

National Aeronautics and  
Space Administration



# ORION

OCTOBER 2014

# ORION ASSEMBLY COMPLETE



# ORION READY FOR MOVE TO THE LAUNCH PAD



NASA and Lockheed Martin completed final assembly and testing of the Orion spacecraft inside the Launch Abort System Facility, or LASF, at NASA's Kennedy Space Center in Florida where Orion's launch abort system for Exploration Flight Test-1 was lowered by crane for installation on the Orion spacecraft.

The final assembly stages of the spacecraft included installing Orion's ogive panels, which protect the crew module from the acoustics and vibrations it will experience during launch and ascent. Orion was then crane-lifted, rotated into the proper orientation for mating with the Delta IV Heavy launch vehicle and placed onto the transport pallet.

Several tests were then performed, including a fairing purge test, which verifies how much dry gas needs to be pumped into the space between the ogive panels and the spacecraft. The dry gas ensures that when Orion is transported to the launch pad, it does not accumulate moisture, which could cause corrosion and contamination. Orion will remain inside the LASF until mid-November,

when the United Launch Alliance Delta IV Heavy rocket is ready for integration with the spacecraft.

When Orion arrives at Space Launch Complex 37, it will be hoisted 170 feet and mated to the Delta IV Heavy. The rocket and spacecraft will then be integrated and powered up, and interfaces between the two will be verified in preparation for the flight on December 4.

Orion is the exploration spacecraft designed to carry astronauts to destinations not yet explored by humans, including an asteroid and Mars. It will have emergency abort capability, sustain the crew during space travel and provide safe re-entry from deep space return velocities. The first uncrewed test flight of Orion will launch atop the Delta IV Heavy rocket from Cape Canaveral Air Force Station in Florida to an altitude of 3,600 miles above the Earth's surface. The two-orbit, four-hour flight test will help engineers evaluate the systems critical to crew safety including the heat shield, parachute system and launch abort system.

# NASA'S SPACE POWER FACILITY GETTING READY TO SHAKE UP ORION



What is it like to sit on top of a rocket with 8.6 million pounds of thrust? A table in Sandusky, Ohio, could give you a feel for it.

The 22-foot-wide, 55,000-pound vibration-simulating table was delivered to Glenn Research Center's Space Power Facility at the Plum Brook Station in Sandusky during the first week in October. It uses four horizontal servo-hydraulic actuators and 16 vertical actuators to vibrate the table in such a way that a spacecraft set on top of it would experience the same amount of shaking that it could expect when launching on top of a rocket.

It's a valuable asset for a spacecraft like Orion, which on its second mission will be launching on top of a rocket more powerful than any currently in existence – NASA's new Space Launch System rocket.

The table is the newest addition to the Space Power Facility, which is also home to the world's largest vacuum chamber

and the world's most powerful acoustic testing chamber for spacecraft. With this delivery, it now counts itself home to the world's highest-capacity and most-powerful spacecraft shaker system as well.

Orion testing at the facility will begin with the European Space Agency-built service module that will fly on Orion's second mission, Exploration Mission-1. It will also be used to verify that Orion's crew module can sustain the vibrations of launch, as well as a launch abort, when the Orion launch abort system would activate to pull the crew module away from an emergency on the launch pad or in the early stages of ascent. If necessary, it can carry the crew to a peak height of about one mile at 42 times the speed of a drag race car.

A total of five Orion shaker tests are already planned, with the first one targeted for next fall.

► [Find Out More](#)

