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December 16, 1999



Peace on Earth

LAGNIAPPE Commentary

Gator's 1999 Christmas Wish...

Mercy! I thought to myself. This will be the last Lagniappe commentary of this century! Would you believe this millennium? Frankly, writing this "Gator" column for the last time in the 20th century has weighed on me for some time.

What do you say for such a momentous occasion? You would think after 22 years me and Gator could whip this out in no time. By the way, where is the Gator? Haven't seen him since he left for the swamps. Sure could use his thoughts for this commentary.

"Ho, Ho, Ho! Merry Christmas, Nicholas, my boy, Merry Christmas!"

Thank goodness, I thought, Gator is back!

And there the old boy stood at my door, all decked out in his raggedy, bedraggled Santa Claus suit. "I was in the neighborhood out here at Stennis Space Center dropping off some presents and thought I would drop by to see if you needed a hand," Gator volunteered. "I knew this would be an important commentary for you, being it's Christmas, Y2K and the new millennium coming on. Besides, I've still got a few days left before the, uh, big ball drops."

"Well, Gator, it is good to see you," I replied, "I was afraid you would still be in the swamps."

"Don't take it lightly, my friend. You really should take some precautions," Gator said. "But I decided that our people have been smart enough to survive in this old world for several thousand years, and they ain't gonna let a little old microchip stop them now! By the way, Nick, what we got going for this year's little newspaper?"

I handed Gator a proof sheet of the December Lagniappe cover.

"Wow, you guys really got a beautiful cover on this month's paper," Gator exclaimed. "It looks like a Christmas card with the Earth floating out there in space."

"Gator, you are very perceptive," I said. "Actually, the astronauts shared such a thought when they first saw the Earth from space during the Christmas flight of Apollo 8. Jim Lovell described our planet as a 'beautiful, fragile ball.' In fact, many believe those early pictures from space inspired the environmental movement that started in the early 1970s."

"Keep talking, Saint Nick," Gator said with a wistful look on his face, "I know you are just dying to give me another history lesson."

"Now Gator, don't be that way," I replied. "It's not every day that these special events occur."

"I get the drift," Gator smartly replied. "This holiday is not just your everyday, garden-variety Merry Christmas and Happy New Year. But, I don't see why you're so concerned, Mr. Wiseman. What's that you journalists always claim, 'A picture's worth a thousand words.' You can't look at that beautiful Earth hanging out there in space and not want to take care of her."

"Gator, you can come up with some smart thinking sometimes."

"No trick to it, my man. That message on your cover, 'Peace on Earth,' has been with us for 2,000 years," Gator observed. "And, I suspect the same truth will be with us when the next millennium rolls around. Have a good one, my friend!"

"Same to you, Gator, and thanks for the memories."

M.R.H.



NEWSCLIPS

NASA continues efforts to contact Mars Polar Lander—Mission controllers for NASA's Mars Polar Lander acknowledge that they hold out very little hope of communicating with the spacecraft, but they vow to learn from the experience and continue exploring the Red Planet.

Mars Polar Lander is part of a series of missions in a long-term program of Mars exploration managed by the Jet Propulsion Laboratory for NASA's Office of Space Science, Washington, D.C.

The Lander, following its Dec. 7 landing on Mars, was scheduled to begin communications with Earth via NASA's currently orbiting Mars Global Surveyor.

Astronomers discover six new planets orbiting nearby stars—A team of astronomers searching the galaxy with powerful telescopic instruments has found six new planets orbiting nearby stars, increasing the number of planets astronomers have discovered outside our solar system by more than 25 percent.

The astronomers made the discoveries as part of a long-term project supported by the National Science Foundation and NASA to survey 500 nearby stars for orbiting planets.

Gamma-ray bursts light the way to the early universe—NASA astronomers say they have uncovered a specific property of gamma-ray bursts that will enable them to gauge the distances to thousands of these powerful explosions, many perhaps beyond the reach of all existing telescopes.

This finding, experts say, may allow scientists to determine the geometry of the universe, as well as when and where massive stars formed in the very early universe.

A team at NASA's Goddard Space Flight Center in Greenbelt, Md., performed the new analysis.

