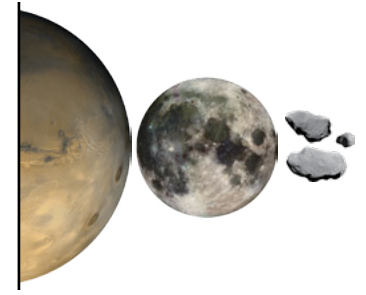


**MONTHLY
ACCOMPLISHMENTS**
July 2013

LOCKHEED MARTIN

Orion



Orion heat shield progressing toward completion at Textron Defense Systems



Progress continues toward completion of the Orion Exploration Flight Test-1 (EFT-1) heat shield at Textron Defense Systems in Wilmington, Mass.

To date, the Textron Orion team has applied more than 80 percent of the Avcoat ablative material and completed the intermediate cure process for the third of four Avcoat gunning cycles for the heat shield. In parallel, the seams for the fourth and final gunning cycle were trimmed, eliminating the need for a heat shield lift-and-transfer operation after the intermediate curing process was completed for the third cycle.

In August, the Orion team will complete gunning the remaining open areas on the heat shield with Avcoat. The heat shield will then

be transferred to a vacuum cart for bagging and curing. After this intermediate cure, the heat shield will be prepped for post cure, followed by the commencement of the machining operation.

The heat shield is scheduled to be shipped to Kennedy Space Center in early October, where it will be integrated onto the Orion crew module in preparation for EFT-1 in 2014. The heat shield's Avcoat ablative coating will burn away from the crew module, protecting it from heat as the spacecraft endures temperatures as high as 5,000 degrees Fahrenheit upon entering the Earth's atmosphere at more than 20,000 mph from a high altitude orbit.

The Orion heat shield is the world's largest structure of its kind and is critical for crew safety.

Aerojet Rocketdyne tests new graphite material for Orion jettison motor



Orion supplier Aerojet Rocketdyne successfully conducted a key Orion jettison motor (JM) test this month that demonstrated potential low-cost replacement graphite material for the JM throat inserts. The JM is a critical component of the Launch Abort System (LAS) for NASA's Orion spacecraft.

The JM test was conducted under contract to Lockheed Martin and represents a collaborative effort between graphite material supplier GrafTech and design teams at Aerojet Rocketdyne, Lockheed Martin and NASA. The test successfully met all

test plan objectives, providing data to enable performance assessment of the new graphite material.

Orion's LAS is designed to safely propel the crew module away from the launch vehicle in the event of an emergency on the launch pad or during the initial ascent phase. Aerojet Rocketdyne designed and manufactured the JM, which is required on every mission to jettison the LAS from the crew module for both nominal and abort scenarios.



First look at Deep Space Network

For the first time ever, the human spaceflight communications integration team came together to tour the prime antenna at Goldstone Deep Space Communications Complex in California's Mojave Desert, which will enable Orion to safely voyage into deep space.

Unlike previous manned programs, which have used the deep space network (DSN) as a support or a tracking site, Orion will be the first to use DSN antennae exclusively for communications, including voice, video, command and telemetry, after leaving low-Earth orbit. The 34-meter Beam Wave Guide antenna (shown here) will be the prime antenna used to allow communications between Houston's Mission Control Center and the Orion spacecraft during flight.

Orion parachute system performs at record altitude

The Orion parachute team successfully conducted the Parachute Test Vehicle (PTV-5) airdrop test at the U.S. Army's Yuma Proving Ground in Arizona on July 24. The test demonstrated a drop from 35,000 ft -- the highest test altitude to date.

There were 17 parachutes deployed during this test; nine were test technique related and eight were the Orion system parachutes. The primary test objectives demonstrated the performance of a skipped first stage on one main parachute using a new second stage reefing ratio for the first time, and the simulated failure of one main parachute steel riser for the first time.

During the test, NASA also hosted a Google+ Hangout on site. Reporters Clara Moskowitz of Space.com and Eric Berger of the Houston Chronicle were two of the participants who interviewed NASA and Army test team members via the Web-based connection. The conversation was open to everyone on Google+ and YouTube. It was also carried live on NASA Television. More than 1,000 people listened to the Google+ Hangout and more than 2,500 saw it on YouTube.

Watch the parachute test vehicle loading operations for the July 24 drop test: <http://vimeo.com/70836390>



Ball Aerospace Orion cameras installed for EFT-1

Three Ball Aerospace & Technologies Corp. flight cameras have been installed on the Orion Exploration Flight Test-1 (EFT-1) crew module by prime contractor Lockheed Martin. Ball's cameras are the first avionics hardware completed for EFT-1, which is scheduled to launch in September 2014.

The Ball cameras are based on the design of the docking camera that flew aboard the STS-134 Sensor Test for Orion Relative Navigation Risk Mitigation (STORRM) mission in 2011. The on-orbit test validated the performance of the navigation sensor suite for Orion and other future spacecraft by demonstrating a robust relative navigation design that provided the required docking accuracy and range capability necessary to meet crew safety, mass, volume and power requirements for a wide variety of future NASA missions, including those into deep space.

The new ultra-wide-field cameras built by Ball for EFT-1 have

enhanced software and exposure controls, and will be positioned in various windows on the spacecraft in order to monitor the flight test as different procedures are carried out.

Variations of the Ball cameras are planned for each Orion flight. In addition to providing test and docking cameras, Ball is producing the conformal phased array antennae and star trackers that will be installed on each Orion launch system.



