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AA-2 effort wrapping up

By Jay Levine
X-Press editor

When it comes to data systems for the Orion Ascent Abort-2 (AA-2) flight test vehicle, NASA Armstrong is ensuring engineers will have all the information they need to assess how the spacecraft's launch abort system can pull the Orion crew module to safety in an emergency.

During a 2019 test, the AA-2 flight will test if the system will work in the high-stress aerodynamic conditions during ascent to space.

Several Armstrong organizations are working together to make sure elements of the AA-2 are ready for flight and capable of withstanding the stresses expected during the test including the Environmental, Pressure, Calibration and Electronic Fabrication laboratories, the Telemetry Shop and Electrostatic Discharge Program, all within the Engineering Support Branch.

"It is a well-rounded branch and very interconnected," said Cindy Jeffers, the branch chief. "With the AA-2 flight, every single part of my branch is affected. Telemetry does all of the checkouts, Fabrication built wire harnesses and does all of the inspections, Environmental does all of the vibration and temperature testing, then it goes back to Fab for an additional inspection to make sure nothing broke during environmental testing. Then it goes back to telemetry for checkout."

AFRC2018-0128-029 NASA/Lauren Hughes

April Torres and Kyle Dauk set up for a thermal test of components in the Environmental Laboratory. The components are part of the work for the Orion AA-2 vehicle that is scheduled for a flight test in 2019.

Components like the Orion AA-2's main data acquisition system are thoroughly inspected and tested, checked and rechecked. That system started in the Telemetry Shop, where April Torres, lead information technology specialist, and Angelo De La Rosa, Armstrong flight termination system administrator, uncrated it. A general health check of the instrumentation, called an acceptance test, begins the complex process.

"Each functional check and acceptance test have 10 different setup configurations, there are 10 kinds of modules that we test and there are 10,168 test points per functional test," Torres explained. "From that we created 21 different lists, 21 different displays and 964 parameters were imported from that information for functional testing."

After the initial test on components such as the main data acquisition system that came to Armstrong, they go to the Fabrication Lab for an inspection to make sure the components inside are secure. The elements also will be ruggedized, a process that involves precision

Orion, page 4

C-20 provides floodwater views

By Kate Squires
Armstrong Public Affairs

In the aftermath of Hurricane Florence, which struck the Carolinas on Sept. 14 causing widespread damage, NASA quickly deployed a sophisticated airborne radar to give disaster response agencies a much-needed view of floodwaters that continued to threaten the region.

A NASA airborne science team flew an agency Gulfstream-III aircraft over the region between Sept. 17 and 23, surveying flooded areas and collecting data. Scientists analyzed the data with supercomputers to produce maps and other information on the extent of flooding and water levels that were provided to federal, state, and local agencies planning the disaster response.

"This deployment brought multiple NASA centers together with federal and state agencies, emergency responders, academic researchers, and university computing facilities with one goal in mind: help those most impacted by Hurricane Florence," said Gerald Bawden of NASA's Earth Science Division in Washington.

The G-III aircraft from Armstrong carried the Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR), a versatile imaging radar instrument with multiple applications, including detection of flooded areas. The instrument, which is widely used by the NASA Earth science research community, is operated and managed by NASA's Jet Propulsion Laboratory in Pasadena, California.

NASA/Samuel Choi

NASA's G-III aircraft staged operations from Gainesville, Florida. The UAVSAR pod is seen beneath the aircraft fuselage.

NASA/Samuel Choi

A view from NASA's G-III aircraft during a science flight on Sept. 19 of the receding floodwater flow at Topsail Beach, just north of Wilmington, North Carolina.

The information gathered by these flights is critical to local authorities providing rescue and recovery to assess covered roadways and to prioritize recovery efforts as flood waters recede. The main goal was to rapidly map water inundation extent along river floodplains and potentially identify damage and blockage to infrastructures such as roadways and levees. It also measured flood level change to assist hydrologists at the National Oceanic and Atmospheric Administration (NOAA) and NASA's Goddard Space Flight Center, Greenbelt, Maryland, in updating their flood prediction models.

The U.S. Geological Survey (USGS) will use the flood level change information to help guide their teams to the regions that had the greatest water level change.

