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LAGNIAPPE

John C. Stennis Space Center

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RS-25 hot fire!

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Watching the RS-25 engine test earlier this month got me to thinking about how many times I had stood a ways off from the A-1 Test Stand and viewed the same show of fire and power through the years. There was no use in trying to add up the score – the total is well north of what my poor Gator brain can calculate even on a good day. Ark!

The stand was built in the 1960s to test the Saturn V rocket stage and engines that carried humans to the Moon during the Apollo Program. Seven tests of a Saturn S-II stage and five J-2 engines were conducted on the stand during a two-year period ending in late 1969.

The stand then was modified to test engines for the new space shuttle. The very first space shuttle main engine test was conducted at A-1 in May 1975. A whole lot more would follow – with 1,007 space shuttle main engine tests conducted on A-1 from 1975 to 2006.

There was but one break in that period of testing. In the late 1990s, the A-1 stand was modified for XRS-2200 linear aerospike rocket engine testing. The first aerospike powerpack test was conducted on Oct. 2, 1998, and the first full engine test came on Oct. 7, 1999. Engineers conducted the final of 35 tests for the innovative engine on Aug. 6, 2001. The stand then was refitted to resume space shuttle main engine testing.

When shuttle testing ended in 2006, engineers modified the stand to house yet another engine. Powerpack testing for the next-generation J-2X engine began on the A-1 stand in December 2007 and continued for more than a year. A second powerpack test series came in 2012 – and J-2X engines were tested during 2013.

In a familiar story, the stand then was modified for its fifth different test series. The first RS-25 test was conducted on the stand Jan. 9, 2015. Testing of the engine and its components have continued since that time, paving the way for NASA to return astronauts to deep space and to such destinations as the Moon and Mars.

It is pretty amazing to think of how much space exploration and adventure had been made possible because of testing done on the A-1 stand. Suffice it to say, the stand has had quite a history – and it is still adding to it. In that respect, it is a lot like ole Gator. Ark!

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FULFILLING NASA'S EXPLORATION MISSION

NASA marches on with test of RS-25 engine flight controller

NASA continued its steady march to deep space with another full-duration, 500-second test of an RS-25 engine Sept. 6 at Stennis Space Center. The test was a certification hot fire of an RS-25 flight controller unit that will be used on a future flight of the agency's new Space Launch System (SLS) rocket. It marked a sixth test of a 3D-printed pogo accumulator assembly, a critical component that dampens potential engine propellant pressure oscillations that can cause a rocket to become unstable in flight. In addition, it was the second test of an RS-25 main combustion chamber fabricated using a bonding technique called hot isostatic pressing (HIP), which saves considerable time and money over more traditional methods. The HIP process uses high pressure and heat to create bonds that can withstand extreme stress. It already has been used on main combustion chambers in two other Aerojet Rocketdyne engines. The hot fire was on the A-1 Test Stand at Stennis, which has been conducting RS-25 engine and component tests since January 2015. NASA began testing RS-25 flight controller units on the stand in March 2017. The RS-25 engines to be used for initial SLS flights are former space shuttle main engines, modified to operate at a higher power level needed for the larger, heavier SLS rocket. The new flight controller units are a key component of the modifications, serving as the "brain" of the engine to help it communicate with the rocket and to provide precision control of its operation and internal health diagnostics. Four RS-25 engines will help power SLS at launch, supplying a combined 2 million pounds of thrust and working in conjunction with a pair of solid rocket boosters to provide more than 8 million pounds of thrust. The SLS rocket is being built to return humans to deep space destinations, including the Moon and Mars. Exploration Mission-1 will test the new rocket and carry an uncrewed Orion spacecraft into space beyond the moon. Exploration Mission-2 will be the first flight to carry humans aboard the Orion spacecraft to deep space. In addition to testing RS-25 engines and flight controllers, NASA's Stennis Space Center is preparing to test the actual SLS core stage for the first mission. The testing will involve installing the flight stage on the B-2 Test Stand and firing all four of its RS-25 engines simultaneously, as during a launch. RS-25 tests at Stennis are conducted by a team of NASA, Aerojet Rocketdyne and Syncom Space Services engineers and operators. Aerojet Rocketdyne is the RS-25 prime contractor. Syncom Space Services is the prime contractor for Stennis facilities and operations.

