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LAGNIAPPE

John C. Stennis Space Center

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SLS Hot Fire!

See page 3

There is a fitting word to summarize the Jan. 16 hot fire test of NASA's Space Launch System (SLS) core stage on the B-2 Test Stand at Stennis – as long as one understands the etymology of the term and applies correct emphasis in its pronunciation.

Booyah!

The term is thought to be a variant of "bouillon" and refers to a stew or thick soup in some parts of the country. More popularly, the phrase is one of joy, achievement, and overcoming, as in – Booyah! I just sank that 45-foot putt. Ark!

Some would say the phrase is inappropriate for the recent test. After all, the hot fire of the core stage's four RS-25 engines was targeted for a minimum of 250 seconds but experienced an automatic shutdown at the 67.2-second mark. However, a stop watch is a poor way to measure what happened during the day. In many ways, both definitions of "booyah" apply.

The Jan. 16 event was a true team effort that involved folks from across the test complex in a host of leading and support roles. Just as various ingredients are mixed to create a delicious stew, it is difficult to name and number all of the people who helped operators achieve hot fire ignition on their very first attempt.

Stennis test complex leaders praised the effort of each person involved, whether one contributed as the starting quarterback or a bench player. In regards to Stennis operations, site teams shined like the brightest star in the sky, one leader involved in the Green Run test series maintained.

As for the test itself, just reaching the point of ignition was a remarkable achievement. Operating teams had to work through issues that arose during the countdown process just to make the attempt possible. By the 10-minute countdown mark, all had been addressed, and ignition of the engines occurred as scheduled.

Be proud of the effort and accomplishment, leaders reminded team members following the hot fire. As one summarized a few days later, the Jan. 16 test was a success in so many ways regardless of how others may choose to characterize it.

In other words – join with me now – BOOYAH!

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NASA conducts hot fire test of Space Launch System core stage for Artemis I mission

NASA conducted a hot fire Jan. 16 of the core stage for the agency's Space Launch System (SLS) rocket that will launch the Artemis I mission to the Moon. The hot fire is the final test of the Green Run series.

The test plan called for the rocket's four RS-25 engines to fire for a little more than eight minutes – the same amount of time it will take to send the rocket to space following launch. The team successfully completed the countdown and ignited the engines, but the engines shut down a little more than one minute into the hot fire. Teams are assessing the data to determine what caused the early shutdown, and will determine a path forward. (See page 4 update).

For the test, the 212-foot core stage generated 1.6 million pounds of thrust, while anchored in the B-2 Test Stand at NASA's Stennis Space Center near Bay St. Louis, Mississippi. The hot fire test included loading 733,000 pounds of liquid oxygen and liquid hydrogen – mirroring the launch countdown procedure – and igniting the engines.

> ***Stennis has not witnessed this level of power since the testing of Saturn V stages in the 1960s.***
>
> Stennis Director Rick Gilbrech

"Saturday's test was an important step forward to ensure that the core stage of the SLS rocket is ready for the Artemis I mission, and to carry crew on future missions," said NASA Administrator Jim Bridenstine, who attended the test. "Although the engines did not fire for the full duration, the team successfully worked through the countdown, ignited the engines, and gained valuable data to inform our path forward."

Support teams across the Stennis test complex provided high-pressure gases to the test stand, delivered all operational electrical power, supplied more than 330,000 gallons of water per minute to protect the test stand flame deflector and ensure the structural integrity of the core stage, and captured data needed to evaluate the core stage performance.

