National Aeronautics and Space Administration

LAGNIAPPE

John C. Stennis Space Center

Volume 17 Issue 2 www.nasa.gov/centers/stennis February 2021

RS-25 engine – fired up!

See page 3

This year marks pretty big anniversaries for human space exploration, NASA, and Stennis alike. In April 1961, Yuri Gagarin became the first human to fly to space. Alan Shepherd followed a month later to as the first American to reach space. Then, in October, NASA announced its plan to build a propulsion test site, now known as Stennis Space Center, in south Mississippi. I sure hope someone provides cake for each of those anniversaries. Ark!

To commemorate the 60th anniversary of human space exploration, NASA is asking folk about their favorite moment from the last 60 years of human spaceflight. For ol' Gator, the answer is easy.

The moment came late in 1968 as the Apollo 8 mission carried three astronauts on human's first trip around the Moon. The first trip around the dark side of the Moon came on Christmas Eve and stands as one of the most iconic moments of human space exploration. For the first time, humans viewed Earth in an entirely new way as astronauts Frank Borman, Jim Lovell and Bill Anders emerged from the dark side of the Moon and beamed home footage of "the good Earth" rising like the Sun above the lunar horizon.

I was one of those watching and listening. The moment still defines the word "breathtaking" for me and yet remains my favorite memory for so many reasons. It revealed the courage of humans to reach beyond the known and the ingenuity of humans working together with will. It opened the door to the inevitable moment of just seven months later as humans stepped onto the lunar surface for the first time. And it fueled dreams of all that was possible, including a trip to Mars that humans now are preparing to make.

Apollo 8 also fully revealed for the first time the central role Stennis Space Center was destined to play in such grand achievements and in the entire grand future of human space exploration. With the flight, Borman, Lovell and Anders not only became the first to fly to the Moon but the first to fly powered by a rocket stage tested at Stennis – the Saturn V S-II-3. The following July, astronauts flew to the lunar surface on first and second stages tested at Stennis.

Decades later and counting, humans still fly powered by Stennis – and as they raise their eyes to go even farther and deeper into space, I can hardly what to see the wonders they allow us all to behold.

Lagniappe is published monthly by the Office of Communications at NASA's John C. Stennis Space Center.
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NASA conducts 1st hot fire in new series of developmental tests for RS-25 engine

NASA conducted the first hot fire Jan. 28 in a new round of tests for development of RS-25 engines that will help power the agency's Space Launch System (SLS) rocket on future missions to the Moon and, eventually, Mars. The hot fire was conducted on the A-1 Test Stand at Stennis.

The seven-test series will use RS-25 developmental engine No. 0528 and will provide valuable data for Aerojet Rocketdyne, prime contractor for the SLS engines, as it begins production of new RS-25 engines for use after the first four SLS flights. Operators will focus on evaluating new engine components and reducing risk in engine operation. They also will fire the engine through a range of operating conditions to demonstrate and verify its capabilities.

The test series will provide data to enhance production of new RS-25 engines and several engine components that are being manufactured with cutting-edge and cost-saving technologies. Operators also will demonstrate engine gimbaling capabilities, using a newly installed thrust vector control system. "Gimbaling" refers to how the engine must move on a tight circular axis in order to ensure proper flight trajectory.

> ***It is exciting to get back ... to the business of testing for future deep space missions.***
>
> RS-25 Project Director Chip Ellis

"We're going to evaluate these newly designed parts that were made using advanced manufacturing techniques," said Johnny Heflin, SLS liquid engines manager at Marshall Space Flight Center,where the SLS Program is based. "This test series will prove that the RS-25 production restart engines can be built with the same high performance but with more affordability. This is a big milestone that will greatly contribute to the future sustainability of SLS."

Resumption of RS-25 single-engine testing on the A-1 Test Stand follows completion of major maintenance work on the facility originally built for Apollo Program testing more than 50 years ago. Projects designed to ensure the facility continues functioning at a high level included upgrading piping and the test stand flame deflector, painting the 40,000-gallon liquid oxygen 100,000-gallon liquid hydrogen tanks, remodeling the Test Control Center, and upgrading the data acquisition system, facility cameras, and facility control systems. The new NASA-designed-and-manufactured thrust vector control system also was finalized and installed during this time.

