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The Marshall Star is published every Wednesday by the Public and Employee Communications Office at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. The Star does not publish commercial advertising of any kind.

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Marshall-Managed Spacelab Paved Critical Path to Space Station

By Jessica Eagan

Rewind to the year 1983. NASA astronaut Sally Ride is the first American woman to visit the depths of the universe. Guion Bluford is the first African-American astronaut in space. Microsoft Word is first released. Michael Jackson performs the popular dance move forever known as the "Moonwalk." Also 30 years ago on Nov. 28: The launch of Spacelab 1, a reusable laboratory managed by NASA's Marshall Space Flight Center, with a legacy that still lives on through the International Space

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Aboard Spacelab 1 during STS-9 in 1983 are, from left, Mission Specialist Robert Parker, Payload Specialist Byron Lichtenberg, Mission Specialist Owen Garriott and Payload Specialist Ulf Merbold. (NASA)

Teresa Vanhooser: Spacelab taught us how to do science in an orbital lab

Long before Teresa Vanhooser became Marshall Space Flight Center's deputy director, she -- like many others here at the center -- was heavily involved with Spacelab, which first launched 30 years ago on Nov. 28. It was a lab that paved the way for the International Space Station and taught us how to do science experiments in orbit. Below, Vanhooser shares about her experience as a manager during the

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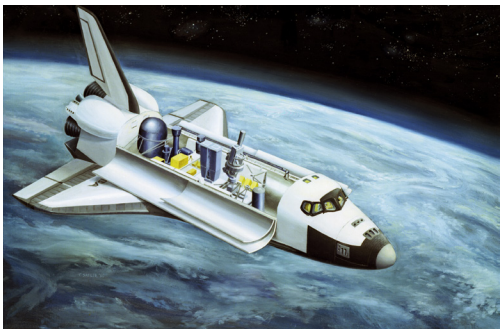

This illustration depicts the configuration of the Spacelab-2 in the cargo bay of the orbiter. (NASA)

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Station.

The lab was the size of a medium house trailer and was flown in the space shuttle's cargo bay. Spacelab consisted of an enclosed, pressurized laboratory module and open, U-shaped pallets that could be placed behind the module or flown alone. Equipment -- including telescopes, antennas and sensors -- was mounted on the pallets for direct exposure to space.

In the 17 years of Spacelab, with 36 missions flown and about 800 investigations completed, this program taught scientists how to operate experiments in the microgravity environment of low-Earth orbit.

Built by the European Space Agency (ESA), Spacelab 1 launched from NASA's Kennedy Space Center aboard space shuttle Columbia on its STS-9 mission. It orbited Earth 166 times during 10 days before landing at Edwards Air Force Base in California on Dec. 8, 1983. Liftoff came 10 years after NASA and ESA signed a Memorandum of Understanding to create the laboratory.

"Spacelab served as a precursor to the space station because it taught scientists how to design, integrate and operate experiments in an orbiting laboratory," said Rick Rodriguez, currently a payload operations manager at Marshall, who served as a simulation engineer during the Spacelab years. "It provided a plug-in structure for experiments, similar to what is available in ground laboratories, that provide power, communication, cooling, vacuum and other resources needed. Scientists learned how to design experiments that could be integrated into Spacelab. They also learned how to design experiments that could withstand being launched into space, operated in microgravity and returned to Earth."

Crews worked around the clock in two shifts to staff this unique laboratory so that the maximum amount of science could be achieved. Spacelab 1 proved many experiments could be performed in multiple disciplines at the same time -- a concept still used by station crews today. The Spacelab 1 crew completed more than 70 scientific investigations during the 10-day mission.

Spacelab allowed NASA and scientists around the world to learn how to work together to operate investigations during a long-term mission. The NASA team learned what the scientists required and how to schedule the mission to meet those requirements. Scientists learned how to design experiments that would work in space and how to work with NASA during the mission to perform studies and react to changes when experiments or systems did not operate as expected.

On June 19, NASA unveiled an upgraded Payload Operations Integration Center at the Marshall Space Flight Center. (NASA/MSFC/Emmett Given)

When NASA designed the space station, it started with the lessons learned from Spacelab. The space environment and general design of the laboratories use a similar module approach with racks for experiments and facilities, and with special mounting facilities for exposing experiments to space. The difference is that most station hardware had to be operational for years, rather than weeks. Also technology, primarily communications and computers, had greatly advanced.

