National Aeronautics and Space Administration

ESD

Exploration Systems Development

Combined Monthly Report August 2016

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NASA'S JOURNEY TO

MARS

National Aeronautics and
Space Administration

ORION

AUGUST 2016

ORION GETS FIRED UP!

ORION'S MONTHLY HIGHLIGHTS

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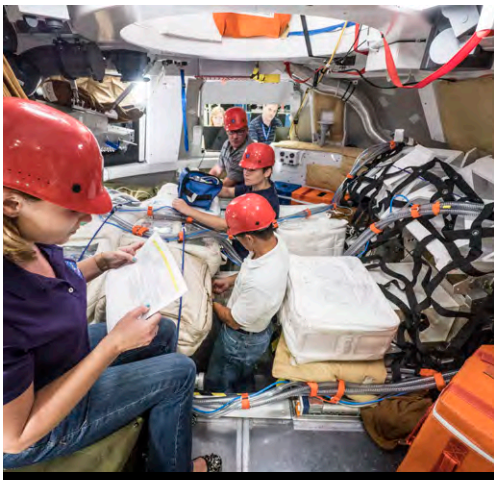

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Left to right: Howard Hu (NASA), Robert Decoursey (NASA), Cheryl Rehm (Aerojet Rocketdyne), Roger McNamara (Lockheed Martin), Jim Paulsen (Aerojet Rocketdyne), Sasha Ellis (NASA) and Don Mahr (Aerojet Rocketdyne) pose in front of the Orion Jettison Motor test stand following the test firing.

AEROJET ROCKETDYNE COMPLETES SUCCESSFUL JETTISON MOTOR TEST

You often don't think that something the size of a college dorm refrigerator is capable of lifting two schools buses off the ground, but that is exactly the case with Orion's jettison motor. At the end of August, representatives from NASA, Lockheed Martin, Aerojet Rocketdyne and local congressional staff including Representative Bera (D-CA), Rep. Matsui (D-CA) and Rep. McClintock (R-CA) gathered to watch the third development jettison motor for Orion generate 45,000 pounds of thrust during a 1.5 second test firing in Sacramento, California.

One and half seconds may seem like an extremely short time, but that is all the time required to separate Orion's launch abort system (LAS) from the crew module. The LAS consists of three solid rocket motors: the abort motor that pulls the crew module away from the launch vehicle; the attitude control motor that is used to steer the crew module following an abort; and the jettison motor, which separates the launch abort system from the crew module.

This most recent test of the jettison motor provided Aerojet Rocketdyne and Lockheed Martin key data, including pressure, temperature, thrust, acceleration and strain measurements to ensure their readiness to begin manufacturing the qualification and flight production motors for Exploration Mission-1 (EM-1).

Senior leadership from NASA, Lockheed Martin and Aerojet Rocketdyne welcome Congressman Ami Bera (at right) to watch the jettison motor test.

To watch video of the test, visit: http://bit.ly/OrionJettisonTestVideo

Read how Orion's Launch Abort System Motor Gets Fired-Up About the Journey to Mars at: http://bit.ly/OrionFiredUp

Astronauts Stephanie Wilson, Karen Nyberg and Rick Mastracchio check out Orion's docking hatch.

HATCHING NEW IDEAS FOR SPACECRAFT DESIGN

Engineers and astronauts conducted testing in a representative model of the Orion spacecraft at NASA's Johnson Space Center to gather the crew's feedback on the design of the docking hatch and on post-landing equipment operations. The testing, shown here with astronauts Stephanie Wilson, Karen Nyberg and Rick Mastracchio (L to R), was done to evaluate the equipment used during egress to ensure that a fully suited crew member carrying survival equipment can get out of the spacecraft through the docking hatch if necessary.

While the crew will primarily use the side hatch for entry and exit on Earth and the docking hatch to travel between Orion and a habitation module on long-duration deep space missions, the crew will need to be able to exit out of the docking hatch if wave heights in the Pacific Ocean upon splashdown are too high. The work is being done to help ensure all elements of Orion's design are safe and effective for the crew to use on future missions on the journey to Mars.

Orion Backstage Video: **http://bit.ly/OrionHatchBackstage**

Astronaut Anne McClain and Orion engineers and astronauts evaluate radiation sheltering procedures inside the Orion mockup at Johnson Space Center in Houston.

ORION CREW LEARN HOW TO SHELTER IN SPACE

Radiation shelter evaluations were conducted in a full-scale Orion mockup at NASA's Johnson Space Center in August to determine the amount of time astronauts would need to complete crew cabin reconfiguration to create a safe haven from deep-space radiation in the event of a solar particle event.

The Orion crew will take shelter in the central stowage bays, which can accommodate four crew members. The stowage components double as radiation shielding blocks when they are strategically repositioned at specific locations around the crew cabin to optimize protection. The cabin reconfiguration is an operations intense process that requires about 30 to 60 minutes to complete.

Spaceflight veteran Dr. Don Pettit participated in the exercises to provide real-time feedback from an astronaut's perspective. The radiation protection team assessed the desired mass density and material properties best suited for radiation shielding to meet requirements.

As part of an ongoing international collaboration between Lockheed Martin and StemRad Israel, the radiation protection design team is working on the development of a personal radiation shield that could provide radiation protection comparable to that inside the Orion shelter but with improved mobility of crew during solar particle events, which can occur anytime and on very short notice.

Astronaut radiation protection is essential to human exploration of deep space because astronauts will be traveling outside the protection of the Earth's magnetosphere and exposed significantly harsher radiation beyond Earth's orbit. Without adequate protection, the crew could experience detrimental health effects including increased risk for certain cancers.

Orion is NASA's first stand-alone spacecraft to implement radiation protection engineering as an integral part of the design process from the very early development stages of the preliminary design review.

Read the facts: http://bit.ly/OrionRadiationFS

ORION SPLASHDOWN TESTS KEEP ASTRONAUTS SAFE

Ellen Ochoa, director, NASA Johnson Space Center speaking with attendees of a NASA Social at the Orion splashdown test taking place Aug. 25 at NASA's Langley Research Center.

Onlookers gathered near the Hydro Impact Basin at NASA's Langley Research Center in Hampton, Virginia, applauded and cheered as they witnessed the simulated water landing of the Orion spacecraft, through the use of a 7.2-ton mockup covered with sensors capable of detecting forces that the structure and its astronaut crew would experience.

The drop was the ninth in a series of 10 tests taking place at Langley's Landing and Impact Research Facility. It was designed to simulate one of the Orion spacecraft's most stressful landing scenarios, a case where one of the capsule's three main parachutes fails to deploy. That would cause Orion to approach its planned water landing faster than normal and at an undesirable angle.