# IT TAKES A COUNTRY



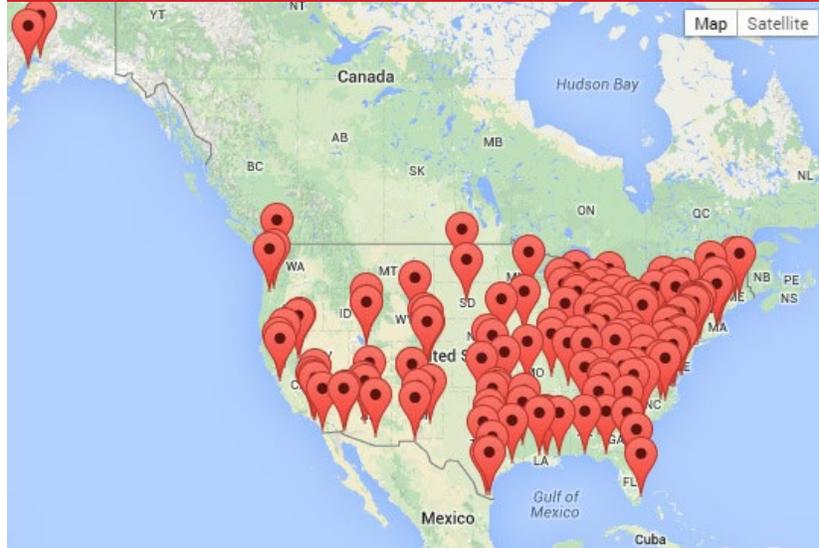
## MISSION CONTROL PREPARES FOR LAUNCH

A joint integrated simulation was performed October 21 and 22, enabling the pre-launch mission management team to practice a full launch sequence simulation. The simulations involved various possible hardware anomalies, recovery asset anomalies and weather conditions for launch and landing.



## ORION PROGRAM MANAGERS RECOGNIZE TEAM MEMBERS IN ILLINOIS, INDIANA

The Orion-Lockheed Martin team traveled to Illinois and Indiana October 4-8 for a series of outreach, media and supplier visit events. Program managers presented awards to United Technologies Aerospace Systems, Ingersoll Machine Tools, Major Tool and Scot Forge to thank them for their hard work and dedication to building the Orion spacecraft. Outreach events were held at Adler Planetarium and the Museum of Science and Industry to build awareness and excitement for Exploration Flight Test-1.



The Orion spacecraft was assembled with parts and pieces created by hundreds of suppliers and small businesses across the United States. The magnum opus of three years of manufacturing and assembly work, the nation's first human-rated spacecraft for deep space exploration currently sits inside the Launch Abort System Facility at Kennedy Space Center, where it waits to be transported to the launch pad and placed atop a Delta IV Heavy launch vehicle.

Just as the design, engineering, manufacturing and testing of Orion was a nationwide affair, so will be Exploration Flight Test-1. The NASA Orion and Lockheed Martin communications teams have been working together to reach out to 200 venues to host Orion First Flight viewing events. Attendees will be able to view the entire spaceflight from launch to splashdown, engage in Orion activities and watch live presentations given by Orion subject matter experts.

The end goal of this project is to increase awareness of Orion and its flight, according to Robin Hart-Prouse who led this project for the Orion Program Communications Office.

“Exploration Flight Test-1 represents our nation's very first step into deep space by NASA's next generation space exploration program,” Hart-Prouse said. “Without Orion and SLS, we would not be able to expand human exploration of our solar system beyond low-Earth orbit and the International Space Station.”

To find more information on how you can host a First Flight viewing event or locate an event near you, visit [ExploreDeepSpace.com](http://ExploreDeepSpace.com)

# A TEAM EFFORT

As assembly and stacking of the Orion spacecraft nears completion, the satellite communications teams have been hard at work preparing their networks for Exploration Flight Test-1 in December. Space Communications and Navigation (SCaN) has been an integral part of this preparation.

SCaN serves as the program office for all of NASA's space communications activities. It manages and directs the ground-based facilities and services provided by three distinct networks: the Deep Space Network, the Near Earth Network and the Space Network. Using these networks, SCaN is able to support a variety of mission types ranging from planetary missions to astrophysics missions.

"The most complex missions are typically human spaceflight, such as Orion," said Gary Morse, SCaN mission commitment manager. "Orion will utilize all three networks during the course of its missions."

It is essential during initial launch of a human spaceflight mission that the ground team has continuous contact with

