

National Aeronautics and  
Space Administration



**ULA**  
United Launch Alliance

# ORION

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# ORION ARRIVES AT THE LAUNCH PAD



# NASA'S ORION SPACECRAFT ARRIVES AT LAUNCH PAD, HOISTED ONTO ROCKET AHEAD OF ITS FIRST SPACEFLIGHT

NASA's new Orion spacecraft completed its, six-hour journey to the launch pad in the early morning hours of Wednesday, Nov. 12. It arrived at Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida at 3:07 a.m. EST, where the spacecraft then was lifted onto a United Launch Alliance Delta IV Heavy rocket in preparation for its first trip to space.

The spacecraft, which includes the crew and service modules, launch abort system and the adapter that will connect it to the rocket, was completed in October and has since been awaiting its rollout inside the Launch Abort System Facility at NASA's Kennedy Space Center in Florida. Although storms in the area slightly delayed its move, Orion completed its 22-mile trek with no issues.

"This is the next step on our journey to Mars, and it's a big one," said William Gerstenmaier, NASA's associate administrator for Human Exploration and Operations. "In less than a month, Orion will travel farther than any spacecraft built for humans has been in more than 40 years. That's a huge milestone

for NASA, and for all of us who want to see humans go to deep space."

Over the course of the final weeks leading up to liftoff, the spacecraft will be fully connected to the rocket and powered on for final testing and preparations.

"We've put a lot of work into designing, building and testing the spacecraft to get it to this point and I couldn't be prouder of the whole team," said Mark Geyer, NASA's Orion Program manager. "Now it's time to see how it flies. Sending Orion into space will give us data that is going to be critical to improving the spacecraft's design before we go to an asteroid and Mars."



# ESA AWARDS PRIME CONTRACT FOR ORION SERVICE MODULE TO AIRBUS DEFENCE AND SPACE



Airbus Defence and Space signed a contract with the European Space Agency (ESA) on Nov. 17 for the development and construction of the service module for the Orion spacecraft. The contract was signed in Berlin, Germany, in the presence of Brigitte Zypries, Parliamentary State Secretary at the Federal Ministry for Economic Affairs and Energy and Federal Government Coordinator of German Aerospace Policy.

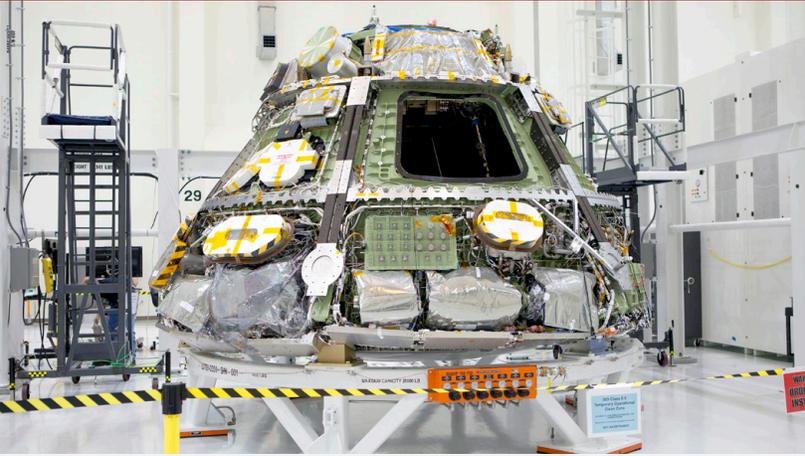
Exploration Mission-1 (EM-1) will send an uncrewed Orion on a 25-day mission into lunar distant retrograde orbit, a large orbit around the moon that is farther into space than any human spaceflight system has ever traveled. The orbit was selected as a trajectory test or practice run for the crewed portion of the Asteroid Redirect Mission. It will demonstrate Orion's performance capabilities and achieve qualification for NASA's new Space Launch System rocket before crew fly on board.

As one of the three major elements of the Orion spacecraft, the service module will provide propulsion, power supply,

thermal control and the central elements of the crew module's life support system. The European service module is based on the design of and the experience gained from the Automated Transfer Vehicle, developed and constructed by Airbus Defence and Space on behalf of ESA as a supply craft for the International Space Station.