International Space Station Status Report

The International Space Station's altitude has been raised by an average of 10 statute miles following two recent thruster firings using jets on the Zarya module. The result of the orbit-raising burns placed the station in a 245-by-238-statute-mile orbit in preparation for the arrival of the Zvezda service module early next year.

Zvezda's date for launch atop a Proton rocket remains uncertain until an investigation into the most recent failure of a Proton is completed, and until station managers conclude a General Design Review meeting in Moscow scheduled for later this month or January.

Since the launch of Zarya a year ago, the Space Station has completed more than 5,900 orbits around Earth.



Director's Dialogue

from Center Director
Roy Estess



Christmas Message

I want to extend a warm greeting to each of you as we celebrate this holiday season. I also thank you all for your continued, outstanding work that resulted in many successes this year.

Time seems to fly by faster when we are so busy. It hardly seems possible that another year has passed. But, when we take a look at our collective accomplishments this year, it is remarkable. Everywhere I look around the Center, there is an almost unprecedented level of activity: new buildings going up; new technical facilities being constructed or updated; new people joining the Stennis family; and a level of programmatic activity beyond what we have seen in a number of years. It has been a great year with many challenges, a lot of hard work, with people in all the Stennis organizations committed to excellence. This is evidenced by the outstanding accomplishments they have made.

Let me ask that during this season, you find a little time to set aside the pressure and worry of life. Concentrate on the job of living, the pleasure of family, and the many other important things. If we do, we will find ourselves refreshed and dedicated to even greater accomplishments next year.

Happy Holidays to you...



Stennis Space Center recently honored five employees who were recipients of Space Flight Awareness Awards. The honorees will attend the launch of STS-103 at Kennedy Space Flight Center in Florida. Recipients, from left, were Fedele Marchioni III of Lockheed Martin Stennis Operations; Gary Marshall and Marianne Smith, both of Boeing/Rocketdyne; NASA's Randy Canady; and Bryant Quave of Mississippi Space Services.

Gen. Dailey to leave NASA for National Air & Space Museum

Gen. John R. Dailey, associate deputy administrator, recently announced his departure from NASA to become Director of the Smithsonian Institution's National Air & Space Museum (NASM) in January 2000.

Gen. Dailey came to NASA in 1992 after 36 years of service in the U.S. Marine Corps, most recently as Assistant Commandant. For the past seven years, he has served as the NASA Administrator's most senior advisor and led the Agency's reinvention activities.

"The leadership provided by Jack Dailey has been unparalleled," Administrator Daniel Goldin said. "He has shaped and strengthened the Agency and was responsible for developing an infrastructure that will carry NASA into the new millennium. His commitment to aviation and space is unmatched."

Stennis entering the 21st century following an unprecedented ambitious, year in testing, remote sensing and Earth sciences

John C. Stennis Space Center is ready to enter the 21st century on the heels of an ambitious and unprecedented year for the men and women in rocket propulsion testing, commercial remote sensing and Earth system sciences.

Testing of newer, more powerful rocket engines, exciting activities in Earth science and commercial remote sensing, and the beginning of a major expansion project for the Visitors Center were among the events that took place at Stennis in 1999.

Propulsion Programs

Stennis began the year riding on the crest of momentum gained in 1998. With all major test stands occupied by rocket engines for the Space Shuttle; the X-33 and X-34; larger, more powerful hybrid rocket motors; hydrogen peroxide engines; and other new rocket engines being tested for private industry, Stennis was prepared to respond to new challenges.

Modifications to the B-1 test stand were completed to test the new, innovative RS-68 engine. Developed by the Rocketdyne Propulsion & Power division of the Boeing Company, the RS-68 will be the first engine to be assembled at Stennis. The RS-68 will provide propulsion for Boeing's expendable Delta IV launch vehicles that will be used to launch commercial and government payloads into orbit. Assembly of the engine at Stennis is expected to begin in early 2000.

NASA's Low Cost Technologies Fastrac engine project achieved its first long-duration test firing in March. The engine will power the new, unpiloted X-34 technology demonstrator rocket-plane.

Designed and developed at Marshall Space Flight Center in Huntsville, Ala., the Fastrac is fueled by a mixture of kerosene and liquid oxygen and has a rated power of 60,000 pounds of thrust. Testing of the Fastrac Propulsion Test Article began in late September.

