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Director's Corner: Q&A with Patrick

Since I arrived at Marshall 17 months ago, I have found the people to be warm and engaging. Team members are open with one another, and you have been open with me. All of this impacts both individuals and the center's mission positively.

As I trust you know by now, I am always looking for ways to build a more collaborative and innovative center culture. It takes all of us to do that of course. For my part, I would like to offer a new way for you to keep in touch with me, with senior leadership, and with each other as well.

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Patrick Scheuermann (NASA/MSFC)

Orion Stage Adapter Aces Structural Loads Testing

By Megan Davidson

A test article of the stage adapter that will connect the Orion spacecraft to a United Launch Alliance (ULA) Delta IV rocket for its first mission, Exploration Flight Test-1, aced structural loads testing Jan. 30. Now, the stage adapter that will fly on the Delta IV is officially ready for the journey to its final exam -- a flight more than 15 times farther into deep space than the International Space Station.

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The test article stage adapter is lowered into a test stand in the East Test Area at the Marshall Center. Twenty-five tests were completed on the adapter. (NASA/MSFC/David Olive)

NASA Evolves Student Rocketry Challenge

From NASA news release

Student teams from 26 colleges and universities in 16 states and Puerto Rico will design and launch innovative rockets and payloads as part of the 2013-2014 NASA Student Launch rocketry competition.

The competition, organized for the agency by NASA's Marshall Space Flight Center, will be held May 15-17 at the Bonneville Salt Flats in Tooele County, Utah. There, student teams will undergo a rigorous launch readiness review -- just like actual NASA flight missions -- and launch their rockets. This historic site has hosted numerous American land-speed tests since 1914 and also was the recovery site for comet and interstellar dust samples returned from NASA's Stardust mission in 2006.

"This new engineering competition ties participating students' work to NASA's pursuit of new, more demanding missions," said William Gerstenmaier, NASA's associate administrator for human exploration and operations. "Giving these students exposure to building and launching model rockets to 20,000 feet allows them to recognize the challenges in pushing new limits."

The student rocketry challenge is an evolution of the NASA Student Launch Projects, which for 12 years challenged students to build rockets of their own design capable of flying 1 mile high. The challenge was inspired by NASA's mission to build, test and fly the new Space Launch System, the nation's next flagship rocket for solar system exploration. This latest competition reaches for even greater heights -- taking student-built vehicles more than 3 miles high, into the troposphere.

Another new feature of this competition is the requirement that the teams build their vehicles with

a parachute-based recovery system and provide three payloads capable of delivering data that could shape future NASA missions.

Of the three payloads, one is mandatory for all teams: a landing hazard detection system, including a camera and customized software to transmit real-time information about surface conditions to operators on the ground. The teams will select the other two payloads from a list of options, all of which support NASA spacecraft development challenges. These range from studying how liquids slosh in microgravity and refining new liquid propulsion systems, to studying the environmental effects of supersonic flight on vehicle paints and coatings. All payloads must be recoverable and reusable.

Teams must predict the maximum flight altitude of their vehicle based on the research needs of their payloads. No rocket may fly higher than 20,000 feet. The team whose rocket comes closest to their predicted maximum altitude will win the coveted altitude award.

In addition, each team must prepare detailed preliminary and post-launch reports, and build and maintain a public website about their work. They also must develop an educational engagement program to inspire younger students in their local schools and communities.

Teams will be judged on their successful launch and payload deployment, as well as the thoroughness of supporting documentation. The winning team will receive a \$5,000 prize provided by the corporate sponsor for the rocketry challenge, ATK Aerospace Group of Promontory, Utah. NASA and ATK judges will present a variety of additional awards for winning elements of the

See [Student Rocketry Challenge](#) on [page 4](#)

Director's Corner *Continued from [page 1](#)*

Beginning Feb. 19, I will start asking questions in the "Q&A with Patrick" community on ExplorNet. I want to get your thoughts and ideas so we can grow as individuals and as a workplace. This gives us another tool for strengthening a culture of collaboration and creativity.

I will put questions to you every so often, not on an arbitrary schedule but based on timely topics that arise -- "ripped from today's headlines," if you will -- and questions I may have as I work with the agency and with

all of you around the center. I encourage you to reply with your ideas, with further questions, even with humor. I will join in the conversation.

Along the way, I will invite subject matter experts and other senior staff to jump in and contribute as well.

The first question? To find out, come join the dialogue by following the "Q&A with Patrick" community on ExplorNet.

