
# MISSION OVERVIEW

SLC-41
CCAFS, FL

ULA®
United Launch Alliance

ATLAS®

United Launch Alliance (ULA) is proud to be a part of the Space Based Infrared System (SBIRS) Geosynchronous program with the U.S. Air Force.

Like SBIRS GEO-1 launched in 2011, SBIRS GEO-2, with its highly sophisticated scanning and staring sensors, will provide the nation with significantly improved missile warning and defense, battlespace awareness and technical intelligence.

The ULA team is focused on attaining Perfect Product Delivery for the SBIRS GEO-2 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 and to our mission partners for their dedication in bringing SBIRS GEO-2 to launch and to the U.S. Air Force for making possible this extraordinary mission.

Go Atlas, Go Centaur, Go SBIRS!

**Jim Sponnick**
Vice President, Mission Operations



## SBIRS GEO-2 SATELLITE | Overview

The Space Based Infrared System is considered one of the nation's highest priority space programs and is designed to provide global, persistent, infrared surveillance capabilities for missile warning and defense, battlespace awareness and technical intelligence.

The SBIRS program is the follow-on capability to the highly successful Defense Support Program (DSP). DSP has provided early warning for Intercontinental Ballistic Missile launches for more than 30 years. The SBIRS sensors provide greater flexibility and sensitivity and can detect short-wave and expanded mid-wave infrared signals allowing the system to perform a broader set of missions. These enhanced capabilities result in improved prediction accuracy for global strategic and tactical warfighters.

The SBIRS GEO spacecraft is a 3-axis stabilized platform with a scanning sensor and a staring sensor. Sensor pointing is accomplished with pointing mirrors within the telescopes. The GEO scanning sensor provides a shorter revisit time than DSP sensors over its full field of view, while the staring sensor will be used for step-stare or dedicated stare operations over smaller areas.

Prime contractor Lockheed Martin Space Systems Company is responsible for program management, systems engineering, and spacecraft development. Lockheed Martin Information Systems and Global Solutions is the ground systems developer and supports systems engineering. Northrop Grumman Electronic Systems is the payload subcontractor and supports systems engineering and ground mission processing.

The Air Force acquisition of SBIRS is managed by the Infrared Space Systems Directorate. The Directorate is responsible for the development, acquisition, integration, and early orbit operations of the SBIRS GEO satellites.