FULFILLING NASA'S EXPLORATION MISSION

NASA testing redesigned RS-25 components

NASA redesigned and tested a key component for the RS-25 engine that powers the agency's new deep space rocket, the Space Launch System (SLS), by incorporating modern manufacturing techniques that significantly reduce both cost and fabrication time.

The redesigned main combustion chamber, which is the heart of the engine, has performed well during two tests in flight-like conditions. During the tests, temperatures reached 6,000 degrees Fahrenheit, and the part experienced 3,000 pounds of pressure as the engine fired up in a test stand at Stennis Space Center. When SLS launches, four RS-25 engines will produce 2 million pounds of thrust to help send SLS to space for missions to the Moon and beyond.

NASA is testing a new main combustion chamber made by modern manufacturing techniques during RS-25 engine hot fires at Stennis.

"We're testing propulsion parts like the main combustion chamber, one of the most complex and critical components for engine operations, to show it can be made less expensively without sacrificing reliability, safety or performance," said Steve Wofford, SLS liquid engines manager. "The SLS rocket will be the most powerful rocket in the world, and these tests show engines can be made with modern manufacturing techniques and still provide the power to safely send astronauts to the Moon."

Inside the chamber, the fuel and oxidizer combust and flow through the nozzle, to turn the high-pressure combustion into the 500,000 pounds of thrust that each engine produces. The new chamber design reduces the complexity of the part by eliminating 29 welds. The chamber is made in less time for less money with a bonding technique called Hot Isostatic Pressure bonding. Its internal metal liner and external jacket are bonded together under very high pressures and temperatures.

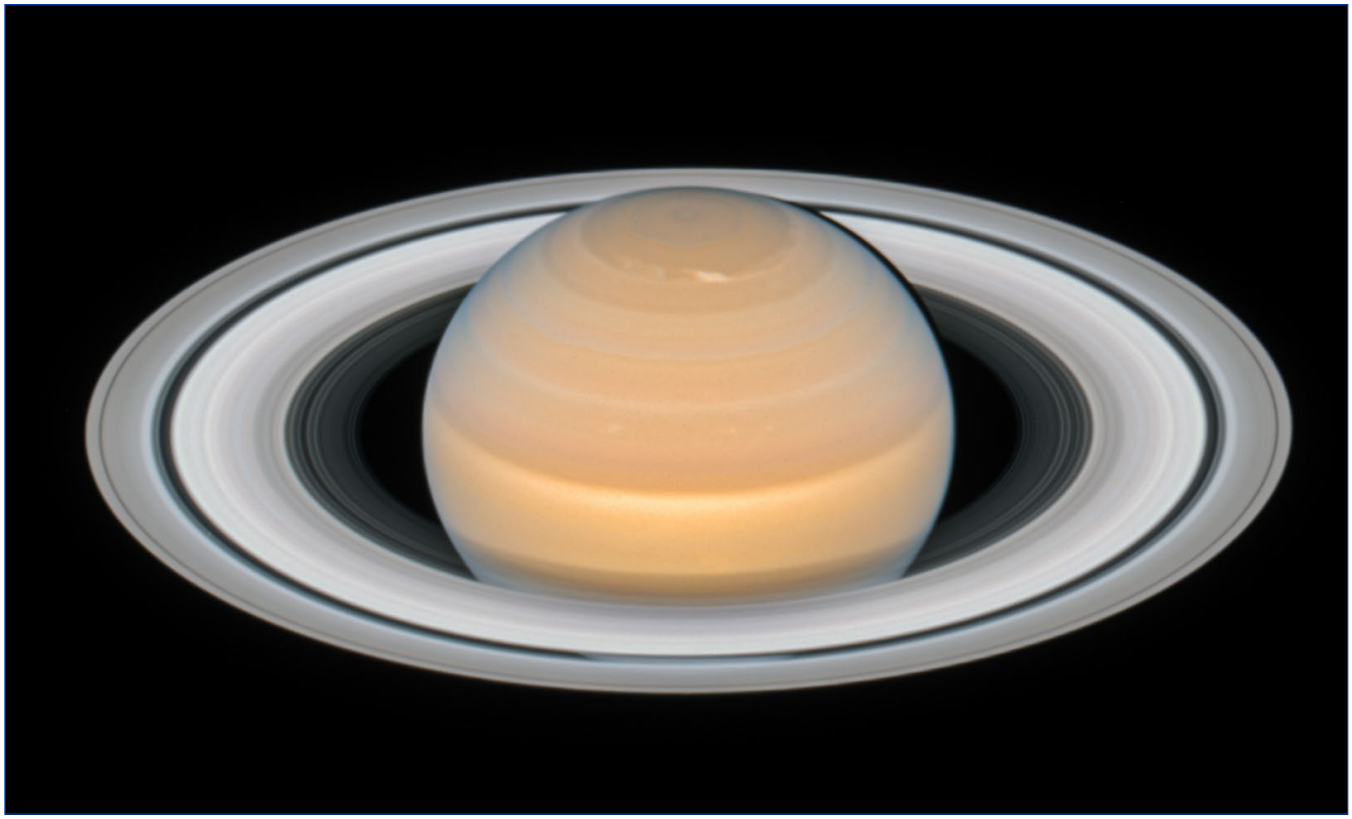
"The innovative bonding process has reduced the chamber cost and build time by around 50 percent each." said Mike Shadoan, the SLS combustion devices manager for liquid engines. "This series of nine tests allows us to test flight controllers for early missions and at the same time expose parts made with innovative techniques to the same conditions they will see during launch and flight."

