



LAGNIAPPE

John C. Stennis Space Center

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NASA completes J-2X gimbal series, sets sights on testing SLS engines



J-2X Engine No. 10002 is test fired for the final time on the A-1 Test Stand at NASA's Stennis Space Center. The 330-second test was the last in a series of gimbal, or pivot, tests on the engine. Following the removal of this engine, the test stand will be modified to begin RS-25 engine testing. J-2X testing has provided valuable data and experience for the team developing the RS-25 engine, which will power the core stage of NASA's new Space Launch System.

All sights are set on testing RS-25 engines that will power NASA's new Space Launch System (SLS) following completion of a series of hotfire tests on the next-generation J-2X engine Sept. 5.

NASA conducted a 330-second test fire of the J-2X rocket engine on the A-1 Test Stand at the agency's Stennis Space Center in south Mississippi. The stand now will be prepared to house and test RS-25 engines, beginning next spring.

"The RS-25 test series is as frontline

as it gets," said Gary Benton, RS-25 test project manager at Stennis. "We will be firing the very engines that will power America's launch of humans into deep space. It is a critical and exciting test series."

A-1 Test Stand personnel will spend the next several months completing a long checklist of work for RS-25 testing. The first engine is set for delivery to stand in April 2014. Testing will focus on rating the former space shuttle main engines to operate at a higher propellant inlet pressure needed for NASA's SLS.

Completion of this series of J-2X testing provides valuable data and experience for the team developing SLS' engine. Design, manufacturing and test improvements are being implemented to develop an affordable RS-25, some of which are based on knowledge gained from the J-2X test series. For example, the engine control unit to be used on the RS-25 is evolved from the J-2X controller, and engineers have tested 3-D printing of complex engine components and new materials like the liner for

See **GIMBAL**, Page 3

"I'm confident that this next (fiscal) year will bring us many opportunities to showcase the talent, expertise and capabilities that Stennis Space Center has to offer."



From the desk of
Don Beckmeyer

Deputy Director, Project Directorate, Stennis Space Center

Greetings from the Project Directorate! The summer is winding down, school is back in session, Labor Day weekend is in the rear view mirror, and we will soon close out the last month of the government fiscal year.

Looking back over 12 months, we have achieved many great accomplishments at Stennis Space Center and across the agency. I would like to share some of the highlights.

J-2X engine testing has been extremely successful, starting with the powerpack testing in December 2012 and recently completing the latest test series at the A-1 Test Stand. We will continue J-2X testing and transition into RS-25 testing next spring.

On the B-2 Test Stand, work is well under way getting it ready to test the Space Launch System core stage in 2016. It will be powered by four of the RS-25 engines, all firing in unison to generate 2 million pounds of thrust! Work on B-2 will continue with the removal and replacement of the corroded structural steel, to be followed by buildout of the unique superstructure that will support the rocket stage towering 342 feet above sea level. The J-2X, RS-25 and B-2 work is all in support of the SLS Program.

On the E-1 Test Stand, Aerojet AJ26 engine testing has continued this year with three engines successfully hot-fired. An important milestone was completed April 21 with a successful first flight of the Orbital Sciences Corporation's Antares launch vehicle from Wallops Flight Facility in Virginia. Two AJ-26 engines power each Antares, and Stennis will continue accep-

ance testing of Orbital's engines to support the flight manifest in the future.

At the E-3 Test Stand, there has been a significant amount of engine testing in support of the Morpheus lander. Stennis is partnering with Johnson Space Center on this project, sharing information and talent. To date, we have performed over 30 hot-fire tests on the Morpheus engines.

The A-3 Test Stand has completed construction this past year and is undergoing the activation phase of the project. This phase will complete in the next few months.

In the Applied Science and Technology Project Office area, the ForWarn forest tracking tool developed in partnership with the U.S. Department of Agriculture has received four awards, and a new water quality assessment tool has been delivered to the Environmental Protection Agency. Stennis also is working with NASA Headquarters to expand the coastal applied science program beyond the Gulf of Mexico.

This past fiscal year has been a busy year of formulating and executing test projects with our customers. I'm confident that this next year will bring us many opportunities to showcase the talent, expertise and capabilities that Stennis Space Center has to offer in propulsion testing and applied science and technology.

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FULFILLING NASA'S EXPLORATION MISSION

GIMBAL

Continued from Page 1

the Main Combustion Chamber on J-2X.

