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MARSHALL STAR

In This Week's Star

Director's Corner: Day of Remembrance


Patrick Scheuermann (NASA/MSFC)

We tend to think of what we do at Marshall Space Flight Center as mainly technical in nature. I believe it's a quintessentially human endeavor. This is never more apparent than this time of year when NASA sets aside a day to remember the crews of Apollo 1, Challenger and Columbia, who gave their lives in the cause of exploration and discovery.

February 1st will be the 10th anniversary of the Space Shuttle Columbia accident. Seven brave astronauts died just 16 minutes from landing safely after a successful mission. They were explorers and heroes in the finest tradition of our nation. To us, they were also family. We took their safety and their loss personally.

The physical cause of the accident was identified, and engineers fixed it. That's what we do. But the Columbia Accident Investigation Board, or CAIB, emphasized that the "underlying weaknesses in NASA's organization and history" were as much to blame as the more easily understood physical cause.

In response, we worked hard to change our processes and our culture, just as we did after Apollo 1 and Challenger. As an organization, we learned the lessons of Apollo, Challenger and Columbia once. But the human equation defies such an easy solution.

Memories fade. We move on to fly new vehicles. We work with different people and different teams. We get absorbed in the challenges of the moment. We push the envelope of human achievement daily. We are challenged to meet often changing

cost, schedule and performance goals. We live in a can-do culture that pushes us to overestimate our abilities. We face complexities that defy simple solutions, and we push innovation and leadership to the limit.

This week, as we remember the colleagues and friends we lost, I hope we take time to reflect on the very human nature of the work we do and try to rediscover the lessons of these tragedies as individuals and teams. I encourage you to read or re-read the CAIB report in light of the challenges you face today, not just the challenges others faced in the past. You can find it at: http://www.nasa.gov/columbia/home/CAIB_Vol1.html

Human spaceflight is one of our most glorious, inspiring endeavors. Our mission is unique. It represents our nation at its best. Our accomplishments are a source of pride and inspiration to the world. The people we remember this week believed those things were worth risking their lives.

As we remember, let's honor them by renewing our commitment to safety and diligence in following up on concerns and voicing them. Above all, let's renew our dedication to continuing the work of these remarkable men and women who gave all.

Patrick

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Day of Remembrance Ceremony to be Held Feb. 1 in Morris Auditorium

Feb. 1 is NASA's 2013 Day of Remembrance to honor the 17 astronauts of Apollo 1, space shuttle Challenger and Columbia crews, as well as other members of the NASA family who lost their lives supporting the agency's mission of exploration. It also marks the 10th anniversary of the space shuttle Columbia STS-107 accident. The Marshall Space Flight Center remembrance ceremony will be held in Morris Auditorium, Building 4200, from 9:30-10:15 a.m. Marshall Center Director Patrick Scheuermann will be joined by former astronaut Jan Davis to pay tribute to these fallen heroes.

The ceremony will be broadcast on Marshall centerwide TV and streamed to desktop TV.

Buses will run in continuous loops to Building 4200 from 9-9:30 a.m. Return loops will begin at 10:30 a.m.

For more information, visit ExplorNet.

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World's Most Powerful Engine Blazes Path for Space Launch System Advanced Propulsion
NASA News Release

To help develop the nation's future heavy-lift rocket, NASA resurrected the world's most powerful rocket engine ever flown -- the mighty F-1 that powered the Saturn V rocket-- and test fired its gas generator Jan. 24 at NASA's Marshall Space Flight Center.

Image left: The gas generator from an F-1 engine was test-fired at the Marshall Space Flight on Jan. 24. Data from the 30-second test will be used in the development of advanced boosters for NASA's Space Launch System, which is managed at the Marshall Center. (NASA/MSFC/Emmett Given)

NASA engineers ran the gas generator for 30 seconds at the Marshall Center's Test Stand 116. The test is part of a series that will push the gas generator to limits beyond prior Apollo-era tests. Modern instruments on the test stand measured performance and combustion properties to allow engineers a starting point for creating a new, more affordable, advanced propulsion system for NASA's Space Launch System, or SLS, which is managed at Marshall.

"Our young engineers are getting their hands dirty by working with one of NASA's most famous engines," said Tom Williams, director of the Propulsion Systems Department in the Marshall Center's Engineering Directorate. "These tests are only the beginning. As SLS research activities progress, these young NASA engineers will continue work with our industry partners to test and evaluate the benefits of using a powerful propulsion system fueled by liquid oxygen and rocket grade kerosene, a propellant we haven't tested with in some time."

