John C. Stennis Space Center

# OASIS

OCEAN AIR SPACE INDUSTRY SITE

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## 30 years of Space Shuttle Main Engine testing at NASA's Stennis Space Center

### Inside:



Explore.
Discover.
Understand.

# From the Director's Desk

**STENNIS SPACE CENTER DIRECTOR**

Adm. Thomas Q. Donaldson V USN (Ret.)

Next month, on June 24, Stennis Space Center (SSC) will celebrate the 30th anniversary of Space Shuttle Main Engine (SSME) "hot fire" testing in south Mississippi. That initial test signaled the beginning of an era for propulsion testing among the Stennis family. Since that historic day, the Stennis family has conducted more than 2,100 tests on SSMEs, including the ones that will help propel Space Shuttle Discovery into orbit when the Orbiter once again returns to flight.

Over the course of the three decades that followed, many changes have been introduced to the rocket propulsion testing here – and to SSC.

In this issue of OASIS, you will find much more information on the history and transformation of the Space Shuttle Main Engines that roared to life at SSC in 1975.

However, when that first hot fire occurred, our center, known then as the National Space Technology Laboratories (NSTL), was a far cry from the federal and commercial city we have today. In fact, it was less than a year after that engine test that a flag-raising ceremony marked the official move of the Naval Oceanographic Program to NSTL. This move ushered in a change that would eventually make SSC a center of excellence in naval oceanography and a model of government efficiency.

There is a culture, character and technical skill set that flourishes at SSC, and it doesn't just reside in one organization – it's synergy attained by agencies working with, and benefiting from, each other. NASA, along with 40 resident agencies and 60 technology-based companies, share the common costs of owning and operating the facility, making it more cost effective for each agency to accomplish its independent mission.

With this effective cost-sharing philosophy and our reputation for state-of-the-art test facilities, highly trained, professional work force and our commitment to safety and customer satisfaction, SSC is well poised to continue to grow and prosper. The commitment by Rolls-Royce and Ionatron to relocate to SSC are two prime examples of this growth.

We can learn from the past while looking to the future. Just as the SSME has evolved into a safer, more reliable engine, SSC also continues to evolve. I am certain the future for NASA and the Stennis family continues to be bright, and I look forward to another 30 years of rocket propulsion testing and growth for our city.

As summer time and vacations approach, please be safe in all your activities, here on site and at home. Wear sunscreen when needed, don't drink and drive, and be extra careful with boats and watersports. Each one of you is much too precious to your family, friends, co-workers and SSC to be injured at work or at play.

## On the cover

The cover art depicts an early Space Shuttle Main Engine test (top photo) at NASA's Stennis Space Center (SSC), and the 1 millionth second of Space Shuttle Main Engine testing (bottom photo) at SSC in January 2004. For 30 years, SSC has tested and proven flight-worthy all of the Space Shuttle's Main Engines.

# Griffin takes helm as NASA Administrator

NASA Administrator Michael Griffin (left) takes the oath of office April 14.

Michael Griffin is returning to NASA as the agency's 11th Administrator. He reported to work at NASA Headquarters in Washington on April 14, the same day the Expedition 11 crew launched to the International Space Station.

"I have great confidence in the team that will carry out our nation's exciting, outward-focused, destination-oriented program," said Griffin. "I share with the agency a great sense of privilege that we have been given the wonderful opportunity to extend humanity's reach throughout the solar system."

Administrator Griffin, who served as NASA's Chief Engineer earlier in his career, takes the helm of the agency as it's charting a new course. The Space Shuttle fleet is poised to Return to Flight, the first step in fulfilling the Vision for Space Exploration – a bold plan to return humans to the Moon, journey to Mars and beyond.

In his first address to NASA employees, Griffin said he would focus immediately on Return to Flight efforts, and noted that the agency has much on its plate right now. "It's going to be difficult, it's going to be hectic, but we will do it together," he said.

He also told employees that he saw "nothing but cheers" in the public reaction to the Vision for Space Exploration. "People want a space program that goes somewhere and does something," he said.

Griffin was nominated by President George W. Bush on March 14, and confirmed by the United States Senate on April 13. At his confirmation hearing on April 12, he made clear that the "strategic vision for the U.S. manned space program is of exploration beyond low Earth orbit."

In his statement to the committee, Griffin said, "It is a daring move at any time for a national leader to call for the bold exploration of unknown worlds, a major effort at the very limit of the technical state of the art," adding later, "in the 21st century and beyond, for America to continue to be preeminent among nations, it is necessary for us also to be the preeminent spacefaring nation."

A holder of five master's degrees and a Ph.D., Griffin also made clear that, despite limited resources, "NASA can do more than one thing at a time."

