

National Aeronautics and
Space Administration



ORION

JUNE 2016

OUT OF THIS WORLD!

Natalie Oluwo, as Undyne from Undertale, gives Orion's PORT mockup a thumbs up at Comicpalooza.



ORION DISCOVERS 'STRANGE NEW WORLDS' AT COMICPALOOZA

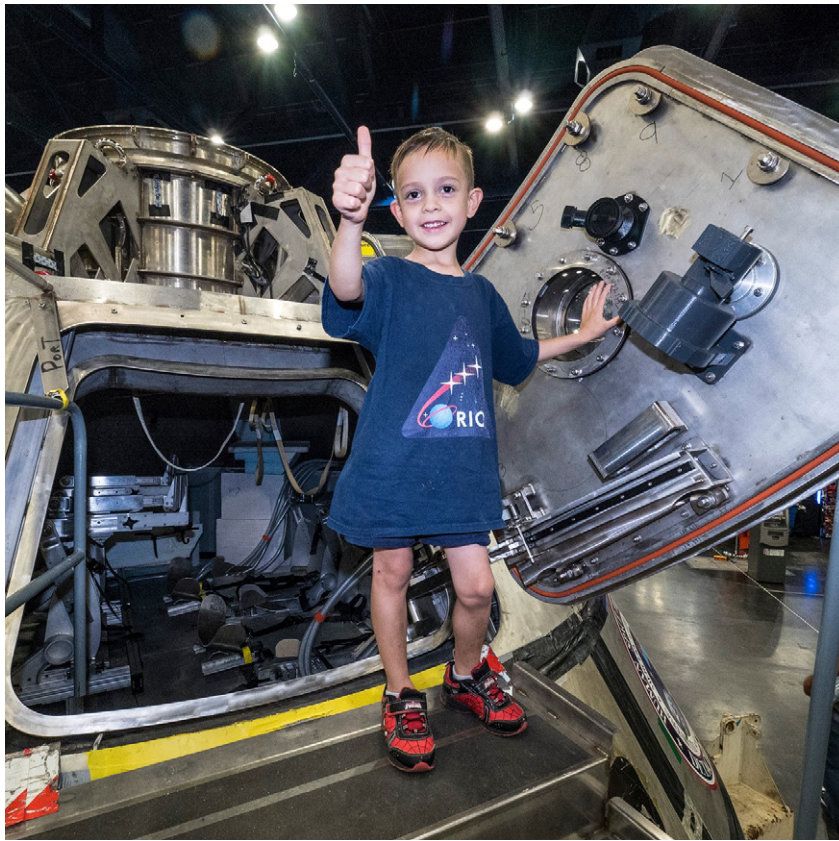
Science fact met science fiction as NASA and the Orion team created an out-of-this-world exhibit at this year's Comicpalooza, held June 17-19 at the George R. Brown Convention Center in Houston.

Prior to the event, people around Houston shared their surprise and excitement to see a full-scale Orion mockup heading up the freeway as it was transported from NASA's Johnson Space Center to Comicpalooza. The Orion Post-landing Orion Recovery Test (PORT) mockup is used to train astronauts for Orion ingress and egress maneuvers in the Neutral Buoyancy Lab. Snapshots of the spacecraft posted online throughout the weekend catapulted #SpotOrion posts to 22 million impressions around the world.

The PORT attracted the cast of characters at Comicpalooza to strike a pose with America's first interplanetary spacecraft for humans that will boldly go where no one has gone before as it takes astronauts far beyond the moon to explore our solar system.

Continued on next page.





Like the Silver Surfer, Orion will don a shiny new coating for its exploration missions which will provide better thermal protection for the spacecraft components and crew.

At the event, Orion engineer Nujoud Merancy briefed a standing-room-only crowd on how astronauts will live and work in space aboard the Orion spacecraft and deep space habitats during her talk “Journey to Mars: Home Sweet Habitat.”

