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With Opening of Newest 'Green' Building, NASA Marshall Looks to the Future

By Rick Smith

On Aug. 13, Marshall Space Flight Center leaders, members of the Alabama congressional delegation and other guests and Marshall team members gathered under breezy blue skies to mark the official opening of Building 4220.

The five-story, glass and steel edifice is home to the Space Launch System Program (SLS) Office, and speakers at the ribbon-cutting ceremony expressed pride in Marshall's leadership in the development of NASA's next flagship launch vehicle.

"The [Space Launch System] is a game-changer," said Marshall Center Director Patrick Scheuermann. "It will transform the way we explore space."

U.S. Rep. Mo Brooks of Alabama's 5th District and U.S. Sen. Jeff Sessions

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HIRAD Set to Fly in Hurricane Mission

The Hurricane Imaging Radiometer, known as HIRAD, will fly aboard one of two unmanned Global Hawk aircraft during NASA's Hurricane Severe Storm Sentinel, or HS3 mission, from NASA's Wallops Flight Facility beginning Aug. 26 through Sept. 29.

NASA's HS3 mission is a collaborative effort that brings together several NASA centers with federal and university partners to investigate the processes that underlie hurricane formation and intensity change in the Atlantic Ocean basin. The 2014 flights will take place

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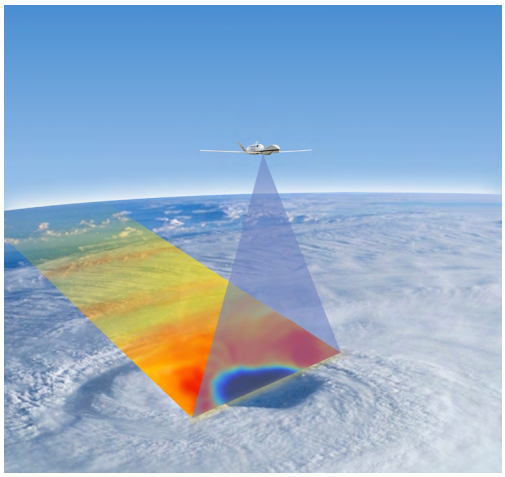

Artist's concept of aircraft with HIRAD scanning a tropical cyclone. (NASA)

History of Marshall-Developed Rocket Engine Preserved as Practical Art

By Kenneth Kesner

In a casual meeting area on the second floor of Marshall Space Flight Center's new Building 4220, a 55-inch round glass tabletop sits on an elegantly curved black pedestal that previously handled 60,000 pounds of fiery thrust.

The table's base is the nozzle of a Fastrac liquid-fuel rocket engine. Fastrac was designed from scratch by center engineers in the mid-1990s as part of the Low Cost Technologies effort under NASA's Advanced Space Transportation Program, which was managed at Marshall. The reusable Fastrac was relatively simple, made use of some commercial-off-the-shelf technology, was about one-fourth the cost of similar engines and was developed with industry teammates very quickly -- it rocketed from the drawing board to full-engine hot-fire testing in under three years.

Fastrac was on track and set to propel the X-34 unmanned space vehicle -- a low-cost advanced technology flight demonstration test bed for space access technology demonstration. The X-34 funding ended in 2001.

In its new role as both historical exhibit and functional art, the Fastrac nozzle is again part of efforts to contain costs and get the most use from materials and spending. Building 4220 is energy efficient, uses fewer resources and costs less to operate and maintain than the facility it replaces -- Building 4202, constructed in 1963. The nozzle, made partly of ablative material and designed to withstand tremendous heat and pressure, is very difficult to affordably break down for recycling, so it's fortunate that a new, creative, ecologically friendly role for it was found.

The table was the idea of Ken Criswell, team lead in Marshall's Facilities Planning Office and part-time furniture designer.

"I'm a geek at heart," he said. When working with architects and designers, Criswell said he always asks, "How can we incorporate some of Marshall's history and functions into our buildings?"