Testing of the XRS-2200 Linear Aerospike Engine powerpack concluded with the testing of the third and final powerpack in April. More than 1,500 seconds



The Fastrac engine, the second engine developed in the U.S. in the past 26 years, will power the new, unpiloted X-34 technology demonstrator. Stennis performed a chill test in October 1998 to check the engine for leaks before its hot-firing in January. The January test on the Fastrac was the first hot firing on the B-2 stand since 1981.

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Modifications to the B-1 test stand to accommodate the RS-68 got under way in January. Above, technicians unload the Thrust Measurement System.

YEAR-END . . .

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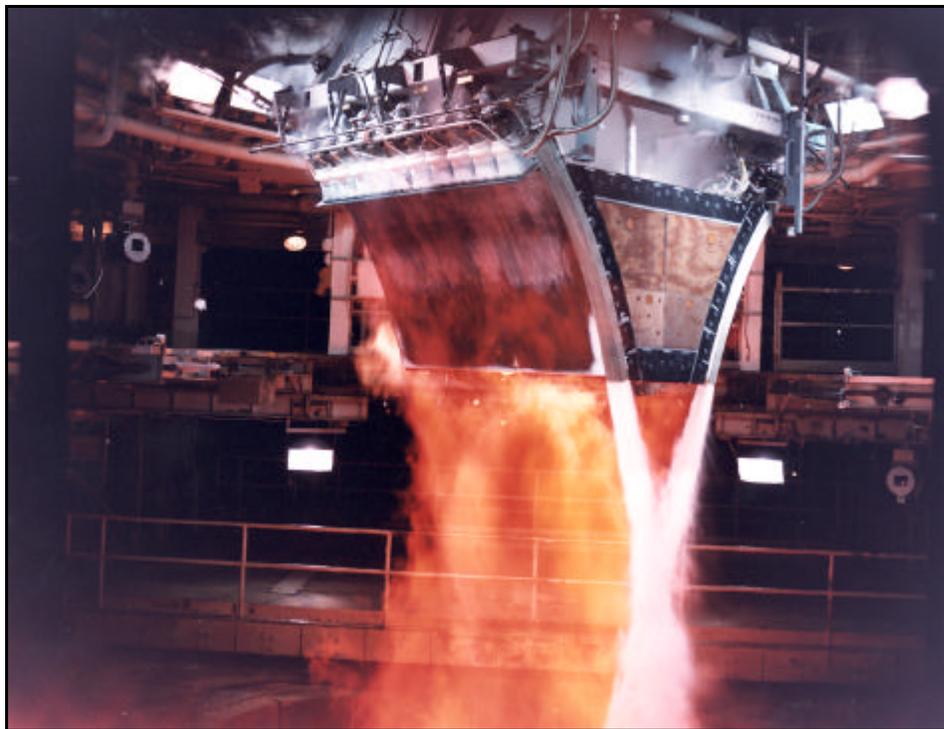
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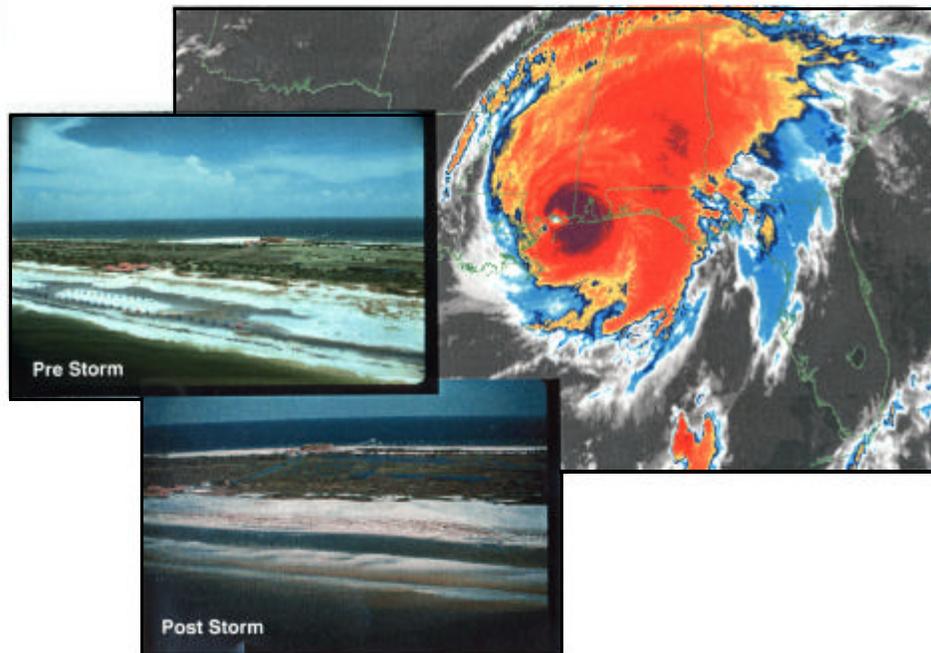
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Testing of the XRS-2200 Linear Aerospike Engine powerpack concluded



