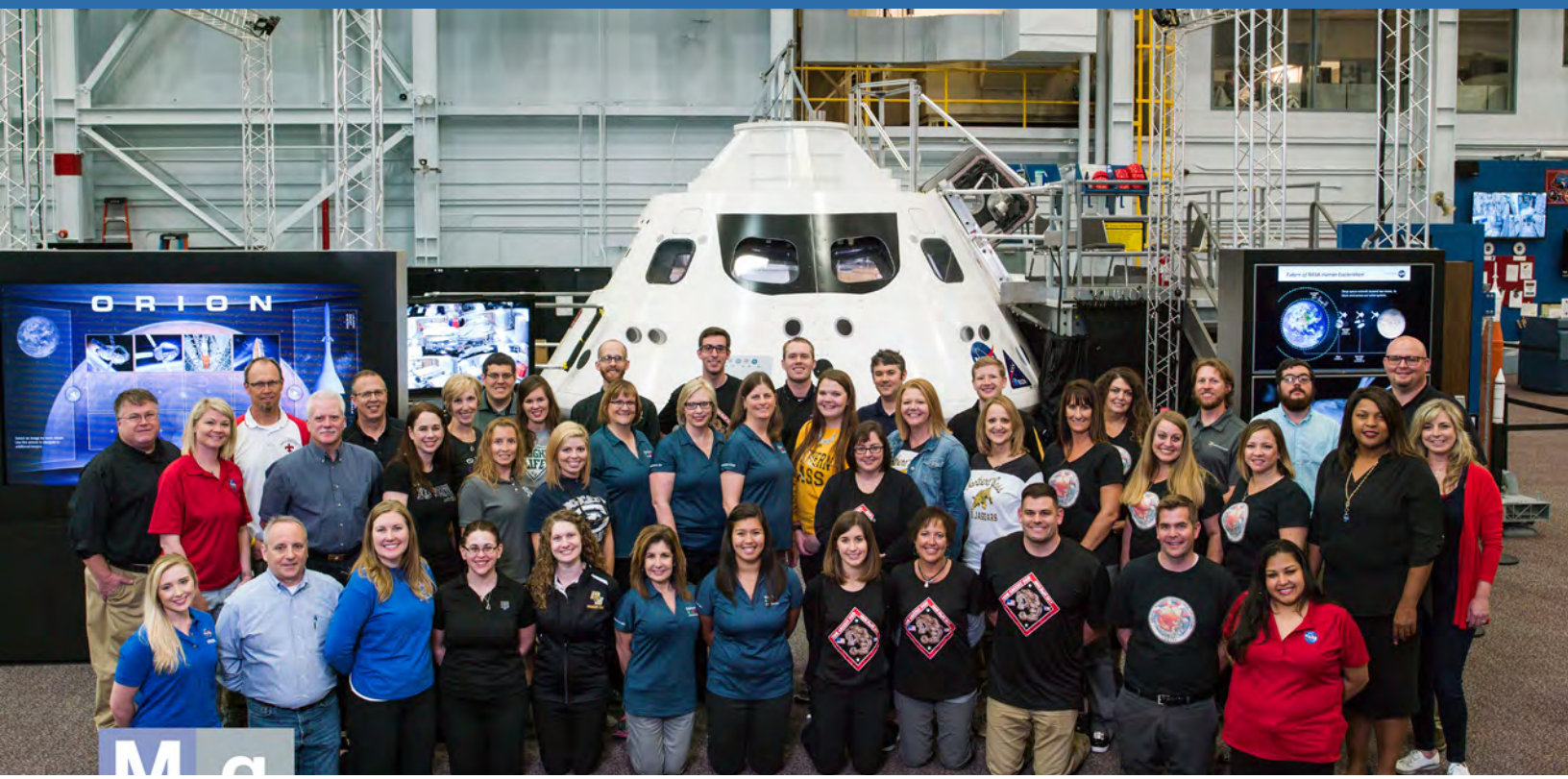
ORION

JUNE 2018

Our Summer School is Cool!

See what these students and teachers from across the country chose to do on their summer vacations.

OUR SUMMER SCHOOL IS COOL!



Even during the summer months when school is out, dedicated teachers and students chose to continue learning instead of taking time off. Hundreds of participants traveled from across the country to NASA's Johnson Space Center in Houston to get hands-on experience with new technologies and learn about exploring outer space from the experts who make it happen.