"My conclusion is that we as a nation can clearly afford well-executed, vigorous programs in both robotic and human space exploration as well as in aeronautics. We know this. We did it," he said, referring back to NASA's accomplishments during the Apollo era.

He closed his statement with a call for exploration: "I believe that, if money is to be spent on space, there is little doubt that the huge majority of Americans would prefer to spend it on an exciting, outward-focused, destination-oriented program. And that is what the President's Vision for Space Exploration is about."

## Experience:

- Space Department Head, Johns Hopkins University Applied Physics Laboratory
- President and CEO, In-Q-Tel, Inc.
- CEO of Magellan Systems, Inc.
- Chief engineer and associate administrator for exploration at NASA Headquarters, also worked at NASA's Jet Propulsion Laboratory
- Deputy for Technology, Strategic Defense Initiative Organization

## Education:

- Bachelor's degree in physics, Johns Hopkins University
- Master's degree in aerospace science, Catholic University of America
- Ph.D. in aerospace engineering, University of Maryland
- Master's degree in electrical engineering, University of Southern California
- Master's degree in applied physics, Johns Hopkins University
- Master's degree in business administration, Loyola College
- Master's degree in civil engineering, The George Washington University

# Integrated Powerhead Demonstrator engine successfully tested at SSC

A 'plume' of fire lights up the night during the test at Stennis Space Center's E-1 Test Stand as the Integrated Powerhead Demonstrator engine is successfully fired April 28.

An engine developed to demonstrate advanced rocket technologies for future launch vehicles was successfully ignited April 28 during its test firing at NASA's Stennis Space Center (SSC).

The initial tests on the engine, known as the Integrated Powerhead Demonstrator (IPD), were conducted at SSC's E-1 test stand. The purpose of the test series was to demonstrate the feasibility and benefits of the full-flow, staged combustion rocket engine cycle, and to demonstrate advanced engine component technologies.

The demonstrator engine test lasted 4.9 seconds. This was the third of 22 planned static ground tests of the engine.

The IPD project is the first of three phases of the Department of Defense's Integrated High Payoff Rocket Propulsion Technology Program, aimed at demonstrating technologies that double the capability of state-of-the-art cryogenic booster engines. The project's goal is to develop a full-flow, hydrogen-fueled, stage combustion rocket engine.

This phase one demonstrator engine uses dual preburners that provide oxygen-rich and hydrogen-rich staged combustion, expected to keep engine components cooler during flight.

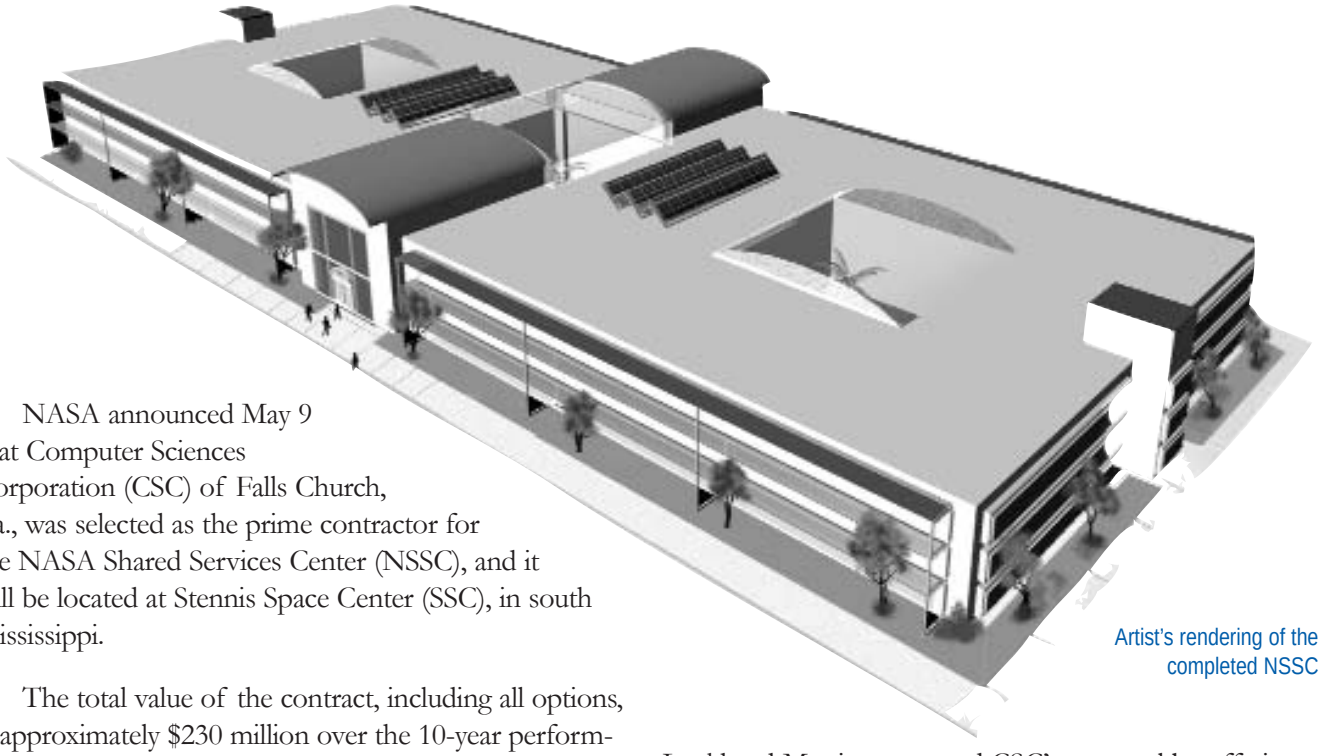
While attaining the desired objectives for the Integrated High Payoff Rocket Propulsion Technology Program, the IPD engine tests also will demonstrate component technologies applicable to the goals of NASA's Exploration Systems Mission Directorate.

