

National Aeronautics and
Space Administration



ORION

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FLYING RIGHT

**ORION PARACHUTE
SYSTEM PASSES FAILURE
SIMULATION TEST**





FAILURE IS STILL NOT AN OPTION: ORION PASSES PARACHUTE MALFUNCTION TEST

NASA successfully completed a dramatic test of the Orion spacecraft's parachute system and its ability to perform in the event of a partial deployment on re-entry. On Aug. 26, a test version of Orion safely landed in the Arizona desert, despite the test engineers' intentional failure of two different parachutes used in the sequence that stabilizes and slows the spacecraft for landing.

During the test, a C-17 aircraft dropped an Orion capsule mockup from its cargo bay at an altitude of 35,000 feet, or more than 6.5 miles, in the skies above the U.S. Army Yuma Proving Grounds in Yuma, Arizona. The engineering test capsule then began its parachute deployment sequence. The model has a mass similar to that of the Orion crew module being developed for deep space missions, and similar interfaces with its parachute system. Engineers purposefully simulated a failure scenario in which one of the two drogue parachutes, used to slow and stabilize Orion at high altitude, and one of its three main parachutes, used to slow the crew module to landing speed, did not deploy.

"We test Orion's parachutes to the extremes to ensure we have a safe system for landing crews safely back on Earth

following future flights, even if something goes wrong," said C.J. Johnson, project manager for Orion's parachute system. "Orion's parachute performance is difficult to model with computers, so putting them to the test in flight helps us better evaluate and predict how the system works."

Orion's parachute system is a critical part of returning future astronauts who will travel to an asteroid, on toward Mars and return to Earth in the spacecraft. The first parachutes deploy when the crew module is traveling more than 300 mph, and in a matter of minutes, the entire parachute system enables it to touch down in the ocean at about 20 mph.

Wednesday's airdrop test was the second to last evaluation as part of an engineering test series before testing can begin next year to qualify the parachute system for crewed flights. The space issue series will include eight airdrops over a three-year period that will put the final design through extreme conditions to ensure a safe return for the astronauts.

► [Read the full story](#)

WELDING PREPARATIONS FOR ORION SPACECRAFT IN PROGRESS AT MICHLOUD

At NASA's Michoud Assembly Facility in New Orleans, engineers welded together the Orion crew module pathfinder in preparation for the welding process that began Sept. 5 for the Exploration Mission-1 Orion spacecraft. The pathfinder, including the barrel section shown here, is a full-scale version of the current spacecraft design. It is used to demonstrate the manufacturing and assembly procedures that will be used to produce flight hardware for Orion's next mission.



ORION RETURNS TO HIGHER ALTITUDES FOR POST-FLIGHT TESTING IN COLORADO

NASA's Orion spacecraft that flew into space in 2014 has completed its trek from the agency's Kennedy Space Center in Florida to Lockheed Martin's Waterton facility in Littleton, Colorado. Engineers there will perform final decontamination of the crew module, continue post-flight analysis and evaluate a new acoustic technology to determine if the method can produce enough energy to simulate the acoustic loads Orion will experience during launch and ascent atop NASA's Space Launch System rocket. ► [Read the full story](#)

USC STUDENTS WATCH VOTAW ROLL OUT THE BARREL

Larry Price, Lockheed Martin Orion deputy program manager, and Ed Stanton of NASA's Orion Production Operations team, spoke to the University of Southern California (USC) AIAA student chapter in Los Angeles on Aug. 27, prior to a visit the next morning to Orion supplier Votaw Precision Technologies in Santa Fe Springs, California. Thirty-two USC students had the opportunity to tour the Votaw plant and see the Exploration Mission-1 (EM-1) Orion crew module barrel, which the company manufactures.

The EM-1 flight barrel will be transported from Votaw to NASA's Michoud Assembly Facility in New Orleans onboard the Super Guppy aircraft in early September.



ORBITAL ATK IS “GO” FOR LAUNCH ABORT MOTOR PRODUCTION



Orbital ATK successfully completed its Critical Design Review (CDR) with Lockheed Martin and NASA for the Orion launch abort motor on Aug. 6. The abort motor is a major part of the Orion Launch Abort System (LAS), which will help ensure the safety of astronauts who launch on missions to explore deep space aboard NASA's new, heavy-lift Space Launch System (SLS).

