The Marshall Star

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Marshall to Recognize Outstanding Team Members at Annual Honor Awards Ceremony July 30

By Jena Rowe

NASA's Marshall Space Flight Center will honor more than 300 employees and contractors during its Annual Honor Awards ceremonies in Morris Auditorium on July 30. All Marshall team members are invited to attend.

Awards presentations will be made during two ceremonies -- agency-level honor awards at 10 a.m. and center-level honor awards at 2 p.m. The morning ceremony will recognize those who have made significant

*See **Annual Honor Awards** on page 2*

Choosing Sides for the Fight Against Hunger

Marshall Space Fight Center Director Patrick Scheuermann, left, and Marshall Center Deputy Director Teresa Vanhooser flip a coin to decide who gets first pick of buildings to create a competitive atmosphere of giving for the "2013 MSFC Feeds Families Campaign." For the campaign, the occupants of each building are assigned to Team Scheuermann or Team Vanhooser to determine which team donates the most. This center-wide effort

*See **Fight Hunger** on page 3*

(NASA/MSFC/Fred Deaton)

'Hammering' Out the Answer: How Much Impact Can SLS Flight Hardware Handle?

By Megan Davidson

To what extent will shock waves be attenuated -- or reduced -- when they travel through the forward skirt, a key piece of flight hardware on NASA's new heavy-lift launch vehicle, the Space Launch System (SLS)? A common toolbox item may just hammer out the answer.

The forward skirt, a part of the SLS core stage, will house the avionics, including the flight computers, for the rocket. The skirt exterior will have two vehicle stabilization system brackets attached, allowing connection to the launch tower structure. The brackets and tower structure will stabilize the SLS until liftoff when it will be released instantaneously. The devices that will perform this release can generate high mechanical shock levels, which the SLS must be able to withstand.

Engineers at NASA's Marshall Space Flight Center are using simple means -- a hammer and a repurposed test article from another program -- to simulate how much shock magnitude key components housed in the forward skirt may

A repurposed test article and a hammer are being used to study how much shock the SLS forward skirt may experience when the hardware's brackets are detached from the ground tower at launch. Accelerometers are affixed to the test article to measure the magnitude and frequency generated when the structure is hit with a hammer. (NASA/MSFC)

*See **Hammering Hardware** on page 3*

Annual Honor Awards *Continued from page 1*

achievements to NASA's mission at an agency level. The afternoon ceremony will recognize those who have made outstanding mission contributions to the center.

Goddard Space Flight Center Director Christopher J. Scolese will be the keynote speaker at both ceremonies. He and Marshall Center Director Patrick E. Scheuermann will present the awards to the honorees.

Announcing the agency-level awards will be Tereasa H. Washington, director of Marshall's Office of Human Capital; Paul A. Gilbert, deputy manager of the Flight Programs and Partnerships Office; and Christopher E. Singer, director of the Engineering Directorate.

The center-level awards will be announced by Robin N. Henderson, Marshall Center associate director; Jay F. Onken, director of the Mission Operations Laboratory in the Engineering Directorate; and Joan A. (Jody) Singer, manager of the Flight Programs and Partnerships Office.

Joe L. (Larry) Leopard, deputy manager of the Space Systems Department in the Engineering Directorate, will emcee.

For a list of the NASA Honor Awards, click here.

For a list of the Marshall Honor Awards, click here.

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

*See **Annual Honor Awards Photos** on page 7*

'Hammering' Hardware *Continued from page 2*

experience when the vehicle stabilization system brackets are detached from the launch tower structure.

During the test, accelerometers are affixed to the test article to measure the shock magnitude and frequency at various locations, including areas where flight-critical avionics are mounted. The shock simulating the release of the vehicle from the tower is generated by hitting the vehicle stabilization system bracket attachment location with a simple hammer.

"When the vehicle stabilization system is released instantaneously at liftoff of the SLS, it will create a shock environment, with a certain magnitude and frequency level -- very similar to the structure being hit with a hammer," said Charles Adams, a Jacobs systems engineer supporting Marshall's Systems Design and Definition Branch. "We assess that magnitude and frequency at various locations and set a limit on the shock environment that the forward skirt can handle at its interface with the launch tower."