NASA's Exploration Systems Mission Directorate in Washington and the Department of Defense's Integrated High Payoff Rocket Propulsion Technology Program are jointly developing the IPD. The project is being managed by the U.S. Air Force Research Laboratory at Edwards Air Force Base in California in cooperation with NASA's Marshall Space Flight Center (MSFC) in Huntsville, Ala.

The demonstrator engine is a research and development activity intended to deliver advanced propulsion technologies. The engine's unique component technologies have been produced by industry partners, Aerojet and Rocketdyne. The technologies developed will benefit many Department of Defense space-access programs, as well as NASA's goal to power future missions to the Moon and beyond – cornerstones of the Vision for Space Exploration, which seeks to expand human and robotic exploration of the Solar System.

MSFC is partnering with the Department of Defense to provide technical and programmatic support for the IPD. SSC is responsible for providing test services.

# Stennis Space Center chosen as location for NASA Shared Services Center



Artist's rendering of the completed NSSC

NASA announced May 9 that Computer Sciences Corporation (CSC) of Falls Church, Va., was selected as the prime contractor for the NASA Shared Services Center (NSSC), and it will be located at Stennis Space Center (SSC), in south Mississippi.

The total value of the contract, including all options, is approximately $230 million over the 10-year performance period.

The NSSC will bring 450 jobs to SSC with an average salary of $50,000. It will be a consolidation of activities being performed across NASA in the areas of human resources, procurement, financial management and information technology operations. NASA expects significant annual savings from consolidating services, once the NSSC transition is completed. It is due to be operational in October 2005.

"We look forward to establishing a world-class organization to provide the kind of timely, efficient and effective support so important to NASA operations," said NSSC Executive Director Richard Arbuthnot. "We look forward to working with CSC and the Stennis community to get the NSSC up and running."

Selection was based on a competitive process. The State of Mississippi passed a bond appropriation totaling $23.7 million to provide the building for the NSSC.

Lockheed Martin supported CSC's proposal by offering interim facilities at SSC while the new building is constructed.

The State of Louisiana assisted in this effort through a $1 million training support package. More than 27 percent of SSC employees live in Louisiana.

**"The hard work and commitments by the states of Mississippi and Louisiana, as well as by our NASA-contractor workforce, are evident in this selection."**

***– NASA SSC Director Adm. Thomas Q. Donaldson V, USN (Ret.)***

"Naturally, we are pleased that NASA Stennis Space Center was chosen as the site for NASA's Shared Services Center," said NASA SSC Director Adm. Thomas Q. Donaldson V, USN (Ret.).

"This decision is a reflection of the outstanding contractor team of CSC and Lockheed Martin that initially selected and proposed Stennis to be the site for the NSSC. The hard work and commitments by the states of Mississippi and Louisiana, as well as by our NASA-contractor work force, are evident in this selection."

For more information about the NSSC on the Internet, visit: http://nssc.nasa.gov/

