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MARSHALL STAR

In This Week's Star ⊟

NASA Space Launch System Core Stage Moves from Concept to Design

NASA news release

The nation's space exploration program is taking a critical step forward with a successful major technical review of the core stage of the Space Launch System, the rocket that will take astronauts farther into space than ever before. The SLS Program office is located at the Marshall Space Flight Center.

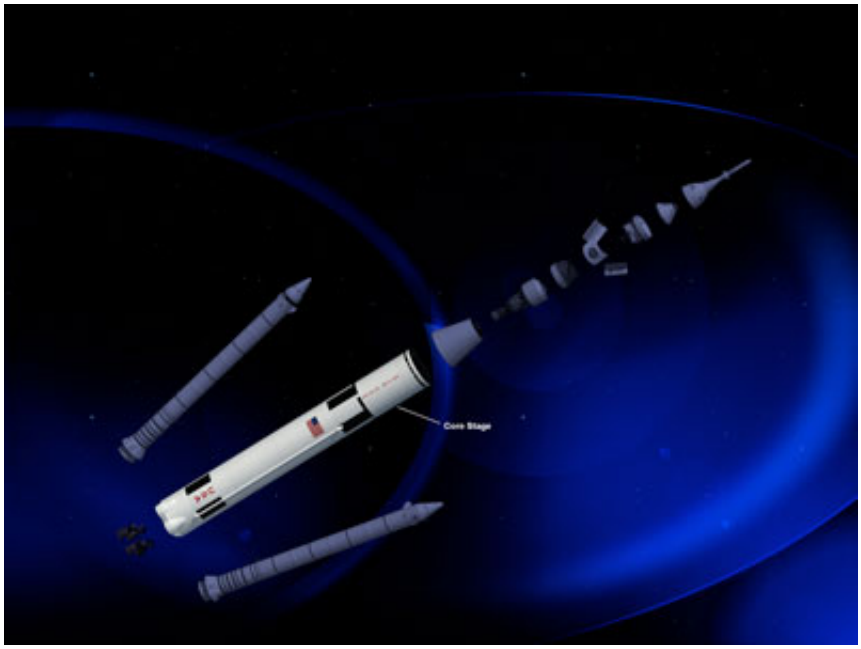

Image right: An expanded view of an artist rendering of the 70-metric-ton configuration of NASA's Space Launch System, managed by the Marshall Center. The core stage, highlighted above, recently passed a review by a panel of NASA, The Boeing Co. of Huntsville, and independent engineers. (NASA)

The core stage is the heart of the heavy-lift launch vehicle. It will stand more than 200 feet tall (61 meters) with a diameter of 27.5 feet (8.4 meters).

The Marshall Center hosted the comprehensive review. Engineers from NASA and The Boeing Co. of Huntsville presented a full set of system requirements, design concepts and production approaches to technical reviewers and the independent review board.

"This meeting validates our design requirements for the core stage of the nation's heavy-lift rocket and is the first major checkpoint for our team," said Tony Lavoie, manager of the SLS Stages Element at Marshall. "Getting to this point took a lot of hard work, and I'm proud of the collaboration between NASA and our partners at Boeing. Now that we have completed this review, we go from requirements to real blueprints. We are right on track to deliver the core stage for the SLS program."

The core stage will store liquid hydrogen and liquid oxygen to feed the rocket's four RS-25 engines, all of which will be former space shuttle main engines for the first few flights. The SLS Program has an inventory of 16 RS-25 flight engines that successfully operated for the life of the Space Shuttle Program. Like the space shuttle, SLS also will be powered initially by two solid rocket boosters on the sides of the launch vehicle.

The SLS will launch NASA's Orion spacecraft and other payloads, and provide an entirely new capability for human exploration beyond low-Earth orbit. Designed to be safe, affordable and flexible for crew and cargo missions, the SLS will continue America's journey of discovery and exploration to destinations including nearby asteroids, Lagrange points, the moon and, ultimately, Mars.