Image courtesy of Lockheed Martin



# Atlas V SBIRS GEO-2

## ATLAS V 401 LAUNCH VEHICLE | Overview

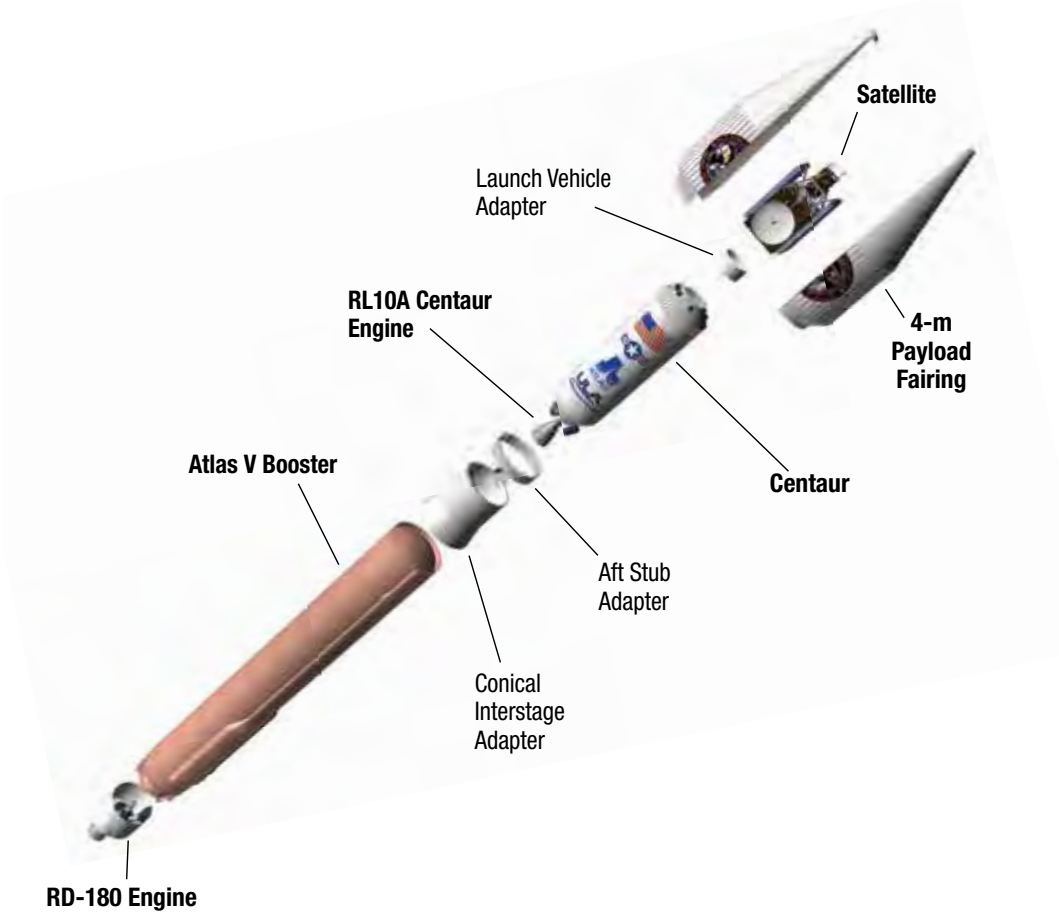
The Atlas V 401 configuration consists of a single Atlas V booster stage, the Centaur upper stage and a 4-m diameter payload fairing (PLF).

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 which 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 spray-on foam insulation (SOFI). The Centaur forward adapter (CFA) provides the structural mountings for the fault-tolerant avionics system and the structural and electronic interfaces with the spacecraft.

The SBIRS mission uses 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.

## ATLAS V 401 LAUNCH VEHICLE | Expanded View

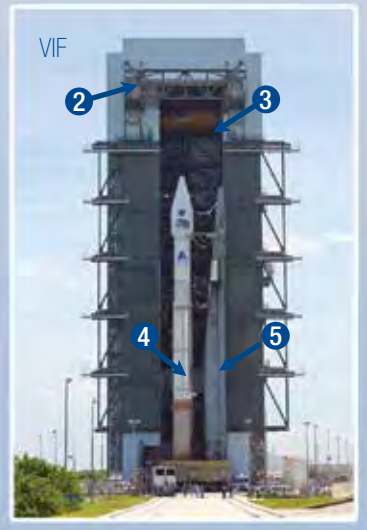





# Atlas V SBIRS GEO-2

## SPACE LAUNCH COMPLEX 41 (SLC-41) | Overview

1 Vertical Integration Facility (VIF) (See inset)
2 Bridge Crane Hammerhead
3 Bridge Crane
4 Launch Vehicle
5 Mobile Launch Platform (MLP)
6 Launch Vehicle
7 Centaur $LO_2$ Storage
8 High Pressure Gas Storage
9 Booster $LO_2$ Storage
10 Pad Equipment Building (PEB)
11 Pad ECS Shelter







## ATLAS V SBIRS GEO-2 | Mission Overview

The SBIRS GEO-2 mission will be flown on an easterly trajectory from Space Launch Complex 41 at Cape Canaveral Air Force Station (CCAFS), FL. The SBIRS GEO-2 satellite will be released into a geosynchronous transfer orbit (GTO).

The mission begins with ignition of the RD-180 engine approximately 2.7 seconds prior to liftoff. Liftoff occurs at T+1.1 seconds. Shortly after the vehicle clears the pad, it performs its pitch/yaw/roll maneuvers.