Orion Stage Adapter *Continued from page 1*

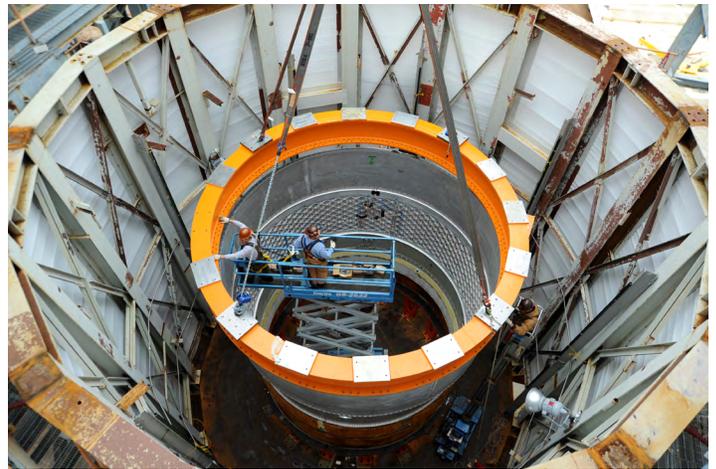
For the structural loads test, the hardware was attached with lines running in different directions on the hardware. Hydraulic pressure was added to those lines in increments, which pushed on the adapter to evaluate its integrity. The test was similar to the recent “can-crush” tests on a rocket fuel tank, but the adapter wasn’t purposefully buckled for the structural test as it was on the fuel tank. Twenty-five test cases were completed on the adapter.

“The loads put on the adapter are similar to the conditions it will experience in flight,” said Brent Gaddes, Spacecraft & Payload Integration Adapter Subsystem manager at NASA’s Marshall Space Flight Center, where the test was conducted. “This test showed us the adapter can handle loads even higher than it will see in flight, without any compromise to the hardware -- like bending or cracking.”

“It takes a lot of hard work from many different teams to pull a large-scale test like this together,” said Dee VanCleave, lead test engineer for the structural loads test at Marshall. “We were able to compare the test data with the stress-analysis predictions in real-time for immediate results.”



For the structural loads test, the adapter was attached with lines running in different directions on the hardware. Hydraulic pressure is added to those lines in increments, which pushes on the adapter to evaluate its integrity. (NASA/MSFC/David Olive)



Crews at Marshall prepare the adapter for testing. The orange cylinder on top of the hardware is the upper load ring. Hydraulic pressure is used to push down on the adapter to ensure the hardware won't bend or crack. (NASA/MSFC/David Olive)

The flight adapter will be shipped in mid-March to ULA’s facility in Decatur, where the Delta IV is being constructed. From there, it will travel by ship to Cape Canaveral, Fla., ahead of Orion’s inaugural flight in September.

During the mission, Orion will travel approximately 3,600 miles above Earth’s surface before re-entering the atmosphere at almost 20,000 mph, generating temperatures near 4,000 degree Fahrenheit. The uncrewed flight will provide engineers with important data about Orion’s heat shield and other elements, including the adapter’s performance, before it is flown in 2017 as part of the first mission to include the Space Launch System (SLS).

SLS will be capable of powering humans and potential science payloads to deep space. It has the greatest capacity of any launch system ever built, minimizing the cost and risk of deep space journeys.

“It will be so gratifying to see the adapter fly on Orion’s flight test this fall and know that I helped in a small way,” VanCleave said.

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

Marshall Black History Month Event to Feature Noted Journalist Clarence Page

NASA's Marshall Space Flight Center will commemorate Black History Month with a special event featuring a Pulitzer Prize-winning journalist.

Clarence Page, a syndicated columnist whose work appears in nearly 200 newspapers, will present remarks to the Marshall Center workforce Feb. 25 in Morris Auditorium. He also will take questions from the audience and sign autographs after the event.

Page began his career at 17 as a freelance writer and photographer for the Cincinnati Enquirer. He received his journalism degree from Ohio University in 1969. Besides being a successful columnist, he also serves as a member of the Chicago Tribune's editorial board.

The Voices of Marshall, a choir made up of center team members, will perform at the event.



Clarence Page, syndicated columnist, will speak at a special program in honor of Black History Month in Morris Auditorium Feb. 25. (Photo courtesy of Clarence Page)

The Black History Month event is sponsored by Marshall's Office of Diversity & Equal Opportunity.