"It is exciting to return to hot fire testing at the A-1 Test Stand," Stennis RS-25 Project Manager Chip Ellis said. "We have worked hard the last 20 or so months to complete needed test stand maintenance projects. Now, the team is ready to get back to the business of testing for future deep space missions."

The engine will be fired seven times for a total of 3,650 seconds during the first half of 2021. The schedule calls for six full-duration tests of about eight-and-a-half minutes (500 seconds) and one hot fire of just under 11 minutes (650 seconds). A full duration test refers to the time the engine must fire during an actual launch in order to power SLS towards orbit. Longer duration hot fires are conducted to test the limits of engine performance.

For about half of the firing time, the engines will operate at 111 of the power level at which the original space shuttle main engines were designed to perform. Operators will also demonstrate operation at the 113 percent power level for an extended period, as was initially demonstrated in a Feb. 2018 hot fire.

The previous round of RS-25 testing concluded April 4, 2019, and focused primarily on validating new operating parameters for the initial RS-25 engines, which are modified heritage space shuttle main engines. The series also included acceptance testing of 16 former space shuttle main engines that will help launch the first four SLS missions.

The new RS-25 test series begins as a separate test series, called Green Run, is in its final phase. Green Run is a comprehensive series of tests on the core stage of the SLS rocket, which includes four RS-25 engines, and culminates with a final test to fire all four together for about eight minutes.

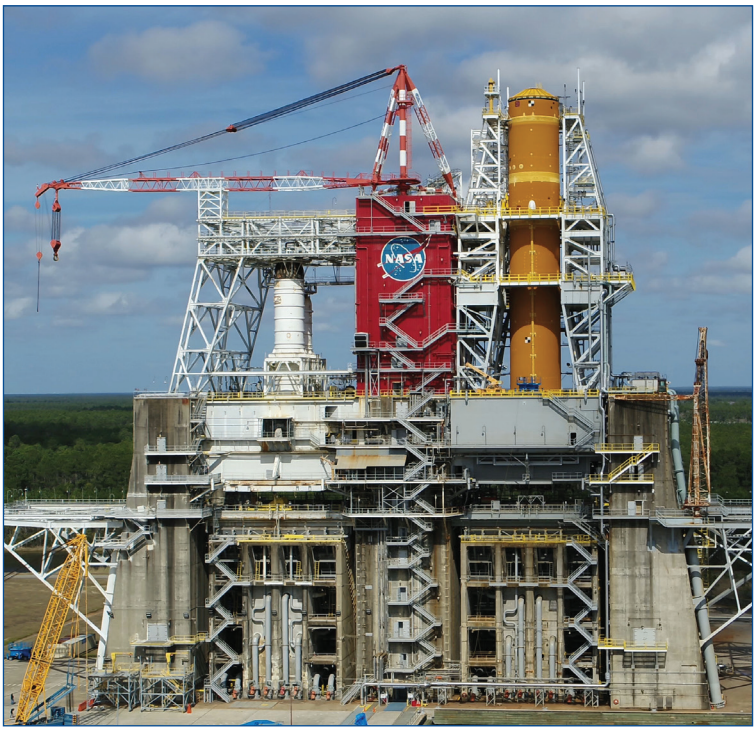
The Green Run team recently fired all four RS-25 engines together for the first time. However, that test experienced an automatic shutdown after 67 seconds. Operators were planning a second hot fire test of the core stage by the end of February.

