National Aeronautics and Space Administration

NASAfacts

Constellation Program:

America's Fleet of Next-Generation Launch Vehicles

The Ares I Crew Launch Vehicle

NASA is designing, testing and evaluating hardware and related systems for the agency's Ares I crew launch vehicle — the rocket that will carry a new generation of space explorers into orbit.

Under the goals of the Vision for Space Exploration, Ares I is a chief component of the cost-effective space transportation infrastructure being developed by NASA's Constellation Program. These transportation systems will safely and reliably carry human explorers back to the moon, and then onward to Mars and other destinations in the solar system.

The Ares I effort includes multiple project element teams at NASA centers and contract organizations around the nation, and is led by the Exploration Launch Projects Office at NASA's Marshall Space Flight Center in Huntsville, Ala. Together, these teams are developing vehicle hardware, evolving proven technologies, and testing components and systems. Their work builds on powerful, reliable space shuttle propulsion elements and nearly a half-century of NASA spaceflight experience and technological advances.

Ares I is an in-line, two-stage rocket configuration topped by the Crew Exploration Vehicle, its service module and a launch abort system.

Concept image of launch of Ares I. (NASA/MSFC)

The launch vehicle's first stage is a single, five-segment reusable solid rocket booster derived from the Space Shuttle Program's reusable solid rocket motor that burns a specially formulated and shaped solid propellant called polybutadiene acrylonitrile (PBAN).

A newly designed forward adapter will mate the vehicle's first stage to the second, and will be equipped with booster separation motors to disconnect the stages during ascent.

The second or upper stage — a wholly new element — is propelled by a J-2X main engine

Concept image of Ares I elements. (NASA/MSFC)

fueled with liquid oxygen and liquid hydrogen. The J-2X is an evolved variation of two historic predecessors: the powerful J-2 upper-stage engine that propelled the Apollo-era Saturn 1B and Saturn V rockets to the moon and the J-2S, a simplified version of the J-2 developed and tested in the early 1970s but never flown.

In addition to its primary mission — carrying crews of four to six astronauts to Earth orbit — the launch vehicle's 25-ton payload capacity might be used for delivering cargo to space, bringing resources and supplies to the International Space Station or dropping payloads off in orbit for retrieval and transport to exploration teams on the moon.

During the first two-and-a-half minutes of flight, the first stage booster powers the vehicle to an altitude of about 200,000 feet and a speed of Mach 6.1. After its propellant is spent, the reusable booster separates and the upper stage's J-2X engine ignites and powers the crew vehicle to an altitude of about 63 miles. Then, the upper stage separates and the Crew Exploration Vehicle's service module propulsion system completes the trip to a circular orbit 185 miles above Earth.

Once in orbit, the crew vehicle and its service module will rendezvous and dock either with the space station or with a lunar lander and Earth Departure Stage that will send the astronauts on their way to the moon.

Crew transportation to the space station is planned to begin no later than 2014. The first lunar excursion is scheduled for the 2020 timeframe.

Ares I Team, Partners

The Ares I effort and associated element project teams are led by the Exploration Launch Projects Office at Marshall, on behalf of the Constellation Program, hosted by

Concept image of the J-2X engine. (NASA/MSFC)

NASA's Johnson Space Center, Houston, and NASA's Exploration Systems Mission Directorate in Washington.

Participating agency facilities include NASA's Johnson Space Center, which is responsible for the Crew Exploration Vehicle and flight operations projects; Stennis Space Center near Bay St. Louis, Miss., which is primarily responsible for J-2X and stage testing; NASA Glenn Research Center's Plum Brook Station in Sandusky, Ohio, which is responsible for vacuum chamber testing of the J-2X upper stage engine, developing the ascent development flight test upper stage mass simulator, and upper stage power, thrust vector control and sensor development; NASA's Langley Research Center in Hampton, Va., which is responsible for aerodynamic characterization, ascent development flight test vehicle integration and Crew Exploration Vehicle mass simulator development, and support to flight mechanics and structure development; NASA's Ames Research Center in Sunnyvale, Calif., which is responsible for integrated health monitoring, blast modeling and reliability analysis support; NASA's Michoud Assembly Facility in New Orleans, which will assemble the upper stage; and NASA's Kennedy Space Center, Fla., which is home to all Constellation launch operations and associated ground activities.

ATK Thiokol of Brigham City, Utah, is the prime contractor for the first stage. Pratt & Whitney Rocketdyne in Canoga Park, Calif., is the prime contractor for the crew launch vehicle upper stage engine.

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George C. Marshall Space Flight Center
Huntsville, AL 35812

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