



National Aeronautics and Space Administration



LAGNIAPPE

John C. Stennis Space Center

Volume 15 Issue 1

www.nasa.gov/centers/stennis

February 2019



Hot fire!

See page 3

Whew! Who would have guessed this ole Gator would be so excited to be back at work? Nonetheless, I am. If the recent government furlough taught me anything, it is that for every job completed on the household to-do list, two more are instantly added. Ark!

It really is more than that, though. If you think about it, we typically spend more waking-hours time with work colleagues than anyone else. It is no wonder that we come to think of them as family – and that is certainly true about Stennis employees.

That being so, when you go a long period without spending time with those “family” folk, you miss it – and them. That is one of the lessons learned that has been discussed upon the return to work – how to help employees stay in touch with colleagues better during extended absences from work.

In addition, when you work on something meaningful, it comes to mean something to you personally. You can see that clearly at Stennis. Folk here, regardless of their particular work position or duties, are all part of something exciting and important – helping to power this nation’s space program.

Everyone knows the space program is headed deeper into space than ever before, and Stennis is playing a critical role in making that happen. All involved are anxious to see the new Space Launch System blast off, especially since it will be powered by engines tested right here. Just as during the Apollo and space shuttle years, folk at Stennis will watch the launch with a sense of personal pride in helping to make it possible.

You could feel that anxiousness and pride as Stennis resumed RS-25 engine testing Feb. 13. The test was a clear signal – we are back in business, back at work, back to moving ahead toward deep space. In other words, it is all jambalaya, crawfish pie and file’ gumbo on the bayou again (to plagiarize Hank Williams). Ark!

Stennis will conduct another hot fire at the end of the month before preparing to test another RS-25 flight engine. With that hot fire, all RS-25 engines for the first four SLS flights will have been tested – and the much-anticipated SLS launch will be even closer.

Now, you have to excuse me so I can pass by the florist this afternoon. Tell me – how many roses do you have to buy to make up for forgetting Valentine’s Day? Ark!



Lagniappe is published monthly by the Office of Communications at NASA’s John C. Stennis Space Center.

Access monthly copies at: www.nasa.gov/centers/stennis/news/publications/index.html

Contact info – (phone) 228-688-3749; (email) ssc-pao@mail.nasa.gov; (mail) NASA OFFICE OF COMMUNICATIONS, Attn: LAGNIAPPE, Mail code IA00, Building 1100 Room 304, Stennis Space Center, MS 39529

Managing Editor – Valerie Buckingham

Editor – Lacy Thompson

Staff Photographer – Danny Nowlin





NASA conducts first RS-25 engine test of 2019

NASA resumed RS-25 engine testing for its new Space Launch System (SLS) rocket with a Feb. 13 hot fire on the A-1 Test Stand at Stennis Space Center. The hot fire marked the first RS-25 test of the year at Stennis, continuing a series with developmental engine No. 0525 that began last August. The test featured a flight controller to be used on an SLS mission and marked the third time since last February that NASA has powered its RS-25 engine up to 113 percent of original thrust. NASA is testing RS-25 engines to help power the SLS rocket, being built to send humans deeper into space than ever before, including to such destinations as the Moon and, ultimately, Mars. Four RS-25 engines, firing simultaneously, will produce 2 million pounds of combined thrust during SLS launch and ascent. RS-25 engines for initial missions are former space shuttle engines, designed to provide a power level categorized as 100 percent thrust. For SLS, engineers are modifying RS-25 engines to provide up to 111 percent of original thrust. Testing at 113 percent at Stennis demonstrates a margin of safety for operating the engine at the higher thrust. A key component of the modifications is the new flight controller, which acts as the "brain" to help control engine operation and facilitate communication between the engine and SLS rocket. Aerojet Rocketdyne has received delivery of 18 new controllers from subcontractor Honeywell International Inc., 16 to be used on the first four SLS missions, one qualification unit and one engine spare. NASA has been

testing the new controllers at Stennis since March 2017. The RS-25 hot fire also continued testing of two engine components – a 3D-printed pogo accumulator to dampen pressure oscillations that can cause flight instability and a main combustion chamber fabricated using a hot isostatic pressure (HIP) bonding technique. These components are significant early milestones in NASA's and Aerojet Rocketdyne's endeavor to maximize state-of-the-art manufacturing methods to significantly reduce the cost and time needed to build new RS-25 engines. The Feb. 13 test was the first since mid-December, when a test was terminated early due to an observed anomaly. A subsequent investigation identified the cause as a faulty ground test instrument, which was removed for inspection and was not needed for this test. Each RS-25 test marks progress towards Exploration Mission-1, during which SLS will launch an Orion spacecraft around the Moon and back to test critical capabilities needed for deep space flights. Exploration Mission-2 is scheduled to carry astronauts aboard Orion to deep space. In addition to testing RS-25 engines, NASA plans to test the fully assembled SLS core stage for the first mission on the B-2 Test Stand at Stennis, firing all four engines at once. RS-25 tests at Stennis are conducted by a combined team of NASA, Aerojet Rocketdyne and Syncom Space Services operators. Aerojet Rocketdyne is the RS-25 prime contractor. Syncom Space Services is the prime contractor for Stennis facilities and operations.