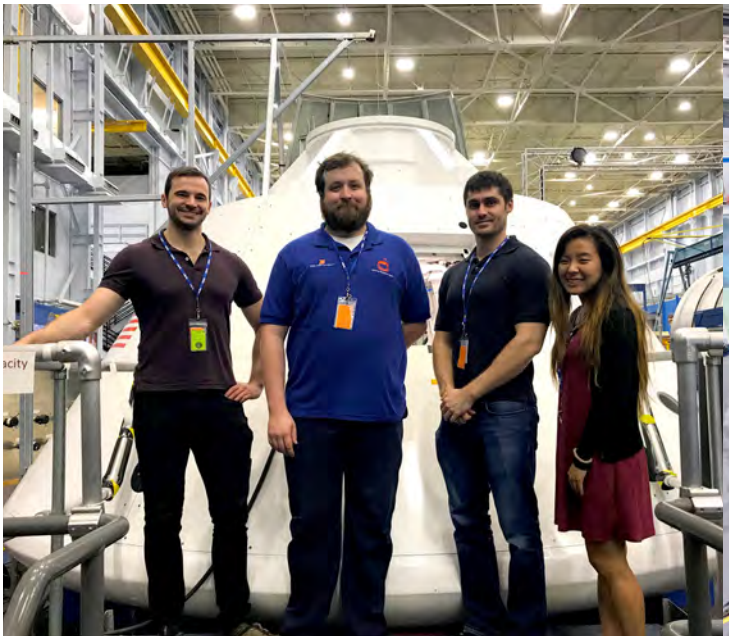
These action-packed programs inspire, engage and educate students and teachers to help create a new workforce ready to serve our nation's future space exploration endeavors.

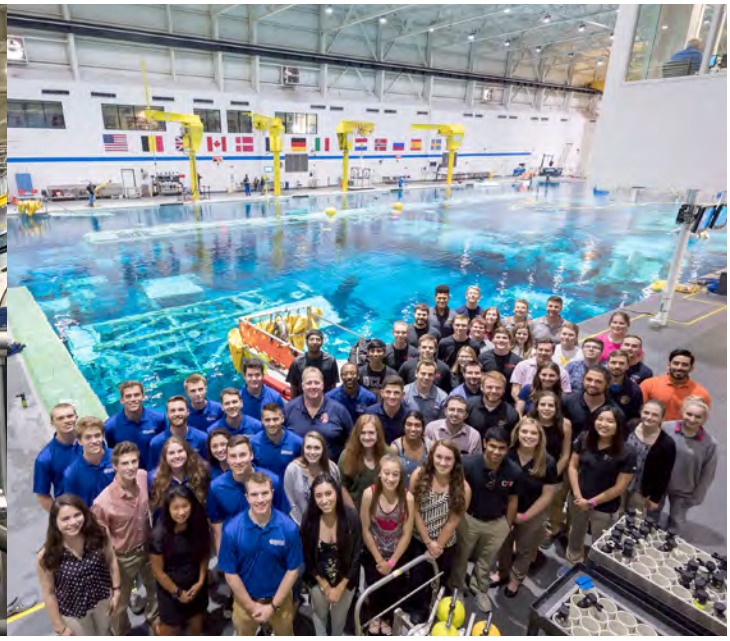
Nine teams of teachers and students from across the country took part in Microgravity University for Educators (MgUE), an authentic learning experience. The teams each designed and built a unique robotic device which mimicked real devices that NASA uses to launch satellites. The teams took their designs and tested them on the precision air-bearing floor (PABF) at Johnson, where scientists and engineers routinely test articles that require low-friction movement. In addition to testing, the teams met with subject matter experts, including Orion engineers who showed them the full-scale Orion mockup used for training astronauts to prepare them for deep space exploration. Teachers also had the opportunity to experience partial gravity simulations, explore space through virtual reality, and meet and learn from NASA astronauts.

Teachers attending the LiftOff Summer Institute focused their attention on Orion and deep space. LiftOff is a nationally competitive educator professional development institute where teachers are provided with materials and activities they experience firsthand, so that they can create unique learning experiences to share with their students and fellow educators. During this session, teachers were given a tour of Johnson and learned how scientists and engineers are currently building and testing the Orion spacecraft in order to take humans back to the Moon and on to Mars.

