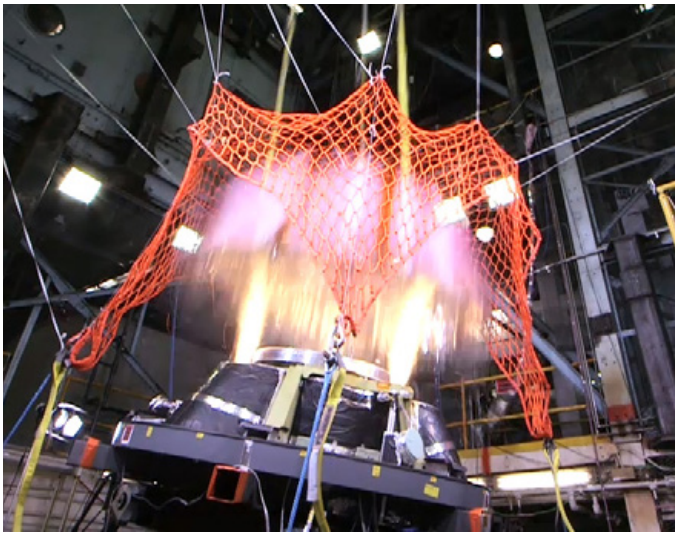
MONTHLY ACCOMPLISHMENTS
December 2013

orion

Orion team,

I could fill your inbox with images of your accomplishments last year.

This year we will significantly ramp up our efforts for Exploration Missions 1 & 2 (EM-1/EM-2) as evidenced by key events such as the European Space Agency Preliminary Design Review, the Orion Delta Preliminary Design Review and our initiation of drawings and procurements for EM-1. Our friends in SLS and GSDO have similarly ambitious program milestones planned as we all move toward our goal of exploring the solar system.



Orion forward bay cover jettisons successfully

The first test to ensure Orion will successfully jettison its Forward Bay Cover (FBC) was conducted by Lockheed Martin on Dec. 19.

See video of the test at: **http://bit.ly/1ir8Mzp**

The FBC protects the top portion of the crew module during launch, orbital flight, and reentry. When Orion reenters the Earth's atmosphere from deep space, the FBC will be jettisoned at an altitude of approximately 23,000 feet. This event is crucial to mission success and crew safety—a successful jettison is required for deployment of the main parachutes.

This test will be followed by two more ground jettison tests, simulating different stress scenarios, and two air-drop tests which will simulate flight-like aerodynamic conditions. The next air drop test is scheduled for Jan. 15 from the U.S. Army's Yuma Proving Ground in Arizona.

Orion end of year stories

Work on NASA's new Orion spacecraft progresses as engineers pivot to 2014
http://1.usa.gov/19dVVQn

2013 End of Year Orion/SLS Industry Accomplishments
http://bit.ly/1cSBhQY

Thank you for your year-round contributions to this program, and thank you to those who worked most of the holiday to keep us moving on the critical path. Your dedication to the mission and success of this program is greatly appreciated.

I remember Christmas Eve, 1968. Not because of the Christmas presents, but from watching and listening as the Apollo 8 crew sent images from the moon's orbit. They were more than just pictures, the astronauts personal descriptions of what they were seeing made an emotional connection with the world.

That mission changed the way we viewed our planet. Although changing our view was not the primary reason for the mission, it was clearly one of the biggest and most enduring outcomes. This is a great example of how exploration can shape views and change culture in unexpected ways.

You are working on the next human exploration vehicle. We can only guess what new discoveries Orion will share as we send our crews further into the solar system. One of the great things about Orion is that we are not just designing a capability, but we are flying now (within 9 months). You may begin to sense the excitement around NASA, because our flight will prove that the United States is still in the human space exploration business.

Thank you again for all your hard work, and let's keep focused on Exploration Flight Test-1 mission success.

Video links:
Quarter 1: **https://vimeo.com/82298321**
Quarter 2: **https://vimeo.com/64176823**
Quarter 3: **https://vimeo.com/72924681**
Quarter 4: **https://vimeo.com/82298467**

Link to the video and audio of the Apollo 8 broadcast:
http://1.usa.gov/1cvAg1w

Mark Geyer

Orion heat shield arrives in ship shape at KSC

The heat shield that will protect NASA's Orion spacecraft during its first test mission shipped from Manchester, N.H., to Kennedy Space Center in Florida on NASA's Super Guppy aircraft on Dec. 4.