The system designs for Orion's European service module were approved by ESA in May 2014. The detailed definition phase and first hardware construction are scheduled to be completed by November 2015. This directly contributed to a successful Lockheed Martin Orion Preliminary Design Review of the complete spacecraft in August 2014. The Lockheed Martin and Airbus Orion teams will be working collaboratively through the NASA/ESA agreement to integrate the Orion spacecraft for EM-1, as well as the follow-on EM-2 flight, which will be the first crewed mission for the Orion and SLS spacecraft.

# ORION... THEN & NOW



Orion will make its first flight into space during Exploration Flight Test-1 in December. The team on the ground will be collecting data from the spacecraft's computer systems and hardware, including the heat shield and parachute deployment system. But for four Orion team members, December's launch is more than a test flight. It is a culmination of years of planning, designing, assembling and hard work.

"It's really happening," said Bob Armstrong, lead for Mission Operation's Orion Vehicle Systems Integration. "For someone who's been working on Orion from concept to completion, watching EFT-1 is going to be fantastic!"

Orion's development began in September 2004 in Washington D.C. in a building known as the "bunker," Armstrong said. The team consisted of about six to 10 people, according to Jim Scheib, Crew and Service Module office business integration manager. Orion was to be part of NASA's new Constellation Program, designed to enable NASA to return humans to the moon and other deep space destinations, as well as the International Space Station.

The team determined it needed a contract to build the vehicle, according to Robert Floyd, Vehicle Integration Office business manager. Lockheed Martin was selected as the primary Orion contractor in August 2006. From there, the team began working to ensure everyone knew what was needed to build NASA's next human exploration spacecraft.

"There was cross integration from all the different disciplines," Armstrong said. "We were looking out for each other, making

sure that we were asking for the vehicle that the future missions would require."

Orion's first major flight test and program milestone was Pad Abort Test-1 in May 2010, according to Donald Reed, Orion Flight Test Management Office manager. The team tested the launch abort system and verified that it could accelerate from zero to 500 mph in a matter of seconds to pull the crew module away from danger in the event of an emergency on the launch pad or during initial ascent.

However, the Constellation Program was cancelled that same year leaving Orion without a launch vehicle, Reed said.

Floyd said it was tough knowing there would be another year and a half of transition needed to evolve into the new deep space exploration program before things would begin progressing again. But the team stayed focused and kept pressing forward, Armstrong said.

Fast forward a few years later and Orion now sits atop a United Launch Alliance Delta IV Heavy rocket awaiting launch. Orion's test is a critical step on NASA's Journey to Mars, which involves developing new capabilities to send astronauts farther into space than ever before, first to an asteroid, and onward toward the Red Planet.

"To me, this launch is a huge event because it brings together many different programs within the Agency who have all worked together to make it happen," Reed said. "It's a big endeavor. It's a big step toward our future."



# SPACE AND QUILT ENTHUSIASTS BUNDLE UP FOR #JOURNEYTOMARS

## ORION'S TIM STRAUBE FEATURED IN THE COLORADOAN

Although Orion Flight Dynamics System Manager Tim Straube now lives in Houston, his home state of Colorado has not forgotten about him. Straube was recently profiled in the Oct. 31 edition of The Coloradoan, which featured his interview with Windsor Beacon reporter Adrian D. Garcia.

[Read full story in the Coloradoan](#)



## KENNEDY SPACE CENTER HOSTS EFT-1 L-30 PRESS CONFERENCE

NASA's Kennedy Space Center held a L-30 press conference on Nov. 6 with briefings from Lockheed Martin and NASA Orion program and operations management. William Hill, NASA deputy associate administrator for Exploration Systems Development; Mark Geyer, NASA Orion Program manager; Bryan Austin, Lockheed Martin mission director; Mike Sarafin, NASA Orion flight director; Jeremy Graeber, NASA recovery director; and Ron Forston, United Launch Alliance director of mission management came together to brief reporters on what to expect of Orion's flight test.



Astronaut Karen Nyberg and volunteers from Johnson Space Center briefed attendees of the International Quilt Festival on Orion and space exploration. The festival was held Oct. 29 through Nov. 2 at the George R. Brown Convention Center in Houston. The 60,000 guests also got a chance to view some multi-layer insulation, or MLI, blanket material that will be used in Orion's future flights. More than 2,200 star blocks were submitted to NASA's Astronomical Quilt Challenge, which then created 28 quilt panels.