Following maximum dynamic pressure, the RD-180 is throttled down to 95%. Guidance steering is enabled approximately 140 seconds into flight. At 212 seconds, the vehicle throttles up to a constant 5.0 G-level. Approximately 10 seconds prior to booster engine cutoff (BECO), the Atlas V throttles down to a constant 4.6 G's. BECO occurs 243 seconds into flight followed by Centaur separation 6 seconds later.

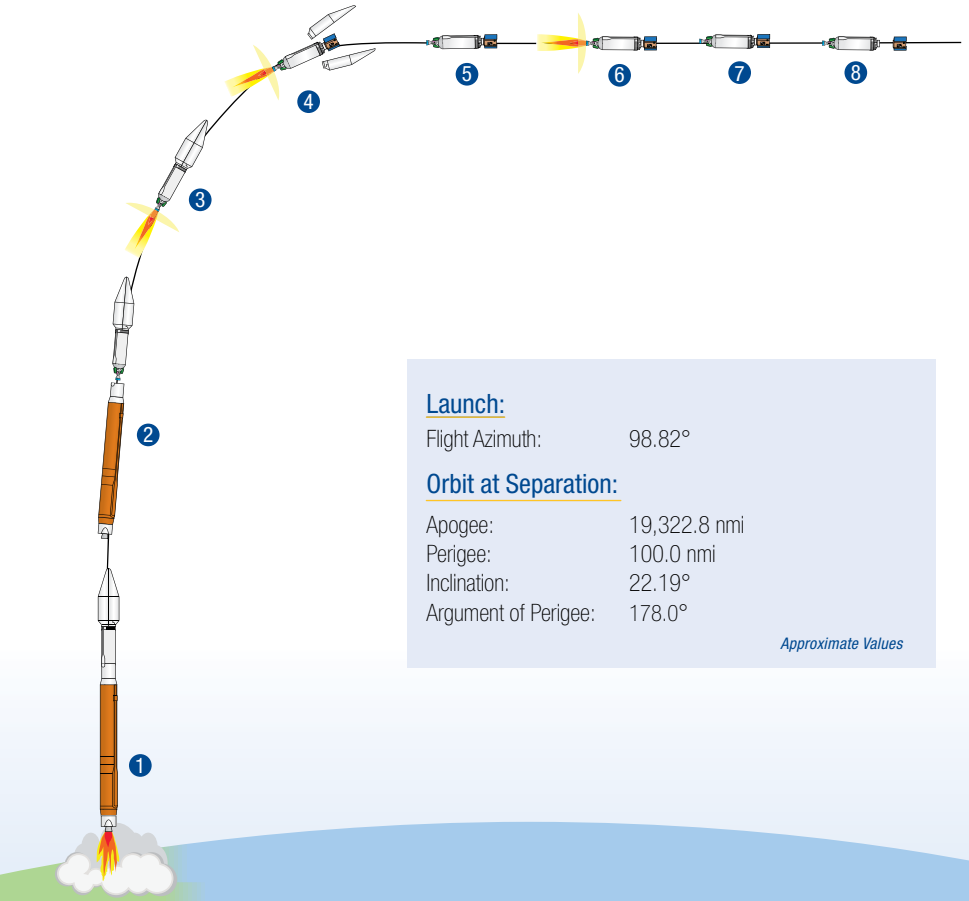
Approximately 4 and a half minutes into flight, the Centaur stage ignites its main engine (MES-1) which begins a nearly 11-minute burn to place the vehicle into a parking orbit. Eight seconds into the first Centaur burn, the payload fairing is jettisoned.

Following a 9-minute coast, the Centaur main engine is ignited for a second burn (MES-2), lasting nearly 4 minutes. The mission enters a 15-minute coast phase following MECO-2. SBIRS GEO-2 is released approximately 43 minutes after liftoff.