SLS is a new heavy-lift rocket capable of missions beyond low-Earth orbit, including the agency's recently announced plans to send astronauts to study an asteroid that has been redirected into a stable lunar orbit.

The rocket will provide an entirely new capability for human exploration and send humans in NASA's Orion spacecraft into deep space. The SLS Program is being managed by Marshall Space Flight Center in Huntsville, Ala.

The just-completed J-2X test series evaluated the development engine's gimbaling, or pivoting, to see that it moves just as it should during an actual flight to ensure proper trajectory.

During the series, the engine was fired at full power and for the total time it would operate during an actual flight.

"This was a thrilling test series," said Tom Byrd, J-2X engine lead in the SLS Liquid Engines Office at Marshall. "We saw our engine parts flex as designed during gimbaling. We also collected much-needed loads data as the engine gimbaled. These were our only scheduled open-atmosphere tests, so we got to see J-2X show its bright flame, intense heat and, of course, the incredible sound that makes rocket engine testing so exciting."

For more information regarding NASA's SLS Program, visit: www.nasa.gov/sls/



A number of NASA officials and guests visited Stennis Space Center on Sept. 5 to view the J-2X gimbal test on the A-1 Test Stand. They included:

- (Top left photo) NASA Space Launch System Program Manager Todd May from Marshall Space Flight Center in Huntsville, Ala. Prior to the test, May toured the B-2 Test Stand, where preparation is under way for testing the SLS core stage.
- (Left photo) Apollo 13 astronaut Fred Haise (l), a native of Biloxi, Miss., and Mississippi state Rep. Philip Moran of Bay St. Louis.
- (Top right photo) Stennis Space Center Deputy Director Jerry Cook (r) and deputy directors from other NASA centers. The group is shown during a tour of the B-1 Test Stand.
- (Middle right photo) Stennis Safety & Mission Assurance Director Freddie Douglas (second from left), Deputy Director Maggie Jones (far right) and other SMA personnel.
- (Bottom right photo) U.S. Rep. Steven Palazzo, R-Miss. (third from right).

FULFILLING NASA'S EXPLORATION MISSION

NASA continues preparation for RS-25 engine testing at Stennis

Think about negotiating an intricate maze, and you begin to appreciate the challenge of designing and fabricating test stand piping for NASA's RS-25 rocket engine.

NASA is meeting that challenge at its Stennis Space Center near Bay St. Louis, Miss., where liquid oxygen (LOX), liquid hydrogen and related piping is being produced for RS-25 engine testing on the A-1 test stand. Testing of the core-stage engine for NASA's new Space Launch System (SLS) is scheduled to begin next spring. The SLS is being developed to carry humans deeper into space than ever before.

"This is a big undertaking," said Robert Ek, systems engineer for the RS-25 test project at Stennis. "These are massive lines, weighing hundreds of pounds, and they have to be threaded through a great deal of other stand equipment and structure needed for testing. It's a real challenge."

NASA engineers recently completed a series of gimbal, or pivot, tests on a J-2X engine on the A-1 stand, with a final 330-second test on Sept. 5. Stand equipment now will be modified to meet RS-25 rocket engine drawing and specification requirements. A new thrust frame adapter already has been fabricated for installation on the stand this fall. Fabrication of the new piping system is under way.

Design of the piping was an involved process that required collecting a lot of information about the RS-25 engine and its performance specifications. Even though RS-25 engines were used as space shuttle main engines, some modifications will be made before testing begins.

"Even with the RS-25 engine's flawless performance on all 135 space shuttle missions, a different rocket like SLS has new environmental and thrust conditions and therefore different test consider-



(Top photo) A welder at NASA's Stennis Space Center works on a portion of piping to be installed on the A-1 Test Stand for RS-25 rocket engine testing. NASA is scheduled to begin testing RS-25 engines next spring for use on its new Space Launch System.

(Right top photo) Fabrication is under way on liquid oxygen, liquid hydrogen and related piping for RS-25 engine testing on the A-1 Test Stand at NASA's Stennis Space Center. Fabrication of the piping presented a design challenge; it has to be threaded through a great deal of other stand equipment and structure. RS-25 engines will power the core stage of NASA's new Space Launch System, which is being developed to carry humans deeper into space than ever before.

(Right bottom photo) An illustration shows the RS-25 thrust frame adapter and engine piping as it will be mounted on the A-1 Test Stand at Stennis.