To read more about Orion at Comicpalooza, view the links below:

bit.ly/OrionTravelsHouston

bit.ly/SpotOrion

bit.ly/Orion_on_Freeway

bit.ly/OrionlandsatComicpalooza

bit.ly/WhereInTheWorldIsOrion

bit.ly/Driving_Orion



ORION'S SERVICE MODULE COMPLETES CRITICAL DESIGN REVIEW

NASA and ESA (European Space Agency) conducted a critical design review (CDR) culminating in a final review board June 16 for Orion's European-built service module. The service module is an essential part of the spacecraft that will power, propel, and cool Orion in deep space as well as provide air and water for crew members. The CDR rounds out the latest in a series of reviews for the three human exploration systems development programs that will enable the journey to Mars.

During the review process, technical experts examined the module designs and numerous items were processed and closed out, giving engineers confidence the module design is mature enough to continue with fabrication, assembly, integration and testing.

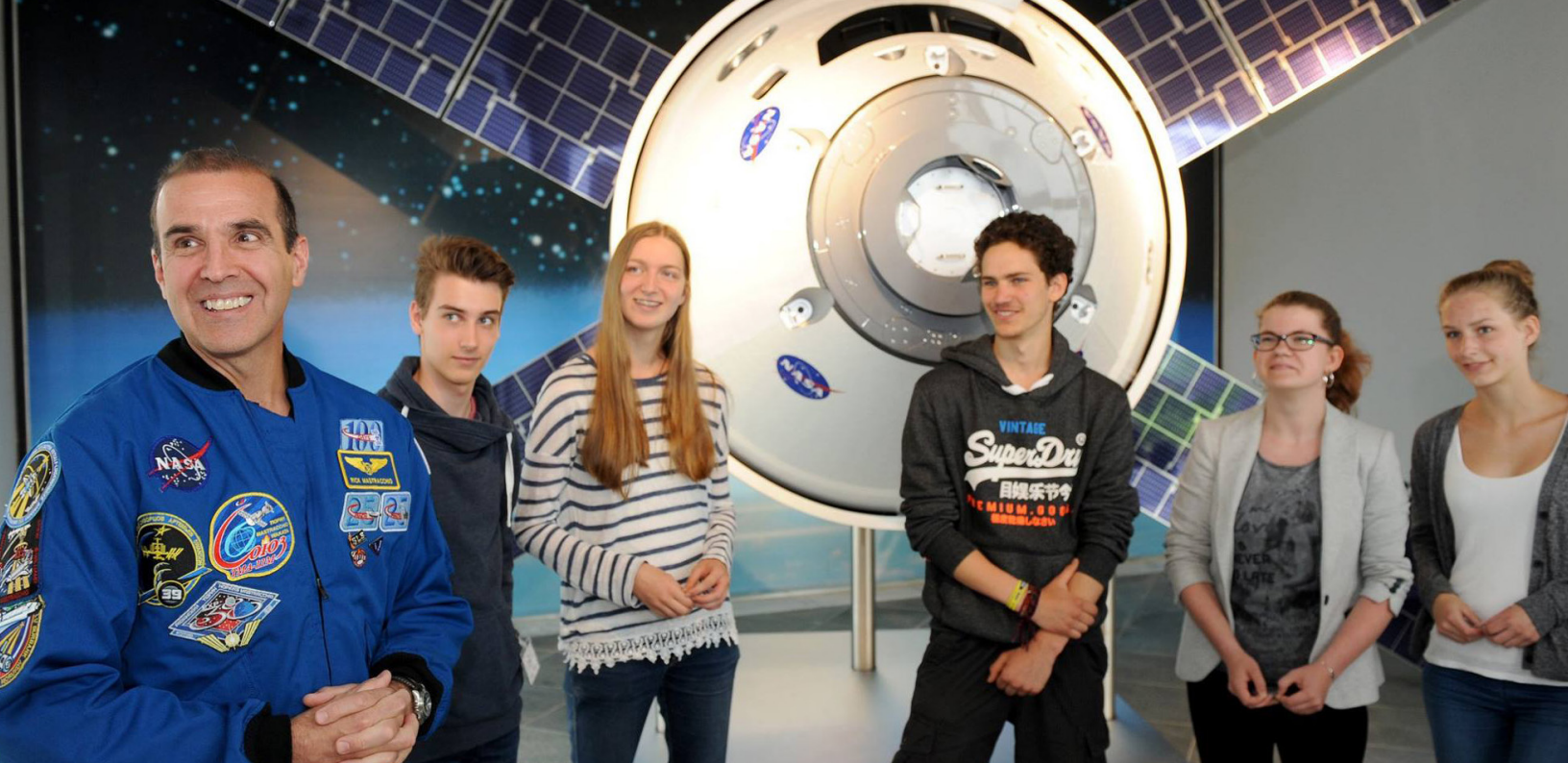
The recently completed review focused on the overall service module design while discussing differences between Orion's first deep space mission atop the Space Launch System (SLS) rocket and the mission to follow that will carry crew. No new major issues were identified during the review, and the teams worked together to develop a plan for work going forward in areas such as power, solar array management and propellant usage.