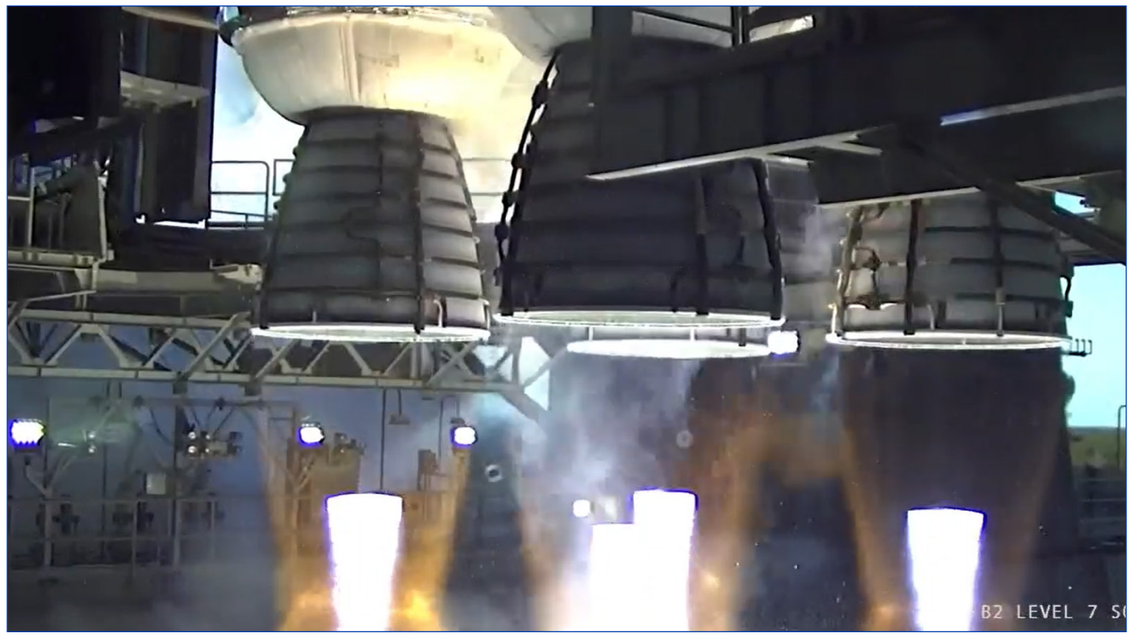
"Seeing all four engines ignite for the first time during the core stage hot fire test was a big milestone for the Space Launch System team" said John Honeycutt, the SLS program manager at NASA's Marshall Space Flight Center in Huntsville, Alabama. "We will analyze the data, and what we learned from today's test will help us plan the right path forward for verifying this new core stage is ready for flight on the Artemis I mission."

The Green Run series of tests began in January 2020, when the stage was delivered from NASA's Michoud Assembly Facility in New Orleans and installed in the B-2 Test Stand at Stennis. The team completed the first of the eight tests in the Green Run series before standing down in March due to the ongoing coronavirus pandemic. After resuming work in May, the team worked through the remaining tests in the series, while also standing down periodically as six tropical storms or hurricanes affected the Gulf Coast. Each test built upon the previous test with increasing complexity to evaluate the stages' sophisticated systems, and the hot fire test that lit up all four engines was the final test in the series.

"Stennis has not witnessed this level of power since the testing of Saturn V stages in the 1960s," Stennis Center Director Rick Gilbrech said. "Stennis is the premier rocket propulsion facility that tested the Saturn V first and second stages that carried humans to the Moon during the Apollo Program, and now, this hot fire is exactly why we test like we fly and fly like we test. We will learn from today's early shutdown, identify any corrections if needed, and move forward."

In addition to analyzing the data, teams also will inspect the core stage and its four RS-25 engines before determining the next steps. Under the Artemis program, NASA is working to land the first woman and the next man on the Moon in 2024. SLS and the Orion spacecraft that will carry astronauts to space, along with the human landing system and the Gateway in orbit around the Moon, are NASA's backbone for deep space exploration.

For more about the Green Run test series, visit here.
To view the NASA TV hot fire broadcast, visit here.
To view the SLS hot fire test, view here.
To view the post-test press conference, view here.



A billowing steam cloud towers into a clear blue sky above the B-2 Test Stand at Stennis Space Center as operators conduct a Green Run hot fire of the core stage for NASA's Space Launch System (SLS) rocket Jan. 16 (top photo). An on-stand camera offers a close-up view of the stage's four RS-25 engines as they fire during the Green Run test, generating a combined 1.6 million pounds of sea-level thrust. The hot fire marked the last of eight Green Run tests of the SLS core stage and its sophisticated, integrated systems.

Green Run update: Data and inspections indicate SLS core stage in good condition

NASA posted an Artemis blog entry Jan. 19 that the Space Launch System (SLS) rocket Green Run team has reviewed extensive data and completed preliminary inspections that show the rocket's hardware is in excellent condition after the Green Run test that ignited all the engines at 4:27 p.m. CST at NASA's Stennis Space Center.

After analyzing initial data, the team determined the shutdown after firing the engines for 67.2-seconds on Jan.16 was triggered by test parameters that were intentionally conservative to ensure the safety of the core stage during the test.

