United Launch Alliance

Atlas V Launches the Orbital Test Vehicle-1

Mission Overview

Atlas V 501

Cape Canaveral Air Force Station, FL

Space Launch Complex 41

ATLAS

Atlas V/OTV-1

United Launch (ULA) Alliance is proud to support the Air Force Rapid Capabilities Office (RCO) with the first launch of the Orbital Test Vehicle (OTV).

The OTV, also known as the X-37B, supports space experimentation, risk reduction, and concept of operations (CONOPS) development for long duration and reusable space vehicle technologies.

My thanks to the entire Atlas team for its dedication in bringing the OTV to launch, and to the RCO for selecting Atlas for this ground breaking mission.

Go Atlas, Go Centaur, Go OTV!

Mark Wilkins
Vice President, Atlas Product Line

Atlas V 501 Vehicle

Configuration Overview

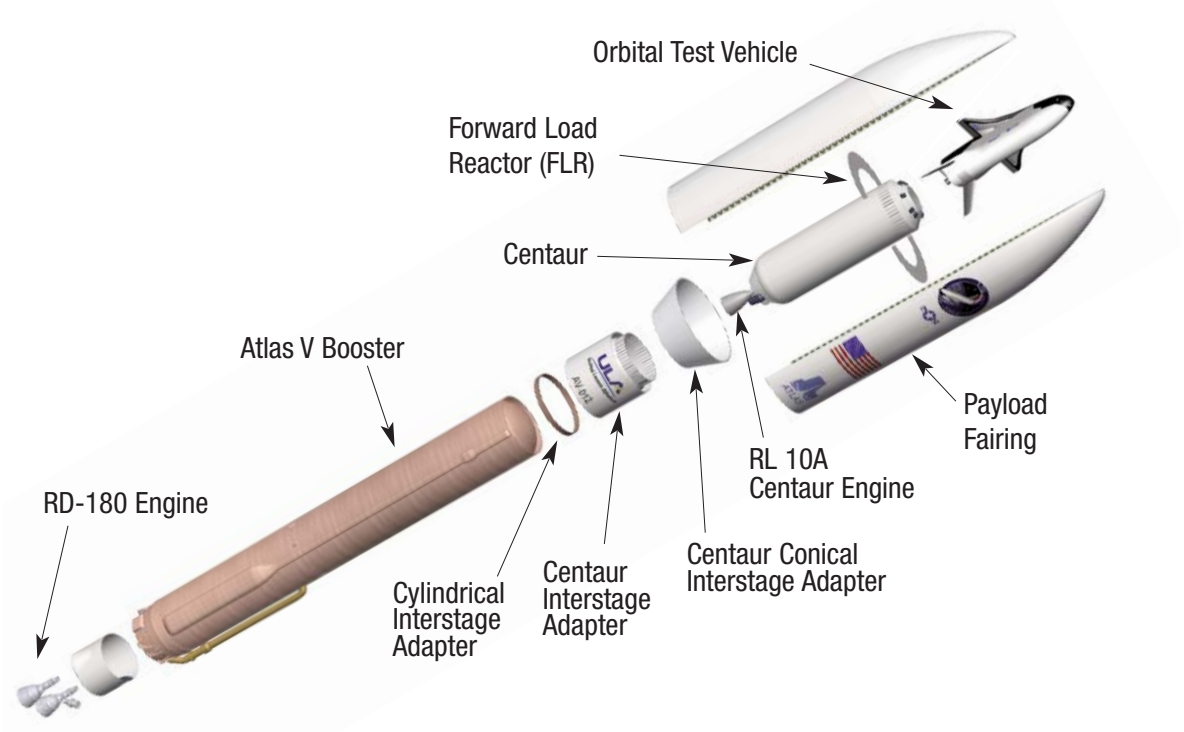
The Atlas V 501 configuration consists of a single Atlas V booster stage and the Centaur upper stage.

The Atlas V booster is 12.5 ft in diameter and 106.5 ft long. The booster's tanks are structurally stable 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 that provides guidance, flight control, and vehicle sequencing functions during the booster and Centaur phases of flight.