The review was conducted at ESA's European Space Research and Technology Centre in Noordwijk, Netherlands with teams from NASA, ESA, Lockheed Martin and Airbus Defence & Space in Bremen, Germany. Lockheed Martin is NASA's main contractor building Orion, and Airbus is ESA's contractor for the service module.

The CDR identified April 2017 as the target for the service module delivery to Kennedy Space Center in Florida. Teams will begin integrating hardware into the rocket before the service module is delivered, and NASA plans to continue to optimize processing when it arrives at Kennedy. Initial results maintain EM-1 launch date no later than November 2018.

Read the full story at: bit.ly/ServiceModule_DesignReview

A test version of the Orion service module has been undergoing acoustic and vibration testing at NASA Glenn Research Center's Plum Brook Station in Sandusky, Ohio.



On June 8, NASA astronaut and Orion representative Rick Mastracchio visited the Airbus Defence and Space team in Bremen, Germany and spoke to students in Bremen about the challenges of living and working in space. A veteran of four spaceflights, Mastracchio flew as a mission specialist on STS-106, STS-118, STS-131 and as a flight engineer on International Space Station Expeditions 38 and 39. (above)

The Orion spacecraft and its European-built service module were showcased at this year's ILA 2016 airshow in Berlin, Germany. The event was hosted by Airbus Defence and Space together with ESA, the Ministry for Economics Affairs and Energy, the German Aerospace Center and the German Aerospace Industries Association. (below)





The team at L-3 Cincinnati Electronics poses for a photo.



U.S. Senator Rob Portman addresses employees at Metalex Manufacturing in Blue Ash, Ohio, during an All Hands presentation from Orion and SLS teams (above) and the team at Metalex Manufacturing poses for a photo (below).



OHIO SUPPLIERS COMMENDED BY SENATOR PORTMAN

U.S. Senator Rob Portman delivered remarks to employees and industry leaders at Orion and Space Launch System (SLS) supplier Metalex Manufacturing in Blue Ash, Ohio, on June 1. Orion and SLS management from NASA, Lockheed Martin, Boeing, Aerojet Rocketdyne and Orbital ATK recognized Metalex's contributions to NASA with a Space Flight Awareness Supplier Award. Metalex precision machines parts for the Orion crew module pressure vessel and the SLS RS-25 engine and rocket boosters.

L-3 Cincinnati Electronics, also an Orion/SLS supplier, was visited the next day by the team. L-3 provides expertise in avionic components for both Orion and SLS.

Read all about it in the news features below:

