

## MISSION

A United Launch Alliance (ULA) Atlas V 531 rocket will launch the NROL-101 mission for the National Reconnaissance Office (NRO). Liftoff will occur from Space Launch Complex-41 at Cape Canaveral Air Force Station, Florida.

When the United States needs eyes and ears in critical places where no human can reach – be it over the most rugged terrain or through the most hostile territory – it turns to the NRO. The NRO is the U.S. government agency tasked with designing, building, launching and maintaining America's intelligence satellites.

Whether creating the latest innovations in satellite technology, contracting with the most cost-efficient industrial suppliers, conducting rigorous launch schedules, or providing the highest-quality products to our customers, the NRO never loses focus on who they are working to protect: our nation and its citizens.

Beginning in 1961 to declassification to the public in 1992, the NRO has worked tirelessly to provide the best reconnaissance support possible to the Intelligence Community and Department of Defense.



## LAUNCH VEHICLE

### Payload Fairing (PLF)

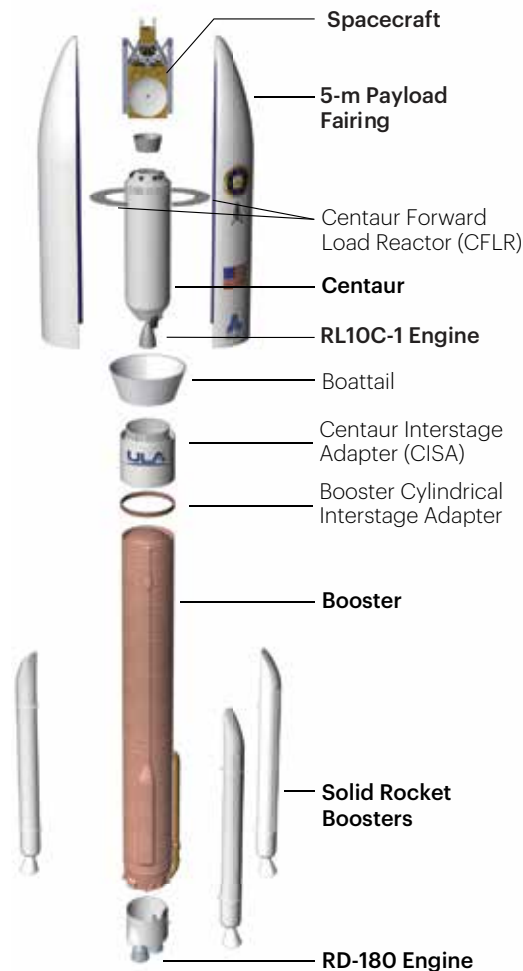
The spacecraft is encapsulated in a 17.7-ft (5-m) diameter medium payload fairing. The 5-m PLF is a sandwich composite structure made with a vented aluminum-honeycomb core and graphite-epoxy face sheets. The bisector (two-piece shell) PLF encapsulates both the Centaur and the satellite. The vehicle's height with the 5-m medium PLF is approximately 206 ft (62.8 m).

### Centaur

The Centaur second stage is 10 ft (3 m) in diameter and 41.5 ft (12.6 m) in length. Its propellant tanks are pressure-stabilized and constructed of corrosion-resistant stainless steel. Centaur is a cryogenic vehicle, fueled with liquid hydrogen and liquid oxygen, powered by an RL10C-1 engine producing 22,900 lb (101.9 kilo-Newtons) of thrust. The cryogenic tanks are insulated with a combination of helium-purged blankets, radiation shields and spray-on foam insulation (SOFI). The Centaur forward adapter (CFA) provides structural mountings for the fault-tolerant avionics system and structural and electrical interfaces with the spacecraft.

### Booster

The booster is 12.5 ft (3.8 m) in diameter and 106.5 ft (32.4 m) in length. The booster's tanks are structurally rigid and constructed of isogrid aluminum barrels, spun-formed aluminum domes and intertank skirts. 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 (3.83 mega-Newtons) of thrust at sea level. Three solid rocket boosters (SRBs) generate the additional power required at liftoff, providing 371,550 lb (1.6 mega-Newtons) of thrust. The Centaur avionics system provides guidance, flight control and vehicle sequencing functions during the booster and Centaur phases of flight.