"This is a very exciting time for the country and NASA as important achievements are made on the most advanced hardware ever designed for human space flight," said William Gerstenmaier, associate administrator for the Human Exploration Operations Mission Directorate at NASA Headquarters. "The SLS will power a new generation of exploration missions beyond low-Earth orbit and the moon, pushing the frontiers of discovery forward. The innovations being made now, and the hardware being delivered and tested, are all testaments to the ability of the U.S. aerospace workforce to make the dream of deeper solar system exploration by humans a reality in our lifetimes."

The first test flight of NASA's Space Launch System, which will feature a configuration for a 77-ton (70 metric ton) lift capacity, is scheduled for 2017. As SLS evolves, a two-stage launch vehicle configuration will provide a lift capability of 143 tons (130 metric tons) to enable missions beyond low-Earth orbit and support deep space exploration.

Boeing is the prime contractor for the SLS core stage, including its avionics. The core stage will be built at NASA's Michoud Assembly Facility using state-of-the-art manufacturing equipment.

Across the SLS Program, swift progress is being made on several elements. The J-2X upper-stage rocket engine, developed by Pratt & Whitney Rocketdyne of East Hartford, Conn., for the future two-stage SLS, is being tested at Stennis Space Center. The prime contractor for the five-segment solid rocket boosters, ATK of Brigham City, Utah, has begun processing its first SLS hardware components in preparation for an initial qualification test in 2013.

For more information about the Space Launch System, visit: www.nasa.gov/sls.

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Marshall Acting Director Gene Goldman Presents Center Update to National Space Club - Huntsville
By Jessica Eagan

Marshall Space Flight Center Acting Director Gene Goldman updated 100 members and guests of the National Space Club - Huntsville on June 15 about significant milestones for the center in recent months -- including the continuing momentum of the Space Launch System Program, and the successful commercial launch and demonstration flight of Space Exploration Technologies', or SpaceX, rocket and spacecraft.

Image left: Marshall Center Acting Director Gene Goldman updates the National Space Club - Huntsville on June 15 about the center's recent significant milestones. (Sarah Lincoln)

Goldman applauded the recent SpaceX -- one of NASA's industry partners -- mission to the International Space Station. He noted that both SLS, America's next heavy-lift launch vehicle, and commercial crew and cargo transportation to the station are important to NASA's goal of exploration beyond Earth orbit.

Goldman said that excellent progress is being made with SLS. Hardware testing and various reviews are under way at Marshall. Contractor companies have made significant deliveries including three flight computer software test beds, the first critical component for flight software development.

"We're meeting our milestones and are beginning to gain momentum," said Goldman.

Goldman also pointed out the great work going on in the space station. Marshall's Payload Operations Center continues to provide 24/7 support in managing the experiments onboard the orbiting laboratory. More than 400 scientific studies were conducted last year, and there are probably five to 10 investigations going on any given day in an array of disciplines -- not just those related to human health. This is a tremendous effort for the center, Goldman said, and "it's building a capability that we hope to be able to use in the future on other mission-support programs."

Goldman said that the May 22 liftoff of SpaceX's Falcon 9 rocket and Dragon spacecraft was a great accomplishment. "NASA needs commercial to be successful if we want to explore beyond low-Earth orbit," he said. "I used to talk about 'us', 'them' and 'we'. The reality is 'we' is here today. The futures of NASA and commercial space are linked."

The Dragon capsule docked with the space station on May 25, and returned to Earth with a splash in the Pacific Ocean on May 31, marking an end to the first mission by a commercial company to resupply the station.

"It was symbolic that the same day the Dragon berthed to the space station that we were testing J-2X down at Stennis Space Center," Goldman said.

He acknowledged the center's support to SpaceX under a Reimbursable Space Act Agreement. The center's aerodynamics team conducted 176 runs on the Falcon 9 first stage in the Marshall Aerodynamic Research Facility's 14-square-inch trisonic wind tunnel to provide SpaceX with test data that will be used to develop a re-entry database for first-stage recovery.

"Marshall's engineers have great experience in launch vehicle design and development, and our wind tunnel offers an affordable solution to companies who are looking to get aerodynamic test data on early launch vehicle design configurations," said Goldman.