bit.ly/Ohio_FutureSpace

bit.ly/MetalexInspiresYouth

bit.ly/ThankYouBlueAsh

bit.ly/OhioVisit_Orion



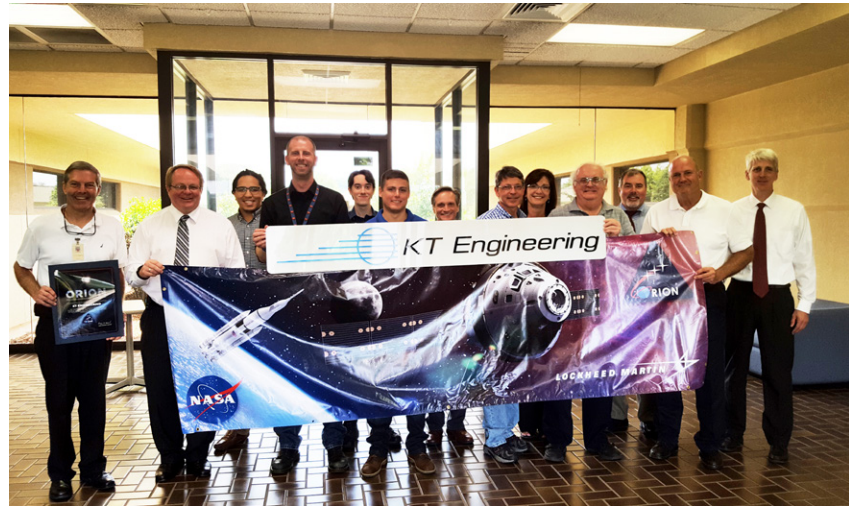
ORION AND SLS PROGRAMS THANK ALABAMA WORKFORCE

NASA Orion managers visited with Alabama suppliers KT Engineering and SEA Wire & Cable in Madison and Micor Industries in Decatur following a presentation to Orion and SLS employees working at NASA's Marshall Space Flight Center in Huntsville. Several Orion Program Manager Commendations were awarded during the events.

Congratulations to NASA's Marshall Space Flight Center Orion Program Commendation winners Melinda McCord and Terry Abel. (above)

KT Engineering developed the designs for the Orion crew module assembly fixture, handling adapters and launch abort system support pallets. (right)

The SEA Wire & Cable team shows their pride in space exploration. The woman-owned small business has about 90 employees and was founded in Madison, Alabama, in 1970. The company supports NASA's Orion and SLS programs. (below)





The team at MICOR Industries in Decatur, Alabama, shows off the completed Exploration Mission-1 environmental control life support system palette. Micor Industries machines many of the brackets that go on the Orion crew module.