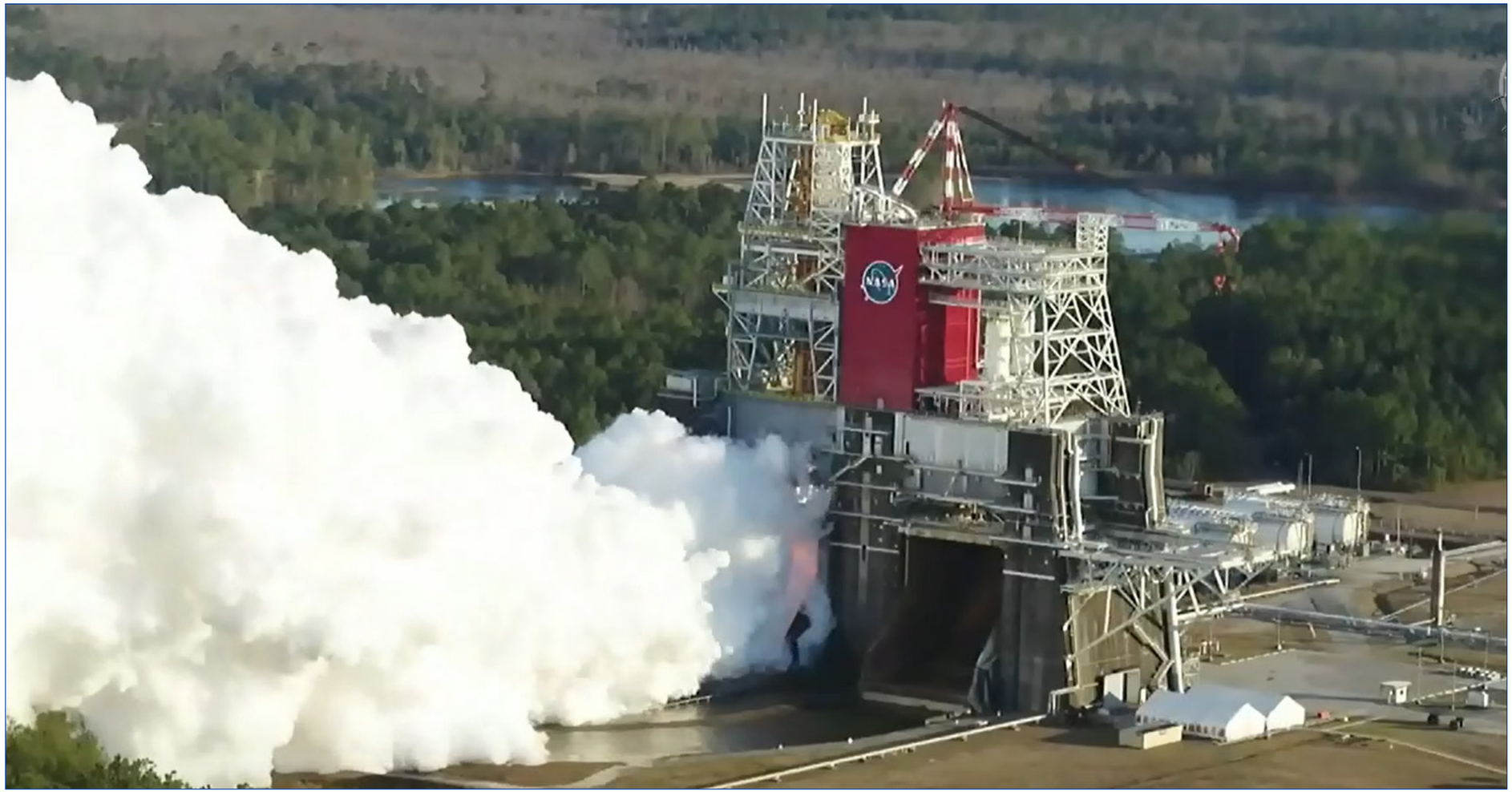
These preprogrammed parameters are designed specifically for ground testing with the flight hardware that will fly NASA's Artemis I mission to ensure the core stage's thrust vector control (TVC) system safely moves the engines. There is a TVC system that gimbals, or pivots, each engine, and there are two actuators that generate the forces to gimbal each engine. The actuators in the TVC system are powered by Core Stage Auxiliary Power Units (CAPU). As planned, the thrust vector control systems gimbaled the engines to simulate how they move to direct thrust during the rocket's ascent.