The center is providing propulsion engineering support to SpaceX in the development of the SuperDraco Launch Abort System and on-orbit propulsion systems. Marshall engineers also are providing technical insight in the development of materials and processes to support future improvements of the Falcon 9 and Dragon to be used in the SpaceX Commercial Crew Development Program.

In addition to work that Marshall has done for SpaceX, Goldman said that the center is continuing work with the Orbital Sciences Corp. of Virginia, which specializes in the manufacturing and launching of satellites. "Orbital is getting prepared to launch their flight demonstration, which will come out of Wallops Flight Facility later this year. We have engineers that are currently working to get that facility ready. We've had some challenges, but I believe that we're beginning to make strong progress."

Orbital Sciences and NASA have been developing a new space transportation system in the Commercial Orbital Transportation Services Program, known as COTS, a cooperative program to provide re-supply capability to service the International Space Station.

Goldman said that Marshall has supported COTS since 2007 by providing engineering expertise and technical insight to aid commercial partners in developing their capabilities. This program helps U.S. industry develop privately operated space transportation systems, with NASA in the roles of lead investor, technical consultant and potential customer. "We have over 50 years of spaceflight experience and propulsion expertise to draw upon, and we're offering our assistance to the private industry," he said.

In 2013, NASA is planning for at least three flights by U.S.-developed cargo delivery systems to deliver research and logistics hardware to the station.

Marshall in National Initiatives

"We continue to make progress with the National Institute for Rocket Propulsion Systems," said Goldman in his presentation at the Shelby Center on the University of Alabama in Huntsville campus. "One of the items that we're particularly proud of is that the Office of Science and Technology Policy is using NIRPS to do one of the studies that is related to the [nation's rocket propulsion] industrial base. And the fact that we're chosen to lead that effort is wonderful. Dale Thomas [Marshall lead for NIRPS and associate director, technical in the center's Office of the Director] and his team are doing a great job there."

The goal of NIRPS is to help reverse the decline in our national rocket propulsion base that is so critical to national security, economic growth and peaceful space exploration. NIRPS is based at Marshall but taps into the expertise of all its government, industry and university partners.

As part of the NIRPS activity or related activity on propulsion development, Marshall is working very closely with the U.S. Air Force, Goldman said, and is looking at common engine development and how Marshall might suit the Air Force's needs with work the center is doing in propulsion arena. "So that again is a tremendous opportunity for our younger engineers to work on hardware programs," he said.

Goldman said Marshall is doing great work in the science arena. NASA and Marshall are continuing to make incredible discoveries about the universe while remaining relevant to our nation's economy and security.

"I'm really proud that Marshall is continuing to keep the work going on the propulsion side and, while at the same time doing cutting-edge work in science," said Goldman.

Goldman said that President Barack Obama's budget request is one that is good for Marshall in that "we can continue to build momentum and support NASA's mission."

Join the National Space Club - Huntsville

The National Space Club, founded in 1957, is a nonprofit organization headquartered in Washington committed to fostering

excellence in space activity through interaction between industry and government, and through a continuing program of educational support. The Huntsville chapter was founded in 1985, with a primary focus on education. Since 2008, the local organization has presented $60,500 in scholarships to 28 North Alabama students interested in studying science or engineering.

"The National Space Club is one of NASA's most important stakeholders," said Goldman. "For that matter, it's important as both a voice and an ear for the entire community of people who really care about and believe in space exploration and our future as a nation."

The Huntsville chapter conducts events such as the Dr. Wernher Von Braun Memorial Dinner, held every October to honor those who have made significant contributions in aerospace-related fields, and the Leadership Luncheon held each spring featuring top government officials who present an overview and plans relevant to aerospace technology.

Space enthusiasts interested in joining the Huntsville chapter can visit here. Dues are $25 a year for professionals and $15 for educators. Membership for students is free. For more information, visit here. For a list of the 2012-2013 directors and officers, visit here. For questions, contact club administrator Barbara Jo Webb at 256-431-7947 or at BarbaraJo.Webb@Spaceclub-hsv.org.

