NASAfacts

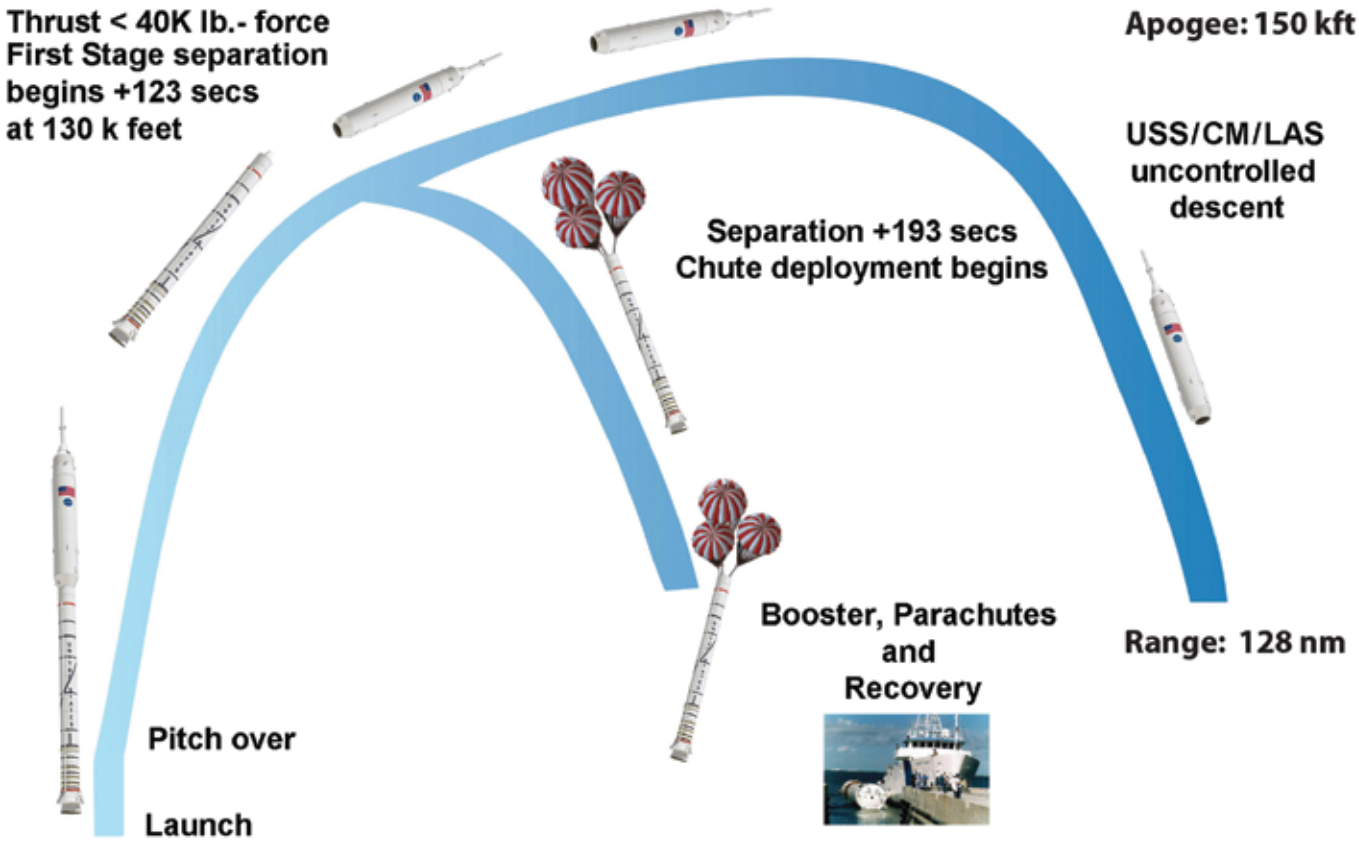
# Constellation Program:
## Ares I-X Flight Test Vehicle
*"The first flight of a new era."*

