



# EXPLORATION SYSTEMS DEVELOPMENT

COMBINED MONTHLY REPORT  
*May 2018*

Orion:  
**Taking Orion to  
the Brink**

SLS:  
**Build Up to the  
Big Squeeze**

EGS:  
**Crawler-Transporter 2  
Tests Weight of Mobile  
Launcher**



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# ORION



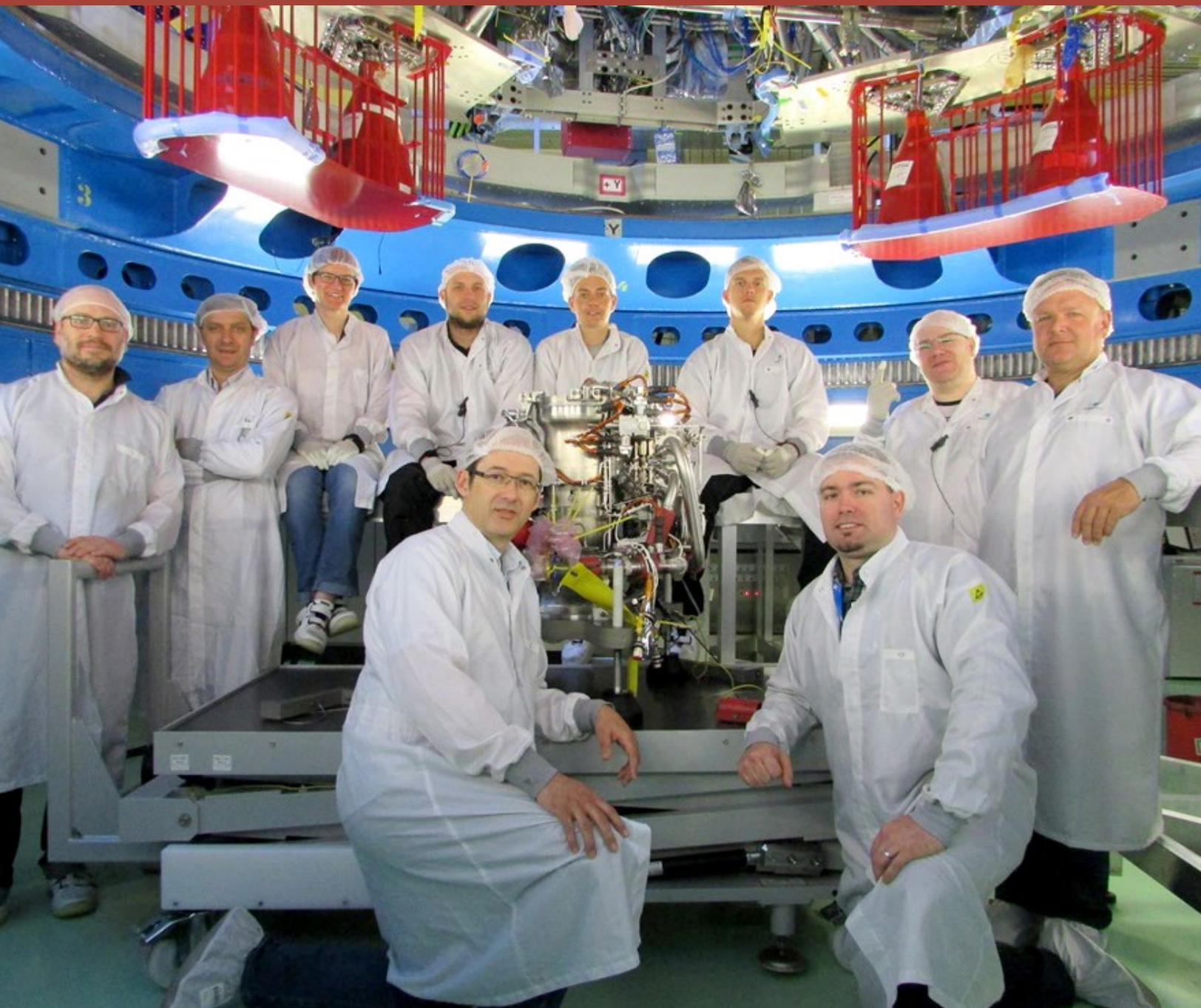
MAY 2018



## A Perfect Coupling

Orion's OMS engine gets hitched to the EM-1 service module in Bremen, Germany.

# A PERFECT COUPLING



A very special union took place at the Airbus cleanroom in Bremen, Germany.

A proven Orbital Maneuvering System (OMS) engine was mated with ESA's (European Space Agency) European Service Module (ESM) that is currently being assembled in Bremen. This engine will provide the main thrust during Orion's journey to the Moon. It is one of 33 engines that have been installed to date. In addition to the OMS engine, there

are eight auxiliary thrusters and 24 attitude control thrusters. The engine has flown on 19 space shuttle missions and is now prepared for its last mission to lunar orbit.

With this final assembly, all engines are now integrated into the ESM. Pictured here are the combined Assembly, Integration and Test team members from Airbus, ArianeGroup, and NASA during the integration of the engine.

# EXPLORATION MISSION TESTING AND PRODUCTION



Orion teammates from NASA and Lockheed Martin gathered for a picture with the Ascent Abort-2 (AA-2) capsule being outfitted at NASA's Johnson Space Center in Houston for the upcoming flight test of the Launch Abort System.



Lockheed Martin technicians at NASA's Michoud Assembly Facility in New Orleans, LA, completed the forward structure to cone weld on the Exploration Mission-2 crew module pressure vessel.



The Orion Rapid Prototype Lab (RPL) team recently conducted the fifth in a series of "mini-sims" with NASA astronauts and a small team of flight controllers. The team designed and executed complex and innovative simulations of the newly prototyped Orion crew on-orbit burn display formats and electronic procedures. The RPL team gained valuable experience using these displays and procedures in a more realistic scenario with crew members and the ground control team. These evaluations will help to validate or identify areas needing updates to ensure key changes can be made earlier and more economically in the software development cycle. The team consisted of members from Aerospace Applications North America, Barrios Technology, Ames Research Center, and interns from NASA and SGT.