Aerospace industry companies such as Lockheed Martin, Boeing, SAIC, Barrios, MEIT, KBR Wyle and Jacobs, hosted the annual Teacher Externs Program this summer. Middle and high school educators from the greater Houston area and Tennessee got the chance to go behind the scenes to learn about the various careers needed to support NASA's space exploration programs. The teachers toured company sites and NASA facilities such as the Space Vehicle Mockup Facility where engineers, industry professionals, and project managers provided program updates and information about future career opportunities in the space industry. They also visited the Neutral Buoyancy Lab (NBL) where they saw astronauts train for missions in space in one of the world's largest indoor pools.

Students and faculty from higher institutions traveled to Johnson this summer to test their prototypes in an on-site facility as part of the full NASA Spacesuit User Interface Technologies for Students (NASA SUITS) Design Challenge Experience. More than 130 also participated in the online challenges, all of which focused on teams designing and





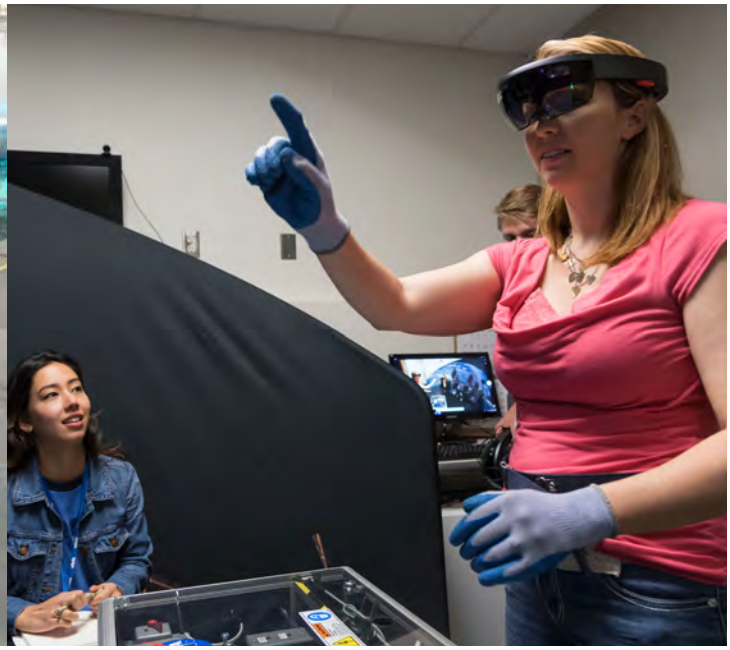
creating spacesuits using an augmented reality Microsoft HoloLens platform. Student teams were able to test their designs with subject matter experts who work with suits that astronauts are currently using, and the suits being designed for astronauts to use when flying in Orion.

More than 100 high school juniors from all across the state of Texas participated in the 2018 High School Aerospace Scholars (HAS) program, which offers a one-of-a-kind experience for Texas high school students to explore the possibilities of a career in science, technology, engineering and mathematics (STEM) related fields. The adventure started last fall with an online course and culminated with an onsite summer experience at Johnson for those students who earned the opportunity.

Orion engineers and project managers met with the students to give them real-life insight into building spacecraft and planning human spaceflight missions. Students participated in design challenges, face-to-face chats with scientists and engineers, facility tours, and planned a mission to Mars.

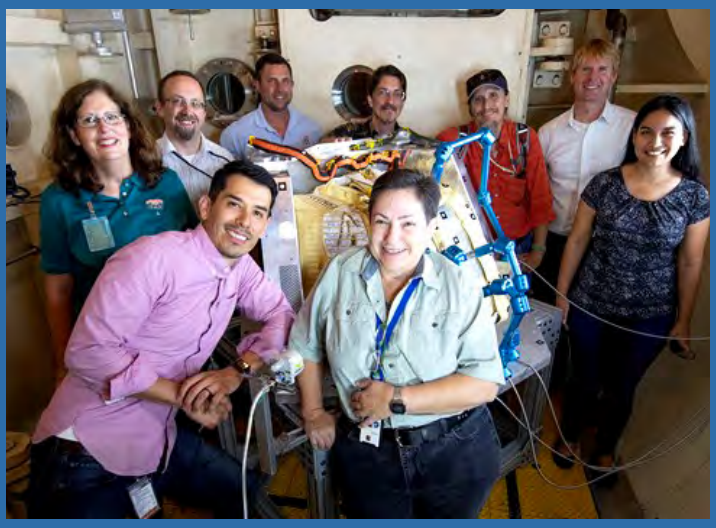
At Johnson's NBL, Orion engineers also worked with students participating in the Micro-g NExT program. Student teams worked to build Extra Vehicular Activity (EVA) prototypes over the past six months and put those tools to the test in a real NASA facility. This year's program featured three EVA Design Challenges for the International Space Station (ISS) and an Exploration panel comprised of experts from the Orion, International Space Station, and Exploration Integration and Science programs.