PLUM BROOK STATION: POWERING UP FOR THE NEXT 75 YEARS

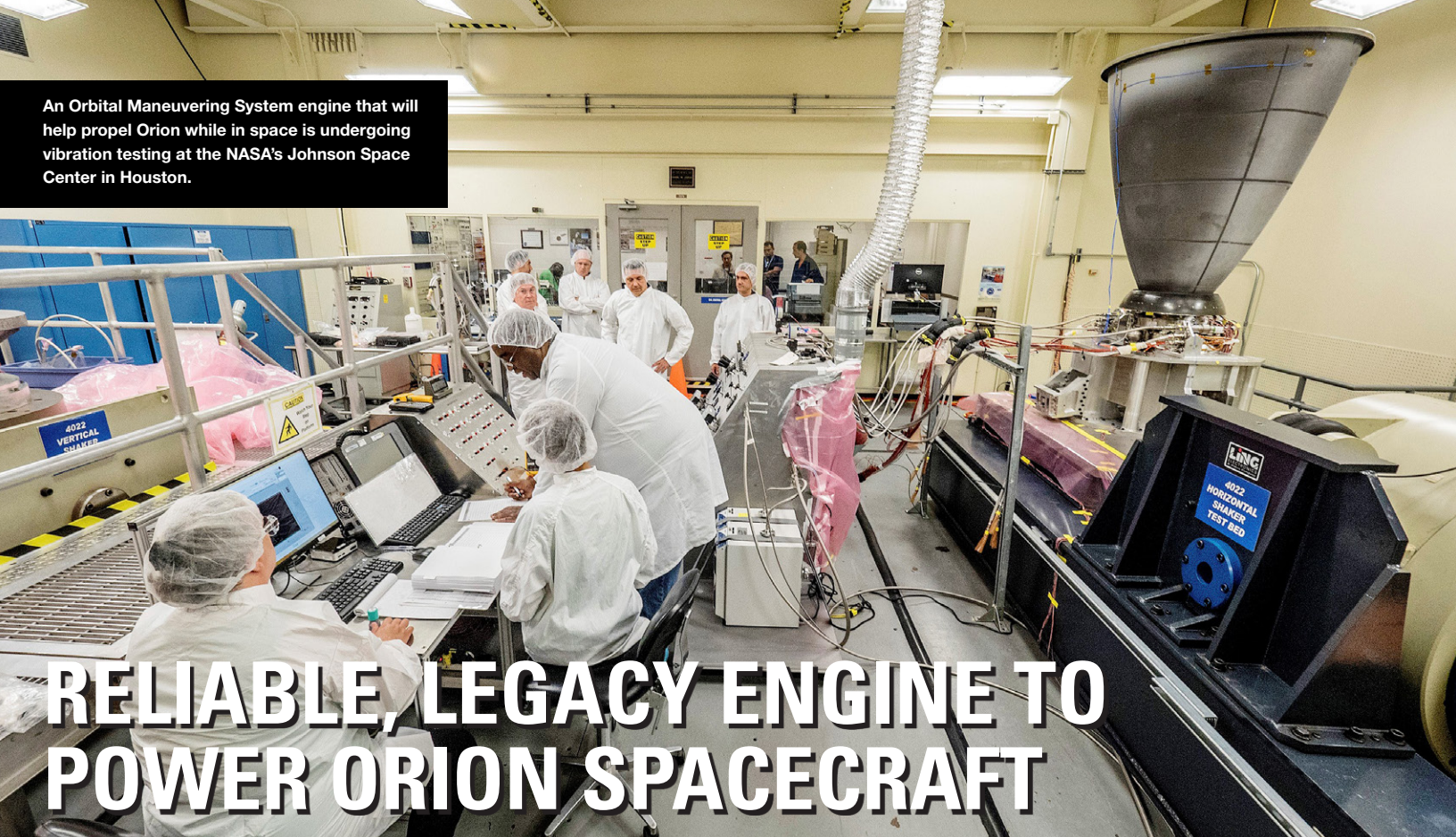
In celebration of its 75th anniversary, NASA's Glenn Research Center welcomed more than 15,000 visitors at an open house event for its Plum Brook Station in Sandusky, Ohio. Attendees enjoyed exhibits, hands-on activities and tours of Plum Brook's space environment test facilities, including the Space Power Facility, which is currently testing Orion's European Service Module structural test article.

The Space Power Facility houses the world's largest space simulation thermal-vacuum chamber, the world's most powerful reverberant acoustic test chamber, the world's highest capacity and most powerful mechanical vibration test stand, and the world's largest reverberant-mode electromagnetic interference/electromagnetic compatibility (EMI/EMC) test capability.

The 6,400-acre Plum Brook Station was originally developed by the War Department in the 1940s for ordnance production for World War II, then used by the National Advisory Committee for Aeronautics in the 1950s to design for nuclear-powered aircraft. NASA adopted Plum Brook in the 1960s with intent to test nuclear-powered spacecraft in simulated space environments, but that never occurred. Since then, Plum Brook's Space Power Facility has tested numerous spacecraft systems, such as fairings, space station radiators, Mars lander airbags, and solar sails.

The Orion spacecraft test series at Plum Brook Station spans across all vehicles and test articles from the structural test article to the Exploration Mission-1 vehicle. These series include acoustic testing, solar array deployment tests, thermal vacuum and thermal balancing testing, and EMI/EMC.

An Orbital Maneuvering System engine that will help propel Orion while in space is undergoing vibration testing at the NASA's Johnson Space Center in Houston.



RELIABLE, LEGACY ENGINE TO POWER ORION SPACECRAFT



An Orbital Maneuvering System engine is outfitted at NASA's Johnson Space Center in Houston before shipment to NASA's White Sands Test Facility in New Mexico.

