



National Aeronautics and Space Administration



LAGNIAPPE

John C. Stennis Space Center

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A year of 'firsts' and milestones

See page 7



“Seven swans a -swimming / Six geese a-laying / Five golden rinnngggss!” Goodness, you caught me singing again. No matter how many times you hear certain yuletide songs, you cannot help from singing along – or trying to, at least. Ark!

Many holiday songs have interesting origin stories. You may know *Jingle Bells* was initially written for Thanksgiving, but do you know the story of how it became the first song performed and broadcast from space?

It was December 1965. In south Mississippi, work to build Stennis Space Center had been disrupted by Hurricane Betsy, which had slammed area residents a few months earlier. Meanwhile, NASA was continuing its march to the Moon with a series of Gemini missions.

Gemini 6 and Gemini 7 missions coincided for two days, performing critical maneuvers to show that vehicles could be docked in space. On Dec. 16, as Gemini 6 was preparing to return to Earth, command pilot Wally Schirra surprised ground control with a message about an unidentified flying object that had been spotted.

“This is Gemini 6,” he said. “We have an object, looks

like a satellite going from north to south, up in a polar orbit. He’s in a very low trajectory traveling from north to south and has a very high climbing ratio. ... Very low. Looks like he might be going to reenter soon. Stand by ... You might just let me try to pick up that thing.”

Ground control next heard a short rendition of *Jingle Bells* played with an eight-note harmonica and small string of bells that Schirra and fellow astronaut Thomas Stafford had carried to space.

No one had known Schirra and Stafford were planning the historic duet. When the short performance ended, astronaut Jim Lovell chimed in with from the nearby Gemini 7 capsule – “We got him, too, six” – and laughed. “That was live, seven, not taped,” Schirra said. “You’re too much, six,” a relieved ground control voice returned. Ark!

What a great holiday story – and you can still find a recording of the incident online! Listen to it some evening and recall your own favorite holiday stories. Sharing memories makes the season so special – especially when combined with a big glass of eggnog. Enjoy the holiday eggnog, everyone. Ark!



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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 invests in incredible space exploration future



Note: The following is an op-ed by Stennis Space Center Director Rick Gilbrech. It was written in response to NASA's announcement of new partnerships for commercial lunar payload delivery services Nov. 29 and was distributed to area media outlets for publication.

Perhaps you were posed this question as a young school student: Given the choice, would you rather receive \$1 million in 30 days or a total amount that begins with one penny on Day One and doubles every day for 30 days?

The exercise teaches one to examine choices carefully, especially ones that offer choices between short-term and long-term effects. While \$1 million in one month sounds good and certain, the better choice is the penny that doubles every day. You begin with one penny, double to two on the second day, to four on the third day and so on – until Day 30 when your doubling total reaches a mind-boggling \$5,368,709.12.

Talk about a wise investment.

The exercise is a timely one when you think about NASA and the future of space exploration for this country. Everything in that arena seems to be “in planning” or “in the works.” It is only natural to wonder if real progress is being made.

Indeed, real progress is being made and concrete steps are being taken. NASA – and the nation – are moving forward, closer and closer to the day we will fly farther than ever into unexplored space. Just this week, NASA made a major announcement regarding its Commercial Lunar Payload Services initiative.

The agency declared nine companies eligible to provide delivery services to the Moon. Moving ahead, these companies will bid to fill a critical need in delivering necessary equipment and technologies to the Moon.

Actual missions are still to come, but the selection of the companies is a step forward, an investment in the future success of NASA's plan to return to the Moon and continue on to such deep space destinations as Mars.

The United States first sent humans to the Moon almost 50 years ago. The golden anniversary of that mission actually comes this summer. On those early missions, astronauts stayed a few days on the lunar surface and returned.

This time, the country has been challenged to return to

the Moon to stay. The Moon provides a place for NASA to develop and test technologies and capabilities needed for longer missions into space and offers economic potential for the nation. Just as 50 years ago, a return to the Moon also will serve as an inspirational and rallying point for the nation and the next generation of space explorers.

The Commercial Lunar Payload Services initiative is a key to enabling the innovative and sustainable lunar exploration approach called for in the president's Space Policy Directive-1. It fulfills the directive's vision of NASA partnering with American companies in achieving long-term exploration and scientific study of the Moon.

In response to the vision, NASA plans to work with commercial partners to deliver and build a lunar orbiting platform called Gateway that will serve as a staging point for missions to the lunar surface and to deep space destinations such as Mars. Think of Gateway as a lunar space station where astronauts can develop technologies and capabilities needed for deep space exploration.

It is an ambitious plan – and focusing on the big picture to come is exciting. However, it is just as exciting to watch today's progress toward it. As the nation's largest propulsion test center, Stennis Space Center understands the importance of that progress.

It is the same path of progress followed in the Apollo Program when Stennis tested the Saturn V stages that later carried astronauts to the Moon. It is the same step-by-step work Stennis performed in testing the engines and propulsion system that powered 135 historic space shuttle missions from 1981 to 2011.

Now, we are working with commercial companies that already are – or will be – NASA's partners in space. Stennis Space Center also is testing the Aerojet Rocketdyne RS-25 engines that will power the new Space Launch System (SLS) rocket, which will carry astronauts on deep space missions and help build Gateway. Soon, we will test the actual SLS rocket stages.

Each test represents a step, a move forward as new engine components are tested and additional data is gathered on RS-25 performance. Each test adds to the excitement, as does each space program announcement and each milestone met.

With every such action, anticipation grows and the envisioned day grows nearer when American astronauts launch from this country deeper than ever into space, to destinations no human has ever reached.

Return on investment has never looked better.

Stennis family members, guests visit site to view RS-25 test



About 650 family members and guests of Stennis Space Center employees visited the site Dec. 12 to view a scheduled RS-25 engine test on the A-1 Test Stand. Astronaut Shannon Walker was on hand to visit with Stennis Director Rick Gilbrech (top center photo) and other guests. She also answered questions from visiting children and others prior to the test. Guests



also were able to enjoy select activities prior to the test. Stennis is testing RS-25 engines for use on NASA's new space Launch System (SLS) rocket, being built to carry humans deeper into space than ever, to such destinations as the Moon and ultimately Mars. Four RS-25 engines will help power SLS at launch.