# Atlas V SBIRS GEO-2

## FLIGHT PROFILE | Liftoff to Separation




**Launch:**

Flight Azimuth: 98.82°

**Orbit at Separation:**

Apogee: 19,322.8 nmi
Perigee: 100.0 nmi
Inclination: 22.19°
Argument of Perigee: 178.0°

*Approximate Values*

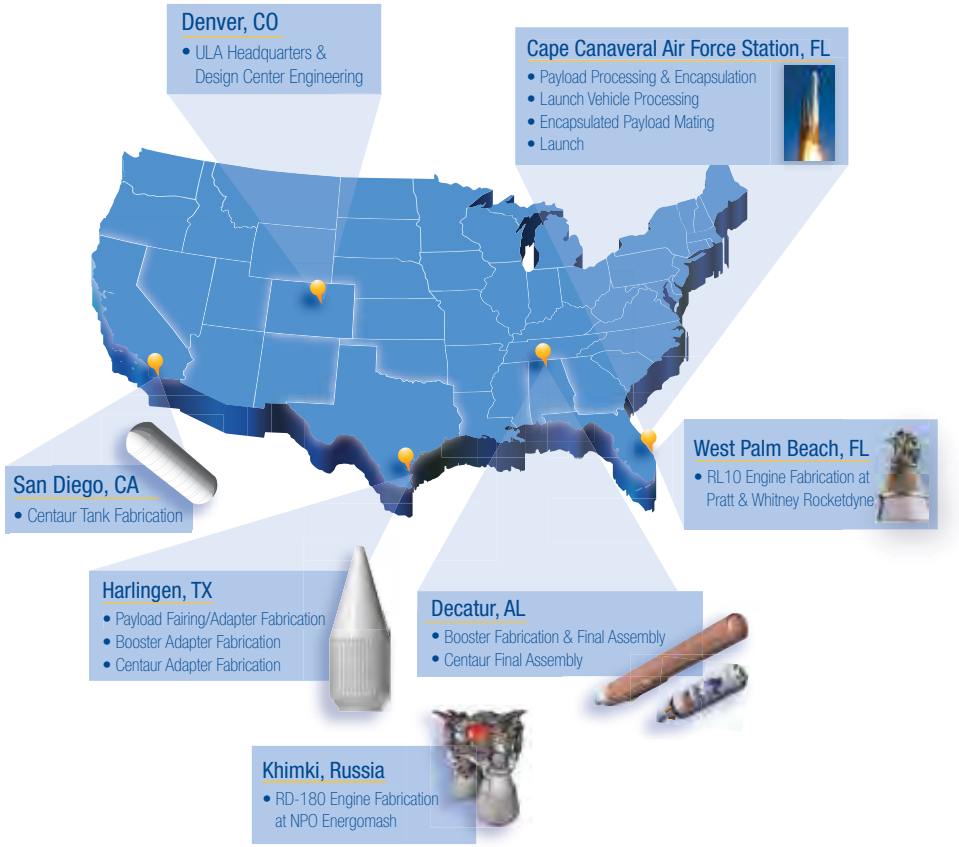
## SEQUENCE OF EVENTS | Liftoff to Separation

| | Event | Time (seconds) | Time (hr:min:sec) |
|---|---|---|---|
| 1 | RD-180 Engine Ignition | -2.7 | -0:00:02.7 |
| | T=0 (Engine Ready) | 0.0 | 0:00:00.0 |
| | Liftoff (Thrust to Weight > 1) | 1.1 | 0:00:01.1 |
| | Begin Pitch/Yaw/Roll Maneuver | 17.7 | 0:00:17.7 |
| | Maximum Dynamic Pressure | 90.6 | 0:01:30.6 |
| 2 | Atlas Booster Engine Cutoff (BECO) | 243.1 | 0:04:03.1 |
| | Atlas Booster/Centaur Separation | 249.1 | 0:04:09.1 |
| 3 | Centaur First Main Engine Start (MES-1) | 259.0 | 0:04:19.0 |
| 4 | Payload Fairing Jettison | 267.1 | 0:04:27.1 |
| 5 | Centaur First Main Engine Cutoff (MECO-1) | 920.9 | 0:15:20.9 |
| 6 | Centaur Second Main Engine Start (MES-2) | 1447.5 | 0:24:07.5 |
| 7 | Centaur Second Main Engine Cutoff (MECO-2) | 1682.9 | 0:28:02.9 |
| 8 | SBIRS GEO-2 Separation | 2592.6 | 0:43:12.6 |