"For the Marshall Center, Spacelab helped gain skills needed to work on the International Space Station," said Marshall Deputy Director Teresa Vanhooser who was manager of the Microgravity Science Laboratory (MSL-1) mission, in which 29 experiments were performed in a Spacelab module. Vanhooser began her NASA career at the center in 1980 as an engineer in the Ground Systems Analysis Branch, where she led development and documentation of requirements for integration and testing of payloads for the Spacelab carrier. "We learned about payload integration as well as building and managing complex hardware like Spacelab modules and pallets. We proved we had the skillset to support critical roles on the space station. I think it was really just a tie from Skylab to Spacelab then on to the station. It was that continued effort down what I call our 'swim lane.' Our Spacelab operations experience helped Marshall add value to the space station program and communicate the

*See **Spacelab to Space Station** on page 3*

Marshall Employees Mark 30th Anniversary of Spacelab, 15 years of Operations on International Space Station

By Tracy McMahan

Employees gathered at NASA's Marshall Space Flight Center on Nov. 21 to commemorate the 30th anniversary of the first Spacelab 1 mission launched on Nov. 28, 1983. Spacelab missions used modular hardware carried in the shuttle's payload bay. Spacelab paved the way for operations on the International Space Station, which marked 15 years in space on Nov. 20, when the first module launched.

Marshall Center Deputy Director Teresa Vanhooser, who played critical leadership roles in both Spacelab and space station, praised the teams that contributed to these ventures. Spacelab astronauts Owen Garriott, Jan Davis and Rick Chappell attended, as did former Marshall Center Director Jack Lee, who headed the Spacelab Program and helped establish Marshall's role in station payload operations.

Many Spacelab mission managers, station hardware developers, controllers and other employees listened to speakers and watched a movie highlighting station research results. Jay Onken, manager of the Marshall Mission Operations Laboratory, spoke of the role his team plays now that science

*See **Employees Celebrate Skylab** on page 7*

From left, space station controllers Jay Onken, Pat Patterson, Lybrease Woodard, Lamar Stacy, Carrie Olsen and James Graves donned shirts from past space station expeditions when they worked in the control room, to mark station's 15 years of operations. Space station crews serve in six-month increments, or expeditions, and each expedition has a distinct patch. Team members who staff the Marshall Center's Payload Operations Control Center often buy shirts adorned with the expedition patch. (NASA Photo/Fred Deaton)

Spacelab to Space Station

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rationale for the center's Payload Operations Integration Center."

Marshall began staffing the Payload Operations Integration Center in 2001 where controllers have since been managing all science experiments around the clock, 365 days a year.

Other beneficial components that came out of Spacelab include a multiple-user rack system created by Marshall. Today's station racks, called Expedite the Processing of Experiments to the Space Station (EXPRESS) racks, were successfully tested during the STS-94 MSL-1 mission in 1997. The mission bridged the gap between the relatively short-duration work done on Spacelab flights and the long-duration research to be performed on the station. These racks supported space studies by providing structural interfaces, power, data, cooling, water and other items needed to operate science experiments.

Spacelab's legacy has helped space station research thrive, with crews conducting science experiments that provide powerful results in fields from astronomy to human health to telemedicine, to observations of our own planet. Continuing to seek answers to these scientific questions is benefiting our lives today and the lives of future generations, as well as helping human explorers travel safely as they journey even farther away from planet Earth.

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

Vanhooser: Spacelab *Continued from page 1*

days she describes as "an awesome time in NASA's life."

Please talk about the progression from Spacelab to ISS you've witnessed. What stands out to you? Any challenges?
For Marshall Space Flight Center, Spacelab helped gain skills needed to work on the International Space Station. We learned about payload integration as well as building and managing complex hardware like Spacelab modules and pallets. We proved we had the skillset to support critical roles on the space station. I think it was really just a tie from Skylab to Spacelab then on to the station. It was that continued effort down what I call our "swim lane."

Our Spacelab operations experience helped Marshall add value to the space station program and communicate the rationale for the Marshall Payload Operations Integration Center. As station got underway, we had to figure out how our control center would work with the Mission Control Center in Houston and with all the other control centers around the world. There were bumps early on, but once we all settled in, it became very smooth and that still continues today.