Eagan, an AI Signal Research Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.

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Payload Operations Center Team at Marshall Honored for Expedition 29 and 30 Space Station Contributions
By Lori Meggs

NASA's Payload Operations Center at the Marshall Space Flight Center was recently honored by the International Space Station's Expeditions 29 and 30 crew members and lead flight directors for the important contributions made to the success of the missions.

The Payload Operations Center was part of a team recognized for outstanding work building a plan that allowed Expeditions 29 and 30 to be the first to meet the goal of averaging 35 hours per week of crew time allocated for utilization.

Presenting the awards at Space Center Houston, the Johnson Space Center's visitor center, were Expedition 30 Commander Dan Burbank, whose mission lasted from November 2011 to April 2012; Johnson Space Center Director Michael Coats; and Expedition 30 Flight Director Scott Stover. Jorge Sotomayor, lead increment scientist for the missions at the Johnson Center, accepted the award for the team.

Staffed around the clock to provide support to the space station crew members performing experiments, the Payload Operations Center is NASA's primary research command post. Team members coordinate all U.S. scientific and commercial experiments on the station, as well as Earth-to-station research communications. The Marshall team also trains station crew members on experiments and ground controllers on monitoring those experiments. The payload activities of NASA's international partners, including the Russian Space Agency, European Space Agency, Japan Aerospace Exploration Agency and Canadian Space Agency, also are coordinated by Marshall.

"It's a great accomplishment to be the first to achieve an average of 35 hours of utilization per week on station," said Tim Horvath, payload operations manager for Expeditions 29 and 30. "It means a lot to be able to show the space station is a platform that can be used to conduct and complete significant research. This milestone is a team effort among the Houston and Huntsville teams, as well as scientists and payload developers around the world."

"Planning and executing this many hours of research on a weekly basis is no easy task, and I am so proud of our team for helping to accomplish this very important goal," said Sam Digesu, manager of Marshall's Payload Operations Directors branch of the Mission Operations Laboratory. "It's truly an honor to be recognized by our colleagues at Johnson."

Meggs, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

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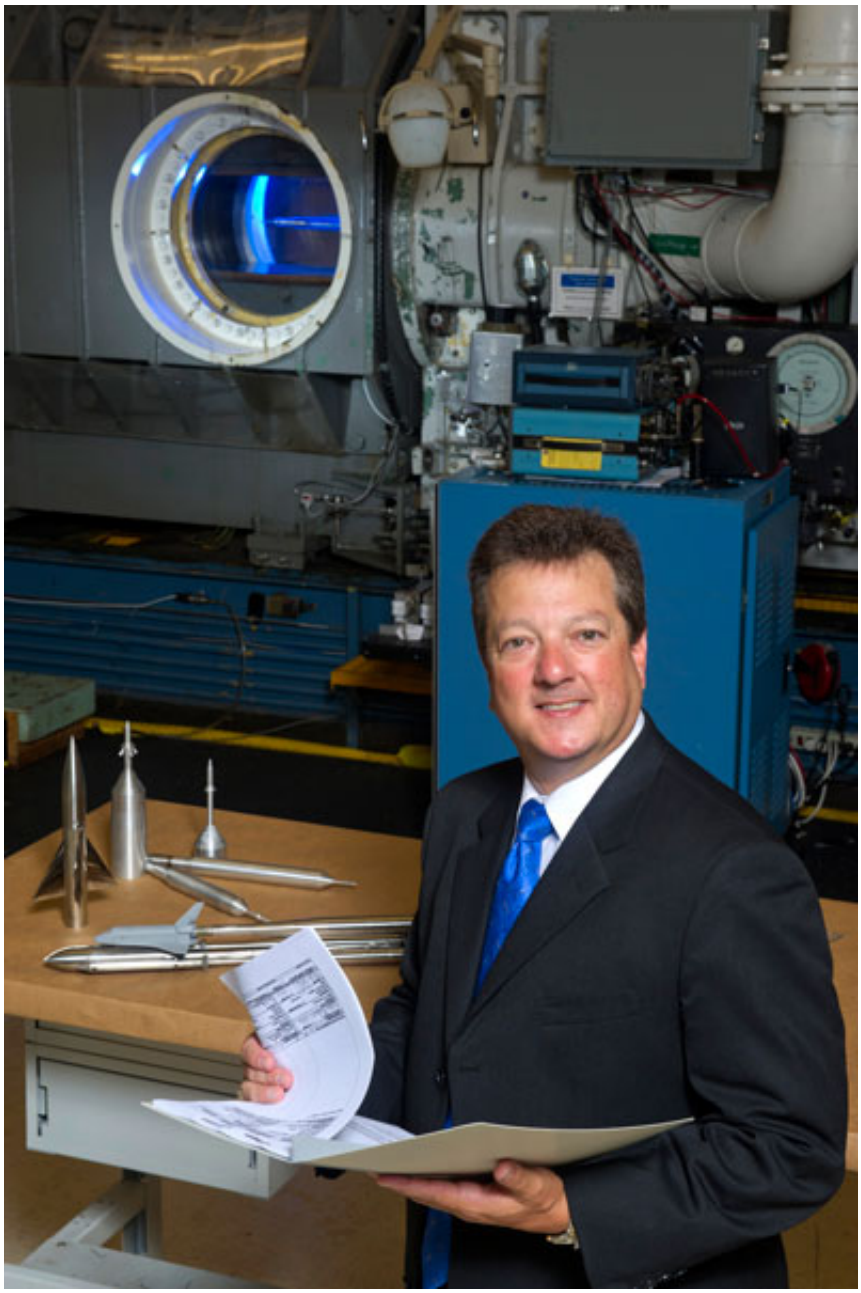
The Face of Mission Success at Marshall Is:
Charlie Nola
Partnerships manager