## ORION RECOVERY TEAM GETS IT RIGHT, UPRIGHT THAT IS

The Orion recovery team continues to train for Exploration Flight Test-1 recovery operations. Navy divers practiced manual uprighting procedures of the crew module Nov. 7 at the Neutral Buoyancy Laboratory in Houston, to prepare for the possibility that Orion could turn over after splashdown. If Orion does land upside-down, crew module uprighting system, or CMUS, bags will initially upright the vehicle before the team arrives to perform the recovery operation.

# FINAL EFT-1 SIMULATION COMPLETED



Orion will reach an altitude of 3,600 miles and return to Earth at 20,000 miles per hour. But the spacecraft is in good hands—the Flight Control Team’s hands, that is. The flight operations team (above) and pre-launch team (below) have performed several launch and flight simulations this past year in preparation of Exploration Flight Test-1.



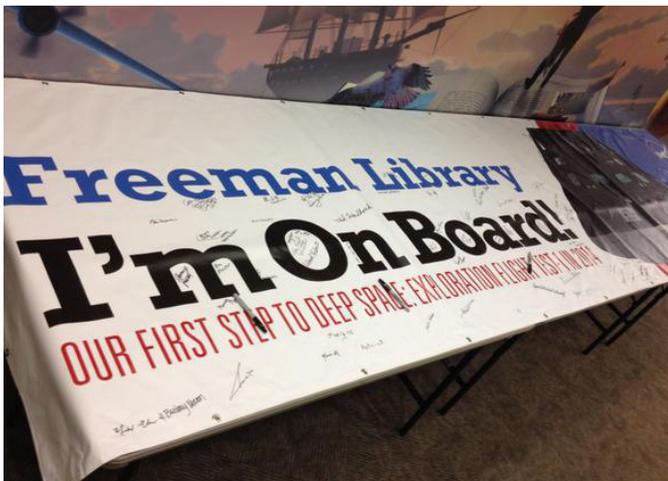
The Orion flight control team successfully completed Joint Integrated Simulation #4 Nov. 12. The long simulation ran from spacecraft power up at L-6 hours through splashdown.





## NATIONAL COMMUNITY COLLEGE AEROSPACE SCHOLARS RECEIVE ORION BRIEFING

NASA Orion engineer Stu McClung gave an Orion and Exploration Flight Test-1 overview presentation to the National Community College Aerospace Scholars on Nov. 13 in front of the Orion mock-up at NASA's Johnson Space Center. Approximately 50 students and instructors from community colleges across the country were at the center to complete their course program.



## FREEMAN LIBRARY CELEBRATES 50TH ANNIVERSARY WITH ORION

The Freeman Library in Houston, celebrated its 50th anniversary on Nov. 8. The NASA and Lockheed Martin Orion team was at the event to provide Orion presentations and materials during the celebration and spread excitement for the upcoming Exploration Flight Test-1.

Lockheed Martin and Space Center Houston hosted a special advance screening of the movie *Interstellar* on Nov. 4 in Houston. Lockheed Martin Orion program manager Mike Hawes introduced the movie, and the Orion *Trial by Fire* video was shown in advance of the film.



## ORION TEAM PRESENTS AT STENNIS' FALL FAMILY DAY

Orion engineer, Stu McClung talked about Orion and deep space exploration with employees and their families at Fall Family Day on Nov. 1 at NASA's Stennis Space Center.



## MEDIA DAY AT JOHNSON SPACE CENTER

A media day was held at NASA's Johnson Space Center on Nov. 19 as part of an ongoing center-wide Journey to Mars campaign. The day highlighted Orion's first test flight and the Asteroid Redirect Mission. Approximately 24 media guests from 15 media outlets and local networks participated in the event.

# LOCKHEED MARTIN NAMED JSC PRIME CONTRACTOR OF THE YEAR

Lockheed Martin was named Prime Contractor of the Year for FY2014 at NASA's Johnson Space Center (JSC). Lockheed Martin was selected for the "value-added and outstanding support of the NASA small business program and the company's commitment to work with small businesses on the Orion Project." As a result of being the JSC Prime Contractor of the Year for FY2014, Lockheed Martin is also nominated for the NASA agency award for Prime Contractor of the year for the agency, which will be awarded later this Year.

## 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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## DECEMBER:

- Sesame Street countdown to launch
- Exploration Flight Test-1
- JSCelebrates Event