NASA conducts the first hot fire Jan. 28 in a new series of tests for production of RS-25 engines that will help power the agency's Space Launch System (SLS) rocket on future deep space missions. The test of RS-25 developmental engine No. 0528 on the A-1 Test Stand at Stennis, marks the beginning of a seven-test series designed to provide valuable data to Aerojet Rocketdyne, lead contractor for SLS engines, as the company begins production of new RS-25 engines. Four RS-25 engines help power SLS at launch, firing simultaneously to generate a combined 1.6 million pounds of thrust at launch and 2 million pounds of thrust during ascent. The RS-25 engines for the first four SLS flights are upgraded space shuttle main engines and have completed certification testing. NASA now is focused on providing data to enhance production of new RS-25 engines and components for use on subsequent SLS missions. The new test series will evaluate the performance of engine components made with cutting-edge manufacturing technologies and techniques. The testing is part of NASA's and Aerojet Rocketdyne's effort to use advanced manufacturing methods to significantly reduce the cost and time needed to build new RS-25 engines. For the Jan. 28 test, the RS-25 developmental engine was fired for a full duration of about eight-and-a-half minutes (500 seconds), the same amount of time the engines must fire to help send SLS to orbit. The engine was fired at 111 percent of its original space shuttle main engine design power and the same power level needed to help launch SLS on its missions. The hot fire marks the first test on the historic stand since April 2019, when NASA concluded testing of RS-25 engines for the first four SLS missions. Since that time, Stennis teams have worked to complete major maintenance and upgrade projects to the A-1 Test Stand and its systems to ensure future test capabilities.

NASA plans 2nd SLS core stage hot fire

NASA plans to conduct a second Green Run hot fire test as early as the fourth week in February with the Space Launch System (SLS) rocket's core stage that will launch the Artemis I mission to the Moon. The Green Run is a comprehensive assessment of the rocket's core stage prior to launching Artemis missions.

While the first hot fire test marked a major milestone for the program with the firing of all four RS-25 engines together for the first time for about a minute, it ended earlier than planned. After evaluating data from the hot fire and the prior seven Green Run tests, NASA and core stage lead contractor Boeing determined that a second, longer hot fire test should be conducted and would pose minimal risk to the core stage while providing valuable data to help certify the core stage for flight.



A drone image shows NASA's Space Launch System (SLS) core stage installed on the B-2 Test Stand at Stennis, where it is undergoing Green Run testing.

Inspections showed the core stage hardware, including its engines, and the B-2 Test Stand are in excellent condition after the first hot fire test, and no major repairs are needed to prepare for a second hot fire test at Stennis.

All SLS rockets use the same core stage design, so a second Green Run hot fire will reduce risk for not only Artemis I, but also for all future SLS missions. The Green Run series of tests is designed to certify the core stage design and verify that the new stage is ready for flight. The hot fire test is the final Green Run test and will provide valuable data that minimizes risk for American deep space exploration missions for years to come.

The Green Run team scrutinized data from the first hot fire test and determined a second hot fire lasting at least about four minutes would provide significant data to help verify the core stage is ready for flight. A second hot fire test is planned for about eight minutes to simulate the amount of time it will take to send the rocket to space following launch. The Green Run wet dress rehearsal and first hot fire test completed several operations:

- Transitioning to the automated launch sequence operated by the core stage flight computer and Green Run software.
- Completing the terminal countdown sequence that is like the launch countdown.
- Pressuring the tanks, delivering propellant to the engines and demonstrating performance of the core stage's main propulsion system.
- Firing the engines at 109 percent power level.
- Operating the thrust vector control system that steers the engines.

Conducting a second hot fire will allow the team to repeat operations from the first hot fire and obtain data on how the core stage and engines perform over a longer period that simulates more activities during the rocket's launch and ascent.

To prepare for the second hot fire test, the team is analyzing data from the first test, drying and refurbishing the engines, and making minor thermal protection system repairs. They are also updating conservative control logic parameters that resulted in the flight computer ending the first hot fire test earlier than planned. The team has already repaired the faulty electrical harness which resulted in a notification of a Major Component Failure on Engine 4. This instrumentation issue did not affect the engine's performance and did not contribute to ending the first test early.

After the second hot fire test, it will take about a month to refurbish the core stage and its engines. Then, the Pegasus barge will transport the core stage to NASA's Kennedy Space Center in Florida where it will be assembled with the other parts of the SLS rocket and the Orion spacecraft being prepared for the Artemis I launch later this year.