The RS-25 was proven during the Space Shuttle Program and has been updated with new controllers and nozzle insulation for its job with SLS. Currently, the SLS Program has 16 engines in its inventory from the Space Shuttle Program, enough for four flights. Engines for later flights are being built by the SLS core stage engine prime contractor, Aerojet Rocketdyne. NASA and Aerojet engineers are working to smartly incorporate today's modern manufacturing techniques not just in the chamber, but also on key components across the entire engine, leading to a host of benefits in cost, schedule and reduced complexity.

"Engine hot fire testing is the ultimate demonstration that new component designs and incorporation of modern manufacturing technologies are paying off big-time for the program," said Dan Adamski, RS-25 program director for Aerojet Rocketdyne. "Continued testing will integrate additional upgraded components into the engine design culminating with final certification testing in 2021."

During six tests, technicians and engineers tested the first 3D printed part on an RS-25 engine, the pogo accumulator. Aerojet Rocketdyne is under contract to manufacture an initial set of six new engines for future SLS missions. These new engines will be fabricated using the components and techniques that are being validated on development engines during engine tests at Stennis.

NASA is leading a return to the Moon through an innovative and sustainable program of exploration to expand human presence into the solar system. Beginning with Exploration Mission-1, SLS and Orion will demonstrate the critical backbone capabilities that will carry humans to the Moon and farther into space than ever before on a variety of missions with increasing complexity. SLS's unprecedented power and volume will also carry the large pieces of hardware needed to build the Gateway and other long-term infrastructure at the Moon and, later, for human missions to Mars.



Hubble takes portrait of opulent ring world

Saturn is the solar system's most photogenic planet, and in the latest Hubble Space Telescope snapshot, it is especially so because Saturn's ring system is near its maximum tilt toward Earth. Hubble was used to observe the planet this summer when Saturn was about 1.36 billion miles from Earth, nearly as close as it ever gets. Though all of the gas giants boast rings, Saturn's are the largest and most spectacular, stretching out eight times the radius of the planet. The rings were first identified as a continuous disk around the planet by Dutch astronomer Christiaan Huygens in 1655.

NASA in the News

NASA, SpaceX agree on launch day plan

NASA's Commercial Crew Program and SpaceX are finalizing plans for launch day operations as they prepare for the company's first flight test with astronauts on board. The teams are working toward a crew test flight to the International Space Station, known as Demo-2, with NASA astronauts Bob Behnken and Doug Hurley in April 2019. In preparation for this test flight, SpaceX and NASA will continue to complete and review the important analyses and tests leading to launch. A key question the program and the company have been assessing is whether the astronauts will climb aboard the Crew Dragon spacecraft before or after SpaceX fuels the Falcon 9 rocket. NASA has made the decision to move forward with SpaceX's plan to fuel the rocket after the astronauts are in place. NASA teams will continue to conduct independent analysis and testing to ensure all identified risks have been mitigated or accepted. The crew launches of SpaceX and Boeing will return the nation's ability to launch our astronauts from the United States to and from the International Space Station on American spacecraft.