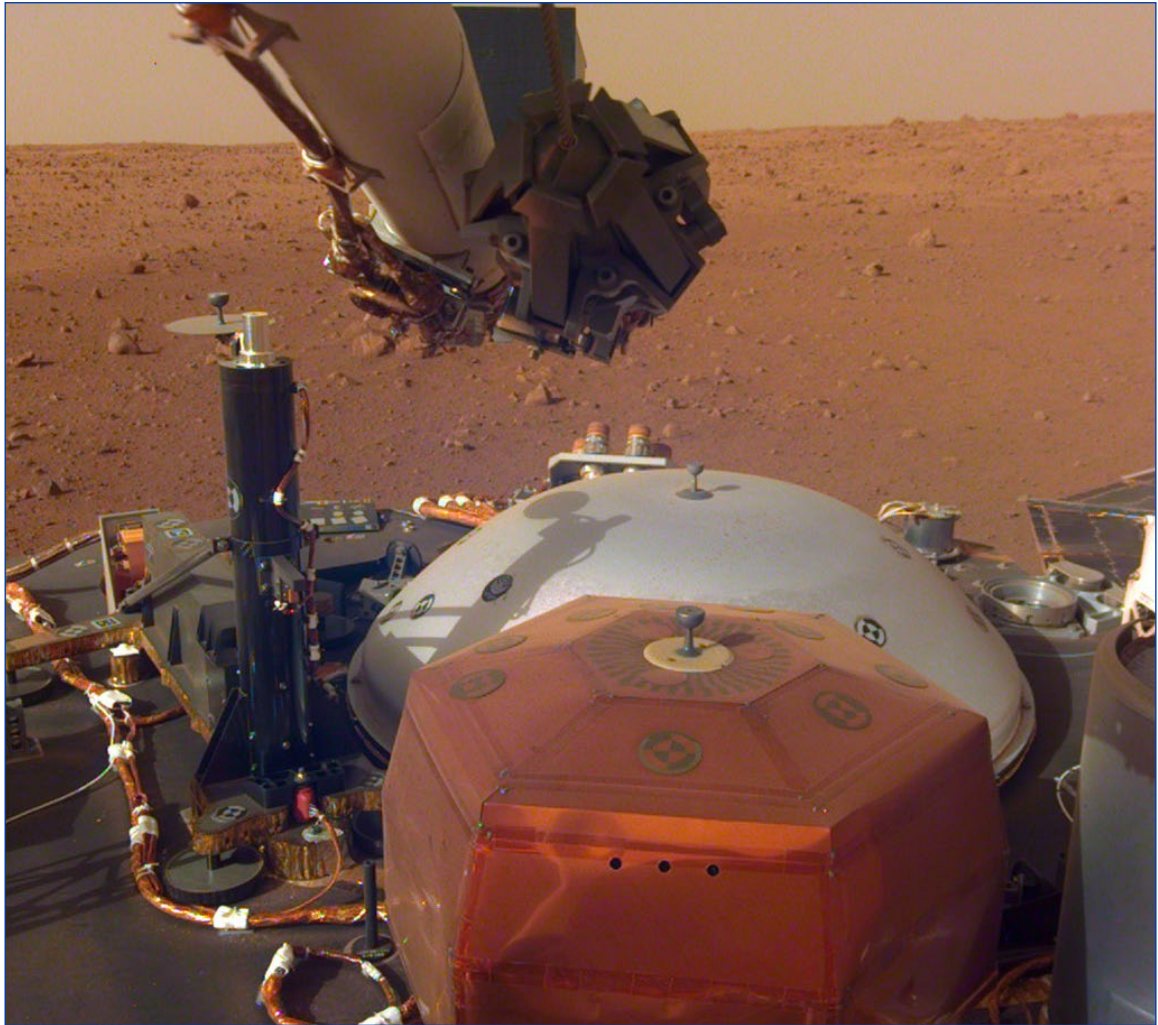
Happy Stennis Holidays from the B-2 Test Stand team

An oversized Santa joins members of the B-2 Test Stand team at Stennis on the top levels of the stand Dec. 13 to wish Happy Holidays to all. Santa and

Stennis employees who have worked to prepare the B-2 stand for Space Launch System testing were photographed by a NASA drone.

InSight settles in on Mars

This image from NASA's InSight lander shows instruments on the spacecraft's deck, with the Martian surface in the background. The image was received on Dec. 4, 2018, the eighth Martian day of InSight's mission on the planet. InSight landed on Mars on Nov. 26 to begin its mission to study in-depth the "inner space" of Mars: its crust, mantle, and core. Scientists hope the mission will answer key questions about the early formation of rocky planets.



NASA in the News

NASA announces commercial partnerships

Nine U.S. companies now are eligible to bid on NASA delivery services to the lunar surface through Commercial Lunar Payload Services (CLPS) contracts, as one of the first steps toward long-term scientific study and human exploration of the Moon and eventually Mars. These companies will be able to bid on delivering science and technology payloads for NASA, including payload integration and operations, launching from Earth and landing on the surface of the Moon. NASA expects to be one of many customers that will use these commercial landing services. The selected companies announced by NASA on Nov 29 are: Astrobotic Technology, Inc. in Pittsburgh; Deep Space Systems in Littleton, Colorado; Draper: Cambridge, Massachusetts; Firefly Aerospace, Inc. in Cedar Park, Texas; Intuitive Machines, LLC in Houston; Lockheed Martin Space: Littleton, Colorado; Masten Space Systems, Inc. in Mojave, California; Moon Express in Cape Canaveral, Florida; and Orbit Beyond in Edison, New Jersey. For more about NASA's Moon to Mars exploration plans, visit: <https://www.nasa.gov/moontomars>.

Voyager 2 enters interstellar space

For the second time in history, a human-made object has reached the space between the stars. NASA's Voyager 2 probe now has exited the heliosphere – the protective bubble of particles and magnetic fields created by the Sun. Comparing data from different instruments aboard the trailblazing spacecraft, mission scientists determined the probe crossed the outer edge of the heliosphere on Nov. 5. This boundary, called the heliopause, is where the tenuous, hot solar wind meets the cold, dense interstellar medium. Its twin, Voyager 1, crossed this boundary in 2012, but Voyager 2 carries a working instrument that will provide first-of-its-kind observations of the nature of this gateway into interstellar space. Voyager 2 now is slightly more than 11 billion miles from Earth, which means information takes about 16.5 hours to travel from the spacecraft to Earth. Voyager 2 launched in 1977, 16 days before Voyager 1, and both have traveled well beyond their original destinations and extended well past their original five-year lifespan. For more about Voyage, visit: <https://www.nasa.gov/voyager>.

Stennis achieves notable ‘firsts,’ major milestones in 2018

As NASA celebrated six decades of accomplishments during the anniversary celebration of its establishment this year, Stennis Space Center squarely focused on adding to its own lengthy achievement list.

