MONTHLY ACCOMPLISHMENTS
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orion

Orion sees flawless separation test

Three massive Exploration Flight Test (EFT-1) spacecraft fairing panels successfully deploy during a Nov. 6 test at the Lockheed Martin facility in Sunnyvale, Calif.

Using a series of precisely-timed, explosive charges and mechanisms, the test team proved the Orion spacecraft can successfully jettison its protective fairing panels. The 14-foot-tall panels encase Orion's service module and shield it from the heat, wind and acoustics it will experience during the spacecraft's climb into space. The service module is located directly below the crew capsule and will contain the in-space propulsion capability for orbital transfer, attitude control and high-altitude ascent aborts. The service module will generate and store power and will also provide thermal control, water and air for the astronauts when Orion begins carrying humans in 2021. The service module will remain connected to the crew module until just before the capsule returns to Earth. During EFT-1, the spacecraft's flight test next year, a test service module will be attached to the capsule.

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Unlike conventional rocket fairings, these panels are designed to support half of the weight of Orion's crew module and launch abort system during launch and ascent, which improves performance, saves weight and maximizes the size and capability of the spacecraft. Each panel is 14 feet high and 13 feet wide.

The fairings' work is done soon after launch. They must be jettisoned when Orion has reached an altitude of about 560,000 feet. To make that possible, six breakable joints and six explosive separation bolts are used to connect the fairing panels to the rocket and each other. In a carefully timed sequence, the joints are fired apart, followed shortly by the bolts. Once all of the pyrotechnics have detonated, six spring assemblies will push the three panels away, leaving the service and crew module exposed to space as they travel onward.

This test, conducted by Orion's primary contractor, Lockheed Martin, at the company's Sunnyvale, Calif., facility, was the second test of the fairing separation system. The first occurred in June, when one of the three fairing panels did not completely detach. Engineers determined the issue was caused when the top edge of the fairing came into contact with the adapter ring and kept it from rotating away and releasing from the spacecraft. Because of the engineers' confidence in successfully eliminating the interference, they maintained plans to increase this week's test fidelity by emulating the thermal loads experienced by the fairings during ascent. They used strip heaters to heat one of the fairings to 200 degrees Fahrenheit and simulate the temperatures the panels will experience.

The data gathered during the flight will influence design decisions, authenticate existing computer models, and innovative new approaches to space systems development. It also will reduce overall mission risks and costs for subsequent Orion missions to an asteroid and eventually Mars.

Shaping up for shipping out

Orion's mechanical systems functional area manager Ronnie Baccus and Lockheed Martin heat shield lead Brian Hinde make their final inspections on the Orion heat shield before preparing it to ship out from Textron Defense Systems in Wilmington, Mass., to NASA's Kennedy Space Center in Florida. The world's largest heat shield structure requires a large transport vehicle and is scheduled to be flown via NASA's Super Guppy aircraft from Manchester-Boston Regional Airport in New Hampshire. The heat shield will be unloaded at KSC's Shuttle Landing Facility on Dec. 5 for transfer to the Operations and Checkout Building where it will undergo final processing and spacecraft integration prior to the EFT-1 launch scheduled for September 2014.

The heat shield team at Textron has been working around the clock for the past several months to complete the meticulous work required to apply the Avcoat TM ablative material that sheds heat away from the spacecraft upon reentry into the Earth's atmosphere. At the end of November, the heat shield underwent additional curing cycles and cold soak testing to ensure the structure can withstand the extreme temperatures of a deep-space mission that can span thousands of degrees.

I am building Orion

Read about Henry Martinez, Orion Spacecraft Certified Principal Engineer at Lockheed Martin, at: **http://on.fb.me/1aAqwBN**

EFT-1 spacecraft adaptor added to service module

The Exploration Flight Test (EFT-1) spacecraft adaptor was moved into position under the service module for alignment prior to final assembly operations at Kennedy's Operations & Checkout building on Nov. 12. An air bearing palette, which rides on a cushion of air, was used to allow four technicians to move the spacecraft adaptor into position. The spacecraft adaptor is used to attach the Orion service module to the United Launch Alliance Delta IV upper stage, which will provide propulsion for the EFT-1 mission.

Mission Control runs first EFT-1 flight operations simulation

NASA and Lockheed Martin flight operations personnel conducted the first EFT-1 operations training simulation dry run on Nov. 14. The flight control team for EFT-1, led by NASA Flight Director Mike Sarafin, worked through the nominal flight test timeline, practicing nominal commanding and voice loop protocols. This simulation was conducted in the blue flight control room (BFCR) in the Mission Control Center in Houston. The BFCR was the room used for the first International Space Station flight 15 years ago. The team will conduct two more simulations in December that will include malfunctions designed to test and train the NASA and Lockheed Martin flight control team's responses to off-nominal situations.