NASA in the News

Firefly selected for Moon deliveries

NASA has awarded Firefly Aerospace of Cedar Park, Texas, about $93.3 million to deliver a suite of 10 science investigations and technology demonstrations to the Moon in 2023. The delivery, planned for Mare Crisium, a low-lying basin on the Moon's near side, will investigate a variety of lunar surface conditions and resources. Such investigations will help prepare for human missions to the lunar surface. The award is part of the agency's Commercial Lunar Payload Services (CLPS) initiative, in which NASA is securing the service of commercial partners to quickly land science and technology payloads on the lunar surface. The initiative is a key part of NASA's Artemis program. Firefly Aerospace will be responsible for end-to-end delivery services, including payload integration, launch from Earth, landing on the Moon, and mission operations. This is the sixth award for lunar surface delivery under the CLPS initiative and the first delivery awarded to Firefly Aerospace. For more about CLPS, visit here.

'Moon trees' continue to thrive

When Apollo 14 flew to the Moon in 1971, Command Module Pilot Stuart Roosa carried a special cargo in his personal travel kit – a canister of 400-500 loblolly pine, sweet gum, redwood, Douglas fir, and sycamore tree seeds. A joint effort between NASA and the U.S. Forest Service, the seeds were flown as an experiment to determine the effects of deep space on seeds and also to help raise awareness about the Forest Service and its wildland forest firefighters. Following the mission, some 450 saplings were grown from the seeds and distributed to schools, universities, parks, and government offices, many as part of the U.S. bicentennial celebrations in 1976. Some trees were planted beside their Earth-grown counterparts. After decades of growth, no discernable differences can be found between the trees that grew from seeds that traveled to the Moon and those that never left Earth. Second-generation trees, grown from Moon Tree seeds, are sometimes known as Half-Moon Trees and are also growing around the world. As NASA prepare to return humans to the Moon as part of the Artemis program, understanding the effects of deep space on plant growth is critical – a foundation the Apollo 14 mission help lay. To learn more about the Moon Trees, visit here. To learn more about Apollo 14 , visit here.

Viewing the Moon from ISS

This picture of the waning gibbous Moon was taken on Jan 29, 2021, the day after its full Moon phase as the International Space Station orbited 264 miles above China near the Mongolian border. Humanity's only orbital laboratory, the space station, orbits the Earth about 90 minutes or about 16 times every 24 hours.

Byrd embraces history in her new role as 1st female in Stennis front office post

Mary Byrd embraces a simple philosophy – if a person sets goals and works hard to achieve them, anything is possible. Her selection in late December as associate director at Stennis Space Center – the first female to hold one of the top three front office positions at the NASA center – is testament to that belief.

"I'm not going to lie – it's pretty cool," Ms. Byrd said when asked for her reaction to the new position. "Being recognized for your achievements and given the opportunity to serve as a senior leader is very rewarding."

At the same time, Ms. Byrd is quick to put her selection in perspective, particularly regarding what it says about the opportunities for women at Stennis. "Honestly, I believe it says what has always been there – that regardless of gender, hard work gets recognized at Stennis," Ms. Byrd said. "For those who put in the extra effort, who 'bleed NASA blue,' and truly care about Stennis, your opportunities are endless."

Ms. Byrd certainly embodies all three criteria, having served in several roles during the past 26 years at Stennis, the first five as a contractor responsible for electrical maintenance across the site. As a member of the NASA team, Ms. Byrd served as a contracting officer's representative before being named deputy director of the Stennis Center Operations Directorate. She was named head of that directorate in 2018.

In that leadership role, she oversaw critical areas of work for Stennis. "Center Operations provides a large variety of services that every program needs," Ms. Byrd noted. "Every NASA and tenant mission needs Center Operations After all, if I can boast a bit about it, you can't even get on site without going through the Office of Protective Services in Center Operations."

In her new role as Stennis associate director, Ms. Byrd's area of responsibility is even greater as she helps lead and manage sitewide activities and employees. It is a far cry from where she started 26 years earlier, when she arrived at Stennis almost by chance.

As a native of nearby Gretna, Louisiana, and resident of Covington, Louisiana, Ms. Byrd certainly was familiar with Stennis. As a child, she had joined her engineer father in watching the black-and-white images of the Apollo 11 astronauts step foot on the Moon for the very first time.

Mary Byrd is making history in her newest role as Stennis Space Center associate director, the first female to fill one of the site's top three leadership posts.