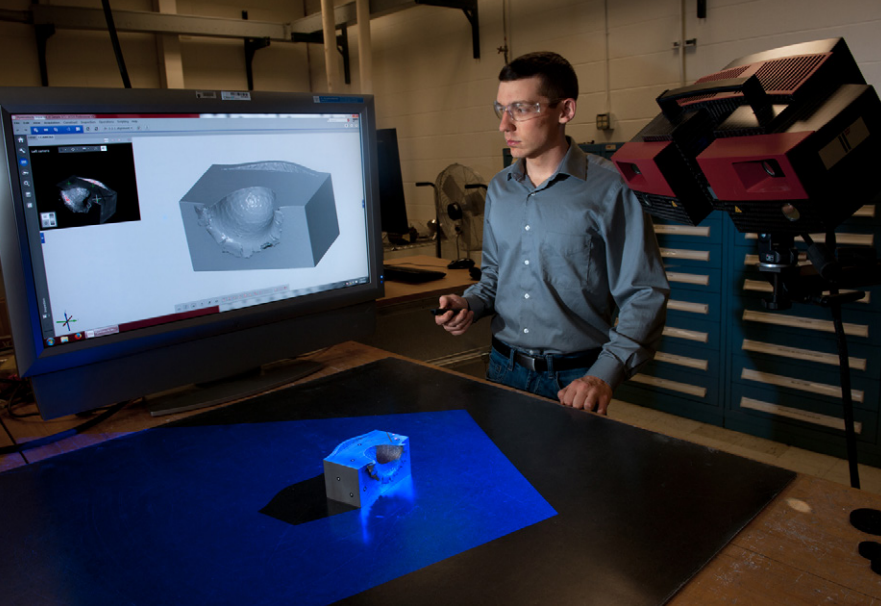


For more than 50 years, NASA has built upon the trials, tribulations and successes of all its human spaceflight missions to safely evolve to today's more ambitious and demanding missions required for the journey to Mars.

Engineers at NASA's Johnson Space Center in Houston are conducting vibration tests on an Orbital Maneuvering System engine used on the space shuttle before shipping it to the agency's White Sands Test Facility in New Mexico, where it will be fired to qualify the engine for use on Orion's service module. The vibration testing will help ensure the engine can withstand the loads induced by launch on the agency's SLS rocket. This summer, another Orbital Maneuvering System engine will be tested at Johnson before it is supplied to ESA to integrate into Orion's service module, which will power, propel and cool Orion in space, and also provide consumables like air and water for future crews.

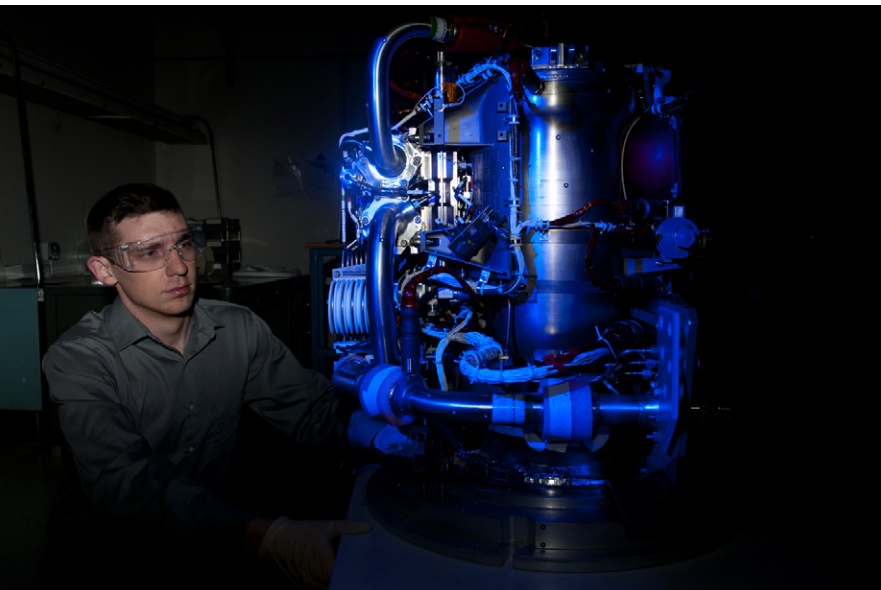
ESA and its contractor Airbus Defence & Space are providing the service module for Exploration Mission-1, a 2018 mission of the Orion spacecraft and SLS rocket that will send the spacecraft about 40,000 miles beyond the moon. This Orbital Maneuvering System engine was used on the space shuttle to provide the thrust for orbital insertion, orbit circularization, orbit transfer, rendezvous, deorbit and abort situations and flew on 31 shuttle flights. The engine flying on Exploration Mission-1 flew on 19 space shuttle flights, beginning with STS-41G in October 1984 and ending with STS-112 in October 2002.

