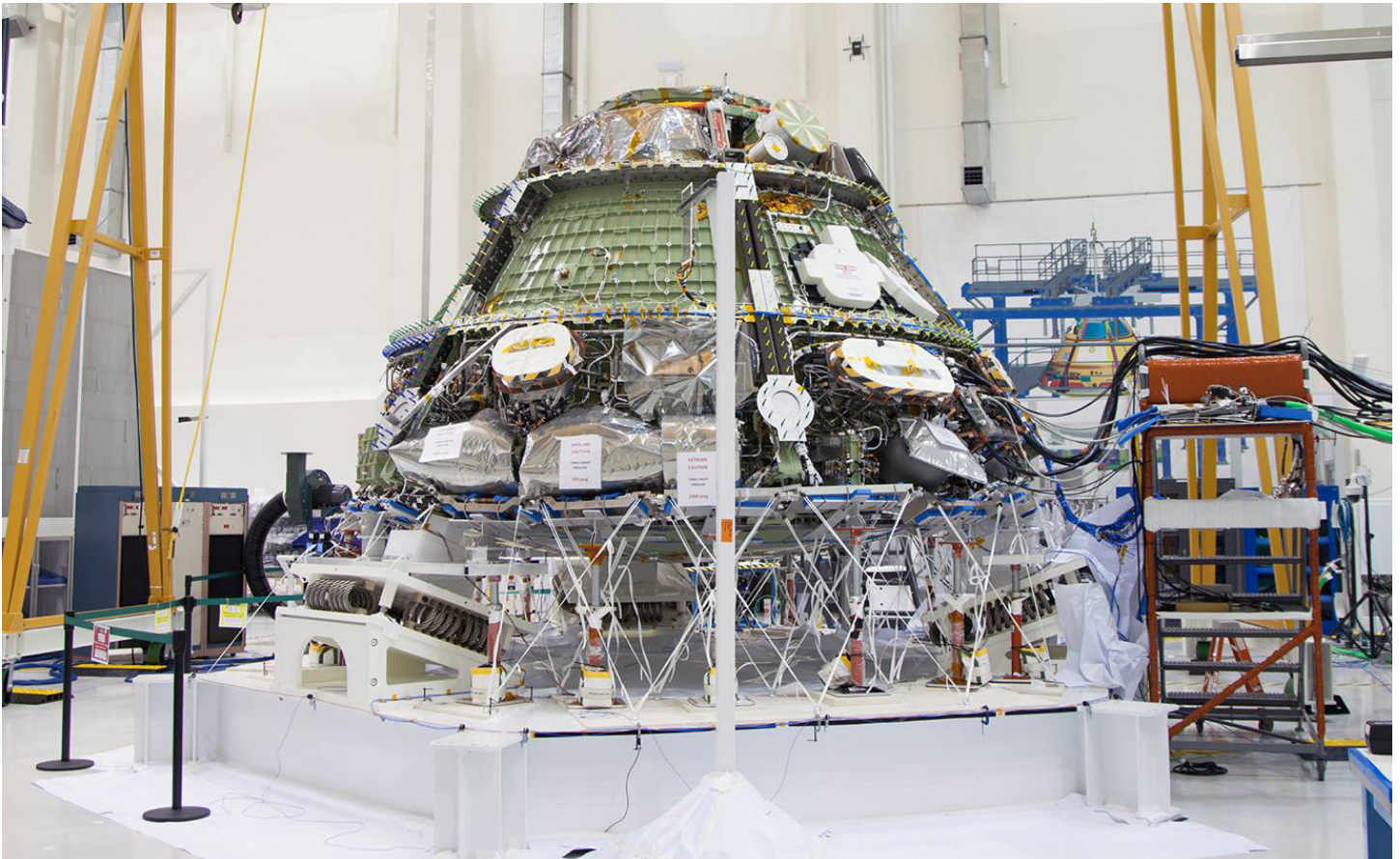


Orion team shakes things up



Testing designed to validate Orion's avionics systems and simulate the vibrations NASA's new spacecraft will experience during its first trip to space successfully wrapped up inside the Operations and Checkout Building high bay at NASA's Kennedy Space Center in Florida. The completion of the testing marks another step forward toward Orion's uncrewed flight that will put to the test the spacecraft that will send astronauts to an asteroid and eventually Mars on future missions.

To prepare for the vibration tests, which were conducted April 17-24, a team of NASA and Lockheed Martin engineers and technicians transferred Orion from the

crew module assembly station to a special vibration stand in a portable test chamber.

Accelerometers and strain gages were placed around the crew module in various locations. These were used to measure simulated acceleration and strain levels on Orion's structure.

Two electromagnetic shakers, each capable of up to 4,000 pounds of force, were attached to Orion on opposite sides. Baseline vibration tests began at 5 megahertz and gradually were increased up to about 500 megahertz.

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After each test run, the shakers were relocated to different points on Orion and systems specialists checked for any changes or abnormalities in the spacecraft's structure.

Before each 30-second test run, Orion's avionics, batteries and electrical systems were powered up and its ammonia and helium tanks were pressurized to 200 psi.