An ignition system test of the XRS-2200 Linear Aerospike Engine for the Lockheed Martin X-33 prototype vehicle is successfully conducted. The test, which was done to develop the engine start sequence from zero to 1.12 seconds and verify combustion wave ignition, ran the full, planned duration. The ignition system serves as a kind of "pilot light" to ignite the combustible propellant and oxidizer and literally "light" the engine.



The image, above right, is of remote sensing data mapped to show landfall of Hurricane Georges, Sept. 28, 1998. CRSP investigators are experimenting with data acquired during the storm to evaluate technology for potential application before, during and after natural disasters. The information will be used in emergency preparedness, emergency management, emergency response and disaster relief.

YEAR-END . . .

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with the testing of the third and final powerpack in April. More than 1,500 seconds of testing on three powerpacks were conducted between October 1998 and April 1999. These tests validated the turbo-machinery used in the aerospike engine.

The first developmental linear aerospike engine arrived at Stennis Space Center in July. Chill down tests of the engine began in mid-September, with the first ignition system test in October.

Upon completion of single engine testing, modifications to the test stand will be made to accommodate testing of two aerospike engines in a flight configuration, as they will be mounted on the X-33 vehicle. Dual engine testing will begin in summer 2000.

Testing at Stennis' E-3 test facility was run at full pace in 1999, with both of its testing cells occupied. The facility was testing new hybrid and hydrogen peroxide rocket technology propulsion systems, which included testing a small-scale hybrid rocket motor horizontally in cell one.

Testing was also performed in cell two on a low-cost, upper-stage propulsion system that uses hydrogen peroxide as the oxidizer propellant.

In early July, the first test firing of the 250,000-pound thrust hybrid rocket motor, the largest hybrid rocket motor yet tested at Stennis, occurred. Longer duration tests were also conducted on the motor designed and constructed by a consortium of aerospace corporations.

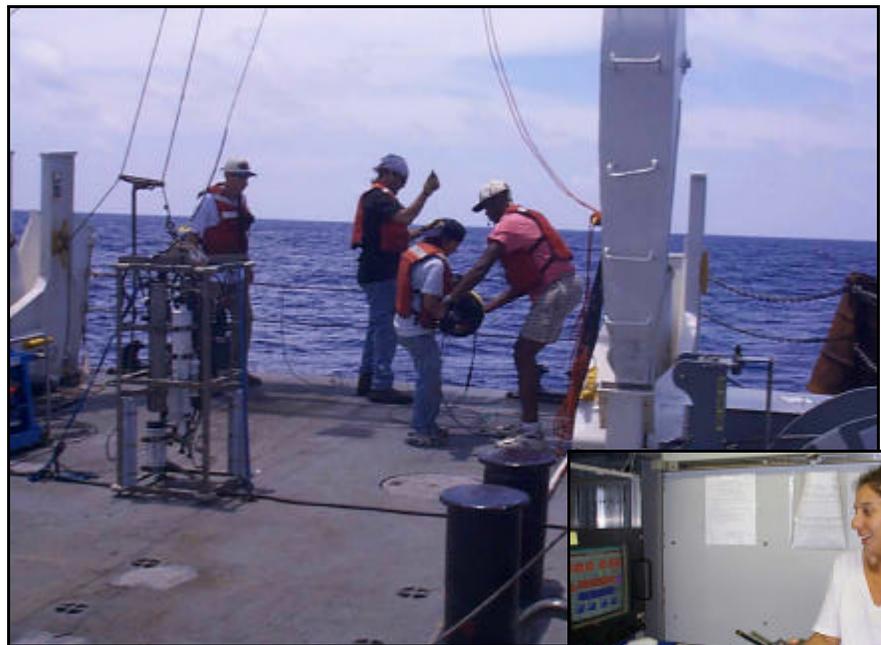
The year 2000 promises to be an even busier one for propulsion testing at Stennis Space Center. Other new propulsion programs will begin. These include the TRW Ultra Low Cost Engine, a 650,000-pound thrust motor; a hybrid sounding rocket; more hydrogen peroxide engines; and the RS-76 rocket engine.