Under ideal conditions, the Orion capsule would slice into the water of the Pacific Ocean traveling about 17 miles per hour. Thursday's test had it hitting the pool at about 20 mph, and in a lateral orientation. Instead of being pushed down into their seats, astronauts in this scenario would splashdown to the side.

The tests at Langley — along with many others across the agency — are leading up to the first integrated flight of the Space Launch System (SLS) and Orion known as Exploration Mission-1. There will be no crew on EM-1, but it will prepare the way for future missions with astronauts as NASA pushes ahead on its journey to Mars.

To read the full article, visit: http://bit.ly/OrionSplashdown

A COOL TEST FOR CREW SAFETY

The third and final Launch Abort System (LAS) abort motor igniter qualification static test firing was successfully performed at the Orbital ATK test facility in Promontory, Utah, the morning of August 9. This igniter was conditioned by cold temperature cycles (25-35 degrees Fahrenheit) and vibration testing prior to the cold condition static test.

Conducting igniter static tests is part of the design, development, test and evaluation program. Igniters are tested to validate engineering models, and verify predicted performance after subjection to the expected extreme pre-operating and flight conditions. The three igniter tests consisted of nominal, hot (95-105 degrees Fahrenheit) and cold temperature extremes to qualify the igniter prior to operational production.

This test is a significant milestone for Orion and an important step forward on the path to full qualification of the abort motor for the LAS. A full-scale abort motor static test firing is planned for mid-2017.

HOT SHOT DELIVERY!

The heat shield that will protect the Orion crew module during reentry after the spacecraft's first uncrewed flight atop NASA's Space Launch System rocket in 2018 arrived at the agency's Kennedy Space Center in Florida on Aug. 25. The heat shield arrived aboard NASA's Super Guppy aircraft at Kennedy's Shuttle Landing Facility, and was offloaded and transported to the Neil Armstrong Operations and Checkout Building high bay.

The heat shield was designed and manufactured by Lockheed Martin in the company's facility near Denver. Orion's heat shield will help it endure the approximately 5,000 degrees F it will experience upon reentry. The heat shield measures 16.5 feet in diameter and is the world's largest structure of its kind.

MULTI-PAYLOAD PROCESSING FACILITY PROVIDES 'GAS STATION' FOR ORION

The first stop when loading up the family car to go on a long trip usually is the gas station. Before NASA's Orion spacecraft launches on deep-space missions, an important step to "fill 'er up" will include a visit to the Multi-Payload Processing Facility (MPPF) at the agency's Kennedy Space Center in Florida.

At the MPPF, Orion will receive its flight load of propellant, high pressure gases and coolant in a building where recently completed modifications now are being tested.

The Orion crew module for EM-1 now is being assembled inside the Neil Armstrong Operations and Checkout Building at Kennedy. The next step will be to mate the spacecraft to its service module. The combination then will move to the MPPF.

Once commodity loading and tests are completed in the MPPF, the next stop will be the Launch Abort System Facility where the Orion spacecraft will be fitted with its launch abort tower and fairing assembly. From there, it's on to the Vehicle Assembly Building for mating to the SLS rocket prior to rollout to Launch Complex 39B.

Read the full article at: http://bit.ly/OrionGasStation

Left-to-right: Bob Kamm (Space Coast Transportation Planning Organization); Percy Luney (Space Florida); Joe Mayer (Lockheed Martin), John Murray (Port Canaveral), Todd Pokrywa (The Viera Company); and Lynda Weatherman (Economic Development Commission of Florida's Space Coast). Photo Credit: Jim Carchidi – Orlando Business Journal

LOCKHEED MARTIN TALKS ORION/SPACE EXPLORATION IN ORLANDO

Joe Mayer with Lockheed Martin Government Relations in Florida, discussed assembly of the Orion Exploration Mission-1 spacecraft and NASA's Journey to Mars during an Orlando Business Journal forum on "Business in Brevard" on Aug. 25. More than 200 attendees representing a broad cross section of businesses throughout the Space Coast area attended the lunch forum session that covered a range of topics important to Brevard county.

NASA's Lara Kearney and Astronaut Rick Mastracchio (middle) and Lockheed Martin's Chris Lacoste, Mark McCloskey and Josh Fineout in the Orion manufacturing area at NASA' Michoud Assembly Facility, New Orleans.

NASA AND INDUSTRY TEAM PARTNERS SHOWCASE JOURNEY TO MARS PROGRESS

NASA hosted events on August 18 to give social media users, news reporters and VIP guests a behind-the-scenes look at advancements in science, technology and human spaceflight operations to prepare for deep space exploration of our solar system on the agency's journey to Mars.

Attendees got a close-up look at some of the world's largest welding and manufacturing machines at NASA's Michoud Assembly Facility in Louisiana used on the Space Launch System rocket and Orion.

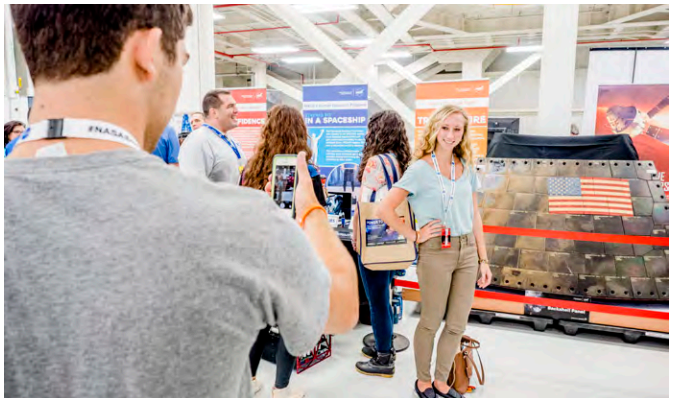
The Orion spacecraft manufacturing team at Michoud touches every structural piece of the Orion spacecraft from tip to tail for friction-stir welding operations, crew module assembly and structural integrity testing.

Following the event at Michoud, reporters traveled to NASA's Stennis Space Center in Mississippi where they

Continued to pg 10

got to witness a full duration test firing of one of the RS- 25 engines that will help propel NASA's new rocket far beyond Earth for space exploration missions beyond the moon. While at Stennis, attendees toured the Aerojet Rocketdyne rocket engine facilities and the B-2 test stand that is being renovated for SLS core stage testing.

NASA and industry team experts talked with media about technologies needed to explore the Red Planet, including SLS, Orion and ground systems operations, as well as habitat and lander development, landing site selection, propulsion, advanced manufacturing and robotic exploration.