Later, she followed in the footsteps of her father and brothers to earn her own engineering degree from Louisiana State University. By the early-1990s, she was working as an electrical facilities engineer at the NASA Slidell Computer Complex just a few miles from Stennis.

When a decision was made to close the complex, Ms. Byrd prepared to search for a new job, including at Stennis. Before she could begin her own search, however, a contracting supervisor at the site saw her photograph in a newspaper article about the closing of the computer facility. He learned how to reach her and called to see if she would be interested in working on site.

It was a fortuitous move. "It's like working with family," Ms. Byrd said, looking back on her time at Stennis.

Ms. Byrd is particularly impressed with the diversity and inclusion found in the Stennis workplace. "I believe the two go hand-in-hand," she explained. "When you have an environment where people from different cultures and backgrounds work together, people simply feel more comfortable being themselves. I think that is what makes Stennis feel so much like family."

After 26 years, though, Ms. Byrd was thinking about saying goodbye to the family, at least as far as the workplace setting was concerned. She was seriously weighing plans to retire this April but also was keeping the door a bit open just in case a great opportunity presented itself.

The offer to serve as associate director was just that opportunity. "It changed my whole future plans," Ms. Byrd said. "I couldn't pass it up, not just because it was a senior level position but, specifically, because I would be making history as the first woman in a Stennis senior leadership position."

Ms. Byrd is not alone in understanding the significance of the moment. She shares the moment – and her home – with Greg Carmouche, her longtime "husband without papers" and himself a senior Stennis engineer. Her larger family extends to two daughters and sons-in-law, two "amazing" grandchildren (a three-year-old girl known as Mare-Bear and two-year-old boy who goes by Will-Will) and two "fur baby" dogs. There is the entire Stennis family to share in her achievement as well.

"Personally, it felt good just to be asked to serve, but when I started getting comments of encouragement and support from friends and colleagues, it felt even better," she said. "I was tickled when I saw comments on social media that included the hashtag – #girlpower."

Ms. Byrd is eager to use that #girlpower in her new role as she works with fellow directors to help shape the future for Stennis. The site is playing a key role in testing stages and engines for NASA's Space Launch System rocket, being built to return humans to the Moon and to power an eventual mission to Mars.

At the same time, Stennis faces the ongoing challenge of continuing to grow and adapt. Historically, the site overcame huge obstacles to grow into a unique federal city that is home to more than 50 organizations and companies. New challenges await as the COVID-19 pandemic continues to impact workplace logistics and dynamics, as NASA moves through an internal restructuring process, and as Stennis works to ensure and expand its operations.

"When it comes to the future, the work never ends," Ms. Byrd said. "The challenge is to continue to build and continue to grow, to keep the unique federal city alive and vibrant."

Of course, the fact that Ms. Byrd has joined the front office leadership team engaged in that work is an undeniable signal in its own right about that future – the opportunities are endless.

Did You Know?

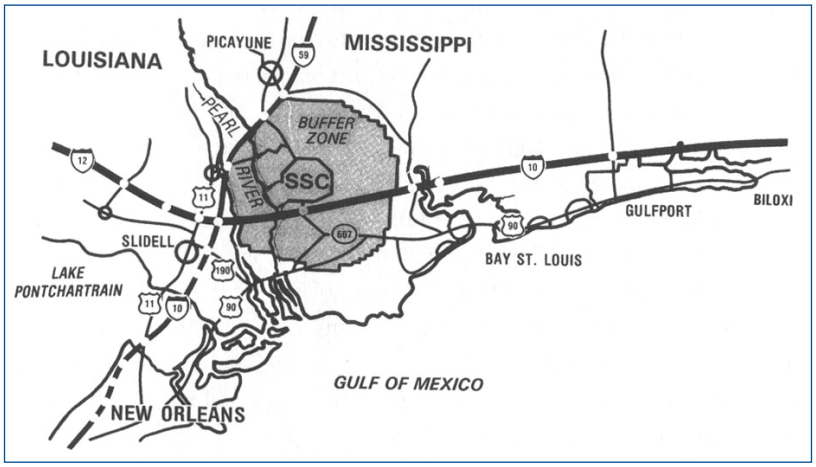
During NASA's Apollo Program, Stennis Space Center conducted 43 tests on 27 Saturn V rocket stages. These include all first and second Saturn stages that carried humans to the Moon on lunar landing missions.

