2019 Marshall Star Year in Review

Jan. 8, 2020

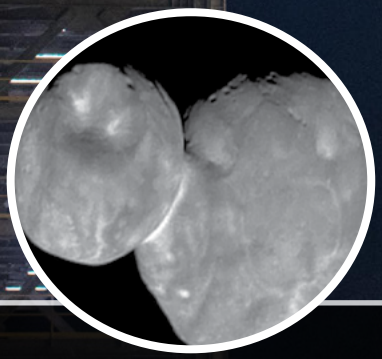
JANUARY

Crews Lift SLS LH2 Tank Test Article in Test Stand

Crews loaded the 149-foot-tall liquid hydrogen tank structural test article, below, for NASA's Space Launch System rocket into Marshall Space Flight Center's Test Stand 4693 Jan. 14. Test Stand 4693 is one of the newest test stands at Marshall and the liquid hydrogen tank test article was the first piece of hardware to be installed in the stand. The test article is structurally identical to the flight version of the liquid hydrogen tank, which comprises two-thirds of the rocket's core stage.

Marshall Gets Back to Work in Wake of Government Furlough

Marshall Director Jody Singer welcomed team members back following a government furlough, praising workers' "character and selflessness" in supporting one another during the 35-day shutdown. "Each and every one of you is important," she said in a Jan. 31 all-hands meeting, highlighting Marshall's 2018 accomplishments to prove her point.



New Horizons Reveals Newest View of Most Distant Object Ever Explored

NASA's New Horizons spacecraft successfully flew past Ultima Thule, later officially named Arrokoth, in the early hours of New Year's Day, ushering in the era of deep space exploration from the enigmatic Kuiper Belt, a region of primordial objects that holds keys to understanding the origins of the solar system. On Jan. 2, scientists released the first detailed images of the most distant object ever explored. New Horizons is part of the New Frontiers Program managed by Marshall.

FEBRUARY

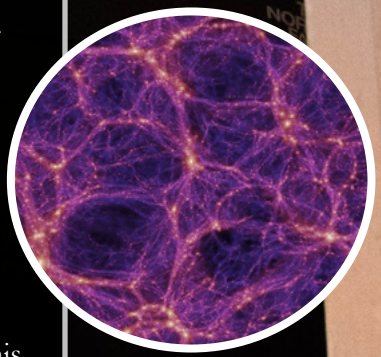
SLS Core Stage Begins to Take Shape

Engineers and technicians at NASA's Michoud Assembly Facility completed the "forward join," or top part, of the core stage, seen below, for NASA's Space Launch System rocket in early February. The forward join consists of three structures: the forward skirt, liquid oxygen tank and intertank. The milestone marked the beginning of integration and assembly of the massive, 212-foot-tall core stage that will help power the first mission of SLS and NASA's Orion spacecraft to the Moon.

Marshall's Newest 'Green' Building Points to Future

On Feb. 19, Marshall officially opened for business Building 4221, home to the Human Exploration Development Operations Office, the Science & Technology Office and NASA Engineering & Safety Center. The latest addition to Marshall's increasingly "green" campus is designed and built to meet federally mandated standards of energy and water efficiency, with state-of-the-art energy-conservation systems and technologies throughout the building. Designed by the Nashville-based architectural firm of Thomas Miller & Partners and constructed by Yates Construction of Philadelphia, Mississippi, the building features a central atrium and innovative meeting spaces on every floor, providing offices and workspace for some 440 team members.

Where Is The Universe Hiding Its Missing Mass?

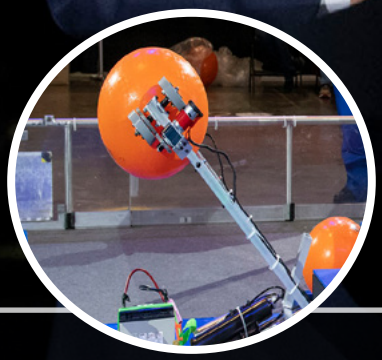


Astronomers have spent decades looking for something that sounds like it would be hard to miss: about a third of the "normal" matter -- meaning hydrogen, helium and other elements -- in the universe. By using a new technique to detect warm gas in ultraviolet light, astronomers say recent results from NASA's Chandra X-ray Observatory may have helped them locate this elusive expanse of missing matter.