# AIRBUS TEAM GETS THUMBS-UP TO START EM-2 SERVICE MODULE ASSEMBLY



The structure for Europe's second service module for NASA's Orion spacecraft recently arrived at the Airbus clean room in Bremen, Germany.

Technicians are now working to install nearly 7.5 miles of cables, fuel, water and air tanks, computers, engines, and other components needed to support astronauts as they venture farther from Earth than any human being has been during Exploration Mission-2 (EM-2).

The European Service Module is a crucial element of Orion, providing support to the crew module that will house up to four astronauts. The crew will travel more than 600,000 miles during EM-2 and fly around the Moon before returning to Earth.

The module provides structural rigidity to the Orion spacecraft much like the chassis of a car. It absorbs the vibrations and energy from launch and protects the crew from micrometeoroids and space debris.

By connecting the crew module to the launcher, it also absorbs the vibrations from NASA's Space Launch System rocket that has the equivalent thrust of 34 jumbo jets—holding everything together for the wild ride into space.

The service module for the first mission—without astronauts—is nearing completion and is set to ship to the United States this summer. The production schedule for the service module is going at full speed with Airbus technicians working in shifts 24 hours a day.

The Orion spacecraft is built by NASA with ESA providing the service module. The arrangement stems from the international partnership for the International Space Station.

Read more at: [bit.ly/ESM2\\_Arrival](https://bit.ly/ESM2_Arrival)

# SHAKE, SHUDDER AND SHOUT: TAKING ORION TO THE BRINK



The second uncrewed test flight of NASA's Orion, called Exploration Mission-1 (EM-1), is the first time the Orion spacecraft and the Space Launch System rocket will undergo an integrated launch and travel beyond the Moon. During launch, the rocket engines and solid rocket boosters ignite creating 8.8 million pounds of thrust, producing deafening sound and vibration that shakes the vehicle. It's this intense environment that Orion engineers have studied and worked to mitigate when designing the spacecraft. Before Orion flies on EM-1, the limits of the spacecraft's structures are being taken to the brink in a series of tests at the Lockheed Martin facility near Denver.

An Orion test structure, called the structural test article (STA), was built and is undergoing punishing tests throughout the year that will deliberately take the vehicle's structure to the edge of its design. The tests will simulate the raucous launch and harsh space environment throughout the approximately three-week EM-1 mission that physically affect the structures of the Orion spacecraft. While the STA in Denver is being tested, the Orion for the EM-1 mission is nearly complete and is being assembled in Florida at NASA's Kennedy Space Center in the Operations and Checkout Building.

To enable engineers to catch problems on the ground and prevent them from occurring in space, testing on Orion's structural twin will, in some phases, push expected pressure, vibration and shock conditions up to 40 percent beyond the most severe conditions anticipated during the mission to confirm that the craft can weather any environment it encounters in deep space.

Invaluable to the mission, the tests on Orion's twin in Colorado provide a way to validate Orion structurally, and enable engineers to push that structure past design standards, without slowing down the progress of the EM-1 flight vehicle's construction in Florida.

During a typical mission, Orion goes through multiple configurations, so the testing is broken into different states to mimic the flight configuration and conditions; such as launch, Earth reentry, and parachute deployment. They are centered on Orion's three main sections, the crew module, launch abort system (LAS) and service module, which are identical to Orion structurally, but are missing critical non-structural items such as the vehicle's computers, propulsion and seats or its "guts"—not required for these tests.

Learn more at: [lmt.co/2xLD9Cz](http://lmt.co/2xLD9Cz)

# MARK GEYER NAMED JOHNSON SPACE CENTER DIRECTOR



NASA Johnson Space Center's (JSC) mission is to lead human space exploration, and that is exactly what former Center Director Dr. Ellen Ochoa did in her 30 years with NASA. As a pioneer not only as an astronaut and the first Latina center director, but also in diversity and inclusion within the Center, Dr. Ochoa will be missed. But as she said in her goodbye, she is leaving JSC in good hands. Mark Geyer was named JSC's newest director, the 12th for the Center. He began his NASA career in 1990. Since then, he worked in a variety of human spaceflight fields such as the International Space Station

Program and Orion, which he led as program manager from 2007 through Exploration Flight Test-1 in December 2014. Most recently, Geyer served as the Acting Deputy Associate Administrator for the Human Exploration and Operations Mission Directorate at NASA Headquarters in Washington, DC. With experience working with international counterparts, coordinating efforts between different Centers around the country, and his direct experience with Orion, Geyer looks forward to leading JSC into deep space exploration and furthering NASA's leadership in human spaceflight.

# IN A CLASS OF THEIR OWN



NASA'S 2017 astronaut class recently toured NASA's Kennedy Space Center to get an up-close look at launch pads, test facilities, and assembly work on the Exploration Mission-1 Orion spacecraft. They were able to learn more about and see progress towards EM-1, which will test all of

the systems and components in preparation for Exploration Mission-2, the first crewed Orion flight which may be taking one of them farther into space than any astronaut has ever gone before.

# STELLAR ORION TEAM MEMBERS RECOGNIZED AT RNASA



The Rotary National Awards for Space Achievement (RNASA) Foundation holds an annual event to recognize outstanding achievements in space and create greater public awareness of the benefits of space exploration. This year's event honored former NASA Acting Administrator Robert Lightfoot with the National Space Trophy and actor William Shatner as the 2018 Space Communicator. Orion team members were recognized for the following achievements and contributions towards getting humans out into deep space:

## Early Career Stellar Award

**Elishabet Lato of Orbital ATK** - Outstanding leadership of the Orion attitude control motor energetics development and qualification, and community service through AIAA leadership and STEM activities.