The gas generator tested is a key F-1 rocket component that burns liquid oxygen and kerosene and is part of the engine responsible for supplying power to drive the giant turbopump. The gas generator is often one of the first pieces designed on a new engine because it is a key part for determining the engine's size, which is a factor in the engine's power and ability to lift heavy payloads and send them to space.

SLS will provide an entirely new capability for human exploration beyond low Earth orbit. The initial 70-metric-ton SLS configuration will use two, five-segment solid rocket boosters similar to the boosters that helped power the space shuttle to orbit. The evolved 130-metric-ton SLS vehicle will require an advanced booster with more thrust than any existing U.S. liquid- or solid-fueled boosters. Last year, NASA awarded three contracts aimed at improving the affordability, reliability and performance of the rocket's advanced booster, including one focused on the F-1 engine.

"It's important that our workforce gets hands-on experience on systems like the F-1 gas generator as it helps make them smart buyers, and good stewards of what we procure from industry," said Chris Crumbly, manager of the SLS Advanced Development Office at the Marshall Center. "As we look to the future advanced boosters for SLS we are eager to see what our partners in industry can provide as far as a more powerful and affordable solution."

Visit here for video of the test.

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Marshall-Led 'Hi-C' Mission Sees Energy in Sun's Corona
By Janet Anderson

The optics engineering expertise at NASA's Marshall Space Flight Center made it possible for a group of solar scientists to see into the sun's corona in unprecedented detail. The final mirror configuration was completed with inputs from partners at the Smithsonian Astrophysical Observatory in Cambridge, Mass., and a new manufacturing technique developed in coordination with L-3Commmunications/Tinsley Laboratories of Richmond, Calif.

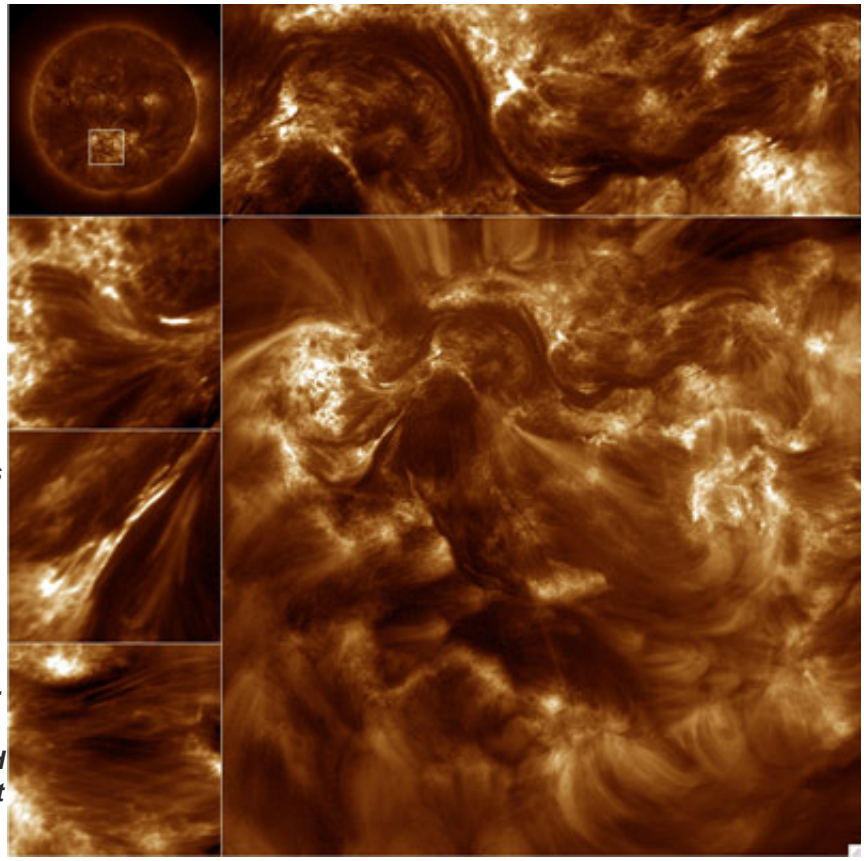

Image right: This resolution is the equivalent of resolving a dime from 10 miles away. This Hi-resolution Coronal Imager full resolution image is from the solar active region outlined in the Atmospheric Imaging Assembly image, upper left. Several partial frame images are shown, including a potion of a filament channel at upper center/right; the braided ensemble, left, second from top; an example of magnetic recognition and flaring, left, third from top; and fine stranded loops, left, bottom. These Hi-C images are at a resolution of 0.2 inches or 90 miles. (NASA)