MARCH

Vice President Pence to NASA, Nation: 'Return Americans to Moon' in Next Five Years

During his March 26 visit to Huntsville, Vice President Mike Pence delivered an historic challenge to NASA and its partners to return American astronauts to the Moon in the next five years. Pence also praised ongoing work at Marshall and nationwide to build, test and prepare to fly the Space Launch System, the most powerful rocket in history. "The first woman and the next man on the Moon will both be American astronauts, launched by American rockets from American soil," Pence told NASA Administrator Jim Bridenstine and other National Space Council members at the U.S. Space & Rocket Center. "The men and women of Marshall know exactly what it takes to be first in space, because you've been doing it for generations."



Students Face Off at FIRST Robotics Competition's 'Rocket City Regional'

More than 2,000 high school students competed in the FIRST Robotics Competition "Rocket City Regional," supported by Marshall, on March 15-16 at the Von Braun Center. Opposing alliances of three teams used remotely controlled robots, designed and built over the course of 10 weeks, to collect cargo and assemble rockets before blasting off from "Planet Primus." Marshall leaders spoke at the event's opening ceremonies. The competition's winning alliance, along with several wildcard bids, qualified to move on to the FIRST Robotics Championship in Houston.

Marshall's 'Ladies Who Launch' Visit NBC's Today Show

A group of female team members from Marshall celebrated International Women's Day with NBC's Today Show in New York on March 8. Among those representing the agency were Marshall's first female director, Jody Singer. The group promoted science, technology, engineering and math careers. Today co-anchor Hoda Kotb helped tell Singer's story, and introduced the female engineers who serve alongside her.

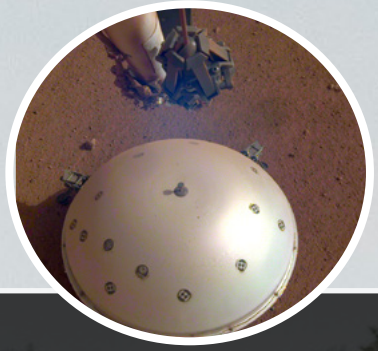
APRIL

NASA Announces Winners of Student Launch Competition

After eight months of designing, building, testing, launching and documenting, the category winners of the annual NASA Student Launch competition were announced at an awards ceremony April 6 at the U.S. Space & Rocket Center in Huntsville. The coveted altitude award -- given to the team that came closest to their predicted altitude -- was won by North Carolina State University of Raleigh, in the college/university division; and Boy Scout Troop 17 of Charlottesville, Virginia, in the middle/high school division. North Carolina State University missed their target altitude of more than 4,000 feet by just 12 feet. The Boy Scouts missed their predicted altitude of 4,900 by 187 feet. A full list of the category winners can be seen here. Vanderbilt University was announced as the overall Student Launch winner in May, after calculations were reviewed for accuracy.

NASA Announces Winners of 25th Annual Rover Challenge

NASA announced the winners of the annual Human Exploration Rover Challenge, held April 12-13 at the U.S. Space & Rocket Center. The International Space Education Institute of Leipzig, Germany, won first place in the high school division; the University of Puerto Rico in Mayagüez - Team 1 won the college/university division. Teams earned points based on successful navigation of obstacles and completion of tasks with the top point-earners in each division winning. The competition challenges student teams to design, build and test human-powered roving vehicles inspired by the Apollo missions and future missions to the Moon, Mars and beyond. This year's competition marked 25 years since the inaugural event, a milestone shared with the Apollo 50th anniversary. A full list of the winners can be seen here.