The heat shield had been under construction at Textron Defense Systems in Wilmington, Mass., since March. Journalists were invited to see the heat shield loaded onto the Super Guppy and interview Orion team members at both ends of the journey.

Before leaving New England, the Orion team visited several other companies building hardware for the spacecraft, including Yardney Technical Products in East Greenwich, R.I.; Fiber Materials in Biddeford, Maine; and Smith Connectors/Hypertac of Hudson, Mass.

The shield will protect the spacecraft from heat as it endures reentry temperatures near 4,000 degrees Fahrenheit while traveling more than 20,000 mph from a high-altitude orbit. The Orion heat shield is the world's largest ablative heat shield for a spacecraft and is critical for crew safety.

NASA's John Casper and Bill Hartwell and Lockheed Martin's West Womack visited Yardney Technical Products, Inc. to see the Orion EFT-1 batteries prior to shipment to KSC.

Read about the Orion team visit to Yardney Technical Products at: **http://bit.ly/1epESsf**

LAS tower completed in preparation for EFT-1

NASA engineers and contractors successfully completed the Orion Launch Abort System (LAS) tower this month, marking a milestone that puts NASA one step closer to the Exploration Flight Test-1 (EFT-1) mission.

The LAS, built at ATK and Aerojet and integrated at Kennedy Space Center in Florida, is comprised of three motors: the abort, attitude control, and jettison motors.

The LAS is designed to protect astronauts if a problem arises during launch by propelling the Orion spacecraft away from a failing rocket or launch pad emergency. The LAS tower will be encased by a fairing assembly that forms an aerodynamic shell for Orion and protects the crew module during launch. Both the LAS and the fairing assembly will be put to the test during EFT-1. Because EFT-1 is an uncrewed mission, only the jettison motor will be operational during the flight to detach the LAS from the crew module as it would during a normal crewed mission.

This flight test will provide information on the abort system's performance during the vehicle's trip beyond low Earth orbit.

In a worst-case scenario, the abort motor would fire 500,000 pounds of thrust to immediately propel the crew module off the launch pad. The attitude control motor then steers the vehicle away from danger by producing up to 7,000 pounds of thrust in multiple directions. Finally, the jettison motor pulls the LAS away from the crew module, allowing its parachutes to deploy and the vehicle to land safely. This was successfully demonstrated during the Pad Abort-1 integrated system flight test in 2010.
http://vimeo.com/23167570

More than 60 employees from NASA's Langley Research Center in Virginia, NASA's Marshall Space Flight Center in Alabama, and the Lockheed Martin industry team, helped design and build the LAS.

Technicians attached the fourth and final Ogive panel on the Orion ground test vehicle in Vehicle Assembly Building high bay 4 at NASA's Kennedy Space Center in Florida. The Ogive panels enclose and protect the Orion spacecraft and attach to the Launch Abort System. The test vehicle is being used by Ground Systems Development & Operations (GSDO) for pathfinding operations, including simulated manufacturing, assembly and stacking procedures.

EFT-1 simulation tests mission contingencies

NASA and Lockheed Martin flight operations personnel conducted the first Exploration Flight Test-1 (EFT-1) operations training simulation on Dec. 5. The flight control team for EFT-1, led by NASA Flight Director Mike Sarafin, executed the simulated flight from prelaunch at Cape Canaveral to recovery in the Pacific Ocean.

The simulation included several systems failures that exercised the flight rules and had the joint team send preplanned contingency commands. Some of the malfunctions required the flight director to contact the EFT-1 mission management team for authority to send unplanned commands to resolve inflight anomalies.

NASA and Lockheed Martin management considered the successful simulation a critical milestone in preparation for the September 2014 flight. This simulation was conducted in the Blue Flight Control Room in the Mission Control Center in Houston. This room was used for the first International Space Station mission more than 15 years ago.

Senior-level Astrium Space Transportation representatives toured the Space Operations and Simulation Center in Lockheed Martin's Waterton, Colo., facility near Denver this month.

Astrium is contracted to the European Space Agency to support Lockheed Martin's integration work on the European Service Modules that will support Orion's Exploration Missions 1 & 2.