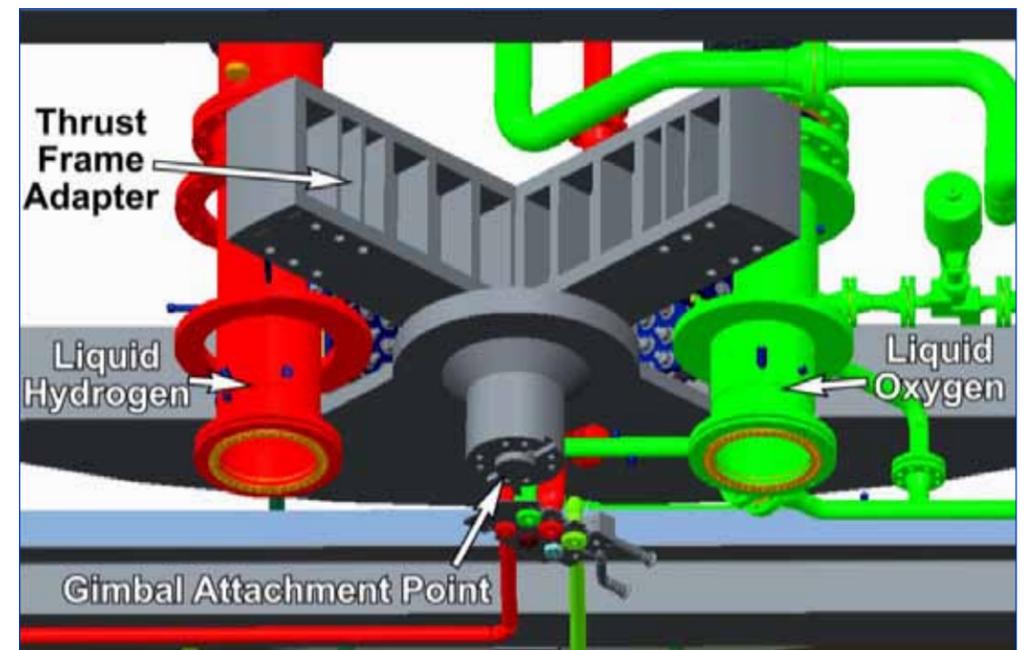
ations," said Mike Kynard, SLS Liquid Engines program manager. "Anytime we make changes to an engine, or to environmental conditions in which it will run, we'll need to put it through a full set of tests. What we typically do in the rocket engine industry is run things twice as long as we plan to use them in flight to ensure the robustness of the design. We run it at different conditions to make sure we've covered the full range of the design."

Engineers had to take into account new engine performance factors to determine such things as the flow rate of cryogenic fuels needed in the lines and the pressures under which they must operate. In terms of simple geometry, they also had to make sure piping connections were located properly and identify how and where to install supports to hold the piping in place.

"Negotiating a maze is a good analogy,"

Ek said. "There was a lot of ingenuity and working together to make sure good decisions were made. The design engineering team, supported by both operations and systems engineering, did a great job in finding answers along the way."

The RS-25 testing project was accelerated by a few months, shortening the time for preparation work on the A-1 test stand. The piping now being fabricated



by Jacobs Technology crews at Stennis is expected to be completed and installed on the stand by the end of the year.

Once in place, the lines will be sealed and tests performed to make sure there are no leaks in the system and that they perform properly at the extremely low temperatures required to flow LOX and liquid hydrogen propellants. The first installation of an RS-25 engine will be in early April 2014, with a series of LOX

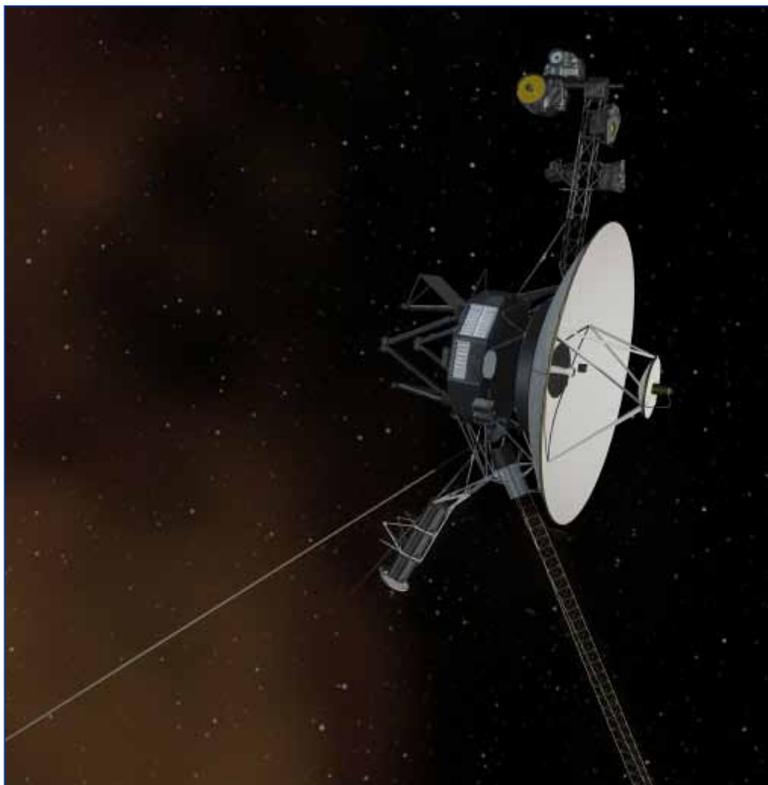
chill tests and eight hot fire tests to follow.