About a year ago, a Fastrac nozzle table was crafted for Building 4601. Then came this second one for Building 4220. In addition to preserving pieces of propulsion

The base of this table, near the Liquid Engines Office in Marshall's new Building 4220, is the nozzle of a Fastrac rocket engine -- developed and tested at the center in the late 1990s. Reminiscing about the project and talking about the table are former Fastrac team members, from left, Jeff Clounch, manufacturing engineer in the Engineering Directorate's Mechanical Fabrication Branch, which put the table together; George Young, deputy chief engineer of the Space Launch System Advanced Development Office; Michael Ise, propulsion discipline lead engineer in the Propulsion Systems Department; Kent Criswell, the table's designer, of Marshall's Facilities Planning Office; and Thomas Byrd, J-2X engine lead in the SLS Liquid Engine Office. (NASA/MSFC/ Emmet Given)

history in a useful way, Criswell hopes the artifacts-turned-tables subtly inspire today's engineers and managers as they develop the Space Launch System and other projects.

"This nozzle was actually hot-fired," said George Young, the Fastrac project's first chief engineer, now deputy chief engineer of the Space Launch System Advanced Development Office, as he peered at the blackened char layer of the nozzle through the glass tabletop, which is supported by an aluminum frame the same size and shape of those that will hold mirrors on NASA's James Webb Space Telescope.

The aluminum support, bolted to existing ports in the nozzle, was made from material left over from other test laboratory projects, said Jeff Clounch, a manufacturing engineer in the Engineering Directorate's Mechanical

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of Alabama, who helped cut the ceremonial ribbon, agreed.

"I'm so proud of what you do here at Marshall -- the capabilities that you've shown in the past and the capabilities you're going to show in the future," Brooks said.

Sessions echoed the sentiment, noting "how proud I am of the work that all of you are doing."

"It's up to you to keep this ball rolling," he added.

Scheuermann, Sessions and Brooks joined Marshall Deputy Director Teresa Vanhooser; Lt. Col. Tom Nelson, deputy commander of the U.S. Army Corps of Engineers' Mobile District; John Honeycutt, deputy manager of the SLS program; and Marshall engineer David Skridulis, project lead for the 4220 construction effort, to cut the ribbon -- earning applause from the scores of assembled Marshall team members. Then Scheuermann and his Washington guests spoke briefly with local reporters before touring visitors through Marshall's nearby Propulsion Research Development Laboratory.

The spacious, cost-efficient interior of Building 4220 will house some 400 Marshall workers, most supporting the Space Launch System Program Office. Displays in the lobby include scale models of the Space Launch System rocket and Orion crew capsule, built by the Marshall Exhibits team. (NASA/MSFC/Emmett Given)

Aiding in the official Building 4220 ribbon-cutting are, from left, John Honeycutt, deputy manager of the Space Launch System Program Office; Lt. Col. Tom Nelson, deputy commander of the U.S. Army Corps of Engineers-Mobile District; U.S. Sen. Jeff Sessions of Alabama; Marshall Center Director Patrick Scheuermann; U.S. Rep. Mo Brooks of Alabama's 5th District; Marshall Deputy Director Teresa Vanhooser; and Marshall engineer David Skridulis, team lead for the Facilities Management Office's civil structural group. (NASAMSFC/Emmett Given)

The rest of the crowd filed into Building 4220 to see firsthand why the facility itself, not just the work done inside, is a significant game-changer in its own right.

Green, 'Pocketbook Friendly' Infrastructure

Designed and built to meet federally mandated standards of energy and water efficiency, Building 4220 is an ultra-modern, "green" facility situated at the southeast corner of Marshall's Building 4200 administrative complex. Featuring a central atrium and innovative meeting spaces on every floor, it provides offices and workspace for some 400 team members.

State-of-the-art green technologies and energy-conservation systems can be found throughout the building. The entire structure is specially insulated, with much of the exterior covered in low-emissivity glass that deflects heat to reduce cooling costs within. Rooftop solar-power units absorb energy to augment electrical power, and a 10,000-gallon cistern collects stormwater to irrigate the surrounding greenery. Even the facility's new parking lot has a green element: Rather than gutters, it includes a "bioswale," a natural, soil-and-vegetation-based means of capturing and filtering stormwater runoff, which is

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HIRAD *Continued from page 1*

during the peak of the Atlantic hurricane season.

One of the NASA Global Hawks will cover the storm environment and the other will analyze inner-storm conditions. HIRAD will fly aboard the inner-storm Global Hawk and will be positioned at the bottom, rear section of the aircraft.