NASA team tours suppliers and schools in northeast



Despite the northern latitudes, NASA received warm welcomes in Massachusetts and Connecticut during recent educational outreach events at several schools and science centers during the week of July 15. The events were coordinated in conjunction with a July 17 media event hosted by Textron Defense Systems, where dozens of students, reporters and elected officials were invited behind the scenes to join NASA officials for a close-up look at the Orion spacecraft heat shield in production at their facility.

Textron and Lockheed Martin employees were also recognized at the event with Program Manager Commendations for their outstanding work on the heat shield. Textron engineer Michelle Pelersi was also featured on Orion's Facebook site and received more than 128,000 views. Read her profile piece at:

<http://on.fb.me/1eHGUmN>

Sharon Cobb and Kimberly Robinson, with NASA's Space Launch System (SLS) program at Marshall Space Flight Center in Alabama, shared information about Orion and SLS to 250 students during a summer school session at the Jordan/Jackson Elementary School in Mansfield, Mass., on July 16. Read about their visit at: <http://bit.ly/13V7ML0>

On the same day, NASA Orion Crew and Service Module Manager Charlie Lundquist and Textron Vice President for Program Execution Jeff Picard spoke

with more than 100 middle school students participating in Young Scholars and FIRST Robotics programs at Northeastern University in Boston.

More than 100 high school students studying at MIT summer camps gathered for a panel discussion on Orion on the evening of July 16 with NASA Orion Program Manager Mark Geyer giving a presentation, followed by a question and answer panel with Geyer, Cobb and NASA astronaut Rex Walheim. The students were participating in MIT's Women's Technology Program and the Minority Introduction to Engineering and Science (MITES) team workshop. Read about their presentation at: <http://bit.ly/14CYXf0>

Lockheed Martin engineers Todd Sullivan and Brian Hinde gave presentations at the Boston Museum of Science on July 16 and 18 about their work on the Orion heat shield and the importance of thermal protection systems for deep space exploration. The spacecraft subject matter experts also participated in career education discussions with summer interns and recorded a podcast for the museum, which can be replayed at: <http://bit.ly/1eFOW1f>

Following the outreach events, Lockheed Martin and NASA Orion program managers visited with employees and toured work in progress at Ensign Bickford and United Technologies Aerospace Systems in Connecticut.

Astronauts site visit to Arizona supplier featured on NPR



Astronauts Rex Walheim and Douglas Hurley recently visited Paragon Space Development Corporation in Tucson, Ariz., a supplier for the Orion spacecraft. The two astronauts toured the facility and gave Paragon an update on the status of Orion. Walheim also conducted an interview with KUAZ Radio in Tucson, an NPR station.

Paragon designs and manufactures the tubing for the environmental control and life support system, along with supporting thermal analyses, flight radiator design and cabin computational fluid dynamics/ventilation.

Read more about their visit and listen to Walheim's interview at: <http://bit.ly/19hbg2k>

Oh my gosh! Space invades Oshkosh!

Every year more than half a million aviation enthusiasts attend the week-long mecca of "all things flight" – EAA's AirVenture in Oshkosh, Wisconsin.

This year, for the first time, the NASA contractor space exploration team attended the event, showcasing the technical innovation and mission capabilities of NASA's new Orion spacecraft and Space Launch System. Activities included presentations by former Apollo and space shuttle astronauts and an International Space Station commander, an up-link with current space station crew members, a space exploration team display, and a media briefing with executives from NASA, Lockheed Martin, Boeing, Alliant Techsystems and Aerojet Rocketdyne.

In a media briefing open to all attendees, Dan Dumbacher, NASA's deputy associate administrator for exploration systems development, outlined the agency's path for human exploration of Mars, and each representative explained their company's role in NASA's upcoming deep-space missions, which begin in 2014 with Exploration Flight Test-1.



Integrated Test Lab team recognized for contributions to risk mitigation

During a recognition ceremony in Denver on July 15, the Integrated Test Lab Dual-String Avionics Integration and Initial Power-On Test Procedure Validation Test team received a Program Manager Commendation from Orion Deputy Program Manager Mark Kirasich.

Jeff Greteman, Darrell Williamson and William (Kurt) Drilling also received commendations for their efforts as part of the Michoud Orion Exploration Flight Test-1 Crack Recovery Team.

Orion team members receive safety awards at JSC ceremony

Three Orion team members were recognized during the 11th Annual Johnson Space Center Safety and Health Action Team (JSAT) Recognition Ceremony on July 11.

The JSAT promotes employee participation in Johnson's environmental protection, safety, health and emergency preparedness programs.

Clifford Kraus, Matt Granger and Brian VanGanderen received JSAT Star awards for making contributions to the center's overall safety and safety awareness in the past year.



Space exploration team gallantly takes on 27,000 at SpaceFest

The Intrepid Sea, Air & Space Museum held its second annual SpaceFest in New York City, July 27-29, with NASA as the premier exhibitor.

The Exploration System Development (ESD) team with members from Orion, Space Launch System (SLS) and Ground Systems Development Office (GSDO) helped staff the four-day event with a special exhibit on deep space.

NASA ESD leaders, Marshall Smith (Cross-Program System Integration), Dr. Sharon Cobb (SLS), and Jeremy Parsons (GSDO) spoke to an audience of more than 100 people who attended a presentation and panel discussion on NASA's future in deep space.