## Middle Career Stellar Awards

**Jerry Draper of Lockheed Martin** - Outstanding technical achievement in inventing the new Orion heat shield block architecture and upgrading the re-entry design for lunar and Mars mission returns.

**William E. Green of Orbital ATK** - Outstanding leadership, technical excellence and dedication to the Orion Launch Abort Attitude Control Motor Controls team success.

## Late Career Stellar Award

**Frank Salazar of CACI** - Significant engineering knowledge and expertise contributing to the design of numerous human spaceflight pyrotechnic hardware systems, including multiple parachute elements of the Orion Program.

## Team Stellar Awards

**Orion Launch Abort System Propulsion Team of Lockheed Martin** - Outstanding accomplishment in successfully completing two high-visibility hot fire tests to validate solid rocket motor designs for NASA's Orion Launch Abort System.

**Orion Spacecraft Test and Qualification Team of Lockheed Martin** - Outstanding execution of the Orion spacecraft test program in support of NASA's Exploration Missions EM-1, EM-2 and beyond.

More details of the 2018 RNASA event can be found at: [rnasa.org](http://rnasa.org)

**Pictured above are the 2018 RNASA Middle Career Stellar Award winners.**

# INSPIRING GIRLS TO PURSUE STEM

Throughout the year, a group of 3rd-5th grade girls from McWhirter Elementary participated in a STEM after school program led by Girls, Inc. in partnership with Lockheed Martin Women's Impact Network members in Houston. The students took part in different experiments, using the engineering process to design acoustical devices, catapults, and rocket launch towers out of everyday materials. In addition, the students learned about notable female scientists and engineers, and also took part in team-building exercises. To end the year with a memorable event, Orion team members put together a tour for the girls to see NASA's Johnson Space Center. Not only were the girls able to see spacecraft mock-ups, Rocket Park and the Mission Control Center; they were able to meet and talk with women STEM professionals to see what their future may hold. The highlight of their tour was meeting JSC Center



Director Dr. Ellen Ochoa, who shared with them her experience as an astronaut and what they can pursue if they want.

# OCEANEERING HOSTS HOUSTON SUPPLIERS



Oceaneering Space Systems hosted a space exploration open house for Houston area suppliers to hear program updates on Orion and the Space Launch System rocket led by Lockheed Martin Orion Deputy Program Manager Larry Price, Boeing Program Manager Mark Mulqueen, and Orbital ATK Vice President Brian Duffy.

Congressman John Culberson (R-TX), made a special appearance at the event to tour Oceaneering's precision machining and fabrication shops and thank the employees for their hard work on the Nation's space exploration endeavors.

# MAINE CELEBRATES SPACE DAY

Exploration Systems Museum Alliance Liaison Patricia Moore shared NASA's deep space exploration story with five rural schools in Maine during an annual National Space Day education initiative that promotes science, technology, engineering, and mathematics to thousands of students across the state. The capstone event at Brunswick Junior High School on May 4 was attended by Senator Angus King (I-ME) and Mike Lippold (at right), advanced development manager at Orion supplier Fiber Materials, Inc., also led three

classroom presentations and shared the work his company is doing to support Orion's efforts.

Fiber Materials, Inc. develops and manufactures high temperature materials and composites for use in industrial, commercial, and aerospace applications. The company built three different components for the Orion Launch Abort System attitude control motor using carbon-carbon silicon carbide composite material.



# DESTINATION IMAGINATION

Orion team members Matt Lemke (NASA) and Trevor Wagoner (Jacobs), along with Marshall Smith (Exploration Systems Development, NASA Headquarters) helped staff a NASA booth at the Destination Imagination Global Finals at the University of Tennessee where nearly 8,000 students from approximately 15 countries attend every year. This year's theme for the NASA exhibit was "Past. Present. Future." with NASA's deep space human exploration programs highlighting the Future section. Attendees were able to experience an Oculus Virtual Reality of SLS on the launch pad and the interior of Orion during a countdown, a 30-ft. tall SLS inflatable, interactive games to learn more about Orion, and other information to share how NASA is leading the way back to the Moon and beyond.



# SUPPLIER SPOTLIGHT

## DAMPING TECHNOLOGY, INC.



Founded in 1989 in Mishawaka, Indiana, Damping Technology, Inc. (DTI) is a small business focused on developing, designing, and manufacturing noise and vibration control solutions. DTI was selected as Orion's Small Business of the Year for providing outstanding support to the Launch Abort System (LAS) team. After months of collaboration with Orion engineers, DTI developed a constrained layer damping system to reduce ogive fairing vibration and mitigate the high

dynamic environment impacts to the spacecraft during an abort. Program Managers Mark Kirasich (NASA) and Mike Hawes (Lockheed Martin) awarded DTI the Rigel Award at an Orion Program Management quarterly review in March 2018. Every year, Lockheed Martin presents the Rigel Award to a small business that performs above and beyond their Orion-specific contractual commitments.

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

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# JUNE 2018

STEM Day at Fenway Park/Boston

Honeywell recognition in Arizona

Supplier events in Tennessee and New Hampshire



# SPACE LAUNCH SYSTEM

MAY 2018

**BUILD UP  
TO THE BIG  
SQUEEZE**

# SLS MANUFACTURING, TESTING HEATS UP



The EM-1 liquid hydrogen tank has completed priming and is being prepared to be coated with thermal protection foam at NASA's Michoud Assembly Facility in New Orleans.

Just in time for summer, SLS manufacturing and testing is heating up. At Michoud Assembly Facility near New Orleans, every major section of the core stage for the first mission, *Exploration Mission-1 (EM-1)*, is structurally assembled. Currently, technicians are installing internal hardware and performing checkout tests. Core stage prime contractor Boeing is completing the outfitting for the forward skirt, liquid oxygen tank and intertank.