# SSC marks 30 years of Space

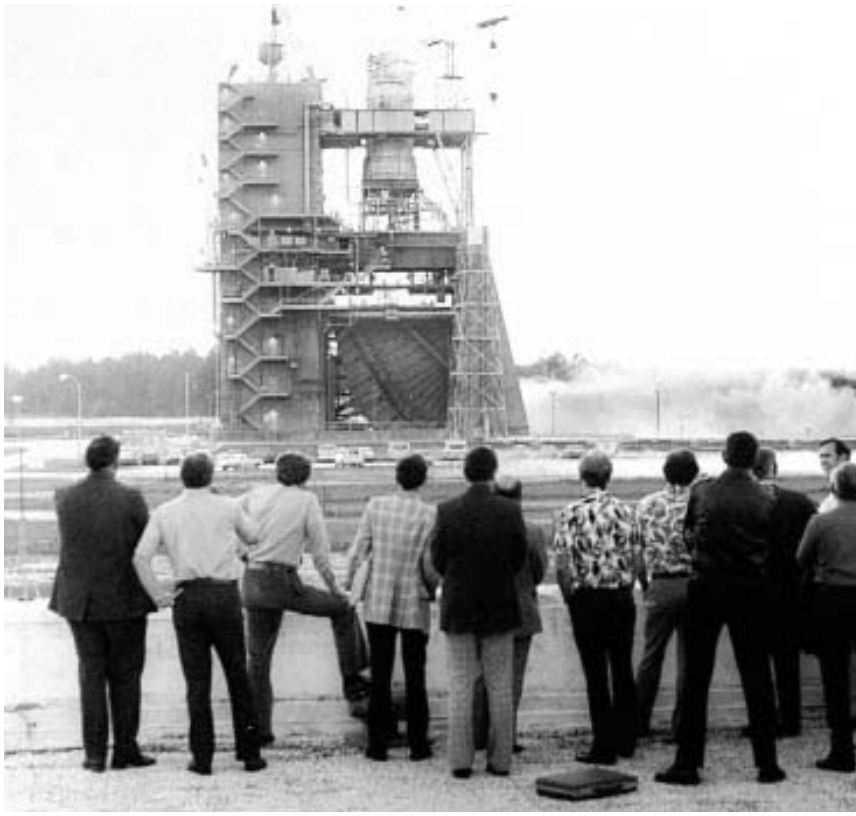
Thirty years ago there were no Internet, laptop computers or CDs; Gerald Ford was president; "The Mary Tyler Moore Show" was on TV; and "Jaws" was at the movies.

But in south Mississippi, NASA engineers were testing a new reusable rocket engine, built to power the world's first reusable spacecraft – America's Space Shuttle.

This year marks the 30th anniversary of testing the Space Shuttle Main Engines (SSMEs) at NASA's Stennis Space Center (SSC), which will commemorate the milestone event on June 24.

Since the first test on May 19, 1975, the NASA-contractor team at SSC has conducted more than 2,200 tests on SSMEs, including the ones that will help propel Space Shuttle Discovery on STS-114, NASA's Return to Flight mission.

A total of 10 tests were conducted in the first two months to help establish fuel preburner, oxygen preburner and main combustion chamber ignition. Three years later, test teams at SSC were firing the Main Propulsion Test Article: the three-engine cluster that helps propel the Space Shuttle into orbit. On Jan. 21, 2004, SSC celebrated 1 million seconds of successful SSME engine firings, both in testing and flight operations. This milestone is a testament to the employees and to the engine itself, which has never experienced a major anomaly.



Onlookers take in an early static test-firing of a Space Shuttle Main Engine at NASA's Stennis Sp
Space Technology Laboratories.

Members of the NASA-contractor team at NASA's Stennis Space Center view an early Space Shuttle Main Engine test from the Test Control Center.

"The unmatched reliability and durability of the SSME serves as an enormous credit to the NASA-contractor teams that have manufactured and tested the engine for three decades," said Ronnie Rigney, SSME Project Manager at SSC. "They've done an extraordinary job."

There have been 113 missions since the first Space Shuttle took flight from Kennedy Space Center (KSC) on April 12, 1981, all powered by SSMEs tested at SSC.

The engines are tested on the A-1 and A-2 Test Stands which were built in the 1960s to test the first and second stages of the Apollo Saturn V rocket that safely transported Americans to the Moon. The stands were converted from the Apollo/Saturn V configuration to accommodate SSMEs.

"The SSME is a unique engine, and 30

***— Celebrating 30 years of Space Shuttle Main Engine testing at Stennis Space Center —***

# e Shuttle Main Engine testing

ace Center, then called the National

years of testing the engine at Stennis is highly unique, also," said Dave Geiger, The Boeing Co.'s site manager at SSC. "We have learned a lot about how to not only improve the engine, but also the test facilities and capabilities."

During testing at SSC, the engines are mounted vertically on the 185-foot-tall stands for test-firing. Instruments are added, and then the engines are hot-fire tested for durations as long as 520 seconds (about 8-and-a-half minutes), the amount of time it takes to lift the Space Shuttle into space.