## ATLAS V



With a 5-meter payload fairing and the additional thrust provided by three solid rocket boosters, the Atlas V 531 rocket delivers the unique capacity and performance required for a range of mission types. The 531 launched the first three Advanced Extremely High Frequency (AEHF) satellites for the Space Force and will loft a pair of C-band satellites for SES in 2022.

First Launch: Aug. 14, 2010  
Launches to Date: 3

Performance to GTO:  
16,420 lb (7,450 kg)  
Performance to LEO-Reference:  
34,250 lb (15,530 kg)

## MISSION SUCCESS

With more than a century of combined heritage, ULA is the world's most experienced and reliable launch service provider. ULA has successfully delivered 140 missions to orbit that provide Earth observation capabilities, enable global communications, unlock the mysteries of our solar system and support life-saving technology.

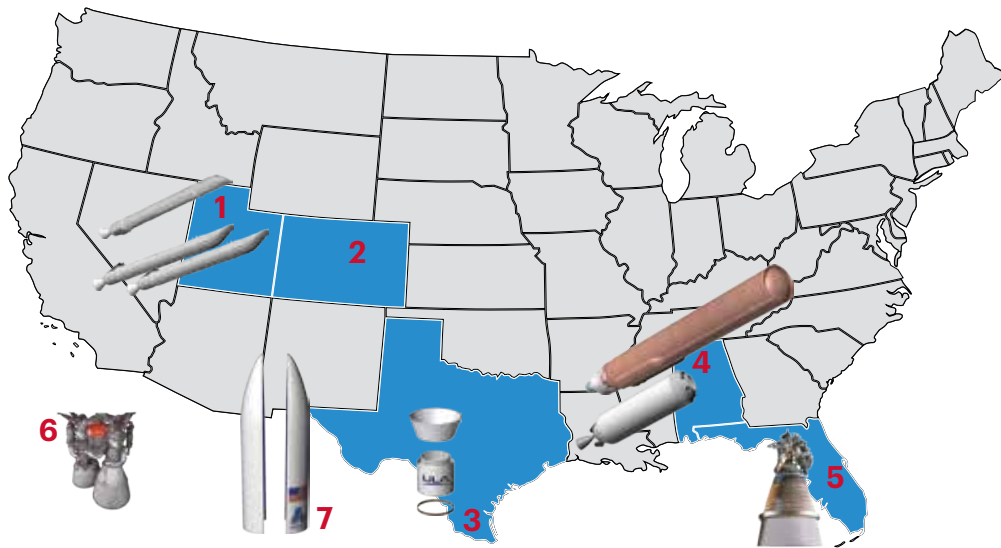
# MISSION OVERVIEW



[ulalaunch.com](http://ulalaunch.com)

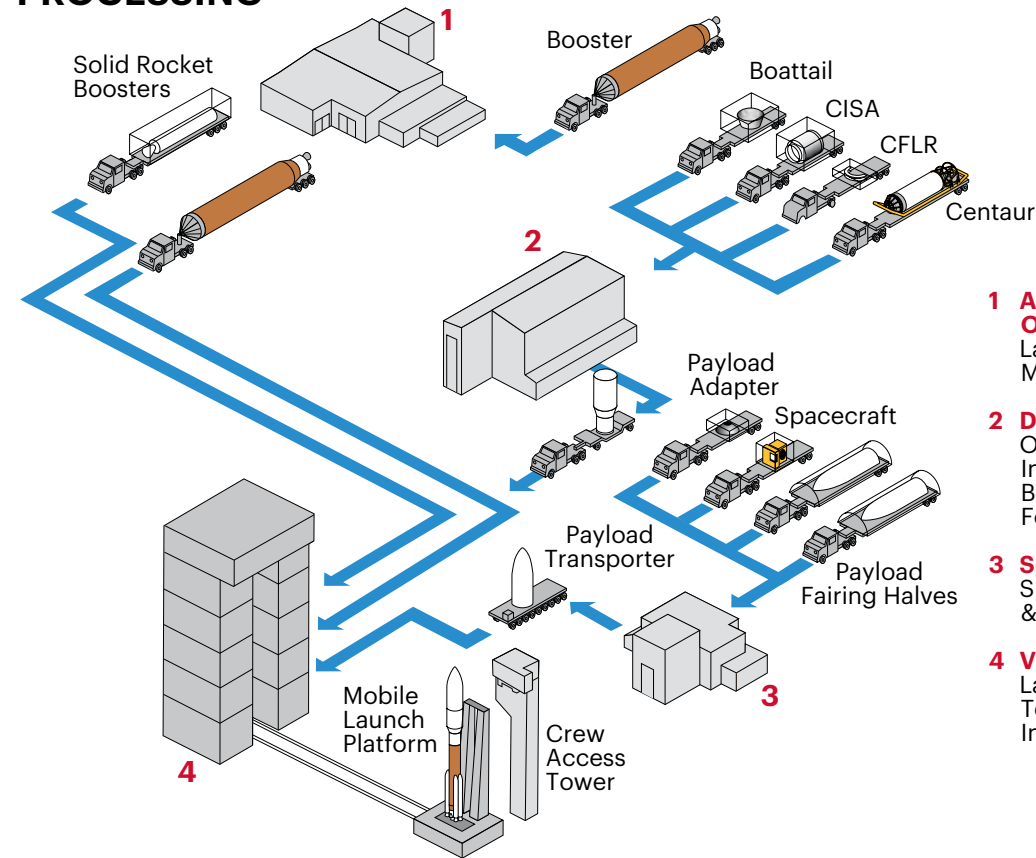
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## PRODUCTION