To read the full article, visit: http://bit.ly/MichoudSocial

NASA PREPARES FOR ORION EUROPEAN SERVICE MODULE PROPULSION QUALIFICATION TESTING

Engineers are preparing for tests to qualify the propulsion subsystem, including the main engine, for Orion's European-built service module that will propel the spacecraft during different phases of flight in deep space. They will test engineering units of the spacecraft elements that will fly on Orion's first test flight with NASA's Space Launch System rocket in late 2018, moving the agency another step forward on its journey to Mars.

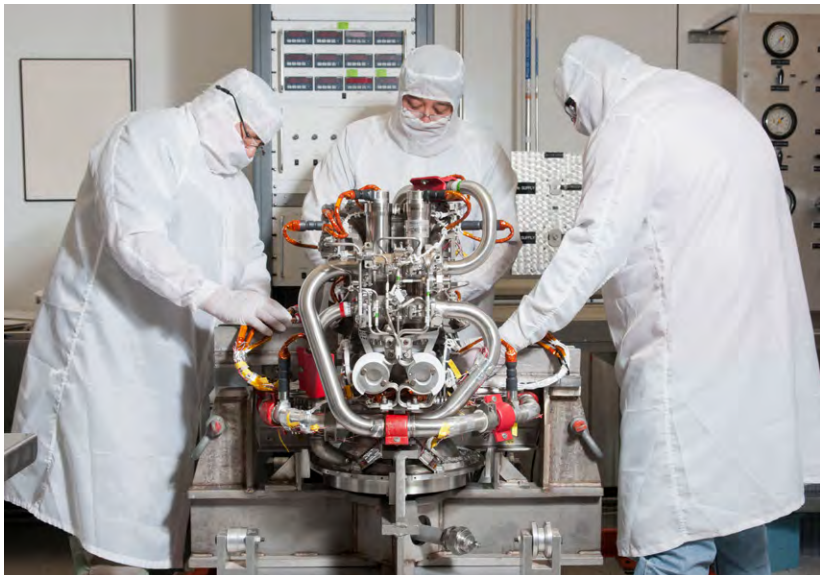
NASA is scheduled to test a propulsion qualification module including flight-like test units of the engine, propellant systems, and propulsion control units at the agency's White Sands Test Facility (WSTF) in New Mexico beginning in spring 2017.

Orion's service module main engine is a modified Orbital Maneuvering System (OMS) engine initially used on the space shuttle. NASA is repurposing the OMS engines for use in the European service module.

The Propulsion qualification module that will be used for testing is currently being assembled by ESA contractor, Airbus Defence and Space. It is scheduled for delivery to WSTF later this year. It consists of several helium tanks, propellant tanks, thrusters and flight-representative equipment such as piping, electronics, pressure control assemblies, a pressure regulation unit and propellant isolation equipment.

Data from the testing at WSTF will support verification of the proper operation of the service module propulsion system.

The propulsion team at White Sands Test Facility in Las Cruces, New Mexico, will test the engine for Orion's European Service Module.



While the main engine and test facilities are prepared for the spring hot-fire, the main engine for flight has been refurbished and acceptance tested at WSTF, and was shipped to NASA's Johnson Space Center in Houston for vibration testing. The vibration testing is helping to ensure the engine can withstand the loads induced by launch on the SLS rocket. Following testing at Johnson, the flight engine will be supplied to ESA to integrate into the Orion European service module for flight.

The Orion crew module for Exploration Mission-1 is transferred into the clean room inside the Neil Armstrong Operations and Checkout Building at Kennedy Space Center for installation of the spacecraft's critical systems, including propellant lines.

PROPELLENT TUBE WELDING BEGINS ON ORION EM-1 SPACECRAFT

Assembly of the Orion crew module for the first uncrewed flight test atop NASA's Space Launch System reached a significant milestone this month in the Neil Armstrong Operations and Checkout Building high bay at the agency's Kennedy Space Center in Florida. Lockheed Martin, manufacturer of Orion, and its subcontractor engineers, technicians and X-ray specialists completed the first propellant system tube welds on the exterior of the Orion pressure vessel.

Orion's propulsion lines are comprised of multiple metal tubes of varying lengths that are welded together around the vehicle. With the first tubes in place, X-ray specialists performed inspections of the welds for any imperfections. This process will be repeated as each of the remaining tube assemblies are completed along the exterior of the crew module in the clean room.

The propellant lines will provide hydrazine to the spacecraft thrusters during missions into deep space. The propellant lines complete a continuous connection from the propellant tanks in the aft bay of the crew module to the spacecraft's thrusters, which are part of the system that helps to steer the capsule during the mission.

Orion was moved from the birdcage assembly fixture and secured in the clean room for the first time in late July. The first propellant system weld was completed in the clean room. The spacecraft's critical systems, including the Environmental Control and Life Support System and propellant lines, will be completed in this room.