New video highlights B-2 Test Stand preparations for SLS

Stennis Space Center has released a new video highlighting preparations to test the core stage of NASA's new Space Launch System (SLS) rocket. Titled *Six Years of Nonstop Work*, the video shows tasks performed to restore and renovate the B-2 Test Stand at Stennis for the SLS core stage project. The video can be accessed via a *Six Years of Nonstop Work* link on the Stennis site or at the YouTube link listed below.

NASA is building its SLS rocket to carry astronauts deeper into space than ever before, including to such destinations as the Moon and, ultimately, Mars. It has been testing RS-25 engines that will help power the rocket on the A-1 Test Stand at Stennis since January 2015.

In addition, NASA has spent the last six years renovating and preparing the B-2 stand to test the SLS core stage prior to its first launch. For the testing, the flight stage for the first SLS Exploration Mission-1 will be installed on the stand, then all four of its RS-25 engines test fired, just as will occur during an actual launch.

Six Years of Nonstop Work highlights the extent and range of tasks performed to prepare the stand. Engineers spent 18 months in the formulation phase, evaluating all B-2 facility structures and systems and identifying work needed for restoration and renovation of the stand, as well as that needed for core stage testing.

Design, construction and activation work followed. The project was divided into three phases – restoring the stand to original condition after years without use, building the facility out to accommodate the SLS stage and installing all special test equipment needed.

The new video highlights the build out stage, which was significant and featured upgrades of every major system on the stand, as well as the high-pressure system that provides hundreds of thousands of gallons of water needed during a test. It also involved extending the large derrick crane atop the stand, which will be used to lift the SLS stage into place.

The most visible work items on the test stand featured the repositioning and extension of the Main Propulsion Test Article framework, which was used to test the space shuttle propulsion system in the 1970s. The shuttle framework stood 61 feet tall and included about 1.2 million pounds of fabricated steel. After it was repositioned 20 feet horizontally on the test stand, an additional 1 million pounds of steel was added in order to extend the framework 100 feet to house the larger, taller SLS stage.

SLS core stage testing will mark the latest chapter in Stennis history. The site also tested Saturn V stages and engines that carried humans to the Moon during the Apollo Program, as well as engines used to power 135 space shuttle missions.

To access the *Six Years of Nonstop Work* video, use the following links to access the Stennis website or to go directly to the YouTube video posting:
<https://www.youtube.com/watch?v=94ryD3b8qEE&feature=youtu.be>
<https://www.nasa.gov/centers/stennis/home/index.html>

For more about B-2 Test Stand preparations for SLS testing, visit:
<https://go.usa.gov/xEQrC>.

Stennis set for ‘pretty full year’ of testing in 2019

Last year offered a number of engine testing highlights at NASA’s Stennis Space Center, including an RS-25 hot fire at the highest power level ever achieved and an unprecedented string of 10 large rocket engine tests in 10 days on the AR-22 engine.

There are no plans for the site to rest on these laurels in 2019. “We are looking at a pretty full year,” said Kevin Power, lead of the propulsion test Project Management Branch of the Stennis Engineering and Test Directorate.

Two commercial companies – SpaceX and Stratolaunch – ended test projects at Stennis in 2018. Meanwhile, work is proceeding at full pace across the Stennis test complexes. Projects already planned for this year include:

