



Ares I-X Flight Test 2009

The First Flight of a New Era



Mission Profile

Ares I-X is the first flight test for the Ares I crew launch vehicle. The mission will be a suborbital development flight test that will give NASA its first opportunity to demonstrate and collect key data to inform the Ares I design:

- Roll and overall vehicle control
- Staging/separation
- Aerodynamics and vehicle loads
- First Stage entry dynamics for recovery
- Vehicle integration, assembly, and launch operations



A. Command Module Launch Abort System (CM/LAS)

The top of the Ares I-X flight test vehicle will be a combined Orion crew module and launch abort system simulator, resembling the structural and aerodynamic characteristics of Ares I. This simulator is being built at Langley Research Center in Hampton, Virginia, with high fidelity to ensure that it accurately reflects the shape and physical properties of models used in computer analyses and wind tunnel tests. The simulator will include thermal, aerodynamic, acoustic, and vibration sensors that will record data during the flight. The CM/LAS will splash down in the ocean along with the upper stage simulator (USS) after the boost phase of the mission.



B. Upper Stage Simulator (USS)

The Ares I-X Upper Stage Simulator provides a full-scale shape, weight, and mass property model of the Ares I Upper Stage. It consists of 11 segments all fabricated and test-stacked at Glenn Research Center in Cleveland, Ohio. The interior is hollow and includes platforms and ladders for ground staff access to flight controls, sensors, and other equipment. Steel plates provide the proper weight and center of gravity attributes to match Ares I in flight.



C. Roll Control System (RoCS)

The Ares I-X Roll Control System, or RoCS, will rotate the flight test vehicle immediately after liftoff and maintain the vehicle's roll attitude during flight. The RoCS consists of two hypergolic engines mounted on the interstage segment of the Upper Stage Simulator. Harvested from Peacekeeper missiles, the RoCS modules use existing pressurization and fuel tanks and new control hardware to meet the needs of the Ares I-X flight. The engines were duty-cycle tested at White Sands Test Facility before being reconfigured to fit inside the flight test vehicle. The modifications and testing for the RoCS engines were performed by Teledyne Brown Engineering in Huntsville, Alabama under contract to the Marshall Space Flight Center (MSFC), and shipped to the Kennedy Space Center (KSC) in January 2009 for integration into the vehicle.



D. First Stage Reusable Solid Rocket Motor (RSRM)

The Ares I-X first stage, built by ATK in Promontory, Utah, consists of a four-segment solid rocket motor directly from the Space Shuttle inventory. The stage includes new forward structures and a fifth segment simulator to match the length of the Ares I First Stage. The stage also includes new, separation and parachute recovery systems, which will be tested as primary objectives of the flight. The First Stage will power the vehicle from liftoff to 130,000 feet and maximum speed of Mach 4.8. The stage's fifth segment simulator houses the First Stage avionics module, which includes most of the rocket's controls and a flight recorder for collecting data during the flight, which will be recovered with the rest of the stage after splashdown.



