National Aeronautics and Space Administration

ORION

SEPTEMBER 2016

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ORION'S MONTHLY HIGHLIGHTS

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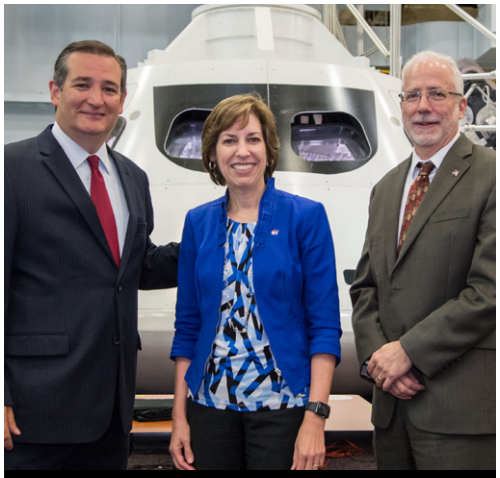

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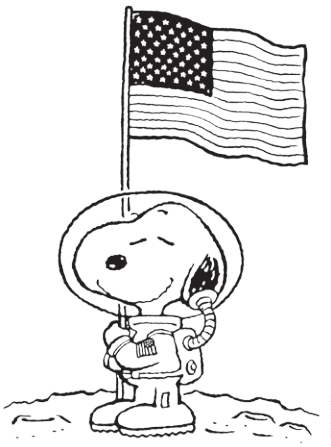

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ORION TEAM DIVES INTO RECOVERY OPERATIONS

A group of U.S. Navy divers, Air Force pararescuemen and Coast Guard rescue swimmers practiced Orion underway recovery techniques Sept. 20-22 in the Neutral Buoyancy Laboratory (NBL) at NASA's Johnson Space Center in Houston to prepare for the first test flight of an uncrewed Orion spacecraft with the agency's Space Launch System rocket during Exploration Mission 1 (EM-1).

A test version of the Orion spacecraft was lowered into the water in the NBL. Divers wearing scuba gear used ground support equipment and zodiac boats to swim or steer to the test spacecraft. They placed a flotation collar around Orion and practiced using the new tow cleat modifications that will allow the tether lines to be connected to the capsule. The tether lines are being used to simulate towing Orion into the well deck of a Navy recovery ship.

Training at the NBL will help the team prepare for Underway Recovery Test 5 (URT-5), which will be the first major integrated test in a series of tests to prepare the recovery team, hardware and operations to support EM-1 recovery.

The recovery team, engineers with NASA's Ground Systems Development and Operations program and Orion manufacturer Lockheed Martin, are preparing for URT-5, which will take place in San Diego and aboard the USS San Diego in the Pacific Ocean off the coast of California in October.

Read the full article: bit.ly/NavyDivers_NBL

More images: flickr.com/photos/nasaorion

CONGRESSIONAL GUESTS SEE ORION UP CLOSE

NASA's Johnson Space Center Director Ellen Ochoa gave U.S. Senator Ted Cruz (R-TX) a pilot's perspective of how it feels to be an astronaut inside the Orion spacecraft mockup at Johnson on Aug. 8.

U.S. Senator Gary Peters (D-MI), a member of the Senate Commerce Committee's Space, Science and Competitiveness Subcommittee, visited the Neil Armstrong Operations & Checkout (O&C) building for a tour and program update on Orion and deep space exploration on Sept. 9. The senator got a sneak peek at the Exploration Mission-1 spacecraft that is now undergoing clean room operations in the O&C.

U.S. Senator Marco Rubio (R-FL) visited the Florida Space Coast on Aug. 19, to participate in an industry space roundtable organized by the Aerospace Council of the Economic Development Commission of Florida's Space Coast. During the discussion where Jules Schneider, deputy of Orion Kennedy Operations represented Lockheed Martin, and in a media interview event that followed, Senator Rubio discussed Orion and voiced support for America's space exploration program.

