The Marshall Star

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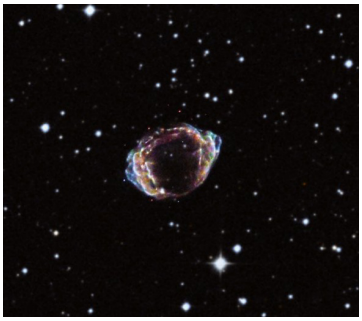

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Images From Space Station Camera Help Canadians Evaluate Flooding

By Jessica Eagan

On June 22 and the days following, floodwaters ravaged downtown Calgary in Alberta, Canada, and took over the area. More than 100,000 residents were forced to evacuate the "Stampede City" and nearby towns.

Canadian Space Agency astronaut Chris Hadfield sets up the ISS SERVIR Environmental Research and Visualization System (ISERV) in the Destiny laboratory of the International Space Station. (NASA)

In the midst of the disaster, a new NASA camera aboard the International Space Station (ISS), called the ISS SERVIR Environmental Research and

*See **Space Station Camera** on page 2*

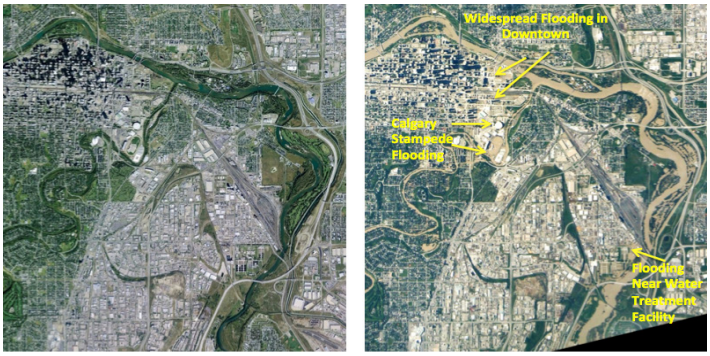
SLS Featured at Atlantis Exhibit Grand Opening at Kennedy

Tom Erdman from the Space Launch System (SLS) Resident Management Office at NASA's Kennedy Space Center briefs the media during a June 27 pre-grand-opening media event for the space shuttle Atlantis exhibit at Kennedy's Visitor Complex. "We are designing a rocket that will be evolvable, sustainable and affordable for this country -- and for the world," Erdman said. NASA's Marshall Space Flight Center sent the Exploration Systems Development Division/SLS exhibit to the grand-opening, held June 29. More than 12,500 people visited the exhibit. (NASA/Jim Grossman)

Space Station Camera *Continued from page 1*

Visualization System (ISERV), snapped 24 images of the flooded area. The ISERV team sent photos of the scene to Canadian officials to help with response and assessment.

"I'm happy that this NASA camera can help the space station lend support to countries around the world, making the station even more of an international asset," said Dan Irwin, project director of NASA's SERVIR project at the Marshall Space Flight Center. "ISERV is proving itself as a testbed that will inform the development of future operational systems."



This image shows Calgary before and after the devastating floods of June 22. The venue for the famous annual rodeo and exhibition known as the Calgary Stampede is annotated in the image. (SERVIR/ISERV)

In January, Canadian Space Agency astronaut Chris Hadfield helped install ISERV in the Earth-facing window of the space station's Destiny module, which was built at the Marshall Center and was designed with a high-quality optical window especially for cameras like ISERV.

"My heart goes out to my fellow Canadians affected by the disaster," said Hadfield, who returned from the International Space Station in May after a six-month mission. "I am also proud that we are using the unique view from the space station with ISERV to help make response efforts more effective. The space station has a global reach in its ability to help those in need and make lives better here on Earth."

From the station's vantage point, nearly 95 percent of the planet's populated area is visible during the station's orbit, so the window is the perfect perch for taking photos of Earth from space. Researchers on the ground use the high-resolution camera to acquire image data of specific areas of the globe. These images are helping decision-makers address environmental issues, humanitarian crises and disasters -- such as the recent floods in Canada. The ISERV system, based on a modified commercial telescope and driven by custom software, uses its downward viewpoint to obtain near real-time images and transmits the data within hours to scientists and decision-makers on Earth.