All wire harness installations are complete in the core stage forward skirt and intertank. And, in late May, technicians brought part of the rocket to life when they powered on the flight computers and avionics subsystems as part of a functional test of the forward skirt avionics. The liquid oxygen tank was the first flight tank to complete priming and application of the thermal protection system.

Later this year, those forward (or top) sections of the core stage will be vertically stacked and eventually integrated with the aft (or bottom) section of the stage. Work is also underway on the hydrogen tank, engine section and boat tail, which will be stacked vertically. Then, both halves of the core stage will be connected horizontally. Boeing is also completing the last two core stage test articles, which will be used for structural testing to give engineers real-world data on how the hardware responds to millions of pounds of forces and loads.

Meanwhile, engineers at Marshall Space Flight Center continue to set up the third of four SLS test articles for structural testing. Test stand buildup around the intertank test article continued at Marshall in May and about 48 tests are scheduled to begin this summer. Structural testing on the core stage engine section and the upper stage/payload section articles is complete.

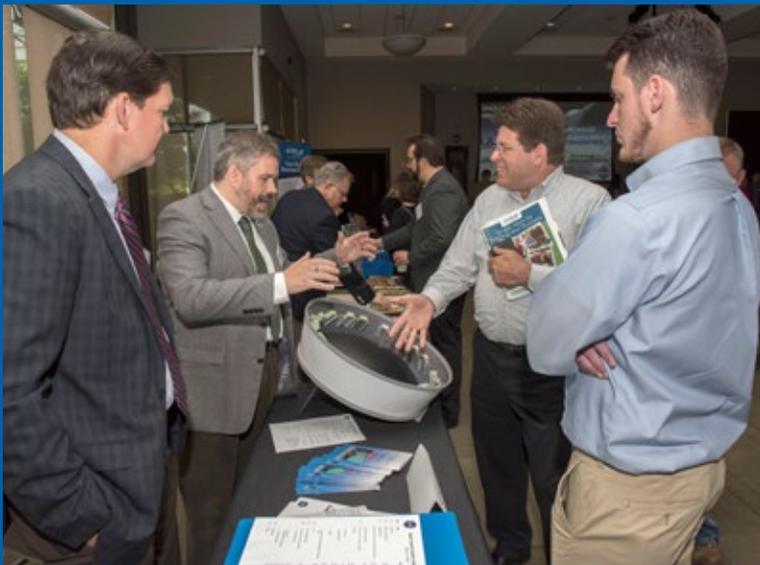
After two RS-25 tests early this year, Stennis Space Center temporarily shut down the A-1 test stand for improvements that include enabling Aerojet Rocketdyne engines to be gimbaled for future hot-fire tests. Engine testing is scheduled to resume in August with a ground test engine equipped with a new main combustion chamber that will be incorporated into future production engines.

Boosters prime contractor Orbital ATK is continuing work on the EM-1 solid rocket motors, with all 10 segments cast and five complete. Nozzles and booster separation motors for the first flight are also complete.



Boosters prime contractor Orbital ATK has cast all 10 motor segments for EM-1.

# SLS PROGRAM WELCOMES SMALL BUSINESSES TO INDUSTRY DAY



More than 400 business representatives from large and small businesses, as well as prime contractors and subcontractors, attended an industry day May 22, hosted by NASA's Marshall Space Flight Center. Small business owners talked to SLS managers and prime contractors at the event to learn about opportunities for working on the SLS rocket that will send astronauts to the Moon and beyond. More than 1,100 companies from 44 states, including many small businesses, are helping to build SLS.

## NEW HAMPSHIRE SUPPLIERS PLAY KEY ROLES

NASA's SLS rocket, being built to return astronauts to the Moon and carry larger, heavier payloads to deep space, is being built all over the United States by large and small companies. Truly America's rocket, SLS has suppliers in more than 44 states and each company plays a key part in returning astronauts to deep space.

In May, the SLS Program partnered with prime contractors Boeing, Orbital ATK, and Aerojet Rocketdyne to visit suppliers in New Hampshire to update them on overall progress in manufacturing the first vehicle for EM-1, the first integrated flight of SLS and Orion, launching from modernized facilities at Kennedy Space Center. Astronaut and U.S. Navy Captain Barry "Butch" Wilmore emphasized the importance of the work of the key Granite State suppliers. Each part of the rocket and the Orion crew vehicle are designed and tested to ensure they will be safe for astronauts.

The NASA and Industry team, with astronaut Wilmore in tow, visited Haigh Farr in Bedford, which provides couplers and antennas for the SLS core stage. The team also visited Henkel in Seabrook which manufactures adhesives used on the solid rocket booster nose caps, frustums, systems tunnels and forward and aft skirts. The final stop for the team was Smiths Titeflex in Laconia, which

manufactures all external plumbing for the RL-10 engines that power the interim cryogenic propulsion stage. The EM-1 interim cryogenic propulsion stage with its Aerojet Rocketdyne RL-10B2 engine, was completed and delivered to the Exploration Ground Systems (EGS) Program in 2017.



## NASA'S ROCKET SCIENCE IN 60 SECONDS

### THIS MONTH: SECONDARY PAYLOADS



Calling all aspiring rocket scientists, engineers, and students—and well, all rocket enthusiasts! [NASA's "Rocket Science in 60 Seconds"](#) video series breaks down complex topics into snack-sized information chunks. So if you're hungry for some rocket science, check out this month's portion featuring Dr. Kimberly Robinson explaining how shoebox-sized payloads will be getting a ride in the skyscraper-sized SLS rocket.

## HOUSTON, WE HAVE A PODCAST: EPISODES 41 AND 42

Marrying engrossing story telling and rocket science, episodes 41 and 42 of [Houston, We Have a Podcast](#) will help you stay up-to-date on all things SLS and learn about the large and small payloads the rocket will deliver to the Moon and even farther into deep space. And, you can listen while you're out for a walk, or commuting, or cleaning, or on the treadmill (or the couch if that's your speed). Really, the possibilities for listening and learning are almost as vast as deep space. Check out [Part 1 here](#) and [Part 2 here](#).