Read the full story at: http://bit.ly/OrionPropWelding

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**

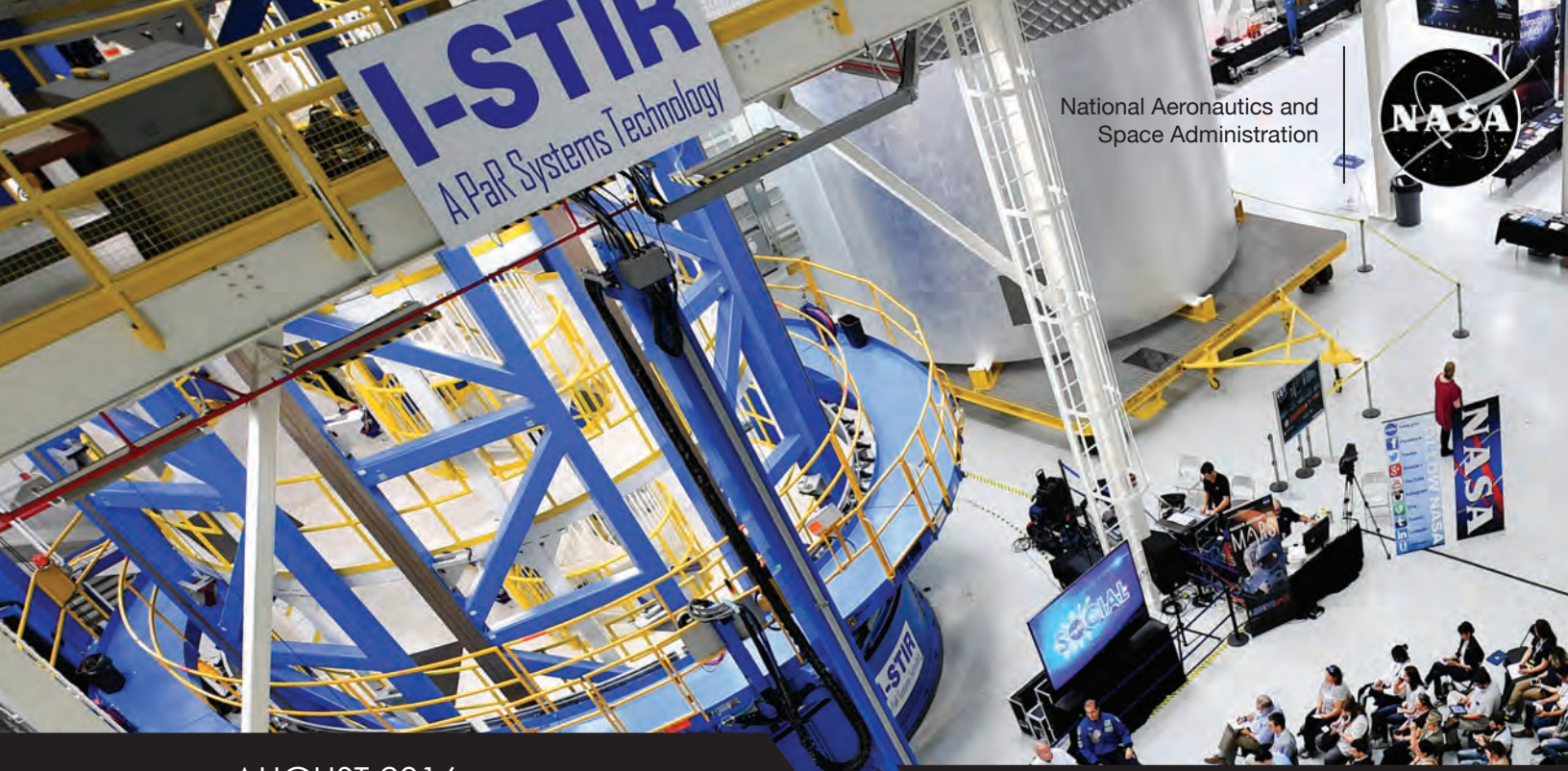
SEPTEMBER

Final Splashdown Test at LaRC

Journey to Mars Suppliers Visit KSC

Orion Participates in Fleet Week in San Diego

International Astronautical Congress Highlights



National Aeronautics and Space Administration

AUGUST 2016

SPACE LAUNCH SYSTEM HIGHLIGHTS

BEHIND THE SCENES OF NASA'S JOURNEY TO MARS

www.nasa.gov

Bill Hill, second from left, deputy associate administrator for the Exploration Systems Development at NASA Headquarters, talks about the Journey to Mars during a live NASA Social broadcast. During the broadcast, social media participants asked questions and heard from NASA officials about the agency's numerous efforts to enable human exploration on Mars.

'NASA MARS DAY' HIGHLIGHTS PROGRESS ON GETTING TO THE RED PLANET

It was all Mars, all day Aug. 18 at NASA's Michoud Assembly Facility in New Orleans and Stennis Space Center near Bay St. Louis, Mississippi. Dubbed "NASA Mars Day," The event gave hundreds of people, including members of the media and 85 NASA Social participants, a behind-the-scenes look at progress on the agency's Journey to Mars. The event included tours of Michoud, where the SLS core stage and key components of the Orion spacecraft are in production. In late 2018, SLS and Orion will launch together for the first time for an uncrewed flight test, and on future missions, the two will be capable of sending humans farther into space than ever before.

Social media participants also had the opportunity to ask questions and hear from NASA officials about numerous efforts being made now to enable human exploration on Mars. The panel for that discussion included Todd May, director of NASA's Marshall Space Flight Center in Huntsville, Alabama; Bill Hill, deputy associate administrator for the Exploration Systems Development at NASA Headquarters; Rick Davis, assistant director for Science and Exploration, Planetary Science Division at NASA Headquarters; John Vickers, principal technologist for the Space Technology Mission Directorate at Marshall; Katie Boggs, manager for Systems and Technology Demonstration at NASA Headquarters; and NASA astronaut Rick Mastracchio from Johnson Space Center in Houston.

A tour of Stennis and a successful hot fire of the SLS RS-25 development engine on the A-1 test stand closed out the day. See more 'NASA Mars Day' photos on Flickr.

More than 30 booths were set up at Michoud where eventgoers spoke one-on-one with subject matter experts about NASA programs and initiatives. Here, a NASA Social participant, left, visits a booth highlighting technology that is being used to learn more about growing vegetation on Mars.

Continued on next page.

The B-2 stand was a tour stop at Stennis and will be used for "green run" -- when the SLS core stage and four RS-25 engines fire up for testing together.

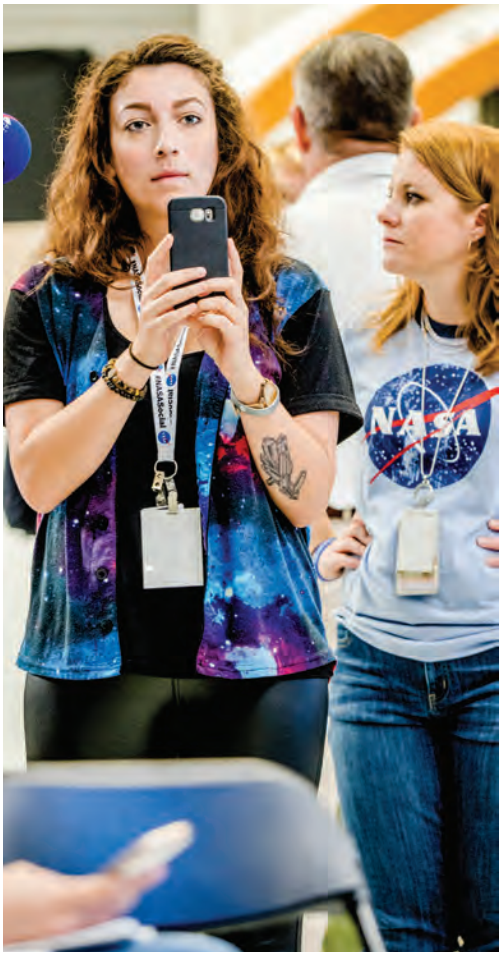
'NASA Mars Day' participants take a tram tour of Michoud and see the liquid hydrogen qualification tank recently welded on the facility's Vertical Assembly Center. Leading the tram tour is SLS Stages Manager Steve Doering and Michoud Director Bobby Watkins.