For more information about NASA's Education Programs: **go.nasa.gov/2NEZchk**

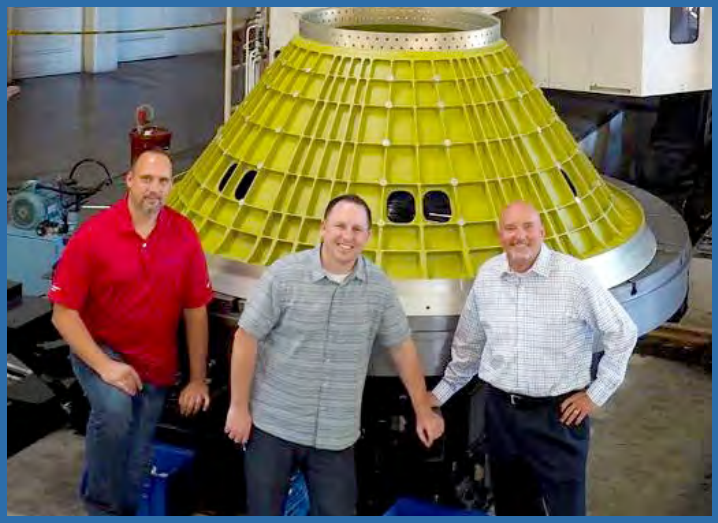


SMALL STEPS LEAD TO BIG PROGRESS

The Ascent Abort-2 (AA-2) Aeroshells Tier 1 and 2 recently arrived at NASA's Kennedy Space Center in Florida. Aeroshell Tier 3 is expected to arrive mid-July, and all three will make up the outer covering of the abort test booster for AA-2. In April 2019, AA-2 will test the Launch Abort System's capabilities to quickly propel the crew module away from the rocket within milliseconds should a life-threatening event arise during launch. The test is critical to ensuring crew safety during Orion's future launches on the Space Launch System.



The Capsule Parachute Assembly System team completed the main parachute rapid depress qualification test on June 12 at NASA's Johnson Space Center. This test helps give insight into how parachutes react during the rapid transition from air pressure at sea level to the vacuum of space, as the parachutes on Orion will experience during ascent to orbit. It is the last test in a series of environmental tests at Johnson that included thermal cycling and vibration testing. In August, the main parachute will be integrated into the parachute test vehicle and then functionally tested and deployed during the final air drop test planned for Sept. 12.



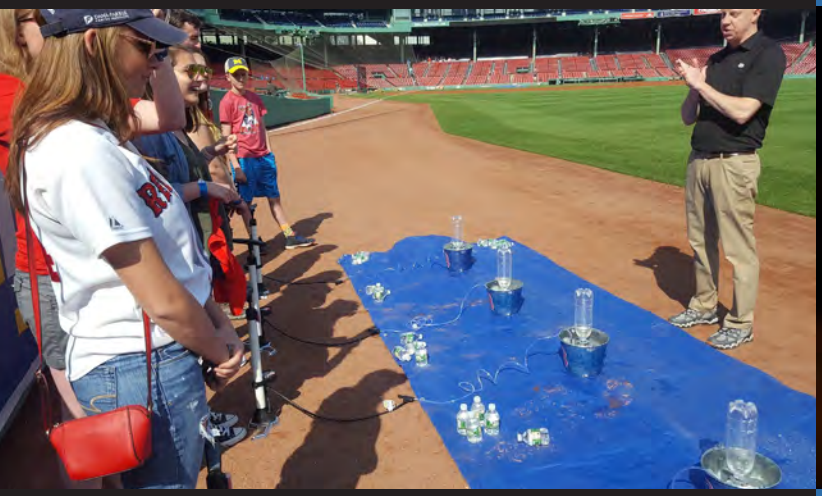
The Metallic Motor Adapter Truss Assembly cone for the Ascent Abort-2 flight test was completed at AMRO Fabricating in South El Monte, California, and shipped to NASA's Michoud Assembly Facility in New Orleans, Louisiana, on June 13. Founded in 1977, AMRO is a small business manufacturer that specializes in building metallic structures for spacecraft and launch vehicles. AMRO employs more than 250 people in Southern California.

