

## DELTA IV WGS-8 MISSION

A United Launch Alliance (ULA) Delta IV Medium+ (5,4) will deliver the eighth Wideband Global SATCOM (WGS) satellite to supersynchronous transfer orbit. Liftoff will occur from Space Launch Complex-37 at Cape Canaveral Air Force Station (CCAFS), FL.

WGS-8, the second Block II follow-on satellite, supports communications links in the X-band and Ka-band spectra. While Block I and II satellites can instantaneously filter and downlink up to 4.410 GHz, WGS-8 can filter and downlink up to 8.088 GHz of bandwidth.

Depending on the mix of ground terminals, data rates, and modulation and coding schemes employed, a single WGS satellite can support data transmission rates over 6 Gbps, and WGS-8 with its advanced digital channelizer may support over 11 Gbps. The current fleet is providing more than 16 Gbps globally, and the most heavily loaded WGS vehicle is now providing over 4 Gbps locally.

WGS has 19 independent coverage areas, 18 of which can be positioned throughout its field-of-view. This includes eight steerable/shapeable X-band beams formed by separate transmit/receive phased arrays; 10 Ka-band beams served by independently steerable diplexed antennas; and one transmit/receive X-band Earth-coverage beam. WGS can tailor coverage areas and connect X-band and Ka-band users anywhere within its field-of-view. The X-band phased array antenna enables anti-jam functionality without sacrificing performance.

Five globally-located Army Wideband SATCOM Operations Centers provide 24/7 payload monitoring and command and control of the WGS constellation. In coordination with the WGS-8 launch, the US Army has modernized the Global SATCOM Configuration and Control Element to a new service-oriented virtualized software system residing on a new ground hardware platform. Each Global Satellite Configuration and Control Element has the capability to control up to ten WGS satellites at a time.

Spacecraft platform control and anomaly resolution is accomplished by the 3rd Space Operations Squadron at Schriever Air Force Base in Colorado Springs, CO.

### Payload Fairing (PLF)

The PLF is a composite bisector (two-piece shell), 5-meter diameter fairing. The PLF encapsulates the spacecraft to protect it from the launch environment on ascent. The vehicle's height, with the 47-ft tall PLF, is approximately 217 ft.

### Delta Cryogenic Second Stage (DCSS)

The DCSS propellant tanks are structurally rigid and constructed of formed aluminum plate, spun-formed aluminum domes and aluminum ring forgings. It is a cryogenic liquid hydrogen/liquid oxygen-fueled vehicle, powered by a single RL10B-2 engine that produces 24,750 lbf of thrust. The DCSS cryogenic tanks are insulated with a spray-on insulation and helium-purged insulation blankets. An equipment shelf attached to the aft dome of the DCSS liquid oxygen tank provides the structural mountings for vehicle electronics.

### Booster

The Delta IV common booster core (CBC) tanks are structurally rigid and constructed of isogrid aluminum barrels, spun-formed aluminum domes and machined aluminum tank skirts. Delta IV booster propulsion is provided by the throttleable RS-68A engine system which burns cryogenic liquid hydrogen and liquid oxygen and delivers 705,250 lbf of thrust at sea level. The booster's cryogenic tanks are insulated with a combination of spray-on and bond-on insulation and helium-purged insulation blankets. The booster is controlled by the DCSS avionics system, which provides guidance, flight control.

### Solid Rocket Motors (SRM)

Four SRMs generate the additional thrust required for liftoff and attain a combined maximum thrust of 1,124,000 lbs in flight. The SRMs are 5 ft in diameter and 53 ft long and constructed of a graphite-epoxy composite. The SRMs are connected to the booster by two ball-and-socket joints and structural thrusters.