Once tested and certified, the engines will be used for both SLS test flights and operational missions, a fact that Ek and others at Stennis find gratifying. "I used to work on space shuttle main engines during the Space Shuttle Program," Ek said. "That program has ended, but the engines live on to fly again. It's very exciting to help make that happen."

FULFILLING NASA'S EXPLORATION MISSION

Historic! Voyager I enters interstellar space

NASA's Voyager 1 spacecraft (artist concept shown right) officially is the first human-made object to venture into interstellar space. The 36-year-old probe is about 12 billion miles (19 billion kilometers) from our sun. New and unexpected data indicate Voyager 1 has been traveling for about one year through plasma, or ionized gas, present in the space between stars. Voyager is in a transitional region immediately outside the solar bubble, where some effects from our sun are still evident. A report on the analysis of this new data, an effort led by Don Gurnett and the plasma wave science team at the University of Iowa, Iowa City, was published in the Sept. 12 edition of the journal *Science*. "Now that we have new, key data, we believe this is mankind's historic leap into interstellar space," said Ed Stone, Voyager project scientist based at the California Institute of Technology, Pasadena. "The Voyager team needed time to analyze those observations and make sense of them. But we can now answer the question we've all been asking – 'Are we there yet?' Yes, we are." Voyager 1 and its twin, Voyager 2, were launched 16 days apart in 1977. Scientists do not know when Voyager 1 will reach the undisturbed part of interstellar space where there is no influence from our sun. For a sound file of the oscillations detected by Voyager in interstellar space, animations and other information, visit: www.nasa.gov/voyager.



NASA in the News

NASA LADEE mission headed to moon

NASA confirmed Sept. 7 that the reaction wheels of its Lunar Atmosphere and Dust Environment Explorer (LADEE) were successfully brought back online and the spacecraft has acquired its safe-mode attitude profile. During technical checkouts Sept. 6, the LADEE spacecraft commanded itself to shut down the reaction wheels used to position and stabilize the spacecraft. According to the NASA mission operations team, this was the result of fault protection limits put in place prior to launch to safeguard the reaction wheels. The limits that caused the powering off of the wheels soon after activation were disabled, and reaction wheel fault protection has been selectively re-enabled. The spacecraft was successfully launched Sept. 6 at 10:27 p.m. CDT from Pad 0B at the Mid-Atlantic Regional Spaceport, at NASA's Wallops Flight Facility, Wallops Island, Va. The launch caused a sensation in the eastern United States and was visible from Virginia to Massachusetts. Crowds gathered in Times Square in New York and on the steps of the Lincoln Memorial in Washington to watch. The launch turned the hashtag #NASA into the top trending topic on Twitter in the U.S. late Friday. The launch coverage on

NASA TV went out in 66,000 webcast streams. LADEE is on its way to arrive at the moon in 30 days, then enter lunar orbit. LADEE is managed by NASA's Ames Research Center in Moffett Field, Calif. LADEE is a robotic mission designed to gather detailed information about the lunar atmosphere, conditions near the surface and environmental influences on lunar dust. To learn more about NASA's LADEE mission, visit: www.nasa.gov/ladee.

NASA launches Instagram profile

NASA is launching an official Instagram profile that will take its fans on an out-of-this-world journey through images of Earth and beyond. Featuring aeronautics, astrophysics, Earth science, human spaceflight and more, the NASA account will provide a wide view of the agency by sharing new and historic images and videos. The first NASA posts highlighted the launch of the agency's Lunar Atmosphere and Dust Environment Explorer (LADEE) on Sept. 6. To follow NASA's new Instagram account, visit: <http://instagram.com/nasa>. For a list of NASA social media websites, visit: www.nasa.gov/connect.