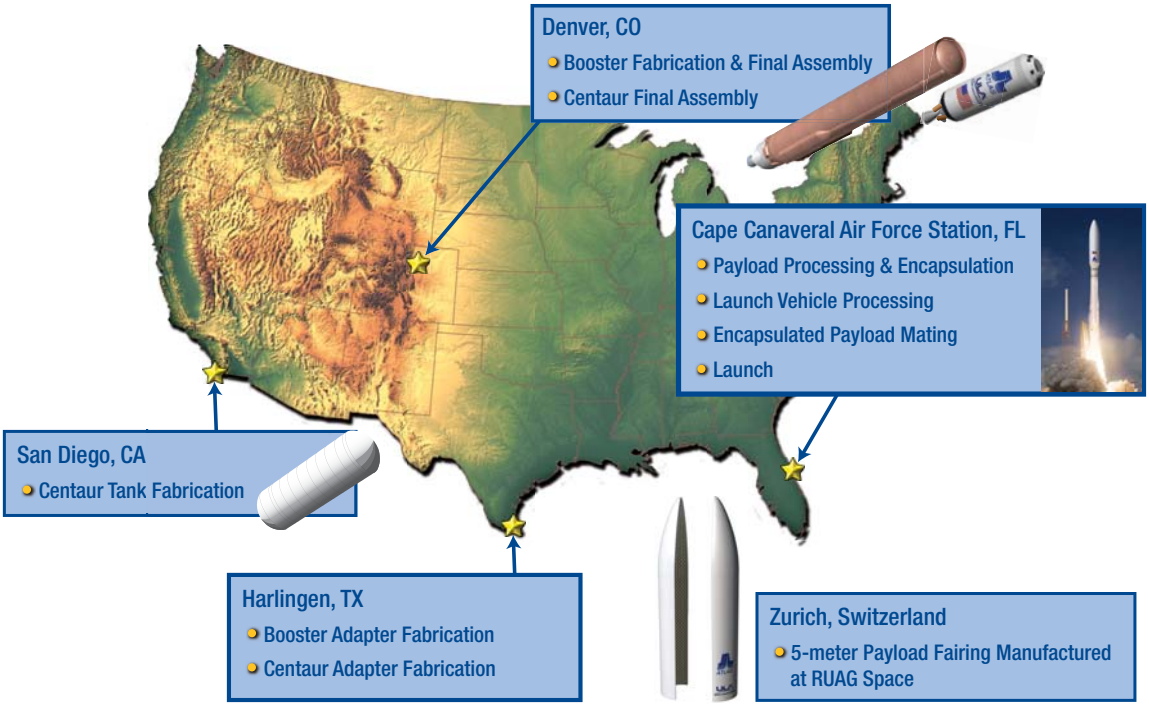
The Centaur upper stage is 10 ft in diameter and 41.5 ft long. Its propellant tanks are constructed of pressure-stabilized, corrosion resistant stainless steel. Centaur is a liquid hydrogen/liquid oxygen- (cryogenic-) fueled vehicle. It uses a single RL10A-4-2 engine producing 22,300 lb of thrust. The cryogenic tanks are insulated with a combination of helium-purged insulation blankets, radiation shields, and closed-cell foam insulation. The Centaur forward adapter (CFA) provides the structural mountings for vehicle electronics and the structural and electronic interfaces with the spacecraft.

The OTV mission is encapsulated within the Atlas V 5-meter-diameter short payload fairing (PLF). The 5-meter PLF is a bisector PLF with a composite structure made from sandwich panels with carbon fiber face sheets and a vented aluminum honeycomb core. The 5-meter PLF is comprised of two major components: the lower section, or base module, that encapsulates the Centaur, and the upper section, or common payload module (CPM), that encapsulates the spacecraft. The Atlas V booster, Centaur, and the 5-meter payload fairing boattail are attached by the 3.8-meter diameter Centaur interstage adapter (C-ISA). The C-ISA is a composite structure with graphite epoxy facesheets over an aluminum honeycomb core.