What are your personal highlights from Spacelab?
To me, the best thing about Spacelab was being able to see something from start to finish in a short period of your career. Within four to five years, we went from the mission inception to flight. We got to see all aspects of that. All the way from trying to figure out what the configuration looks like through the analytical integration, physical integration and then the flight operations. And you can do that in a very short amount of time. The satisfaction of seeing what you started working on all the way through the success of it was a very unique part of what Spacelab was all about. For me, the ones that I was heavily involved in -- the Atlas-1 and -2 missions, and the Microgravity Science Laboratory-1 -- were my highlights just because I was more involved from the early stages. The delight of seeing scientists so excited about getting their data from their instruments at the close of the mission was probably the best reward that I could have gotten because that was worth all the hours that we spent.

How did payload operations change from Spacelab to space station?
On Spacelab, it was how much can we cram into 10 to 16 days. Every minute was planned, and every minute we tried to get as much science as possible. It was always at a fast pace and with a lot of urgency. Whereas on space station, we tried to get to the point where it was "OK, we have time." There's not that same level of urgency. Although you want to use the time you have, it's not like it has to be tomorrow or you've missed it. It's a little more of a relaxed environment particularly with the payload side. The payloads are up there for an extended amount of time. If something doesn't work the first time, you can make modifications and run it again. On Spacelab, in some cases, if you missed your opportunity, everything else was so planned, you never got a second chance.

Astronaut Jan Davis, now vice president and deputy general manager of Jacobs Engineering, Science, and Technical Services (ESTS) group supporting Marshall, worked inside the Spacelab-J module in space shuttle Endeavour during STS-47 in 1992. Spacelab-J was a combined National Space Development Agency of Japan (NASDA) and NASA mission. The objectives included life sciences, microgravity and technology research. (NASA)

In your opinion, how did Spacelab advance us to the International Space Station?
Spacelab taught us a lot about how to operate in the space environment. You only had the two weeks and if something went wrong with the hardware, it would come back on the shuttle, so you could figure it out and potentially re-fly it on another mission. Even the hardware and experiments that didn't work as well as planned provided a learning experience. Once you fly something to station, it's normally up there for six months or longer. Spacelab

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really taught us what to expect with regards to space environments. We could implement that when we were doing our designs for the station because we had all that data in hand. This helped us create better designs and anticipate what issues we might have. Plus, we were able to take existing payloads, and make modifications to them for ISS.

What did we learn about payload operations during Spacelab that helped us prepare for 24/7 operations on the space station?
We learned about shift work and what we can expect from our folks relative to that. The Spacelab time showed us how to manage people and lead teams. And how to manage the shifts and produce products we needed to be able to successfully plan and implement a mission. That was the first step. We could do it for a short, two-week mission. Now how do we apply that forever? A lot of people had a concern whether we could support 24/7 operations continuously because we were used to the short duration. We learned what we should and shouldn't do when we actually got to continuous ops. We learned how to pace ourselves and how we should set the right expectations. What do we need to do to train the crew for science operations? How much data can they absorb? How detailed do the procedures need to be? How long does it really take to conduct an experiment? All those aspects really factored in to our planning. By learning about them on Spacelab, we were able to take those to the next level for space station.

What did we learn about helping payload developers prepare investigations for flights in an orbital laboratory? How is this different for space station?
I don't think it's much different for space station except they have to think about longer duration. But as far as us helping them, they don't always think about how much more difficult it is to operate in microgravity. The advantage that we bring to the table is because we have worked with Spacelab payloads, we can help them with their design and tell them whether it will work or provide detailed help like telling them they need to change these fasteners. Or it's not good that the crew has to take that many things apart to fix something. What we learned on Spacelab is how to make the design more crew-friendly, both from an operational standpoint but also from being able to fix it. If there are easy changeouts, they can do the repairs on orbit. That's what is beneficial, because it's up there long term. You can't just bring it back whenever you want to, repair it and send it back up there because of launch costs and available up-mass. This is all good practice for exploration missions even farther away from home with the Space Launch System.

What did we learn about working with Mission Control at JSC?
We learned the functions are completely different. They were really focused on making sure the vehicle was working. Their focus wasn't necessarily on the science. At MCC it was about the crew, and the health of the crew and the vehicle. Not that we didn't care about that. That just wasn't our role. We were completely focused on what science can we do. How can we get some time in with the crew for experiments? We developed a mutual respect for what the other brings. The longer we worked together, the better it got. They respected that our role was to get as much science as we could get. We respected the fact that they need to make sure things are in working order. So what has to be done on space station now is a balance. You can literally spend all of your time doing one or the other. But what is the right balance? It is an orbital science lab. We didn't put it up there just to maintain. We put it up there to do science.