The High Resolution Coronal Imager, or Hi-C, captured the highest-resolution images ever taken of the million-degree solar corona using a resolution five times higher than previous imagers. The corona is hotter than the solar surface and is the location where solar flares occur and energy is released that drive solar storms that can impact Earth.

Weighing 464 pounds, the 6-foot-long Hi-C telescope took 165 images during its brief 620-second sounding rocket flight July 11. The telescope focused on a large active region on the sun, with some images revealing the dynamic structure of the solar atmosphere in fine detail. When combined with the full sun images from NASA's Solar Dynamics Observatory, a new picture of the solar corona is now emerging.

Hi-C's mirrors are approximately 9.5 inches across, roughly the same size as the Solar Dynamics Observatory instrument's mirrors. However, due to a set of innovations on Hi-C's optics array, the nimble telescope was able to peer deeper into the sun's corona in the extreme ultraviolet wavelength.

"These mirrors were to be the finest pieces of glass ever fabricated for solar astrophysics," said Marshall heliophysicist Dr. Jonathan Cirtain, principal investigator on the Hi-C mission. "We had never attempted such a program before and had to develop new techniques for grinding the optics and polishing the surfaces, not to mention figuring out how to mount them without diminishing the performance. The final mirror surface is so smooth that it only deviates from being perfectly smooth by a few angstroms over the 24 cm optic."

Using these quality optics, images were acquired at a rate of approximately one every five seconds, and provided proof of a long-standing theory to explain solar coronal dynamics.

The optical design was provided by scientists and engineers from Marshall's Science & Technology Office, as well as Smithsonian Astrophysical Observatory personnel. "Dr. Cirtain asked us to develop the mirrors initially to see how well we could make them," said John Calhoun, lead for optics at Marshall. "The initial specifications were only a goal; however, we made such excellent progress on them that Dr. Cirtain was able to get the funding for his flight demonstration. Credit

belongs to the superb work performed by our senior opticians, although their initial response to the very challenging fabrication was to refer to the optics as the 'oh, my god' mirrors."

Scientists at Lededev Physical Institute in Moscow, Russia, developed the filters for the instrument front aperture plate. These whisper-thin filters reject the unwanted wavelengths of light and only transmit the extreme ultraviolet spectrum.

The high-quality optics were aligned with extreme accuracy. Mounting of the mirrors in the telescope was done using a new method that significantly reduced the impact of the process on the shape of the mirrors. Scientists and engineers from the Smithsonian Astrophysical Observatory, along with Marshall and the University of Alabama in Huntsville, worked to complete alignment of the mirrors, maintaining optic spacing to within a few 10-thousandths of an inch. This innovative approach to aligning and installing the mirrors then had to be maintained so the instrument could survive the harsh vibration and thermal conditions during launch and flight of the rocket.

Scientists have worked for the better part of a decade designing and building test facilities, followed by development, fabrication and testing of the optics.

"This flight represents the culmination of 30 years of effort to develop these exceptionally high-quality optics," said co-investigator Dr. Leon Golub of the Smithsonian Astrophysical Observatory.

Marshall scientists and engineers also partnered with engineers from the University of Central Lancashire and Apogee Imaging Systems in Richmond, Calif., to develop a large-format camera detector (16 megapixel) with a high-speed image readout. The combination of the optics, the telescope and the camera system combined to deliver the highest cadence and highest resolution image set ever collected for the solar million-degree atmosphere.

"As for the findings from Hi-C, the most important implication to me is the realization that at 150 km spatial resolution and an image cadence of five seconds, solar astrophysics can make multiple major advances in the science of how stars work and evolve," said Cirtain. "That, I find, is breathtaking, especially for a sounding rocket to discover."

Partners associated with the development of the Hi-C telescope also include Lockheed Martin's Solar Astrophysical Laboratory in Palo Alto, Calif.; the University of Central Lancashire in Lancashire, England; the Lebedev Physical Institute of the Russian Academy of Sciences in Moscow; and the Southwest Research Institute in Boulder, Colo.