Dawn nears the end of historic mission

NASA's Dawn mission is drawing to a close after 11 years of breaking new ground in planetary science, gathering breathtaking imagery and performing unprecedented feats of spacecraft engineering. Dawn's mission was extended several times as it explored Ceres and Vesta, the two largest bodies of the main asteroid belt. Now, the spacecraft is about to run out of a key fuel, hydrazine. When that happens this fall, Dawn will lose its ability to communicate with Earth. It will remain in a silent orbit around Ceres for decades. Dawn launched in 2007 and is the only spacecraft to orbit a body in the asteroid belt and to orbit two extraterrestrial destinations. These feats were possible thanks to ion propulsion, a tremendously efficient propulsion system familiar to science-fiction fans and space enthusiasts. Dawn reached Vesta in 2011 and investigated it for 14 months in orbit. In 2012, engineers steered Dawn though the asteroid belt for more than two years before inserting it into orbit around dwarf planet Ceres, where it has been collecting data since 2015. For more on Dawn, visit: https://dawn.jpl.nasa.gov/mission/toolkit/.

Workplace safety includes office environments

Note: The following is part of a regular focus on safety and health at Stennis Space Center. It was written by J.C. Cogley with the NASA Shared Services Center.

Most often when you think about occupational safety and health, you envision heavy machinery, electrical hazards, lockout/tagout procedures, confined space entry, etc., and rarely office-related illnesses and injuries.

By comparison with more typical work areas, office environments would appear to be safe havens, but that is actually not the case. Slips-trips-falls alone are the most common office incidents and account for the most disabling injuries according to the Centers for Disease Control and Prevention. In fact, office workers are 2 to 2.5 times more likely to suffer a disabling injury from a slip-trip-fall than non-office workers.

The NASA Shared Services Center (NSSC) provides support to NASA through the consolidation and standardization of select business activities from across the agency. The NSSC accomplishes these tasks in a fast-paced office environment that presents a unique set of potential hazards to the 475-plus office workers and the occupational injuries and illness that accompany them.

To help identify and counter potential hazards and to promote occupational safety and health awareness throughout the workplace, the NSSC has developed a joint contractor and civil servant Safety and Health Committee that meets on a monthly basis or when required.

The NSSC Safety and Health Committee has four clear and concise objectives:

1. Involve employees and promote ownership in a safe and healthful workplace.

- Annually, each department nominates an employee, (both service provider contractor and civil service), to serve on the NSSC Safety and Health Committee for a term of one year.
- The newly elected members of the NSSC Safety and Health Committee initiate their tenure with a meeting to review past incidents, target trends and plan future safety and health promotions.
- Each month, the NSSC Safety and Health Committee selects a safety and health topic and promotes the subject through training, speakers and literature. Examples: Fire safety, emergency evacuation, office ergonomics, etc.

2. Promptly investigate all safety/occupational related near miss incidents, injuries and illnesses, abate the hazards/contributing factors and recommend corrective actions.

- The NSSC Safety and Health Committee is tasked to identify hazards and contributing factors and to take steps to prevent similar occurrences in the future, with the knowledge that incidents can rarely be attributed to a single cause.

3. Conduct bimonthly workplace inspections of assigned areas, identifying safety discrepancies and recommend corrective actions.

- Each departmental NSSC Safety and Health Committee representative perform bimonthly health and safety inspections of their assigned area, accompanied by a member of management.
- Identified discrepancies are immediately corrected or a work order is submitted within the Maximo system with a safety notation attached and tracked to completion.

4. Annually evaluate the workplace safety-and-health program and recommend to NSSC management how to improve or enhance the process.

- Members meet with the NSSC senior leadership team to review past incidents, examine identified trends and discuss ways to enhance the NSSC Safety and Health Program.

The office is like any other work environment in that it presents real and potential health and safety hazards. However, all too often, office safety is an overlooked area of workplace safety.

Sadly, this lax attention towards office safety puts employees at a significantly greater risk than their counterparts in other industries and/or trade especially when considering easily preventable injuries.

An engaged safety culture keeps Stennis Space Center rocketing forward!