For NASA news releases, visit: www.nasa.gov/news/releases/latest/index.html.

Stennis completes Feds Feed Families effort

Stennis Space Center employees concluded their 2013 Feds Feed Families effort at the end of August with a collection of 8,115 pounds of nonperishable food items. Shown with some of the donated items are (l to r): Cecile Salzman (NASA), Hamp Stewart (Bastion Technologies Inc.), Patricia Knowles (Jacobs Technology Inc.), Taryn Sciambra (Patriot Technologies), Marsha Ladner (Lockheed Martin) and Cabrina Bell (NASA). Nationally, NASA exceeded its overall goal of 110,000 pounds, with totals to-date more than 130,000 pounds. Stennis donations will support three area charities – the Hancock County Food Pantry, the Mount Olive Food Kitchen and the Gulf Coast Food Pantry. Notable participants included the NASA Office of Communications (highest per capita donations with 71.34 pounds per person), the NASA Office of Procurement (highest total donations with 1,436 pounds) and Gregory Fletcher (highest individual donation with 1,209 pounds). Campaign organizers also voiced thanks for the combined efforts of Stennis contractors.



Stennis observes Women's Equality Day



Sonya Stewart, vice president of performance excellence with the Lockheed Martin Information Systems & Global Solutions – Civil Group at Stennis Space Center speaks during the 2013 Women's Equality Day program at the rocket engine test facility Aug. 28. The theme of this year's annual observance was "Celebrating Women's Right to Vote." The Stennis program was sponsored by the Stennis Diversity Council, Jacobs Technology Inc. and Lockheed Martin.

1962 – NASA announces plan to build Stennis

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.

Next month, Stennis Space Center will turn 52 years old. That is when NASA announced it was going to build a national site to static test-fire rocket engines bound for the moon.

The announcement, made at 2 p.m. on Oct. 25, 1961, stunned residents of south Mississippi and Louisiana. It also set the clock ticking for the new space agency, only three years old at the time, to begin constructing a unique, futuristic rocket engine test facility in the wilds of the worst kind of Mississippi mud. The project was placed under the auspices of NASA's Marshall Space Flight Center in Huntsville, Ala., headed by famed German rocket scientist Dr. Wernher von Braun.

The giant test facility would contain many new structures, designed especially for its mission of testing rocket engines. Von Braun, who often referred to the new site as "my baby," said the purpose of the facility was to "provide the U.S. with a capability during the next 20 to 50 years for captive test firing large space vehicle systems."

Over a course of time, the facility grew and prospered under five different names: the Pearl River Site (1961), the Mississippi Test Operations (1961-65), the Mississippi Test Facility (1965-74), the National Space Technology Laboratories (1974-88) and the John C. Stennis Space Center (1988-present).

The first rocket test was conducted April 23, 1966. After the first test, things started "popping" in the test complex. Every booster rocket engine used in America's lunar landing missions was first test-fired at the Mississippi Test Facility. All first- and second-stage rockets of the Saturn V performed their missions according to plan to help make the Apollo Program one of America's greatest engineering and scientific achievements.

When the Apollo Program began to diminish in 1970, the small management team at Mississippi Test Facility met changing national priorities head-on, making bold moves to diversify and utilize unique facilities. The NASA "can-do" crew invited other federal and state agencies engaged in space, oceans and Earth research endeavors, as well as critical national defense programs, to come to Mississippi and join in a multiagency endeavor to apply space technology to problems on Earth.

As the NASA team searched for new and diverse partners, the space shuttle main engine test project was assigned to the site in 1971, initiating a rocket engine test



Workers clear land for construction of Stennis Space Center in 1963.

and certification effort unparalleled in aerospace history. All of the main engines used on 135 space shuttle flights performed their missions flawlessly. For more than three decades, every modification and configuration of main engines was tested and proven flightworthy at Stennis before being used on a mission.

Stennis was designated NASA's Center of Excellence for rocket propulsion testing in 1991. In May 1996, the facility was named the agency's lead center for all rocket engine testing in NASA and for management of important assignments for propulsion testing for commercial entities and the Department of Defense.