# I AM BUILDING SLS: BETH ST. PETER

Years before SLS soars off the launch pad, Beth St. Peter and her team plan how to capture the images NASA needs not only to document the historic launch but also to capture important engineering data. St. Peter and her team coordinate with engineers at NASA's Kennedy Space Center in Florida, Johnson Space Center in Houston, and Langley Research Center in Hampton, VA, to use the cameras on the rocket, on the ground, and in the air to document how the rocket lifts off, clears the mobile launcher, and travels during ascent. Using photography to measure distances between objects is called photogrammetry and the black-and-white checkerboards on the rocket are targets for the cameras.

Read the full story at: [go.nasa.gov/2JfDYVp](http://go.nasa.gov/2JfDYVp)

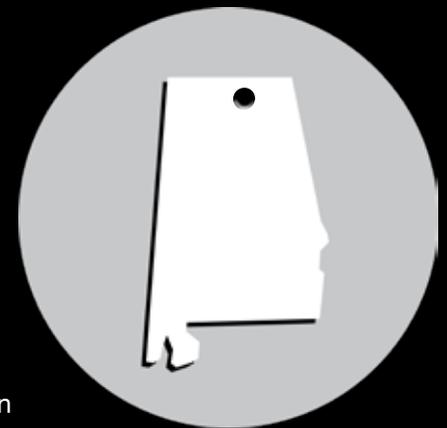


## SPACEFLIGHT PARTNERS: *Emerald City Initiatives, Inc. (ECI)*

**NUMBER OF EMPLOYEES:** 10

**LOCATION:** *Huntsville, AL*

**WHAT THEY DO FOR SLS:** ECI provides project coordination and assistance with verification and data deliveries, in addition to being a key resource for design and development of the EM-1 launch vehicle stage adapter, which will partially cover the interim cryogenic propulsion stage and connect the core stage to the Orion stage adapter. Launch vehicle stage adapter prime contractor Teledyne Brown Engineering Huntsville, selected ECI, a woman-owned small company with offices in Grant and Huntsville, AL, to collaborate on the design, assembly and supporting data needed to successfully manufacture the EM-1 launch vehicle stage adapter, scheduled to be completed later in 2018.