The tests were monitored in a separate control room near the high bay, and the data after each 30-second run was analyzed to check for imperfections or defects and how the crew module performed. A flight simulation team in Firing Room 1 in Kennedy's Launch Control Center monitored Orion during periods of powered-up testing.

Preliminary analysis of the test data confirmed that Orion performed as predicted.

Earlier in the month, testing of Orion's avionics system was conducted at Kennedy. During these tests, engineers activated and sent commands to more than 20 different critical systems installed on the crew module including the pyrotechnics, batteries, thermal control, cameras, guidance and navigation, propulsion, and environmental control life support systems, all while evaluating signal quality, on-board system responses, and data production.

The spacecraft ran for 26 uninterrupted hours during the testing phase.

The tests verified the crew module can route power and send commands that enable the spacecraft to manage its computer system, software and data loads, propulsion valves, temperature sensors and other instrumentation. It also verified that the avionics for Exploration Flight Test-1 are ready to support a successful flight and re-entry of the spacecraft.



Media preview renovated flight control room for NASA's Orion spacecraft

Mission Operations Director Paul Hill spoke to the media as NASA Administrator Charles Bolden and Johnson Space Center Director Ellen Ochoa visited Mission Control on April 10 in the historic White Flight Control Room, which has been newly renovated to support Orion during NASA's deep-space exploration missions.

During the tour, Bolden, Ochoa and Hill also spoke with Jimmy Spivey, the Orion/SLS Manager for the Mission Operations Directorate (pictured below left), about the EFT-1 simulation between NASA and Lockheed Martin control teams where the team flowed recorded Orion data from tests to simulate the mission.

ABC News: bit.ly/1uHm7dX

FOX News: bit.ly/1srSCdZ



Read about the Houston Mission Control Center team that will be taking the helm of the Orion spacecraft for Exploration Flight Test-1 on page 4 of the JSC Roundup.

1.usa.gov/RvoMI2

Orion's parachutes tested in launch abort scenario

The team designing the parachute system for NASA's Orion spacecraft has tested for almost every parachute failure they could imagine. But on April 23, they tested how the system would perform if the failure wasn't in the parachutes.

Orion is the safest spacecraft ever built to carry humans, and its Launch Abort System can take a good deal of the credit for that distinction. In a life-threatening emergency on the launch pad or during the early stages of ascent, it will activate in milliseconds to propel the crew to safety. Once it has pulled the crew module away from danger, it's up to the parachutes to bring it down for a safe landing.

In a pad abort or a low altitude launch abort, Orion's three main parachutes would be called on to lower the crew module to the ground without the help of the two drogues that normally precede them. The parachute system won't have as long to do the job since the spacecraft will be at much lower altitude than for a nominal mission reentry, and with the vehicle going slower, they won't deploy as quickly. And on top of all of these factors, the crew module will be flying sideways when the parachutes deploy, instead of falling straight down as it does during reentry.

To simulate those conditions, a test version of Orion was dropped from a C-17 at 13,000 feet above the U.S. Army's Yuma Proving Ground, with the main parachutes deploying soon after leaving the plane, before the capsule had a chance to straighten out. All the elements worked together and the parachutes reached a fully open state, setting up a soft landing as expected. But the real value of the test will come with the data the engineers were able to gather from it.



In addition to the new test conditions, this was also the first time that the steel risers connecting the parachute lines to Orion were replaced with the textile risers that will be incorporated into future Orion spacecraft after Orion's first flight this year. The new risers are lighter and more flexible – two qualities that will come in particularly handy when Orion is ready to carry humans into space.

bit.ly/SEPFus

Orion's Launch Abort System's attitude control motor completes high thrust valve test

The attitude control motor (ACM) that steers Orion's Launch Abort System (LAS) and crew module away from the launch vehicle in the event of an emergency passed the motor's high thrust-9 (HT-9) valve test. The HT-9 test is a significant milestone for the motor, as it included a number of technical firsts, such as the valve operating at 100 percent thrust, and the highest maximum expected operating pressure for any ACM valve tested to date. It follows on a development campaign that included two full system demonstration tests and the Pad Abort-1 flight test.

Developed by ATK, the ACM consists of a solid-propellant gas generator, with eight proportional valves equally spaced around the circumference of the three-foot-diameter motor. In combination, the valves can exert up to 7,000 pounds



of steering force to the vehicle in any direction upon command from the crew module. As part of the LAS, the ACM responds to the guidance system as the LAS pulls Orion from hazards. The ACM then orients the capsule for parachute deployment. The quick-look data shows that all test objectives have been met and the design is validated.



Greg Hurst from KHOU-TV Channel 11 in Houston interviewed Orion's Mark Geyer and Julie Kramer-White (shown here), along with Astronaut Shane Kimbrough for a local television story.



Mark Geyer, Orion program manager was interviewed by National Fox News Correspondent Phil Keating on April 10 at Kennedy Space Center.



Lara Kearney, deputy manager, for the Orion crew and service module, spoke about Orion and engineering as a career path for students at the Clear Creek Independent School District career day at Clear Falls High School on April 3.