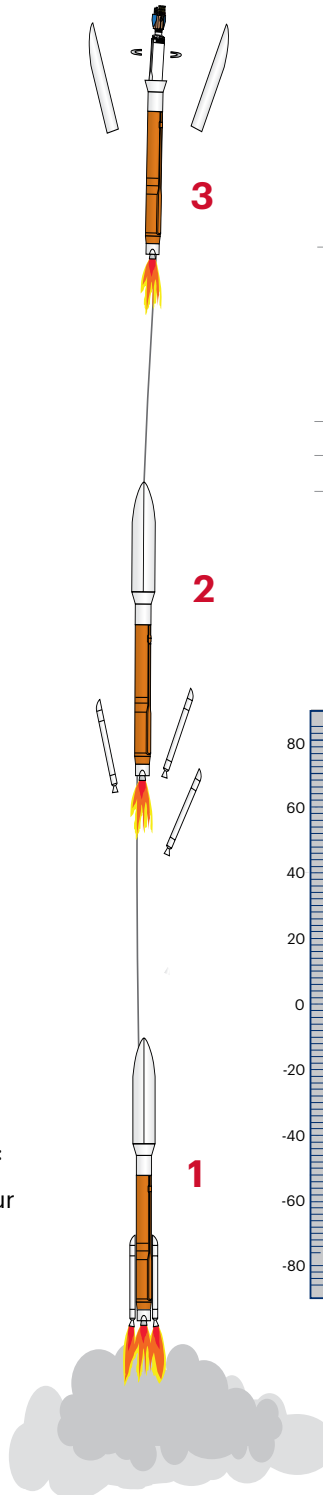
- 1 Promontory, UT**  
Solid Rocket Booster Fabrication at Northrop Grumman
- 2 Denver, CO**  
ULA Headquarters & Design Center Engineering
- 3 Harlingen, TX**  
Payload Adapter, Booster Adapter & Centaur Adapter Fabrication
- 4 Decatur, AL**  
Booster Fabrication & Final Assembly, Centaur Tank Fabrication & 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

## SPACE LAUNCH COMPLEX-41 PROCESSING



- 1 Atlas Spaceflight Operations Center (ASOC)**  
Launch Control Center & Mission Director's Center
- 2 Delta Operations Center**  
Offline Vertical Integration (OVI): Interstage Adapters, Centaur, Boattail, Base Module and Centaur Forward Load Reactor Deck
- 3 Spacecraft Processing Facility**  
Spacecraft Processing, Testing & Encapsulation
- 4 Vertical Integration Facility**  
Launch Vehicle Integration & Testing, Spacecraft Mate & Integrated Operations

## FLIGHT PROFILE



Event	Time (hr:min:sec)
<b>1</b> RD-180 Engine Ignition	-00:00:02.7
Liftoff (Thrust to Weight > 1)	00:00:01.1
Begin Pitch/Yaw Maneuver	00:00:05.6
Mach 1	00:00:38.8
Maximum Dynamic Pressure	00:00:51.4
<b>2</b> SRB Jettison	00:01:53.9
<b>3</b> PLF Jettison	00:03:19.3