### FOLLOW THE PROGRESS OF NASA'S NEW LAUNCH VEHICLE FOR DEEP SPACE:

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## JUNE 2018

Go inside the intertank structural test article

Boosters progress for first two missions

Connecting to mission and launch control



# EXPLORATION GROUND SYSTEMS

H I G H L I G H T S

M A Y 2 0 1 8

## CRAWLER- TRANSPORTER 2 TESTS WEIGHT OF MOBILE LAUNCHER



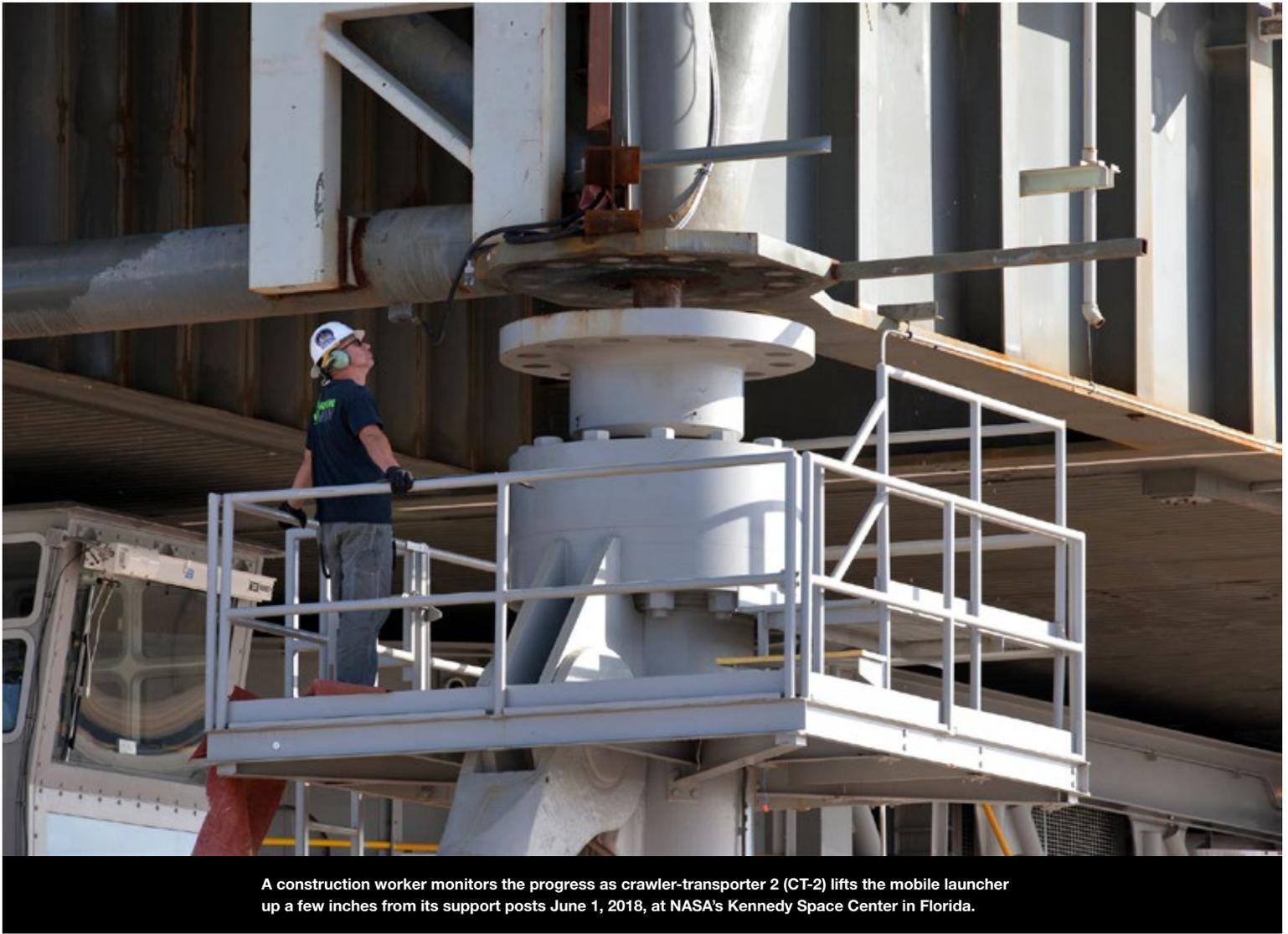
# CRAWLER-TRANSPORTER 2 LIFTS MOBILE LAUNCHER

A construction worker monitors the progress as crawler-transporter 2 (CT-2) lifts the mobile launcher up a few inches from its support posts June 1, 2018, at NASA's Kennedy Space Center in Florida.

Three lifts were performed to practice lifting procedures, validate interface locations, confirm the weight of the mobile launcher, and develop a baseline for modal analysis.

The mobile launcher is equipped with a number of lines, called umbilicals, which will connect to NASA's Space Launch System (SLS) and Orion. The lift helped to test the capability of the upgraded CT-2 to handle the weight of the mobile launcher.

Exploration Ground Systems is preparing the ground systems necessary to support the SLS and Orion spacecraft for Exploration Mission-1 and deep space missions. Photo credit: NASA/Kim Shiflett



A construction worker monitors the progress as crawler-transporter 2 (CT-2) lifts the mobile launcher up a few inches from its support posts June 1, 2018, at NASA's Kennedy Space Center in Florida.

# LAUNCH PAD 39B FLAME TRENCH NEARS COMPLETION

The nearly 9 million pounds of thrust expended during lift-off of the Agency's new Space Launch System (SLS) rocket would cause quite a bit of damage if it wasn't for modifications made to Launch Pad 39B. Exploration Ground Systems at NASA's Kennedy Space Center in Florida achieved a significant milestone on the path to supporting the Agency's first integrated launch of the SLS and Orion spacecraft by completing the major construction on the main flame deflector in the upgraded flame trench at Pad B.

"With a lot of hard work, a lot of bricks, and tons of steel, we now have a flame trench and deflector system ready to support SLS," said Regina Spellman, EGS pad senior project manager. "It has been truly exciting to see the main flame deflector come together."

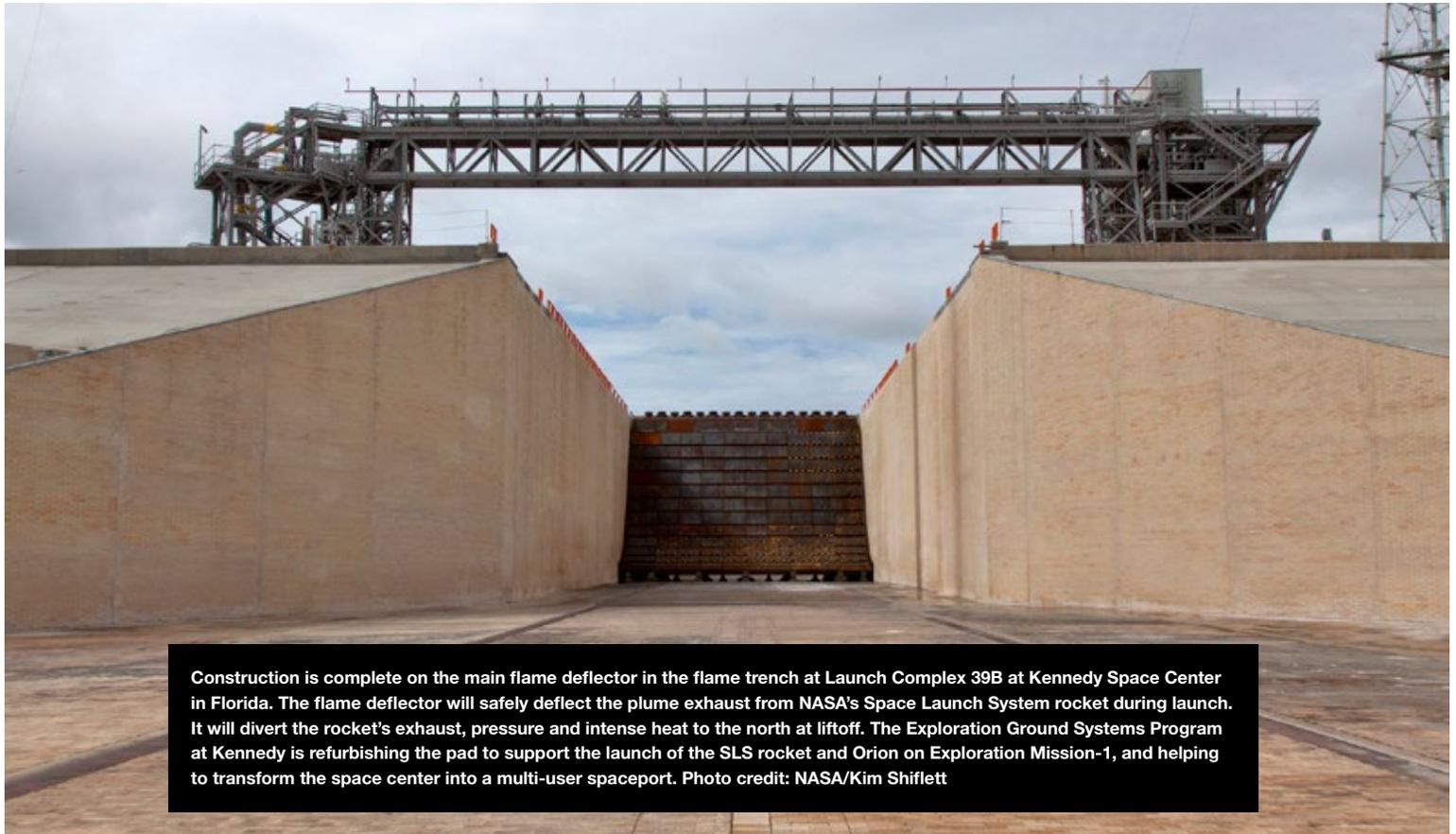
The new main flame deflector is critical to safely deflecting the plume exhaust from the massive rocket during launch. Measuring approximately 57 feet wide, 43 feet high and 70 feet long, the deflector's north side is slanted at about a 58-degree angle and will divert the rocket's exhaust, pressure and intense heat to the north at liftoff. Two side deflectors soon will be installed. They will help to contain and protect the vehicle and surrounding pad structures from the solid rocket boosters during liftoff.