Pictured left to right are: Dr. Stephen Walther, director of marketing, KAM USA and Russia, Astrium Space Transportation; Jim Crocker, vice president and general manager, civil space, Lockheed Martin Space Systems; Dr. Reinhold Lutz, senior vice president, Astrium Americas; and Scott Norris, senior manager, business development, Lockheed Martin Space Systems.

Orion mock-up makes a splash across the country

A test version of NASA's Orion spacecraft turned heads and excited space enthusiasts as it traveled across the country in December. Starting from NASA's Langley Research Center in Hampton, Va., the mockup took a four-week journey across the nation to the Naval Base San Diego in California. There, the test article will be used to support NASA's Underway Recovery Test in February 2014. The test will simulate the recovery of Orion during its first mission, Exploration Flight Test-1 (EFT-1), scheduled for September 2014.

During the cross-country move through Virginia, Tennessee, Arkansas, Texas, New Mexico, Arizona and California, social media users tracked its progress and shared their photos online by using the hashtag #SpotOrion. View some of their posts at:
https://twitter.com/NASA_Orion

During the holidays, the spacecraft made a two-week rest stop in Tucson, Ariz., where it was showcased at the Pima Air & Space Museum from Dec. 11 to Jan. 3.

While the spacecraft is in San Diego, it will undergo recovery testing in which it will be set adrift in open and unstable waters, providing NASA and the U.S. Navy the opportunity to recover the capsule into the well deck of the USS San Diego. While deployed, the team will seek out various sea states in which to practice the capsule recovery procedure in an effort to build their knowledge base of how the capsule recovery differs in calm and rough seas and what the true physical limits are.

NASA and the Navy practiced recovery in calm seas during a Stationary Recovery Test in August where the spacecraft was set adrift in the waters of Naval Station Norfolk in Virginia and recovered into the docked well deck of the USS Arlington.

View some of the news coverage of the cross-country trip at:

News 4 / Arkansas	**http://bit.ly/1aHCb2X**
KnoxViews News / Tennessee	**http://bit.ly/1aHAzG9**
KVOA / Tucson, Ariz.	**http://bit.ly/1a8P0TN**
KGUN9 / Tucson, Ariz.	**http://bit.ly/19dWzxk**
KOLD/KMSB / Tucson, Ariz.	**http://bit.ly/1dg4smV**

NASA extends deadlines for student exploration design challenge

NASA is extending deadlines for its Exploration Design Challenge, an educational program connected to Exploration Flight Test-1 (EFT-1) – the first mission for NASA's new Orion spacecraft scheduled to launch in September 2014 from Cape Canaveral Air Force Station in Florida.

The new deadline for high school students to submit payload design notebooks has been extended to Feb. 28. The deadline for all students to complete a radiation learning module and fly their names on EFT-1 is now June 30.

The challenge invites students from kindergarten through 12th grade to research and design proposed solutions to help protect astronauts from space radiation during Orion's long-duration deep space missions to asteroids or Mars.

The Exploration Design Challenge was launched in March through a partnership between NASA and Lockheed Martin Corp., in collaboration with the National Institute of Aerospace. The challenge brings cutting-edge learning to educators and students using standards-based activities, as well as print and video resources and technical guidance to help them learn how to solve difficult problems associated with human space exploration.

Participating students in grades kindergarten through eighth grade will analyze different materials that simulate space radiation shielding for human space travelers aboard the Orion spacecraft. After participating in activities guided by their teachers, students will recommend materials that best block harmful radiation.

Joe LeBlanc works on the payload integration plan for the EDC student experiment that will fly in Orion's crew module during EFT-1.

Participating students in grades 9-12 can take the challenge a step further by designing a shield to protect a sensor inside Orion from space radiation. Five high school team designs will be selected for program review in March 2014, and the final winning design will be announced by the end of the school year. The high school team with the winning payload design will be flown to NASA's Kennedy Space Center in Florida to watch their experiment launch into orbit aboard Orion.

Be a part of space history. Get involved at:
http://www.nasa.gov/education/edc/

Read about Kent Beringer, NASA production lead on Orion:
http://on.fb.me/JL2kqL

Coming up in January 2014

- Parachute Test Vehicle drop test
- Service module structural loads testing
- Heat shield drilling operations
- End to end live sky test
- Orion All Hands