Image right: Charlie Nola (NASA/MSFC/Emmett Given)



- **Organization:** Flight Programs & Partnerships Office
- **Years at Marshall:** 23 years
- **Education:** Bachelor's degree in computer science, Auburn University
- **Responsibilities:** My primary responsibility is to facilitate and assist external partners with their requests to use Marshall's unique resources and knowledge. Our office provides centerwide leadership in forming collaborative agreements. We provide a beginning-to-end institutional capability for partnerships. Although our office carries the "Partnerships" title, the reality is that partnership activities are performed across the center. We serve as a customer advocate by providing guidance and removing any impediments. We are the entry point for those unfamiliar with the center. We work to match a customer's needs with our center capabilities.
- **How does your work at Marshall support the agency's goals?** The collaborative agreements our office helps form support NASA's program of exploration, technology development and scientific research by enabling the sharing of government facilities, capabilities and research data with the external community. Sharing these resources achieves the agency's goal to support the growing commercial space industry. Establishing external agreements also helps to sustain Marshall's capabilities by leveraging available facilities and skilled workforce, while serving external community needs. "Partnerships" is an agency-wide initiative. Marshall, along with the other centers, has established a Partnerships Office to support the initiative. Our office strives to stay informed of breaking issues and new partnering processes and efficiencies by working closely with other center partnership

offices. The Partnerships Office recently supported two major Space Launch System procurements. The office formed partnership agreements to be finalized based on award of the competitive proposals. One of Marshall's recent partnership successes was with Sierra Nevada Corp. This agreement provided key testing of a new spacecraft design that could be used to transport crew and cargo to and from the International Space Station. Marshall's experience and unique trisonic wind tunnel offered a proven, quick, affordable way to test Sierra Nevada's Dream Chaser vehicle.