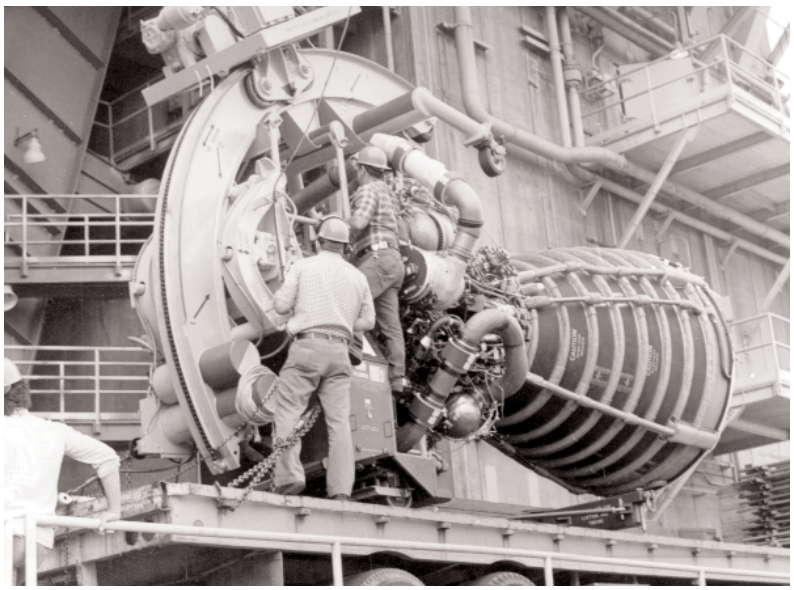
Each SSME is 14 feet long, weighs about 7,000 pounds and is 7-and-a-half feet in diameter at the end of the nozzle. The engine operates at greater temperature extremes than any other mechanical system in use today. It is fueled by liquid hydrogen – at -423 degrees Fahrenheit, the second-coldest liquid on Earth.

When it is combusted with liquid hydrogen, the temperature in the Main Combustion Chamber of the SSME is 6,000 degrees Fahrenheit, hotter than the boiling point of iron. The three SSMEs on a Space Shuttle produce the equivalent of more than 37 million horsepower; if they pumped water instead of fuel, they could drain an average-sized swimming pool in 25 seconds.

The Rocketdyne Propulsion and Power unit of The Boeing Co. in Canoga Park, Calif., manufactures the SSME. Pratt and Whitney, a United Technologies Company of West Palm Beach, Fla., builds the high-pressure turbo pumps. Marshall Space Flight Center in Huntsville, Ala., manages the Space Shuttle Main Engine Project for the Space Shuttle Program.

The engines are assembled at KSC in Florida and shipped to SSC for testing. After passing flight acceptance tests, they are weighed and subjected to a formal acceptance review, then shipped back to KSC for installation on a Space Shuttle Orbiter. The result is a safe, strong, reliable engine, thoroughly tested at SSC for the last 30 years, and ready to return the Space Shuttle to flight.

"What's amazing is that 30 years of knowledge has been passed on without a gap in important information," said Miguel Rodriguez, SSC Propulsion Test Director. "Most processes suffer through a knowledge gap over this many years. Because this program has been continuously maintained, others have had the opportunity to learn from people like Pat Mooney or Al Lenz of the SSME test world, carrying on the 30 years of knowledge developed over the entire period. Indeed, a very unique situation."



An early Space Shuttle Main Engine is hoisted into the A-2 Test Stand at NASA"s Stennis Space Center before undergoing a test-firing.

After a Shuttle mission, the engines receive post-flight inspections and maintenance at KSC, and then may be shipped back to SSC for a pre-flight acceptance test prior to use on another mission.

The Space Shuttle's Return to Flight begins the journey to finish construction of the International Space Station, return to the Moon and go on to explore Mars and the solar system. Discoveries from these explorations will continue to advance scientific knowledge as well as lead to the development of new, everyday technologies.

# Inspiring
the next generation . . .

as only NASA can

## SSC hosts students for JASON project

More than 350 fourth- through eighth-graders from Louisiana, Alabama and Mississippi participated in the JASON Project's 2004-05 expedition, 'Disappearing Wetlands' at SSC. They conducted field lab experiments and watched live broadcasts from JASON Expedition Louisiana research sites.

## Astronaut Fincke visits Space Station exhibit

NASA Astronaut Mike Fincke visits 'Space Station Imagination' with students from Resurrection Catholic School in Pascagoula on Jan. 25. The students were at StenniSphere, the visitor center at NASA's Stennis Space Center, to hear Fincke talk about his six-month stay aboard the International Space Station last year.

## StenniSphere

Beginning Memorial Day weekend, StenniSphere, the visitor center at NASA's Stennis Space Center, will be open daily until 5 p.m. Guests can see the new Return to Flight exhibit, and tour America's largest rocket test complex. Tours begin at 10 a.m. from the Launch Pad, located at the Hancock County (Miss.) Welcome Center, Interstate 10, Exit 2. Visitors 18 years and older must present a valid photo ID. Admission is free. For more information, call (800) 237-1821 or visit *www.nasa.gov/centers/stennis/ home/index.html* and click on the StenniSphere logo.