The UAVSAR collected imagery in the areas that had the most significant flooding from the hurricane. These radar observations were made over the Neuse, Cape Fear, Lumber and Catawba Rivers in North Carolina and the Pee Dee, Waccamaw, Congaree, and Santee Rivers in South Carolina, as well as over the Croatan National Forest in North Carolina.

"UAVSAR provides the advantage of being able to see through clouds and image the ground below during day and night. The instrument is able to image flooding under vegetation, which is especially needed in heavily vegetated areas such as the Carolinas," said Yunling Lou, UAVSAR principal investigator.

"UAVSAR is able to fly daily to fill gaps between satellite radar observations and provide quick turnaround inundation maps to help emergency responders prioritize their daily evacuation and rescue efforts. In some applications, UAVSAR's high resolution images are used in conjunction with satellite optical images to better understand the conditions that the emergency responders will face," Lou said.

Data collected by UAVSAR were transferred by the University of Florida's HiPerGator (high performance computing) team to NASA Ames Research Center for processing on the Pleiades Supercomputer.

NASA through its Earth Science Disasters Program worked closely with the states of North Carolina and South Carolina, the Federal Emergency Management Agency (FEMA), USGS, Federal Aviation Administration (FAA), NOAA, the National Guard, United States Forest Service, University of South Carolina, and University of Florida Gainesville to leverage their science and application experience to provide analysis of satellite imagery, data products and other decision-support aids to inform disaster mapping and response efforts.

"FEMA uses flood and damage proxy maps from our teams along with information gathered from other scientists, international partners, government teams, and commercial vendors to map the extent of water, "said Andrew Molthan, NASA research meteorologist and disasters team coordinator at NASA's Marshall Space Flight Center. "Many of

Florence, page 8

AFRC2018-0252-01 NASA/Lauren Hughes

Students participating in the NASA Pathways programs include top from left Erick Castillon, Julio Trevino III, Andres Leyva Garcia, Lydia Hantsche, Emily Glover and Matthew Klosterman. The bottom row includes from left Marie Aguirre, Gabrielle Ludwig, Alyssa Lee, Diana Franzone and Victoria Hawkins. Other students currently particpating in the program include Cody Christiansen, Spencer Somes and Nathan Smith. The NASA Pathways Programs provide opportunities for students and recent graduates to be considered for Federal employment through the NASA Pathways Intern Employment Program, the NASA Pathways Recent Graduates Program and the NASA Pathways Presidential Management Fellows program.

ER-2 aircraft work

Some people feel like they work in a confined work space and really need to stretch now and then. For Sam Habbal, who is working on the ER-2 high-altitude aircraft's forward body pod, it's just another day at the office.

AFRC2018-0228-01 NASA/Lauren Hughes

News at NASA

Parker Solar Probe makes a new record

The Parker Solar Probe now holds the record for the closest approach to the Sun by a human-made object. The spacecraft passed the current record of 26.55 million miles from the Sun's surface on Oct. 29, as calculated by the Parker Solar Probe team.

The previous record for the closest solar approach was set by the German-American Helios 2 spacecraft in April 1976. As the Parker Solar Probe mission progresses, the spacecraft will repeatedly break its own records, with a final close approach of 3.83 million miles from the Sun's surface expected in 2024.

"It's been just 78 days since Parker Solar Probe launched, and we've now come closer to our star than any other spacecraft in history," said Project Manager Andy Driesman, from the Johns Hopkins Applied Physics Laboratory in Laurel, Maryland. "It's a proud moment for the team, though we remain focused on our first solar encounter, which begins on Oct. 31."

The Parker Solar Probe is also expected to break the record for fastest spacecraft traveling relative to the Sun. The current record for heliocentric speed is 153,454 miles per hour, set by Helios 2 in April 1976.

The Parker Solar Probe team periodically measures the spacecraft's precise speed and position using NASA's Deep Space Network, or DSN.

The Parker Solar Probe will begin its first solar encounter on Oct. 31, continuing to fly closer and closer to the Sun's surface.

AFRC2018-0128-016 NASA/Lauren Hughes

Clark Johnson inspects components tested in the Environmental Laboratory. He ensures none of the research items were damaged during testing and checks that workmanship standards for the components are met.