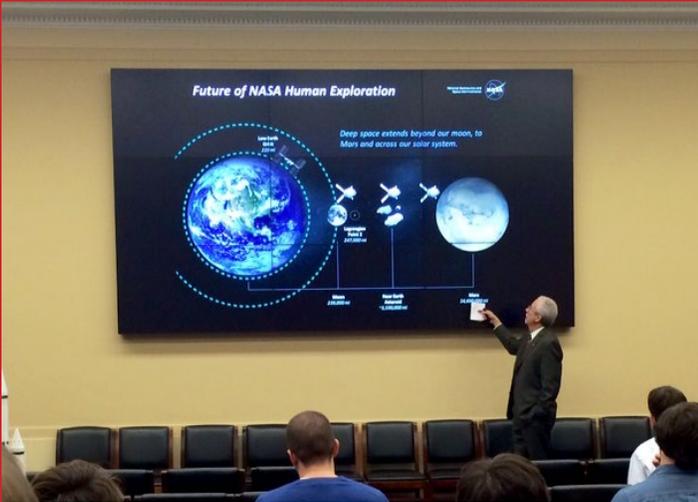
the flight crew in order to exercise contingency procedures in the event of an abort situation. The same applies to the reentry and landing of Orion. The Orion and SCaN teams are working closely to formulate a mission support plan, utilizing all the available networks and applying lessons learned from the space shuttle program.

"We always plan and simulate the worst case abort conditions in order to maximize the network coverage and ensure that there is data available to prevent it from happening again," Morse said.

SCaN is also utilizing communications technologies that were tested onboard the International Space Station.

"These transformation technologies are the foundation of SCaN future communications network capabilities," said Badri Younes, deputy associate administrator for SCaN. "They enable future science missions and human exploration, in particular those on Orion, to transmit streaming videos from far away distances such as Mars."





# HOUSE AND SENATE MEMBERS RECEIVE ORION BRIEFING

Program Manager Mark Geyer (left) briefed members of the House and Senate on Orion and Exploration Flight Test-1 October 7 in Washington D.C. The statesmen (above) were also able to show their support by signing the "I'm On Board" banner.



# AFFORDING MARS WORKSHOP

Wayne Jermstad gave an Orion presentation Oct. 14 and 15 at the second Affording Mars workshop in Pasadena, California. The workshop displayed a side-by-side comparison of major architectures for initial human missions to Mars; their key strengths and challenges and common next steps and technology capability challenges. Explore Mars and the American Astronautical Society sponsored the event.



# SILVER SNOOPY AWARD

Larry Gagliano, deputy project manager for the Orion Launch Abort System, was presented with the Silver Snoopy Award by Teresa Vanhooser, deputy director at Marshall Space Flight Center in Huntsville, Alabama, and NASA astronaut Lee Morin.

# MARSHALL TECHNOLOGY EXPOSITION



Orion LAS Engineers (L to R): Scott Ringel, Mark Stucker, Jack Phelps, and Mike Haynes

Orion engineers staffed a launch abort system exhibit Oct. 27 at the Marshall Technology Exposition. The event featured more than 30 exhibits along with technology and partnership-focused panels that invited businesses to join NASA on the journey of exploration into deep space. NASA technologists and senior executives, along with business and academia, came together to discuss the challenges associated with exploration, technologies required and opportunities to partner in developing those technologies that enable global exploration ambitions.

► [Find Out More](#)

## SPACE COAST FLORIDA COMMUNITY SIGNS ORION “I’M ON BOARD” BANNER AT AIR & SPACE SHOW

Several thousand people of all ages from the Florida Space Coast community came by the Lockheed Martin Orion exhibit to sign the “I’m on Board” banner and learn about Exploration Flight Test-1 and the next steps in our nation’s journey of human, deep-space exploration. Volunteers from Lockheed Martin and engineering students from the University of Central Florida are pictured below taking a break during a performance by the Air Force Thunderbirds.



## ORION PRESENTATION AT WERNHER VON BRAUN MEMORIAL SYMPOSIUM

The seventh annual Wernher von Braun Memorial Symposium was held October 27-29 at the University of Alabama, Huntsville. Program Manager Mark Geyer presented a joint Space Launch System-Orion capability progress report to attendees. The symposium was sponsored by the American Astronautical Society in conjunction with the National Space Club-Huntsville and NASA Marshall Space Flight Center.



## AMES OPEN HOUSE, ORION INFLATABLE ATTRACT BIG CROWDS

Ames Research Center celebrated its 75th anniversary with an Open House October 18. More than 150,000 people attended the event. The Orion team staffed a booth where attendees could ask questions, grab some handouts, sign the “I’m On Board” banner and take pictures with the full-scale Orion inflatable.