- **RS-25 rocket engine tests on the A-1 Test Stand.** NASA has scheduled two upcoming RS-25 tests. A late February test will feature an RS-25 flight controller, as well as engine components made with innovative techniques that save time and money. An early April test will feature an RS-25 flight engine. With that hot fire, engines for the first four flights of NASA’s new Space Launch System will have been tested. RS-25 engine testing will pause for the rest of 2019, then resume at a steady pace.
- **AR-22 rocket engine tests on the A-1 Test Stand.** Last summer, a test team of NASA, Defense Advanced Research Projects Agency (DARPA), Aerojet Rocketdyne, Boeing and Syncom Space Services engineers and operators tested Aerojet Rocketdyne’s AR-22 engine 10 times in a 10-day (240-hour) period. It marked the first time a large liquid hydrogen/liquid oxygen engine had been fired so many times consecutively in such a short period of time. In late summer 2019, the team will reassemble at the A-1 Test Stand to conduct another round of AR-22 tests. The engine has been chosen to power DARPA’s Experimental Spaceplane (XSP) – called the Phantom Express. The spaceplane is being built as a low-cost, reusable system for delivering small satellites into orbit.
- **RS-68 rocket engine tests on the B-1 Test Stand.** Aerojet Rocketdyne has tested RS-68 engines on the B-1 Test Stand at Stennis since 1998. Testing of the engine in support of United Launch Alliance Delta IV missions will continue in 2019.
- **SLS core stage testing on the B-2 Test Stand.** Late last year, NASA and Stennis completed six years of extensive build up and activation of all B-2 Test Stand systems to prepare for testing the core stage that will fly on the uncrewed SLS Exploration Mission-1. In 2019, the core stage “pathfinder” – a size and weight replica – will arrive on site. Test stand crews will spend ensuing months using the pathfinder to ensure the B-2 stand is ready for the actual core stage and to train for handling and installing it. Arrival and testing of the core stage is targeted during 2020.
- **Hydrocarbon Boost (HCB) preburner testing on the E-1 Test Stand.** Stennis has partnered with Aerojet Rocketdyne to conduct HCB preburner testing in Cell 1 of the E-1 Test Stand. The testing is part of a joint project between NASA and the U.S. Air Force to develop a 500K thrust hydrocarbon engine both have an interest in developing. Testing to support the project is scheduled into the fall of 2019.
- **Subscale steam generator testing on the E-2 Test Stand.** In addition to testing the SLS core stage on the B-2 Test Stand at Stennis, NASA plans to use the facility to test the rocket’s Exploration Upper Stage (EUS) in the future. In 2019, Stennis will conduct subscale steam generator testing on Cell 1 of the E-2 Test Stand in preparation for EUS testing. Steam generators would be used to help create a vacuum at the test stand, allowing operators to simulate test firing the four engines on the stage at higher altitudes, as the EUS engines will do during an actual mission.
- **Subscale diffuser testing on the E-3 Test Stand.** Later in 2019, Stennis will conduct subscale diffuser tests in Cell 1 of the E-3 Test Stand, also in support of planned SLS EUS testing on the B-2 stand. A diffuser is used in testing to simulate high altitudes. The subscale project will test the design for possible construction of a full-scale diffuser for the B-2 stand.
- **Subscale Rocket Exhaust Capture System testing on the E-3 Test Stand.** Later in 2019, Stennis will begin testing a subscale version of a new rocket exhaust capture system on Cell 1 of the E-3 Test Stand. The new system is designed to help operators capture and hold engine exhaust byproducts so they can be cleaned before they are released into the atmosphere.
- **Aeon engine testing on the E-3 Test Stand.** In 2018, Stennis entered into an agreement with Relativity Space for the company’s exclusive use of the E-4 Test Complex on site. Relativity is focusing on an innovative approach to developing small launch vehicles. As it develops the E-4 facilities, Relativity began testing in 2018 on components, engine and stage simulator for its 15,500-pound-thrust Aeon engine in Cell 2 of the E-3 Test Stand and plans to continue the testing into the latter part of 2019.

In addition to scheduled testing, new projects could be added during the year. “Stennis is the lead center for testing for NASA,” Power said. “It also is a leader in partnering with commercial companies to support their test needs, so a busy test schedule is certainly to be expected.”

NASA ends record-setting Mars mission

One of the most successful feats of interplanetary exploration, NASA's Opportunity rover mission is at an end after almost 15 years exploring the surface of Mars. The rover stopped communicating with Earth when a severe Mars-wide dust storm blanketed its location in June 2018. After more than a thousand commands to restore contact, NASA engineers made their last attempt on Feb. 12, to no avail. "It is because of trailblazing missions such as Opportunity that there will come a day when our brave astronauts walk on the surface of Mars," said NASA Administrator Jim Bridenstine. "And when that day arrives, some portion of that first footprint will be owned by the men and women of Opportunity, and a little rover that defied the odds and did so much in the name of exploration." Meant to last just 90 Martian days and travel 1,100 yards, Opportunity surpassed all expectations in its endurance, scientific value and longevity. It exceeded its life expectancy by 60 times and traveled more than 28 miles by the time it reached its final resting spot on Mars – Perseverance Valley.