Anderson is a public affairs officer in the Office of Strategic Analysis & Communications.

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NASA Telescope Observes How Sun Stores and Releases Energy
NASA News Release

A NASA suborbital telescope has given scientists the first clear evidence of energy transfer from the sun's magnetic field to the solar atmosphere or corona. This process, known as solar braiding, has been theorized by researchers, but remained unobserved until now.

Researchers, including several scientists from NASA's Marshall Space Flight Center, were able to witness this phenomenon in the highest resolution images ever taken of the solar corona. These images were obtained by the agency's High Resolution Coronal Imager, or Hi-C, telescope, which was launched from the White Sands Missile Range in New Mexico in July 2012.

"Scientists have tried for decades to understand how the sun's dynamic atmosphere is heated to millions of degrees," said Hi-C principal investigator Dr. Jonathan Cirtain, a heliophysicist at Marshall. "Because of the level of solar activity, we were

able to clearly focus on an active sunspot, and obtain some remarkable images. Seeing this for the first time is a major advance in understanding how our sun continuously generates the vast amount of energy needed to heat its atmosphere."

Initial image sequences demonstrated the evolution of the magnetic field and showed the repeated release of energy through activity seen on the sun at temperatures of 2 million to 4 million degrees.

Many of the stars in the universe have magnetic fields. The evolution of these fields is used to explain the emission of the star and any events like flares. Understanding how the magnetic field of the sun heats the solar atmosphere helps explain how all magnetized stars evolve.

These observations ultimately will lead to better predictions for space weather because the evolution of the magnetic field in the solar atmosphere drives all solar eruptions. These eruptions can reach Earth's atmosphere and affect operations of Earth-orbiting communication and navigation satellites.

The images were made possible by a set of innovations on Hi-C's optics array. New techniques for grinding the optics and polishing the surfaces were developed for the mirrors. Scientists and engineers worked to complete alignment of the mirrors, maintaining optic spacing to within a few 10-thousandths of an inch.

"The Hi-C observations are part of a technology demonstration that will enable a future generation of telescopes to solve the fundamental questions concerning the heating of the solar atmosphere and the origins of space weather," said Jeffrey Newmark, sounding rocket program scientist at NASA Headquarters.

Hi-C's resolution is about five times finer than the imaging instrument aboard NASA's Solar Dynamics Observatory launched in February 2010 to study the sun and its dynamic behavior. The Hi-C images complement global sun observations continuously taken by the observatory.

NASA's suborbital sounding rockets provide low-cost means to conduct space science and studies of Earth's upper atmosphere. The Hi-C mission cost about $5 million.

"This suborbital mission has given us a unique look into the workings of the sun, addressing a major mystery in nature," said John Grunsfeld, associate administrator for NASA's Science Mission Directorate. "Hi-C has demonstrated that high-value science can be achieved on a small budget. NASA's sounding rocket program is a key training ground for the next generation of scientists, in addition to developing new space technologies."

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The Face of Mission Success at Marshall is:
Randy D. Brackins
Operations Controller for the Mission Operations Laboratory in the Planning, Operations and Analysis Branch

Image right: Randy D. Brackins (NASA/MSFC/Emmett Given)

- **Organization:** Engineering Directorate
- **Education:** Bachelor's degree in aerospace and mechanical engineering, University of Alabama in Huntsville, 2012
- **Years at Marshall:** Six months
- **Responsibilities:** The operations controller is a Payload Operations Integration Center, or POIC, flight control position that manages the resources required to effectively operate International Space Station payloads and science experiments. For example, some of the resources needed to operate experiments include power and crew time. As an operations controller, I am responsible for real-time planning, re-planning and general management of the payload

portion of the space station timeline, and I must maintain an in-depth knowledge of the scientific experiments and planning activities. The operations controller position is staffed around-the clock, so I work with other operations controllers as shifts change. We all must ensure that crew procedures, equipment, consumables and personnel are available for successful payload operations. I report to the payload operations director, and I document and coordinate payload planning changes with the POIC team and externally with NASA's Johnson Space Center and NASA's international partners.