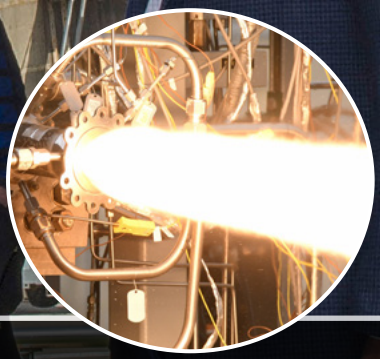
InSight Lander Captures First Martian Tremors

NASA's Mars InSight lander measured and recorded for the first time a likely "marsquake." The signal was detected by InSight's seismometer, which the lander placed on the Martian surface Dec. 19, 2018. The faint seismic signal was recorded on April 6, the lander's 128th Martian day, or sol. This is the first recorded trembling that appears to have come from inside the planet, as opposed to being caused by forces above the surface, such as wind. Scientists still are examining the data to determine the exact cause of the signal. InSight's seismometer will enable scientists to gather similar data about Mars. By studying Mars's deep interior, they hope to learn how other rocky worlds, including Earth and the Moon, formed.

MAY

NASA, Blue Origin Agreement Signals Rocketing Growth of Commercial Space

Marshall Director Jody Singer, below center, met with Madison County commissioner Dale Strong, left, and Terry Benedict, chief operating officer for Blue Origin, on May 20 in front of historic Test Stand 4670 at Marshall. Under a Commercial Space Launch Act agreement, Blue Origin is upgrading and refurbishing the test stand to support testing of its BE-3U and BE-4 rocket engines.



Teams 3D Print Planetary Habitats, Awarded $700K in NASA Challenge

After 30 hours of 3D printing over four days of head-to-head competition, NASA and partner Bradley University of Peoria, Illinois, awarded $700,000 to two teams in the final round of the 3D-Printed Habitat Challenge. The top prize of $500,000 was awarded to New York-based AI. SpaceFactory. Second place and $200,000 was awarded to Pennsylvania State University of University Park.

NASA, Virgin Orbit 3D Print, Test Rocket Combustion Chamber

Future Moon or Mars-bound rocket engines could employ a uniquely manufactured combustion chamber. Virgin Orbit teamed with researchers at Marshall to develop and test a 3D-printed combustion chamber that takes advantage of cutting-edge manufacturing processes. The effort incorporates GRCop-84, a proven NASA additive copper alloy developed at Marshall and NASA's Glenn Research Center in 2014 to successfully print and test the first full-scale, 3D-printed copper rocket engine part. The test article, using high-pressure liquid oxygen/kerosene propellants, successfully delivered more than 2,000 pounds of thrust in nearly two dozen test firings at Marshall in 2018-2019. Funded by NASA's Space Technology Mission Directorate, the joint effort will reduce future mission launch costs and enable more robust scientific exploration of the Moon and Mars.

JUNE

NASA Deputy Administrator Morhard Views SLS Progress

NASA Deputy Administrator James Morhard, below left, visited Michoud for the first time June 28 to see the latest progress in manufacturing and assembling NASA's Space Launch System rocket. Morhard, joined by Robert Champion, below right, director of Michoud, and Paul McConnaghey, Marshall deputy director, toured the facility and spoke to technicians and engineers assembling the core stage. His visit came as the last test article for the SLS core stage, the liquid oxygen tank, was loaded onto NASA's Pegasus barge June 26 for delivery to Marshall for testing and as all four RS-25 engines for the first Artemis mission arrived at Michoud from NASA's Stennis Space Center.

Past, Present Marshall Directors Discuss Center's Role in Future of Space Exploration

The vital role Marshall plays in the Artemis program -- developing the Space Launch System rocket that will send humans to the Moon and Mars -- was a frequent topic of discussion at the Pass the Torch center directors panel June 20 at the U.S. Space & Rocket Center. The event featured current Marshall Director Jody Singer and former directors Todd May, Patrick Scheuermann (above) and William Lucas. Gene Goldman, acting director in 2012, was the moderator.