Darrel Williamson, Exploration Flight Test- 1 vehicle manager for Lockheed Martin (center), speaks about Orion to faculty and staff at the Florida Institute of Technology on April 2.



Orion Program Manager Mark Geyer visited NASA's Glenn Research Center in Cleveland, Ohio, on April 24. Glenn Research Center provides critical support to the program including propulsion, manufacturing, vehicle integration and testing.



Lucy Kranz, program planning and control manager for Orion (fourth from left), was awarded the Rotary National Award for Space Achievement (RNASA) Stellar Award for her outstanding leadership and expertise in the programmatic control of large human spaceflight programs and personal dedication to NASA's mission.

Students' "rad" experiment design earns spot on Orion's first flight



All EDC Finalist Teams with representatives from NASA, the Lockheed Martin Orion industry team and National Institute of Aerospace

After a year-long competition, the Exploration Design Challenge (EDC) culminated with the announcement of the winning team at the USA Science & Engineering Festival in Washington, DC, which hosted more than 325,000 visitors April 25-27. NASA Administrator Charles Bolden and Lockheed Martin Chairman, President and CEO Marillyn Hewson jointly presented the prestigious honor to Team ARES from the Governors School for Science & Technology in Hampton, Virginia. The five-member high school team will be flown to Kennedy Space Center to watch their experiment launch into orbit on Exploration Flight Test-1.

The top five EDC finalist teams were invited to Washington, DC, to be recognized at the festival by NASA, Lockheed Martin and the National Institute of Aerospace for their outstanding work on this project. Orion industry team companies Aerojet/Rocketdyne, ASRC Federal, ATK, and United Technologies Aerospace Systems sponsored the travel expenses for the students: Team Aegis from Utah, Team ARES from Virginia, Team LORE from California, Team Titan from Illinois, and Team Erion from Kansas.

The Team ARES radiation shielding experiment incorporated a cubic prism design to block radiation from a dosimeter sensor as the Orion spacecraft passes through the Van Allen Belt, a dense radiation field that surrounds the Earth in a protective shell of electrically charged ions. The team's design received the highest radiation protection score during an online simulation of radiation exposure. They also demonstrated evidence of additional research outside of the material provided, and included additional information about the materials and estimated cost for their experiment.

The students will now work with the NASA and Lockheed Martin spacecraft integration team to build the flight hardware and have their experiment approved to fly in space.



Team ARES pictured with Bolden (left) and Hewson (right): Christopher Dobyns, Anna Montgomery, Sajan Sheth, Abid Rizvi, Danny McNamara and teacher sponsor Gregory Hajos

More than 130,000 students from 81 countries around the world have signed up to participate in the challenge, and 20,000 have completed it and earned the honor of flying their names on Orion. Students in grades K-12 still have until June 30 to complete the challenge.

Go to www.nasa.gov/education/edc to register and download a challenge activity.

The EDC announcement event aired on NASA-TV and may be seen at: bit.ly/1gcAHAY



All aboard! Senior leaders join the “I’m on Board” campaign

Senior leadership from NASA and Lockheed Martin signed up for Orion’s #ImOnBoard campaign this month to express their support for Exploration Flight Test-1 – NASA’s first step to deep space exploration.

Pictured are NASA Administrator Charles Bolden, Johnson Space Center Director Ellen Ochoa (right), Lockheed Martin Chairman, President and CEO Marilyn Hewson (below left), Orion Program Manager Mark Geyer, Glenn Research Center Director Jim Free and Deputy Director Greg Robinson (below right), Orion Program Astronaut Rex Walheim (far bottom left), NASA Associate Administrator for the Office of Communications David Weaver (far bottom right).





For the fifth year in a row, an Orion Small Business was chosen as Johnson Space Center's (JSC) Small Business Subcontractor of the Year. And this year, Houston Precision Fasteners (HPF) was recognized by JSC and agency-wide as NASA's 2013 Small Business Subcontractor of the Year. HPF custom designed and manufactured a unique bracket needed for the final assembly of the crew module. NASA's Small Business Industry Awards recognizes companies for their outstanding support to NASA.



The latest Exploration Systems Development video entitled "Acing the Test" showcases the latest progress and testing on the Orion, SLS and Ground Systems Development and Operations programs. The video is now online at: bit.ly/1ivSsei



NASA Orion Program Astronaut Rex Walheim spoke to young participants at the third annual USA Science and Engineering Festival held April 25-27 in Washington, DC. More than 325,000 people attended the event, which featured more than 3,000 hands-on activities, 150 performances and lectures, book signings and a career pavilion. Lockheed Martin and NASA were among the hundreds of exhibitors showcasing leading-edge technology and innovation. The festival helps to re-invigorate the interest of our nation's youth in science, technology, engineering and math (STEM) through compelling, educational and entertaining content.



Team ARES, winners of the Exploration Design Challenge, are helping to build Orion. Read more about the team at: on.fb.me/1oboML9

Coming up in May:

- Final Delta-IV Heavy booster shipment to KSC
- EFT-1 Joint Integration Simulation
- Crew Evaluation at NBL for Asteroid mission