- **Have you found any unique, cost-saving or collaborative processes or innovations in the last year?** One of the charges of the Partnerships Office is to facilitate and enable external requests to gain access to Marshall's resources. A lot of our success in establishing collaborative agreements relies on our ability to provide a timely response. Therefore, our office is always looking for efficiencies by exploring alternative approaches with the center process owners for solutions that provide a more timely response. Our office also is charged with transforming the conventional government/supplier business approaches by placing emphasis on long-term relationship management and being receptive to commercial business needs and environment. While the agreement is in the works, we are assessing partner and government expectations. Before an agreement expires, we are asking if there is a next logical step for follow-on or future activities. Our focus is on customer feedback and relationship building, and we want our customers to have a positive experience and continue to want to do business with us in the future.
- **Safety remains Job One for NASA; how do you strive to live by that code?** Many of the agreements we form are for NASA to perform work for small companies that are not necessarily familiar with our safety processes and culture. There is a benefit of revealing our safety culture to these partners for incorporation throughout the community. In my opinion, the Safety & Mission Assurance Directorate has set the standard for instilling a personal responsibility for safety that speaks to the heart. Events, such as the Charlie Morecraft motivational safety lecture and programs such as Incident and Injury-Free workshop, reveal the broader emotional impacts resulting from an incident to family and others in your life. That connection motivated me to a more heightened safety responsibility.
- **What do you hope to accomplish in your role this year?** We are finalizing definition of the newly established Partnerships Office authorities, roles and responsibilities relative to other center organizations. Since 2011, Marshall has gone from 125 agreements to over 285, and this is an accomplishment of the entire Marshall partnerships community. It is also impressive that the process team for Space Act Agreements has reduced the time from formation to a signed agreement to less than 30 days. By the end of this year, it would be personally rewarding and a major accomplishment to be able to answer two questions with measured results: "How have you helped in supporting the agency's goal for growing the commercial space industry?" and "How have you added value to Marshall's partnerships endeavors?"
- **What is the biggest challenge you face?** My biggest challenge is adjusting to my new role, which is more business and relationship management focused. Relationship management requires a lot of experience and practice in social and communication skills. The partnerships team is immersed in activities and forums that are providing that exposure. I have found several people at Marshall who are masters at these skills and I try to observe and learn from them at every opportunity. Learning to listen to a partner's needs without imposing your approach is a good example of a subtle change in culture required to establish the relationship. Another example is setting expectations early. It is easy to overpromise in your exuberance to seize the opportunity. Although the environment for establishing external agreements is more enabling, we have to be sensitive to the time it takes to adapt and work through the process.
- **Do you partner outside your org/outside Marshall on your work? What, in your mind, exemplifies Marshall's value as a business partner?** The president and Congress's initiative for growing the commercial space industry creates an opportunity-rich environment for partnering. Commercial industry's responsibility to service low-Earth orbit is part of this initiative. I believe the recent Space Exploration Technologies' Falcon 9 mission to the space station marks the beginning for the success of commercial industry in servicing low-Earth orbit. Marshall's value as a business partner resides in the economic benefits industry can gain by leveraging Marshall's half-century of unique experience in space systems development, science and operations capabilities. It is a win-win for the nation's space program to advance commercial industry and better the United States' global competitiveness. Marshall is committed to partnerships and so is industry. If you spent a day observing the commotion around the partnerships team's office area, you'd experience the enthusiasm in the environment.

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Robots Rule at Centennial Challenges Event in Worcester, Mass.

By Janet Sudnik

They ran over kids, shot lasers across the Martian surface and surveyed the faces of more than 7,000 people who turned out to see them over a recent weekend. Robots were the stars at NASA's Sample Return Robot Challenge and TouchTomorrow technology festival, held June 15-17 at Worcester Polytechnic Institute in Worcester, Mass.

Image left: More than 7,000 visitors attended the TouchTomorrow robotics and technology festival on the campus of Worcester Polytechnic Institute held June 15-17 in Worcester, Mass. The event featured 12 NASA exhibits, the Sample Return Robot challenge, speakers, education outreach and other activities for families. (NASA/Bill Ingalls)

The robotics competition was the latest of the Centennial Challenges program, a series of contests that encourage independent inventors, businesses and student groups to create solutions in various disciplines that support NASA's missions with potential for broader practicality in the private sector.

Beginning in 2005, the challenges have awarded more than $6 million in prize money for projects including greener aircraft development, moon soil excavation and constructing a better astronaut glove.

For the Worcester event, teams from all over the United States and one from Canada were tasked with building and programming autonomous robots that could maneuver a natural landscape and identify and collect samples within a set period of time. Two levels of competition were outlined, each with different types of samples and time limits, potentially leading to a grand prize of $1.5 million.