During gimbaling, the hydraulic system associated with the core stage's power unit for Engine 2, also known as engine E2056, exceeded the pre-set test limits that had been established. As they were programmed to do, the flight computers automatically ended the test. The specific logic that stopped the test is unique to the ground test when the core stage is mounted in the B-2 Test Stand at Stennis. If this scenario occurred during a flight, the rocket would have continued to fly using the remaining CAPUs to power the thrust vector control systems for the engines.

During the test, the functionality of shutting down one CAPU and transferring the power to the remaining units was successfully demonstrated. This gimbaling test event that resulted in shutting down the CAPU was an intentionally stressing case for the system that was intended to exercise the capabilities of the system. The data is being assessed as part of the process of finalizing the preset test limits prior to the next usage of the core stage.

Throughout the hot fire, all four engines performed as expected. While the test planned to fire the four engines for about 8 minutes, the team still achieved several objectives during the shorter firing:

- They repeated the wet dress rehearsal, once again filling the tanks with more than 700,000 gallons of propellant with some added modifications to procedures to ensure proper thermal conditioning of the engines.
- They successfully pressurized the propellant tanks, completed the countdown, and ignited the engines for the first time.
- The engines reached full power of 109 percent, producing 1.6 million pounds of thrust, just as they will during the Artemis I launch.



A NASA drone offers a bird's-eye view of the Jan. 16 Green Run hot fire test of the core stage for NASA's Space Launch System rocket on the B-2 Test Stand at Stennis Space Center. Operators achieved hot fire ignition of the stage's four RS-25 engines at 4:27 CDT.

Initial data indicate the sensor reading for a major component failure that occurred about 1.5 seconds after engine start was not related to the hot fire shutdown. It involved the loss of one leg of redundancy prior to T-0 in the instrumentation for Engine 4, also known as engine number E2060.

Engine ignition begins 6 seconds prior to T-0, and the engines fire in sequence about 120 milliseconds apart. Test constraints for hot fire were set up to allow the test to proceed with this condition, because the engine control system still has sufficient redundancy to ensure safe engine operation during the test. The team plans to investigate and resolve the Engine 4 instrumentation issue before the next use of the core stage.

Engineers also continue to investigate reports of a "flash" around the engines. A visual inspection of the thermal blankets that protect the engine show signs of some exterior scorching, which was anticipated due to their proximity to engine and CAPU exhaust. Sensor data indicate temperatures in the core stage engine section were normal. Both observations are an early indication the blankets did their job and protected the rocket from the extreme heat generated by the engines and CAPU exhaust.

Data analysis is continuing to help the team determine if a second hot fire test is required. The team can make slight adjustments to the thrust vector control parameters and prevent an automatic shut down if they decide to conduct another test with the core stage mounted in the B-2 stand.

Watch the Green Run hot fire video here.

Behind the scenes – Stennis teams, facilities provide critical support for hot fire test

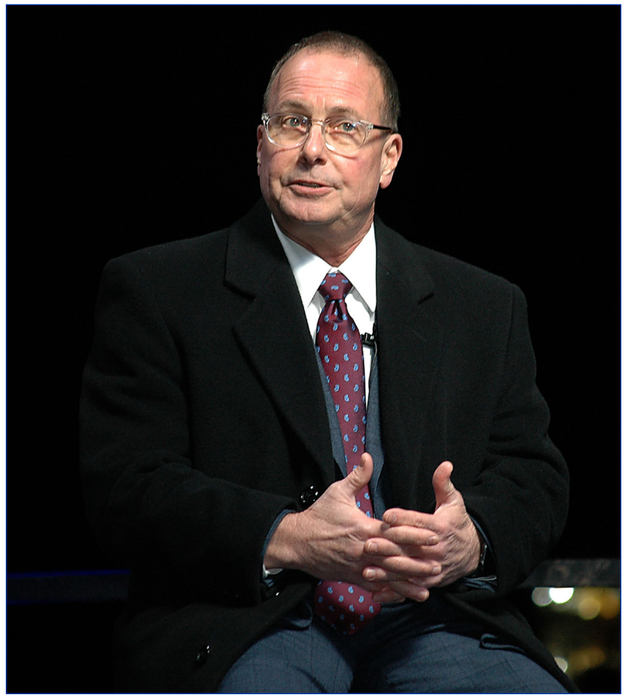
Teams across the Stennis Space Center test complex were involved in critical support roles in the lead up to the culminating Green Run hot fire of the core stage for NASA's Space Launch System (SLS) rocket on Jan. 16. The hot fire effort included support teams at the High Pressure Gas Facility (top left and center photos), the E Test Complex (top right photo) and the High Pressure Industrial Water Facility (bottom right photo). Prior to Jan. 16, personnel at the Cryogenic Storage Facility had transported liquid oxygen and liquid hydrogen barges to the B-2 Test Stand to provide propellant needed for the stage test (bottom left photo).