## Model T club pays a visit to SSC

Hervey Purcell of Ocean Springs (pictured) and fellow members of the Magnolia Model T Ford Club, along with members of the Model T Ford Club of America, toured SSC as part of their recent driving tour of the Gulf Coast.


## Students celebrate Sun's importance at annual event

From left, Orange Grove Elementary School students Amanda Stone, Mya Hyman and Nailah Bell make solar clocks while visiting NASA's Stennis Space Center for Sun-Earth Day. Sun-Earth Day is an annual celebration of the Sun and its connection to the Earth. Students participated in hands-on activities and learned about the importance of the Sun to ancient cultures.

# Rolls Royce bringing jet engine testing facility to SSC

Rolls-Royce will spend $42 million on construction and facility upgrades as well as use existing infrastructure at the H-1 test facility (pictured) at SSC.

Rolls-Royce announced Feb. 15 that it had selected NASA's John C. Stennis Space Center (SSC) for relocation of its large-engines outdoor test facility from the United Kingdom.

The facility will be used to test development and prototype engines for performance, noise and other factors.

Rolls-Royce will spend $42 million on construction and facility upgrades as well as use existing infrastructure at the H-1 test facility at SSC.

"We are pleased that Rolls-Royce has chosen our region to perform this work," said Mississippi Sen. Trent Lott. "The people of Mississippi and Rolls-Royce have enjoyed a close relationship for some time and this relocation only enhances that partnership."

Work involving the company's two latest, high-thrust Trent engine programs will take place at SSC in 2007 when the Trent 900, which powers the Airbus A380, and the Trent 1000, being developed for the Boeing 787 Dreamliner, both undergo noise measurement testing.

# SSC volunteers help local teams succeed in FIRST Robotics competitions

At right, SSC employees Allan Forsman of Mississippi Space Services and M.J. Miller of the Naval Research Laboratory worked with Pearl River Central and Picayune Memorial High School students to fine tune their robot at the FIRST Robotics Lone Star Regional competition. Other SSC mentors at the event included NASA engineers Bo Clarke, James Cluff, Christine Powell and Scott Olive.

Three Mississippi teams competed in the event. The combined team of Pearl River and Picayune made it to the quarterfinals. Gulfport High School won three team awards and made it to the semifinal round. Warren Central High School from Vicksburg won two awards, including the runner-up medal.

Gulfport and Provine High School from Jackson represented Mississippi at national competition.

SSC also helped four teams from Louisiana that competed in the FIRST regional in Duluth, Ga.: the New Orleans Center for Science and Mathematics, Marion Abramson High School, O. Perry Walker High School and John F. Kennedy High School. Teams from Abramson High School and the New Orleans Center for Science and Math were seeded high enough at the end of preliminary rounds to continue to the quarterfinal and semifinal rounds, respectively.

# AROUND

## ERC, Incorporated, receives George M. Low Award

NASA presented ERC, Incorporated, the 2004 George M. Low Award in the small business service category. ERC was cited for its "outstanding contribution to the advancement of excellence in our nation's space program."

The George M. Low Award demonstrates NASA's commitment to promote excellence and continual improvement by challenging the NASA-contractor community to be a global benchmark of quality management practices.

The George M. Low Awards were presented by Acting Administrator Fred Gregory at NASA's 19th annual Continual Improvement and Reinvention Conference in Alexandria, Va., on March 1-2. The conference is attended by senior managers and engineers from government and industry. It provides a forum for NASA and its contractor partners to exchange ideas, success stories and lessons learned, providing the opportunity for participants to apply quality management practices in their own organizations.

The George M. Low trophy (pictured) contains a medallion alloyed with material flown to the Moon and back on Apollo 11 in 1969, the first human lunar landing mission.

ERC, Incorporated, is a privately-held small business providing high technology services and products to NASA, the Army and the Air Force. ERC was founded by Dr. Susan Wu in 1988, and has provided services to NASA for more than 15 years. In addition to corporate headquarters in Huntsville, Ala., ERC conducts business at NASA's Stennis Space Center (SSC) and other locations across the nation. For more information, visit *www.erc-incorporated.com.*

## Boeing employees receive engineering awards

The Boeing Co.'s Christina P. Zeringue and David McConnell were honored with Outstanding Engineering Achievement Merit Awards at the San Fernando Valley Engineers' Council's 50th Anniversary Honors & Awards Banquet held recently.

Zeringue, a test article engineer, was recognized for her efforts supporting SQL-RAMS and received the achievement award for her "significant contributions in bringing the SQL-based paperless planning system online at Stennis Space Center."