"The [space] station imagery captured over Calgary is a great example of the importance of high-resolution optical images for flood mapping in urban environments, weather permitting," said Alice Deschamps, alternate lead for the Emergency Geomatics Service (EGS), Earth Observation and Geosolutions Division, Canada Centre for Remote Sensing, Natural Resources Canada. "It is a complementary source of information to the large area Synthetic Aperture Radar (SAR)-based flood mapping products generated by EGS. Our team will use the photos for validation purposes as we move forward with improving our SAR flood mapping algorithms."

ISERV was developed by NASA to support a joint project between NASA and the U.S. Agency for International Development (USAID) known as SERVIR, Spanish for "to serve." The SERVIR project provides satellite data and tools to environmental decision-makers in developing countries and operates via regional hubs in Nairobi, Kenya; Kathmandu, Nepal; and Panama City.

Eagan, an Analytical Services Inc. employee, supports the Office of Strategic Analysis & Communications.

Game Changing Composite Cryotank Completes Testing at Marshall Center

By Tracy McMahan

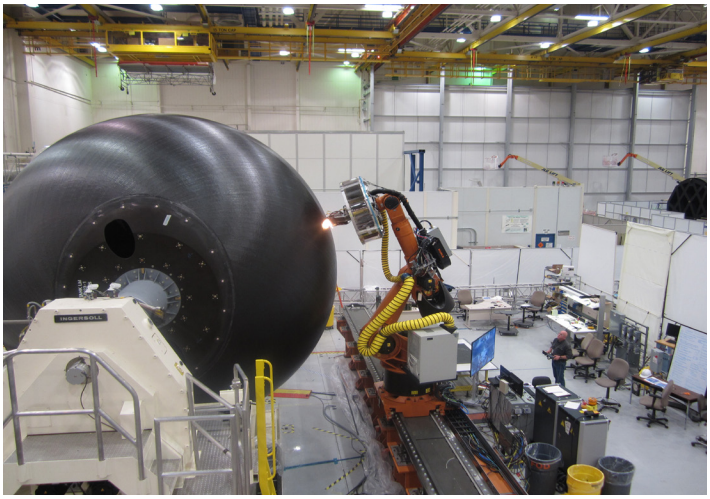
NASA's Marshall Space Flight Center engineers recently completed a major space technology development milestone by successfully testing a pressurized, large cryogenic propellant tank made of composite materials.

Currently, most propellant tanks are fabricated out of metals. The almost 8-foot-diameter (2.4 meter) composite tank tested at the Marshall Center's Hydrogen Cold Flow Test Facility is considered game changing because composite tanks may significantly reduce the cost and weight for launch vehicles and other space missions. A potential initial target application for the composite technology is an upgrade to the upper stage of NASA's Space Launch System heavy-lift rocket.

Cryogenic propellants are gasses chilled to subfreezing temperatures and condensed to form highly combustible liquids. Cryogenic propellants, such as liquid oxygen and liquid hydrogen, have been traditionally used to provide the enormous thrust needed for large rockets and NASA's space shuttle.

The tank, built by Boeing at its Tukwila, Wash., facilities, arrived at Marshall in late 2012. Marshall engineers inspected and insulated the tank, and then put it through a series of tests to measure its ability to contain liquid hydrogen at extremely cold temperatures under pressurized conditions. The tank was cooled down to -423 degrees Fahrenheit and underwent 20 pressure cycles as engineers changed the pressure up to 135 psi.

"This testing experience with the smaller tank is helping us perfect manufacturing and test plans for a much larger tank," said John Vickers, the cryogenic tank project manager at Marshall. "The 18-foot (5.5-meter) tank will be one of the largest composite propellant tanks ever built and will incorporate design features and manufacturing processes applicable to a 27.5-foot (8.4-meter) tank, the size of metal tanks found in today's large launch vehicles."



The 18-foot-diameter (5.5-meter) tank is currently being manufactured at the Boeing Developmental Center in Tukwila, Wash. It will be one of the largest composite propellant tanks ever made and is scheduled to be pressure tested in 2014 at Marshall. (Image Credit: Boeing)

The NASA and Boeing team are in the process of manufacturing the 18-foot-diameter tank, which will be tested at the Marshall Center next year. The tank manufacturing process represents a number of industry breakthroughs including automated fiber placement of oven-cured materials, fiber placement of an all-composite tank wall design that is leak-tight and a tooling approach that eliminates heavy joints. In the past, composite tank joints, especially bolted joints, have been a particularly troubling area prone to leaks. Boeing and its partner, Janicki Industries of Sedro-Woolley, Wash., developed novel tooling to eliminate the need for heavy joints.