In the 1970s, there were a number of tests on how shock attenuates in various structures, Adams said. Marshall engineers are using that empirical data as a basis for their analysis today. "Structures have changed a lot since then, and the ability to measure shock has gotten much better," Adams said. "We wanted to do this test to make sure our allowable shock levels are accurate and are as high as possible without forcing any changes to the current design and certification of the forward skirt-mounted components."

"Data from the shock test also will help us decide what kind of release device will be used to disconnect the vehicle from the tower," said Kathy Owen, deputy branch chief of Marshall's Structural Dynamics Test Branch. "If SLS can withstand higher shock levels, it gives the launch tower designers more options for release devices. It also reduces the amount of testing they will have to perform, which saves money." [To read more about the types of release devices being considered, click here.]

The SLS will take its first unmanned flight in 2017 and will allow future explorers to travel farther into our solar system than ever before.

The SLS Program is managed at Marshall. For more information on SLS, visit: www.nasa.gov/SLS.

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

Fight Hunger *Continued from page 1*

is a part of the "Feds Feeds Families Campaign" to collect 2 million pounds of non-perishable food items this year. Food donation bins, like the one shown between Scheuermann and Vanhooser, are located in buildings across the Marshall Center and in the lobby of the National Space Science & Technology Center. The 2013 MSFC Feeds Families Campaign runs July 15-Aug. 15. For more information, contact Elia S. Ordonez at elia.s.ordonez@nasa.gov or 256-544-6658.

Team Scheuermann
Buildings 4200, 4201, 4202, 4203, 4205, 4207, 4229, 4241, 4244, 4249, 4251, 4306, 4315, 4316, 4346, 4353, 4436, 4471, 4475, 4476, 4479, 4481, 4483, 4484, 4485, 4487, 4491, 4493, 4494 and the National Space Science & Technology Center (NSSTC)

Team Vanhooser
Buildings 4514, 4522, 4540, 4550, 4561, 4570, 4572, 4583, 4600, 4601, 4602, 4605, 4608, 4610, 4612, 4619, 4623, 4624, 4627, 4628, 4629, 4631, 4646, 4648, 4650, 4655, 4663, 4665, 4666, 4670, 4674, 4696, 4705, 4707, 4708, 4711, 4718, 4723, 4727, 4728, 4732, 4747, 4752, 4755, 4760

See Video of Game-changing Manufacturing at Marshall Saving Weight and Cost

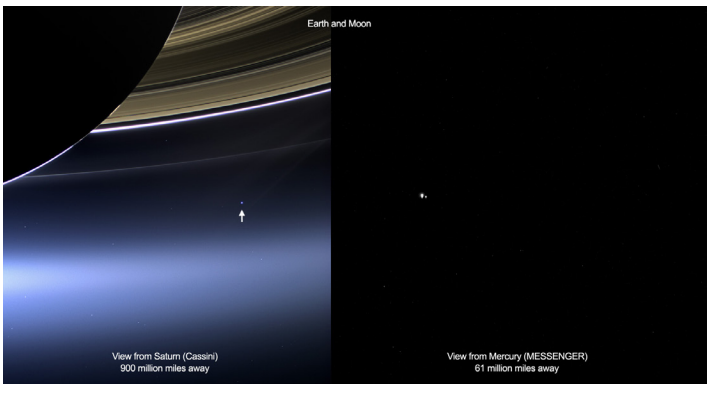
By Bill Hubscher

A new propellant tank made of composite materials recently completed successful pressurized testing at NASA's Marshall Space Flight Center. Marshall Television produced this YouTube video about the construction and testing of the tank, and video was also broadcast nationwide on the agency's This Week @ NASA program. The 2.4 meter diameter tank provides a substantial weight and cost savings, not in single digit changes, but up to a 30 percent weight savings and a 25 percent cost savings over state-of-the-art metallic tanks. The Composite Cryotank Technologies Demonstration Project is one of the projects funded by NASA's Space Technology Mission Directorate, which is innovating, developing, testing and flying hardware for use in NASA's future missions.