McConnell, who works in facility controls, was cited for his "outstanding contributions in building the SSC Facility Control System and leading the way in meeting future testing requirements."

## Ferrario now directs Environmental Chemistry Lab at SSC

Joe Ferrario took over the reigns as the new Director of the U.S. EPA's Environmental Chemistry Laboratory (ECL) at SSC in October 2004. Ferrario, an internationally recognized scientist in the area of dioxin analytical chemistry, has been with the ECL since April 1988. His areas of specialization are dioxin analyses, trace organic analysis, environmental chemistry, high and low resolution gas chromatography/mass spectroscopy (gc/ms).

Ferrario is responsible for managing and providing analytical support for all dioxin/furan/PCB-related projects, including the EPA's Dioxin Reassessment and Dioxin Exposure Initiative. His work focuses on the development of analytical methods for the ultra-trace analyses of environmental contaminants at sub part-per-trillion levels. The ECL provides analytical support to the Office of Pesticide Programs and is part of EPA's efforts in support of Homeland Security, and has provided analytical support to both OSHA and the Department of the Army at the World Trade Center and the Pentagon following the disaster of Sept. 11, 2001.

## Senator Lott's staffers see SSC's diverse capabilities

Jim Sartucci, legislative director for Sen. Trent Lott, and other Lott staffers, visited SSC on March 30. The group toured sites for the new Rolls-Royce testing facility and the new Stennis Technology Park; participated in an ocean coastal observation strategy meeting with NASA, Navy, NOAA, and university representatives at SSC; and toured SSC's B-1 Test Stand, which could support testing propulsion systems for future space vehicles.

# UR WORLD

## Naval Research Laboratory measures record hurricane wave

The largest wave ever recorded in the Gulf of Mexico was measured as Hurricane Ivan passed over a Naval Research Laboratory (NRL) instrument array.

The 91-foot wave was measured with instruments placed on the continental shelf for the Slope to Shelf Energetics and Exchange Dynamics (SEED) field experiment. The instrument array, consisting of six current profiler moorings with wave/tide gauges, was deployed at water depths ranging from 60 to 90 meters just west of the DeSoto Canyon, about 100 miles south of Gulfport. Some time between 8 p.m. and midnight on Sept. 15, 2004, the eye of Ivan passed through the center of the array and directly over four of the six instruments.

Bill Teague, a physical oceanographer in NRL's Ocean Sciences Branch, said that most instruments in the ocean do not even survive near misses of such powerful storms, much less direct hits.

"The moorings provided the best ocean measurements of currents and waves ever obtained directly under a major hurricane," said Teague.

During the approach of Ivan, a moored buoy deployed by the National Data Buoy Center (NDBC) near the west side of the SEED array, registered a significant wave height of 53 ft. According to NDBC, this height appears to be the largest ever reported by NDBC from a hurricane and comes within a few tenths of a meter of NDBC's all-time record reported in the North Pacific. The buoy broke loose and was set adrift at 5 p.m. Sept. 15, just prior to the arrival of the main force of the hurricane.

At array mooring number 3, located under the most intense winds, the maximum measured wave height of 91 feet (higher than an eight-story building) was part of a group of large waves where several waves reached heights of about 66 feet.

"These waves recorded by the SEED gauges are by far the largest waves ever directly measured," said David Wang, also an oceanographer at NRL.

However, Teague said that waves of this magnitude would never make it to the shorelines along the Gulf of Mexico. Large waves in deep water tend to break, lose energy, and become smaller as they enter shallower water approaching the coast, if they even make it that far.

## NAVOCEANO surveyors assist relief effort in Haiti

NAVOCEANO recently participated in a humanitarian and civic assistance mission in South America and the Caribbean sponsored by the U.S. Southern Command called New Horizons. The group was tasked to conduct a beach clearance survey in Haiti, following many changes resulting from the active 2004 hurricane season, particularly Hurricane Jeanne in September 2004.

The group was interested in identifying hazards to navigation in the Gulf of Gonaïves area and ensuring navigation clearance for the relief effort. The channel needed to be surveyed before U.S. Navy relief ships could proceed to unload 1,200 tons of supplies, equipment and 50 Seabees on land.