History of Stennis site dates back to the 1700s

Note: NASA's John C. Stennis Space Center has played a pivotal role in the nation's space program. The following offers a glimpse into the history of the space program and the rocket engine test center. As the center celebrates its 60th anniversary later this fall, Lagniappe is looking back at the history of the site.

The history of the area where the Stennis Space Center now sits can be traced back well before Mississippi entered statehood in 1817. There were five towns located in what now is the acoustic buffer zone that surrounds SSC: Napoleon, Logtown, Gainesville, Santa Rosa and Westonia.

The town of Napoleon began with 640 acres granted by the British Government to John Claudius Favre in 1767. By 1808, John had transferred the land to his son, Simon Favre. Simon built the first house and store in what would become the small town of Napoleon. The town's claim to fame was a home named "Parade Rest" that was more than 3,000 square feet with thousands of azaleas and camellias decorating the landscape.



A 1961 map shows the location of Stennis Space Center, 45 miles east of New Orleans, along the East Pearl River in Hancock County, Mississippi. The 13,800-acre "fee" area – or fenced-in portion of the site – is shown in the center. The 125,000-acre acoustic buffer zone extends outward about six miles in all directions.

Logtown, at its peak, had 3,000 residents, most of whom worked for the lumber industry that was very prevalent in the area. The earliest resident of what would become bustling Logtown was Jean Baptiste Rousseve, who was given the land in 1788. The first log mill was built there in 1845, and the town grew until 1930. With the Great Depression and the railroad locating north of the town, by 1961, only 250 residents were left.

Gainesville was the only town in what is now Stennis that lay in the fee area. It began in 1810 with a land grant by Dr. Ambrose Gaines for more than 500 acres in what was then Spanish territory. Gaines laid out his plan for a new town, naming it Gaines Bluff. Andrew Jackson, just prior to the Battle of New Orleans in 1813, marched his troops through Gainesville so not to be detected by British troops. Gainesville grew due to the shipping and logging industries along the Pearl River, but in 1883, the Southern Railroad Line between New Orleans and Meridian, Mississippi bypassed the town by 10 miles. By 1961, when NASA was looking to build the rocket test facility, Gainesville only had 35 families left.

Santa Rosa was one of the more distinctive towns in the buffer zone. At its largest, it only had a handful of homes, but what it lacked in population, it made up for in character. In the town were a couple of stores and churches, a post office, a one-room school house and quite a few bars. These "dens of inequity" were closed and chased out of town many times, but the bars always reopened. There was quite a bit of illegal activity going on at the bars for the time, one being the sale of whiskey. Mississippi was a dry state at the time, and moonshiners populated the area surrounding Stennis until the mid-1960s.

The town of Westonia was named for the lumber tycoon Horatio Weston who founded the H. Weston Lumber Company. Westonia grew up around the timber industry and also housed a repair station for railroad flat cars and steam engines. It was a small town with churches, stores, one hotel, a small school and a couple of wells used for the steam engines that traveled through the town. After 1930 and the Great Depression, the timber industry in the area shut down. By the 1960s, the town was almost nonexistent.

On Nov. 1, 1961, on the grounds of the Logtown elementary school, U.S. Sen. John Stennis of Mississippi gave a speech to the 1,500 people from the surrounding area. The government planned to build a rocket testing center on their land, and Stennis spoke about the project and what the government was asking the people to do.

"There is always the thorn before the rose; … you have got to make some sacrifices, but you will be taking part in greatness," he said. It was a "call to arms" in the space race against the Soviet Union. Soon, because of the sacrifices of the families in the surrounding towns to allow construction of the rocket engine test site, it was widely said, "If you want to go to the moon, you first have to go through Hancock County, Mississippi."

(Originally published in the Mississippi Monitor).

Office of Diversity and Equal Opportunity

Black History Month focuses on families

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.

Credit for the evolving awareness of the true place of Black people in history can, in large part, be bestowed on one man, Carter G. Woodson, a historian and author also 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. He founded the Association for the Study of African American Life and History (ASALH) which is continuing Woodson's tradition of disseminating information about black life, history, and culture to the global community.