Construction began on the main flame deflector in July 2017. The deflector incorporates several novel design approaches, including steel cladding plates, an open structure on the south side, and a configuration that maximizes functionality with commercial launch vehicles. The open south side allows easy access for inspection, maintenance, and repair.

"The thick steel plates are designed to withstand the exhaust and heat from several launches," said Nick Moss, EGS pad deputy project manager. "There is flexibility of maintenance; as steel plates closest to the exhaust plume begin to erode, they can be replaced."

New water pipes used for sound suppression were installed on the crest of the main flame deflector. At launch, thousands of gallons of water flow from a tank through the pipes and out to cool the main flame trench and absorb and re-direct shock waves while reducing sound levels that can damage the vehicle and surrounding structures.

Read the full story at: <https://go.nasa.gov/2xs6fGY>



Construction is complete on the main flame deflector in the flame trench at Launch Complex 39B at Kennedy Space Center in Florida. The flame deflector will safely deflect the plume exhaust from NASA's Space Launch System rocket during launch. It will divert the rocket's exhaust, pressure and intense heat to the north at liftoff. The Exploration Ground Systems Program at Kennedy is refurbishing the pad to support the launch of the SLS rocket and Orion on Exploration Mission-1, and helping to transform the space center into a multi-user spaceport. Photo credit: NASA/Kim Shiflett

# MESSAGE FROM EM-1 LAUNCH DIRECTOR



Teammates,

Every day we make progress towards our goal of deep space exploration. As we march towards EM-1, the first launch of NASA's powerful Space Launch System rocket, there is excitement as we complete our critical milestones and prepare for the flight hardware processing. I wanted to take a few moments to share with you some of the recent accomplishments made by our Exploration Ground Systems Program as we prepare for the EM-1 launch.

Recently, members of our team conducted a launch countdown cryogenic loading demonstration. As the EM-1 Launch Director, this simulation allowed myself, and members of our launch team, the opportunity to rehearse and prepare for launch day. During this simulation, we were able to identify and address areas that could be improved within our emulation and training capabilities. We also conducted a variety of simulated problem scenarios to evaluate our communications protocol and day of launch work sequencing.

I'm extremely proud of this team, the hard work they did preparing for, and executing this demonstration. We have plans for more launch countdown simulations in the future and I look forward to seeing what the sim team has in store for us. I would also like to take a moment to thank my team for their hard work to make this simulation possible.

To the Moon and beyond!

Sincerely,  
Charlie Blackwell-Thompson  
Launch Director  
Exploration Ground Systems



*EXPLORATION MISSION-1*

# WATER DELUGE TEST COMPLETED AT LAUNCH PAD 39B



About 450,000 gallons of water flowed at high speed from a holding tank through new and modified piping and valves, the flame trench, flame deflector nozzles, and mobile launcher interface risers during a wet flow test on May 24, 2018, at Launch Pad 39B at NASA's Kennedy Space Center in Florida.

At peak flow, the water reached about 100 feet in the air above the pad surface. The test was performed by Exploration Ground Systems to confirm the performance of the Ignition Overpressure/Sound Suppression system. During launch of NASA's Space Launch System rocket and Orion spacecraft, the high-speed water flow will help protect the vehicle from the extreme acoustic and temperature environment during ignition and liftoff.

## CRAWLER-TRANSPORTER 2 TAKES A TEST SPIN TO LAUNCH PAD 39B



Crawler-transporter 2 (CT-2) moved slowly up the ramp to the surface of Launch Pad 39B for a fit check on May 22, 2018, at NASA's Kennedy Space Center in Florida. The test drive to the pad confirms that all of the recent modifications to CT-2 and Pad 39B are operational to support the launch of the agency's Space Launch System rocket and Orion spacecraft on Exploration Mission-1.

Exploration Ground Systems managed the modifications and upgrades to CT-2 and Pad 39B to prepare for EM-1 and deep space exploration missions.

# EGS ALL-HANDS MEETING YIELDS “SHARK TANK” WINNERS

Recently, Exploration Ground Systems held an all-hands meeting for employees. During the event, Jennifer Kunz, Deputy Program Manager, described entries and announced the results of the EGS Shark Tank “Unlocking Innovation” event.

Groups and individual workers in EGS pitched their innovative ideas to senior management, including Kunz, and EGS Program Manager Mike Bolger. Ten ideas were selected and the winners were announced during the meeting.