"HIRAD's purpose is to map out where the strongest winds are in a hurricane," said Daniel J. Cecil, the principal investigator for the HIRAD instrument at NASA's Marshall Space Flight Center. "During its first deployment in 2010 for the Genesis and Rapid Intensification Processes experiment, a NASA Earth science airborne campaign, HIRAD had two interesting hurricane cases, Earl and Karl. We have made improvements to the instrument since then, and are looking forward to the next good case -- out over water, avoiding land of course!"

HIRAD is a passive microwave radiometer that was developed at Marshall. A radiometer is an instrument used to measure the power of electromagnetic radiation. Because HIRAD is a passive microwave radiometer, it detects microwave radiation naturally emitted by Earth. The radiation HIRAD detects is then used to infer wind speed at the surface of an ocean.

The antenna on HIRAD takes measurements of microwaves emitted by the ocean surface that are increased by the storm. As winds move across the surface of the sea, they generate white, frothy foam. This sea foam causes the ocean surface to emit increasingly large amounts of microwave radiation, similar in frequency or wavelength, but much lower intensity to that generated within a typical home microwave oven. HIRAD measures that microwave energy allowing scientists to deduce how powerfully the wind is blowing. With HIRAD's unique capabilities, the two-dimensional structure of the surface wind speed field can be much more accurately determined than current operational capabilities allow.

HIRAD provides unique observations of sea surface wind speed and rain. The data HIRAD gathers will advance understanding and predictability of hurricane intensity. It will also help better determine maximum wind speed and structure of the vortex (spinning center). The regions of strongest winds are also much better observed with HIRAD than current capabilities.

When HIRAD makes a cross track scan, it reads a swath of passive microwave radiation emitted from Earth. HIRAD obtains measurements of rain rates and hurricane-strength winds, even through heavy rain. HIRAD measures rain rates ranging from ~ 5 to 100 millimeters per hour (0.2 to 3.9 inches per hour) and wind speeds ranging from ~10 to 85 meters per second (22.3 to 190.1 miles per hour / 36 to 306 kilometers per hour).

The HIRAD instrument provides "brightness temperature data" that is color-coded by the HIRAD team at Marshall. That color-coded data shows areas of falling rain and possible moderate-to-strong surface winds.

For more information on HIRAD, visit: http://hirad.nsstc.nasa.gov/.

Practical Art *Continued from page 2*

Fabrication Branch, which put the table together. He started working at Marshall in the 1990s and remembers machining parts for the Fastrac engine. "This is neat, bringing things back to life," he said.

"A lot of people learned a lot by actually developing this engine in-house," said Thomas Byrd, now the J-2X engine lead in the SLS Liquid Engine Office. He said the table gets a lot of compliments, and honors a past effort that advanced the workforce's knowledge of liquid engine design.

History and efficiency aside, the Fastrac nozzle's then-cutting-edge composite construction -- graphite epoxy over layers of silica phenolic -- creates shimmering black patterns that combine with the metal and glass to make an impressive, interesting and cool piece of furniture.

"It was a cool engine," Young said.

Kesner, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Marshall Engineer Byron Williams Supports His Customers from Design to Completion

By Jena Rowe

It's summer in the South. That means days of temperatures barely below 100 degrees and humidity so thick you'd swear you were living in a sauna. It also means that in most places the air conditioner will be running on full blast.

Byron Williams, senior project mechanical engineer in the Facilities Management Office at NASA's Marshall Space Flight Center, is one of the people you can thank for cool, air-conditioned temperatures at the center. Part of Williams' day-to-day activities is overseeing the progress of replacing existing chillers in Marshall's Main Chiller Plant with newer, more efficient chillers to keep team members comfortable while making less of an impact on the environment.

However, Williams' primary duties amount to much more than achieving cool temperatures. He is also the alternate project manager for the construction of test stands being built at Marshall to test NASA's Space Launch System. Yet, no matter the type of project, his main goal is meeting customer needs.

"As a project manager, my primary job is to take customer requirements and manage the project from a design and construction point of view," said Williams. "The customer provides a need and requirement, and we develop a design to meet their need."

Watching a project mature from an idea to a reality requires a certain amount of patience for the process. Requirements can change, designs can mature and Williams has to be ready for it all. "Flexibility is one of the most important aspects of my job," he said. "Anything can happen during construction. You can plan and plan and have the best design, but sometimes there are things that are unseen. We have to be able to adapt when those things come up."