Read the full story at: bit.ly/SMEngine_ShakeTest



3D SCANNER PROVIDES AS-BUILT SERVICE MODULE ENGINE MEASUREMENTS FOR ORION

A former shuttle Orbital Maneuvering System (OMS) engine, modified for its new role supporting Orion's European-built service module, was recently digitized and measured by NASA's White Sands Test Facility Materials and Components Laboratories Office to identify port and wire harness positions for external customers. Alaskan native and Eastern New Mexico University materials engineering graduate Jordan Wladyka performed the scan using the Advanced Topometric Optical Sensor II 3-D digitizer to ensure the engine, in its current state of construction, will interface correctly with components fabricated across the country. The projection-based scanner produces highly accurate files that can easily be imported into solid modeling software. Critical component mating interfaces were measured with an accuracy better than 27 microns (0.002 in.). In later scans the OMS engine heat shield and oxidizer inlet were also digitized.



NASM HOSTS SPACE DAY EVENT

On June 4, NASA Orion's C.J. Johnson (pictured here) and Lockheed Martin Space Systems' David Brandt spoke with visitors at the annual Space Day event at the National Air and Space Museum in Washington, D.C. The educational event included hands-on activities, "Meet an Astronaut" sessions, and show and tell presentations by NASA and museum staffers.