Image right: NASA Deputy Administrator Lori Garver, second from right, and NASA Chief Technologist Mason Peck, second from left, take a look at the Be A Bot exhibit, which was created by personnel at the Marshall Center. Participants steer a rover while wearing special glasses that allow them to see what the vehicle sees in its front-mounted camera. (NASA/Bill Ingalls)

The program, based at the Marshall Space Flight Center, is managed by NASA engineer Sam Ortega.

Eleven teams registered to compete, narrowing to six as the competition approached. After impoundment of the robots for inspection and weighing, one team -- SpacePRIDE, with members based in South Carolina and Florida -- emerged, having met the rigorous requirements. The team's robot competed in level one, but no prize money was awarded because it failed

to collect the required samples in the allotted time. The Centennial Challenges program does not award funds to competitors unless the challenge objectives have been met. This assures that desired results are gained before government funds are paid.

Many of the teams, including SpacePRIDE, expressed interest in competing again next year, and the $1.5 million prize remains available.

Image left: Centennial Challenges Program Manager Sam Ortega of the Marshall Center teaches a young attendee how to work the Be A Bot controller at the TouchTomorrow festival at the Worcester Polytechnic Institute. Ortega has headed the Centennial Challenges Program since September 2011. (NASA/Bill Ingalls)

The challenge took place in conjunction with Worcester Polytechnic Institute's TouchTomorrow technology and robotics festival. The event attracted students, families and educators and included 12 NASA exhibits and activity stations with a special focus on robotics. NASA Deputy Administrator Lori Garver, Chief Technologist Mason Peck and astronauts Lee Morin and Chris Ferguson were on hand to speak to the crowd and tour the exhibits.

Exhibits included an inflatable rover, a Mark III space exploration suit and a small, lightweight rover that gently rolls over kids for fun. Several were constructed especially for this event, including the new Centennial Challenge trailer and interactive Be A Bot activity. Personnel from Marshall, NASA Headquarters, the Jet Propulsion Laboratory and Johnson Space Center assisted in staffing exhibits.

The pull-behind trailer featured galaxy images and a waving astronaut wrapped around each side and 3D planets orbiting the exterior. Special magnetic wheel covers were attached to the standard wheels bearing images of lunar rover wheels. A flat-screen television built into one side showcased video highlights of past challenges, and a NASA tent over the screen harbored a table of giveaways.

Image right: Students from Ontario, Canada's University of Waterloo robotics team test their robot before the challenge in a practice field on the Worcester campus. (NASA/Bill Ingalls)

At the Be A Bot activity, participants drove a remote-controlled lunar rover around a Martian landscape while wearing special glasses that allowed them to see what the vehicle "sees" from a front-mounted camera. Kids and adults both lined up to watch Marshall personnel demonstrate and to take part in this new toy, which also sported a laser sight that could be aimed at various golden targets around the terrain.

"The Sample Return Robot Challenge was a great success," Ortega said. "State-of-the-art technology was demonstrated this year, and I expect there will be significant advancements in the avionics and sensing such that we will advance the technology to a winning level at the next event."

Sudnik, a Schafer Corp. employee, supports the Office of Strategic Analysis & Communications.

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Marshall Strictly Prohibits Cell Phone Usage While Driving

Effective immediately, in collaboration with the Redstone Arsenal police, the Marshall Space Flight Center's Protective Services Office is kicking off an aggressive safety campaign to make team members aware of the risks associated with using cellular phones while driving.

Based upon input from the workforce through the Incident and Injury-Free sessions, the center will begin enforcing a federal policy that prohibits cell phone usage while operating a motor vehicle on a federal Installation. Talking, dialing or texting while driving is not allowed on the arsenal, and all NASA roadways and parking lots. Use of hands-free devices is acceptable per the policy provided the individual is not manually dialing the device.

When tickets are issued on federal property, points may accumulate against your driving privileges on Redstone Arsenal as well as your state driver's license. Additionally, there may be monetary fines associated with any ticket received while using a cell phone and driving on the arsenal.

