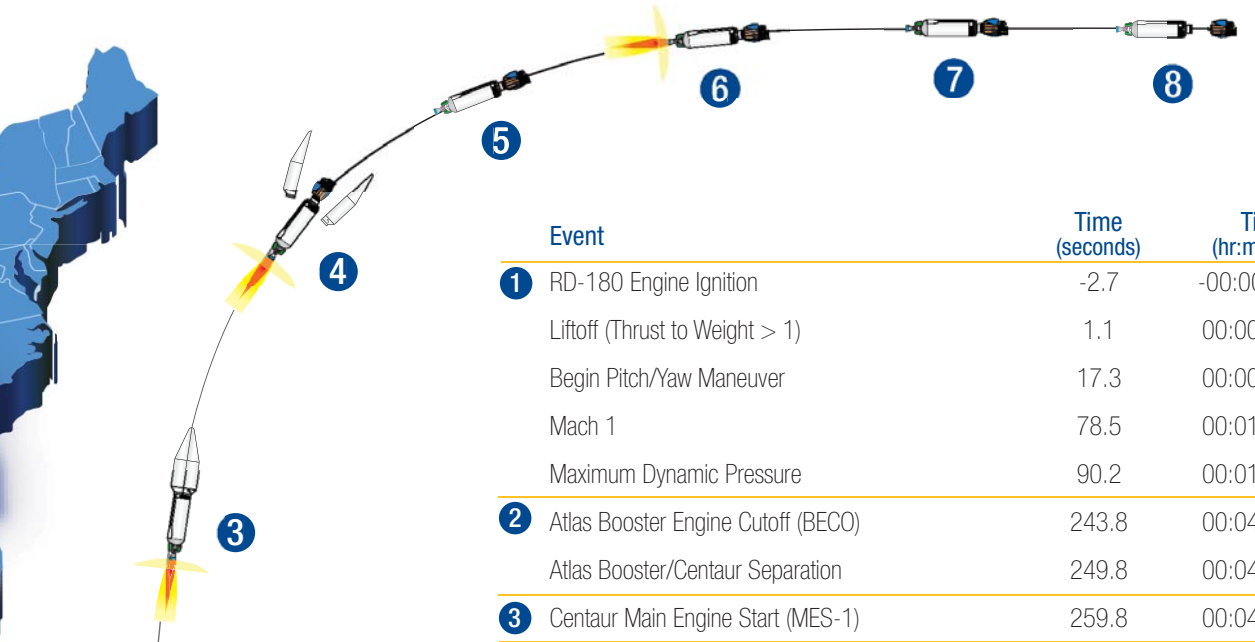


- 1 Atlas Spaceflight Operations Center (ASOC)** | Launch Control Center and Mission Director's Center
- 2 Spacecraft Processing Facility** | Spacecraft processing, testing and encapsulation
- 3 Vertical Integration Facility** | Launch vehicle Integration and testing, spacecraft mate and integrated operations

- 1 Vertical Integration Facility (VIF)** (See inset)
- 2 Bridge Crane Hammerhead**
- 3 Bridge Crane**
- 4 Launch Vehicle**
- 5 Mobile Launch Platform (MLP)**
- 6 Centaur LO₂ Storage**
- 7 High Pressure Gas Storage**
- 8 Booster LO₂ Storage**
- 9 Pad Equipment Building (PEB)**
- 10 Pad ECS Shelter**



MISSION PROFILE AND GROUND TRACE



Event	Time (seconds)	Time (hr:min:sec)
1 RD-180 Engine Ignition	-2.7	-00:00:02.7
Liftoff (Thrust to Weight > 1)	1.1	00:00:01.1
Begin Pitch/Yaw Maneuver	17.3	00:00:17.3
Mach 1	78.5	00:01:18.5
Maximum Dynamic Pressure	90.2	00:01:30.2
2 Atlas Booster Engine Cutoff (BECO)	243.8	00:04:03.8
Atlas Booster/Centaur Separation	249.8	00:04:09.8
3 Centaur Main Engine Start (MES-1)	259.8	00:04:19.8
4 Payload Fairing Jettison	267.8	00:04:27.8
5 Centaur First Main Engine Cutoff (MECO-1)	1,022.5	00:17:02.5
6 Centaur Second Main Engine Start (MES-2)	11,820.8	03:17:00.8
7 Centaur Second Main Engine Cutoff (MECO-2)	11,907.8	03:18:27.8
8 GPS IIF-11 Separation	12,193.8	03:23:13.8

Perigee Altitude: 11,047 nmi | Apogee Altitude: 11,047 nmi | Inclination: 55.0 deg | Flight Azimuth: 45.8 deg