The differentness of races ... is no evidence of superiority or inferiority. This merely indicates that each race has certain gifts which the others do not possess.

Carter G. Woodson, *Father of Black History*

This year's Black History Month theme, selected by ASALH, is "The Black Family: Representation, Identity, and Diversity."

The black family has been a topic of study in many disciplines – history, literature, the visual arts and film studies, sociology, anthropology, and social policy. Its representation, identity, and diversity have been reverenced, stereotyped, and vilified from the days of slavery to this current time.

The black family knows no single location, since family reunions and genetic-ancestry searches testify to the spread of family members across states, nations, and continents. Not only are individual black families diasporic, but Africa and the diaspora itself have been long portrayed as the black family at large.

While the role of the black family has been described by some as a microcosm of the entire race, its complexity as the "foundation" of African American life and history can be seen in numerous debates over how to represent its meaning and typicality from a historical perspective – as slave or free, as patriarchal or matriarchal/matrifocal, as single-headed or dual-headed household, as extended or nuclear, as fictive kin or blood lineage, as legal or common law, and as black or interracial, etc.

Variation appears, as well, in discussions on the nature and impact of parenting, childhood, marriage, gender norms, sexuality, and incarceration. The family offers a rich tapestry of images for exploring the African American past and present.

Information in this article selected from the Study of African American Life and History. For more information, visit asalh.org.

Hail & Farewell

NASA welcomes the following:

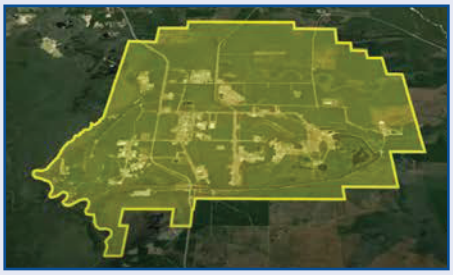
Brendan Cheng	AST, Software Systems	Engineering and Test Directorate
Star Johnson	Contract Specialist	Office of Procurement
Kyle Nester	Contract Specialist	Office of Procurement

NASA bids farewell to the following:

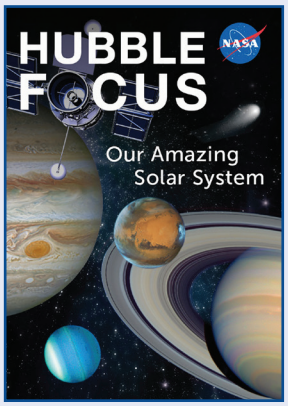
Robert Southers	Lead AST, Safety and Mission Assurance	Safety and Mission Assurance Directorate

Online Resources

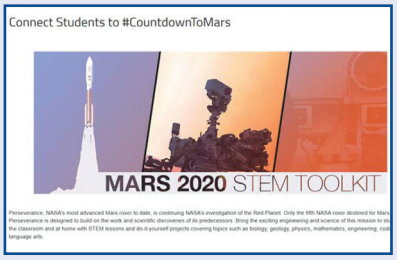
Stennis Emergency Management



Stennis Virtual Tour



NASA E-Book Downloads



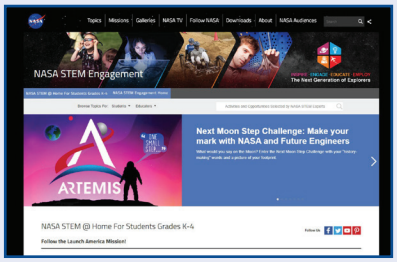
MARS 2020 STEM Toolkit

NASA at Home

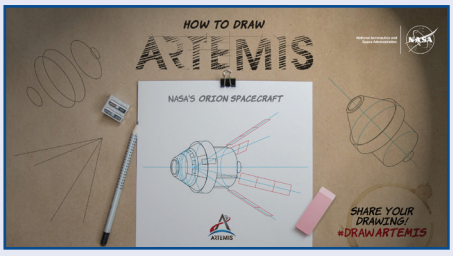
NASA Coronavirus Response

Stennis Fact Sheets

Stennis Artemis Resources page



NASA STEM@Home for Students



How to Draw Artemis