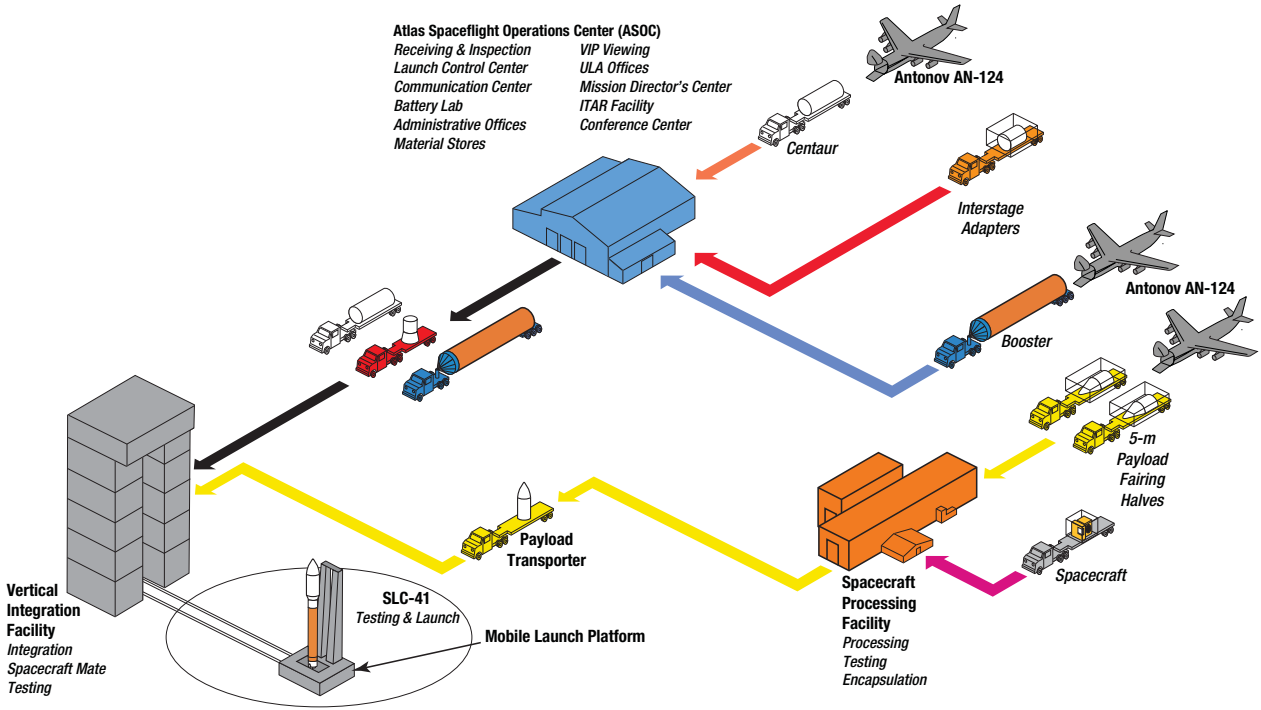
Atlas V 501 Vehicle



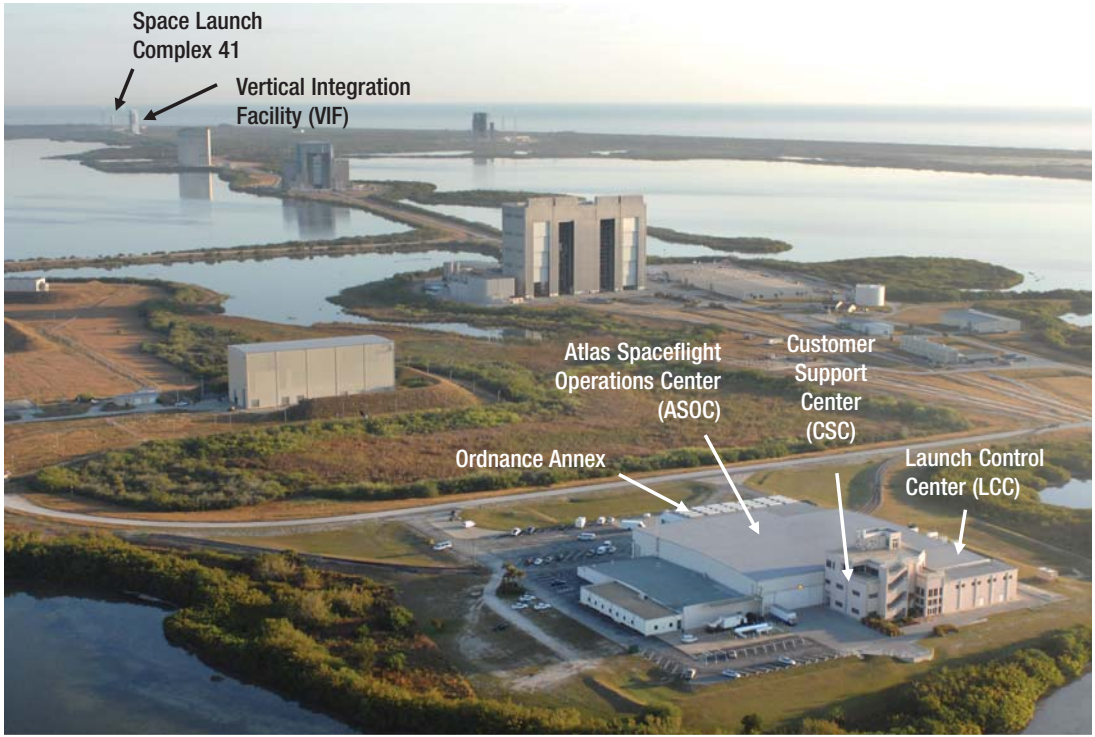
Atlas V Processing Overview



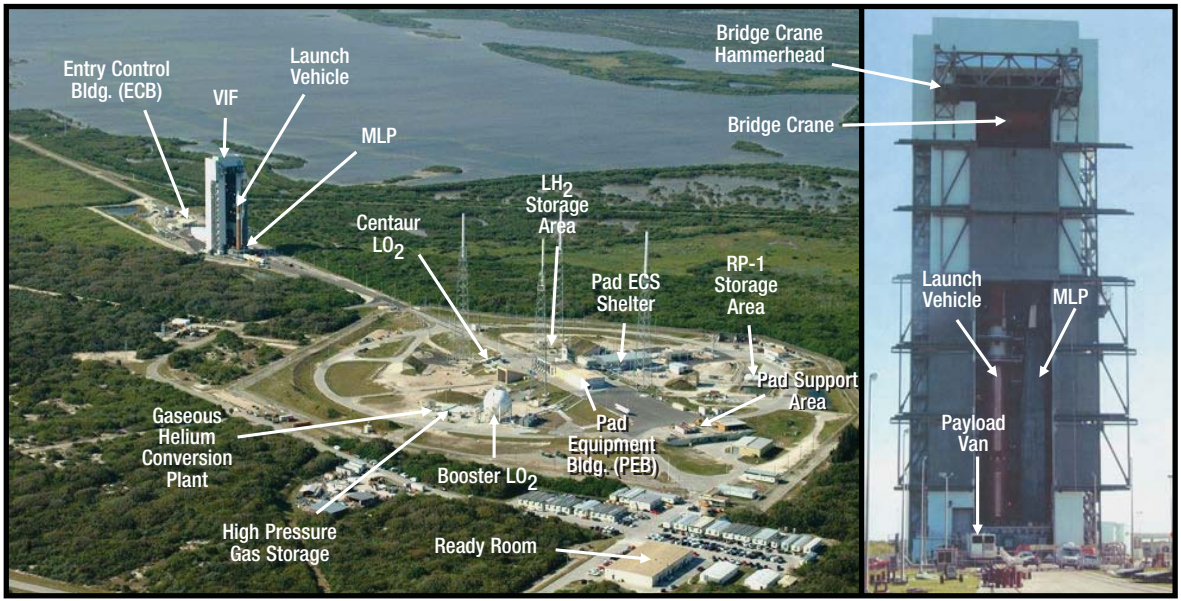
Launch Site Processing Overview



Launch Site Overview



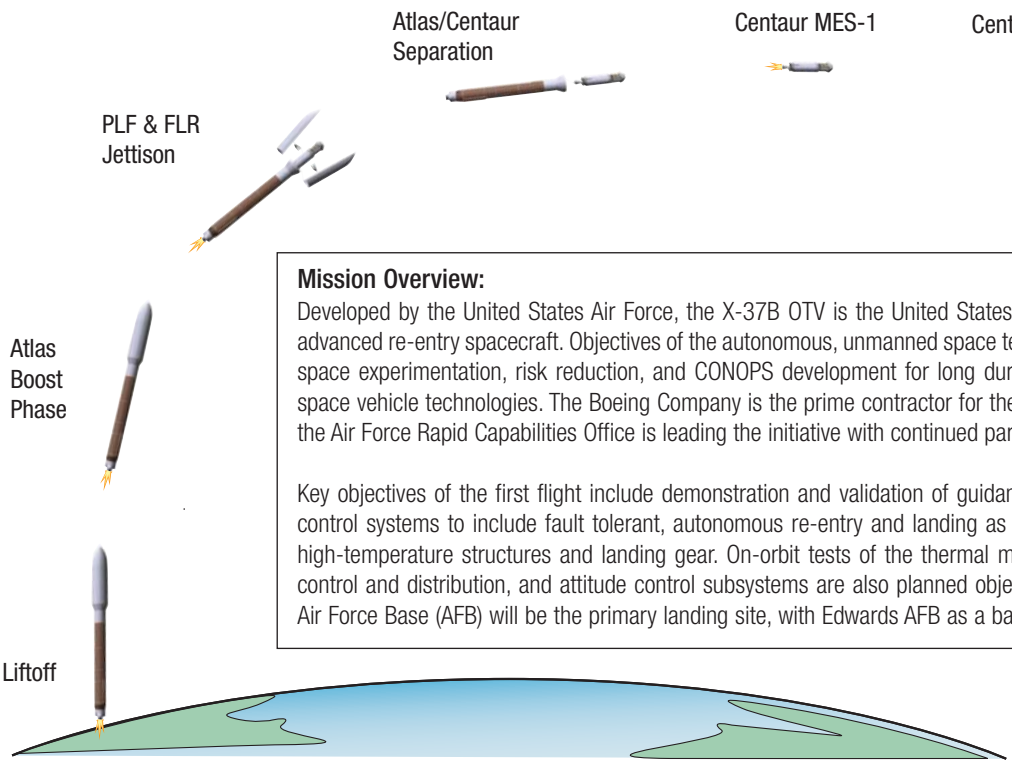
Launch Site Overview (concl'd)



Southwest View of Space Launch Complex 41 (SLC-41)

South View of the Vertical Integration Facility (VIF)

OTV Flight Profile



Mission Overview:

Developed by the United States Air Force, the X-37B OTV is the United States' newest and most advanced re-entry spacecraft. Objectives of the autonomous, unmanned space test platform include space experimentation, risk reduction, and CONOPS development for long duration and reusable space vehicle technologies. The Boeing Company is the prime contractor for the OTV program and the Air Force Rapid Capabilities Office is leading the initiative with continued participation by NASA.

Key objectives of the first flight include demonstration and validation of guidance, navigation and control systems to include fault tolerant, autonomous re-entry and landing as well as lightweight high-temperature structures and landing gear. On-orbit tests of the thermal management, power control and distribution, and attitude control subsystems are also planned objectives. Vandenberg Air Force Base (AFB) will be the primary landing site, with Edwards AFB as a backup.

