ATLAS V GOES-R MISSION


Image Courtesy Lockheed Martin

A United Launch Alliance (ULA) Atlas V 541 rocket will deliver the first of the Geostationary Operational Environment Satellite R-Series (GOES-R) spacecraft to geosynchronous transfer orbit. Liftoff will occur at Space Launch Complex-41 (SLC-41) at Cape Canaveral Air Force Station (CCAFS), Florida.

The GOES-R Series includes four satellites and is the next generation of GOES satellites that will provide continuous imagery and atmospheric measurements of the Earth's Western Hemisphere. GOES-R will produce images of weather patterns and severe storms as frequently as every 30 seconds, which will contribute to more accurate and reliable weather forecasts and severe weather outlooks, including thunderstorm, hurricane and tornado tracking and intensity forecasting. GOES-R will also provide improved detection and observations of meteorological phenomena that directly impact public safety, protection of property and economic health and development.

Designed and built by Lockheed Martin, the GOES-R satellite includes six instruments that fit into three classifications: Earth-pointing, solar-pointing and in-situ (near environment). Lockheed Martin is providing three instruments: the Solar Ultraviolet Imager (SUVI), the Geostationary Lightning Mapper (GLM) and the magnetometer. The three additional instruments include: the Advanced Baseline Imager (ABI), developed by the Harris Corporation; the Extreme Ultraviolet X-Ray Irradiance Sensors (EXIS) from the University of Colorado's Laboratory for Atmospheric and Space Physics; and the Space Environmental In-Situ Suite (SEISS) from the Assurance Technology Corporation.

The GOES-R Series is a collaborative effort between the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA) to develop, launch and operate the satellites. GOES satellites have played a vital role in weather forecasting, severe storm tracking and meteorological research since the first GOES was launched on a Delta rocket in 1975. ULA's Atlas and Delta rockets have launched every satellite in the GOES series.

Payload Fairing (PLF)

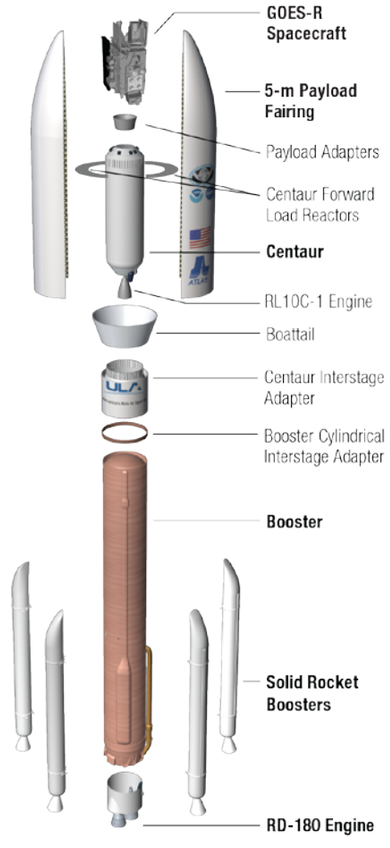
The GOES-R spacecraft is encapsulated in a 5-m (17-ft) diameter short payload fairing. The 5-m PLF is a sandwich composite structure made with a vented aluminum-honeycomb core and graphite-epoxy face sheets. The bisector (two-piece shell) PLF encapsulates both the Centaur and the satellite. The vehicle's height with the 5-m short PLF is approximately 197 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 cryogenic vehicle, fueled with liquid hydrogen and liquid oxygen. It uses a single RL10C-1 engine producing 22,900 lb 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 load reactor (CFLR) 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. Four solid rocket boosters (SRB) generate the additional power required at liftoff, with each SRB providing 348,500 lb of thrust. 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.



ATLAS V 541

One of the most powerful rockets in the Atlas V fleet, the 541 configuration, with four solid rocket boosters, provides the optimum performance to precisely deliver a range of mission types. In addition to completing two national security missions, an Atlas V 541 configuration rocket launched NASA's Curiosity rover on its 10-month, 354 million-mile journey to the surface of Mars.

First Launch: Nov. 26, 2011
Launches to date: 3

Performance to GTO: 8,290 kg (18,270 lb)
Performance to LEO-Reference: 17,410 kg (38,400 lb)

ATLAS

ULA™

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 110 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.