ORION ESM UNDERGOES PREPARATION FOR OVERSEAS TRIP

The first European Service Module (ESM) set to accompany Orion on its trip around the Moon on Exploration Mission-1 (EM-1) is being prepared to be shipped to the United States by Airbus in Bremen, Germany. Once it has undergone final assembly and testing, it will travel overseas to Kennedy Space Center in Florida where it will be integrated with the rest of the hardware for NASA's Orion spacecraft. Learn more about what lies ahead for the EM-1 ESM and what else Airbus and the European Space Agency are working on for future Orion missions.

Read more: **bit.ly/ESMJuly18**

STEM DAY AT FENWAY



Boston area students were able to take part in a Science, Technology, Engineering and Math (STEM) Day event at Fenway Park on May 30. NASA teams joined the Boston Red Sox at Fenway Park to host STEM activities and teach students about NASA's current programs, including Orion's future missions beyond the Moon and onto Mars. Students were able to build their own parachutes to simulate how Orion will land back on Earth after returning from deep space missions, learn about the Space Launch System, touch Moon rocks and look through solar telescopes. They also experienced demonstrations of water bottle rockets, participated in paper airplane contests and heard from Astronaut Sunita Williams about her journeys to space. More than 4,000 students were able to get hands-on experiences, learn about pursuing careers with NASA and be a part of future space exploration missions.

NEW VIKING OCEAN SHIP NAMED AFTER ORION

On June 14, Viking's fifth ocean ship was named Viking Orion by her ceremonial godmother, retired NASA Astronaut Dr. Anna Fisher, in Livorno, Italy. Named in honor of Dr. Fisher's previous work on Orion, the 930-guest 47,800-ton Viking Orion will sail around the Western and Eastern Mediterranean, Asia, Australia and Alaska. Lockheed Martin Orion team member Bryan Austin attended the naming ceremony and presented the ship's captain with framed memorabilia from the Orion spacecraft's first orbital fight and memorabilia from NASA's international partners ESA and Airbus. The ship will feature space-themed photo exhibits and immersive exploration programming for guests to enjoy on their voyages, including an on-board planetarium.

Viking chairman Torstein Hagen and the captain of Viking Orion, Anders Steen.

ORION MEMBERS TAKE PART IN HOUSTON PRIDE FESTIVAL

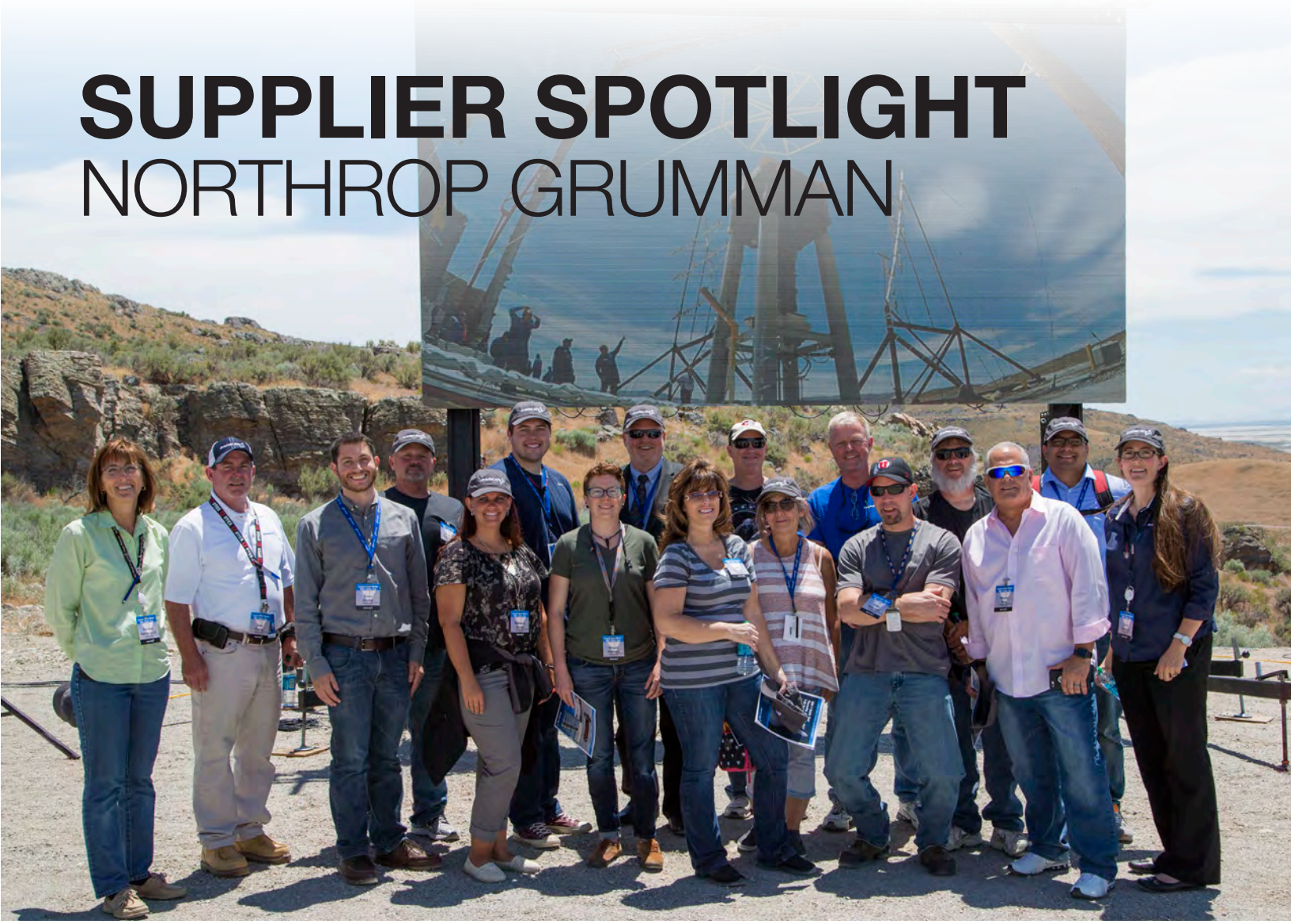
Orion team members and other employees from Johnson Space Center's Out & Allied Employee Resource Group helped staff a NASA booth at the Houston Pride Festival this year. More than 200,000 people attended the event and those who stopped by the booth were able to learn more about Orion, Exploration Ground Systems, Space Launch System and Johnson Space Center's other missions. Members also marched with the Pride parade through the streets of downtown Houston. Pictured are Caitlin Milder in the Space Radiation Analysis Group (left) and Michael Chandler in Exploration Systems Development Configuration and Data Management (right).