Photo (L to R): Joe Mayer, Lockheed Martin; John Couch, vice president of Futuramic Tool & Engineering; U.S. Senator Gary Peters; Scott Wilson, Orion Production Operations manager; and Jules Schneider, Lockheed Martin senior manager for Orion Assembly, Integration & Production.

Photo (L to R): Dale Ketchum, Space Florida; Joe Mayer, chair of the EDC Aerospace, Aviation, and National Security Council and Lockheed Martin Government Relations director; U.S. Senator Marco Rubio; and Julie Roslin, EDC of Florida's Space Coast. (Photo Credit: EDC of Florida's Space Coast)

Photo (Top to bottom): Mark Geyer, NASA Johnson Space Center deputy director, Ellen Ochoa, NASA Johnson director, U.S. Senator Ted Cruz

HEAT SHIELD PREPS FOR EM-1 FLIGHT

Orion's heat shield has been uncrated and secured on a stand in the Neil Armstrong Operations and Checkout (O&C) Building at the agency's Kennedy Space Center in Florida to begin the work to prepare it for EM-1.

In the O&C, technicians will apply the Avcoat, a type of thermal protection that wears away as it heats up (a process known as ablation), to the EM-1 heat shield in a different way than was done for Orion's 2014 flight test. Blocks of Avcoat will be bonded to the heat shield rather than filling individual honeycomb cells. The way the structure is attached to the crew module for the EM-1 heat shield has been simplified. Several different types of instrumentation also will be installed on the heat shield to gather data on heating and performance.

After the thermal protection system has been applied and inspected, engineers and technicians will put the heat shield through a thermal cycle test. The thermal cycle test ensures the thermal protection blocks are properly bonded and will perform as expected when they are exposed to the extreme temperatures during the mission. The heat shield will be attached to the Orion crew module in the summer of 2017.

Read the full story at: bit.ly/EM1_HeatShield

EUROPEAN TEAM WORK PROGRESSES ON ORION SERVICE MODULE

NASA Orion Program Manager Mark Kirasich, (second from left) visited Witzenmann GmbH, a German manufacturer developing service module components for Airbus Defence and Space and ESA (European Space Agency) on Sept. 13.

Also on Sept. 13, NASA Orion team members joined ESA and Airbus representatives for a visit to OHB in Sweden to witness the progress of the ESA service module Propulsion Qualification Motor build and to support a media event. Two Swedish television stations covered the visit as well as radio and several web and print media reporters. Pictured left to right are Philippe Deloo (ESA), Ann Over (NASA), Dr. Mark Michaelis (Airbus) and Susan Motil (NASA) with the OHB team.

ARE THESE STOWAWAY ASTRONAUTS?

Go backstage with Orion engineers to see how they are working with astronauts to develop safe shelter from space radiation during deep-space exploration missions aboard the Orion spacecraft. Using the stowage bags on board that will contain supplies, food and water, in combination with Orion's seats will allow astronauts making the shelter to strategically place denser bags in areas of the vehicle with less radiation-protecting materials.

Read the full feature article: **bit.ly/OrionRadiationProtection**

Also read about Lockheed Martin's collaboration with StemRad Inc. to develop a vest astronauts could wear to protect against radiation exposure in deep space: **bit.ly/LM_RadiationVest**

Watch the Orion Backstage video: **youtu.be/70GrihLXmSs**

WHAT HAS BECOME OF WOMEN AT NASA?