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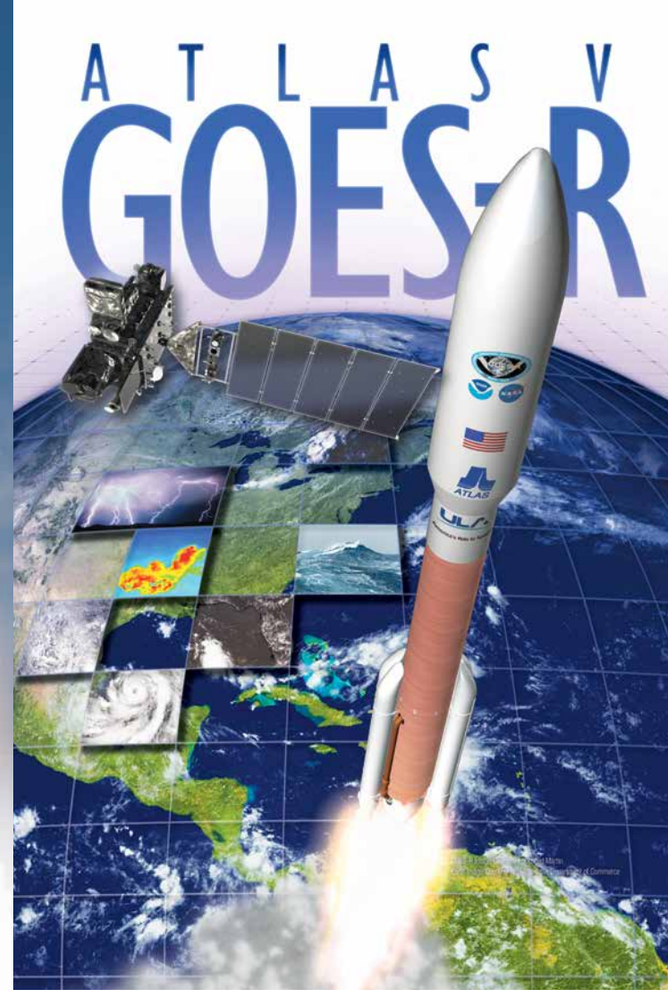
ATLAS V GOES-R



MISSION OVERVIEW

– 67th Atlas V Launch

– 113th ULA Launch

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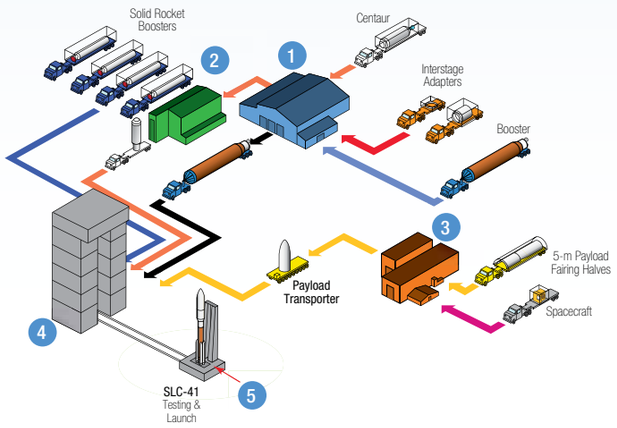
America's Ride to Space

ATLAS V PRODUCTION AND LAUNCH

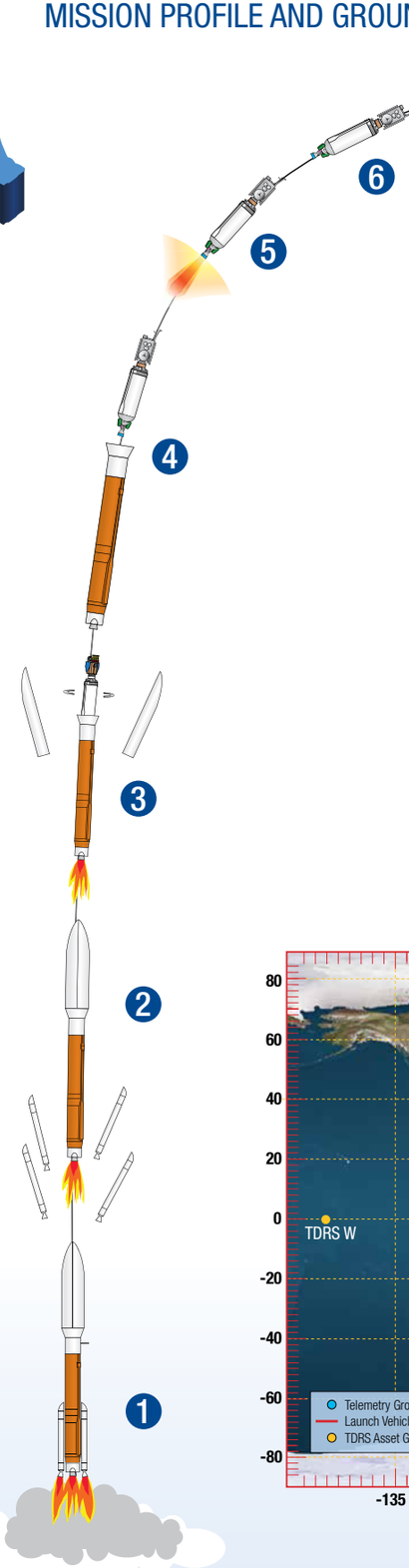
1. **Sacramento, CA**
   – Solid Rocket Booster Fabrication at Aerojet Rocketdyne
2. **Denver, CO**
   – ULA Headquarters & Design Center Engineering
3. **Harlingen, TX**
   – Payload Adapter, Booster Adapter & Centaur Adapter Fabrication
4. **Decatur, AL**
   – Booster & Centaur Fabrication & Final Assembly
5. **West Palm Beach, FL**
   – RL10C-1 Engine Fabrication at Aerojet Rocketdyne
6. **Khimki, Russia**
   – RD-180 Engine Fabrication at NPO Energomash
7. **Zurich, Switzerland**
   – 5-m Payload Fairing Fabrication at RUAG Space