## **Unlocking Innovation Winners**

### **Model based Work Instructions**

Paul Schwindt

### **Mega Training Work Station**

Dean Orr

### **Technical Training classroom(s)**

Kelly Hunter, Dwain Hamilton, and Linda Esposito

### **VOICE IT (Vocera Option: Interactive Comm and Efficiency Improvement Tool)**

Katrine Stelges, Ray Zink, and Steve Defeo

### **Implement RFID tags to all A# parts supporting the EGS Program**

Bill Stinson, Griffin Lunn, and Corey Jones

## **Visual EGS Program Document Tree**

Kevin Ingoldsby

### **Model-Based Definition (MBD) Tools for Element-Element Relationship Evaluation**

John Ingalls and Kevin Kelleher

### **Smart parts to allow a “McCaster-Carr” experience**

Griffin Lunn, Corey Jones, and Paul Schwindt

### **Analysis of remote pressure gauge analog information from a video feed**

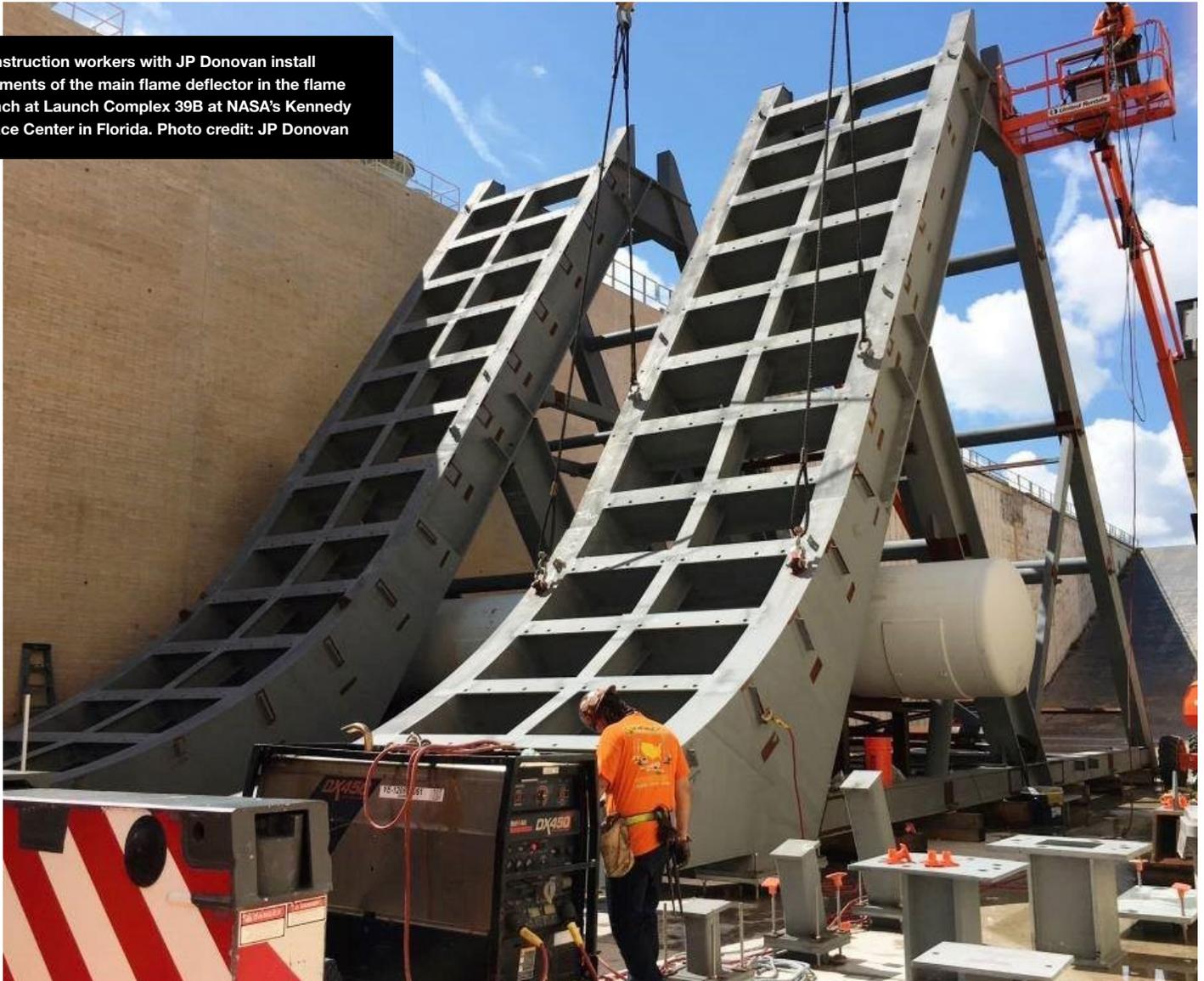
Edwin A. Corte and Mike D. Fore

### **EGS Training and Development Feedback Database**

Rebecca Baturin and Megan Yohpe

# EGS SUPPLIERS SPOTLIGHT

Construction workers with JP Donovan install segments of the main flame deflector in the flame trench at Launch Complex 39B at NASA's Kennedy Space Center in Florida. Photo credit: JP Donovan



## **JP Donovan Construction Inc.**

Rockledge, Florida

JP Donovan is a general contracting firm specializing in aerospace, heavy civil and marine construction. Headquartered in Rockledge, FL, JP Donovan is a third-generation contractor with immense knowledge of construction management. The company successfully completed projects for NASA's Exploration Ground Systems (EGS) Program at Kennedy Space Center. Recent projects include installing the umbilical arms and ground support equipment on the 355-foot-tall mobile launcher (ML). The ML will be used to assemble, test, roll out, and launch the Agency's Space Launch System rocket with the Orion spacecraft atop, for Exploration Mission-1. JP Donovan also installed a new main flame deflector in the flame trench at Launch Complex 39B.



# Did You Know...



Watch a video infographic about the crawlerway at [https://youtu.be/7\\_Api3f49LE](https://youtu.be/7_Api3f49LE).

View the EGS 2017 Year in Review at <https://go.nasa.gov/2C9twKC>.

National Aeronautics and Space Administration

**John F. Kennedy Space Center**  
Kennedy Space Center, FL 32899

[www.nasa.gov](http://www.nasa.gov)

SP-2018-06-667-KSC

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