Commercial Remote Sensing

Stennis' Commercial Remote Sensing Program (CRSP), is continuing to explore new ways of doing business to develop faster, better and cheaper methods to acquire data for scientific research



CRSP has helped Mississippi farmers develop image processes for prescription farming that should reduce the environmental impact on farm lands. Together with national grower associations, CRSP selected a pilot project in the north Mississippi Delta, image above right, that served as a model for ways of using less land, water and fertilizer to improve cost savings and crop yields.



Crew members, above, on board the USNS Silas Bent, take water samples from the South China Sea during a survey conducted as part of the NASA SIMBIOS (Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies) project. Right, NASA co-op student, Callie Hall, reads data printouts on board the research vessel. The work conducted was a joint project between NASA and the Naval Oceanographic Office at Stennis.

YEAR-END . . .

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and to make the results available to the public. Remote sensing is the observation of the surface of the Earth from distant vantage points, usually from sensors mounted on aircraft or satellites. The images gathered by the sensors are used to make detailed maps of selected study areas.

CRSP and Stennis have long used remote sensing images to show the residents and communities in Louisiana and along the Mississippi Gulf Coast their relationship with the environment and the environment's relationship with them.

Imagery collected by Stennis after Hurricane Georges' Sept. 28, 1998, landfall is helping these same residents and communities better prepare for future emergencies, as well as restore areas impacted by such disasters.

In 1999, CRSP launched into Phase II of its \$50 million Scientific Data Buy Program. During this phase of the program, CRSP will purchase data from five companies. The data provided by these companies will address the scientific research themes of land cover and land use research and natural hazard research and applications.

Also, CRSP helped to further develop prescription farming—the ability to tailor soil and crop management to fit site-specific conditions—as a way of finding commercial uses for remote sensing information. CRSP has targeted the country's agricultural production—food and fiber—as an area to help in the application of remote sensing technology and information.

Representatives from the four major agricultural grower associations, along with NASA and the U.S. Department of Agriculture, held a workshop this year at Stennis to craft a strategy to help farmers improve their planting, fertilizing and harvesting methods.

Earth System Science Research

The Earth System Science Office (ESSO) continued its study of the world's oceans in partnership with the Naval Oceanographic Office, also located at Stennis Space Center.

Scientists from the office sailed from Pusan, South Korea, into the port of



NASA's Technology Transfer Office works to share information and establish relationships with industries and businesses to commercially develop products and services derived from space-related technologies. Left, NASA engineer Bruce Spiering shows conference participants the Multispectral Telescope and Portable Video Imager.

Singapore to gather data from the South China Sea on phytoplankton—microscopic ocean plant life. The data will be used to calibrate and validate ocean color algorithms taken by the Sea-viewing Wide Field-of-View Sensor (SeaWiFS) satellite. Subtle changes in ocean color indicate various types and quantities of marine phytoplankton, which has both scientific and practical applications. The SeaWiFS project will develop and operate a research data system that will process, calibrate, validate, archive and distribute data received from an Earth-orbiting ocean color sensor.

ESSO research scientists also helped the U.S. Navy and the University of West Florida's (UWF) Archaeology Institute uncover prehistoric American Indian shell middens—dump sites—and historic sites.

Using Ground Penetrating Radar (GPR), the team, composed of members of UWF's Archaeology Department and the U.S. Navy's Coastal System Station, was able to locate artifacts and map nine midden sites used as refuse heaps by Native American tribes in the Florida area between 900 and 1200 A.D., in Panama City.