Getting set – lead up to SLS core stage hot fire features commentary, COVID-19 protocol

As operators worked toward a hot fire test of NASA's Space Launch System (SLS) core stage, viewing participants arrived at nearby INFINITY Science Center, where they were administered a COVID-19 temperature check (bottom left photo) and given credentials before boarding buses for assigned socially distanced seats and travel to Stennis Space Center (bottom right photo). Participants also received a commemorative SLS Green Run booklet (bottom center photo). On site, NASA TV hosted pre-test programming that featured guest commentators, including astronaut Tracy Caldwell Dyson (top left photo) and outgoing NASA Administrator Jim Bridenstine (top right photo), interviewed by host Leigh D'Angelo from NASA's Michoud Assembly Facility.

‘A beautiful day, a great day’ – from start to finish, participants affirm hot fire achievement

Participants viewing Space Launch System (SLS) core stage test activities at Stennis Space Center on Jan. 16 affirmed all aspects of the experience – including the beautiful weather and the ability of operating teams to achieve hot fire. Prior to the test, participants staked out prime viewing spots (top left photo), while astronauts Matthew Dominick (bottom left photo) and Tracy Caldwell Dyson (bottom center photo) visited with officials and media representatives. Following the hot fire, a trio of NASA leaders hosted a briefing with media, including outgoing NASA Administrator Jim Bridenstine (top tight photo) and Stennis Director Rick Gilbrech (bottom right photo). John Honeycutt, SLS program manager at Marshall Space Flight Center, also participated in the post-test press conference.



Rainbow appears as SLS hot fire ends

A partial rainbow arcs in the sky as the steam cloud disperses following the Green Run hot fire test of the core stage for NASA's Space Launch System (SLS) rocket on the B-2 Test Stand at Stennis Space Center on Jan. 16. The test came a year after arrival of the core stage at Stennis in January 2020 and marked the eighth of eight scheduled Green Run tests of the SLS core stage and its integrated systems.

NASA extends Jupiter mission of its Juno spacecraft

NASA has authorized a mission extension for its Juno spacecraft exploring Jupiter. The agency's most distant planetary orbiter will now continue its investigation of the solar system's largest planet through September 2025, or until the spacecraft's end of life. This expansion tasks Juno with becoming an explorer of the full Jovian system – Jupiter and its rings and moons – with multiple rendezvous planned for three of Jupiter's most intriguing Galilean moons: Ganymede, Europa, and Io. Launched in 2011, Juno arrived at Jupiter on July 4, 2016. The prime mission will be completed in July 2021. The extended mission involves 42 additional orbits, including close passes of Jupiter's north polar cyclones; flybys of Ganymede, Europa, and Io; as well as the first extensive exploration of the faint rings encircling the planet. For more information on Juno mission, visit here and here.

NASA in the News

7 Things to know about new Mars rover

If all goes as planned, NASA's Perseverance rover will touch down on the surface of Mars on Feb. 18, joining another rover and lander currently at work, with several orbiters in the skies above. What sets this rover apart?

- Perseverance is searching for signs of ancient life, using a new suite of cutting-edge science instruments.
- The rover is landing in a place with a high potential for finding these signs of past microbial life.
- Perseverance is collecting important data about Mars' geology and climate.
- Perseverance is the first leg of a round trip to Mars. The rover will collect core samples that NASA plans to return to Earth using a second mission.
- Perseverance carries instruments/technology to pave the way for human missions to the Moon and Mars.
- Perseverance embodies the NASA – and the scientific – spirit of overcoming challenges.
- Perseverance carries more cameras than any interplanetary mission in history, allowing the public to experience in high-definition what it is like on Mars.

For more about Perseverance, visit here and here.