Williams has worked at Marshall for a little more than two years. He moved to Huntsville in 2007 from Mobile where he worked for the U.S. Army Corps of Engineers Redstone Construction Division. As a kid, he always had a curiosity for how things worked and enjoyed working with his hands. But he also knew he didn't want to be too hands-on, which led him to pursue mechanical engineering as his career. He completed a dual degree program in mechanical engineering and physics with Xavier University of Louisiana and Georgia Institute of Technology.

Byron Williams (NASA/MSFC/Emmett Given)

Often behind-the-scenes, Williams and others in the Facilities Management Office work to ensure Marshall team members have a comfortable and safe working environment. However, interacting with different customers has become Williams' favorite part of his job -- especially when it comes to the SLS test stands.

"Getting outside of the office and going to an actual project to talk with the different contractors and partners is exciting," he said. "I'm literally watching something go from design to completion. Working on the SLS test stands has been a great experience. I have been really impressed with what other organizations are doing to make SLS a reality and I'm glad to be a part of that."

Rowe, an ASRC Federal/Analytical Services employee and Marshall Star editor, supports the Office of Strategic Analysis & Communications.

Marshall Center Employees Tour NASA's Payload Operations Integration Center

Alan Johnston, left, deputy chief of the Training and Crew Operations Branch, explains the finer points of the Laboratory Training Complex in Building 4663 to a tour group Aug. 13. The group was one of many Marshall Space Flight Center employees who toured the complex as part of the Payload Operations Integration Center Open House. The training complex has a full-scale model of the Destiny module on the International Space Station, allowing participants in POIC flight controller training to better understand real-life constraints when it comes to living and working on the orbiting laboratory. Visitors also got to see the POIC control room and learn about the important role of the flight controllers, who communicate daily with orbiting astronauts and scientists on the ground to contribute to the scientific effort on the space station. (NASA/MSFC)

'Green' Building

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directed into a nearby collecting pond.

"We are not just opening a building here," Scheuermann said. "We're adding effective, comfortable, environmentally friendly and 'pocketbook-friendly' infrastructure for the next two generations" of NASA workers.

Such modern, energy-efficient elements help cut Marshall's operating and maintenance costs by 65 percent, and reduce utilities expenses by 35 to 40 percent.

They're also why Building 4220 is shortly expected to receive LEED® certification from the U.S. Green Building Council for Leadership in Energy and Environmental Design, the national standard for the development of high-performance, sustainable structures. Building 4220 will become Marshall's seventh LEED® certified facility. Its first -- Building 4600, the anchor of the center's high-tech engineering complex, which opened in 2006 -- was NASA's very first LEED® certified facility.

Building 4220 was designed by the Nashville-based architectural firm of Thomas Miller & Partners, and BL Harbert International of Birmingham, Alabama, constructed the facility. The Army Corps of Engineers oversaw the contract process and provided construction management and inspection services.

A 'master plan' for revitalization

The new facility is the latest step in Marshall's ambitious facilities master plan, which Melvin McKinstry, who leads the master planning team in the Facilities Management Office, said is intended to "revitalize and modernize" Marshall's campus.

Playing a central role in that program of modernization is the agency's "repair-by-replacement" plan, which replaces old structures, costly to maintain and operate, with new facilities, providing enormous health, safety and cost benefits.

Building 4220 replaces the nearby Building 4202, built in Marshall's early years and now awaiting demolition. Once 4202 is leveled, crews will begin construction of Building 4221, which will, in turn, replace Building 4201, another aging edifice standing across the quad from 4202.

Changes such as these, once complete, will fulfill the core goal of the master plan: to reduce Marshall's overall square footage on Redstone Arsenal by 24 percent.

Watch highlights from the Building 4220 ribbon-cutting ceremony on This Week at NASA.

Smith, an ASRC Federal / Analytical Services employee, supports the Office of Strategic Analysis & Communications.

NASA's Chandra Observatory Searches for Trigger of Nearby Supernova

New data from NASA's Chandra X-ray Observatory offers a glimpse into the environment of a star before it exploded earlier this year, as well as insight into what triggered one of the closest supernovas witnessed in decades.

The data gathered on the Jan. 21 explosion -- a Type Ia supernova -- allowed scientists to rule out one possible cause. These supernovas may be triggered when a white dwarf takes on too much mass from its companion star, immersing it in a cloud of gas that produces a significant source of X-rays after the explosion.