Consider the number of “firsts” – as well as a pair of significant milestone achievements – recorded at the rocket engine test site during the past calendar year:

- **First-ever test of an RS-25 engine at 113 percent of its original thrust level, the highest power level ever achieved.** Stennis is testing RS-25 engines on the A-1 Test Stand to help power NASA’s new Space Launch System (SLS) rocket. The record thrust level was achieved during a Feb. 21 hot fire, assuring operators that the engine is capable of providing the power needed for SLS, in development as the largest rocket in history.
- **First-ever Commercial Space Launch Act agreement signed by Stennis.** The agreement grants Relativity Space exclusive use of the E-4 Test Complex at Stennis. Relativity is an innovative company focusing on a new approach to developing small launch vehicles. Stennis Director Rick Gilbrech explained that the new Space Launch Act agreement opens “yet another avenue for commercial customers to perform cost-efficient engine testing at Stennis.”
- **First-of-its-kind thrust vector control (TVC) system for rocket engine testing developed by Stennis engineers.** A TVC system is used during testing to gimbal – or rotate – engines in any direction just as they must do during an actual flight in order to ensure a rocket’s proper trajectory. In the past, a TVC test system had to be designed and produced for each individual rocket. The Stennis system provides a more adaptable and cost-efficient means of conducting such tests with various engines.
- **First-ever string of 10 large rocket engine tests in a 240-hour period.** During early summer, a combined team of NASA, Defense Advanced Research Projects Agency (DARPA), Aerojet Rocketdyne, Boeing and Syncom Space Services engineers and operators performed the unprecedented run of

tests with an AR-22 engine on the A-1 Test Stand. The test series was part of DARPA’s effort to develop a low-cost, reusable launch vehicle system for delivering small satellites into orbit.

- **First-ever Stennis engineer to receive the Women of Color Professional Achievement Award.** The award bestowed on Dawn Davis is one of the most important honors in the STEM (science, technology, engineering and mathematics) field. Davis received the honor during the 23rd Women of Color STEM Conference in October.
- **First visit of new NASA Administrator Jim Bridenstine to the rocket engine test site.** During the day, Bridenstine viewed the first hot fire in a new series of RS-25 engine tests. “What the power of this RS-25 engine represents is America’s ability to fly deeper into space than we ever did before,” he said after the hot fire. “This was a great test.”

“It is difficult to sum up 2018 for Stennis Space Center with a single word or thought because we saw so much accomplished,” Gilbrech said. “It was a productive and gratifying year that saw Stennis continue to build on its expertise as the nation’s premier rocket engine test site.”

In addition to the list of firsts, Stennis provided testing support in a record-setting commercial engine project. At the end of November, Stratolaunch Systems announced it had achieved the fastest preburner development in U.S. history, going from design to development to full-power testing in just 11 months. Stennis is partnered with Stratolaunch to test the preburner component for its new engine and helped the company achieve a full-power hot fire in less than a month of testing.

In addition, although it does not rank as a first, perhaps the most gratifying accomplishment of the year came late as all major activation work was completed on the B-2 Test Stand in preparation for testing SLS core and upper exploration stages.

Completion of final flow tests and a major “stress test” of the Stennis High-Pressure Gas Facility culminated six years of major restoration and renovation work and signaled the readiness of the stand and the Stennis supporting team for SLS testing.



NASA Administrator Jim Bridenstine visited Stennis Space Center on Aug. 14 to meet with various leaders and view an RS-25 rocket engine test on the A-1 Test Stand. Bridenstine spent a full day at Stennis, touring facilities, speaking live on NASA TV following the RS-25 test, addressing site employees, meeting with area media and speaking to guests during a post-test reception.

As in any year, however, Stennis achievement and accomplishment was not limited to the test complex. For instance, the Advanced Technology and Technology Transfer Branch continued its efforts to introduce Stennis-developed technology into the wider market. As evidence of its success, a number of Stennis employees received agencywide innovation and exceptional achievement awards from the NASA Space Technology Mission Directorate early in 2018.

The branch’s work also was highlighted by development of the NASA Platform for Autonomous Systems toolkit, an evolutionary approach to systems management. As designed, the unique soft-

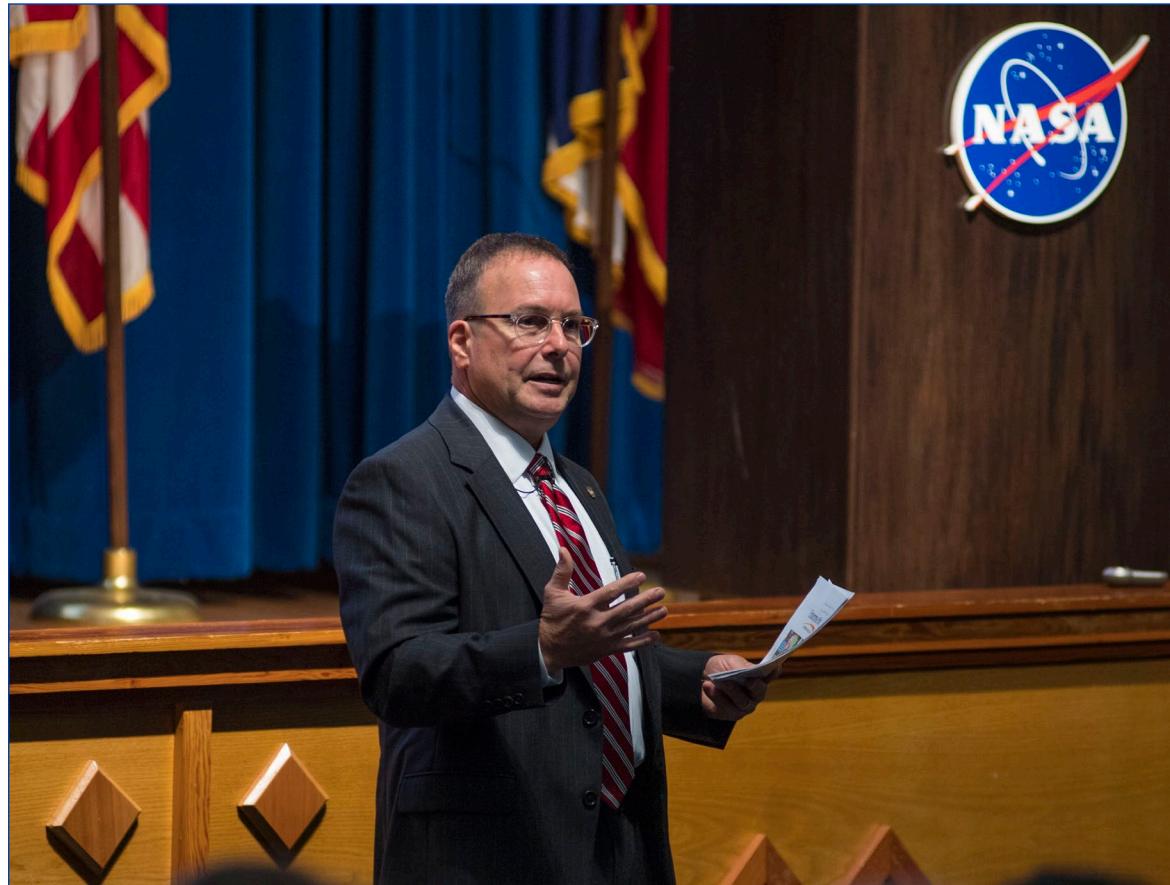
ware toolkit allows fully autonomous capabilities to be implemented into various sorts of systems.