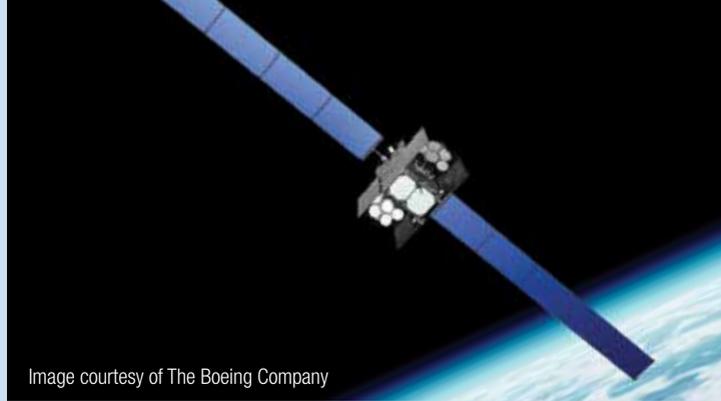
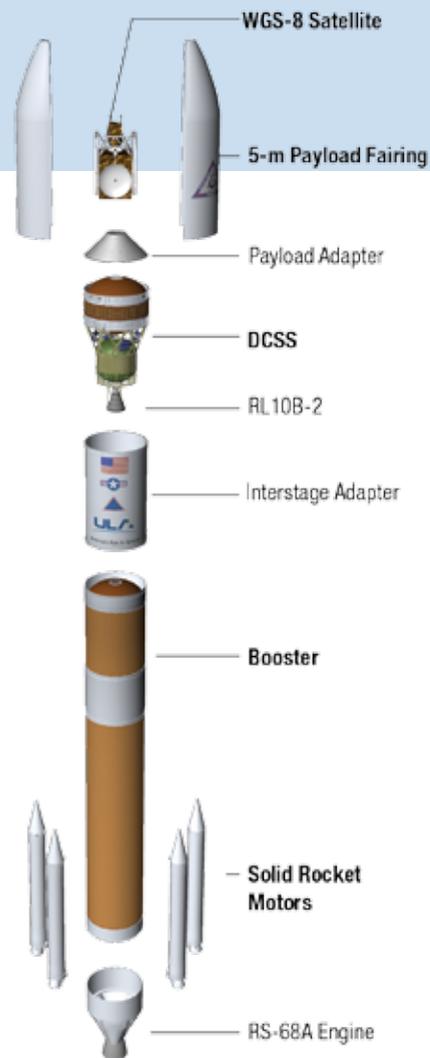


Image courtesy of The Boeing Company



## DELTA IV MEDIUM+ (5,4)

The Delta IV family of launch vehicles combines design simplicity, manufacturing efficiency, and streamlined mission and vehicle integration to meet customer launch requirements. The Delta IV Medium+ (5,4) configuration has launched five WGS satellites.

**First Launch:** Dec. 5, 2009  
**Launches to date:** 5

**Performance to GTO:** 6,890 kg (15,109 lb)  
**Performance to LEO-Reference:** 13,370 kg (30,250 lb)



### 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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# Delta IV WGS-8

Supporting the Warfighter with Enhanced Communication Capabilities



## MISSION OVERVIEW

- 34<sup>th</sup> Delta IV Launch
- 114<sup>th</sup> ULA Launch



America's Ride to Space

# DELTA IV PRODUCTION AND LAUNCH

- 1 De Soto, CA**  
– RS-68A Engine Fabrication at Aerojet Rocketdyne
- 2 Brigham City, UT**  
– Solid Rocket Motor Fabrication at Alliant Technologies
- 3 Denver, CO**  
– ULA Headquarters & Design Center Engineering
- 4 Decatur, AL**  
– Booster, Payload Fairing and Second Stage Fabrication
- 5 West Palm Beach, FL**  
– RL10 Engine Fabrication at Aerojet Rocketdyne