"Boeing has experience building large composite structures, and the Marshall Center has the facilities and experience to test large tanks," explained John Fikes, the cryotank deputy project manager at Marshall. "It has been a team effort with Boeing working with NASA to monitor the tests and gather data to move forward and build even larger, higher performing tanks."

*See **Cryotank Testing** on page 5*

Dream Job for Young Engineers is to Work for NASA

By Jena Rowe

Young engineers across the nation chose NASA as the number one "most attractive" place to work for engineering students in a recent poll.

According to Forbes Magazine, Universum, a global research and advisory firm, asked 9,770 undergraduate engineering majors in the United States to select the companies they would consider for future employment and then to identify their "ideal employer." Based on the results, almost one-fifth of the students chose NASA.

Across the agency, young engineers are given the opportunity to search for answers, ask new questions and develop innovative solutions for a better understanding of our solar system. One opportunity for recent graduates to join the NASA mission is made available through the Pathways Recent Graduate Program. Pathways RGP is a program for individuals who have recently graduated from a qualifying educational institution interested in joining the federal civil service. Successful applicants are placed in a one-year career development program with the possibility of extending for an additional year.

For more information about the study conducted by Universum, see the Forbes article here.

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

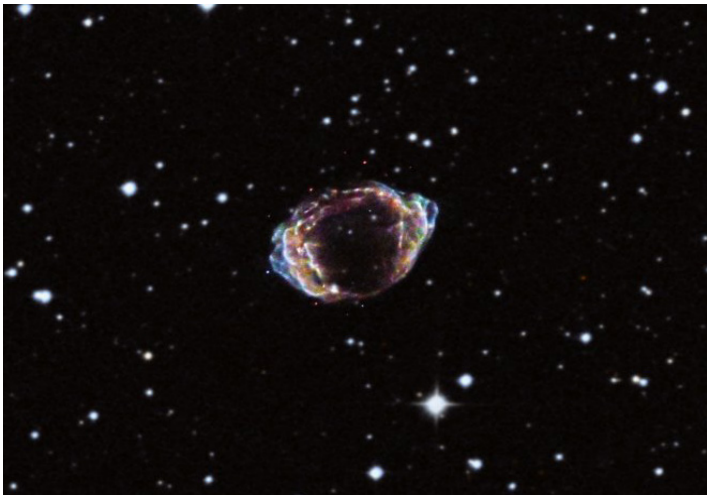
The Remarkable Remains of a Recent Supernova

From NASA Web Release

Astronomers estimate that a star explodes as a supernova in our galaxy, on average, about twice per century. In 2008, a team of scientists announced they discovered the remains of a supernova that is the most recent, in Earth's time frame, known to have occurred in the Milky Way.

The explosion would have been visible from Earth a little more than a hundred years ago if it had not been heavily obscured by dust and gas. Its likely location is about 28,000 light years from Earth near the center of the Milky Way. A long observation, equivalent to more than 11 days of observations, of the debris field known as the supernova remnant G1.9+0.3 using the NASA Chandra X-ray Observatory is providing new details about this important event. NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington.

The source of G1.9+0.3 was most likely a white dwarf star that underwent a thermonuclear detonation and was destroyed after merging with another white dwarf, or pulling material from an orbiting companion star. This is a particular class of supernova explosions (known as Type Ia) used as distance indicators in cosmology because they are so consistent in brightness and incredibly luminous.



This new image is a composite from Chandra in which low-energy X-rays are red, intermediate energies are green and higher-energy ones are blue. Also shown are optical data from the Digitized Sky Survey, with appearing stars in white. (X-ray: NASA/CXC/NCSU/K. Borkowski et al.; Optical: DSS)

*See **Supernova Remains** on page 6*

Marshall Team Encouraged to Take High Risk Conflict Resolution Training to Learn About Workplace Violence

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

The High Risk Conflict Resolution Training is a four-hour, hands-on seminar where attendees will learn what to do if faced with a critical incident of violence at work.

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

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

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

Morning or afternoon sessions will be in Building 4627 on July 16, 8 a.m.-noon; July 17, noon-4 p.m.; July 23, 8 a.m.-noon; and July 24, noon-4 p.m.

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

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

Cryotank Testing *Continued from page 3*

The tanks are major elements of the Composite Cryotank Technologies and Demonstration Project -- one of the top nine projects funded by the NASA Space Technology Mission Directorate.