Sequence of Events

Event	Time (seconds)
RD-180 engine ignition	-2.7
Liftoff	1.1
Start pitchover, turn to zero alpha	19.0
Begin zero angle of attack flight	52.3
Start alpha bias steering	122.4
Enable guidance steering	138.4
Payload fairing jettison	219.4
Forward load reactor jettison	224.4
Booster engine cutoff (BECO)	264.9
Atlas/Centaur separation	270.9
Centaur first burn, main engine start (MES-1)	280.9
Centaur first burn, main engine cutoff (MECO-1)	1038.0

Values Approximate

Atlas V Countdown (F-1 Day)

F-1 Day - MLP TRANSPORT TO PAD

T-11:30 T-11:00 T-10:00 T-9:00 T-8:00 T-7:00 T-6:00 T-5:00 T-4:00 T-3:00

Start Count

Weather Brief Status Check

Weather Brief Status Check

MLP Hard Down

MLP
MLP Transport Preps | MLP Roll | MLP Connect

GC3 & RF / FTS
Transport Preps

Pad Connections

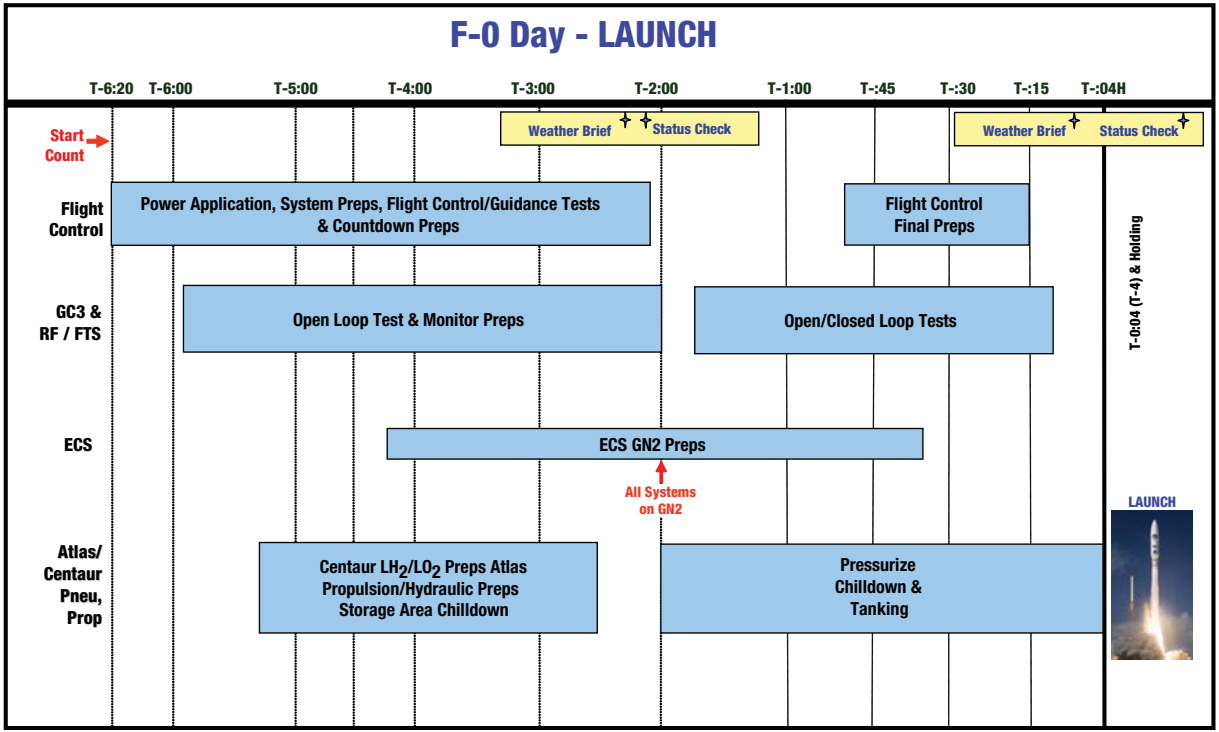
Flight Control
Flight Control Preps

Atlas RP-1
RP-1 Tanking (If Required)

Atlas/ Centaur Pneu, Prop
Transport Preps

Pneumatic System Preps

Atlas V Countdown (F-0 Day)



Notes