The most recent year offered highlights in other areas of Stennis life as well, including a change in leadership with the retirement of Associate Director Ken Human and the naming of Stennis engineer John Bailey as his successor; a range of outreach events focused on sharing the NASA and Stennis stories with the public; a live linkup between summer Astro Camp students and astronaut Ricky Arnold during his mission aboard the International Space Station; continued test partnerships with commercial space companies; and ongoing efforts to promote STEM awareness

and interest among students of all ages.

Meanwhile, there is no time for rest. Testing already is scheduled across the Stennis test complexes headed into 2019, and the center will hit the new year ground running with NASA Day at the Capitol activities in mid-January. The upcoming year also should see arrival of the SLS “pathfinder,” a core stage replica that will be installed on the B-2 Test Stand as a final “fit” test to prove the facility modifications will match and handle the actual flight stage.

In other words, stay tuned for continued Stennis Space Center highlights.



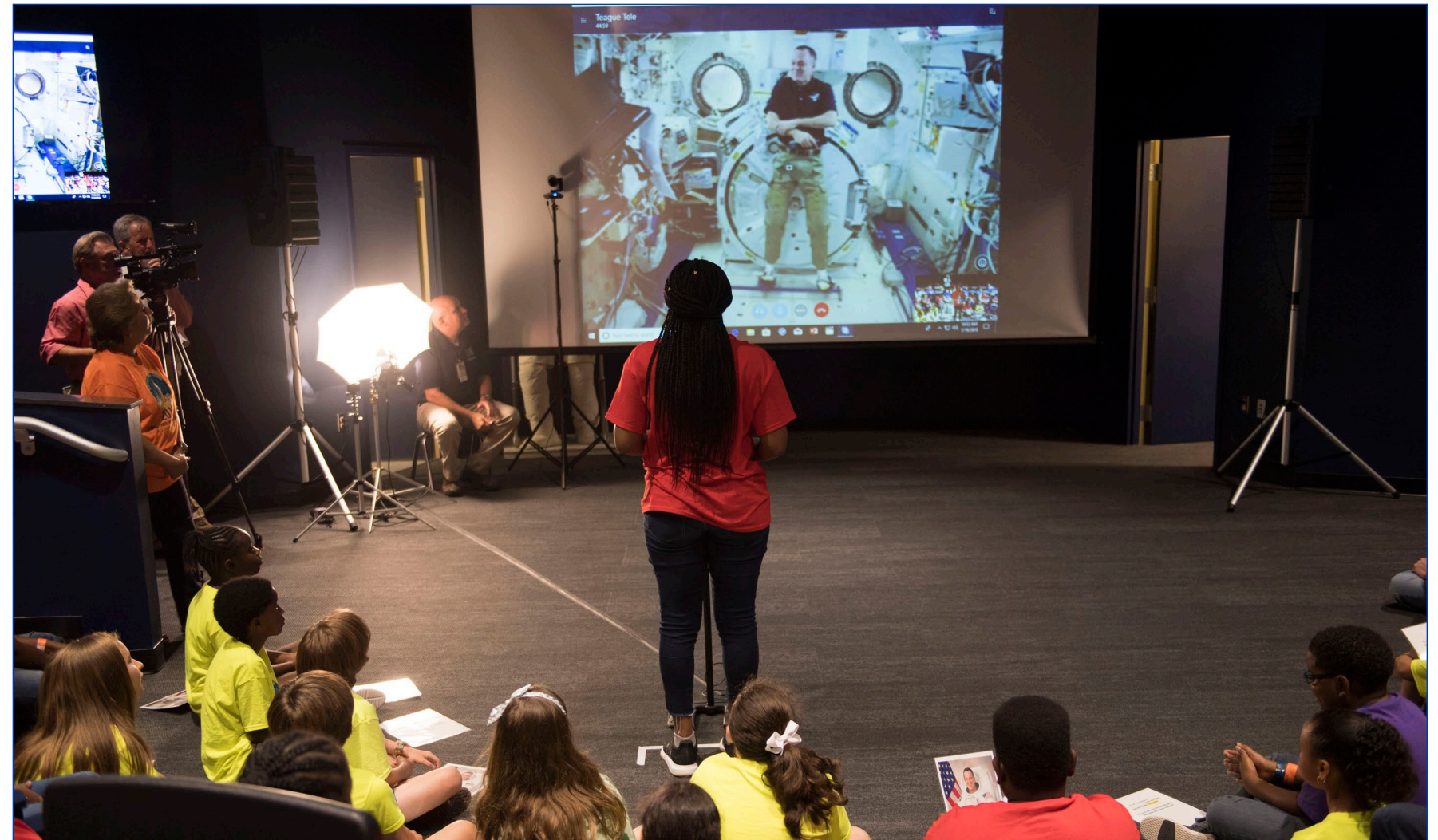
(Top left photo) Stennis Space Center Director Rick Gilbrech talks with NASA employees about the state of the center during an all hands session June 7.