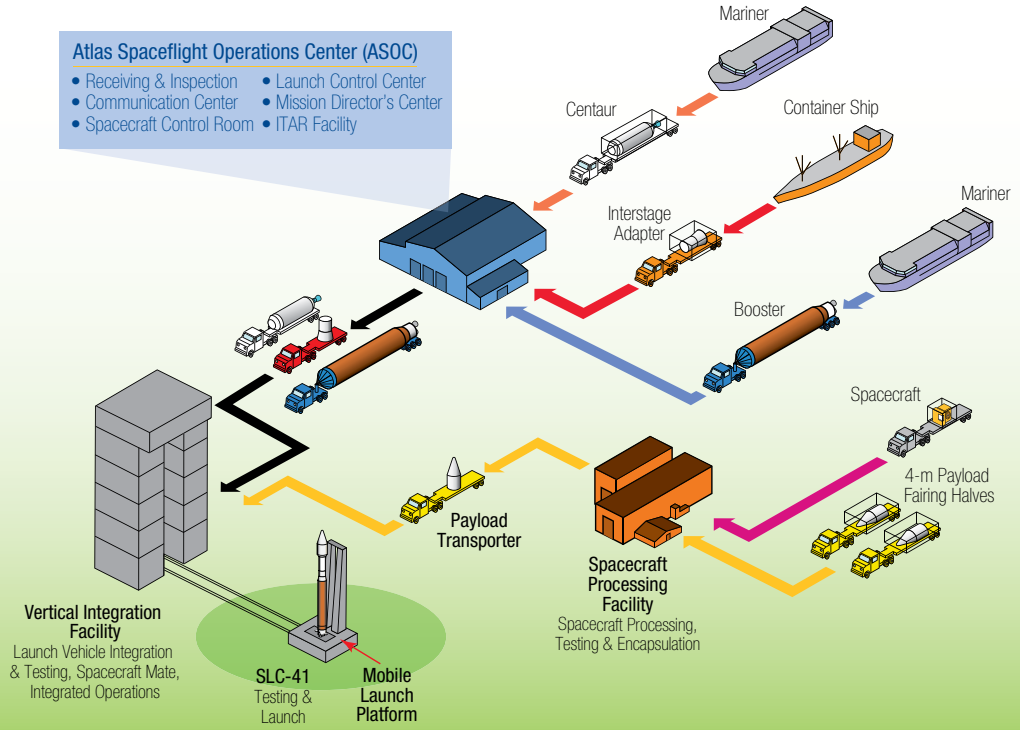
# Atlas V SBIRS GEO-2

## ATLAS V PRODUCTION & LAUNCH | Overview





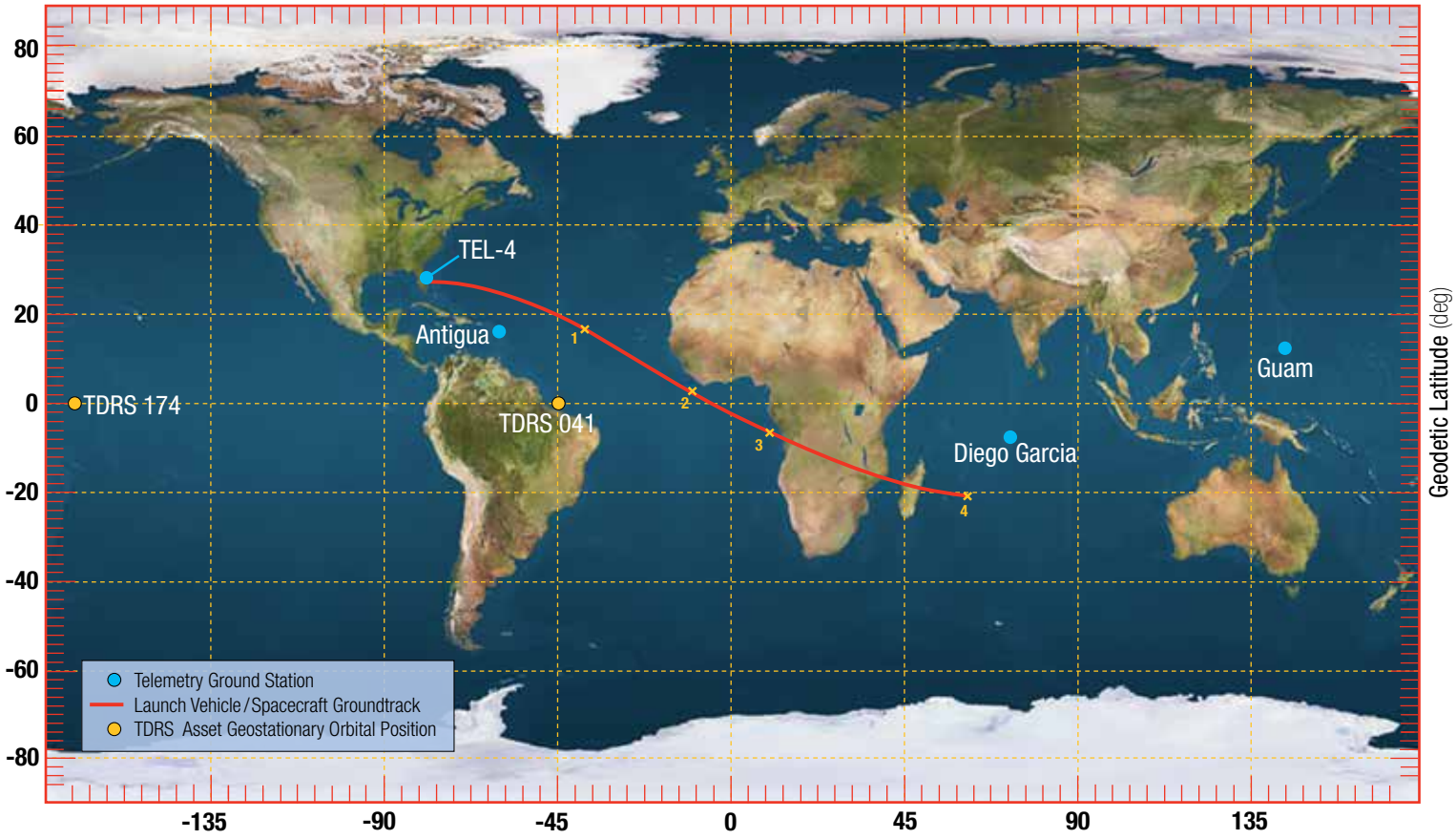

