

**MONTHLY
ACCOMPLISHMENTS**
May 2013

orion

Orion crew module stressed for success



The EFT-1 The Exploration Flight Test-1 (EFT-1) Orion crew module was really put to the test throughout May as the team conducted strenuous simulations on the spacecraft to verify its structural integrity for the EFT-1 in 2014. These tests placed extreme loads on the spacecraft to verify its response to the stresses of a powerful Delta IV heavy liftoff, as well as the forceful pyrotechnics and mechanisms that will jettison hardware and release Orion's parachutes during descent and landing.

The team successfully completed eight loads tests on the crew module, with favorable initial results showing no critical anomalies. Some of the tests used hydraulic actuators to simulate "bend" or "straight" loads, depending on how the test was set up, to put pressure on critical points of the spacecraft.

One of the tests conducted was a follow-on proof pressure test that verified the redesign and fix put into place after the initial proof test generated

superficial cracks in the spacecraft's bulkhead during pressurization last November. Orion engineers were able to design a fix to ensure structural soundness of the crew module, which was validated during these recent tests.

In addition to the loads testing, the engineers and technicians completed a series of pyrotechnic bolt tests on the Orion ground test vehicle in the Launch Equipment Test Facility at Kennedy Space Center, May 13-17.

These tests involved a launch abort system mockup and measured how the explosive separation mechanism affected the crew module and its tiles as it separated the spacecraft from the abort system. The data collected from the tests will be used to assess how shock levels generated by separation events will affect the capsule's tiles and surrounding components. Predicting the EFT-1 shock environment is critical to protecting sensitive electronic components, which helps reduce risk for flight.



Orion heat shield team brings out the big guns

Textron Defense Systems of Wilmington, Mass., completed the first round of gunning cycles on the shoulder sections of the Orion EFT-1 heat shield, filling approximately 25 percent of the 320,000 cells on a honeycomb overlay.

Following each gunning cycle, the heat shield undergoes a heating cycle to cure the Avcoat ablative material that is injected into honeycomb cells during gunning. The team is now priming the honeycomb in preparation for the second round of the four gunning cycles scheduled throughout the summer months.

The honeycomb provides structural reinforcement for the ablative Avcoat material which is bonded to the heat shield's carrier substructure to protect Orion during re-entry into the atmosphere.

Crew module functional testing completed at Integrated Test Lab

As of June 5, all five avionics functional tests have been completed in the Integrated Test Lab (ITL) in Denver. These tests evaluate the procedures and make sure that everything is ready for power-on, scheduled for Oct. 2, and crew module functional testing in the O&C Building starting Oct. 18.

The 9.0 software formal release was delivered on June 4. This release supports the first flight software verification on the 9.0 baseline. It will also be used to support the Crew/Service Module (CSM) functional and performance testing in the ITL beginning July 17.

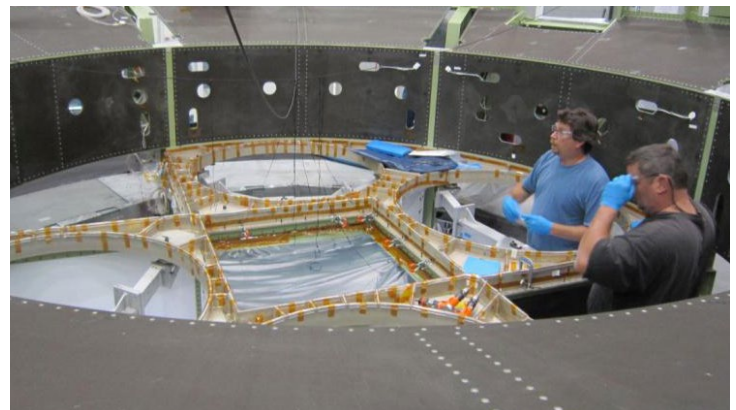
Orion service module comes together...Right now

To date, more than 66,000 parts have been delivered to various Lockheed Martin and NASA facilities to create the Orion spacecraft elements: crew module, service module and launch abort system.