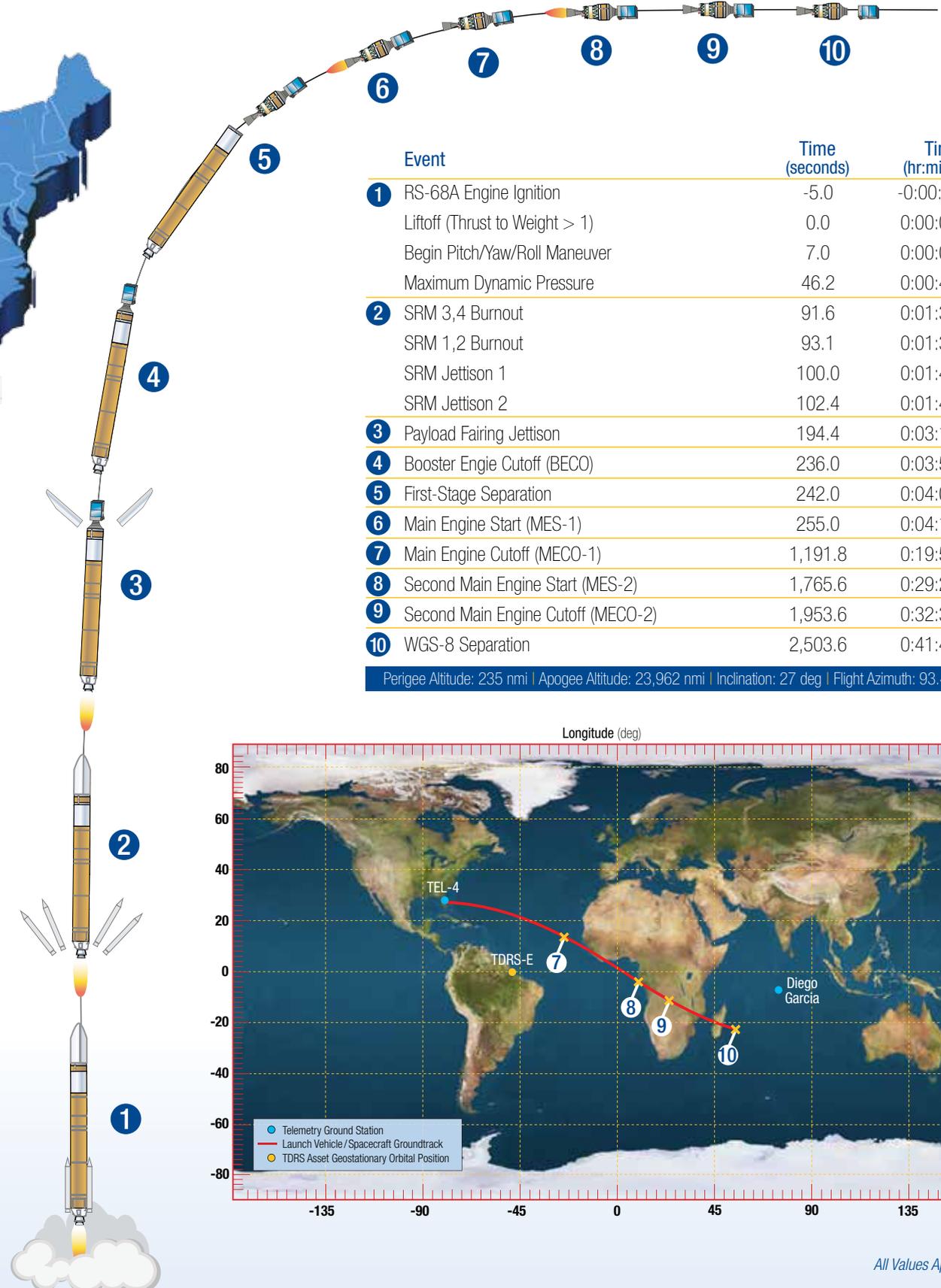
- 1 Delta Operations Center (DOC)** | Launch Control Center and Mission Director's Center
- 2 Horizontal Integration Facility** | Receiving, inspection and integration
- 3 Receipt Inspection Shop** | Receiving, inspection and processing
- 4 Spacecraft Processing Facility** | Spacecraft processing, testing and encapsulation
- 5 Mobile Service Tower** | Launch vehicle integration and testing, spacecraft mate and integrated operations

- 1 Mobile Service Tower (MST)**
- 2 Launch Vehicle**
- 3 Launch Table**
- 4 Fixed Umbilical Tower (FUT)**
- 5 Lightning Protection Towers**
- 6 LH2 Storage Tank**
- 7 L02 Storage Tank**