Since we finished assembly of the station, there has been a big turn toward the science, which is great to see. We're in the spotlight now. Mike Suffredini [manager of the International Space Station Program] said that himself. They [MCC] have a breadth of experience in the real-time operations, we learned a lot from their experience level but we also learned to respect each other for what we all bring to the table. Our relationship with them now is better than I've ever seen and that's because of people working together for a common good.

In my personal opinion, Spacelab was just an awesome time in NASA's life because of what were able to accomplish and, from the science side, being able to do it in such a short timeframe. When things are smaller, you have a lot more control than when something is as huge as a space station, so Spacelab was a good stepping-stone. Without Spacelab, I think we would have had more bumps and more of a learning curve on station.

A Growing Need: Engineers Put a Fun Spin on Raising Funds for CFC

By Bill Hubscher

If you think a group of men around the Marshall Space Flight Center are growing beards to keep their faces warm for the winter, you're partially right.

November is unofficially called "No-Shave November." Many grow beards or moustaches to raise awareness of men's health issues. A group from Marshall's Engineering Directorate decided to put a twist on the growth and turn their facial hair into a fundraiser for the annual Combined Federal Campaign charity drive, or CFC.

A set of glass jars was set up in the Space Systems Department office in Building 4487 and the Spacecraft and Vehicle Systems office in Building 4600 with various styles of beard designs on each can, ranging from the standard beard, to the "chin curtain" -- a beard with no moustache -- and even a goatee in the shape of the Batman logo. At the beginning of the month, people began making financial contributions to vote for their favorite design -- or at least the design they would most like to see their co-workers wear. After two weeks, the beard growers crafted their facial hair into the design raising the most money, all of which went to the CFC.

"About 20 of us put our facial hair and our dignity on the line," said Patrick Hull, a flight structures engineer in the Space Systems Department and one of the leaders of the event. "We let our friends and co-workers decide the fate of our beards, but it was a sacrifice we were willing to make."

Hull and many of his co-workers were quick to be a part of the fund-raiser to support charity when the services offered by one of them hit close to home.

Jim Sledd, also a flight structures engineer in the Space Systems Department, volunteers for a charity group called AMBUCS, building custom-designed bicycles for people with disabilities.

Recently, AMBUCS -- which also awards scholarships to study physical therapy -- gave Hull's special-needs daughter a modified bicycle built specially for her.

"I soon learned AMBUCS is just one of the many non-profit groups of volunteers that also are part of CFC," Hull said. "When I saw first-hand what great work this group does, and there were hundreds more organizations just like them that needed the help, we felt we had to contribute."

The "Beard Alliance" from the Engineering Directorate, whose members volunteered to participate in the No-Shave November event benefiting the Marshall Center's CFC, sport the winning "monkey tail" design in their facial plumage. They wore this look for a week before changing back to a more conventional style. (NASA/MSFC/April Dill)

The Marshall Center team members in the Engineering Directorate pulled together with Sledd and Hull to help by either sacrificing their facial hair or voting with their dollars.

After a flurry of last-minute donations before the Nov. 15 deadline, the winning design was the "monkey tail." This particular style involves a thin strip of hair running from only one of the sideburns, down along the jaw line, back up the other side of the mouth and ending above the lip.

Hull and others in the "Beard Alliance" feel a little awkward, having made the gentleman's agreement to wear the unorthodox design for a week. However, the most important aspect of the "competition" was raising more than $2,100 for CFC.

"We made a commitment and we're sticking to it," said Hull. "In the end, it was about team building and raising awareness for charities for special needs kids and adults. It was a fun way to get a few more dollars to non-profit charities. A week of wearing this is worth the laughs if it also helps people in need."

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A Growing Need *Continued from page 6*

The CFC mission is to support and promote philanthropy, giving all employees an opportunity to improve the quality of life for all. Marshall's fundraiser is part of the annual Tennessee Valley Combined Federal Campaign, a joint effort between the Marshall Center, other federal agencies at Redstone Arsenal, and in surrounding Alabama and Tennessee counties. When the official CFC drive ends in mid-January, the Marshall Center CFC organizing committee hopes to have raised more than $700,000 for charity.