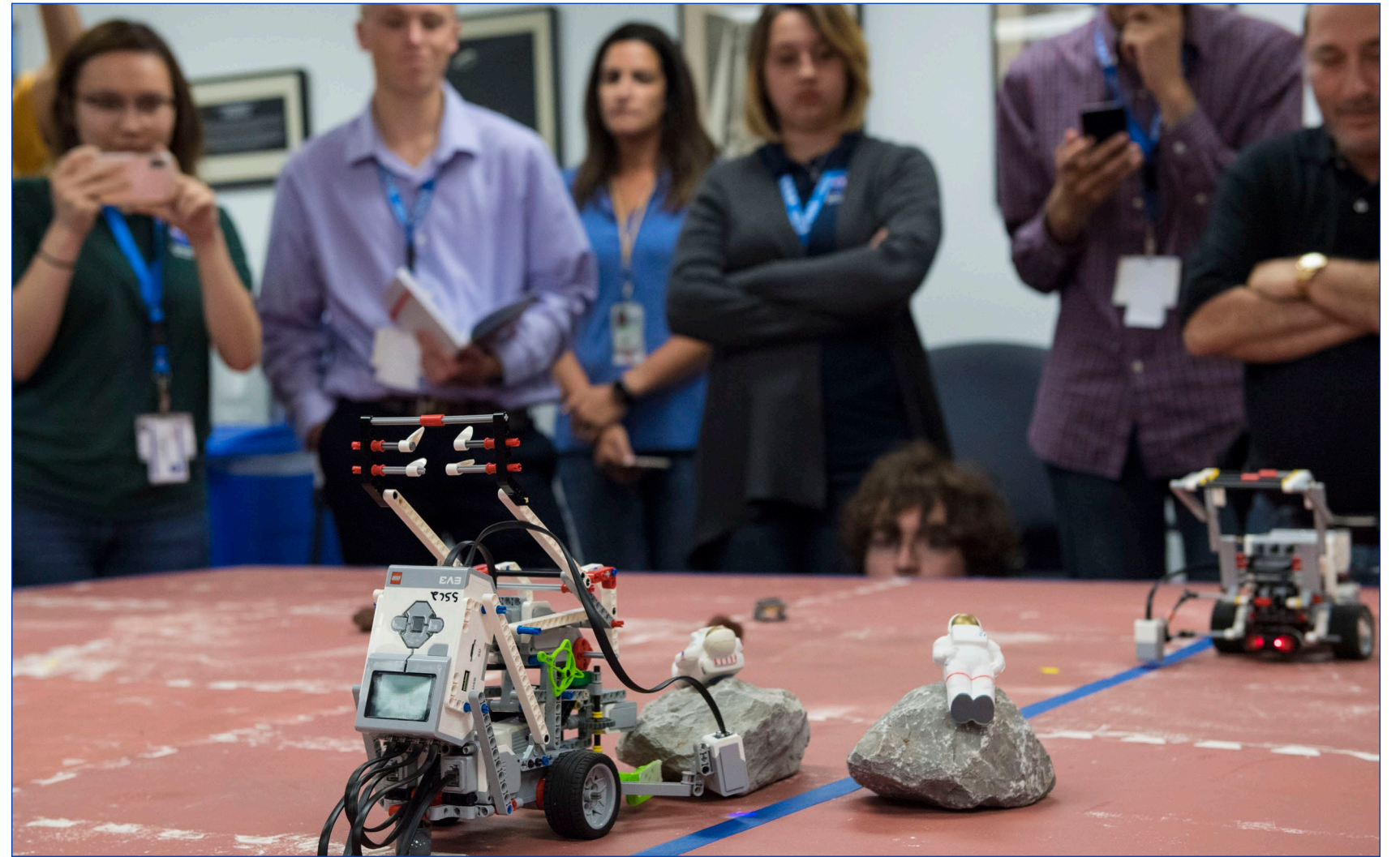


(Top right photo) Astronaut Stephanie Wilson speaks to Mississippi senators during Stennis Day at the Capitol activities March 21 in Jackson, Mississippi.

(Bottom left photo) A pair of educators participate in a hands-on learning exercise during a Minority University Research and Education Program Educator Institute hosted by the Stennis Space Center Office of STEM Engagement in July.

(Bottom right photo) Participants in the NASA Astro Camp® program sponsored by Stennis Space Center enjoyed an “out of this world” treat July 19, speaking live from INFINITY Science Center with astronaut Ricky Arnold aboard the International Space Station.





(Left photo) Young visitors enjoy NASA-sponsored exhibits during the Wings Over Columbus open house/air and space show at Columbus Air Force Base on April 21. Representatives from the Stennis Office of Communications hosted a space-related exhibit featuring hands-on activities during the one-day event outside Columbus, Miss. The effort was part of an ongoing focus to share the Stennis story and help educate individuals about NASA's new Space Launch System rocket.

(Top photo) Community college students demonstrate the capabilities of their robotic rover prototypes on a simulated Mars landscape during a NASA Community College Aerospace Scholars (NCAS) workshop at Stennis Space Center in June. The weeklong workshop offers students a hands-on, collaborative NASA experience to encourage them in their ongoing studies.

(Right photo) Young participants enjoy a visit with Stennis mascot Orbie during the New Orleans Saints/Pelicans STEM FEST in the Superdome on Oct. 20. Stennis Office of STEM Engagement representatives joined with Michoud Assembly Facility and Marshall Space Flight Center personnel to host activities during the outreach event.





(Left photo) A Special Olympics athlete competes in the annual South Mississippi Area III Special Olympics Field Games hosted by Stennis Space Center on March 10. About 120 athletes with special needs gathered for the event at INFINITY Science Center just outside of Stennis.

(Bottom photo) A partially eclipsed moon is seen beside the A-1 Test Stand at Stennis Space Center early on the morning of Jan. 31.

(Right photo) A young participant prepares a "rocket" for launch during NASA-sponsored education activities in Baton Rouge on May 3. Members of the Stennis Space Center Office of STEM (science, technology, engineering and mathematics) Engagement collaborated with employees from Marshall Space Flight Center in Huntsville, Ala., and Michoud Assembly Facility in New Orleans in conjunction with NASA Day at the Louisiana Capitol.