Technology Transfer

The value of technology resulting from space exploration is immeasurable. The scientific and technological advances have applications in health care, environmental protection, transportation, communications, robotics, education and com-



Dr. David Powe, chief of the Education and University Affairs Office at Stennis (far right) presented Dr. Debbie Davis, principal of Pierce Street Elementary School (left) and Linda Clifton, principal of Tupelo Middle School (center) with an image of the state of Mississippi acquired through satellite remote sensing, in recognition of their becoming the first pilot sites for the National Workforce Development Education and Training Initiative (NWDETI).

puter technology. The mission of NASA's Technology Transfer Office at Stennis is to share information and establish relationships with industries and businesses to commercially develop products and services derived from space-related technologies.

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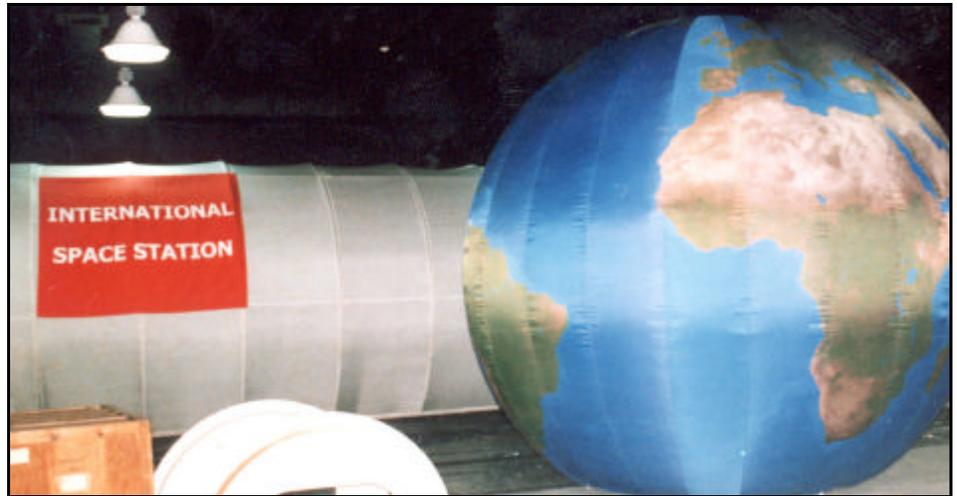
YEAR-END . . .

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In June, Stennis celebrated the kick-off of the center's first dual-use project and the signing of an exclusive license agreement. Stennis' first dual use project involved NASA; Associated Technical Management Corporation of Texarkana, Texas; the Mobile County (Ala.) Board of Health; and the Environmental Protection Agency's Gulf of Mexico Program at Stennis. This collaborative effort worked toward the commercial development of the Multispectral Telescope and Portable Video Imager, a video-based technology capable of detecting plant stress up to 16 days before it becomes visible to the human eye.

Additionally, the Technology Transfer Office helped a number of companies navigate through various technology sources and agreements, such as those with Omni Technologies of New Orleans. Omni will develop methods for commercialization of a fiber optic transceiver, currently used in the High-Speed Data Acquisition System at Stennis.

The transceiver will be marketed to other facilities that perform extremely



The public will experience new exhibits and displays when the Stennis Visitor Center center reopens next year. Construction on a module of the International Space Station, background, will provide visitors with the opportunity to learn about living and working in space. An Earth balloon, foreground, will allow visitors to travel inside to hear lectures.

hazardous testing, such as explosives, nuclear materials, rocket engines and some combustion turbine engines.

Education Programs

In August, NASA's Education and University Affairs Office at Stennis, along with NASA's Commercial Remote Sensing Program and the U.S. Department of Education, announced the

National Workforce Development Education and Training Initiative (NWDETI).

This national workforce initiative will bring remote sensing education to students throughout the country. The national plan, when fully implemented, should establish the United States as the world leader in the remote sensing industry.

Two years ago, Stennis introduced the National Workforce Development Education and Training (NWDETI) program in

Stennis employees alerted to Y2K scams
Y2K survival kits and Y2K compliance stickers for your credit cards are just two of the scams the Better Business Bureau of Mississippi, Inc. warned employees at Stennis Space Center about during the Y2K Employee Awareness Day held last month.

Representatives from the City of Slidell, Mississippi Power, Reliant Energy Entex, Hancock Bank and BellSouth were also on hand to answer questions about Y2K readiness.