## ATLAS V PROCESSING | Cape Canaveral






# Atlas V SBIRS GEO-2

## GROUND TRACE | Liftoff to Separation

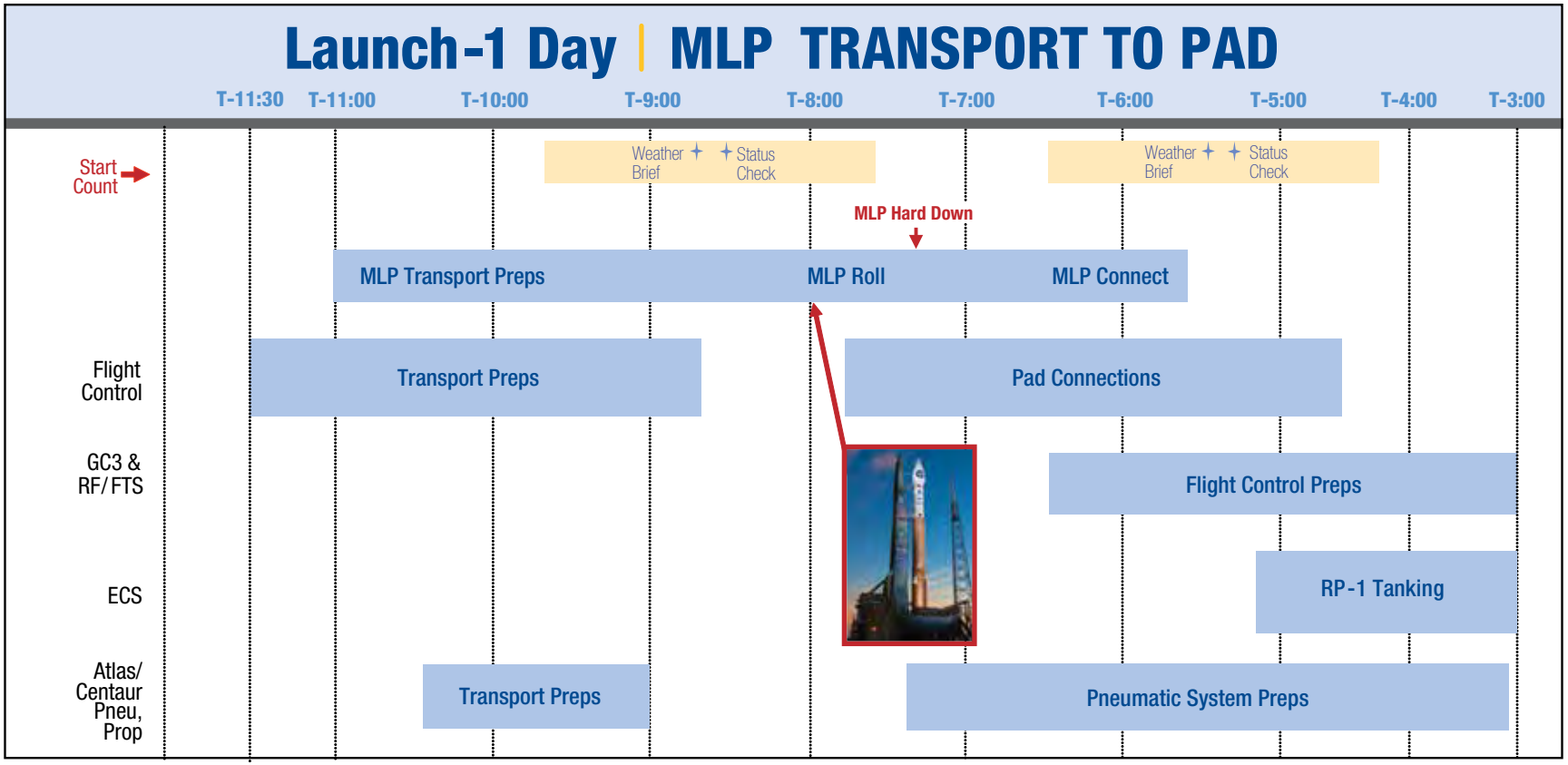



**1 =** MECO-1 (0:15:20.9) | **2 =** MES-2 (0:24:07.5) | **3 =** MECO-2 (0:28:02.9) | **4 =** SBIRS GEO-2 Separation (0:43:12.6)