To contribute to this page, contact:

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Stennis continues to power nation's space missions

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.

In 1966, Mississippi began the impossible, testing the rocket engines and stages that would carry humans to the moon. In 1969 the United States landed humans on the moon.

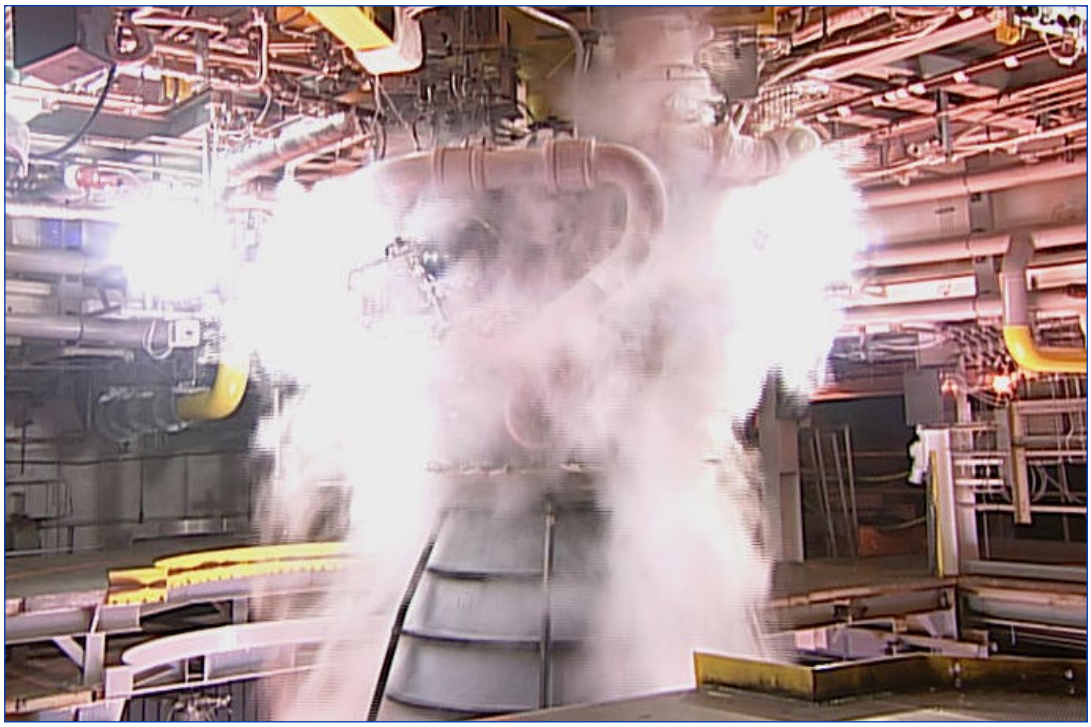
In 1975, Mississippi took the knowledge and expertise from the Apollo era and put it to use in testing the reusable, efficient space shuttle main engine. In 1981, space shuttle Columbia launched on the first mission of the new program.

Subsequent shuttle missions expanded astronauts' time in space and allowed NASA to study the effects long space travel can have on people and equipment, eventually supporting experiments on the International Space Station about how humans can live in space.

In 2015, Mississippi once again fired up engines for something that, much like getting humans on the moon, once seemed impossible. The new engines will power rockets that will propel humans beyond the moon and into deep space.

Jan. 9, 2015, marked the first test of the higher engine performance levels of the RS-25 engine for the new Space Launch System (SLS). Four engines will help power the SLS core stage, operating at a higher pressure and with cooler propellants than the engines for the space shuttle.

With the new engines and rocket, NASA is on its way back to the Moon and on to Mars.



A mounted camera on the A-1 Test Stand at Stennis Space Center gives a closeup view of the RS-25 engine during its first-ever hot fire test Jan. 9, 2015. Stennis is testing RS-25 engines for use on NASA's new Space Launch System rocket, which is being built to carry humans into deep space, to such destinations as the Moon and Mars. Stennis also will test the SLS core stage for the first Expedition Mission-1 flight of the rocket. The testing will involve installing the flight stage on the B-2 Test Stand and firing all four of its RS-25 engines simultaneously, just as during an actual launch.