- **How does your work at Marshall support the agency's goals?** The International Space Station is the centerpiece of our human spaceflight activities. The POIC supports all ISS scientific payloads from resource management to resolving any issues with experiments, both of which are the main priority of my position. For example, if operations for one experiment take longer than planned on the schedule, other experiment activities may have to be postponed and replanned. Along with our international partners, the POIC is fully staffed 24/7 year-round to support NASA’s mission and goals. NASA is committed to using this unique resource for scientific research.
- **Have you found any unique, cost-saving or collaborative processes or innovations in the last year?** Since my arrival at Marshall and starting my training process as an operations controller, our training team has asked for input from other cadre members as well as myself in efforts to enhance our training program dynamics. When a team welcomes diverse perspectives and ideas from new team members, this results in a positive outcome.
- **Safety remains Job One for NASA; how do you strive to live by that code?** Our team takes pride in our safety program and it shows. We expect everyone in the lab to be involved. Our weekly inspections are rotated from the lab director to the newest team member. This implements and drives home our commitment to safety to all team members.
- **What do you hope to accomplish in your role this year?** I want to become more experienced as an operations controller by learning from my peers and maintain the knowledge and integration within our engineering systems. I would also like to become effective in communicating our team's mission objective to ensure the mission success of NASA and space exploration.
- **What is the biggest challenge you face?** The training process for my position is at least a year long. The challenge comes in the learning curve and understanding the big picture and connecting the dots. My position as an operations controller in itself constitutes an overall knowledge of what is happening in space at every moment while I am working on the ground from a console position in the POIC. This responsibility includes safe and efficient executions of all NASA payloads, anomaly resolution and payload integration.
- **Do you partner outside your org/outside Marshall on your work? What, in your mind, exemplifies Marshall's value as a business partner?** Yes, we integrate with other NASA centers as well as our international partners, which include the European Space Agency, the Japan Aerospace Exploration Agency, the Canadian Space Agency and the Russian Space Agency on all aspects of payload development, planning and execution.
- **On the personal side, how do you like to spend your leisure time?** I spend a lot of my leisure time mentoring young kids as part of an outreach program. Here at Marshall, the culture is dedicated to giving back to the community -- especially in the concept of education. Being a part of this team has encouraged me to share NASA's quest for innovation. Therefore, working with the Boys and Girls Club of Decatur, I tutor young people at St. Paul's Episcopal Church in Huntsville and Oakville Christian Faith Center in Danville in Science, Technology, Engineering and Mathematics, or STEM, programs. I enjoy the smiles on the children's faces when they share their dreams to become a future part of NASA's mission. It is encouraging to know that these children dream of becoming part of the world's

most innovative space program.

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Building Relationships: The Partnerships Office at Marshall Space Flight Center
By Shannon Ridinger

Collaborations between NASA and industry, academia and other federal agencies have resulted in a long legacy of successful partnerships for NASA's Marshall Space Flight Center. Commercial firms helped build the Apollo-era Saturn rockets, fly the space shuttle and will help build the Space Launch System, America's next heavy-lift launch vehicle.

Image right: Marshall is partnering with Dynetics for a series of tests on the gas generator of the mighty F-1 engine that powered the Saturn V rocket. Marshall engineers recently completed an initial test series at Marshall's Test Stand 116. These tests are allowing young engineers to evaluate the performance and combustion properties of the generator as a starting point for creating a new, more affordable, advanced propulsion system for NASA's next heavy-lift rocket, the Space Launch System. Dynetics will continue the testing with the gas generator in February. From left, in front of the F-1 gas generator, are Dynetics Program Manager Kim Doering; Dynetics Deputy Program Manager Andy Crocker; Marshall Partnerships Manager Stacy Counts; and Whitney Young, Marshall project manager for Dynetics. (NASA/MSFC/Emmett Given)

Marshall is working with industry, academia and other government agencies to utilize their experience, knowledge and available resources in support of commercial space initiatives. These mutually beneficial partnerships promote technology development, research, operational development and more.

One of the ways Marshall is supporting commercial space and providing access to resources is through the Partnerships Office. Created just over a year ago, the Partnerships Office assists industry, academia and other potential partners with access to Marshall's knowledge, experience and specialized facilities.

"The people at Marshall are doing a great job establishing relationships with our industry partners," said Stacy Counts, Partnerships Office manager. "Our office monitors and tracks partnership activities across the center and serves as a central source of partnership information for center personnel."