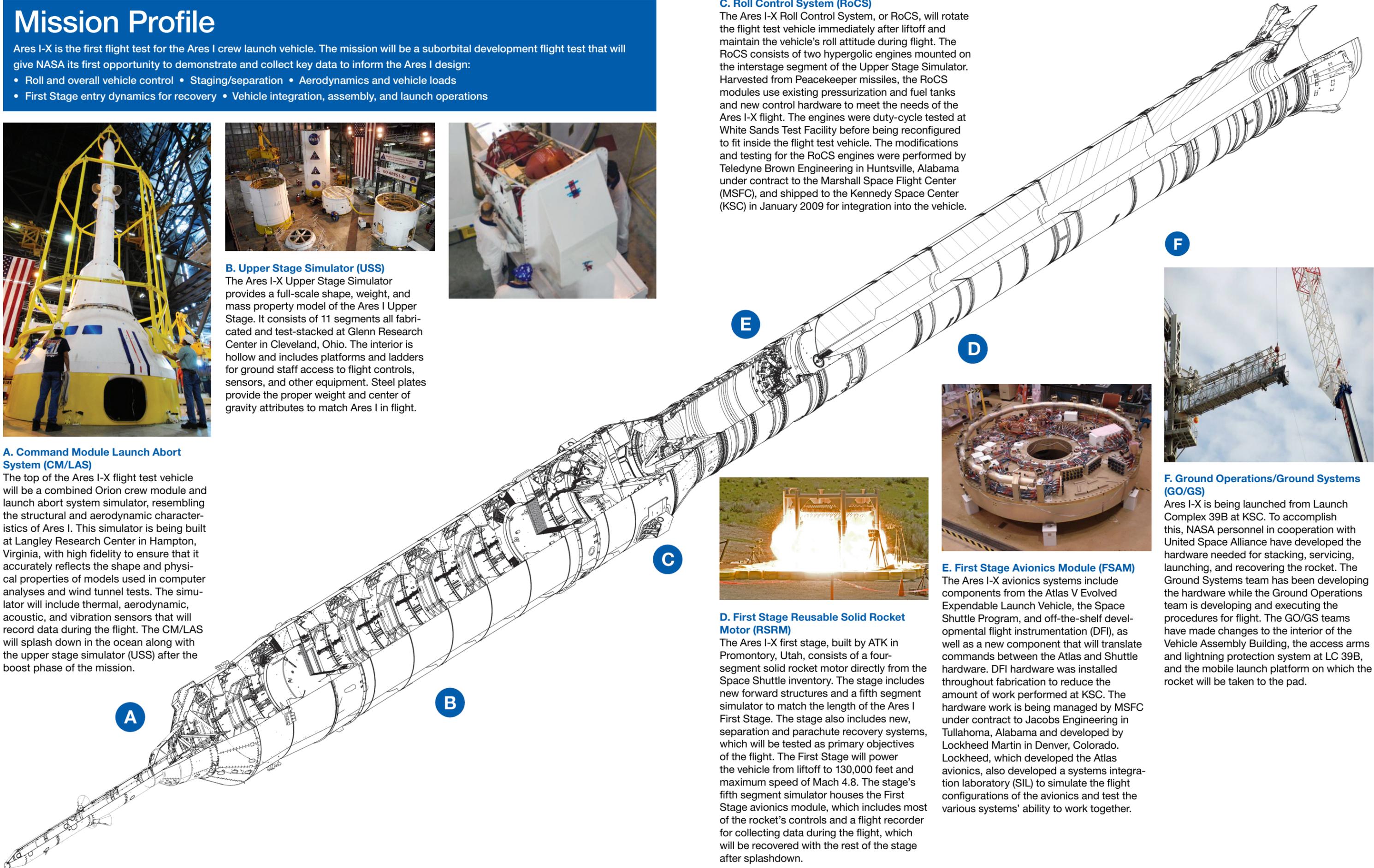
E. First Stage Avionics Module (FSAM)

The Ares I-X avionics systems include components from the Atlas V Evolved Expendable Launch Vehicle, the Space Shuttle Program, and off-the-shelf developmental flight instrumentation (DFI), as well as a new component that will translate commands between the Atlas and Shuttle hardware. DFI hardware was installed throughout fabrication to reduce the amount of work performed at KSC. The hardware work is being managed by MSFC under contract to Jacobs Engineering in Tullahoma, Alabama and developed by Lockheed Martin in Denver, Colorado. Lockheed, which developed the Atlas avionics, also developed a systems integration laboratory (SIL) to simulate the flight configurations of the avionics and test the various systems' ability to work together.



F. Ground Operations/Ground Systems (GO/GS)

Ares I-X is being launched from Launch Complex 39B at KSC. To accomplish this, NASA personnel in cooperation with United Space Alliance have developed the hardware needed for stacking, servicing, launching, and recovering the rocket. The Ground Systems team has been developing the hardware while the Ground Operations team is developing and executing the procedures for flight. The GO/GS teams have made changes to the interior of the Vehicle Assembly Building, the access arms and lightning protection system at LC 39B, and the mobile launch platform on which the rocket will be taken to the pad.

