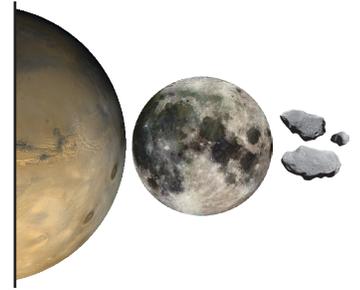


**MONTHLY  
ACCOMPLISHMENTS**  
May 2012

# orion



## Final welding activities at Michoud

The Michoud Assembly Facility (MAF) team in New Orleans recently completed the final welding of the Exploration Flight Test-1 (EFT-1) forward bulkhead-to-cone weld (upper left) and is preparing for the final pathfinder closeout weld and the final EFT-1 closeout weld

joining the cone to the barrel. Other activities included trim and round out on the EFT-1 cone, priming of the EFT-1 crew module forward bulkhead-tunnel assembly (upper right) and installation of the backbone assembly into the aft assembly.

## EFT-1 Service Module Fairing Panels arrive at Michoud



The Exploration Flight Test (EFT-1) Service Module fairing panels have been shipped to the Michoud Assembly Facility in New Orleans where they will be assembled as a tri-sector system.

The fairing panels are unique in that the composite construction of the panels result in a strong, yet lightweight system that can withstand significant load, so when jettisoned they rid the vehicle of valuable mass for a more efficient launch system.



## Successful Risk Mitigation Test

The Orion Program Office and Kennedy Space Center performed an early risk mitigation test, utilizing a Launch Control System (LCS) emulator and an Orion spacecraft test rig earlier this month. The purpose of the testing was to demonstrate interoperability between the two systems, including system functional behavior and system performance.



During the test, the team was able to visually compare telemetry values side-by-side with the Houston Orion Test Hardware (HOTH) command and display platform, and able to confirm the data was the same. Simultaneously, the telemetry was transmitted to the Mission Control Center (MCC) in Houston and the data was displayed on the ground controller workstations in the MCC Flight Control Room.

The testing was very successful, verifying proper implementation of the telemetry transmit protocols on both sides of the interface.

## Parachute team readies for next airdrop test

In advance of the July 17 airdrop test at the U.S. Army's Proving Grounds in Arizona, the team completed preparations for parachute installation, side foam panel installation, recovery and stabilization parachute rigging, suspension sling rigging and avionics installation.

The test will be conducted using the Parachute Test Vehicle (PTV), which represents the Orion Spacecraft capsule, and will examine the effects of one drogue and one main parachute skipping their first reefing stage. The next major set of buildup activities will begin the week of June 11 with an assessment of zero gusset installation, installation of Orion parachutes, and checkouts of test hardware avionics.



## Launch Abort Motor arrives in Utah

Following successful ground testing at Lockheed Martin's new Waterton facility near Denver, Colorado, the Orion Launch Abort System's inert abort motor was offloaded at ATK's solid rocket motor facility in Utah the week of May 14. ATK will be modifying and upgrading the motor for use on the Exploration Flight Test (EFT-1) vehicle scheduled for launch in 2014.



### **Progress continues on Service Module panels**

Fabrication of the EFT-1 service module composite panels continues. One of the aft walls is ready for cure in the autoclave, one of the micro-meteoroid orbital debris (MMOD) laminate panels completed fiber placement and is ready for cure and one of the MMOD panels has completed and passed the non-destructive evaluation process. Out of 49 composite panels, 27 have completed fiber placement.



### **Heatshield progress ahead of schedule**

The laminate skin lay-up on the EFT-1 heatshield carrier structure is a month ahead of schedule and now more than two-thirds complete after having progressed through ply 136 this month. There are a total of 196 plies on the structure. The titanium skeleton assembly is expected to begin in late June.



### **LAS cone in lay-up processing**

The EFT-1 launch abort system flight cone has begun lay-up processes in the Fiber Placement Machine at the Michoud Assembly Facility. Twenty five out of 42 plies are now completed on the laminate.