Marshall Helps Launch Redstone Federal Smart Cities Initiative

Around the world, communities are increasingly pursuing "Smart City" projects that use innovative technologies and advanced data analytics to enhance their infrastructure, conserve resources, save money and improve the lives of their citizens. On April 2, Redstone Arsenal established a Federal Smart City Coordinating Committee comprised of leaders from Marshall, the Redstone Arsenal U.S. Army Garrison Command, FBI Redstone, the Tennessee Valley Authority and the City of Huntsville to coordinate Smart City activities across Redstone's federal tenants. The local Smart City team held a terms of reference signing June 18 and is currently pursuing six pilot projects to strengthen Redstone's foundational infrastructure, including smart lighting tools and sensors on fire hydrants to rapidly detect and respond to water leaks.

JULY

Marshall Celebrates Apollo, First Steps on Moon

The historic Apollo 11 mission was commemorated at Marshall -- where the Saturn V rocket that launched the famous mission was developed -- as well as in the Huntsville community and around the world. People filled the streets of downtown Huntsville for a "Dancing in the Streets" celebration featuring exhibits and music. NASA hosted a nationwide broadcast commemorating Apollo 11, with the Marshall segment featuring astronaut Rex Walheim at the U.S. Space & Rocket Center. Harrison Schmitt -- Apollo 17 astronaut and the first scientist on the Moon -- visited Marshall and participated in a Facebook Live with Marshall planetary scientist Renee Weber. Marshall's annual Summer Blast celebration featured the world's largest MoonPie – 4 feet in diameter and emblazoned with the Apollo 50th celebration logo.

Science at the Moon: Still Much to Learn, say Marshall Researchers

Researchers at Marshall are developing three promising new lunar science missions. The Neutron Measurements at the Lunar Surface project seeks to determine the amount of neutron radiation at the Moon's surface. That's vital to astronaut health as NASA's Artemis program works to send long-term missions there, and could be ready for launch by July 2021. A second team seeks to refine navigation and communications for those orbiting and traversing the Moon via the new Lunar Node 1 Navigation Demonstrator -- a beacon to send orbiters and landers precise geolocation data, digitally confirming their position relative to other craft or ground stations. Marshall astrophysicists, meanwhile, hope to use the Moon to study gamma-ray bursts, the most colossal explosive forces in the cosmos. Their proposed Moon Burst Energetics All-sky Monitor could help detect gamma-ray bursts tied to gravitational waves and aid accuracy for burst hunters.

Model Rockets Take to the Sky to Set Record

Five thousand model rockets took to the sky at the U.S. Space & Rocket Center on July 16 in an attempt to set a Guinness World Record for most model rockets launched at once. An estimated 2,500 people watched the launch in person. The launch came 50 years, nearly to the minute, of the liftoff of Apollo 11. Guinness is still conducting a review to determine if a new world record was set.. Marshall Director Jody Singer, above right, celebrates as the model rockets launch. Also looking on, from left, are Apollo 15 command module pilot Al Worden and Space Camp veteran Lillian Duran.

AUGUST

NASA Selects Marshall to lead Human Landing System Program

Marshall, which already manages NASA's Space Launch System, was announced as the lead center for the agency's Human Landing System Program during an Aug. 16 press conference in front of the 149-foot-tall SLS liquid hydrogen tank structural test article at Marshall. The news came on the heels of Marshall's Lisa Watson-Morgan being named program manager of the Human Landing System. Watson-Morgan, above, gives NASA Administrator Jim Bridenstine a high-five at Marshall following the HLS announcment.

The Latest Look at 'First Light'

NASA's Chandra X-ray Observatory has captured images of cosmic phenomena over two decades of operations, including the supernova remnant Cassiopeia A. Featured in Chandra's "First Light" image release Aug. 26, 1999, Cassiopeia A marked a seminal moment for both the observatory and the field of X-ray astronomy. Near the center of the intricate pattern of the expanding debris from the shattered star, the image revealed, for the first time, a neutron star that the supernova left behind. Chandra has since repeatedly returned to Cassiopeia A to learn more. A new video showing the evolution of the supernova remnant from 2000 to 2013 portrays gas -- around 20 million degrees Fahrenheit -- in the remnant expanding outward.

