NASAfacts

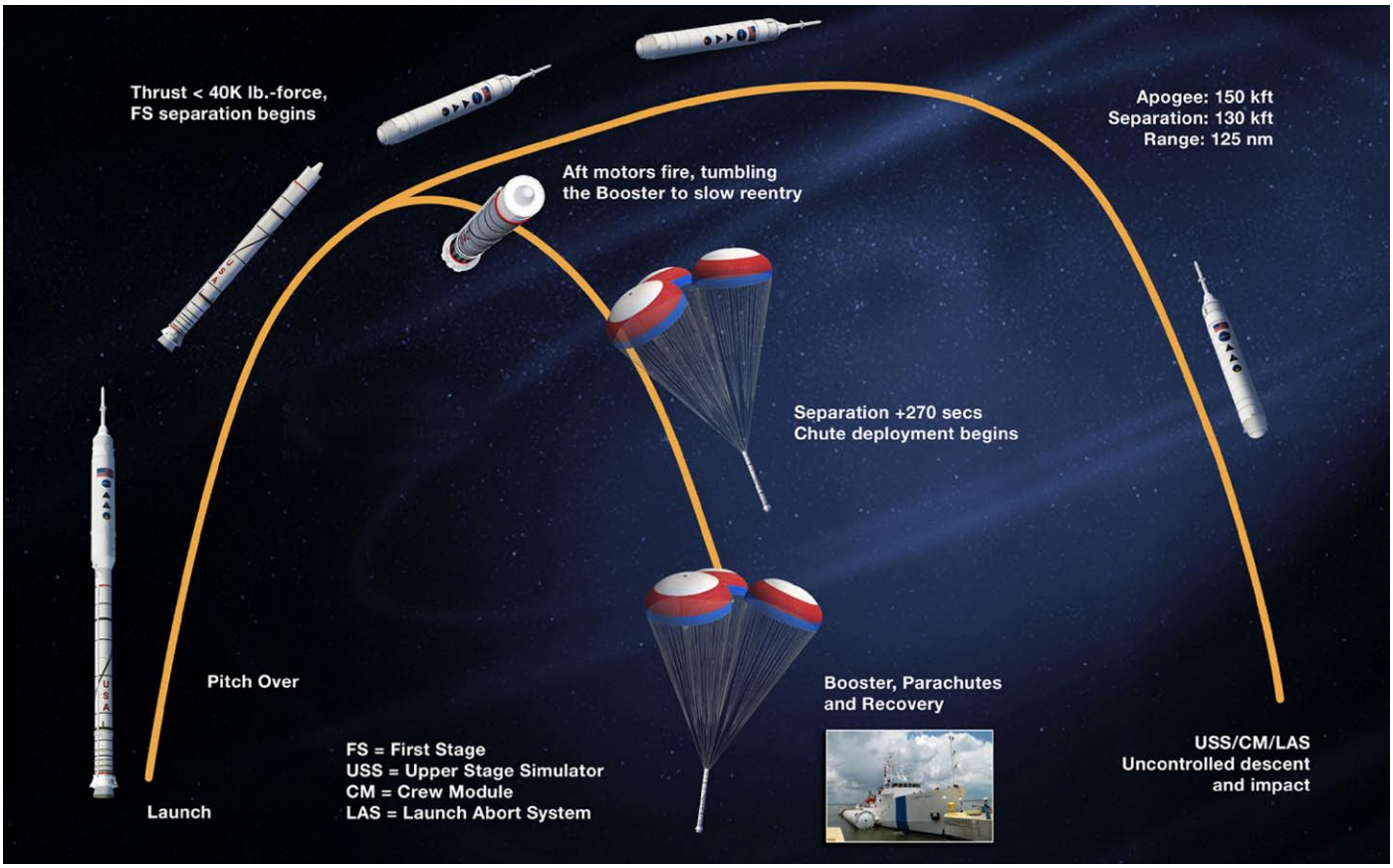
Constellation Program:
Ares I-X Flight Test Vehicle
"The first flight of a new era."

NASA's first flight test for the Agency's Ares I crew launch vehicle is launching in 2009. The flight test, called Ares I-X, will bring NASA one step closer to its exploration goals – to return to the moon for ambitious exploration of the lunar surface and then to travel to Mars and destinations beyond.

The Ares I-X flight will provide NASA an early opportunity to test and prove some hardware, facilities, and ground operations associated with the Ares I. The test also will allow NASA to gather critical data during ascent of the integrated stack, which includes a simulated Ares vehicle and simulated Orion crew module and launch abort system. Data collected will be used to verify the effectiveness of the rocket's design and ensure that it is safe and stable in flight before astronauts begin traveling into orbit.