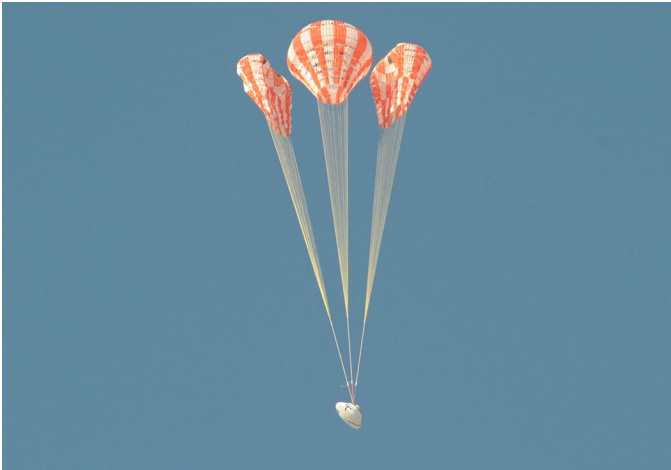
At Kennedy Space Center many of these parts are now coming together during Orion's assembly, integration and testing phase for EFT-1. On May 28, the last of the 49 EFT-1 service module composite panels were delivered to the Operations & Checkout (O&C) Building at Kennedy Space Center for spacecraft assembly. In addition, drilling is complete on the spacecraft's Micro-meteoroid Orbital Debris panels.

Also at the O&C, the Orion team began tube welding on the service module and completed eight of the 40 welds. Bolts on the forward bulkhead and Environmental Control & Life Support System brackets were also installed.

The fairing separation tests remain on schedule to begin at the Lockheed Martin Sunnyvale, Calif., facility beginning June 10. They will test the jettison mechanisms that will shed the service module fairings once the spacecraft is in orbit.



Success continues as NASA's Orion parachute tests get more difficult



The Orion Capsule Parachute Assembly System team successfully conducted the Parachute Test Vehicle-4 airdrop test in Yuma, Ariz., on May 1. There were 15 parachutes deployed during this test; eight were test technique related, and seven were Orion system parachutes.

To test the Orion parachute system, engineers rigged one of the test capsule's three main parachutes – the middle parachute in this view – to skip one stage of its inflation, putting additional stress on the vehicle as it opened. Testing irregularities allows engineers to verify the parachutes are reliable even when something goes wrong. The information gathered during the test can help refine models used to build the system and Orion. The next air drop test is currently scheduled for July 24.

Exploration Design Challenge sets goal to reach 1 million minds

NASA's Exploration Design Challenge, which was launched in March from Johnson Space Center with NASA Administrator Charles Bolden and Lockheed Martin CEO and President Marillyn Hewson, is reaching for the lofty goal of registering 1 million students by Orion's 2014 flight.

To date, the challenge has nearly 70,000 students from around the world registered to help NASA tackle the ongoing challenges of space radiation effects on astronauts during long-duration, deep-space missions. All students who complete the challenge by March 2014 will have their names flown in space in the Orion crew module during Exploration Flight Test-1.

To learn more about the challenge, click on the link below. K-12 teachers, parents and informal educators are all invited to register student-aged participants online at www.nasa.gov/education/.



NASA footage shown before Star Trek movie

A promo video, using footage from a recent NASA video that included Orion, is appearing in more than 400 movie theaters in 50 cities across the U.S. prior to Star Trek Into Darkness. The 30 second trailer, called Support Exploration: We Must Go, was produced by Aerospace Industries Association in partnership with Challenger Center for Space Science Education to energize people about space exploration.

To view the trailer online visit: <http://youtu.be/gqUQYs0HNes>.

Orion team visits California suppliers, schools and museums

The NASA/Lockheed Martin Orion management and outreach team conducted supplier visits and STEM outreach events in the Northern California area May 13-16, reaching more than 500 students, 300 employees and thousands more through media outlets at 10 events in five cities.

The team met with employees and presented recognition awards at Lockheed Martin, Sunnyvale; Aerojet, Sacramento; Tavis Corp., Mariposa; and NASA Ames Research Center, Moffett Field.

The team also gave presentations at the Aerospace Museum of California, McClellan; Fremont High School, Sunnyvale; Chabot Space & Science Center, Oakland; and spoke with engineering students at Santa Clara and Stanford universities and the Naval Post Graduate School in Monterey.