ARIZONA TO FLORIDA, SUPPLIERS CONTINUE TO DELIVER

NASA Avionics Power & Wiring Manager Gary Cox and Lockheed Martin Orion Avionics, Power & Wiring Integrated Product Team Manager West Womack met with the R&D Machine and Engineering team in Clearwater, Florida, to discuss updates and view progress. In addition to the critical Orion inertial measurement unit gyro connector bracket, R&D provides more than 50 different mechanical parts for Honeywell's Orion content. These components span from simple screws to complex sensor blocks, all of which are important to Orion's success in deep space.

NASA Orion Avionics, Power & Software Manager Howard Hu, Cox and Womack also met with the Honeywell team in Glendale, Arizona. During the visit, team members were presented with commendations to highlight their contributions to Orion's progress. Honeywell provides numerous components for Orion including the flight computers, inertial measurement units, GPS receivers, barometric altimeters, core flight software, and numerous onboard data network components. All but three of the Exploration Mission-1 components have been successfully installed and tested on the vehicle and those remaining components are on track for on-time delivery.

SUPPLIER SPOTLIGHT
NORTHROP GRUMMAN



Northrop Grumman recently closed the acquisition of Orbital ATK, a global leader in aerospace and defense technologies. Orbital ATK is now Northrop Grumman Innovations Systems, a new, fourth business sector for the company. Northrop Grumman is a leading global security company providing innovative systems, products and solutions to government and commercial customers worldwide, offering an extraordinary portfolio of capabilities and technologies for applications from undersea to deep space and into cyberspace. The company manufactures the main abort motor and attitude control motor that are an integral part of the Launch Abort System for NASA's Orion spacecraft that will launch atop NASA's Space Launch System and carry crew to deep space missions. More than 380 Northrop Grumman employees work on this innovation system, which greatly improves crew safety by quickly propelling the Orion crew module to safety in the event of a life-threatening event during launch or ascent to orbit.

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

Twitter ..... **Twitter.com/NASA_Orion**
Facebook ..... **Facebook.com/NASAOrion**
Flickr ..... **Flickr.com/NASAOrion**
Tumblr ..... **NASAOrion.tumblr.com**

JULY 2018

Final weld on EM-2 crew module

Heat shield installed on EM-1 crew module

Oshkosh Air Show