A group gets a closer look at the world's largest welding tool, the Vertical Assembly Center, during a tour of Michoud. Flight hardware for the SLS liquid hydrogen tank, part of the core stage, is currently being welded in the tool.

The crowd watches as the SLS RS-25 engine, built by Aerojet Rocketdyne, roars to life for a 420-second hot-fire test on the A-1 test stand at Stennis.

SOCIAL SNAPSHOT OF #NASAMarsDay

#NASAMarsDay trended throughout the day on Twitter and was the most popular NASA-related hashtag of the week.



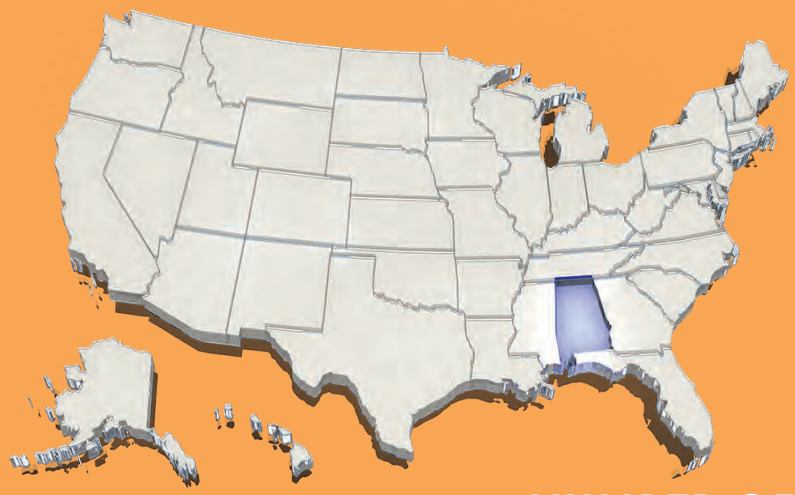
'NASA MARS DAY' IN THE NEWS

NBC News | Spaceflight Insider | Universe Today

WELDERS COMPLETE FINAL PLUG FUSION WELDS ON SLS LIQUID HYDROGEN TANK

Welders inside the enormous SLS liquid hydrogen tank at NASA's Michoud Assembly Facility are plugging holes left after tank assembly. Using frictional heating and forging pressure, friction-stir welding produces high-strength bonds virtually free of defects. More here.

SPACEFLIGHT PARTNERS:
CKS Technologies



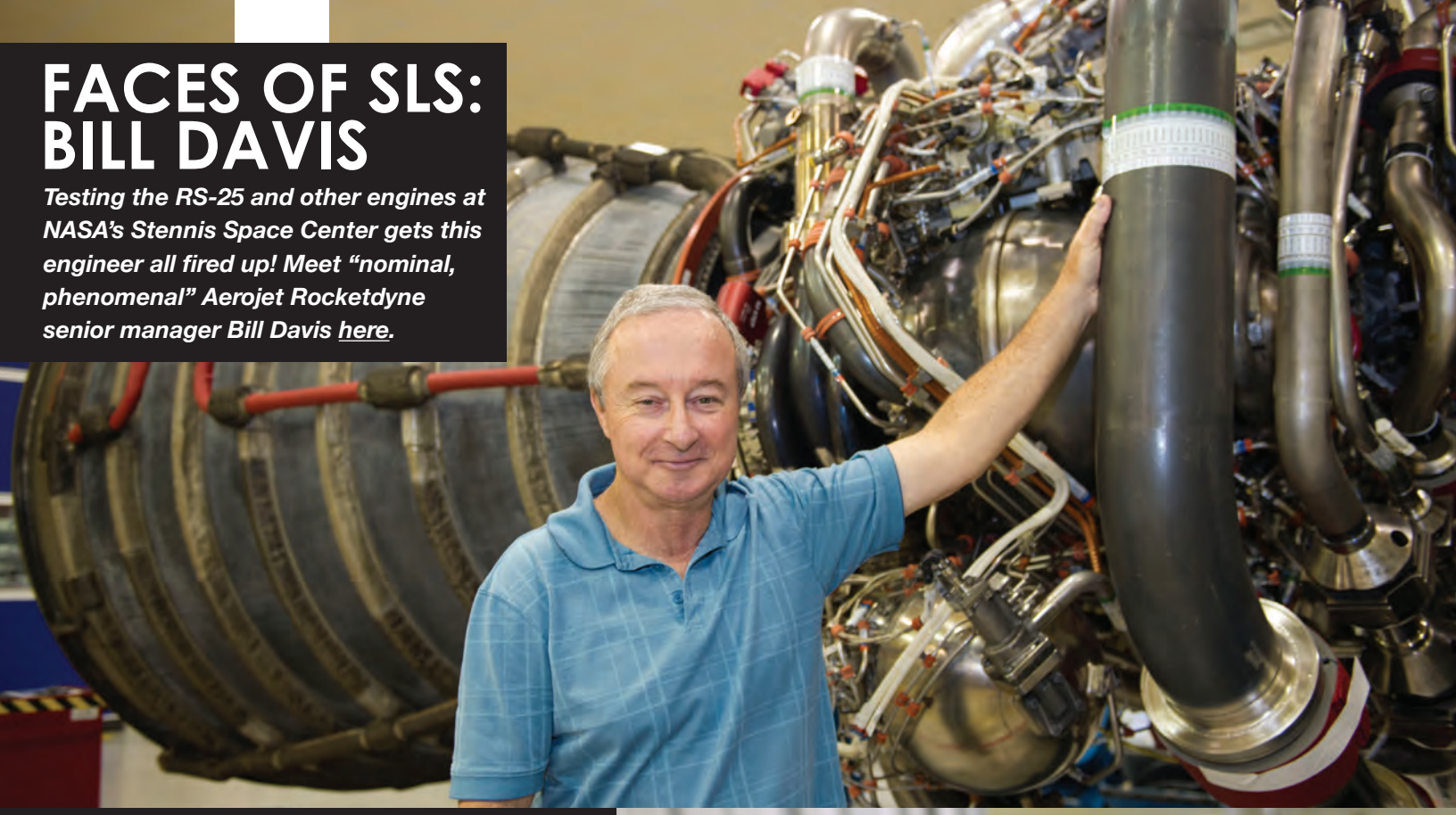
LOCATION:
Huntsville, Alabama

NUMBER OF EMPLOYEES: *3*

WHAT THEY DO FOR SLS:
CKS Technologies supports SLS by supplying structural analysis for the ground support equipment required for lifting, handling and transportation of the launch vehicle stage adapter.