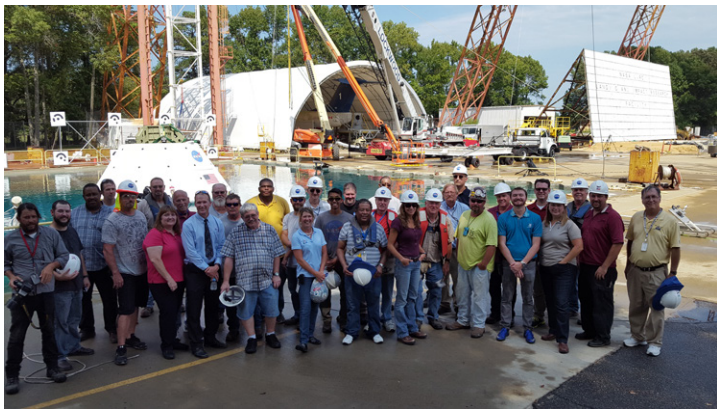
They've become some of the leading female scientists, engineers and astronauts on and off this planet!

NASA celebrates women in STEM (science, technology, engineering and math) with recording artist Grace Potter performing the song, "Look What We've Become." Using scenes of Potter performing as the thread between several stories, the video recognizes the power of women at NASA--past, present and future—and the important role of each in human spaceflight.

The video, recorded at NASA Johnson Space Center, also spotlights the Orion mockup, the space station mockups used for engineering evaluations and astronaut training, NASA's rover-like concept vehicle that could be used for in-space missions and surface exploration, the Mission Control Center and many other laboratories and facilities at Johnson. And, yes, Potter even finds time for a little fun with Robonaut, NASA's humanoid robot.

NASA is working hard to send humans to an asteroid by the mid-2020s and Mars in the 2030s. The powerful new Space Launch System rocket and the Orion spacecraft will travel into deep space, building on our decades of robotic Mars exploration, lessons learned on the International Space Station and groundbreaking new technologies. The agency will need the expertise and ingenuity of the next generation of space explorers and dreamers with technical knowledge to help accomplish its future missions.

Watch the music video and pass this link along to other young women you wish to inspire:
youtu.be/SrSe8IawDi4



IT TAKES A TEAM

The Orion team successfully completed a test of a structural test article of the European service module on the Mechanical Vibration Facility table at NASA Glenn's Space Power Facility at Plum Brook Station in Sandusky, Ohio.

NASA Deputy Orion Program Manager Charlie Lundquist joined the team at NASA Langley Research Center's 20-foot-deep Hydro Impact Basin after completing the final in a series of 10 Orion splashdown tests on September 7. Following the testing, the team was recognized with program manager commendations for their contributions to the successful test series.

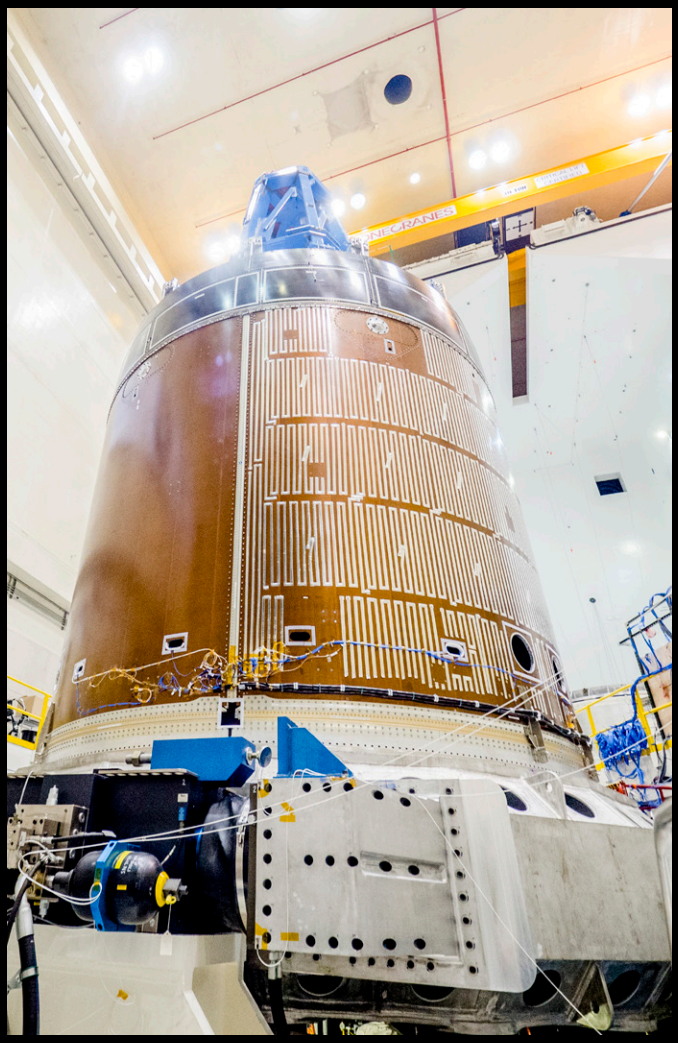
Lundquist also met with members of the Orion Ascent Abort-2 team at NASA's Langley Research Center in Virginia on Sept. 7.