1. **Atlas Spaceflight Operations Center (ASOC)** | Receiving & inspection, communication center, spacecraft control room, launch control center, mission director's center, ITAR facility
2. **Delta Operations Center (DOC)** | Offsite Vertical Integration (OVI) in Cell 4
3. **Spacecraft Processing Facility** | Spacecraft processing, testing and encapsulation
4. **Vertical Integration Facility** | Launch vehicle integration and testing, spacecraft mate and integrated operations
5. **Mobile Launch Platform**



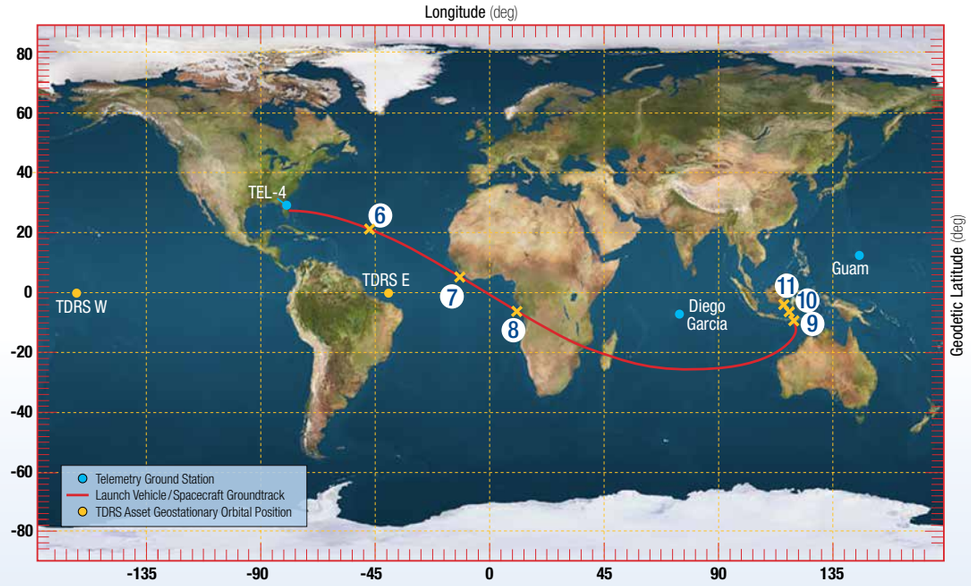
1. **Vertical Integration Facility (VIF)**
2. **Launch Vehicle**
3. **Centaur LO_2 Storage**
4. **High Pressure Gas Storage**
5. **Booster LO_2 Storage**
6. **Pad Equipment Building (PEB)**
7. **Pad ECS Shelter**

MISSION PROFILE AND GROUND TRACE



	Event	Time (seconds)	Time (hr:min:sec)
1	RD-180 Engine Ignition	-2.7	-0:00:02.7
	Liftoff (Thrust to Weight > 1)	1.1	0:00:01.1
	Begin Pitch/Yaw Maneuver	5.2	0:00:05.2
	Mach 1	35.5	0:00:35.5
	Maximum Dynamic Pressure	46.2	0:00:46.2
2	SRB Jettison (1 & 2)	110.4	0:01:50.4
	SRB Jettison (3 & 4)	111.9	0:01:51.9
3	Payload Fairing Jettison	209.9	0:03:29.9
4	Booster Engine Cutoff (BECO)	261.8	0:04:21.8
	Booster/Centaur Separation	267.8	0:04:27.8
5	Centaur Main Engine Start (MES-1)	277.8	0:04:37.8
6	Centaur First Main Engine Cutoff (MECO-1)	735.6	0:12:15.6
7	Centaur Second Main Engine Start (MES-2)	1318.6	0:21:58.6
8	Centaur Second Main Engine Cutoff (MECO-2)	1654.4	0:27:34.4
9	Centaur Third Main Engine Start (MES-3)	12452.6	3:27:32.6
10	Centaur Third Main Engine Cutoff (MECO-3)	12545.9	3:29:05.9
11	GOES-R Separation	12714.9	3:31:54.9

Perigee Altitude: 4,373 nmi | Apogee Altitude: 19,053 nmi | Inclination: 10.6 deg | Flight Azimuth: 100.7 deg



All Values Approximate