## TEXAS 4H GROUPS HEAR ABOUT ORION AT NATIONAL YOUTH SCIENCE DAY IN HOUSTON

On Oct. 8, Orion engineer Stu McClung spoke to an audience of fourth through ninth grade students that won a Texas 4-H essay contest about Orion. The prize for the contest was an on-site visit to Johnson Space Center in Houston. The students worked on a theoretical project in the early morning and afternoon, titled “Rockets to the Rescue,” which asked the students to consider the challenges of designing and building an aerodynamic food transportation device to deliver food to disaster victims.



## CONGRESSMEN “ON BOARD” FOR EFT-1

Congressman Jim Bridenstine (R-OK-1), pictured above, and Congressman John Culberson (R-TX-7) received an Orion briefing during their visits to NASA Johnson Space Center in Houston, Oct. 23. The presentation took place in front of the Orion mock-up and provided them with an overview of the upcoming Exploration Flight Test-1 mission.

# 1.4 MILLION NAMES GO ON THE JOURNEY TO MARS, STARTING WITH ORION'S FIRST FLIGHT

GET YOUR **BOARDING PASS!** to fly your name on Orion's flight test



If only your name could collect frequent flyer miles, you would be up to more than 1 million in only two flights! NASA invited the public to send their names on a microchip to destinations beyond low-Earth orbit, including Mars.

Frequent flyer names in the #JourneyToMars program will begin their interplanetary journey on a dime-sized microchip when the agency's Orion spacecraft launches Dec. 4 on Exploration Flight Test-1.

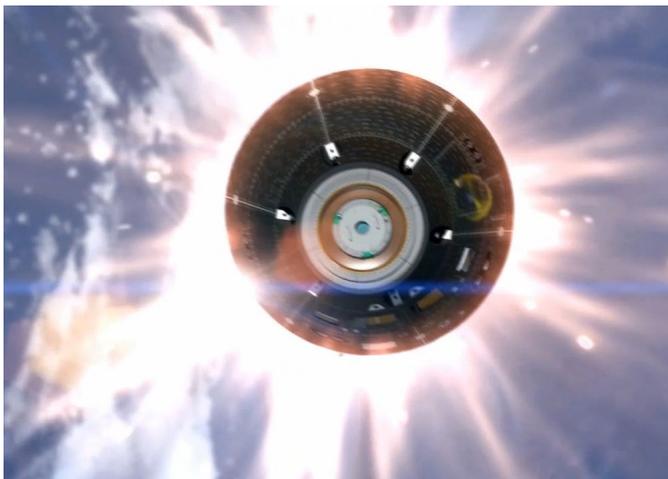
But the journey for these names doesn't end there. After returning to Earth, the names will fly on future NASA exploration flights and missions to Mars. With each flight, selected individuals will accrue more miles as members of a global space-faring society.

As of the Oct. 31 registration deadline, nearly 1.4 million names were submitted to fly on Exploration Flight Test-1.

# COMING UP



KELLY SMITH  
NASA ENGINEER



## ORION: TRIAL BY FIRE

As Orion's first flight nears, NASA released "Trial By Fire," a video that details the challenges of flying to deep space to test critical systems that are difficult to simulate on the ground.

► [View Trial By Fire](#)



## ORION 101 WEBINAR WITH JOE LEBLANC

The Orion team invites you to participate in an interactive webcast featuring Lockheed Martin engineer, Joseph LeBlanc Nov. 20 at 3:00 pm Central. LeBlanc will broadcast live from the Orion mockup in the Space Vehicle Mockup Facility at NASA's Johnson Space Center, to discuss NASA's efforts in deep space exploration and the importance of Orion's first flight. He will also take questions from a live audience at the U.S. Space and Rocket Center in Huntsville, Alabama, as well as webcast viewers from around the country.

► [View the webcast on UStream](#)

## FOLLOW THE PROGRESS OF NASA'S NEW SPACECRAFT FOR HUMAN EXPLORATION:

- NASA's Orion Blog..... [Blogs.NASA.gov/Orion](http://Blogs.NASA.gov/Orion)
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- Google+ ..... [Plus.Google.com/+NASAorion](http://Plus.Google.com/+NASAorion)

## NOVEMBER:

- 10-11** Orion vehicle transport to launch pad
- 11** Orion spacecraft lifted onto Delta IV Heavy. Start of Integration
- 12-13** Joint Integrated Simulation #4
- 13** Orion spacecraft power up on pad
- 17** Integrated System Test