Powered by solid rocket fuel, the launch abort motor is designed to propel the crew capsule away from the rocket in the event of an emergency at the launch pad, or during liftoff and ascent. The abort motor can ignite within milliseconds and quickly accelerates to approximately 500 mph to carry the crew module a safe distance from the primary rocket and debris field.

Successful completion of CDR demonstrates the launch abort motor design meets mission performance requirements and is mature enough for full-scale fabrication, assembly, integration and testing. This work will be performed at Orbital ATK's facilities in Magna and Promontory, Utah. Additionally, the 36-inch diameter by 175-inch long composite case that spans the length of the abort motor will be produced at Orbital ATK's facility in Clearfield, Utah.

Under a separate contract with Lockheed Martin, which is NASA's prime contractor for Orion, Orbital ATK also provides the LAS attitude control motor. This motor is manufactured at the company's Elkton, Maryland, facility.

► [Read the full story](#)



ORION REACHES "CRITICAL" MILESTONE

NASA's Orion program kicked off its critical design review phase at Johnson Space Center in Houston the week of Aug. 3. This major milestone will ensure the spacecraft's design is ready for its deep space missions atop NASA's Space Launch System (SLS) rocket.

The thorough review is a months-long process where engineers delve into the details of the spacecraft's systems and subsystems to evaluate their maturity. The milestone is a rallying point for those with technical stakes in successfully building and flying future Orion missions to ensure all elements are in sync before moving ahead with full-scale fabrication, assembly, integration and testing.

It will include an evaluation of common aspects of the spacecraft for Exploration Mission (EM)-1 and the spacecraft for EM-2, such as the spacecraft's structures, pyrotechnics, Launch Abort System, guidance, navigation and control and software, among many other elements. Systems unique to EM-2, the first Orion mission with astronauts, will be addressed at a follow-on critical design

review in fall 2017 for the crewed mission which is now slated for 2021.

The Orion program's EM-1 critical design review is targeted for completion in late October.



Pieces of the Exploration Mission-1 Orion spacecraft being prepped for welding at NASA's Michoud Assembly Facility.

ORION LAS TEAM TESTS EXTERNAL PROTECTION MATERIALS

Orion Launch Abort System (LAS) team members visited NASA's Marshall Space Flight Center Hot Gas Facility on Aug. 18, where high-rate ablation testing is underway for Orbital ATK on 36 specimens representing the LAS abort motor external protection system (EPS).

The EPS consists of VAMAC, a thermal insulating and chemical resistant polymer, expanded copper foil co-cured into the VAMAC surface for lightning protection, and finally a surface coating of a conductive and

environmental protective paint system. The EPS must withstand the harsh environment of flight as well as exposure to the propellant combustion products exiting the abort motor nozzles during an abort.

Testing for this series was completed at the end of August. The second phase of testing in early 2016 will include higher heating rates than this phase, in addition to the testing of samples subjected to coastal environment exposure.





Pictured above: Wanda Sigur, Lockheed Martin Vice President & General Manager, Civil Space, presented a U.S. flag flown on Orion's first space flight to Sandra H. Magnus, Ph.D. (pictured on right), executive director of the American Institute of Aeronautics and Astronautics. Former NASA astronaut Magnus accepted the commemorative item on behalf of the 35,000-member professional organization during the AIAA Space 2015 Forum held Aug. 31 – Sept. 2 in Pasadena, California.

LEADING THE WAY – A WIN-WIN FOR ALL

This summer, Dale Waldo, a teacher at Folsom Middle School in Folsom, California, came to the Aerojet Rocketdyne facility in Sacramento as a “teacher extern” to work alongside David Daniewicz, a chief engineer on the Orion Jettison Motor program.

Waldo’s mission was to learn about the Orion program and processes in order to create a lesson plan, engage his students in STEM-related activities and teach them about current plans to send humans to explore deep space.

Waldo offered a hint at what he plans to teach students through his experience at Aerojet Rocketdyne. Specifically, he said he plans to have his students design and create propulsion components using 3D CAD software. Students will also have a chance to make their own solid rocket fuel using the specialized CAD technology.

Waldo and Daniewicz both said they hope to inspire students about the great opportunities within aerospace.