FACES OF SLS: BILL DAVIS

Testing the RS-25 and other engines at NASA's Stennis Space Center gets this engineer all fired up! Meet "nominal, phenomenal" Aerojet Rocketdyne senior manager Bill Davis here.



INITIAL RESULTS SHOW SUCCESS FOR SECOND NASA SLS BOOSTER TEST

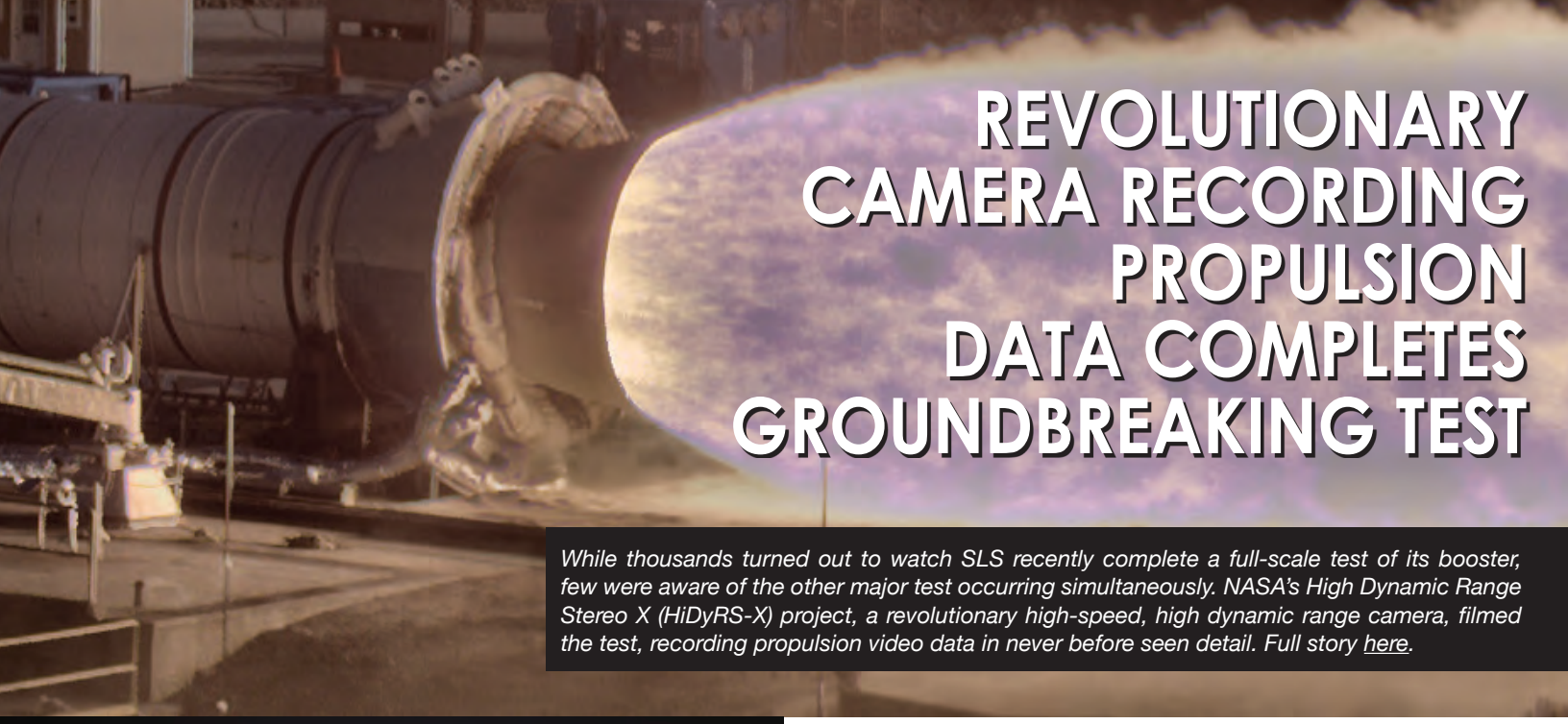
Critical data continues to pour in from the successful June 28 SLS booster ground test at Orbital ATK's test facilities. Here, Orbital ATK engineers begin disassembling the booster aft exit cone from the rest of the motor. Each segment of the booster will be taken apart and undergo a detailed inspection to support verification that the booster design meets SLS requirements. NASA and Orbital ATK also use the inspection to ensure the booster performed as expected during the ground test. "Preliminary analysis from the test shows the instrumentation performed extremely well and gathered the critical data needed to show that we met our test objectives," said Mat Bevill, deputy chief engineer for the SLS Boosters Office at NASA's Marshall Space Flight Center. More here.

BY AIR AND SEA

TOP-RIGHT: *More than 10,000 visitors stopped by to see SLS and NASA at the 2016 Chicago Air & Water Show. The show has been held each year since 1959 and is Chicago's second most popular festival.*

BOTTOM-LEFT: *SLS's Twila Schneider answers questions about SLS from a group of kids and adults at the Chicago Air & Water Show.*

BOTTOM-RIGHT: *Eventgoers got the opportunity to meet NASA astronaut Tim Kopra.*



REVOLUTIONARY CAMERA RECORDING PROPULSION DATA COMPLETES GROUNDBREAKING TEST

While thousands turned out to watch SLS recently complete a full-scale test of its booster, few were aware of the other major test occurring simultaneously. NASA's High Dynamic Range Stereo X (HiDyRS-X) project, a revolutionary high-speed, high dynamic range camera, filmed the test, recording propulsion video data in never before seen detail. Full story here.

SLS GETS UPDATED ADAPTER FOR JOURNEY TO MARS

SLS's Steve Creech addresses questions during Glenn Research Center's industry day on the universal stage adapter for the rocket. More here.

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

NASA SLS Rocketology Blog.... blogs.nasa.gov/Rocketology

Twitter.....Twitter.com/NASA_SLS

Facebook..... Facebook.com/NASASLS

Flickr.....Flickr.com/NASASLS

Google+.....Plus.Google.com/+NASASLS

Tumblr.....nasasls.tumblr.com

COMING IN SEPTEMBER:

EM-1 booster center segment cast

Launch vehicle stage adapter structural test article installed in test stand

Flight liquid hydrogen tank completes welding at Michoud

National Aeronautics and Space Administration

GSDO GROUND SYSTEMS DEVELOPMENT & OPERATIONS

EXPLORATION BEGINS HERE

PROGRAM HIGHLIGHTS • JULY/AUG 2016

At NASA's Kennedy Space Center in Florida, the Ground Systems Development and Operations (GSDO) Program Office is leading the center's transformation from a historically government-only launch complex to a spaceport bustling with activity involving government and commercial vehicles alike. GSDO is tasked with developing and using the complex equipment required to safely handle a variety of rockets and spacecraft during assembly, transport and launch. For more information about GSDO accomplishments happening around the center, visit http://www.nasa.gov/groundsystems.