Marshall Center Safety Crews 'Thaw' Center Grounds After Winter Storm

The Marshall Space Flight Center was closed Feb. 11-13 due to the winter storm that swept across the Southeast region of the United States.

Snow-covered grounds and ice-covered roads could easily be found throughout Redstone Arsenal. However, safety crews were hard at work to ensure Marshall team members were able to return to a "thawed" environment Feb. 14.

"Center United Research Services (URS) crews worked very hard to ensure Marshall was safe and able to open on time" Feb. 14, said Carole Valenti, emergency management director. "Even though there was a little help

from Mother Nature warming temperatures into the 40s, the crew reported at 5 a.m. and remained on-site until all access areas and entries were clear and safe."

The Marshall Center Crisis Action Team -- made up of various management personnel -- held daily teleconferences, sometimes in the middle of the night or early morning hours, to monitor the status of weather conditions in the areas surrounding the center.

Marshall Center Director Patrick Scheuermann thanked the action team for its dedication to ensuring Marshall team members' safety.

Student Rocketry Challenge *Continued from page 2*

challenge, including a new safety award for the team that best integrates safeguards into their vehicle design, launch plan and ground operations.

The Student Launch continues NASA's commitment to using its space missions and programs as launch pads for

engaging students in their pursuit of the vitally important STEM career fields: science, technology, engineering and mathematics.

The competition is sponsored by NASA's [Human Exploration and Operations Mission Directorate](#).

NASA's Marshall Center, U.S. Space & Rocket Center sponsoring 'Robots to Rocket City' on Feb. 23

By Kenneth Kesner

NASA's Marshall Space Flight Center is cohosting "Robots to Rocket City" with the [U.S. Space & Rocket Center](#) on Feb. 23. At this event, area high school teams will demonstrate the robots they built to compete in upcoming competitions of [FIRST](#) -- For Inspiration and Recognition of Science & Technology.

Students from more than half-a-dozen area high school FIRST Robotics teams will present their robots, including two NASA-sponsored "house teams": The Mad Rockers of Bob Jones and James Clemens High Schools in Madison; and Morgan County Mech Tech, comprised of Morgan County schools, including A.P. Brewer High School in Somerville. Also expected are students from schools involved in different robotics programs and grade levels, including the FIRST Lego League and a team from Madison County Schools' Central Elementary School participating in the VEX Robotics Competition.

NASA, through its Robotics Alliance Project, provides grants for high school teams and support for FIRST Robotics competitions around the country to address the critical national shortage in science, technology, engineering, and mathematics -- or STEM fields.

FIRST is a national organization founded in 1989 by

inventor Dean Kamen in Manchester, N.H., to inspire young people to pursue careers in science and technical fields.

The event is open to the public. On Feb. 23, the Space & Rocket Center is offering a special admission price of \$11 per person to those who mention "Robots to Rocket City." The ticket covers "Robots to Rocket City" and full museum admission, including simulators and the current feature exhibition, "Da Vinci: The Genius."

Visitors will also be able to try various robotics activities included in the new Space Camp Robotics Program. Demonstrations will include Lego NXT Programming and Engineering workshops, U.S. Navy SeaPerch underwater robotics, the Space Camp Robotics Challenge table and Kinect-controlled Robot Soccer.

The Space & Rocket Center is open from 9 a.m. to 5 p.m. The Robots to Rocket City presentations will begin at 1 p.m., Feb. 23, beneath the Saturn V on display inside the Davidson Center for Space Exploration.

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

Engineer's Curiosity Leads to a Marshall Center Patent Award to Identify Environmental Contamination Using Plants

By Jena Rowe

Sometimes curiosity doesn't always "kill the cat," at least not in the case of Amy Keith, an environmental engineer in the Occupational Health and Environmental Engineering Office at NASA's Marshall Space Flight Center.

Reading in the Marshall Star about a project to identify genetically modified corn from natural corn using hyperspectral imaging technology, Keith wondered if hyperspectral imaging could be used to identify plants in contact with environmental contamination from plants in clean areas. What began as a curious idea eventually led to the Marshall Center being awarded a patent for hyperspectral imaging software in October

2013.

Just as the human eye sees light in three bands -- red, green and blue -- spectral imaging divides light into many more bands, extending beyond the visible. In the case of hyperspectral imaging, sensors measure how light is reflected off an object and determine its "signature" in the electromagnetic spectrum. These signatures are then used to identify the various materials that make up the scanned object.