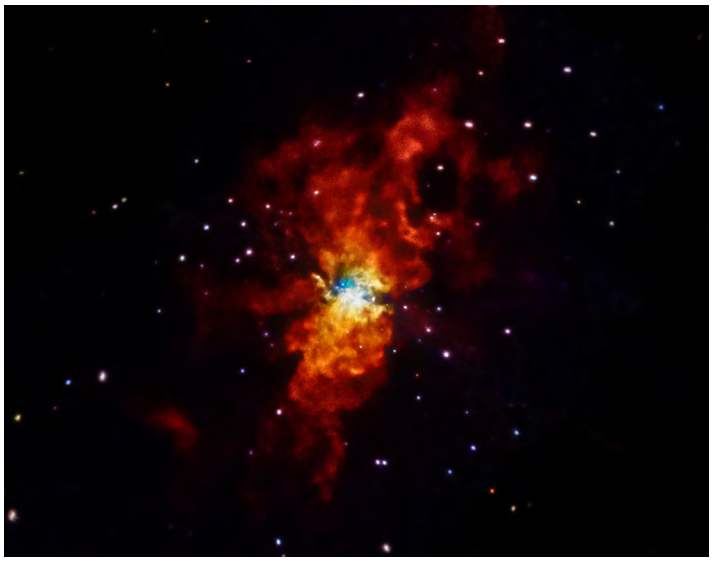
Astronomers used NASA's Swift and Chandra telescopes to search the nearby Messier 82 galaxy -- the location of the explosion -- for such an X-ray source. However, no source was found, revealing the region around the site of the supernova is relatively devoid of material.

"While it may sound a bit odd, we actually learned a great deal about this supernova by detecting absolutely nothing," said Raffaella Margutti of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who led the study. "Now we can essentially rule out that the explosion was caused by a white dwarf continuously pulling material from a companion star."

This supernova, SN 2014J, could instead have been caused by the merger of two white dwarf stars, an event that should result in little or no X-rays after the explosion. Further observations could rule out or confirm other possible triggers.

"Being able to eliminate one of the main possible explanations for what caused SN 2014J to explode is a big step," said Atish Kamble, of the Harvard-Smithsonian Center for Astrophysics, a co-author of the study. "The next step is to narrow things down even further."

Type Ia supernovas are used as cosmic distance-markers and have played a key role in the discovery of the universe's accelerated expansion. At about 12 million light-years from Earth, SN 2014J and its host galaxy are close -- from a cosmic perspective. This offers scientists a chance to observe details that would be too hard to detect in more distant supernovas.



Supernova SN 2014J, soon after it exploded in the Messier 82, or M82, galaxy. (NASA/CXC/SAO/R.Margutti et al.)

"It's crucial that we understand exactly how these stars explode because so much is riding on our observations of them for cosmology," said co-author Jerod Parrent, also from the Harvard-Smithsonian Center for Astrophysics. "SN 2014J might be a chance of a lifetime to study one of these supernovas in detail as it happens."

The study of SN 2014J is similar to a study led by Margutti about another supernova, SN 2011fe, in the nearby galaxy M101. This study was conducted by the Harvard-Smithsonian Center for Astrophysics Supernova Forensics Team, led by Alicia Soderberg. The results were published online and in the July 20 print issue of The Astrophysical Journal.

NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.

Marshall Selects Three Dual-use Technology Development Proposals

By Rick Smith

The Marshall Space Flight Center has awarded a trio of Cooperative Agreements geared to aid development of advanced technologies vital to the achievement of NASA's goals in space and designed to enhance commercial partnerships and technology innovation back home on Earth.

Recipients of fiscal year 2014 Cooperative Agreements are Charles Stark Draper Laboratory Inc., in Cambridge, Massachusetts, and Mississippi State University in Starkville, which made two successful proposals.

In late 2013, the Marshall Center issued the 2014 Cooperative Agreement Notice (CAN) for Dual-use Technology Development -- the first of its kind at Marshall. The agreement notice solicited unique, mutually beneficial technology development proposals from potential American industry and academic partners outside government, targeting specific technology areas that align with Marshall's current technology focus and strategic business endeavors. Its purpose was twofold: furthering development of next-generation NASA spacecraft and space systems, and enhancing Marshall's position as a critical industry partner and resource.