NASA Reaches Platform Milestone for Space Launch System

Installation of new work platforms for NASA's Space Launch System (SLS) rocket and the journey to Mars reached the halfway point in July inside the Vehicle Assembly Building (VAB) at the agency's Kennedy Space Center in Florida.

Prior to rolling out to the launch pad, the rocket and Orion spacecraft will come together in the VAB for processing and assembly. Five of the ten levels of platforms are in place in High Bay 3, all part of the massive amount of work going on inside the iconic building to accommodate SLS and Orion.

"This is a key milestone for NASA and the Ground Systems Development and Operations Program," said Mike Bolger, GSDO program manager at Kennedy.

The F North and South platforms were lifted by crane from the transfer aisle floor of the VAB, slowly raised into position, and attached to rail beams on the south and north walls of the high bay on July 15 and 19, respectively. The rail beams provide structural support and contain the drive mechanisms to retract and extend the platforms.

When all of the platforms are installed, a total of 10 levels of work platforms, 20 platform halves altogether, will surround the SLS rocket and Orion spacecraft and provide access for testing and processing for the uncrewed Exploration Mission 1 and deep-space missions, including the journey to Mars.

A heavy-lift crane lifts the first half of the F-level work platforms, F south, for NASA's Space Launch System (SLS) rocket, from the floor of the Vehicle Assembly Building (VAB) at Kennedy Space Center on July 15. Photo credit: NASA/ Bill White

"This is a significant accomplishment in the production and installation of the platforms for High Bay 3," said Jose Perez Morales, VAB Element Project manager.

It takes about four hours to lift and install each of the platforms. They weigh between 300,000 and 325,000 pounds, and measure about 38 feet long and close to 62 feet wide.

Construction workers with VAB general contractor Hensel Phelps, subcontractors S&R, Steel LLC and Sauer Inc., and the Kennedy Test and Operations Support Contract contractor Jacobs are performing the work.

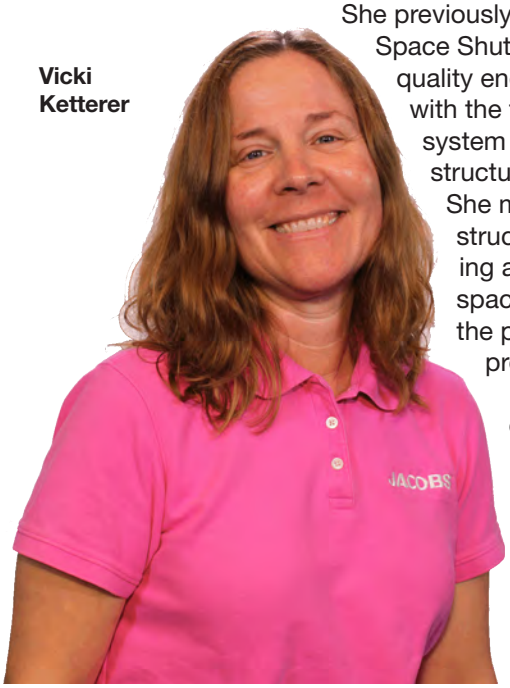
"It's another giant leap for the GSDO Program as we prepare Kennedy Space Center to support the agency's journey to Mars," Bolger said.

To read the complete story, visit http://go.nasa.gov/2aafm05.

Ground Systems Team Spotlight

Vicki Ketterer is an integration engineer with Jacobs on the Test and Operations Support Contract (TOSC) at Kennedy Space Center. Her responsibilities include integrating the requirements between the hardware providers, such as United Launch Alliance and Boeing, with the TOSC engineers to ensure that the requirements are correct and workable. Currently, her work focuses on the Interim Cryogenic Propulsion Stage and main engines of NASA's Space Launch System rocket.

Ketterer has worked at Kennedy for more than 29 years. She previously worked in the Space Shuttle Program as a quality engineer, working with the thermal protection system and conducted structural inspections. She moved on to orbiter structures engineering and finished her space shuttle career in the program office as a project engineer.



Vicki Ketterer

"The coolest part of my job is working on our nation's space program and being able to see spaceflight hardware that very few people get to see up close and personal," Ketterer said.

One of the achievements she is most proud of is receiving a Space Flight Awareness Award in 2007 for her work on Endeavour's return to flight modifications.

Ketterer became interested in space when she was in grade school.

"We watched the Apollo launches in the early 1970s, plus my parents took us to the Kennedy Space Center Visitor Complex and we saw Enterprise on top of a 747 aircraft," Ketterer said. "I got a job here, and the rest is history."

Ketterer's hometown is Pittsburgh, Pennsylvania. She moved to Florida in 1987.

She earned a bachelor's degree in chemical engineering from Penn State University, and a master's in systems management from Florida Tech.

Her first car was a 1984 dark blue Pontiac Sunbird. It was a car from her father's company so she got a good deal on it.

"Every once in a while it made a very loud squealing noise when I started it, so I unintentionally scared a lot of people as they walked by," Ketterer said.

Her interests include traveling to as many places as possible, hiking, learning to sail, and participating in Toastmasters.

She and her husband, Kirk, have been married almost 25 years.

"I'd better plan a great trip for our anniversary," Ketterer said.

Sean Whyard is a mechanical engineer with SGT Inc. on the Engineering Services Contract at Kennedy Space Center. He is the lead design engineer for the mobile launcher fluids and electrical installation. He has worked at Kennedy nearly three years.

He supports the Ground Systems Development and Operations Program by assisting in the design and preparation of the mobile launcher so that it is ready for the new Space Launch System rocket for future missions launching from Pad 39B.

"As someone who grew up in the midst of the Space Shuttle Program, being a part of the next generation of space exploration is exciting," Whyard said. "Every day we are closer to establishing the new foundation from which the next big step will be made."

One of his most memorable times was when he and his team received a NASA Group Achievement Award in 2015 for their work on the mobile launcher.