NASA's first test flight for the Agency's Constellation launch vehicle is planned for the Spring of 2009. The test flight, 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 hardware, facilities and ground operations associated with the Ares I crew launch vehicle. The test also will allow NASA to gather critical data during ascent of the integrated stack, which includes the Ares I vehicle with a simulated upper stage and the Orion crew module and launch abort system. Data collected will begin to confirm the vehicle as a whole 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 five tests of the Orion launch abort system between 2008 and 2011, a follow-on Ares I-Y test in 2012, and an integrated test of both the launch vehicle and spacecraft, called Orion 1, in early 2013.

**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. 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.**

**Test Flight 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 space flight and simulated, or mock-up, 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. Mock-ups of the upper stage and the Orion crew module and launch abort system will be used to simulate the integrated spacecraft system.

The test flight 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 – at which point the vehicle is expected to separate at 130,000 feet. The maximum altitude, or apogee, of the test flight will be about 150,000 feet. The test will simulate the launch vehicle's first stage burnout and separation from the upper stage, which occurs about two minutes into flight.

Ares I-X assembly, testing and launch will occur using existing facilities at Kennedy Space Center, Florida. The first stage motor segments will arrive by rail car and be prepared for assembly on top of a mobile launch platform in the Vehicle Assembly Building. The upper stage simulator will arrive by barge while the Orion simulator will arrive by air. These components will be a assembled into super segments. They will be integrated onto the first stage, and the completed Ares I-X vehicle will roll out to Launch Pad 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 test flight, the launch vehicle upper stage and the Orion crew module and launch abort system mock-ups 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 will be used to fine-tune ground operations.

**Test Flight 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.

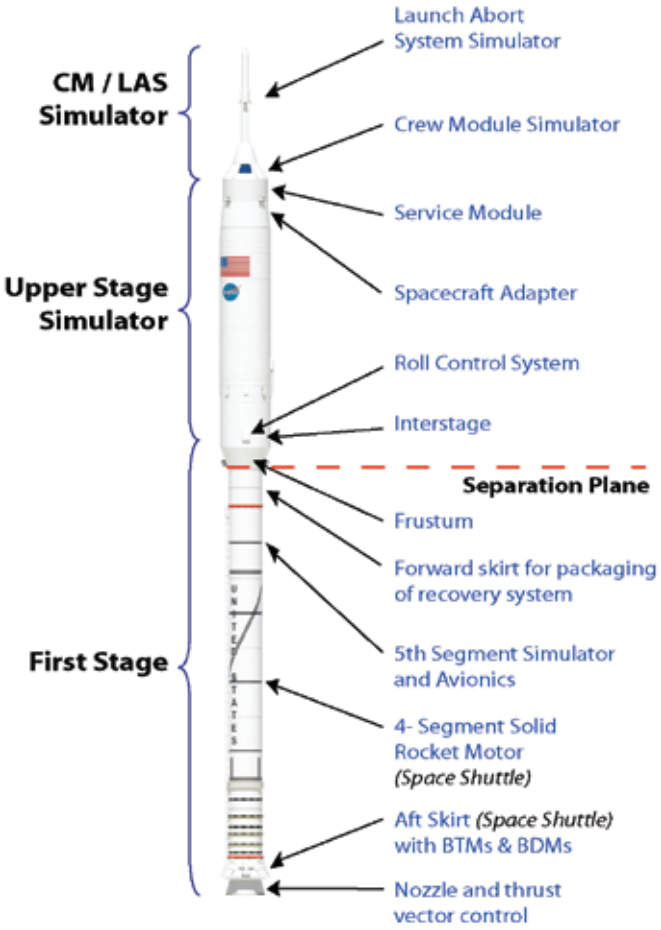
Roll torque is the force that causes the rotation of the launch vehicle, just like the torque caused by a hand turning a jar lid causes the lid to turn. The rocket generates roll torques by the manner in which the propellant burns as well as the vehicle aerodynamics.