"What we want to do with hyperspectral imaging is find out what light signatures are unique to different objects," said Keith. "Millions of dollars and years are spent to

See [Patent Award](#) on [page 8](#)

SERVIR Project Helps African Farmers Combat Frost

By Dauna Coulter

Farmers in Africa are highly vulnerable to the caprices of nature. For example, frost is a perennial agricultural hazard in parts of Africa causing huge agricultural losses. In East Africa, the delicate crystalline coating causes millions of dollars in damage to crops such as tea and coffee.

To protect their crops, farmers need answers to questions such as, under what conditions and where does frost often occur in the region; and, where and when will it occur next?

The Kenya Meteorological Department (KMD) receives a flurry of requests from farmers and businesses each winter for this kind information.

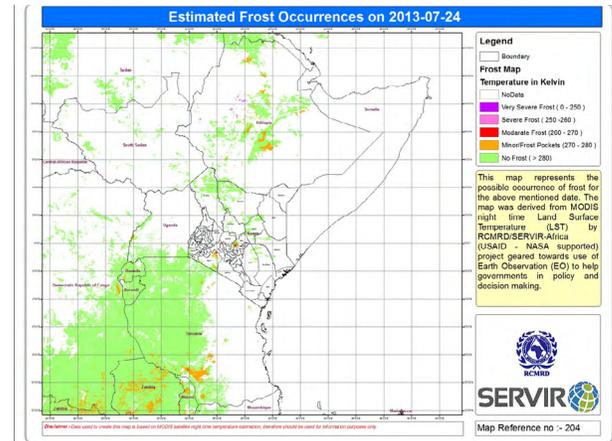
In addition, agricultural insurance companies in the country need independent and reliable data to identify frost affected areas to serve their clients effectively. Such insurance is a vital tool for African farmers and their families.

For these reasons, KMD, the Tea Research Foundation of Kenya -- created by the Ministry of Agriculture, and a Kenyan sector of Aon -- an insurance giant, reached out to the NASA Applied Sciences SERVIR project for support.

SERVIR, a joint NASA/USAID initiative, translates satellite observations into useful information about land cover, land use, climate, water, agriculture, natural disasters and more to help developing nations monitor, forecast and respond to environmental changes. The SERVIR-Africa hub host organization is the Regional Centre for Mapping of Resources for Development based in Nairobi.

In response to the request for support, SERVIR's Africa hub designed and implemented an automated, near real-time frost mapping system that identifies and displays frost-impacted areas by analyzing night time land surface temperature datasets from NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) aboard the Terra and Aqua satellites. Within a few hours of satellite data collection, the system daily emails user-friendly maps identifying areas with high potential for frost to KMD and other end users. The maps' color schemes make it readily apparent where problematic frost is likely to occur.

"The frost maps are excellent tools," said James



Sample frost map. (NASA/SERVIR)

Kiguru of Aon. "These will give us a much stronger basis to conduct our assessments and will boost development of frost insurances. With SERVIR's aid, in forecast and/or real time reports, we will be able to alleviate this problem and make our farmers smile. We are able to assist our clients -- particularly farmers -- when it comes to frost claims which otherwise would be attributed to negligence."

This mapping system will soon incorporate numerical prediction model forecasts in addition to the satellite data-derived frost products to help map areas of potential frost up to three days in advance -- giving farmers time to protect their crops. SERVIR's Wireless Sensor Network (WSN) will be used to better define frost condition thresholds by collecting temperature, wind speed and humidity observations in sample locations and correlating those with the forecasts and satellite data products.

SERVIR has sponsored training workshops and will continue to train regional officials in use of the frost alert system as well as a decision guide for using WSN frost data and satellite frost risk maps.

The frost mapping system demonstrates the critical role satellite imagery technologies can play in human lives. In addition to reducing losses to current crops, these frost maps can help farmers avoid frost-prone times and locations for future planting. The end result is better crop yields supporting people and livelihoods in African countries.

Coulter is an ASRC Federal/Analytical Services employee and writer for the SERVIR program.

New Look at an Old Friend

From Web release

Just weeks after NASA's Chandra X-ray Observatory began operations in 1999, the telescope pointed at Centaurus A (Cen A). At a distance of about 12 million light years from Earth, this galaxy contains a gargantuan jet blasting away from a central supermassive black hole.

Since then, Chandra has returned its attention to this galaxy, each time gathering more data. And, like an old family photo that has been digitally restored, new processing techniques are providing astronomers with a new look at this old galactic friend.