The Ares I-X test is part of a larger flight test program that will include three tests of the Orion launch abort system between 2009 and 2012, a follow-on Ares I-Y test, and an integrated test of both the launch vehicle and spacecraft, called Orion 1, in 2015.

The first high-altitude test of the rocket that will replace the Space Shuttle and ultimately carry astronauts to the moon and beyond is scheduled for 2009. The Ares I-X Flight Test Vehicle will launch from NASA Kennedy Space Center.



The flight of Ares I-X is designed to simulate the first two minutes of Ares I flight. A broad range of performance data will be relayed to the ground and stored in the onboard flight data recorder. The solid rocket motor will separate and will be recovered at sea for later inspection. The simulated upper stage and Orion's crew module and launch abort system will not be recovered.

Flight Test Profile

The Ares I-X test vehicle will be similar in mass and size to the actual Orion and Ares I vehicle systems but it will incorporate a mix of proven spaceflight and simulated, or mockup, hardware. The test vehicle will be powered by a single, four-segment reusable solid rocket booster – flight hardware currently in the Space Shuttle inventory – modified to include a fifth inactive segment to simulate the Ares I five-segment booster. Mockups of the upper stage and the Orion crew module and launch abort system will be used to simulate the integrated spacecraft.

The flight test profile will closely follow the approximate flight conditions to be experienced by the Orion/Ares I vehicle through Mach 4.7 – more than four times the speed of sound. Approximately two minutes into flight, at approximately 130,000 feet, the launch vehicle's first stage will separate from the upper stage. The maximum altitude, or apogee, of the flight test will be about 150,000 feet.

Ares I-X assembly, testing and launch will use existing facilities at Kennedy Space Center, Florida. The first stage motor segments arrived by rail car and will be prepared for assembly on top of a mobile launch platform in the Vehicle Assembly Building. The upper stage simulator was shipped by barge while the Orion simulator was sent by air. These components will be assembled into super segments. They will be integrated onto the first stage, and the completed Ares I-X vehicle will roll out to Launch Complex 39B. From the Launch Control Center, the launch team will perform final checkout and launch the Ares I-X rocket.

During the Ares I-X flight test, the vehicle upper stage simulator and the Orion crew module and launch abort system mockup will separate from the first stage and fall into the Atlantic Ocean.

The first stage booster will continue through a complete recovery sequence, releasing its Ares I prototype three-stage parachute recovery system, falling safely into the ocean and floating until the hardware can be retrieved for inspection and analysis. Data gathered from the first stage will provide vital information on hardware and software performance and also will be used to fine-tune ground operations.

Flight Test Objectives and Strategy

The primary test objectives for the Ares I-X flight include demonstrating the flight control system performance during ascent and gathering information to help engineers better understand how to control the Ares I system's roll torque during flight.

Roll torque is the force that causes the rocket to rotate, just like the torque caused by a hand turning a jar lid causes the lid to turn. The rocket generates roll torques by the manner in which the propellant burns, as well as the vehicle aerodynamics.

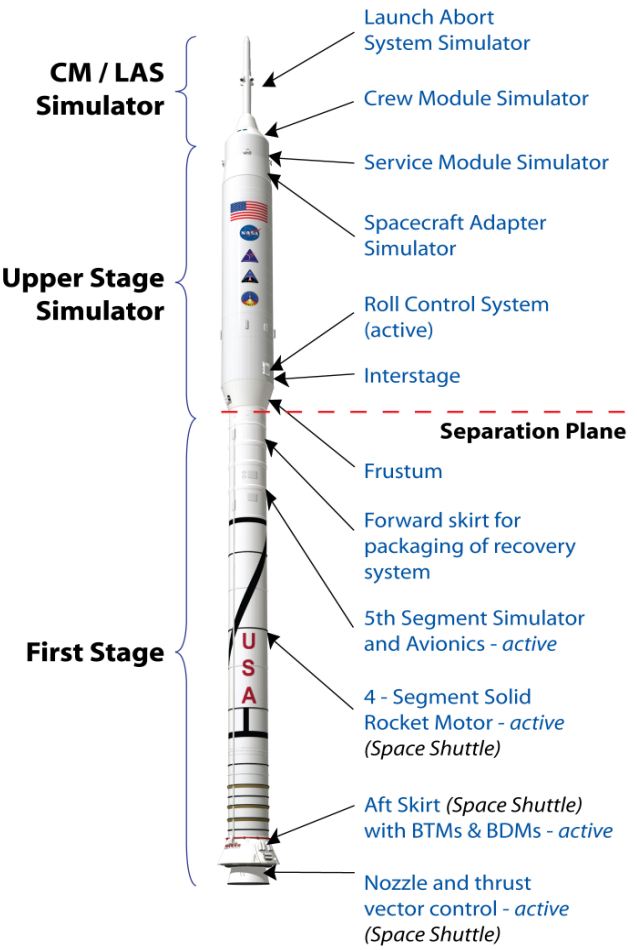
The test will characterize the flight environment during stage separation to better understand any possible effects on the future Ares upper stage J-2X engine. It also will test the first stage parachute recovery system; and validate assembly and processing activities, as well as launch and recovery operations.