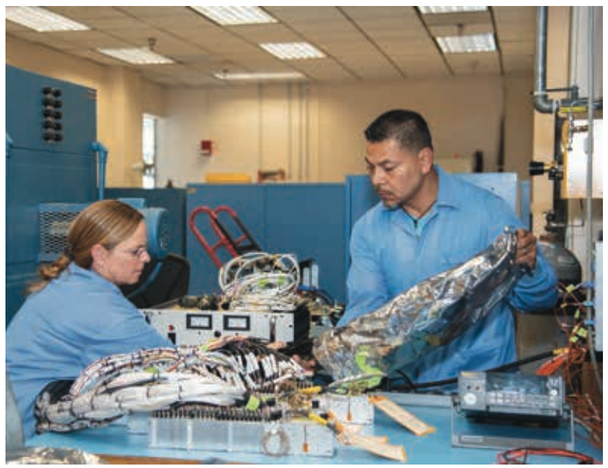
AFRC2018-0128-026 NASA/Lauren Hughes

Don Griffith watches the results of a calibration to an Orion AA-2 accelerometer to see that it meets the required tolerances at Armstrong. The two black fixtures on the floor vibrate the accelerometer affixed to the testbed to make the determination.

X-Press October 2018

AFRC2018-0128-036 NASA/Lauren Hughes

Martin Munday selects the accelerometers that will be used for vibration testing of the Orion AA-2 test article components in the Environmental Laboratory. Following Armstrong's validation and verification work, the components will be integrated on the AA-2 test article for a test flight set for 2019.



AFRC2018-0128-09 NASA/Lauren Hughes

April Torres and Angelo De La Rosa remove wire harnesses for signal input for the Orion AA-2 vehicle from electrostatic discharge protective covers. The AA-2 test article is scheduled for a test flight in 2019.

Orion... from page 1

application of a silicone adhesive to enhance the system toughness for vibration and temperature tests and prove tolerance of flight conditions. Once this process is accomplished, the component goes back to the Telemetry Shop for another full functional test before it goes to the Environmental Lab for testing.

While the data acquisition system was tested, pressure and vibration testing continued on AA-2 accelerometers and pressure transducers. Tim Gadbois validates that the accelerometers, or sensors that record acceleration, and the transducers, which record pressure, perform as intended.

Don Griffith, Armstrong metrology program manager, said he uses the science of measurement, metrology, to characterize how a calibration compares to the standards to ensure the right tool is being used for the right job. Without that step, researchers would be essentially making an educated guess.

As one of the components was prepared for a test at the Armstrong Environmental Laboratory, lead Karen Estes explained that the lab capabilities include testing items up to 4,000 pounds on the main shaker to test how vibration effects the component. In addition, elements can be tested from -100 degrees F to 500 degrees F to record how it responds at various temperature extremes.

"Just about every experiment that goes on an airplane goes through the lab," she said. In this case that includes AA-2. "We know all of the components are working properly and we know it works well in a regular ambient lab environment, so we take it to the Environmental Lab to be subjected to vibration and temperatures," De La Rosa said. "We are monitoring and testing it while it's in the environmental chamber and make sure there are no hiccups or glitches while it is being subject to those extremes."

Armstrong's Dan Nolan and Lucas Moxey developed a camera system that also underwent vibration and thermal testing. The system is designed to operate as part of the Orion AA-2 test article abort test booster/separation ring developmental flight instrumentation subsystem and capture images when the booster separates.

AFRC2018-0128-38 NASA/Lauren Hughes

Dan Nolan, who with engineer Lucas Moxey developed the camera system shown in the photo, is seen working with April Torres to prepare it for vibration testing. The camera system is designed to operate as part of the Orion AA-2 test article's abort test booster/separation ring developmental flight instrumentation subsystem. The testing proved the camera system could function and endure the predicted flight environment.

Monitoring the signals to and from the test article in the environmental laboratory is essential to ensure that all channels are operating as anticipated and no signals are lost, Torres said. If a signal is lost, researchers will examine the data in an effort to determine why.

There are data lists and a number of work spaces to monitor each different item. In addition, a number of files to be processed following the tests are made available for engineers to analyze. Torres and De La Rosa create charts for an overview and deliver them by way of a database in which engineers can investigate in greater depth their individual interests.