NASA in the News

NASA: 2018 continues warming trend

Earth's global surface temperatures in 2018 were the fourth warmest since 1880, according to independent analyses by NASA and the National Oceanic and Atmospheric Administration (NOAA). Global temperatures in 2018 were 1.5 degrees Fahrenheit warmer than the 1951 to 1980 mean, scientists at NASA's Goddard Institute for Space Studies reported. Globally, 2018's temperatures rank behind those of 2016, 2017 and 2015. The past five years are, collectively, the warmest years in the modern record. In a separate analysis, NOAA scientists found 2018 global temperatures were 1.42 degrees Fahrenheit above the 20th century average. Since the 1880s, the average global surface temperature has risen about 2 degrees Fahrenheit. NASA's temperature analyses incorporate surface temperature measurements from 6,300 weather stations, observations of sea surface temperatures, and Antarctic stations. NASA's 2018 data set is available at: <https://data.giss.nasa.gov/gistemp>. For more about NASA's Earth science, visit: <https://www.nasa.gov/earth>. NOAA's report is available at: <http://bit.ly/Global201812>.

NASA invites people to explore exoplanets

NASA is inviting people to explore the plethora of planets outside the solar system with new multimedia experiences from the agency's Exoplanet Exploration Program. In addition to a new Exoplanet Travel Bureau poster celebrating a molten world called 55 Cancri e, space fans can enjoy a 360-degree visualization of the planet's surface, a multimedia journey into the life and death of planetary systems, and a major update to the Eyes on Exoplanets app. Designed as vintage travel posters, the Exoplanet Travel Bureau poster series imagines what it might be like to visit known exoplanets. The Exoplanet Travel Bureau's 360-degree visualization tool enables people to take a virtual tour of what the planet's surface might look like. The interactive "Life and Death of a Planetary System" feature brings readers on an in-depth journey through the formation, evolution and eventual demise of a solar system. With NASA's Eyes on Exoplanets 2.0, users can fly through the galaxy and virtually visit any of nearly 4,000 known exoplanets. NASA's Exoplanet Exploration site can be accessed at: <https://exoplanets.nasa.gov/exep/>.

1970 – ‘Black Monday’ proves to be turning point



Note: For more than 50 years, NASA's John C. Stennis Space Center has played a pivotal role in the success of the nation's space program. This month's Lagniappe provides a glimpse into the history of the south Mississippi rocket engine test center.

Mondays are, usually, universally disliked. Perhaps no Monday was more disliked at the then-Mississippi Test Facility (MTF) than the one that fell on Nov. 9, 1970.

Nicknamed “Black Monday” by employees at the center, it marked the day the closing ceremony of Saturn V rocket testing at MTF took place. The Apollo Program had ended, which meant no more testing of Saturn V engines and rocket stages.

NASA Administrator George Low came to MTF, accompanied by NASA's top managers from both Headquarters and Marshall Space Flight Center to give the employees a “pat on the back” and a “job well done” in supporting the prior program.

However, MTF employees, including then-Director Jackson Balch, also saw the ceremony as a sign that NASA wished to close the Mississippi facility. What Low and the other NASA managers did not know was that Balch, U.S. Sen. John Stennis, U.S. Sen. Bill Colmer, Mississippi Gov. John Bell Williams, local community leaders and heads of at least 10 different federal agencies already located on site or considering locating to MTF were attending the ceremony to talk to Low and let him know just how important MTF was to the government and the local community.

During the day, behind closed doors, Balch, Stennis, Colmer and their team challenged the NASA administrator and his team with some heavy politicking. Colmer was



Jackson Balch (left) walks with Sen. John C. Stennis (center) and then-NASA acting Administrator George Low during the Apollo Awards Ceremony on Nov. 9, 1970.

quoted as saying, “Sen. Stennis is noted to be a gentleman, and you may not understand his message, but I am telling you now that if NASA fails to support MTF, we will withdraw our support for NASA.”

MTF and its employees had reached a turning point. Without the support of Stennis and Colmer in the U.S. Senate, NASA faced a budget cut, and programs already in the works, like the space shuttle, possibly would never materialize.

The importance of MTF was realized that day. It remained open to grow into a unique federal city that eventually was named for one of the men who saved it, Sen. John C. Stennis.



Stennis observes Day of Remembrance

Stennis Space Center Director Rick Gilbrech speaks to site employees during the annual Day of Remembrance ceremony Feb. 7. Following comments, Gilbrech and NASA Shared Services Center Acting Executive Director Anita Harrell placed a memorial wreath in remembrance of NASA family members who lost their lives while furthering the cause of exploration and discovery, including the crews of Apollo 1 and shuttles Challenger and Columbia. The NASA Day of Remembrance is observed each year in January but was scheduled on a later date this year following the government shutdown during January.