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

Mitzi Adams and Marshall Center Summer Interns Wave at Saturn During Cassini Snapshot

Marshall Space Flight Center astrophysicist Mitzi Adams, left foreground wearing a hat, joined by Marshall summer interns at the base of the Saturn V rocket at the U.S. Space & Rocket Center, wave at Saturn as the Cassini spacecraft makes images of Earth from 898 million miles (1.44 billion kilometers) away. Across America, groups gathered to acknowledge this rare space photograph made from the outer solar system. (NASA/MSFC/Fred Deaton)



On June 19, two of NASA's space probes gave Earthlings the opportunity to see their home from great distances where no humans have yet roamed. NASA's Cassini spacecraft snapped this image of Earth and the moon, above left, on July 19, 2013. The wide-angle camera captured Saturn's rings and Earth and its moon in the same frame. Earth, which is 898 million miles (1.44 billion kilometers) away in this image, appears as a blue dot at center right; the moon can be seen as a fainter protrusion off its right side. On the same day, the MESSENGER spacecraft at Mercury imaged the Earth and the moon, right, which appear as a pair of bright star-like features. MESSENGER, which is managed by the Marshall Center, was at a distance of 61 million miles (98 million kilometers) from Earth when it took this image. (NASA)

The Second Crewed Skylab Mission Launched 40 Years Ago This Week

By Michael Wright

Forty years ago this week, the second crew of three astronauts lifted off on a Saturn IB destined for the Skylab -America's first space station. Teams at NASA's Marshall Space Flight Center helped prepare them for further repairs to the orbiting workshop and for a mission filled with scientific research.

On the afternoon of July 28, 1973, they arrived at the workshop and settled down for their mission that lasted two months, at the time a record for the longest human stay in space. That crew included astronauts Alan Bean, Jack Lousma and Owen Garriott, who now resides in Huntsville.

This second Skylab mission followed the first Skylab mission on May 14, 1973, when NASA launched an unmanned Skylab onboard the last of the Apollo-era Saturn V rockets developed by Marshall, and the first crewed mission that ended on June 22, 1973, when the astronauts returned to Earth. During the Saturn V launch, a sunshield/meteoroid shield ripped off, taking one of the craft's two primary solar panels with it. The first crew installed a parasol shade as a temporary fix and the workshop temperatures came down, allowing the first crew to get on with research.

By the time the second crew lifted off, solar radiation had already deteriorated the parasol shade so more repairs were required. The second crew deployed another solar reflector -- a mylar shade folded against a telescopic pole. The crew performed an extravehicular activity and deployed this twin pole solar parasol over the original parasol. The detailed plans for the repair missions had involved hundreds of hours of round-the-clock work on the ground at Marshall and at the Johnson Space Center.

Both crews not only verified Skylab's main objective demonstrating humans could live in space and conduct valuable scientific research, but also showed that human ingenuity could overcome on-orbit problems and that humans could conduct repairs in space.

The second Skylab mission more than doubled the previous endurance record in space, just set by the first astronauts of Skylab. By the 10th day of the second manned mission, the three-man crew was

Astronaut Alan Bean conducts the Ultraviolet (UV) Stellar Astronomy experiment (S019) on the second manned Skylab mission. Bean, along with astronauts Owen Garriott and Jack Lousma, served as the crew for the second manned Skylab mission. The S019, a camera with a prism for UV star photography, studied the UV spectra of early-type stars and galaxies. (NASA)

keeping the orbital outpost running and spending about 19 hours a day on scientific experiments. In about a week, they increased hours devoted to science to 27-to-30 hours of experiments each day involving Earth resources, solar viewing, materials science and biomedical experiments. Marshall Center engineers and scientists had a role in making Skylab a scientific success. During the early 1970s, Marshall developed Skylab's orbital workshop, Apollo Telescope Mount and Multiple Docking Adapter and had responsibility for many experiments that the Skylab astronauts conducted in the low-gravity environment of space.

A pair of common spiders, Arabella and Anita, joined the crew on this second mission as part of one of the most popular Skylab student experiments coordinated by Marshall. Students watched recorded video of the spiders to try to determine the spiders' abilities to spin a web without the influence of gravity.

The second crew splashed down on Sept. 25, 1973. On November 16, 1973, NASA launched its third and final Skylab crew, another successful mission that ended in February 1974.

For more information about Skylab, visit here or here.

Wright is the Marshall Center historian.

A Beautiful End to a Star's Life

From web release

Stars like the sun can become remarkably photogenic at the end of their life. A good example is NGC 2392, which is located about 4,200 light years from Earth. NGC 2392, nicknamed the "Eskimo Nebula," is what astronomers call a planetary nebula. This designation, however, is deceiving because planetary nebulas actually have nothing to do with planets. The term is simply a historic relic since these objects looked like planetary disks to astronomers in earlier times looking through small, optical telescopes.