AFRC2018-0128-010 NASA/Lauren Hughes

Angelo De La Rosa works inside the Environmental Laboratory's thermal chamber to attach test articles to the testing architecture at Armstrong. The center is testing components for integration into the Orion AA-2 test article that is scheduled for a test flight of the launch abort system in 2019.

Following the work in the environmental lab, the component goes back to the fabrication shop for inspection. Once complete, it is returned to Telemetry for another full functional test on that equipment to make sure that the final product, before it is installed on the pallet that is going on the vehicle, is fully functional.

Torres and De La Rosa were consulted early on in order to capitalize on their experiences with components of NASA's Pad Abort-1 flight test, a 2010 evaluation of the Orion abort system to take the crew module to safety during a challenge on the launch pad.

David Dowdell, another experienced team member and Armstrong instrumentation lead for the Orion AA-2 work, has been preparing for the work for years. Dowdell and Joe Hernandez, a senior instrumentation engineer for the AA-2, coordinate the work and assign priorities. The first major package was finished in early summer and the validation of the final components of which the center is responsible is nearly complete.

Process, organization and documentation is how the volume of work flows.

"It doesn't get overwhelming because we know where everything is and we know what's coming next," Torres said.

Ruth inspires as SOFIA pilot

By Alyssa Lee
Armstrong Public Affairs

Elizabeth "Liz" Ruth is as one of a kind as the aircraft she flies – the Boeing 747SP Stratospheric Observatory for Infrared Astronomy (SOFIA). She's the only female research pilot to fly SOFIA at Armstrong. She joined Armstrong's Flight Operations branch in 2016.

As a pilot for the world's largest airborne astronomical observatory, she flies at altitudes between 39,000 feet and 45,000 feet (12–14 kilometers) and above 99 percent of the water vapor in the atmosphere.

Her father being a civilian aeronautical engineer for the U.S. Navy, Ruth grew up with a strong military and aeronautical influence. However, she said her biggest inspiration for wanting to become a pilot was her childhood pediatrician. Ruth's pediatrician flew her own plane to the naval base to see her clients, including Ruth.

Ruth aspired to be just like her pediatrician; hoping someday to become a doctor and fly her own plane. "I always wanted to be in the air, whether that was in a plane, on a Ferris wheel, or on a roller coaster. I loved the feeling of being in the sky," she said. Ruth planned to go to medical school while also obtaining her pilot's license.

However, while she was in high school, the military started a trial program to permit female pilots and eventually allowed them to achieve flight status with military aircraft; this program changed Ruth's focus. She joined Air Force ROTC in college and was selected for the pilot program. She earned a Business Administration degree from the University of Southern California in Los Angeles, California and received her commission in the Air Force.

She attended the United States Air Force Undergraduate Pilot Training Program in 1981 and served as a pilot for the T-38 and T-43 jets. While in the military, she also obtained her Master of Aeronautical Science from Embry-Riddle Aeronautical University, a worldwide campus at McClellan Air Force Base. Ruth earned the rank of captain before concluding her military career.

After leaving the military, Ruth joined United Airlines as a flight officer and instructor. In addition to flying as a pilot on international and domestic routes, she also worked in the United Training Center as a simulator and academic instructor as well as a team member for computer-based training and Advanced Qualification training programs. In 2005, Ruth decided to take a break from flying to be with her family and raise her three daughters.

AFRC2018-0288-08 **NASA/Lauren Hughes**

Research pilot Elizabeth Ruth is the only female pilot who flies the Stratospheric Observatory for Infrared Astronomy (SOFIA). Ruth has been flying SOFIA for NASA Armstrong since 2016.

"Girls can get the message that you can have a demanding career or you can have a family, but not both," she said. "This can be a real disincentive to pursuing a non-traditional job. You have to allow young women to choose options that work best for them.

"However, when I took 10 years off from flying to be with my girls, it was time well spent. It is not the typical model of a flying career, and it is time we came up with new models that will accommodate the realities of a diverse workforce."

When Ruth decided it was time to go back to her other passion of being a pilot again, she noticed an opening at Armstrong.

"They were looking for a pilot with military experience and someone who

Ruth, page 8

Ackeret, former clerk and analyst, dies

Debbie Ackeret, who worked as an analyst at the center for about 25 years, passed Sept. 13. She was 57.

She began as an inventory control clerk and during her career was a supply and equipment analyst and a logistics analyst.