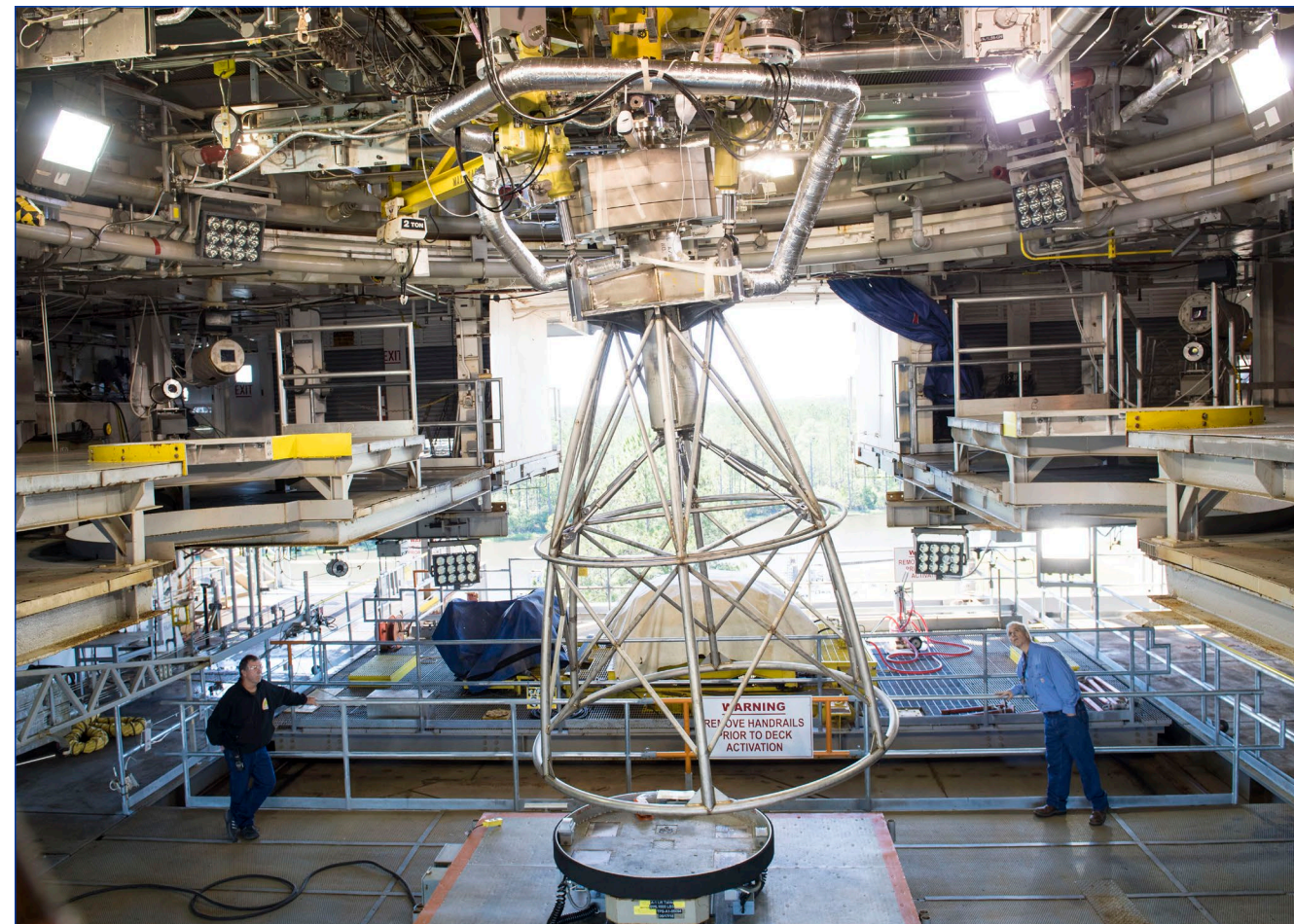




(Left photo) Operators at Stennis Space Center conduct a picture-perfect test of an RS-25 rocket engine on the A-1 Test Stand on Oct. 11. The test was the fourth in a series of tests that will extend into 2019 and represented another acceptance test of an RS-25 engine controller for use on future flights of NASA's new Space Launch System (SLS) rocket.

(Right photo) Engineers and operators at Stennis Space Center conduct tests of a first-of-its-kind thrust vector control (TVC) system on the A-1 Test Stand at Stennis Space Center during the first half of May. Testing involved installing a mass "simulator – the same shape and weight as a rocket engine – on the stand and using the prototype system to gimbal (or rotate) it, as needed during actual flights to control a rocket trajectory.

(Bottom photo) An Aerojet Rocketdyne AR-22 engine is test fired on the A-1 Test Stand at Stennis as part of a historic test series at the south Mississippi site in late June and early July. Following a pair of initial tests, a combined test team of NASA, Defense Advanced Research Projects Agency, Aerojet Rocketdyne, Boeing and Syncom Space Services engineers and operators tested the AR-22 engine 10 times in a 10-day (240-hour) time period. It marked the first time a large liquid hydrogen/liquid oxygen rocket engine had been fired so consecutively in such a short period of time.





(Top left photo) Stennis Space Center achieved a milestone state of readiness late in the year in preparing its B-2 Test Stand for testing the Space Launch System (SLS) core stage. For testing, an SLS flight core stage will be installed on the righthand side of the stand and its four RS-25 engines fired simultaneously, just as during an actual launch.

(Bottom left photo) A blanket of water flows through the B-2 Test Stand aspirator at Stennis Space Center on May 4 during an aspirator system check in preparation for testing the core stage of NASA's new Space Launch System. The aspirator system is designed to provide vibro-acoustic suppression during core stage testing, essentially creating a curtain of water around the firing engines to dampen the loudness of the test and protect the core stage from noise damage.

(Top right photo) The Space Launch System core stage pathfinder is shown at Michoud Assembly Facility in New Orleans, prior to its transport of Stennis Space Center later this year. The pathfinder is a full-scale size and weight replica of the SLS core stage. Once it arrives at Stennis, it will be installed on the B-2 Test Stand to make sure all preparations are complete for testing the actual SLS core stage that will be used on the rocket's initial Exploration Mission-1 flight.

(Bottom right photo) An early 2018 photo shows continuing work to prepare the B-2 Test Stand at Stennis Space Center for testing NASA's Space Launch System core stage. By year's end, Stennis had achieved a milestone level of stand readiness.



Stennis engineer cited as a top Southerner

Stennis Space Center engineer Dr. Howard Conyers has been featured by *Southern Living* magazine as one of its [Southerners of the Year for 2018](#).

Conyers joins several notables on the list, which includes entrepreneurs, authors, preservationists and philanthropic professional football player J.J. Watt.

For the honor, the magazine teams Conyers with Rodney Scott, a South Carolina chef who recently became the first African-American pitmaster to win the James Beard Awards' Best Chef honors. Conyers also has gained recognition as what *Southern Living* calls "another expectation-erasing pitmaster, who is both a NASA rocket scientist and barbecue evangelist."

Within NASA, Conyers has gained recognition for his leadership in developing the revolutionary High Dynamic Range Stereo X (HiDyRS-X) high-speed, high-dynamic range camera. The camera offers a dramatic new way to film and study rocket engine plumes and has been hailed as a game-changing technology expected to revolutionize propulsion video analysis.

Outside of NASA, Conyers has become known as a traditional whole hog BBQ pitmaster, appearing on an episode of *Man Fire Food* on the Cooking Channel. Conyers cooked his first whole hog at age 11, continuing a practice passed down in his South Carolina home community through generations for 200 years.



Stennis Space Center employee Howard Conyers, a New Orleans resident, has gained reknown both as an innovative NASA engineer and a traditional whole hog BBQ pitmaster.

He now co-produces and hosts *Nourish*, a new PBS web series that has topped 1 million viewers. On the show, Conyers relates the history of BBQ as he cooks and talks with notable chefs, such as Scott and New Orleans legend Leah Chase. The series can be viewed on YouTube.

NASA awards research and development contract

NASA has awarded a Research and Development Services Contract to the Mississippi Research Consortium in Hattiesburg, Mississippi, for a range of engineering and scientific research services at Stennis Space Center.

The Firm Fixed-Price/Indefinite Delivery–Indefinite Quantity contract began Dec. 1 and includes a one-year base period and four one-year options, to total five years. The contract has a potential total value not to exceed \$10 million.

Under the contract, the consortium will provide services to NASA, tenant agencies at Stennis and other government agencies in a range of areas, in-

cluding rocket engine and propulsion system testing, unmanned systems, autonomous systems, machine learning, computational modeling and simulation, component engineering, cybersecurity, advanced manufacturing, materials science, advanced sensors and instrumentation, model-based systems, engineering, process optimization, acoustics, magneto hydrodynamics and associated scientific, computational and engineering

Mississippi Research Consortium is a collaboration of four Mississippi universities to provide research and technology development to various state and federal agencies. It consists of Jackson State University, Mississippi State University, the University of Southern Mississippi and the University of Mississippi.