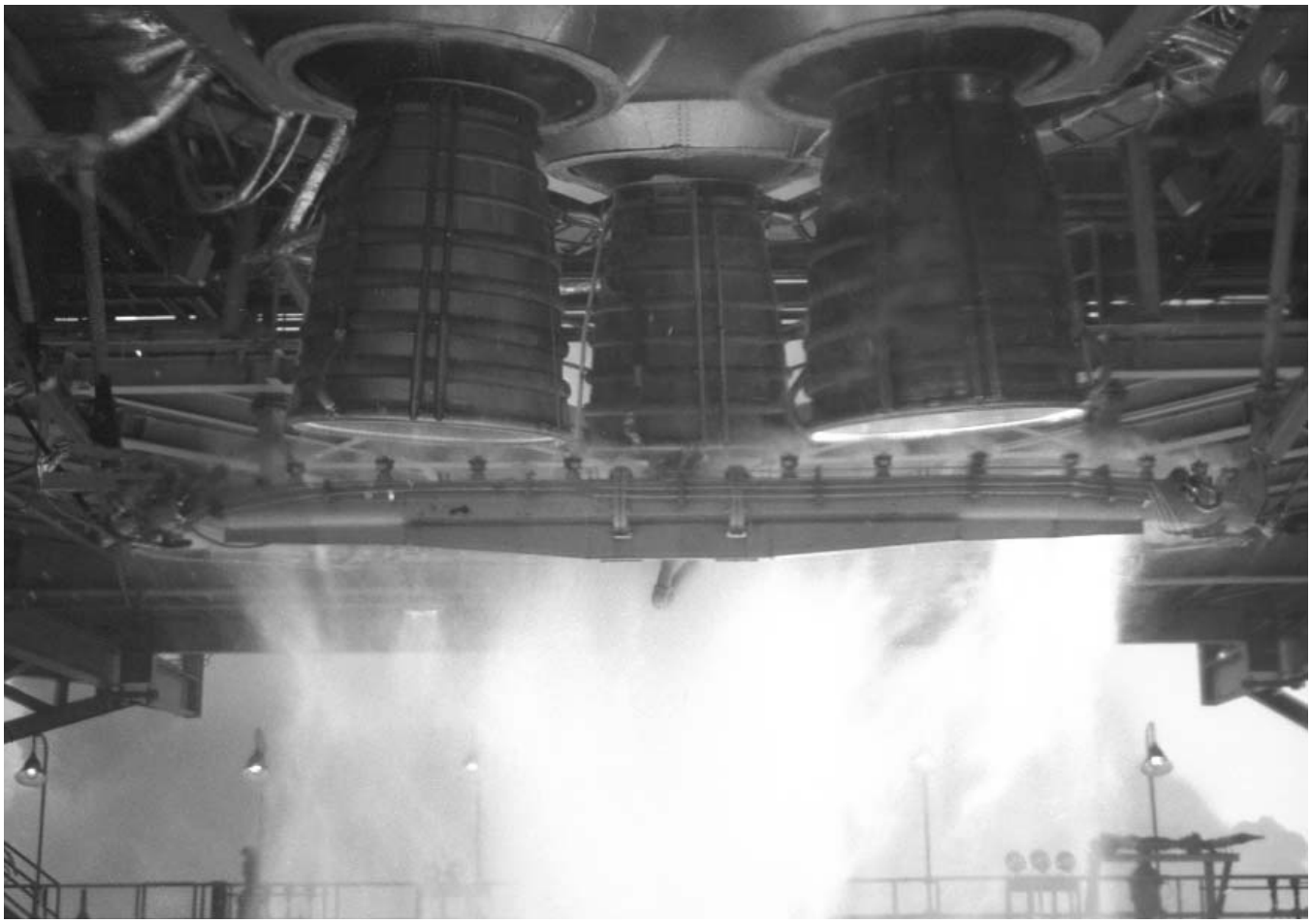
Securing the safety of navigation was the duty of NAVOCEANO's Ian Fergusson, Skip Derry, Wally Stout and LCDR Chris Sterbis. Within seven days aboard Venturous, a U.S. Coast Guard cutter, the team used sidescan sonar, GPS and a single-beam echosounder to successfully create the field charts they were requested to provide.

Different from other charts, field charts are produced and distributed for special circumstances. In this case, it was the drastic changes in the Haitian coastline because of the 2004 hurricanes. The charts identified obstructions in and around the channel and approaches to Gonaïves.

In early February, due to the expertise of the NAVOCEANO team and the cooperation of the Venturous crew, the USS SAIPAN successfully unloaded its supplies, and the SeaBees disembarked to begin rebuilding schools, drilling wells and providing other much needed assistance.

For more information about NAVOCEANO, visit *https://www.navo.navy.mil.*

# Testing at SSC paved the way for first Space Shuttle flight



Testing of the Shuttle's Main Propulsion Test Article (MPTA) on Stennis Space Center's B Test Stand was critical before the launch of the first Space Shuttle in 1981. The MPTA consisted of a simulated Orbiter structure, aft propulsion compartment and a cluster of three Space Shuttle Main Engines.

OASIS
Ocean Air Space Industry Site

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