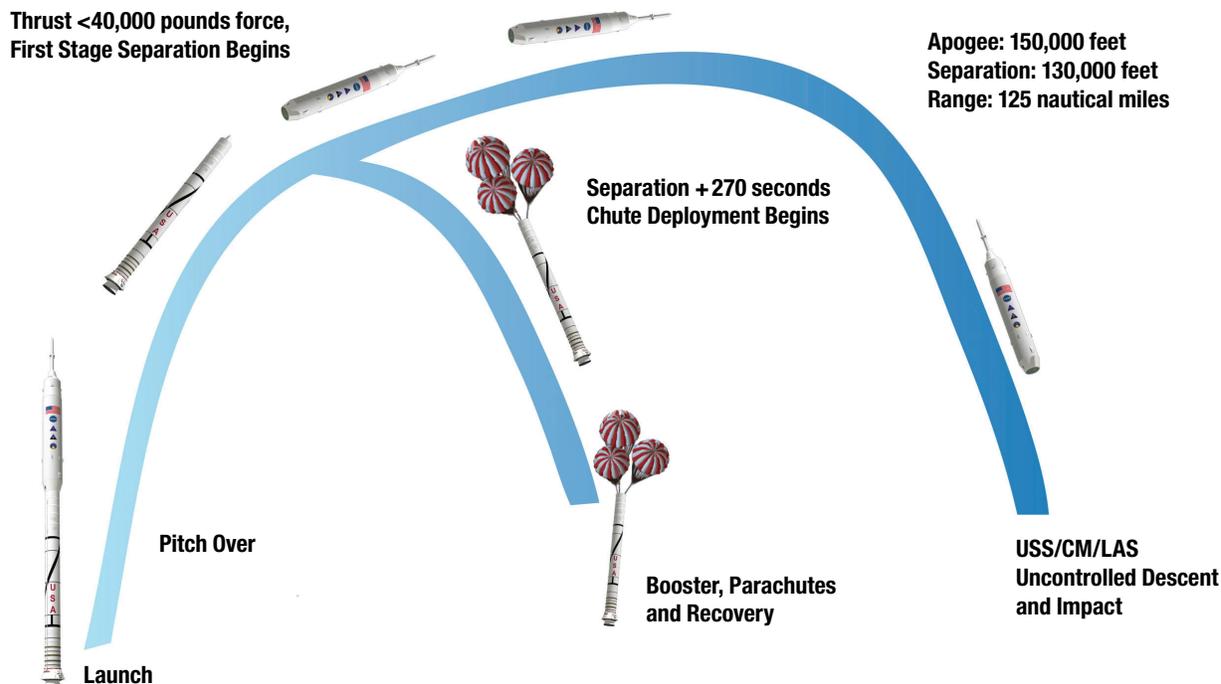


The Constellation Program

The Constellation Program was established to execute NASA's mission to send human and robotic explorers to the Moon and beyond. Projects that are part of Constellation are responsible for developing the launch, exploration, and landing vehicles, as well as the ground and human space systems necessary to accomplish these tasks. Constellation is designed to be a long-term effort, "a journey, not a race," which will maintain the nation's exploration goals within NASA's existing budget and resources.



Ares I-X 2009 Flight Test Profile



The Ares I-X flight profile will closely approximate the flight conditions that the Ares I will experience through Mach 4.7, at an altitude of about 130,000 feet, through maximum dynamic pressure ("max Q"), which is around 800 pounds per square foot. The flight also will test the timing of First Stage burnout, First Stage parachute system operations, First Stage separation, and Upper Stage ignition, which should occur approximately 130 seconds into flight.

Ares I-X Fast Facts

Fast Facts	Ares I-X	Ares I
Length	327 feet (99.6 meters)	325 feet (99.0 meters)
Diameter	18 feet (5.5 meters)	18 feet (5.5 meters)
Liftoff Weight	803.5 tons (815 metric tons)	892.8 tons (907.1 metric tons)
First Stage Maximum Thrust (vacuum)	3.16 million pounds force (14.1 million newtons)	3.55 million pounds force (15.8 million newtons)
Maximum Speed	Mach 4.7	Mach 5.84
Staging Altitude	130,000 feet (39,600 meters)	188,000 feet (57,700 meters)
Maximum Acceleration	2.46 g	3.79 g

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
 Huntsville, AL 35812
www.nasa.gov/marshall

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