For more information on the drive, visit the CFC page on ExplorNet.

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

Employees Celebrate Skylab *Continued from page 3*

is accelerating on the station. Annette Sledd, manager of the Marshall ISS office, described how her team works with payload developers from around the world to help them prepare for flight. Sledd's team keeps station hardware operational. Marshall engineers designed, developed and tested space station experiment facilities and the station's Environmental Control Life Support System that provides clean air and water needed for the crew to live on board the station. Technology from this system is used for Earth applications that assist with disaster relief.

Davis, who served as a mission specialist on the Spacelab-J mission and led ground teams at Marshall during the station's development, said, "Spacelab helped us get where we are today on space station." She said the best part of Spacelab was the people, and that she really enjoyed returning to her home in Huntsville to train on science experiments.

Spacelab 1 Mission Manager Harry Craft closed out the speakers by recalling fond memories of Spacelab's early days. "We worked and worked until we came up with a way to conduct science on the shuttle."

Craft, who also helped build Skylab, America's first space station flown 40 years ago, said moving from doing science in small black and gray boxes on Skylab to the more elaborate plug-and-play racks pioneered on Spacelab and currently on space station, was a major step forward and required

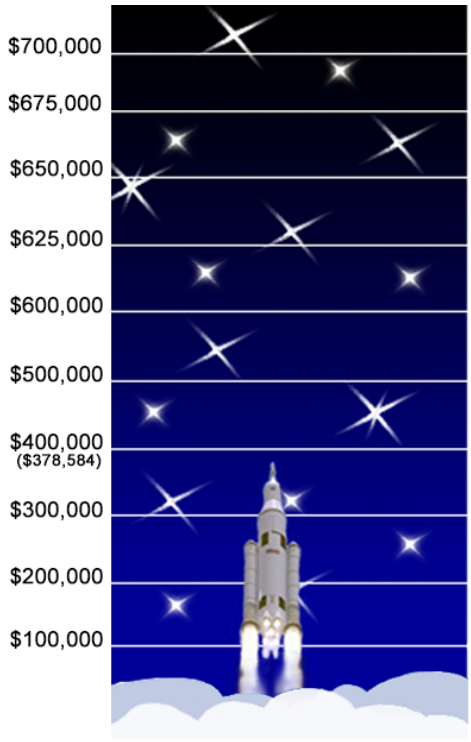
Owen Garriott, who crewed Skylab and Spacelab missions, and Nicole Perrin, who serves as a data management coordinator for the space station, attend an event marking Spacelab's 30th anniversary and 15 years of station operations. (NASA/MSFC/ Fred Deaton)

out-of-the-box thinking at the time. Today, Craft's systems engineering expertise is being put to use to develop the Space Launch System.

McMahan is a public affairs specialist in the Office of Strategic Analysis & Communications.

CFC Donations Reach Halfway Mark

Contributions and pledges continue to roll in for the Marshall Space Flight Center's annual Combined Federal Campaign charity drive. Money raised so far has passed the halfway point of the $700,000 goal. There is still time to donate by the end of the campaign in mid-January. Visit the CFC page on ExlporNet for details on how to help the many charities in need by making a contribution or volunteering.



Marshall to Launch Holiday Season With Tree-Lighting Ceremony Dec. 2

Kids in Marshall's Child Development Center sing "Jingle Bells" and other holiday classics during the 2011 lighting ceremony. (MSFC/Emmett Given)

NASA's Marshall Space Flight Center will ring in the holiday season with a tree-lighting ceremony Dec. 2.

Team members are encouraged to gather on the front steps of Building 4200 at 4:45 p.m. for cookies, hot cocoa and a round of holiday favorites sung by children enrolled in Marshall's Child Development Center.