### **First test of closed-loop GNC capability**

The Integrated Test Lab (ITL)-05 test campaign concluded on May 15 with a completion review and successful demonstration to Orion management and GNC stakeholders in the Houston Orion Test Hardware (HOTH), which is housed in the Exploration Development Lab in Houston. The objective of ITL-05 was to perform closed loop, hardware-in-the-loop functional and performance testing of the flight software and guidance navigation and control (GNC) hardware for nominal and off-nominal scenarios including launch, ascent, low earth orbit, de-orbit, re-entry and landing. ITL-05 was the only opportunity to demonstrate GNC closed-loop testing prior to the hardware being de-integrated from the HOTH and shipped to Denver to be integrated in the ITL to support the ITL-08 test campaign.

### **Avionics hardware delivered to test lab**

The vehicle management computer engineering development unit and two power distribution development units were delivered to the Integrated Test Lab in Denver to begin integration and testing. These two units upgrade the fidelity of the rig to dual-string capability and support 8.0 avionics software testing.

# SSANS Orion Student Project Teams present to NASA

Three teams from the Students Shaping America's Next Spacecraft, or SSANS, program recently gave their final team presentations and delivered their hardware to NASA.

The SSANS project involves teams of university and high school students who are gaining engineering experience from NASA professionals and are applying STEM skills by designing systems for an Orion mockup located at NASA's Johnson Space Center used for testing, verification and astronaut training.

A five-person team from Texas A&M University presented an LED lighting project for the medium fidelity mockup in Building 9 at Johnson Space Center. Another team with the university gave their presentation on a new Orion budget and analysis software tool that looks at new and creative ways to do budget analysis using an Excel program. (pictured upper right)

A team of high school students from Frenship High School in Lubbock, Texas gave a presentation on a new hygiene bay closeout for the medium fidelity mockup. The enclosure would potentially cover the crew hygiene area so the crew will be able to walk across the area when they are on the pad prior to launch. (pictured middle right)

A vocational team from the Houston School of Automotive Machinists took part in the program by working on rotation hand controller/translation hand controller mounts onsite at a lab in Building 7. The mounts will assist with vehicle and docking control. (pictured lower right)



# Recognizing Orion team at Glenn Research Center

During a recent visit to Glenn Research Center in Cleveland, Ohio, Orion Deputy Program Manager Mark Kirasich spoke with Glenn employees at an All Hands meeting and presented several commendations to Orion team members.



Kevin E. Konno was recognized with a certificate for the performance of the fairing and spacecraft separation analyses that verified the sizing assumptions and reactions, and for the successful completion of the ballistics test on the fairing separation bolt cover. (Pictured left to right: Tim Tyburski, Kevin Konno, and Mark Kirasich)



The Affordable Service Module Team was recognized for conducting a comprehensive feasibility study to evaluate service module delivery options in a budget limited timeframe. (Pictured left to right: Luke Staab, Tom Goodnight, Tim Tyburski, Rex Delventhal, James Davic, Frank Gati, Jim Akers, Alan Hewston, Dean Petters, Mark Kirasich. Not pictured: Matt Bielozier, Kevin Dickens, Dale Dragony, Heather Hickman, David Jacobson, Trevor Jones, Frank Quinn, Brian Reed)



Lawrence A. Kren was recognized for the successful completion of the Launch Abort System-Crew Module retention and release testing. (Pictured left to right: Tim Tyburski, Lawrence Kren, and Mark Kirasich)



David B. McKissock received recognition for sustained contributions within the Crew Service Module Systems Engineering & Integration team. (Pictured left to right: Tim Tyburski, Dave McKissock, and Mark Kirasich)



The 3D Finite Element Method (FEM) Development Team received recognition for developing an extensive 3D FEM to highlight and resolve a number of EFT-1 service module loads, margin, and buckling issues. (Pictured left to right: John Ramsey, Tim Tyburski, Elliot Schmidt, Tom Goodnight, Mark Kirasich, Bob Allen, Jenny Hayes, Louis Ghosn. Not pictured: Nelson Morales)



Damon Delap and Allen Guzik received a certificate for the successful completion of testing on the single quick disconnect under varying side loads and temperatures. (Pictured left to right: Tim Tyburski, Damon Delap, Mark Kirasich, Allen Guzik)