Left to right: Dale Waldo, Project Lead the Way teacher at Folsom Middle School and David Daniewicz, Aerojet Rocketdyne chief engineer on the Orion Jettison Motor.

ORION MANAGEMENT HONORED AT NASA SFA CEREMONY

Several members of the Orion team were the recipients of the Space Flight Awareness Management Award. They were honored during a ceremony held Aug. 6.

Matthew Lemke was recognized for his proactive and tireless commitment to excellence for the success of the Avionics, Power and Software Office. (Not pictured)

Dave Petri (top right) was recognized for his outstanding support to the Orion Avionics, Power and Software Office through his leadership of the Exploration Flight Test (EFT)-1 mission support and development of the exploration mission strategy for avionics hardware and software testing labs.

Keith Williams (middle) was recognized for his outstanding leadership support to the Orion Avionics, Power and Software Office through integration of the NASA, Contractor, and European Space Agency Avionics, Software and Test systems.

Paul Boehm (bottom right) was recognized for his exceptional leadership of the Crew Support and Thermal Systems Team.



Mark Kirasich, Orion deputy program manager (middle), along with Todd May, Space Launch System program manager (left), and Mike Bolger, Ground Systems Development and Operations program manager (right), answered questions from social media groups at NASA's Stennis Space Center prior to the RS-25 rocket motor test firing on Aug. 13.



Mike Hawes, Lockheed Martin vice president and Orion program Manager, presented the City of Webster with a U.S. flag flown on EFT-1 during the Webster Business Alliance luncheon on Aug. 12, where he served as keynote speaker and provided an Orion Program update to the local business community. Approximately 200 attended the luncheon and witnessed Webster's Mayor Donna Rogers receive the EFT-1 flown flag on behalf of the City of Webster.

ASRC FEDERAL PARTNERSHIP LEADS TO SUCCESSFUL STUDENT APPRENTICE PROGRAM



This summer, Lockheed Martin subcontractor ASRC Federal Engineering and Aerospace Solution group partnered with Eastern State College in Melbourne, Florida, to select several students enrolled in their Aerospace Technician degree program to intern with the Orion program. This allowed the skilled workers to pass along their expertise and mentor the next generation of aerospace workers. The partnership has been so successful that the ASRC Federal team intends to continue this apprentice program with Eastern State College in the future. ASRC Federal has been supporting Lockheed Martin on the Orion program since 2012.

PREPARING AMERICA FOR DEEP SPACE EXPLORATION: CONSTRUCTING THE FUTURE

Between April and June 2015, NASA's Explorations Systems Development programs continued to make progress developing and building the Space Launch System rocket, Orion spacecraft and the ground systems needed to launch them on deep space missions to new destinations in the solar system.

► [Watch the video](#)



TRADING RED ROCKS FOR THE RED PLANET

Read about Andrzej Stewart, a Lockheed Martin Space Systems' engineer in their Mission Support area, who is heading out for a year-long Mars analog mission in Hawaii as part of the Hawaii Space Exploration Analog and Simulation (HI-SEAS) program.

► [Read the full story](#)



ENGAGING FUTURE EXPLORERS

Nearly 500 guests visited the display to learn about Orion from program representatives at this year's Bring our Children to Work Day on Aug. 13 at Space Center Houston.



NOBODY CAN DRAG ME DOWN IN SPACE!

One Direction defied gravity shooting their new "Drag Me Down" music video this month at NASA's Johnson Space Center. The One Direction crew also filmed in a full-scale mockup of NASA's Orion spacecraft, wearing spacesuits designed to be worn by astronauts when they launch and land.

► [Watch the video](#)



GO BACKSTAGE WITH ORION

Go behind the scenes with the Orion Program and meet the people building the spacecraft that will take humans on the journey to Mars with Orion's "Backstage Pass" video features. In this first episode, NASA astronaut Victor Glover talks about Orion's parachute test in Yuma, Arizona.

► [Watch the video](#)



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

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SEPTEMBER:

First flight weld completed on Exploration Mission-1 crew module

Orion Program Manager Mark Geyer takes on new role

Orion crew module barrel arrives at Michoud Assembly Facility

Item flown on Exploration Flight Test-1 presented to St. Louis Cardinals