In addition, several secondary test objectives are planned for the flight test. NASA engineers will analyze data to learn how effective the first stage separation motors perform and better understand the flight environments the vehicle must withstand during its ascent. The flight test also will demonstrate flight procedures and operations, establish potential access locations in facilities and on the launch pad, and assess induced loads that are caused during the operation of the vehicle system on the launch pad.

Ares I-X is one of three flight tests planned that will benefit NASA's Ares I project. The second flight test, called Ares I-Y, is scheduled for 2014. It will be the first flight of several new systems, including the five-segment reusable solid rocket booster, the flight control system, a cryogenic upper stage, and near-final avionics system. The third flight test, Orion 1, will test the complete Ares I vehicle, including the J-2X upper stage engine, and will place a uncrewed Orion crew exploration vehicle into orbit. The first crewed missions to the International Space Station are planned for no later than 2015.

Partners

NASA's Glenn Research Center in Cleveland, Ohio, developed the Ares I-X upper stage mass simulator. NASA's Langley Research Center in Hampton, Va., provided aerodynamic characterization, Ares I-X flight test vehicle integration, and Orion/launch abort system mass simulator development. NASA's Marshall Space Flight Center in Huntsville, Ala., provided management for the development of Ares I-X avionics, roll control, and first stage systems. NASA's Kennedy Space Center, Fla., provided operations and associated ground activities.



The Ares I-X Flight Test Vehicle will make use of proven spaceflight hardware.

ATK Space Systems of Promontory, Utah, is the prime contractor for the first stage reusable solid rocket boosters. Jacobs Engineering in Tullahoma, Tenn., is the prime contractor for Ares I-X avionics, with Lockheed Martin of Denver, Colo., as subcontractor. Teledyne Brown Engineering of Huntsville, Ala., is the prime contractor for developing the roll control system. United Space Alliance of Houston, Texas, is the prime contractor supporting launch operations at Kennedy Space Center.

Constellation Program

The Constellation Program is developing new systems and vehicles to support the next generation of space exploration. These vehicles will support the International Space Station after the Space Shuttle is retired in 2010, as well as missions to the moon, Mars, and beyond. Unlike earlier programs, Constellation will directly inherit the legacies of both Apollo and the Space Shuttle, using parts and concepts of these earlier programs to build more dependable and economical craft.

The Orion crew exploration vehicle will take astronauts to the International Space Station and beyond. It will be able to rendezvous with the Altair lunar lander and Ares V Earth departure stage in low-Earth orbit to carry crews to the moon and, one day, to Mars-bound vehicles assembled in low-Earth orbit. Orion will be the Earth entry vehicle for lunar and Mars returns. Orion's design will borrow its shape from the capsules of the past, but it takes advantage of 21st century technology in computers, electronics, life support, propulsion and heat protection systems. Orion is scheduled to fly its first missions to the space station by 2015 and carry out its first sortie to the moon by 2020.

The Ares launch vehicles, named for the Greek god associated with Mars, will carry into orbit astronauts, cargo, and the components needed to go to the moon and later to Mars. Ares I will be an in-line, two-stage rocket topped by the Orion crew vehicle and its launch abort system. Ares V cargo launch vehicle will be the heavy lifter of America's next-generation space fleet. The two-stage, vertically stacked launch system will have a 206-ton capacity to low-Earth orbit and 78-ton capacity to lunar orbit.

The Altair lunar lander will be capable of landing four astronauts on the moon, providing life support and a base for week-long initial surface exploration missions, and returning the crew to the Orion spacecraft that will bring them home to Earth. Altair will launch aboard an Ares V rocket into low-Earth orbit, where it will rendezvous with the Orion crew vehicle.

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