**Stennis Space Center
Sitewide Giving Goal – \$145,000**

Lunch-and-learn session focuses on SLS progress



Marcia Lindstrom, NASA Space Launch System (SLS) strategic communications manager at NASA's Marshall Space Flight Center in Huntsville, Ala., talks to Stennis Space Center employees during a lunch-and-learn session Dec. 11. During the session, Lindstrom discussed progress on NASA's SLS vehicle, being built to carry humans deeper into space than ever. Lindstrom noted SLS is designed to be the largest, most powerful rocket in history, built to carry more payload and to fly farther and faster than any other space vehicle. It will provide the foundation for generations of deep space exploration, she said. "SLS is not just any rocket," Lindstrom noted. "It's not like any other rocket. ... It's the right rocket for the right reason at the right time."

Stennis lights 2018 holiday tree

Stennis Space Center employees participate in the annual onsite Holiday Tree Lighting Ceremony on Dec. 3. In addition to comments by Deputy Director Randy Galloway and the ceremonial tree lighting, employees sang carols and enjoyed holiday treats.



Site program showcases Native American heritage

Members of the Chahta Warriors robotics team participate in a Native American Heritage Month program at Stennis Space Center on Nov. 16. The Chahta Warriors are a Native American team from Choctaw, Miss., competing in FIRST® Robotics activities and events with the theme - "So many dreams, so little time." FIRST® Robotics is designed to inspire young people's interest and participation in science and technology, and to motivate them to pursue education and career opportunities in STEM fields. The Native American Heritage Month program was sponsored by the Stennis Diversity Council to celebrate the history and significant contributions of the first Americans. November has been designated as Native American Heritage Month each year since 1990.

Stennis creates safety ‘Crystal Ball’ database

Note: The following article appeared on the NASA Office of Safety and Mission Assurance website at: <https://go.usa.gov/xEqmV>.

Stennis Space Center’s Safety and Mission Assurance (SMA) Directorate has combined its safety data from seven separate databases to create a more streamlined collection of data. The center hopes the system, known as the SMA Crystal Ball, will eventually predict future safety incidents based on past data to help Stennis management better allocate center resources.

Safety incidents – including injuries, property damage and mission failures – cost NASA and contractors thousands of dollars in direct and indirect costs. The leading indicators to these incidents are located in the thousands of data points in agency data systems. By combining the leading indicator information from the NASA Mishap Information System; the Close Call Reporting System; the Audit Tracking and Information System; the Decision Data Management System; the Integrated Risk Management Application; Maximo; and the Safety, Health and Environmental Tracking system, Stennis set the stage to use that collection of data to develop and test an algorithm to predict when and where there is a high probability of a safety incident occurring. (These systems were hosted by various centers, including Stennis, Marshall Space Flight Center and the NASA Safety Center.)

Although the algorithm needed for prediction is still in its infancy, the SMA Directorate plans to release the database in early Fiscal Year 2019, as the combined data alone will be a timesaver when trying to locate data, and it provides the added convenience of all data points being presented in the same format (rather than those of the various systems).

“We immediately are going to be able to save our people time and give them the types of tools to do relational trending and be able to do parts of their jobs better,” said Kamili Shaw, lead of the Safety, Quality and Management Systems Division in the Stennis SMA Directorate. “This will allow us to put our resources where they can be of most benefit to reduce incidents and mishaps and implement facility safety improvements throughout the life cycle of a project.”

Although the concept of the SMA Crystal Ball dates back to 2014, Stennis kicked off the effort in 2017. The first step was identifying INSIGHT as the proper platform to house the new database, a system already developed by the Office of the Chief Information Officer (OCIO) and used on programs like Orion. INSIGHT allowed Stennis to integrate several data sources with a search and export capability.

“This OCIO platform really enabled us to jump forward on this work,” Shaw said.

After importing the data from the various systems, an intern started looking for various ways to categorize the data, as well as various methods for using it to make predictions. Although initial predictions did not achieve high enough levels of accuracy to implement straight away, the work done to date shows the pros and cons of the various methods, and Stennis is now able to map its next steps to improve the prediction capability by improving the data.

As Shaw explained, Stennis has not been seeing as many safety incidents in recent years, which makes machine learning difficult as it requires a lot of data points. While fewer incidents is a positive for the center and the agency as a whole, it requires the team to narrow in on the most useful data for identifying relationships and predictions.

As the SMA Crystal Ball moves into this new phase in FY19, Shaw and others in the Stennis directorate are interested in sharing their story to-date with other centers who may be interested in implementing a similar system.

“We could conceivably use any agency data – a smaller or larger set of data; the platform is expandable,” said Shaw. “We’re really showing what can be done with data everyone has sitting around. We’re showing what we can do with tools that already exist at NASA; we didn’t buy anything new. (And we’re) showing how we can make this data more valuable, and that should be transferable to a lot of different areas.”

For additional information about the Crystal Ball database, visit online at: <https://go.usa.gov/xEqmm>.

Hail & Farewell

NASA bids farewell to the following:

| | | |
|---------------|--|----------------------------------|
| Mike Killam | AST, Aerospace Experimental Facilities | Center Operations Directorate |
| Stephen Rawls | Research Mechanical engineer | Engineering and Test Directorate |
| Paul Rieder | AST, Technical Management | Engineering and Test Directorate |
| Toni Watkins. | Executive Administrative Assistant | Office of the Director |

1972 – One era ends as a new future gets under way



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.

On Dec. 7, 1972, Apollo 17, the final mission of the Apollo Program, launched. Even as the last mission of the Apollo Program, it had a few firsts: The first night launch of a U.S. human space flight, the first mission to be commanded by a person with no test pilot background and the first mission not to have a test pilot on board. It was also the third time the lunar roving vehicle developed and managed by NASA's Marshall Space Flight Center was used and the final launch of the Saturn V rocket, with which Stennis is very familiar.

The year 1972 saw the end of an era for the then-Mississippi Test Facility. The new year of 1973 seemed grim for the few employees left at the center. After the Apollo Program ended, work forces were cut as the facility faced tough times. However, an engine test project was on the horizon – the space shuttle. The space shuttle was designed as a reusable vehicle to carry humans to low-Earth orbit following the Apollo Program.

Mississippi Test Facility jumped at the chance to test the engines that would power the shuttle fleet. An effort to have shuttle engines manufactured at Michoud Assembly Facility in nearby New Orleans and tested in Mississippi went into motion. One of the companies entering bids for the project was the Lockheed Propulsion Co. of California, which embraced the idea of using the two NASA sites to perform the work. Other companies putting in bids for the work were Thiokol Chemical Corp. of Utah; Aerojet Solid Propulsion Co. of California; and United Technology Center of California.