This new image of Cen A contains data from observations, equivalent to over nine and a half days worth of time, taken between 1999 and 2012. In this image, the lowest-energy X-rays Chandra detects are in red, while the medium-energy X-rays are green, and the highest-energy ones are blue.

As in all of Chandra's images of Cen A, this one shows the spectacular jet of outflowing material -- seen pointing from the middle to the upper left -- that is generated by the giant black hole at the galaxy's center. This new high-energy snapshot of Cen A also highlights a dust lane that wraps around the waist of the galaxy. Astronomers think this feature is a remnant of a collision that Cen A experienced with a smaller galaxy millions of years ago.

The data housed in Chandra's extensive archive on Cen A provides a rich resource for a wide range of scientific investigations. For example, researchers published findings in 2013 on the point-like X-ray sources in Cen A. Most of these sources are systems where a compact object -- either a black hole or a neutron star -- is pulling gas from an orbiting companion star. These compact objects form by the collapse of massive stars, with black holes resulting from heavier stars than neutron stars.

The results suggested that nearly all of the compact objects had masses that fell into two categories: either less than twice that of the sun, or more than five times as massive as the sun. These two groups correspond to neutron stars and black holes.

This mass gap may tell us about the way massive stars explode. Scientists expect an upper limit on the



(X-ray: NASA/CXC/U. Birmingham/M. Burke et al.)

most massive neutron stars, up to twice the mass of the sun. What is puzzling is that the smallest black holes appear to weigh in at about five times the mass of the sun. Stars are observed to have a continual range of masses, and so in terms of their progeny's weight we would expect black holes to carry on where neutron stars left off.

Although this mass gap between neutron stars and black holes has been seen in our galaxy, the Milky Way, this new Cen A result provides the first hints that the gap occurs in more distant galaxies. If it turns out to be ubiquitous, it may mean that a special, rapid type of stellar collapse is required in some supernova explosions.

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

New Videos of Marshall Center Flight Hardware and Centennial Challenges News Land on NASA-TV

The completion of the adapter that will mate the Orion spacecraft to a Delta IV rocket on its first test flight later this year is featured in the latest edition of “[This Week @NASA](#),” a weekly video program broadcast nationwide on NASA-TV and posted online. The flight will verify the strength of the adapter, the design of which will be used on NASA’s [Space Launch System](#), or SLS, when it begins test flights in 2017.

A call for ideas of the next NASA Centennial Challenge also was included on this week’s episode.

The [Centennial Challenges](#) program -- managed at the Marshall Space Flight Center -- rewards entrepreneurs for creative ways to demonstrate new technology solutions benefiting NASA and the nation. More information on how to submit ideas can



be found at the Centennial Challenges website: www.nasa.gov/challenges.

You can watch this and previous episodes of This Week @NASA at the [NASA-TV YouTube channel](#).

Patent Award *Continued from page 5*

drill wells, take samples and do chemical laboratory analysis in order to clean up contamination in soil and groundwater. By using our software, the goal is to develop an instrument that can be taken into the field, scan plant’s leaves, and immediately tell if it was exposed to contaminated or clean groundwater. This could be used to determine the best areas to install and use standard contamination cleanup resources and avoid the use of these resources in clean areas.”

Keith is partnering with a team of professionals the Naval Research Laboratory and the State University of New York College of Environmental Science and Forestry.

The team has already completed four experiments at various sites throughout the United States. These experiments have provided evidence that light is reflected differently from plants exposed to

trichloroethene (TCE), a common ground water contaminant, than from plants exposed to clean water. Using different types of plants and various levels of TCE contamination, results also identified five light bandwidths with statistically significant correlations to TCE exposure.

Having recently completed a fifth experiment, Keith and her team are working to refine the bandwidth correlation and identify what physiological changes in a plant are causing the difference in the way light is reflected from clean leaves and contaminated leaves.

If you are curious about hyperspectral imaging, contact [Amy Keith](#) to find out more.

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

Obituaries

Gerald “Jerry” Bruce Waggoner, 82, of Athens, died Feb. 9. He retired from the Marshall Center in 1994 as an aerospace engineer. He is survived by his wife, Janet Elliott Waggoner.

Valmore “Val” Fogle, 83, of Huntsville, died Feb. 11. He retired from the Marshall Center in 1990 as an aerospace engineer. He is survived by his wife, Mary Jo Page Fogle.