Instead, planetary nebulas form when a star uses up all of the hydrogen in its core -- an event our sun will go through in about five billion years. When this happens, the star begins to cool and expand, increasing its radius by tens to hundreds of times its original size. Eventually, the outer layers of the star are carried away by a thick 50,000 kilometer per hour wind, leaving behind a hot core. This hot core has a surface temperature of about 50,000 degrees Celsius, and is ejecting its outer layers in a much faster wind traveling six million kilometers per hour. The radiation from the hot star and the interaction of its fast wind with the slower wind creates the complex and filamentary shell of a planetary nebula. Eventually the remnant star will collapse to form a white dwarf star.

Now astronomers using space-based telescopes are able to observe planetary nebulas such as NGC 2392 in ways their scientific ancestors probably could never imagine. This composite image of NGC 2392 contains X-ray data from NASA's Chandra X-ray Observatory in purple showing the location of million-degree gas near the center of the planetary nebula. Data from the Hubble Space Telescope show -- colored red, green and blue -- the intricate pattern of the outer layers of the star that have been ejected. The comet-shaped filaments form when the faster wind and radiation from the central star interact with cooler shells of dust and gas that were already ejected by the star.

The observations of NGC 2392 were part of a study of three planetary nebulas with hot gas in their center. The Chandra data show that NGC 2392 has unusually high levels of X-ray emission compared to the other two. This leads researchers to deduce that there

Composite image of planetary nebula NGC 2392. (X-ray: NASA/CXC/IAA-CSIC/N. Ruiz et al; Optical: NASA/STScI)

is an unseen companion to the hot central star in NGC 2392. The interaction between a pair of binary stars could explain the elevated X-ray emission found there. Meanwhile, the fainter X-ray emission observed in the two other planetary nebulas in the sample -- IC 418 and NGC 6826 -- is likely produced by shock fronts (like sonic booms) in the wind from the central star. A composite image of NGC 6826 was included in a gallery of planetary nebulas released in 2012. The gallery can be found here.

A paper describing these results, available online, was published in the April 10, 2013, issue of The Astrophysical Journal. The first author is Nieves Ruiz of the Instituto de Astrofísica de Andalucía (IAA-CSIC) in Granada, Spain; the other authors are You-Hua Chu and Robert Gruendl from the University of Illinois, Urbana; Martín Guerrero from the Instituto de Astrofísica de Andalucía (IAA-CSIC) in Granada, Spain; and Ralf Jacob, Detlef Schönberner and Matthias Steffen from the Leibniz-Institut Für Astrophysik in Potsdam (AIP), Germany.

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.

2013 NASA/Marshall Center Annual Honor Awards

NASA Distinguished Service Medal

Stephen F. Cash
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James F. Spann
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KAYA Associates, Inc./ Parsons
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Alliant Technologies, Inc.
Safety and Mission Assurance Directorate

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Roy W. Malone
Michoud Assembly Facility

Todd A. May
Space Launch System Program Office

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Rosalyn M. Patrick
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Chad A. Summers
Engineering Directorate

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Engineering Directorate

Not Pictured:
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Retired

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Philisha B. Stephens
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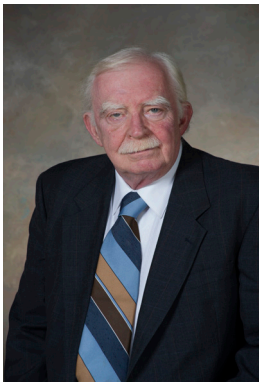
NASA Exceptional Public Achievement Medal



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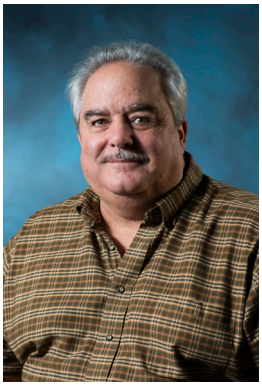
Office of Center Operations

Clay W. Fulcher
Jacobs Engineering
Engineering Directorate



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Retired

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Deltha-Critique
Safety and Mission Assurance Directorate

Esther A. Jefferson
Engineering Directorate

Sherry W. White
Deltha-Critique
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