With bids submitted, a delegation of elected officials, community leaders and business people from Louisiana and Mississippi began lobbying for the work to come to their states. In late 1973, the award was given to Thiokol Chemical Co. The local community around Michoud and Mississippi Test Facility were angered by the announcement since just a few years earlier, the latter had been named “the nation's foremost propulsion test site.”

The announcement set off a series of events that would shape the future of Mississippi Test Facility: the protest of the solid rocket motor contract award to Thiokol; calls for “full utilization” of the site by U.S. Sen. John C. Stennis, U.S. Rep. Trent Lott and other Mississippi and Louisiana officials; and a campaign for renaming the facility and establishing it as an independent NASA installation no longer under direction of Marshall Space Flight Center in Huntsville, Alabama.

Stennis spearheaded the movement, and on June 14, 1974, Mississippi Test Facility was renamed the National Space Technology Laboratories (NSTL) and became an independent installation of NASA, reporting to NASA headquarters. Stennis said the “efforts to increase the use of NSTL by NASA and other federal agencies (would) now be more successful than ever before.” Site Director Jackson Balch was

quite pleased with the changes, saying that “it will be kind of nice to be a member of the club.”

Just a year later, on June 24, 1975, a brief, but very important event occurred at the newly independent site, the first ignition test of a space shuttle main engine. It lasted just a second but marked the return to propulsion testing for National Space Technology Laboratories and opened the door for testing projects to follow, including the current testing of engines that eventually will carry humans further into space than ever before.



Apollo 17 launches from then-Cape Kennedy on Dec. 7, 1972.

Office of Diversity and Equal Opportunity

Make December holidays more inclusive

According to an article by the Society for Human Resource Management, holiday parties are often viewed by companies as a time to thank employees for their efforts over the year, but might be seen by some employees as events to avoid. Awareness of different employee perspectives can help organizations recognize the contributions of all employees in a way that makes everyone feel welcome.

The website of the nonprofit Tanenbaum Center for Interreligious Understanding in New York points out, “There’s no month quite like December, where multiple joyous religious holidays collide with good intentions to create a potentially toxic mix of misunderstandings and intolerance.”

The center says that “the December Dilemma” is a time when decorations in workplaces and shops, office conversations, schools and advertising overwhelmingly focus on Christmas, causing those who do not celebrate the holiday to be overlooked.

While the United States workforce is growing increasingly diverse, Christians still make up about three-quarters of the country’s population. Yet, if even just a small number of employees feel excluded, it can have a negative impact on an organization’s engagement and productivity, experts say.

So, developing a greater awareness of which religious holidays are important to employees – and how people prefer to celebrate (or not) – can have significant benefits for workers and employers alike, said Mark Fowler, deputy chief executive officer of the Tanenbaum Center.

“One way to not be inclusive is to make somebody feel invisible, to make them feel as though the organization just has no idea who they are, what is pleasing to them and what is offensive,” says Peterson, a senior consultant with Cook Ross Inc.

That might happen, for example, when what an employer calls a “holiday party” is “really a Christmas party in disguise,” Fowler says. “There’s a big tree with ornaments and gifts underneath,” which for most people corresponds with Christmas. That does not mean you should shy away from acknowledging Christmas.

“Christians are part of the workforce, too,” Fowler says. “Make sure people understand that it’s fine to say ‘Merry Christmas’ to those who celebrate that tradition, but that not everyone does.”

Several tips are offered for holding more inclusive events:

- Create a diverse planning committee. Avoid missteps by involving people with varying beliefs when preparing for any holiday events, says Deborah Levine, editor-in-chief of the *American Diversity Report*. But remember that not all people of the same faith choose to observe and celebrate holidays the same way.
- Avoid scheduling mistakes. Check an interfaith calendar to avoid scheduling the end-of-year celebration on any of the holidays that might fall in December. For example, Hanukkah, the Jewish Festival of Lights, begins at sundown on Dec. 2 and ends the same time on Dec. 10 this year.
- Make it voluntary. If you are hosting a holiday party, don’t make it mandatory. Some people will not feel comfortable attending. Jehovah’s Witnesses, for example, do not celebrate holidays. Others may have personal reasons for wanting to steer clear. Make it clear to employees that their attendance is optional.
- Provide food options. “Christmas ham is popular, but many groups would not eat that ham—Jewish, Muslim, Hindu,” Levine says. That is why it is important to serve food that meets employees’ kosher, halal and vegetarian dietary needs.
- Make gift exchanges optional. Employees should not be forced to buy gifts for coworkers, Peterson says.
- Choose decorations carefully. If an office chooses to put up holiday decorations, seek ways to make them inclusive. Consider adding educational cards nearby to explain the religious tradition to others.
- Consider a two-stage party. Committed Muslims do not drink alcohol, and “they also don’t want to be present where alcohol is served,” says Hanadi Chahabeddine, a diversity trainer on Islam in Eden Prairie, Minn. Many also might be uncomfortable with secular music and dancing. She suggests planning a party with two parts, one with no alcohol in the initial stage when leaders thank employees and make any special announcements, and then a more free-flowing celebration in which alcohol is available and music is played. The alcohol-free portion of the event might also be appreciated by pregnant women, recovering alcoholics and people of other faiths, she says.

Information in this article came from www.shrm.org.



Faces of Stennis

Each month, Lagniappe will feature employees 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.



Larry de Quay



Larry de Quay was completing his last tour of duty with the U.S. Navy in Gulfport, Mississippi, in 1986, and hoped to remain in the area. A native of Oyster Bay, New York, de Quay had fallen for the Gulf Coast region. Also, since watching coverage of Gemini missions as a child, he had wanted to be part of the space program. Seeing a way to achieve that dream, de Quay applied for a contractor position at Stennis Space Center, only to receive a letter a week later that he had not been selected. He promptly sent out resumes across the nation before receiving a second contact from Stennis. He had not been selected by one division of the contracting company, but another division did wish to hire him at Stennis. Initially a contractor, de Quay became a civil servant with NASA late in 1987. He has filled a number of roles at the rocket engine test site – manager, monitor, lead mechanical

engineer and mechanical design analyst. Currently, de Quay performs design analyses and computer-based modeling to support various fluid and mechanical systems construction, modification and operations activities across the Stennis test complexes. He also oversees NASA engineering standards and is the Stennis representative on the NASA Engineering and Standards Panel. For de Quay, the best thing about Stennis is how employees are empowered to interact with decision makers and encouraged to develop creative and innovative solutions to problems. He is excited about the center's testing work for both NASA's new Space Launch System and various commercial companies. Meanwhile, he enjoys continuing his career at Stennis and the opportunity to mentor – and learn from – young engineers following the same path that opened to him years ago.