The NASA Langley Research Center and Marshall Space Flight Center Launch Abort System Teams met with Lundquist to hear the latest program update on Orion.

Watch video of the testing:
bit.ly/SMVibeTesting_Plumbrook

Read more on the launch abort system:
bit.ly/LAS_FactSheet

(Teams photos are positioned clockwise starting at the left)

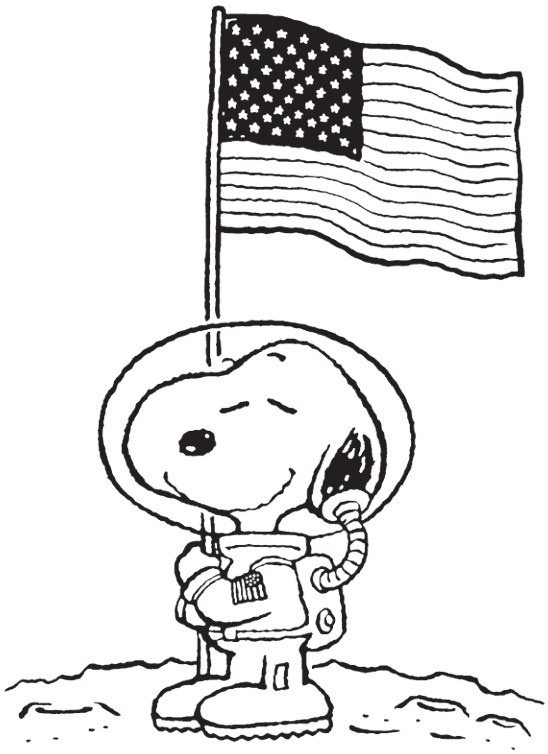


ORION TEAM MEMBERS RECOGNIZED FOR OUTSTANDING ACHIEVEMENTS

On Sept. 27, two members of the Orion team were honored for their achievements during the JSC Honor Awards Ceremony in Houston. Gavin Mendeck and Ryan Proud received the JSC Director's Commendation for their leadership roles and key contributions to Orion's future exploration missions.

In a ceremony at NASA's Plum Brook Station in Sandusky, Ohio, the European Service Module Structural Test Article Transportation and Logistics team received a NASA Group Achievement Award for their outstanding performance delivering the test article to Plum Brook Station that enabled the Orion Program to begin integration and testing of the article ahead of schedule.

Team members included Eric Faykus, Marc Freedman, Gary Horsham, Margaret Nazario, Robert Overy, Lynn Smith, Richard Sorge, Benjamin Van Lear, Joyce Wanhainen, Mark Cmar, Jeanine Hanzel, Sharon Lewis, Dawn Schneider, Rachid Amekrane, Philippe Angellillo, Laurent Brothier, Larry Dickerhoff, Amnon Erhlich, Michael Fach, Christina Galstadi, Rusty Hearne, Ron Johns, Georg Monien, Daniel Paris and Angie Young.



WAG YOUR TAILS FOR ORION SILVER SNOOPY WINNERS!