NASA Administrator takes an up close look at Orion

Inside the Operations & Checkout Building high bay at NASA's Kennedy Space Center in Florida, agency Administrator Charles Bolden answered questions from news media about ongoing preparations of the Orion spacecraft for its first uncrewed launch, Exploration Flight Test-1 (EFT- 1).

Administrator Bolden (foreground along with Scott McDade of Lockheed Martin) also had the opportunity to inspect the Orion crew module during his visit.

Lockheed Martin hosted its first International Space Exploration Forum on Nov. 17, in Cocoa Beach, Fla. This event, which was also attended by NASA officials, local business leaders and space industry experts, was the first of a series of forums to help initiate open discussion on how to utilize existing spaceflight elements to expedite crewed missions to Mars through international collaboration.

The panel of guest speakers was moderated by Frank Morring, Senior Editor for Aviation Week, and included representatives from industry and academia. Pictured from left to right:

- Dan Dumbacher, NASA's deputy associate administrator for Exploration Systems Development
- Jim Crocker, vice president and general manager, Civil Space, Lockheed Martin Space Systems
- Dr. Ed Crawley, president of Skoltech University
- Dr. Benton Clark, Space Science Institute (panelist and keynote speaker)
- Vitaly Lopota, president of S.P. Korolev Rocket and Space Corporation Energia

The panelists presented ideas on how international collaboration will be needed to make deep space exploration affordable and achievable in the foreseeable future. They noted that the ambitious, long-term goal will require international partnerships to drive the capabilities to fruition with the funding and technical expertise needed.

They discussed the possibility of integrating U.S. Orion crew capability with the Space Launch System and Russian habitation modules to support long-duration spaceflight missions to the moon, asteroids and eventually Mars.

Chairman of the House Science Committee, Rep. Lamar Smith (R-TX) toured the Lockheed Martin Exploration Development Lab-Houston in November along with Space Subcommittee Staff Director Tom Hammond. Lockheed Martin Orion Program Manager Cleon Lacefield and Jim Bray, crew and service module director, provided Smith and Hammond with an overview of the spacecraft's progress. Smith also had the opportunity to observe an EFT-1 mission simulation in progress led by the Orion software integration team.

Photo credit: Lockheed Martin

Making space for teachers

On Nov. 18, following the MAVEN spacecraft launch, Lockheed Martin hosted a tour of the Kennedy Space Center's Operations & Checkout Facility for 22 teachers from University of Central Florida's Teaching Academy for Mathematics and Science. Lockheed Martin Vice President and Orion Program Manager Cleon Lacefield provided an Orion program briefing and toured them through the O&C with Orion Senior Manager for Manufacturing Jules Schneider to see the latest progress on the spacecraft slated for EFT-1 in 2014.

Newseum event on deep space

On Nov. 12, at the Newseum in Washington, D.C., Bill Gerstenmaier, NASA associate administrator for human exploration, moderated a panel discussion focused on removing barriers to deep space exploration. The panelists discussed the challenges and benefits of going to Mars, explained the capabilities-based approach and why it is sustainable, spoke about why a heavy lift rocket is needed for deep space exploration, and highlighted what's next for Orion. You can watch the entire replay on YouTube at:

http://bit.ly/1bbjyGR

Stu McClung, NASA's Orion landing and recovery operations manager, gives an overview of the Orion program to an audience during a social media at a Kennedy Space Center event on Nov. 16, prior to the MAVEN launch to Mars.

Orion team members Annie Wargetz (pictured) and Aimee Crane shared the Orion and exploration story with guests at the Kennedy Space Center Visitors Center Nov. 15-17, prior to the MAVEN launch.

Florida executives highlight Orion/SLS progress and EFT-1

Frank DiBello, president and CEO of Space Florida, and Lynda Weatherman, president and CEO of the Economic Development Commission of Florida's Space Coast, recently wrote a Space News op-ed article calling attention to program progress for Orion and SLS as NASA moves toward next year's Exploration Flight Test-1 milestone. They noted that 66,000 custom-designed pieces have come together at Kennedy's Operations & Checkout facility over the past year in the process of assembling the Orion spacecraft, and that EFT-1 will entail Orion travelling farther into space than any human-rated space capsule since the days of Apollo. They conclude that with Orion and SLS, "The countdown to America reasserting its leadership role internationally in space exploration has begun."

http://bit.ly/1aOYX7H