Mission to Mars Student Challenge

On Feb. 18, NASA will attempt to land the Mars 2020 Perseverance rover on the surface of the Red Planet. In conjunction, the agency is inviting individuals and groups to join the excitement with NASA's Mission to Mars Student Challenge. Participants can design, build, and land their own spacecraft – just like NASA scientists and engineers do. There also is a handy Mars 2020 STEM toolkit filled with activities, videos, and more. The most sophisticated rover ever built, Perseverance is the biggest and heaviest to attempt a Mars landing. By participating in the Mission to Mars Student Challenge, individuals and groups can land their own rover, too. Activities include: a flexible, guided five-week education plan; a weekly newsletter; video conversations with mission scientists and engineers; and opportunities to participate in question-and-answer sessions with mission experts. The landing attempt will be broadcast live on NASA TV and the agency's website on Feb. 18, beginning at 1:15 p.m. CDT. Touchdown will take place at about 2:55 p.m. To read more about the Challenge, visit here. To learn more about Perseverance, visit here.

For NASA engineer, Stennis Space Center is home

As far as Christine Powell is concerned, NASA's Apollo Program and the original Star Wars movie changed everything for her.

"The image of a starscape is branded in my memory," said Powell, as she reflected on the impact of the movie and NASA's missions to the Moon. "Space and the stars and exploring the universe became a huge part of my life growing up. Working for NASA or doing something related to space became my main goal."

Powell took a major step toward achieving her goal in college when she was offered a chance to work at Stennis Space Center through the Mississippi State University Co-Op Program. Thirty years later, she remains at the site, serving as assistant director of the Stennis Engineering and Test Directorate.

NASA engineer Christine Powell has found a home at Stennis Space Center, where she began work as a student intern 30 years ago.

For Powell, Stennis is home. A Biloxi native and Carriere resident, she is a lifelong member of the Gulf Coast family. Her family heritage traces back to members of the exploration party that reached Mississippi with Pierre LeMoyne Sieur d'Iberville in 1699. In addition, with her years of subsequent work on site, Powell also has found a true place within the Stennis family.

Powell became a full-time employee at Stennis in 1995 and has served in various roles, including as a controls engineer, instrumentation engineer, data acquisition engineer, test project console operator, systems engineer lead, project manager, and systems engineering branch chief.

In her current position, she leads the Project Formulation, Planning and Control Office and oversees staff functions for various site contracts and office areas. Powell also serves on several program- and agency-level teams and committees, leads efficiency and effectiveness initiatives for propulsion testing, and oversees the data, risk, and business management functions in the directorate.

The work involves direct support of NASA's Artemis program to return humans, including the first woman, to the Moon. Stennis is testing the engines and stages for the new Space Launch System (SLS) rocket that will serve as the backbone of the program and, eventually, fly to Mars.

For her part, Powell works to help maximize limited resources, serves on the operational readiness committee for SLS core stage testing, supports agency teams as they evaluate mission concepts and strategies, and serves as a spokesperson to community, student, and industry groups to promote NASA and its Artemis and mission goals.

The work has its challenges, especially as COVID-19 has impacted operations. "It has been challenging to find a way to maintain relationships, communication, and morale in a 'virtual' world," Powell said. "I have been very impressed by our center leadership in the proactive approaches to engage employees and find solutions in enabling onsite operations."

The leadership and resilience of the center comes as no surprise. For Powell, it is a direct reflection of the commitment and creativity of the Stennis workforce.

"Our workforce is our biggest asset, and I am proud to be a part of this organization, particularly at this time," she said. "Stennis is one of the most engaging and energetic cultures I have seen. Personnel work hard but make time to take care of each other. We respect differences and encourage workforce diversity to ensure we are exposed to new ideas, different perspectives, and different approaches to solving problems."

Powell looks back at her continuing career with pride – at being able to help small companies reach testing goals, assist colleagues, and mentor employees. "It all makes me feel like I am doing my part in helping NASA and the programs succeed," said Powell, who has received a host of achievement awards for her work.

Looking ahead, Powell is excited to see where new technologies, test projects, and missions lead NASA and the center. As for herself, she knows exactly where the roads goes – home, where she belongs and has been all along.

Spinoff 2021 highlights NASA technologies

Whether upgrading air traffic control software or honing the food safety practices that keep our dinner tables safe, NASA has worked for more than six decades to ensure its innovations benefit people on Earth. One of the agency's most important benefits is the way investment in NASA pays dividends throughout the U.S. economy.

The latest edition of NASA's *Spinoff* publication highlights dozens of companies that have benefited from cooperation with NASA. This cooperation means investment in existing companies large and small; it eases the path for entrepreneurs to start new businesses; and it benefits the public as a whole through new jobs and cutting-edge products that improve daily life.

Included in the publication are two technologies developed at Stennis Space Center.