Those who knew her said she was a fine person and Ackeret was skilled at answering questions in an understandable way. She was happy, tactful and firm.

Ackeret also had a knack for fundraising, helping to raise thousands of dollars for the former Judy Janisse Child Development Center.

She also was key to the Peer Awards for many years, handling the logistics masterfully and cleverly. She kept in contact after she left the center and that was part of what made her so special – her ability to make others feel needed and loved.

Bondy, NB-52B former crew chief, dies

Mike Bondy, a long time crew chief of the NB-52B, died Aug. 31. He was 64. He began his NASA career as an aircraft mechanic on the NB-52B and worked his way up to crew chief during his career that spanned nearly 40 years. As crew chief of the NB-52B No. 008, which air launched such vehicles as the X-38 crew return vehicle and the hypersonic X-43A, he was involved in the success of those programs. He also was crew chief of the highly maneuverable X-31. Bondy had a good sense of humor, his friends said, and he was at times like a television comedy skit. He was one of the best storytellers, making even stories he told before seem like the first telling. He loved his wife. He also loved to ride his Harley daily regardless of the weather.

Searfoss, former pilot, astronaut, died

By Leslie Williams
Armstrong News Chief

Former NASA research pilot and astronaut Richard "Rick" Searfoss died Sept. 29 at his home in Bear Valley Springs, California. He was 62.

Searfoss, a retired U.S. Air Force colonel, served as a research pilot in the flight crew branch at NASA Dryden (now Armstrong) Flight Research Center in California from July 2001 to February 2003, having brought with him over 5,000 hours of military flying and 939 hours in space.

He flew on three space flights, onboard space shuttles Columbia and Atlantis, logging 39 days in space. Searfoss was the pilot for his first two space missions, STS-58 and STS-76, landing both times at Edwards Air Force Base. He also served as commander of a seven-person crew on STS-90.

Once at Dryden, medical staff was standing by for the astronauts as well as personnel who supported the NASA convoy team in preparing the shuttle for its return ferry flight to Florida.

"Rick was a brilliant engineer, terrific pilot and superb shuttle commander," recalled former NASA astronaut Mike Mullane. "He spent his career dedicated to the advancement of aviation and space exploration. He will be greatly missed and fondly remembered by his NASA colleagues."

Before joining NASA, Searfoss graduated from the U.S. Air Force Academy with an aeronautical engineering degree in 1978. He earned his Master of Science degree in aeronautics from the California Institute of Technology in 1979.

He completed his undergraduate pilot training in 1980. His training lead to flying F-111s for the Royal Air Force Lakenheath in England and at Mountain Home Air Force Base in Idaho.

This diverse training gave Searfoss the opportunity to attend the U.S. Naval Test Pilot School as a U.S. Air Force pilot exchange officer in 1988. He was also an instructor pilot for the Test Pilot School at Edwards Air Force Base before he was selected for the astronaut program in 1990.

He flew in 56 different aircraft and earned Federal Aviation Administration airline transport pilot, glider and flight instructor ratings. He ended his NASA career at Armstrong as a pilot – a passion for flight that he had held throughout his life.

EC01-0222-2 **NASA/Tony Landis**

Richard A. Searfoss became a research pilot in the Flight Crew Branch of NASA's Dryden Flight Research Center in July 2001, bringing with him more than 5,000 hours of military flight time.

Searfoss was recognized with a number of awards including the Air Force Commendation Medal, the Air Force Meritorious Service Medal, the Defense Meritorious Service Medal, the Defense Superior Service Medal, three NASA Spaceflight Medals, the NASA Exceptional Service Medal, the NASA Outstanding Leadership Medal and the Air Force Distinguished Flying Cross.

Flight seeks Planetary evolution data

By Leslie Williams
Armstrong News Chief

Arizona's World View Enterprises launched its Stratollite high-altitude balloon system on Sept. 26 from a remote launchpad in McCall, Idaho. Onboard was the High-Altitude Electromagnetic Sounding of Earth and Planetary Interiors experiment from the Southwest Research Institute (SwRI) in San Antonio, Texas.

Made possible by support from NASA's Flight Opportunities program, the balloon flight demonstrated the experiment's ability to address questions about the evolution of Earth and other planets by measuring how electromagnetic waves penetrate the surface – and what information that might reveal.