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.

**Wind tunnel tests provide insight into the vehicle's flight characteristics and operational environment.**

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 two Constellation test flights planned that will benefit NASA's Ares I project. The second test flight, called Ares I-Y, is scheduled for 2012. It will be the first flight of several new systems: the five-segment reusable solid rocket booster, the flight control system,




**The Ares I-X Flight Test Vehicle will make use of proven space flight hardware.**

the J-2X engine and near-final avionics system. 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.

ATK Thiokol of Brigham City, Utah, is the prime contractor for the first stage reusable solid rocket boosters. Jacobs Technology in Tullahoma, Tenn., is the prime contractor for Ares I-X avionics. United Space Alliance of Houston, Texas is the prime contractor supporting launch operations at the Kennedy Space Center.

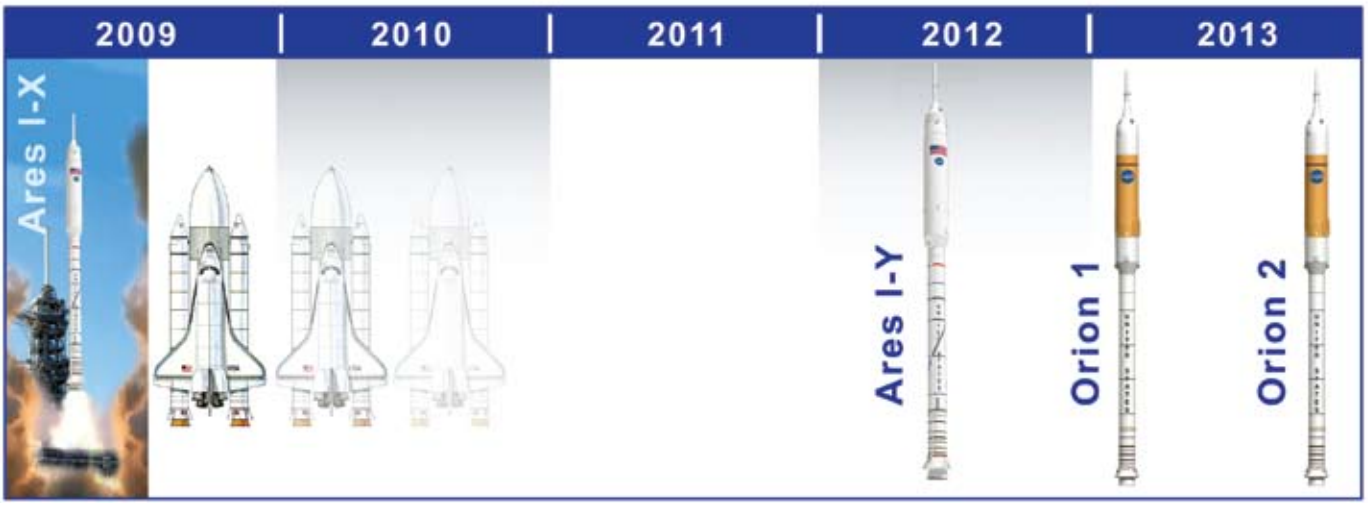
**Constellation Program**

The Constellation Program is developing new systems and vehicles to support the next generation of space exploration. These vehicles are NASA's replacements for the Space Shuttle which is planned for retirement in 2010. 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 that will serve as America's access to the International Space Station, our means of returning to the Moon, and visiting other worlds for the first time.

The Orion crew vehicle will take astronauts to the International Space Station and beyond. It will be able to rendezvous with a lunar landing module and an 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 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 2014 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 configuration 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 142-ton capacity to low-Earth orbit and 72-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.




**With the scheduled retirement of the Space Shuttle the Ares I-X Flight Test ushers in a new era of human space flight.**

National Aeronautics and Space Administration

**Langley Research Center**
100 NASA Road
Hampton, VA 23681

**www.nasa.gov**



FS-2008-04-142-LaRC