On Aug. 1, a new Alabama law goes in effect that makes it a violation of state law to text and drive. Those caught may be stopped, cited and fined.

Any civil service or contractor employee who receives a ticket for phone usage while driving may be subject to an explanation session with the center director.

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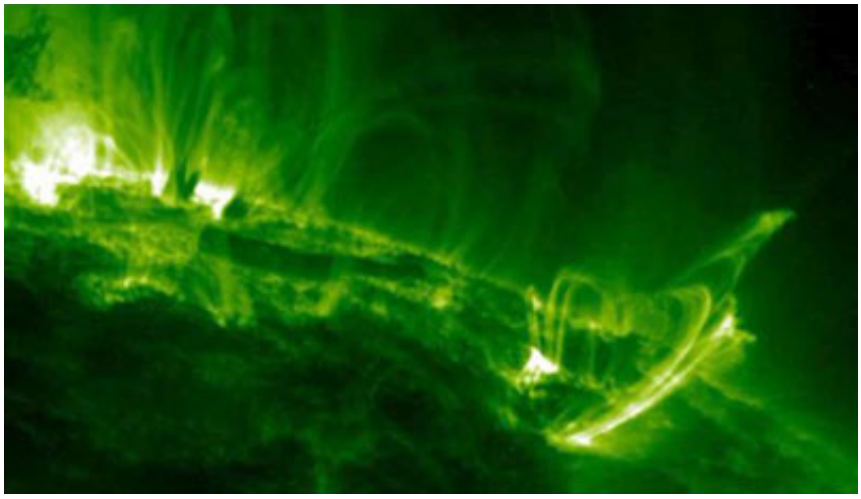
Hi-C to Investigate Activity in Solar Atmosphere
NASA news release



The Marshall Space Flight Center is leading an international effort to develop and launch the High Resolution Coronal Imager, or Hi-C, on a sounding rocket from the White Sands Missile Range. Hi-C is a next-generation suborbital space telescope designed to capture the highest-resolution images ever taken of the million-degree solar corona. Key partners include the University of Alabama in Huntsville; Smithsonian Astrophysical Observatory; University of Central Lancashire in Lancashire, England; and the Lebedev Physical Institute of the Russian Academy of Sciences.

Image left: Hi-C will image the sun at five times higher resolution (0.1 arcsec/pixel image) than any previous imager has done. The mission will demonstrate the technology necessary to collect 150-kilometer-resolution images of the sun in the extreme ultraviolet spectrum. The image above is 0.5 arcsec/pixel. (NASA)

Understanding the sun's activity and its effects on Earth's environment is the critical scientific objective of Hi-C, which will provide unique, unprecedented views of the dynamic activity in the solar atmosphere.

The telescope is slated for launch in July 2012. It will fly aboard a Black Brant sounding rocket to be launched from White Sands.

The mission will demonstrate the technology necessary to collect 150-kilometer-resolution images of the sun in the extreme ultraviolet spectrum. Using a resolution five times greater than any previous imager, Hi-C will observe the small-scale processes that exist everywhere in hot, magnetized coronal plasma. Additionally, the mission is designed to study the mechanisms for growth, diffusion and reconnection of magnetic fields of the corona, and to help understand the coupling of small-scale dynamic and eruptive processes to large-scale dynamics.

A major scientific impact of Hi-C will be to place significant new constraints on theories of coronal heating and structuring, by establishing whether or not there is additional fine structure below the current level of resolution.

"This instrument could push the limits on theories of coronal heating, answering questions such as why the temperature of the sun's corona is millions of degrees higher than that of the surface," said Marshall heliophysicist Dr. Jonathan Cirtain, who is principal investigator on the Hi-C mission.

"Hinode has shown that current instrumentation used for coronal structure studies has insufficient resolution to separate individual features along the line-of-sight," Cirtain said. "Hi-C will accomplish this measurement, with margin."

For more information about NASA and agency programs, please visit http://www.nasa.gov.

Find this article at:

http://www.nasa.gov/centers/marshall/about/star/index.html