"There's been a considerable amount of teamwork from the Stennis community, NASA, contractor staff and resident agencies, in preparing the site for the new millennium," said Terry Jackson, NASA Year 2000 Project Manager. "They've done a great job. We're ready and confident the transition into the year 2000 will be a successful one."



NASA engineers at Stennis and Mississippi State University (MSU) agricultural scientists recently witnessed a milestone in remote sensing research. The Sandmeier Field Goniometer, left, collected data for the first time in the field, as part of a joint NASA-MSU precision agriculture study. The instrument mounted on the goniometer, a spectroradiometer, measures the intensity and "color" of sunlight reflected from a small area on the ground. This information can give commercial remote sensing companies more flexibility in flight schedules and sensor viewing angles, saving them considerable time and money. The only other field goniometer of this kind is the original Swiss Field Goniometer, developed for the University of Zurich.

NASA engineer did not start out to be a rocket scientist

NASA's Richard King, project manager for the Low Cost Technologies project at Stennis, never set out to be rocket scientist. The University of Tennessee graduate said he never thought much about it until the U.S. became serious in the '60s about landing on the Moon and returning safely to the Earth. He knew immediately he wanted to be a part of this historic program.

He joined the Boeing Aerospace Company at Marshall Space Flight Center in Huntsville, Ala., in 1965 and was transferred to Stennis Space Center, then the Mississippi Test Operations, in November 1966. In 1971, after a few years as lead engineer on the F-1 engines that powered the 7.5 million-pound thrust first stage of the three-stage moon rocket, he received an Apollo Achievement Award from NASA for being a member of the team that achieved the first astronaut's landing on the Moon.

"I was proud to live through that part of the century and the era of exploring the Moon," he said about those early Apollo days. "It was an exciting and incredible time in history."

In 1975, King was assigned by Boeing as a consultant in London to work on North Sea oil exploration. His two daughters, Nancy and Lori, graduated in the early 1980s from London Central High School, an American Department of Defense school for overseas students.

In 1984, Richard returned to the U.S. to work as a senior engineering specialist for Boeing in Seattle. His career path steadily moved south, as Boeing promoted him to Systems Test Manager in the management, operation and maintenance of the U.S. Strategic Petroleum Reserve for the Department of Energy in New Orleans.

In 1988, King came to work for NASA as the primary interface between the center's Propulsion Test Operations and the National Launch System (NLS) Project Office. In 1993, King was assigned project support/project control manager for the Propulsion Test Directorate and worked there until 1996.

"I have seen a number of programs start and terminate since 1988," King said. "I first worked on NLS. The program was cancelled in 1992. After that, both the National Aerospace Plane and Advanced Solid Rocket Motor programs were cancelled," King said. "When the Low Cost Technologies/Fastrac engine project came along, I jumped at the chance to head it up. I knew this was a project that could and would succeed."

As project manager, King was reunited with his associates at Marshall who were designing the Fastrac rocket engine as part of NASA's Advanced Space Transportation Program. Fastrac, a 60,000-pound-thrust engine, will be used for the first powered flight of NASA's X-



34 technology demonstrator rocket-plane. The project received a Continual Improvement Award at the 14th Annual Continual Improvement and Reinvention Conference last spring.

Richard lives in Metairie, La., where he and his wife, Charlye, a former schoolteacher and airline stewardess for Delta Airlines, are avid followers of college and pro football. They visit their two daughters' families (four grandchildren) as often as they can. Richard also likes to fish for trout and redfish in the Gulf of Mexico.

As for Stennis, King said, "This is one of the friendliest places in the world to work. Everyone is very professional whether they are working on propulsion systems, remote sensing or whatever. They speak to you when you walk down the hall. That goes a long way in creating a happy, healthy working environment. Enthusiasm is in the air, especially with all the new programs coming our way. The individuals at this place are the best!"

Scientists hope study of Puerto Rican rivers parallel local findings

Scientists from NASA's Earth System Science Office (ESSO) at Stennis Space Center, recently completed a research cruise in Mayaguez Bay, Puerto Rico. As part of ESSO's coastal research program, the cruise was coordinated with Puerto Rican professor, Dr. Fernando Gilbes, an investigator for the Research and Development Center of the University of Puerto Rico, Mayaguez.

The two groups are collaborating to compare the water optical properties in Puerto Rico to the waters off Mississippi and Louisiana.