Relationship management and meeting customer expectations are key elements in building lasting partnerships. Ensuring the customer has a positive experience starts with planning by an integrated Partnerships Working Group that includes the Office of Chief Counsel; the Center Strategic Development and Integration Office, part of the Office of Strategic Analysis & Communications; Engineering; science and technology managers; financial teams; and the Partnerships Office. This Marshall Center group meets weekly to assess center and agency strategic alignment and resource availability for external opportunities.

"It has been important for us to develop methods to convey Marshall’s capabilities to our partners," said Counts. "I often find that partners come to Marshall for a specific capability, then get here and realize how much more we have to offer."

The Partnerships Office works primarily with reimbursable agreements involving the external partner using Marshall resources and facilities. In addition, the office assists with general external requests such as connecting them with the right technology for their business or assisting them with capability contracts. The groups also work closely with other groups across the center to promote awareness of Marshall's unique capabilities.

One of the ways the office is providing awareness of center capabilities is by conducting events that are open to commercial companies, academia and other agencies. In October 2012, the Partnerships Office collaborated with the University of Alabama in Huntsville, or UAHuntsville, Marshall engineering, science and technology personnel to host the first "Marshall Industry Day" on the UAHuntsville campus.

"This event provided an engaging format for businesses to learn about Marshall's unique capabilities, ways to partner with Marshall, and upcoming opportunities that may align with their future needs," said Charlie Nola, Marshall partnership manager for federal government agencies. "We had exhibits and representatives from across Marshall to address inquiries, along with over 150 industry participants. Participants had the opportunity to hear from a panel of center managers, and ask questions so that they can make better decisions on how to best use Marshall resources."

With the positive community response, Marshall is planning to make this an annual event. The Partnerships Office is planning to conduct the 2013 "Marshall Industry Day" on Oct. 7.

"We will roll in what we learned while organizing and conducting last year's event, and are optimistic this year's event will be even better," added Counts.

For more information on this event, or if you have questions about partnerships and potential collaborations, contact Counts at 256-544-6004.

Ridinger is a public affairs officer in the Office of Strategic Analysis & Communications.

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Laboratory Training Complex Open House Showcases Station-Like Environment with Hands-On Mock-Ups

The Laboratory Training Complex, known as LTC, held an open house Jan. 22-24 in the Payload Operations Center at NASA's Marshall Space Flight Center. The complex provides a training environment for cadre members to support science operations for U.S. payloads aboard the International Space Station. Gordy Seuell, right -- an engineer with Teledyne Brown Engineering Inc., supporting Marshall's Engineering Directorate -- demonstrates how the space station rack mock-up rotates to Jay Onken, center, manager of the Mission Operations Laboratory, and Tony Cox, operations lead for Teledyne Brown Engineering. Physical mock-ups and glass rack models replicate station facilities, and functionally or physically simulate flight and ground interfaces. Inside the complex, flight controllers practice station experiment operations before missions. During a mission, controllers can use the complex as an aid for resolving issues encountered while station astronauts perform experiments in space. (NASA/MSFC/Emmett Given)

Preston Jones, left, deputy director of the Engineering Directorate, listens as Marshall engineer Melinda Naderi explains the development of the Window Observational Research Facility, or WORF, mock-up. The WORF on the space station was built at Marshall and is managed by the center. Earth science remote sensing instruments can be placed in the WORF, which has the highest quality optics ever flown on a human-occupied spacecraft. Now that station assembly is complete, crew members are dedicating more time to scientific research. The Laboratory Training Complex provides opportunities for the station cadre at Marshall to train and familiarize themselves with WORF and other flight facilities and experiments, including numerous new experiments that are added for each station expedition. Much of the mock-up hardware was built through a program with regional high schools called HUNCH, or High Schools United with NASA to Create Hardware. (NASA/MSFC/Emmett Given)

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Marshall to Celebrate 40th Anniversary of Skylab, NASA's First Space Station, Jan. 31

The Marshall Exchange is sponsoring an employee social Jan. 31 at 10 a.m. in Morris Auditorium, Building 4200, to commemorate the 40th anniversary of Skylab, NASA's first space station. Skylab astronauts Joe Kerwin, Paul Weitz and Ed Gibson will share firsthand stories and highlights from their trips to and days aboard the space station. A short historical video also will be shown.

Immediately following the presentation, there will be a reception and refreshments for the astronauts and team members in the lobby of Building 4200.

The program will be broadcast on Marshall centerwide TV and streamed to desktop TV. Bus transportation will be available. For more information, visit ExplorNet.

Find this article at:

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