"This new initiative enhances Marshall's ability to collaborate with industry and academic partners in the cooperative pursuit of high-technology solutions critical to NASA's long-term goals in space and our joint endeavors here on Earth," said Dale Thomas, associate director-technical at the Marshall Center. "While the individual projects may be relatively small, they have real potential for strategic impact in terms of fostering long-term partnerships, breakthroughs in technology or both."

Winning proposals are those that augment Marshall's own internal research and development activities, achieve the desired technical development objectives of the proposing partner and potentially enhance American technological competitiveness, said Scott Hutchins, the technical lead for the CAN activity in Marshall's Strategic Development & Integration Office. They typically involve up to a 50-50 sharing of project resource expenditures between NASA and the partner, whether in terms of cash funding, labor and technical expertise resources, facility use or a combination of any of these.

"In most organizations, resources for internal research and development projects are at a premium," Hutchins said. "Marshall's Dual-use Technology Development CAN provides the opportunity for industry and universities to propose projects that combine their research and development resources with those at Marshall to pursue technology development projects of interest to both parties.

Partnerships like these, which pool resources and expertise, certainly can help Marshall engineers and researchers advance targeted technologies essential to advancing NASA's exploration goals, he added.

"Though we can't respond to the Cooperative Agreement Notice ourselves, if Marshall project offices or engineering organizations are working with promising industry or university partners, or know of potential technology development partners, they should be sure to alert those external partners or potential partners to the availability of our CAN," he said. "Marshall organizations can have discussions with outside parties interested in the CAN to explore the potential for a good-fit collaborative project and to inform their response."

The awards range from $20,000 to $90,000. Recipients match approximately 50 percent. Read about the three winning proposals in Marshall's official announcement.

Marshall's Dual-use Technology Cooperative Agreement Notice for fiscal year 2015 is posted on NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) website. U.S. commercial and academic organizations may respond through June 3, 2015.

Smith, an ASRC Federal/Analytical Services employee, supports the Office of Strategic Analysis & Communications.

Marshall Team Encouraged to Attend Surviving an Armed Violent Encounter Training to Learn About Workplace Violence

A workplace violence prevention awareness class is now being offered at NASA's Marshall Space Flight Center.

The Surviving an Armed Violent Encounter, or SAVE, training is a four-hour, hands-on seminar where attendees will learn what to do if faced with a critical incident of violence at work.

The class is designed for all Marshall team members, especially supervisors, managers and human resource specialists. Everyone is encouraged to attend.

"This is a great training opportunity in which all can benefit," said Diana Simpson, Marshall's workplace violence prevention program coordinator in the Protective Services Office. "Participants will examine previous workplace violence incidents, learn the behavior of offenders, and practice verbal and physical tactics to survive a critical incident of violence in the workplace.

"Everyone wants to be safe in their work environment," she added. "The key to preventing a violent situation from occurring is 'Awareness+Action = Prevention.' This seminar will increase the participants' knowledge on what actions to take before and/or during a dangerous event."

Morning or afternoon sessions will be in Building 4627 on Aug. 27, 8 a.m.-noon; Aug. 28, noon-4 p.m.; Sept. 3, 8 a.m.-noon; and Sept. 4, noon-4 p.m.

The training also includes voluntary physical skill drills and practical exercises to overcome conflicts in the office environment. Participants should wear clothing and footwear suitable for physical activity if one plans to take part in the physical activities.

Team members can sign up for the training through SATERN. For questions, contact Shawn Jayne, training coordinator, at 544-1961 or at shawn.d.jayne@nasa.gov.

Ribbon-Cutting Ceremony for Marshall's Building 4220 Featured on NASA-TV

The ribbon-cutting ceremony for Building 4220 at NASA's Marshall Space Flight Center -- the newest LEED® certified facility -- is featured in the latest edition of "This Week @NASA," a weekly video program broadcast nationwide on NASA-TV and posted online.

Marshall team members were joined at this event by U.S. Sen. Jeff Sessions of Alabama and U.S. Rep. Mo Brooks of Alabama's 5th District.

Designed to be energy efficient, with green technologies and cost-saving infrastructure, Building 4220 is now home to the Space Launch System (SLS) Program Office, responsible for NASA's next heavy lift launch vehicle.

This and previous episodes of This Week @NASA are available for viewing at the NASA-TV YouTube channel.