Dr. Gilbes worked with the Stennis ESSO office through the NASA Graduate Student Researcher's Program and was a

recipient of a NASA Global Change Fellowship. He recently received a 1999 NASA Partnership Award made through the Stennis Education and University Affairs Office for his work with ESSO in the development and validation of bio-optical algorithms in coastal waters. The partnership, totaling \$300,000, will fund the project for three years.

"Our plans are to continue to collect data for cross-validation of SeaWiFS satellite data," he said. "In the long term, we expect to be able to use the information gathered here to evaluate more easily and efficiently the impact of farming and agriculture, urban development, and rural growth on our waterways."

Water samples from three characteristically different rivers were surveyed at points where they flow into the Mayaguez Bay. The findings will contribute to a database or a bio-optical model that will help scientists construct mathematical equations to interpret remote sensing data.

NASA scientists from Stennis ESSO—Program Director and Biological Oceanographer Dr. Richard Miller and Biogeochemist Dr. J. Greg Booth—along with Dr. Gilbes, led a team of more than 10 scientists and students during the study of the river plumes from the Anasco, Yaguez and Guanajibo rivers.

"Dr. Gilbes' work in Puerto Rico will

See RIVERS, Page 10



Stennis installs new weather warning system

The chance of Stennis' employees being caught off guard by a tornado should diminish once a new weather warning system is in place by the end of the year.

Stennis has installed the first siren—a 10-foot cylindrical horn that looks like an oversized purple martin feeder—in what could eventually become a multi-siren system. The new siren is near the intersection of Roads 5 and 6 just inside A Complex.

The siren sends out a loud tone with a range of three quarters of a mile to a mile. "It runs off batteries powered by solar panels, which is less expensive than extending power lines to the siren, and is not susceptible to normal power outages," said David Del Santo of the NASA Security Office.

Regular tests are planned for the first Friday of each month beginning in January. The tests will include short, solid tones; actual tornado warnings will be characterized by a 3- to 5-minute wavering tone, followed by two 30-second blasts when danger has passed.

Employees will receive advance notice of the siren test schedule through the Stennis Intranet, e-mail, the electronic sign by the south gate, postings on department bulletin boards and more.

QUICK LOOK

■ The Center of Higher Learning is now online. Class schedules, including Spring 2000, registration information, research activities and other information can now be seen at <http://www.chl.state.ms.us>. For more details, call Keith Long at Ext. 7662.

■ The 1999 Stennis Space Center Christmas Drive is now under way. Donations of new and like-new toys or check donations made payable to **SSC Christmas Drive** should be turned in to your agency or company representative by Thursday, Dec. 16. Donations serve Hancock, Harrison and Pearl River counties in Mississippi and St. Tammany parish in Louisiana.

For information, contact Joyce Lawrence at Ext. 2195.

■ For last minute Christmas gifts, don't forget to shop the NASA Exchange. Conveniently located on the first floor of Building 1100, the Exchange offers an array of items for the Yuletide season, including small gifts, holiday decorations, stocking stuffers and delectable treats and candies.

RIVERS . . .

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complement our studies here in Mississippi and Louisiana," said Miller. "We want to compare the concentrations of phytoplankton, dissolved organic materials and suspended sediment and their relationship to the reflectance and/or absorption of light from the samples taken from each of the three rivers in the Mayaguez Bay to samples collected here in Mississippi and Louisiana. From that information, we will formulate algorithms for validation of satellite images of the same areas."

The Mayaguez data was collected by a uniquely designed bio-optical package engineered by the ESSO scientists to specifically meet their coastal research mission.

"The work in Puerto Rico was also a great opportunity to evaluate the portability and design of the bio-optics package to collect a broad suite of measurements in shallow water from a small boat," Miller said.

"We came back with some ideas on how to improve the system, but we're very pleased with its performance," Miller concluded.



ESSO's bio-optical package used in the survey of the Mayaguez Bay.

LAGNIAPPE

Lagniappe is published monthly by the John C. Stennis Space Center, National Aeronautics and Space Administration. Roy Estess is the center director, Myron Webb is the public affairs officer, and Lanee Cooksey is the news chief. Comments and suggestions should be forwarded to the Lagniappe Office, Building 1200, Room 208D, Stennis Space Center, MS 39529, or call (228) 688-3585.

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