Orion team members from NASA and Lockheed Martin have been recognized with the prestigious Silver Snoopy award. Warren Grant, NASA; Debbie Sharp, ARES Technical Services; and Linda Singleton, Kim Tran, Hamed Agahi and Lora Lechago of Lockheed Martin received the coveted Silver Snoopy pin in a ceremony in Houston on Aug. 2.

The Silver Snoopy is awarded to less than one percent of the NASA workforce each year for outstanding efforts that contribute to the success of human space flight missions. The Snoopy pins they received were flown on NASA's Orion spacecraft during its 2014 flight test. Recipients are also given a certificate and a letter of commendation personally signed by an astronaut, citing the astronauts' appreciation of their outstanding performance.

Image credit: Charles Schulz

JOURNEY TO MARS SUPPLIERS LAND AT KENNEDY SPACE CENTER

Lockheed Martin hosted a series of supplier events Sept. 7-9 in conjunction with the OSIRIS-REx launch in Florida with industry partners Aerojet Rocketdyne, Boeing, Jacobs and Orbital ATK. The event provided an opportunity for the suppliers to meet with industry team managers and NASA program representatives, including Annette Hasbrook for the Orion Program, Ken Tenbusch for the Space Launch System Program and Kim Carter for Ground Systems Development & Operations.

On Sept. 7, the suppliers enjoyed a VIP tour that included the OSIRIS REx launch pad at Cape Canaveral Air Force Station and the Neil Armstrong Operations & Checkout (O&C) Building at NASA's Kennedy Space Center to see the flown EFT-1 Orion spacecraft and the Orion EM-1 spacecraft that is now undergoing final assembly and integration work in the high bay. On Sept. 8, the suppliers participated in a "mini suppliers conference" that included panel presentations on human and robotic exploration and program updates from the Orion, SLS and GSDO industry team leaders as well as Bill Hill, NASA deputy associate administrator for Exploration Systems Development. The day concluded with a networking reception and launch viewing event.

On Sept. 9, Orion, SLS and GSDO management team members visited employees at EMF, Inc. and the Jacobs-run Thermal Protection Systems Facility to see work in progress and tour facilities. SLS/Orion supplier Futuramic also hosted U.S. Senator Gary Peters from Michigan for a VIP tour of the O&C and the Orion spacecraft.

UTC AEROSPACE EXHIBITS NASA SPIRIT AT CHICAGO AIR & WATER SHOW

Gabrielle Torina, UTC Aerospace Orion Contract intern and Kipton Bucey, UTC Aerospace Orion Supply Chain buyer help staff the NASA booth for Orion at the Chicago Air & Water Show.

ORION TEAM PARTICIPATES IN FLEET WEEK IN SAN DIEGO

Over 10,000 people toured the USS San Diego during Fleet Week in San Diego, California Sept. 10-14. The USS San Diego is an amphibious transport dock ship that will be used for recovery testing for NASA's Orion spacecraft.

752 AND COUNTING!

Jacobs Technology education specialist Suzanne Foxworth coordinated annual NASA Space Science Day events in Pharr, and Donna, Texas, Sept. 7-8.

More than 700 middle school students and parents attended the events to participate in a variety of NASA hands-on activities and view astromaterials samples and visit other NASA exhibits.

Get Fired Up about space exploration with the latest Exploration Systems quarterly video: **youtu.be/rgFeAcnF9tY**

FOLLOW THE PROGRESS OF NASA'S NEW SPACECRAFT FOR HUMAN EXPLORATION:

NASA's Orion Blog . . . . . **Blogs.NASA.gov/Orion**

Twitter . . . . . **Twitter.com/NASA_Orion**

Facebook. . . . . **Facebook.com/NASAOrion**

Flickr . . . . . **Flickr.com/NASAOrion**

Google+ . . . . . **Plus.Google.com/+NASAorion**

OCTOBER

EM-1 Abort Motor Gets Cast

Von Braun Symposium

Orion at Universum Science Centre in Bremen

Discovery Education Launches Virtual Field Trips