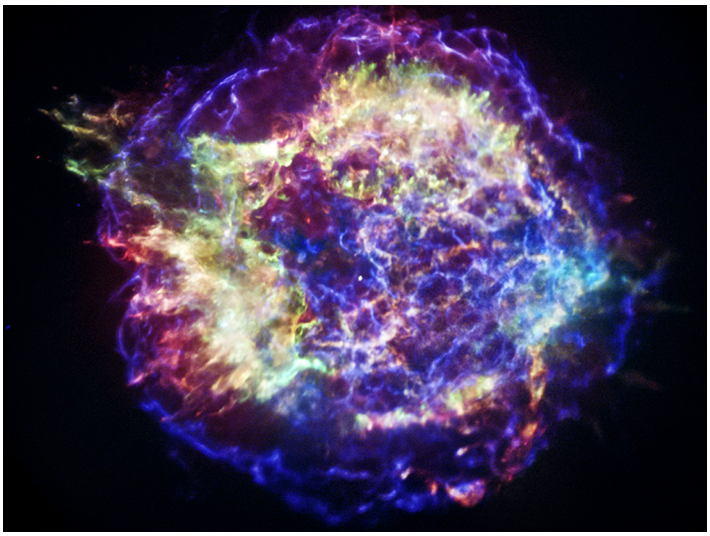
As dusk begins to settle, Marshall Associate Director Robin Henderson and a special guest from the North Pole will oversee the official lighting of trees across the center's front grounds.

The annual lighting event ushers in Marshall's holiday season, which will continue Dec. 12 with a centerwide holiday celebration for the workforce. Details of that event are pending; read more in the Dec. 4 Marshall Star.

Exploring the Third Dimension of Cassiopeia A

From Web release

One of the most famous objects in the sky -- the Cassiopeia A supernova remnant -- will be on display like never before, thanks to NASA's Chandra X-ray Observatory and a new project from the Smithsonian Institution. A new three-dimensional (3D) viewer, unveiled last week, will allow users to interact with many one-of-a-kind objects from the Smithsonian as part of a large-scale effort to digitize many of the institution's objects and artifacts.



(NASA/CXC/SAO)

Scientists have combined data from Chandra, NASA's Spitzer Space Telescope and ground-based facilities to construct a unique 3D model of the 300-year-old remains of a stellar explosion that blew a massive star apart, sending the stellar debris rushing into space at millions of miles per hour. The collaboration with this new Smithsonian 3D project will allow the astronomical data collected on Cassiopeia A, or Cas A for short, to be featured and highlighted in an open-access program -- a major innovation in digital technologies with public, education and research-based impacts.

To coincide with Cas A being featured in this new 3D effort, a specially processed version of Chandra's data of this supernova remnant is also being released. This new image shows with better clarity the appearance of Cas A in different energy bands, which will aid astronomers in their efforts to reconstruct details of the supernova process such as the size of the star, its chemical makeup and the explosion mechanism. The color scheme used in this image is the following: low-energy X-rays are red, medium-energy ones are green, and the highest-energy X-rays detected by Chandra are blue.

Cas A is the only astronomical object to be featured in the new Smithsonian 3D project. This and other objects in the collection -- including the Wright brothers' plane, a 1,600-year-old stone Buddha, a gunboat from the Revolutionary War and fossil whales from Chile -- were showcased in the Smithsonian X 3D event Nov. 13-14 at the Smithsonian in Washington. In addition to new state-of-the-art 3D viewer, the public was able to explore these objects through original videos, online tours and other supporting materials.

Cas A is the only supernova remnant to date to be modeled in 3D. In order to create this visualization, unique software that links the fields of astrophysics and medical imaging (known as "astronomical medicine") was used. Since its initial release in 2009, the 3D model has proven a rich resource for scientists as well as an effective tool for communicating science to the public. Providing this newly formatted data in an open source framework with finely tuned contextual materials will greatly broaden awareness and participation for general public, teacher, student and researcher audiences.

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

Marshall at Work: Matthew McCollum

By Shannon Ridinger

Ask Matthew McCollum the most important element in his career thus far and he is quick to answer "teamwork." McCollum, the electromagnetic effects subsystem manager supporting the International Space Station (ISS) at NASA's Marshall Space Flight Center, was awarded the 2013 Exceptional Service Medal for his work with ISS payloads and operations.

McCollum has worked at the center more than 20 years, and considers himself fortunate to have been able to spend that time working in the same discipline supporting ISS. He graduated from Auburn University in 1990 with a degree in applied physics. He began his career in the Huntsville office of Grumman Aircraft, now Northrup Grumman, before starting his NASA career in 1991. In his position as the electromagnetic effects subsystem manager for the ISS Avionics and Software Office, he works with a team of engineers to identify and address the electromagnetic effects and compatibility of the payloads, systems, subsystems and equipment of the ISS.