"These successful tests mark an important milestone on the path to demonstrating the composite cryogenic tanks needed to accomplish our next generation of deep space missions," said Michael Gazarik, NASA's associate administrator for space technology at NASA Headquarters. "This investment in game changing space technology will help enable NASA's exploration of deep space while directly benefiting American industrial capability in the manufacturing and use of composites."

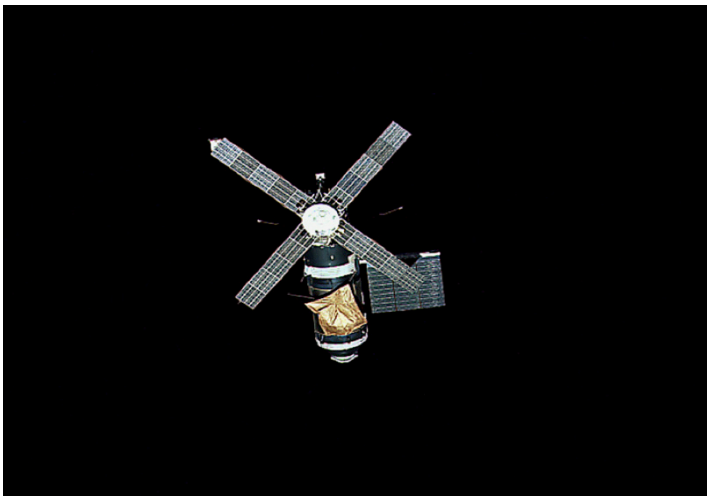
Video: Marshall Engineers Talk Cryotank Technology

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

Technicians move the insulated 8-foot-diameter (2.4-meter) tank to the Hydrogen Cold Flow Test Facility at the Marshall Center. Marshall engineers recently completed pressure testing the tank. (Image Credit: David Olive)

Marshall Engineers Helped Devise Repair for Skylab 40 Years Ago

Before departing for Earth on June 22, 1973, the first Skylab crew took this image of the Skylab space station. The crew made a careful visual and photographic inspection of the orbiting laboratory that showed the golden-colored parasol sunshade deployed by the crew to protect the workshop from solar heating. Skylab's original sunshield and one of its solar arrays were damaged during launch, and the crew conducted the first repair in space to deploy the parasol sunshade and remove the solar array. They worked out many of the repair procedures in an underwater simulator at NASA's Marshall Space Flight Center. Skylab was unmanned until the second crew arrived on July 28, 1973. It operated at reduced power with many of its systems either inoperative or operating at reduced capacity until the next crew arrived. (NASA)



Supernova Remains *Continued from page 4*

The explosion ejected stellar debris at high velocities, creating the supernova remnant that is seen today by Chandra and other telescopes. This new image is a composite from Chandra where low-energy X-rays are red, intermediate energies are green and higher-energy ones are blue. Also shown are optical data from the Digitized Sky Survey, with appearing stars in white. The new Chandra data, obtained in 2011, reveal that G1.9+0.3 has several remarkable properties.

The Chandra data show that most of the X-ray emission is "synchrotron radiation," produced by extremely energetic electrons accelerated in the rapidly expanding blast wave of the supernova. This emission gives information about the origin of cosmic rays -- energetic particles that constantly strike the Earth's atmosphere -- but not much information about Type Ia supernovas.

In addition, some of the X-ray emission comes from elements produced in the supernova, providing clues to the nature of the explosion. The long Chandra observation was required to dig out those clues.

Most Type Ia supernova remnants are symmetrical in shape, with debris evenly distributed in all directions. However, G1.9+0.3 exhibits an extremely asymmetric pattern. The strongest X-ray emission from elements like silicon, sulfur and iron are found in the northern part of the remnant, giving an extremely asymmetric pattern.

Observations of G1.9+0.3 allow astronomers a special, close-up view of a young supernova remnant and its rapidly changing debris. Many of these changes are driven by the radioactive decay of elements ejected in the explosion. For example, a large amount of antimatter should have formed after the explosion by radioactive decay of cobalt. Based on the estimated mass of iron, which is formed by radioactive decay of nickel to cobalt to iron, more than a hundred million trillion (i.e. 10 raised to the power of 20) pounds of positrons, the antimatter counterpart to electrons, should have formed. However, nearly all of these positrons should have combined with electrons and been destroyed, so no direct observational signature of this antimatter should remain.

A paper describing these results is available online in the July 1, 2013, issue of The Astrophysical Journal Letters.