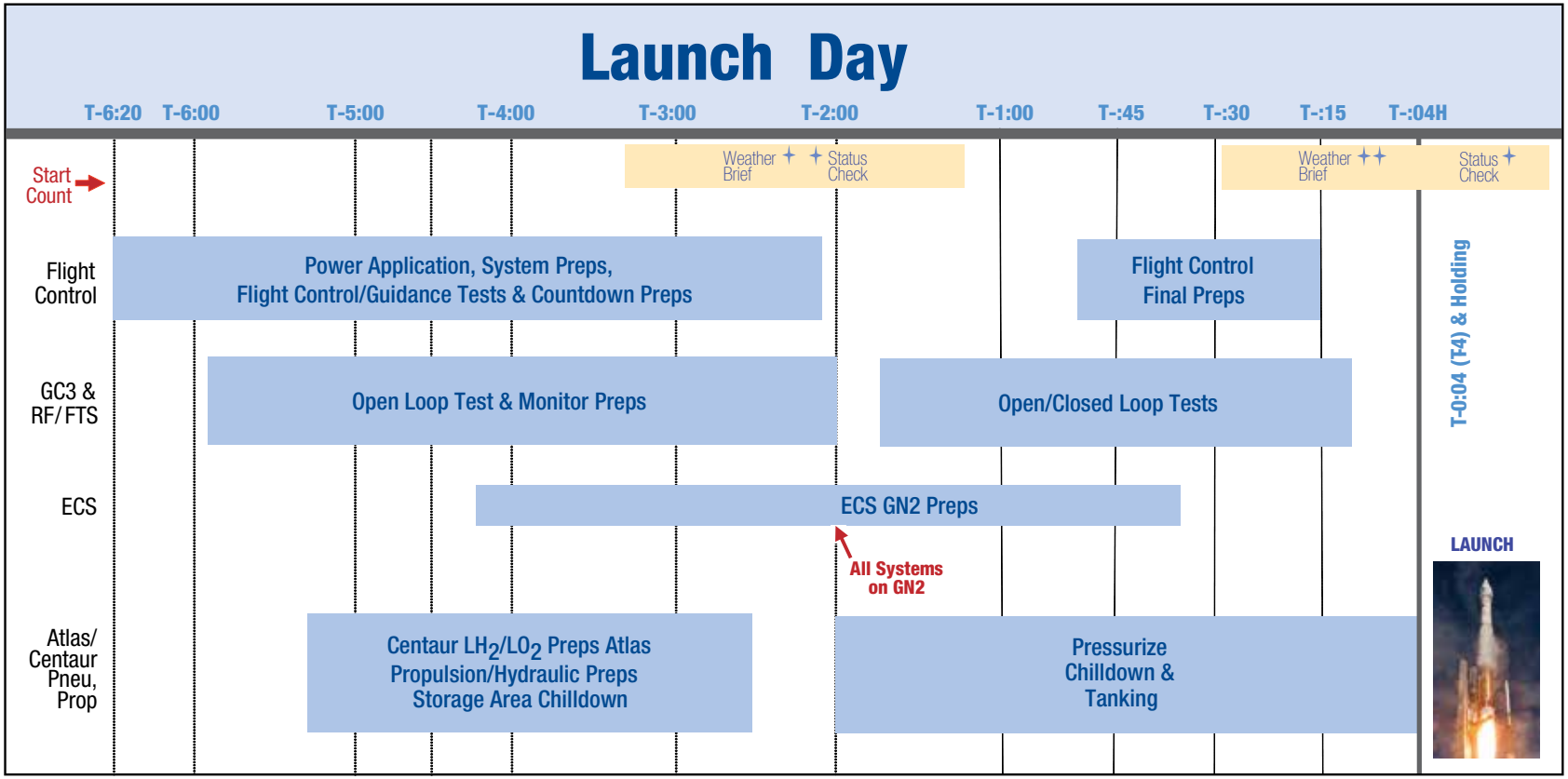
# Atlas V SBIRS GEO-2








# Atlas V SBIRS GEO-2








# Atlas V SBIRS GEO-2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