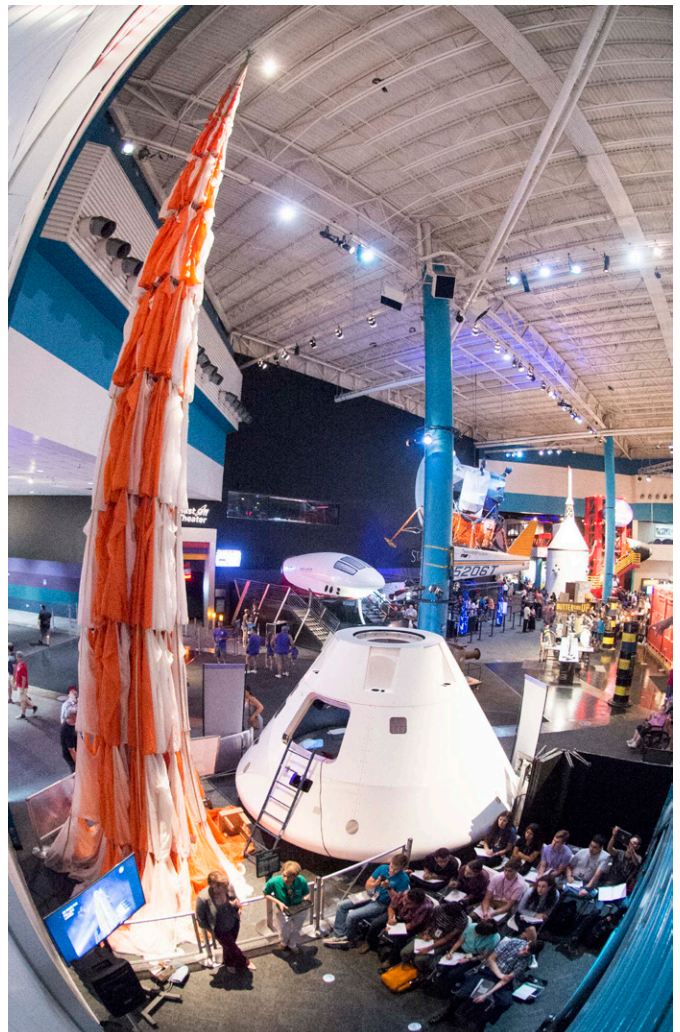
TOP STUDENTS LEARN FROM NASA

Texas high school students with the highest scores stemming from a 16-week High School Aerospace Scholars online curriculum were selected to visit NASA Johnson for one week to learn more about space exploration. Along with their web-based training they have the opportunity to hear from a NASA Orion engineer for each session. Orion engineers Dustin Neill (Lockheed Martin Space Systems) and Nujoud Merancy (NASA), were the first to speak to students at Space Center Houston in front of the Orion mockup.



NASA VISITS STUDENTS

On May 16, Orion engineer David Dannemiller spoke with students at Antioch Elementary School's third grade class in Crestview, Florida. During the presentation, the students followed the progress of the International Space Station as it orbited the Earth, watched videos of Orion flight tests, discussed Sun/Earth/Mars size and distances, made a packing list of the items students would bring on a trip to Mars, and made and flew paper airplanes.



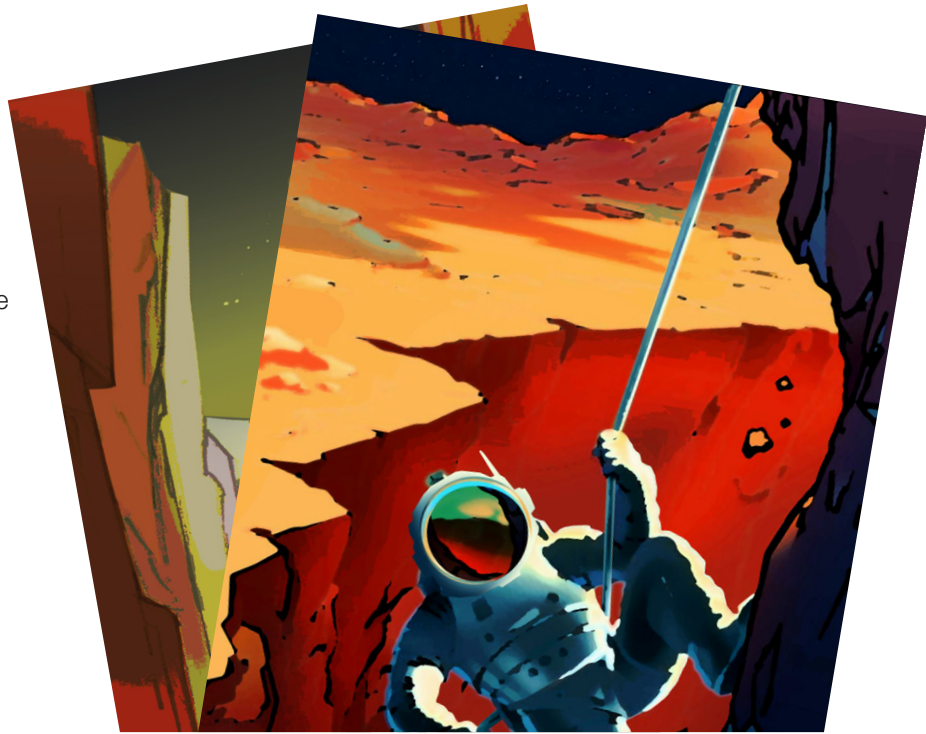
EXPRESS THE EXPLORER IN YOU

Interplanetary travel enthusiasts can now show their true colors with NASA's new series of posters. You can colorize your cubicle, Orion-ize your office or redecorate your room with these colorful posters now available for download and print-on-demand.

Hike the solar system's largest canyon, see the two moons of Mars (Phobos and Deimos) in the night sky, and journey across strange new worlds through these visual vistas.

More styles and other collectibles available at:

bit.ly/Mars_Posters and bit.ly/Orion_Collectibles



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JULY

Avcoat flight tile manufacturing at Michoud
Launch Abort System motor testing
California supplier visits
EAA AirVenture in Oshkosh, Wisconsin