Today, Stennis is on the front lines of NASA's return to deep-space missions. The space agency is preparing the A-1 Test Stand at Stennis to test RS-25 engines that will power the core stage of NASA's new Space Launch System, which will carry humans deeper into space than ever. The agency also is modifying the B-2 Test Stand to test the SLS core stage, which will include firing a configuration of four RS-25 engines simultaneously.

In addition to its growing importance and reputation as a world-class rocket propulsion test center, Stennis is also known for "reinventing government" because of NASA's close involvement with about 30 resident federal, state, academic and private organizations and technology-based companies.

Office of Diversity and Equal Opportunity

Practice of virtues leads to purposeful living

“Kindness. Honesty. Service. Virtues are the essence of our character, and when we keep the practice of virtues at the heart of everyday life, we live with purpose.”

Most people want to be morally good, justified, and acceptable. Everyone wants to be “right.” Being “right” means being just, fair, proper, good, upright, righteous, virtuous, moral, ethical, honorable and honest.

There are few, if any, individuals who can live to such high standards all of the time. However, it doesn’t mean one shouldn’t try. How people treat each other in the workplace can make or break morale within an office, others’ self-esteem and even the outcome of a project.

Virtue, by definition, is the moral excellence of a person. A morally excellent person has a character made up of virtues valued as good. He/she is honest, respectful, courageous, forgiving and kind, for example. Because of these virtues or positive character traits, he/she is committed to doing the right thing no matter what the personal cost and does not bend to impulses, urges or desires but acts according to values and principles. Some might say that good qualities are innate and developed through “good parenting,” which they are, but we’re not perfect. Virtues need to be cultivated to become more prevalent or habitual in daily life. With the habit of being more virtuous, individuals take the helm of their lives, redirecting its course towards greater fulfillment, peace and joy.

By doing so, one encourages others to want that peace and joy they see. A person strengthens those around him/her and helps them to reach their full potential. What

comes from this is a nurtured respect and appreciation of one another and the differences each brings to the table.

Virtues are universal and are recognized by all cultures as basic qualities necessary for well-being and happiness. They are necessary because when individuals practice virtues and build “character muscle,” they attract what may have been missing in life, such as fulfilling relationships, achievement of meaningful goals and happiness. The moment one declares, “I will persevere to achieve this goal in spite of all obstacles, self-doubt and fear,” a shift

occurs where he/she becomes more focused, determined, and courageous, leading to success.

Here are some examples where practicing a virtue in a given situation shapes a certain outcome.

- Discipline enables a person to achieve the goal of running a 25-mile race, creating better health.
- Kindness toward someone who is having a bad day makes

him/her smile and builds rapport.

- Creativity results in an idea that changes how people relate to one another, as shown in social media.
- Trust in a relationship fosters dependability and intimacy, creating valuable, deep relationships.
- Gratitude in a job loss shifts the focus from feeling low to how one can forge a new, more fulfilling career.
- Service to others changes lives and creates better neighborhoods and stronger nations.

In summary, the practice of virtues allows one to develop his/her potential and live a more purposeful, better life – a life not ordinary but extraordinary. Becoming more virtuous people attracts great things to us; it’s a certainty.

Office of Diversity & Equal Opportunity
Mission and Vision



Mission: *To make equal opportunity and the appreciation of diversity an integral part of all NASA SCC programs.*

Vision: *To set an example of diversity appreciation and teamwork for NASA SSC; To be an excellent resource for our customers, stakeholders, and partners; To have a sustained impact on NASA SSC and beyond.*

Hail & Farewell

NASA welcomes the following:

Gregg De Felicibus

Contract Specialist

Office of Procurement

2013 Stennis Space Center Safety & Health Day features activities, presentations

(Right photo) Astronaut Catherine "Cady" Coleman speaks to Stennis Space Center employees during 2013 Safety & Health Day activities Sept. 11. Coleman has flown to space three times and spent 159 days on the International Space Station in 2010-11.



(Far right photo) John "Fish" Herring leads a "safety revival" for Safety & Health Day participants. Herring is an award-winning safety speaker and has made presentations to more than 300 major companies.



(Bottom left photo) Stennis employees visit a variety of exhibits during Safety & Health Day activities. The exhibits featured safety information, as well as health-related activities, such as blood pressure checks.

(Bottom middle photo) Stennis Director Rick Gilbrech welcomes Safety & Health Day participants during his presentation in the StenniSphere auditorium.



(Bottom right photo) Astronaut Catherine "Cady" Coleman handles a live, but muzzled, alligator during a visit to an exhibit on outdoor recreation safety.