The Electromagnetic Environmental Effects team McCollum supports is in the Space Systems Department within the Marshall Engineering Directorate. E3, as it is referred to, encompasses the electromagnetic effects addressed by the disciplines of electromagnetic compatibility, electromagnetic interference, electrostatic discharge, and hazards of electromagnetic radiation to personnel, ordnance and fuels. In layman's terms, McCollum and his team study how things like static electricity, ionospheric plasma charging, radio transmitters and wireless systems can effect equipment and machines on the ISS and how to best prepare for and correct those effects. Ionospheric plasma charging is the interaction between a vehicle, such as the ISS, and the ionospheric plasma that results in a charge buildup on the vehicle. Many different factors can contribute to electromagnetic issues both on Earth and in space, ranging from radio waves, lightning and precipitation static. Precipitation static results from an aircraft or launch vehicle interacting with dust, rain and ice particles as they travel through the atmosphere.

"The E3 discipline requires our team to work across the center, agency and with our contract partners

Matthew McCollum, center, electromagnetic effects subsystem manager supporting the ISS at Marshall, receives the 2013 Exceptional Service Medal award from NASA Johnson Space Center Director Ellen Ochoa, right, and Johnson Deputy Director Kirk Shireman. (NASA/JSC)

on a daily basis. We have to work with avionics, materials and processes, safety, systems engineering -- and that's just a few of them," says McCollum. "In our world, we aren't just a part of the Marshall team, we are a part of much larger team that has an immense responsibility -- keeping the ISS operating successfully."

Not only do McCollum and his team work across the agency, they also work with engineering teams from many different international partners including the Japan Aerospace Exploration Agency, European Space Agency, Rocket and Space Corporation -- Energia and the Canadian Space Agency.

"When I look up at night and see the ISS streak across sky, every single time I am amazed and honored that I get to help make that possible," says McCollum. "I feel extremely blessed to have been a part of this great work."

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

Technology Demonstration Missions Commemorate Accomplishments

By Shannon Ridinger

More than 75 NASA attendees including project managers, program leads and industry partners gathered in Huntsville recently for the second Technology Demonstration Missions (TDM) Program annual review.

Project managers of nine TDM projects and program executives from NASA Headquarters and the program office at NASA's Marshall Space Flight Center convened to review the program's accomplishments and plan for the future.

Mike Gazarik, associate administrator of NASA's Space Technology Mission Directorate that oversees TDM, and his two deputy associate administrators, James Reuther and Dorothy Rasco, attended the two-day review. Randy Lillard, TDM program executive at NASA Headquarters, and John McDougal, TDM program manager at the Marshall Center, presented the successes and challenges occurring over the year.

Presenters from the program office also included JoDe Wilson, business lead, and Keyke Reed, communications outreach lead, both of whom talked about program accomplishments and obstacles from the past year.

John McDougal, TDM program manager, addresses attendees during the TDM annual review. (NASA/MSFC/Keyke Reed)

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

NASA Deputy Associate Administrator Dan Dumbacher to Address National Space Club in Huntsville

Dan Dumbacher, NASA's deputy associate administrator for exploration systems development, is the featured guest speaker at the upcoming National Space Club event in Huntsville on Dec. 3.

The event will be held at the Jackson Center from 3:30-4:30 p.m. with refreshments and a cash bar to follow from 4:30-6:30 p.m. It is open to all National Space Club members and guests. For more information about this event, visit here.

Dan Dumbacher (NASA)

Space Launch System Work Featured on NASA-TV

The continuing effort of the Marshall Space Flight Center to work toward a test flight of the Orion crew spacecraft is featured in the latest edition of "This Week @NASA," a weekly video program broadcast nationwide on NASA-TV and posted online. Marshall engineers put a protective coat of paint on the spacecraft adapter and began pressure testing of a flexible diaphragm -- both of which will help keep the crew capsule separate from the propulsion elements.

The adapter that will fly on Exploration Flight Test-1, or EFT-1, is the same design that will be used on NASA's Space Launch System, managed at the Marshall Center. The topcoat for the adapter is a special paint that protects the hardware and its components, like electronic sensors, from any electrical discharge during ascent. A proof pressure test on the diaphragm was completed Nov. 14. For the test, the adapter was sealed, and a vacuum pump was connected to the diaphragm. The vacuum pressure simulates atmospheric conditions the hardware may experience during the mission.

You can watch this edition of This Week @NASA at the NASA-TV YouTube channel.