"Whether working to send the first woman and next man to the Moon or helping improve the technology that carries passengers from Portland, Maine, to Portland, Oregon, NASA innovators are constantly creating new technology," said Jim Reuter, associate administrator of the agency's Space Technology Mission Directorate in Washington. "Often these advances have wide-ranging benefits well beyond the need they were first imagined to meet."

This year in *Spinoff*, readers will learn how:

- NASA's support for small businesses has paid off with safer hip replacements, more efficient supercomputer coolers, and even better water bottles.
- How efforts to keep astronauts' food safe on the way to the Moon have drastically reduced the incidence of food-borne illness around the world.
- How years of air traffic research helped shape software that enables airports to track airplanes, predict weather impacts, and find alternative flight paths.

In addition to these commercial success stories, the *Spinoff* 2021 issue also delves into NASA's response to the COVID-19 pandemic. In particular, it highlights how the space agency's Technology Transfer program worked to ensure new or improved innovations – including new ventilators and sterilizers – made it into the hands of businesses and the public for the biggest impact.

A pair of Stennis-related technologies are highlighted in the publication as well:

- **Floating Piston Valve.** This novel valve approach reduces maintenance due to fewer parts and seals, reduces size and cost, is hermetically sealed and leak-free, and is able to withstand high pressures. It can be used in power plants, in the chemical industry and refineries, in cryogenic fluid systems, and in the pharmaceutical manufacturing industry.
- **Supersonic Spike Diffuser.** This unique diffuser design doubles pumping efficiency in one quarter the space. Its starting pressure ratio is about 50 percent of conventional diffusers, and it is able to achieve a lower vacuum for the same feed pressure. The diffuser design is compact and reduces structural overhead. It can be used in steel production, chemical processing, oil refinement, and the distillation of flavors and fragrances.

Spinoff 2021 also features 20 NASA technologies that the Technology Transfer program has identified as promising future spinoffs, as well as information on how to license them or partner with NASA to further develop them for commercialization.

"Transferring NASA technology beyond the space agency is part of our culture and one of our longest-standing missions, ..." Reuter said. "W're always working to ensure our innovations find the widest benefit, from space to you."

Digital versions of the *Spinoff* issue and periodic stories about spinoffs are available online here.

For additional information about NASA's Technology Transfer program, visit here.

1961 – NASA decides to build propulsion test site

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.

In 1915, the National Advisory Committee for Aeronautics (NACA) was created to promote aeronautical research. It existed until Oct. 1, 1958, when it was converted to a new agency, the National Aeronautics and Space Administration.

The reason for the conversion was the Soviet Union launch of the satellite Sputnik I into low-Earth orbit on Oct. 4, 1957. The Soviets later launched the first human in space, Yuri Gagarin.

There was a congressional review of the American space program under way at the time of the Sputnik launch, and using the bones of NACA, a bill was presented to President Dwight Eisenhower in July 1958 to create the National Aeronautics and Space Administration (NASA). The official beginning of the agency was Oct. 1, 1958.

President John F. Kennedy delivers a special address on space to Congress on May 25, 1961.

In May 1961, President John F. Kennedy delivered a speech before a special joint session of Congress, proclaiming that the United States should land an astronaut on the Moon before the decade of the 1960s was out. The timeline meant NASA had less than nine years to place a human on the Moon.

In order to achieve that goal, the agency needed to test rockets to fly. In August 1961, an ad hoc committee of members from NASA Headquarters and Marshall Space Flight Center began the work of finding the perfect location to do so.

There were several variables to consider since the Saturn rockets for the Apollo Program would be assembled at the Michoud Assembly Facility outside of New Orleans and launched from Cape Canaveral, Florida. NASA needed a facility that, ideally, would lie between these two places, be situated away from a densely populated area because of the noise associated with testing large rocket engines and stages, have access to both waterway and highway, have a mild climate so testing could conceivably be conducted year round and have supporting communities nearby.

On Oct. 25, 1961, NASA announced that a rocket test site would be established in Hancock County, Mississippi. The site, then known as Mississippi Test Operations, would be the facility to test the Saturn rockets that would launch the Apollo missions to the Moon.

Since that time, every single rocket engine that has launched astronauts from American soil on lunar missions or low-Earth orbit space shuttle missions has been tested at what is now known as Stennis Space Center.

