National Aeronautics and Space Administration

orion First Flight Test

NASA**facts**

Orion, NASA's new spacecraft built to send humans farther than ever before, is launching into space for the first time in December 2014.

An uncrewed test flight called Exploration Flight Test-1 will test Orion systems critical to crew safety, such as heat shield performance, separation events, avionics and software performance, attitude control and guidance, parachute deployment and recovery operations.

The data gathered during the flight will influence design decisions and validate existing computer models and innovative new approaches to space systems development, as well as reduce overall mission risks and costs.

The Orion spacecraft will take astronauts beyond low-Earth orbit to destinations such as an asteroid and eventually Mars on future missions, but to ensure that it's ready for humans to fly in, its December flight test is needed to stress its systems in the real environment it will face as it pushes the boundaries of human space exploration.

Exploration Flight Test-1

During Orion's flight test, the spacecraft will launch atop a Delta IV Heavy, a rocket built and operated by United Launch Alliance. While this launch vehicle will allow Orion to reach an altitude high enough to meet the objectives for this test, a much larger, human-rated rocket will be needed for the vast distances of future exploration missions. To meet that need, NASA is developing the Space Launch System, which will give Orion the capability to carry astronauts farther into the solar system than ever before.

During the uncrewed flight, Orion will orbit the Earth twice, reaching an altitude of approximately 3,600 miles – about 15 times farther into space than the International Space Station orbits. Sending Orion to such a high altitude will allow the spacecraft to return to Earth at speeds near 20,000 mph. Returning at this speed, as fast as any spacecraft built for humans had endured since the Apollo Program, will expose the heat shield to temperatures close to 4,000° F, 80 percent of what the spacecraft would endure returning from the vicinity of the moon on NASA's Asteroid Redirect Mission.

IMAGE CAPTION: Artist's rendering of Orion reentering the Earth's atmosphere following its first flight test.

Orion's crew module is maneuvered into place above its service module in the Operations and Checkout Facility at NASA's Kennedy Space Center in Florida.

Lockheed Martin is the prime contractor building the Orion spacecraft and conducting the flight for NASA.

Following the test, which will take about four and a half hours, Orion will land in the Pacific Ocean and be recovered by NASA's Ground Systems Development and Operations Program and the U.S. Navy.

Orion's flight test will increase efficiencies and reduce risks in several ways:

- Programmatic Risk Reduction – Critical data collected from the flight will help NASA lower 10 of the top 16 risks to the astronauts who will later fly on Orion. Systems to be verified include the thermal protection system, hardware separation events and the parachute system.
- Technical Risk Reduction – While Orion hardware has been tested extensively on the ground, the harsh realities of the space environment can't be entirely duplicated on Earth. This test allows engineers to identify design problems and fix them before Orion carries astronauts on missions that have never been attempted before.
- Efficiencies Identification – Orion's first flight offers NASA the chance to continue to refine its production and coordination processes, aligning with the agency's commitment to build the world's most cutting-edge spacecraft in the most cost-efficient manner possible.
- Industry Partnerships Enhancement – Orion's design teams will gain important experience and training to ensure the industry is prepared to launch Orion aboard the Space Launch System on its second flight.

During Exploration Flight Test-1, NASA is building on knowledge gained through the International Space Station and more than 50 years of human spaceflight experience, solving difficult challenges that will enable humans to safely explore deep space, including radiation mitigation, life support for long-duration missions and advanced thermal protection.

Four primary parts of the spacecraft will be evaluated during the test flight:

- **The Crew Module** – Will house and transport NASA's astronauts during deep space missions and holds many of Orion's most critical systems.
- **The Service Module** – Will contain Orion's propulsion, power and life support systems on future flights; because Orion's flight test is a relatively short duration and the systems aren't needed on an uncrewed flight, this first service module will primarily provide a structural representation.
- **The Launch Abort System** – Will propel the crew module to safety in an emergency during launch or ascent; because this flight is uncrewed, only its jettison from the crew module will be tested.
- **Orion-to-Stage Adapter** – Connects Orion to the launch vehicle; it also serves as a pathfinder for the adapter that will connect Orion to the Space Launch System in the future.

For more information about Orion, please visit www.nasa.gov/orion.

Artist's rendering of Orion during Exploration Flight Test-1, the first spaceflight of America's next generation spacecraft.

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