Hail & Farewell

NASA bids farewell to the following:

Malcolm Wood	Program Specialist	Center Operations Directorate
Celena Thomas	Student Trainee	Office of Human Capital

NASA welcomes the following:

Veaceslav Jolobenco	Student Trainee	Center Operations Directorate
Stephen Martinez	Student Trainee	Engineering and Test Directorate

Office of Diversity and Equal Opportunity

Celebrate Hispanic heritage and contributions

National Hispanic Heritage Month (September 15 to October 15) recognizes the contributions made and the important presence of Hispanic and Latino Americans to the United States and celebrates their heritage and culture.

The observance began in 1968 as Hispanic Heritage Week under President Lyndon Johnson and was expanded by President Ronald Reagan in 1988 to cover a 30-day period starting on September 15 and ending on October 15. This period was selected to observe the anniversary of independence of five Latin American countries: Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. Mexico, Chile and Belize also celebrate their independence days during this period and Columbus Day (Día de la Raza) is celebrated on October 12.

Many Hispanic Americans trace their roots to the cultures of the indigenous peoples of the Americas – including the Arawaks (Puerto Rico), the Aztecs (Mexico), the Incas (South America), the Maya (Central America), and the Tainos (in Cuba, Puerto Rico and other places). Some trace their roots to the Spanish explorers – who set out in the 1400s to find an easier and less costly way to trade with the Indies. Other Latinos trace their roots to the Africans who were brought as slaves to the New World.

For purposes of the U.S. census, Hispanic Americans today are identified according to the parts of the world that they or their ancestors came from, including Mexico, Puerto Rico, Cuba, Spain or the nations of Central or South America. On the 2010 census form, people of Spanish, Hispanic and/or Latino origin could identify themselves as Mexican, Mexican American, Chicano, Puerto Rican, Cuban or "another Hispanic, Latino, or Spanish origin."

Hispanics have had a profound and positive influence on this country through their strong commitment to family, faith, hard work and service. They have enhanced and shaped the national character with centuries-old traditions that reflect the multi-ethnic and multicultural customs of their community.

In 2017, 57.5 million people or 18 percent of the American population identified as Hispanic or Latino origin. This represents a significant increase from 2000, which registered the Hispanic population at 35.3 million or 13% percent of the total U.S. population.

Share in this special annual tribute by learning and celebrating the generations of Hispanic and Latino Americans who have positively influenced and enriched the American nation and society.

Information in article came from www.hispanicheritagemonth.org.

Keesler wing commander visits Stennis

Col. Debra Lovette (l), commander of the 81st Training Wing at Keesler Air Force Base in Biloxi, Miss., stands with fellow service members atop the B-1/B-2 Test Stand during a visit to Stennis Space Center on Aug. 30. The A Test Complex and its trio of test stands is shown in the background. The Air Force group also enjoyed a windshield tour of site facilities, visited the Aerojet Rocketdyne Engine Assembly Facility and were briefed by Stennis Director Rick Gilbrech about work at the site.

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.

Karma Snyder

Karma Snyder is a native of Biloxi, Mississippi, so it was natural that she worked at Stennis Space Center as a student trainee during college. After graduation, she worked for then-Pratt & Whitney Space Propulsion in West Palm Beach, Florida, before returning to Stennis as a NASA systems integration engineer in 2001. Until recently, she served as the systems engineer of the B-2 Test Stand for green-run testing of the core stage for NASA's new Space Launch System rocket. Snyder now works as the Stennis range safety manager and officer, responsible for safe operations of all restricted airspace activities. She is a certified visual observer for unmanned aerial vehicle (UAV) flights and is training to become a NASA UAV pilot. Still, it took talking with people outside of the site during outreach activities to help Snyder fully appreciate the best thing about working at Stennis. "I took for granted all of the incredible things we do out here," she explains. "When you speak with people outside the center, you see what we do through their eyes. We work so close to it all here; we take for granted all the awesome things that we accomplish and are a part of. The best part about working at Stennis is that we do work on amazing programs and projects every day." Those amazing projects and accomplishments are not over. Snyder remembers watching the launch of the first space shuttle on a grade school television and now looks forward to testing and launch of the new SLS vehicle. Meanwhile, she shares the Stennis story with area groups and schools, as well as teaches community college engineering classes and serves as an assistant scout master in the Diamondhead community where she now lives.