We Are Building SLS – Recognizing #NASASLS Teammates

August's edition of "I Am Building SLS" featured Hannah Hopkins, a software engineer at Marshall for the SLS Program. The series spotlights SLS team members from across the country and their contributions to the SLS rocket. Other Marshall and SLS team members highlighted in 2019 included SLS Stages Office manager Julie Bassler, former logistics engineering and transportation team lead Jeff Adams, SLS Spacecraft/Payload Integration and Evolution Operations integration manager Bryan Barley, and SLS flight software design team lead Deanna Whitehead. See all the men and women featured in 2019, here.

SEPTEMBER

Marshall Celebrates 20 Years of Managing Chandra

Twenty years ago, on July 23, 1999, NASA's Chandra X-ray Observatory, seen in the illustration below, launched aboard the space shuttle Columbia. Since its original deployment into orbit, Chandra has quadrupled its original five-year mission, revolutionizing our understanding of the universe each step of the way. "Scientifically, Chandra is as productive now as it was at launch," said Martin Weisskopf, Chandra project scientist at Marshall. As part of NASA's Great Observatories program, Chandra, which is managed by Marshall, was designed and built to observe X-rays alongside the Hubble Space Telescope in ultraviolet, visible and near infrared light, the Spitzer Space Telescope in infrared light and the Compton Gamma Ray Observatory in gamma rays.

NASA Early Career Initiative Program Selects 7 Proposals, including 2 from Marshall

NASA's Early Career Initiative program, a technology maturation effort led by NASA early career employees and their partners, announced its project awardees for fiscal year 2020 -- including, for the first time in program history, two concurrent awardees from one center: Marshall. In partnership with Torch Technologies of Huntsville, Marshall will mature a velocity-sensing and scanning light detection and ranging system for lunar surface characterization and traversal of remote locales where global positioning systems are too weak to properly aid navigation. Partnering with Astrobotic Technology of Pittsburgh, Marshall also will mature a non-nuclear thermal control system capable of surviving the deep cold of a lunar night. Founded in 2014 by NASA's Space Technology Mission Directorate, the Early Career Initiative is funded via STMD's Center Innovation Fund, which stimulates agency-wide creativity and innovation to serve the evolving technology needs of NASA and the nation.

September marks milestones for NASA's SLS Program

On Sept 19, teams at Michoud finished assembling and joining all five of the main structural components for the core stage of the SLS rocket, right. Technicians bolted the engine section to the stage's liquid hydrogen propellant tank. Meanwhile, just a few days later, test teams at Marshall completed structural testing on the liquid hydrogen tank test article, confirming the design for the tank on the rocket's initial Block 1 configuration.

OCTOBER

Marshall Innovates for Rides to Space, Jaunts Around Town

Workers at Marshall know the best journeys, like sending explorers back to the Moon and on to Mars, aren't just about the destination, but how one gets there. Andrew Denio, a Marshall information technology specialist, and Judson Hudson, an Aerie Aerospace contractor in Marshall's Valve & Component Laboratory, drive vehicles almost as out-of-this-world as those they support at Marshall: a 2010 Toyota Prius transformed into a "Star Wars" space fighter, and a 2011 Honda Fit Sport modified to resemble the Ecto-1 from "Ghostbusters," respectively. It's all in service of NASA's core mission, they agree: to engage the Artemis generation and fuel the spirit of endeavor that will put human boots once more on the lunar surface -- this time to stay -- and enable the first crewed missions to Mars.

NASA, Industry Partner for Space-based Study of Potential Alzheimer's Key

An innovative experiment underway on the International Space Station could help researchers fight aggressive neurodegenerative diseases such as Alzheimer's and Parkinson's. Developed by Teledyne Brown Engineering of Huntsville, the Ring-Sheared Drop experiment will be housed in the Microgravity Science Glovebox managed by Marshall. There, it will enable study of the formation of potentially destructive protein clusters like those found in the brain tissue of patients battling neurodegenerative diseases. The project partners also are adapting the Ring-Sheared Drop facility as a bioreactor, customizable for other fluid studies or to grow and study cells, bacteria and other materials. Experiments, begun in September, are expected to continue at least two years.