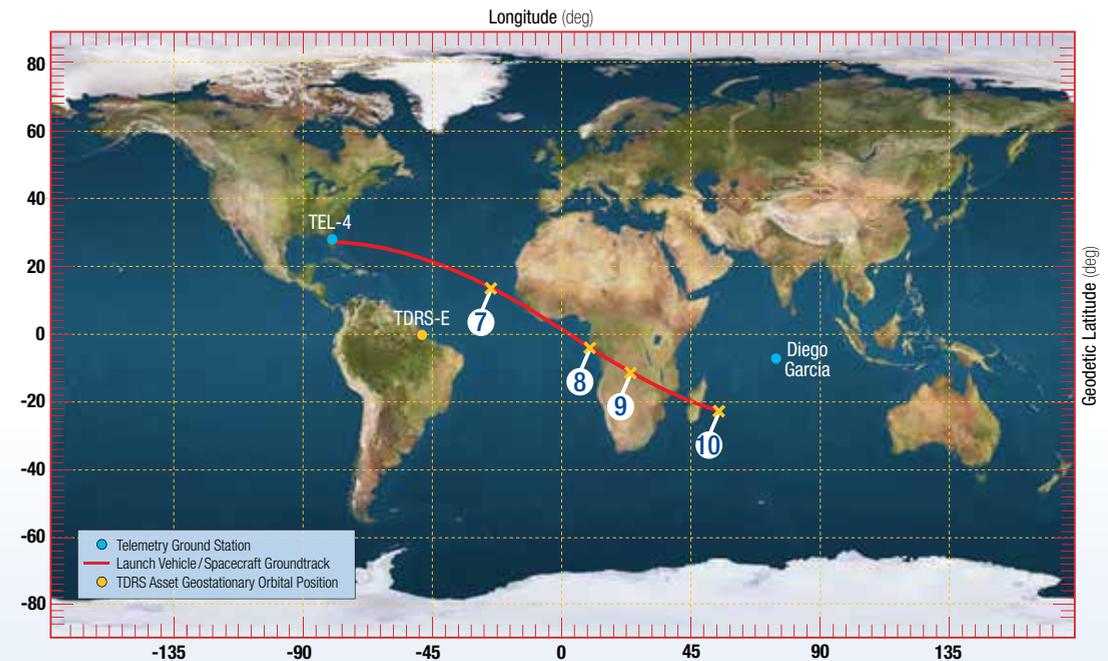
Space Launch Complex-37

# MISSION PROFILE AND GROUND TRACE



Event	Time (seconds)	Time (hr:min:sec)
<b>1</b> RS-68A Engine Ignition	-5.0	-0:00:05.0
Liftoff (Thrust to Weight > 1)	0.0	0:00:00.0
Begin Pitch/Yaw/Roll Maneuver	7.0	0:00:07.0
Maximum Dynamic Pressure	46.2	0:00:46.2
<b>2</b> SRM 3,4 Burnout	91.6	0:01:31.6
SRM 1,2 Burnout	93.1	0:01:33.1
SRM Jettison 1	100.0	0:01:40.0
SRM Jettison 2	102.4	0:01:42.4
<b>3</b> Payload Fairing Jettison	194.4	0:03:14.4
<b>4</b> Booster Engine Cutoff (BECO)	236.0	0:03:56.0
<b>5</b> First-Stage Separation	242.0	0:04:02.0
<b>6</b> Main Engine Start (MES-1)	255.0	0:04:15.0
<b>7</b> Main Engine Cutoff (MECO-1)	1,191.8	0:19:51.8
<b>8</b> Second Main Engine Start (MES-2)	1,765.6	0:29:26.6
<b>9</b> Second Main Engine Cutoff (MECO-2)	1,953.6	0:32:33.6
<b>10</b> WGS-8 Separation	2,503.6	0:41:43.6

Perigee Altitude: 235 nmi | Apogee Altitude: 23,962 nmi | Inclination: 27 deg | Flight Azimuth: 93.46 deg



● Telemetry Ground Station  
 — Launch Vehicle/Spacecraft Groundtrack  
 ● TDRS Asset Geostationary Orbital Position