Office of Diversity and Equal Opportunity

Emphasis celebrates African Americans

Never to forget where we came from and always praise the bridges that carried us over.

Fannie Lou Hamer

Black History Month is an annual celebration of achievements by African Americans and a time for recognizing their immeasurable impact on the history of the United States.

The annual celebration of Black Americans' achievements is credited to Dr. Carter G. Woodson. Known as "The Father of Black History," Woodson dedicated his life and career to the field of African-American history and lobbied extensively to establish Black History Month as a nationwide institution.

The 2019 Black History Month theme is "Black Migrations" and emphasizes the movement of people of African descent to new destinations and, subsequently, to new social realities in the United States. This massive demographic shift remade the nation in ways that are still being felt today – culturally, politically and socially.

Between 1915 and 1970, more than 6 million African Americans moved out of the South to cities across the Northeast, Midwest and West in search of higher wages in industrial jobs, as well as better social and political opportunities.

This relocation – called the Great Migration – resulted in massive demographic shifts across the United States. From a geographical context, historians divide the Great Migration into two periods: 1910-1940 and 1940-1970, with a pause during the Great Depression in the 1930s.

When World War I broke out in Europe in 1914, industrialized urban areas in the North, Midwest and West faced

a shortage of industrial laborers, as the war put an end to the steady tide of European immigration to the United States and millions of men left to serve in the Armed Forces.

Between the years 1910-1930, New York, Chicago, Detroit, St. Louis and Cleveland saw their black populations grow by about 40 percent, and the number of blacks employed in industrial jobs doubled.

Not only was there a massive demographic shift during this time, African Americans began to build a new place for themselves in public life. They actively confronted racial prejudice, as well as economic, political and social challenges to create a black urban culture that would have an enormous influence in the decades to come.

During the migration, many people found doors opening into areas that had been previously denied, resulting in an explosion of opportunities in the arts, sports, science, technology and politics.

"National African American History Month is a call to each and every citizen of our great land to reflect on the cultural, scientific, political and economic contributions of African Americans, which are woven throughout American society," the 2019 Presidential Proclamation on National African American History month states. "We remember, learn from and build on the past, so that, together, we can build a better and more prosperous future for all Americans."

Information in this article came from deomi.org.

Hail & Farewell

NASA bids farewell to the following:

John Ceconni	Contract Specialist	Office of Procurement
Bruce Farner	AST, Experimental Facilities Development	Center Operations Directorate
Gregory Fletcher	Business Development Specialist	Office of Procurement
Paul Foerman	Lead, Public Affairs Specialist	Office of Communications
Stan Gill	AST, Engineer Project Management	Engineering and Test Directorate
Dorsie Jones	Manager	Office of Human Capital
Steven Taylor	Supervisory, Procurement Analysis	Office of Procurement
David Walters	Supervisory, Computer Engineer	Center Operations Directorate



Faces of Stennis

Each month, Lagniappe will feature an employee at Stennis Space Center whose work enables the center to fulfill its mission as the nation's largest rocket engine test center. This month's employee is highlighted on the following page.



Megan Martinez



Megan Martinez was fascinated with space as a child. In elementary school, she wore a glow-in-the-dark constellation shirt until holes began appearing in it. She loved to talk to her engineer father about such things as black holes and the potential of space travel. She eventually followed in her father's footsteps and received a degree in industrial engineering. Even so, Martinez never imagined herself working at NASA. After two years with a New Orleans company, however, she wanted to move closer to home. Although a native of Vicksburg, Miss., Martinez called Waveland, Miss., home by that time. As it turns out, there was a contractor position available at nearby Stennis Space Center. Martinez began work at the site in 2008 and joined the NASA team at the beginning of 2011 as a systems and integration engineer in the Stennis Engineering and Test Directorate. She later

assumed her current position as propulsion test project manager within the same directorate. In her initial role, Martinez was particularly proud to serve as systems engineer for the A-3 Test Stand construction project. She now oversees both the Hydrocarbon Boost (HCB) test project at the E-1 Test Stand and the RS-68 engine test project on the B-1 Test Stand. For Martinez, the best things about working at Stennis are the impressive and inspiring people she works with and the rocket engine test days. The latter is an "awesome reminder of the bigger picture that we play into when there are engine tests," she said. Moving forward, Martinez is excited about Stennis' role in enabling future space exploration and about the interesting new projects arising at Stennis and across NASA as a result of partnerships between government and commercial companies.