Astronaut Completes Spacewalk, Shares Mission with Redstone General

Army Lt. Gen. James Dickinson, commanding general of the U.S. Army Space and Missile Defense Command, spoke with NASA astronaut and current International Space Station crew member Andrew Morgan, an Army colonel, during an Oct. 8 downlink to Marshall's Payload Operations Integration Center. Morgan, an active-duty emergency physician, answered the call two days after completing a seven-hour spacewalk. He reported on the beauty of Earth from space, the camaraderie of the Expedition 61 crew and how his military background prepared him for the mission.

NOVEMBER

Marshall Salutes 20 Years on Station, Looks to Orbiting Lab's Role in New Moon, Mars Journeys

Wherever its point in orbit, the International Space Station, below, is always close for Marshall teams, who play key roles in planning, building, flying and supporting the world's premier orbital research platform. As NASA celebrates 20 years of continuous human occupation of the station, Marshall workers who helped deliver vital elements and continue to oversee science in orbit look back with pride. They also look forward, readying the station to support Artemis lunar missions and crewed journeys to Mars. "So much of the station carries Marshall's fingerprints," said Bobby Watkins, director of Marshall's Human Exploration Development & Operations Office. "All those accomplishments laid the groundwork for the vehicles, hardware and systems Marshall is building today, from the Space Launch System to the human lander that will deliver Artemis crews to the Moon."

All Engines Attached to SLS Core Stage for Artemis I

Michoud teams attached the fourth and final RS-25 engine to the core stage of the agency's Space Launch System rocket Nov. 6. The attachment of the final engine to the core stage that will help power the first Artemis lunar mission came one day after teams structurally mated the third engine to the stage. Integration of the RS-25 engines to the 212-foot-tall core stage was a collaborative, multistep process for NASA and its partners Boeing, the core stage lead contractor, and Aerojet Rocketdyne, the RS-25 engines lead contractor.

Space Shuttle Columbia National Tour Visits Marshall

On Feb. 1, 2003, space shuttle Columbia was returning to Earth following a successful mission. Columbia and the seven-person crew of STS-107 never made it home, but a new traveling exhibit and tour helps ensure that the legacies and lessons of the crew and space shuttle live on. The Space Shuttle Columbia National Tour visited Marshall from Nov. 4-8 and included a display of artifacts from Columbia, a town hall meeting and multiple pnael discussions. The Columbia Tour educates NASA's workforce about the accident and shares lessons learned to ensure NASA's current and future missions are as successful as they possibly can be. Marshall was the second NASA center to host the program, which will visit all 10 NASA field centers.

DECEMBER

Marshall Engineers Push SLS Test Article to Extremes

Engineers at Marshall deliberately pushed a test version of NASA's Space Launch System rocket's liquid hydrogen tank, below, to its designs limits Dec. 5, and the results were spectacular. The liquid hydrogen tank test article withstood more than 260% of its expected flight loads over five hours before it buckled and ruptured. The final test for the test article was the largest controlled test-to-failure of any rocket stage pressured tank for NASA.

New Associate Administrator for HEO Visits Marshall

Doug Loverro, NASA's new associate administrator for the Human Exploration and Operations Mission Directorate, toured Marshall on Dec. 16-17. His visit included an International Space Station flag raising at the Payload Operations Intergration Center and hosting a town hall alongside Marshall Director Jody Singer.

NASA Hosts Artemis Day Events at Michoud, Stennis

NASA Administrator Jim Bridenstine showcased the fully assembled liquid-fueled rocket core stage, above, of NASA's Space Launch System rocket to state, regional and national officials, members of the news media, social media influencers and key NASA personnel at Michoud for Artemis Day on Dec. 9. Visitors to Michoud and Stennis on Dec. 9-10 toured manufacturing and test facilities for an up-close look at the core stage that will be used to help power the first Artemis mission to the Moon. Guests toured the facilities, attended discussion panels and visited an exhibits hall.