Hail & Farewell

NASA bids farewell to the following:

Thomas Galloway	Deputy Director	Office of the Director
Don Beckmeyer	AST, Engineer Project Management	Office of the Director
James Morgan	AST, Experimental Facility Development	Center Operations Directorate

Office of Diversity and Equal Opportunity

MLK Day is reminder – service builds unity

In 1994, Congress passed the King Holiday and Service Act, designating the Martin Luther King, Jr. (MLK) Federal Holiday as a national day of service and charged the Corporation for National and Community Service with leading this effort.

Taking place each year on the third Monday in January, the MLK Day of Service is the only federal holiday observed as a national day of service – "a day on, not a day off." It is an opportunity for Americans from all walks of life to become unified in the pursuit of finding solutions to the most pressing national problems.

The MLK Day of Service is designed to empower individuals, strengthen communities, build unity, and move people closer to King's vision of a "Beloved Community."

Participation in the MLK Day of Service has grown steadily over the past decade, with hundreds of thousands of Americans each year engaging in projects such as tutoring and mentoring children, painting schools and senior centers, delivering meals, building homes, and reflecting on King's life and teachings. Many of the projects started on the MLK Day of Service continue to engage volunteers beyond the holiday and impact the community year-round.

Although the scope of the event grows every year, many people are still not aware of the service component of the holiday. It is not enough just to be aware of the holiday; it is vital to serve. King recognized the power of service. He famously said, "Everyone can be great because everybody can serve."

This year, the MLK Day of Service was observed on January 18, 2021. It offered an opportunity for each of us to reflect on what we can do for others. While the COVID-19 pandemic has impacted many things, there are still many opportunities to serve in the community.

Please see the following online link for ways to serve throughout the year – https://www.nationalservice.gov/serve-your-community/mlk-day-service.

There is strength in numbers, and when people collectively come together to serve, they are unified in effecting change.

Everyone can serve, and everyone has a gift or a talent to share. As King famously observed, "Be a bush if you can't be a tree. If you can't be a highway, just be a trail. If you can't be a sun, be a star. For it isn't by size that you win or fail. Be the best of whatever you are."

Serving in the community makes the community stronger and healthier – and makes each person stronger and healthier in the process. Performing community service is a very worthy endeavor that helps unite people to see the bigger picture of life they often miss in living their daily lives.

Everyone can make a difference in changing and improving the world - and not only on MLK Day of Service. Like King said, "The time is always right to do what is right."

Excerpts for this article taken from: www.aascu.org/programs/ADP/MLKDay/.

Whatever affects one directly, affects all indirectly. I can never be what I ought to be until you are what you ought to be. This is the interrelated structure of reality.

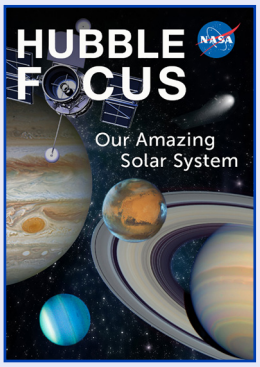
Martin Luther King Jr.

Online Resources

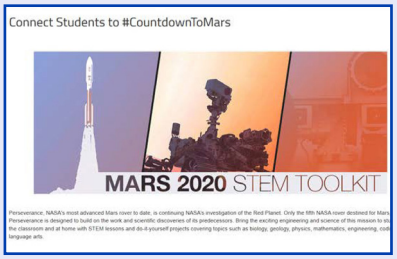
Listen to BizTalks podcast interview with Stennis Deputy Director John Bailey interview here.

Stennis Emergency Management

Stennis Virtual Tour



NASA E-Book Downloads



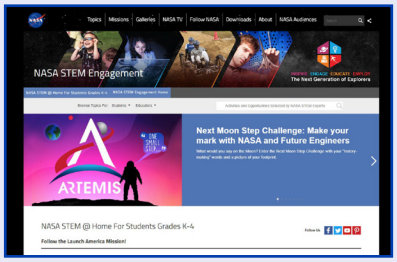
MARS 2020 STEM Toolkit

NASA at Home

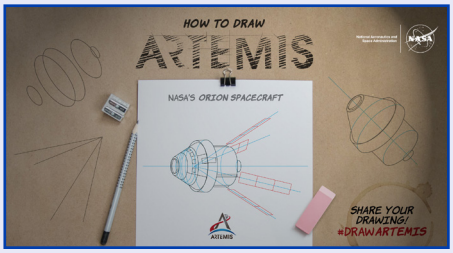
NASA Coronavirus Response

Stennis Fact Sheets

Stennis Artemis Resources page



NASA STEM@Home for Students



How to Draw Artemis