Photo Courtesy of World View Enterprises

Personnel from World View and NASA's Flight Opportunities program were on hand as twilight fell on the launch site in McCall, Idaho. Here, the team prepares to launch World View's Stratollite balloon system with a Southwest Research Institute payload onboard that aims to better understand how Venus and other planets evolved.

"Measuring electromagnetic waves should help us determine the temperature inside Venus [and other planets], and then we can understand how that might have affected their geological history," said Principal Investigator Robert Grimm from SwRI. "The idea is to apply data to comparative planetary science of the solar system so we can better understand things like why Earth evolved to be habitable whereas Venus, which is very close in size and similar in other ways, did not."

Grimm hopes to eventually fly the technology on a mission to Venus. In the meantime balloon

Research, page 8

Research... from page 7

flights have been critical to SwRI's research. The recent demonstration was the second one Grimm's team completed with World View.

The first flight, completed in October 2017, also took place at McCall. World View mobilized a remote launch site at a vast complex of young igneous rock and mountain ranges, enabling researchers to approximate some of the conditions found on the surface of Venus.

Having refined their experiment with the data from the 2017 flight, researchers proposed to fly in the same region – this time at night.

"We knew we would need to fly again at different times of day because the ionosphere is in a different state throughout the day and night," said Grimm.

Grimm explained that Earth's ionosphere – an area of the atmosphere that contains a high concentration of ions and free electrons – is important because it is affected by magnetic fields of Earth and the Sun. So, researchers need to take the different conditions into account.

To meet this need, World View worked closely with SwRI and Flight Opportunities personnel to coordinate a nighttime window with calm winds and the right ionospheric conditions.

"It's extremely beneficial for researchers to access a relevant flight environment like this, and even better when investigators have more than one flight so that they can gather even more data," noted Flight Opportunities Campaign Manager Paul De Léon. "World View's ability to accommodate remote locations for the best launch and data-gathering conditions for NASA-supported payloads is a huge advantage for the maturation of these technologies."

With a second successful flight completed, SwRI is analyzing the recent data and comparing it with data from the first flight. Grimm plans to present their findings next month at NASA's Venus Exploration Analysis Group meeting.

The Flight Opportunities program is funded by NASA's Space Technology Mission Directorate at the agency's Headquarters in Washington and managed at Armstrong. NASA's Ames Research Center in California's Silicon Valley manages the solicitation and selection of technologies to be tested and demonstrated on commercial flight vehicles.

Ruth... from page 6

had experience flying heavy aircraft, so I applied," she said. "When I found out I was flying SOFIA I thought there is nothing better than flying a big airplane and getting to look at the stars."

She adds that "my favorite part of flying SOFIA is being around the scientists. It is so inspiring being around people who are so passionate about what they do. There are no better people to work with than the people at NASA."

When asked how it felt to be the only female pilot for SOFIA she said, "I hope more women get the chance to fly SOFIA. I feel lucky to be here, but it's not surprising that I am the only one because only about 5 percent of professional pilots are women."

She also says she has some advice for future female pilots, "don't let anyone tell you no, and be willing to do what it takes to be a pilot, because though it's fun, it takes a lot of determination and dedication."

Florence... from page 2

those maps are derived from a broad constellation of satellites with fixed orbits and broad coverage – UAVSAR imagery provides greater spatial detail and opportunity for repeat views on rivers and areas of particular interest."

"Mapped water extents from satellites and aircraft provide situational awareness to help with response efforts through combination with other geospatial information available, estimating impacts to homes, roads, agriculture, and other infrastructure," Molthan said.

Following the immediate focus on response and recovery, satellite and airborne observations will help scientists validate and further improve streamflow and flood models, derive improved flood detection products from synthetic aperture radar systems in orbit, and continue to help the science and applications community prepare for data and analysis for the future NISAR satellite radar mission.

"Not only will the UAVSAR data help guide disaster response efforts, they also provide invaluable scientific data to improve the next generation of computer models in advance of the next hurricane that may make landfall in the region," said Bawden.

The data will help a science team from the University of South Carolina who were already conducting field research on flood inundation prior to Hurricane Florence through funding from NASA's Established Program to Stimulate Competitive Research (EPSCoR), managed by NASA's Kennedy Space Center. The science team will continue field observations of the affected areas into early 2019.

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