"I'm extremely honored and proud to be a part of an amazing team, who in our time together, have made me a better person, both professionally and personally," Whyard said. "The success of this project was achieved through the sum of its parts."

Whyard became interested in space at a young age. "Who didn't dream of becoming an astronaut?" His interest peaked during his college years, as he was so close to the space center and watched space shuttle launches from his dorm room.

"I consider myself lucky to be part of it. I want to be able to contribute to the continuation of this legacy and see NASA achieve the next steps for humans to exlore deep space," Whyard said. "Each person here is vital to the success of this mission, and I have high hopes for the future of our space program."

Sean Whyard

Whyard's hometown is Southold, New York. He earned a bachelor's degree in ocean engineering from Florida Tech.

Whyard's first car was a 1988 cherry red Chevrolet Silverado Z71 pickup truck. His hobbies include carpentry, masonry and welding, and he is an avid fisherman. When he has the time, he designs and builds custom fishing rods.

He married his wife, Vanessa Martins, on April 30 of this year.

Industry Spotlight - Tillett Heavy Haul

During his 40 years in business, veteran truck driver Walter "Skip" Tillett, with Tillett Heavy Haul in Titusville, Florida, would say that he's transported some pretty large items for his customers, including NASA. But nothing compares to his recent hauling job.

Since early 2015, Tillett has transported 14 of the 20 new massive work platforms for NASA's Space Launch System (SLS) rocket to the Vehicle Assembly Building (VAB) at Kennedy Space Center in Florida. Safely transporting the platforms is critical for NASA as the agency continues to make progress preparing the center to launch SLS and the Orion spacecraft that will take humans on to deep space.

"We started working on the transport planning phase in July 2014," Tillett said. "We are very excited to be hauling the platforms that are being installed in the historic VAB."

Skip has made the 29-mile trek from Sauer Corp. in Oak Hill, Florida, to the center, each time with an escort provided by the Brevard County Sheriff's Office. Sauer is assembling the platforms. The company is a subcontractor to Hensel Phelps in Orlando, Florida, who is the general contractor for VAB High Bay 3, where the new platforms are being installed. Tillett is a subcontractor to Sauer.

There is more to the job though than just carrying the platforms to their final destination. The platforms are very large, nearly 40 feet wide, and they must be able to clear any obstacles on the right of way during the trip to Kennedy.

"It is a little bit of a challenge each time," Tillett said. "We use a specialty trailer, which is basically a dolly system, to pick up each platform."

When the platform is in place on top of the dolly, the job of centering it and securing it comes next. Counterweights are used to level the platform for the trip.

Walter "Skip" Tillett, with Tillett Heavy Haul in Titusville, Florida, stands near his truck after hauling Platform D South from Sauer Inc. in Oak Hill, Florida, to Kennedy Space Center. Photo credit: NASA/ Ben Smegelsky

"We work very closely with the Brevard County Sheriff's Office motor unit, who do an awesome job directing traffic and providing an escort," Tillett said. "We also alert Kennedy security and local authorities, and we try to notify the community to avoid traffic issues."

Tillett is no stranger to Kennedy. He's hauled a variety of loads to and from the center over the years. Some that come to mind include hauling load test pieces to Cape Canaveral Air Force Station in 2001, hauling an aft skirt for a booster from the center to Salt Lake City, Utah, in 2002, and transporting a piece of load test hardware for the top of the Orion launch escape system from Kennedy all the way to Sacramento, California, in 2008.

Most recently, he hauled work stands, hardware and 20-foot I-beams to the mobile launcher area.

"Being long-time residents of Titusville and with the space program being an integral part of our community, it is a privilege to be able to contribute what we can to NASA's space program and the journey to Mars," Tillett said.

He and his wife, Susan, are owners of the hauling company. She runs the office, while Skip drives the truck.

NASA's Ground Systems Development and Operations Program is overseeing the upgrades and modifications to the high bay to support processing of the SLS rocket and Orion spacecraft.

Check out the VAB platform installation midpoint in 360-degree view at: https://www.youtube.com/watch?v=at3cCCstD2Q

GSDO is Go for Launch with a Facebook Page. Check it out at: https://www.facebook.com/NASAGOforlaunch/

Employee Spotlight - Liliana Villarreal

Liliana Villarreal is manager of Spacecraft and Offline Operations for the Ground Systems Development and Operations Program at Kennedy Space Center.

She leads the team that will be responsible for the Orion and payload offline operations prior to integration with the Space Launch System rocket. This includes offline final assembly, testing and servicing of the Orion spacecraft and payloads as required. The group also is responsible for the maintenance of the ground support equipment and the facilities that will be needed to complete these operations.

Villarreal began working at Kennedy in 2000 for The Boeing Company. She was a mechanical/handling and access engineer supporting assembly missions for the International Space Station (ISS). In 2007, she moved to the NASA Operations team under the ISS Program. During the Kennedy reorganization in 2014, she moved to GSDO as an integration operations manager, and then moved into her current role about a year ago.

"The coolest part of my job is being part of history in the making. Eventually when we get to Mars, we will look back and know this is where it all started and that we were part of it," Villarreal said.

She was born in Cartagena, Colombia, and moved with her family to Miami, Florida, when she was 10. She earned a Bachelor of Arts and a master's degree in aerospace engineering from Georgia Tech. She also has a master's in management of technology from the University of Miami.

Her first car was a 1965 289 V8 Ford Mustang, candy apple red. "It had no air conditioning and was quite the gas guzzler," Villarreal said, "but it was a major reason why I got asked out in high school."

Villarreal's hobbies include reading, running, going to the beach, taking her children to the movies or to Disney World, and at least once a year, she reorganizes or redecorates areas of her home.

She is engaged to Tim O'Hare, and they are planning a fall wedding.

Villarreal has two children, Miguel, 16, and Sabrina, 18. They have a dog, a pug named Daenerys, named for Villarreal's favorite television series, "Game of Thrones." They also have a long-haired tuxedo cat named Snowball.

Prentice Washington, left, senior element program manager for Communications Development at Launch Pad 39B, received the prestigious Silver Snoopy Award during a ceremony on July 26. At right is Mike Bolger, GSDO Program manager. Photo credit: NASA

Courtney Stern, the NASA lead operational engineer for the Orion Landing and Recovery team in the Engineering Directorate, received a Space Flight Awareness Award on June 27 in Ogden, Utah, the day before the QM-2 firing in Promontory, Utah. With her during the ceremony, from left are NASA astronaut Jim Kelly, Kennedy Space Center Director Bob Cabana, and Bill Hill, deputy associate administrator for Exploration Systems Development. Photo credit: NASA