ARTEMIS

National Aeronautics and
Space Administration

NASA

SPACE LAUNCH SYSTEM

JANUARY – APRIL 2022

TANKING PRACTICE IN PROGRESS

www.nasa.gov

ARTEMIS I MOON ROCKET ARRIVES AT LAUNCH PAD FOR FIRST TIME

NASA's Space Launch System (SLS) rocket with the Orion spacecraft aboard is seen on the way to Launch Complex 39B for the first time.

The Artemis I SLS, Orion, and mobile launcher are inside the VAB, following an initial wet dress rehearsal campaign and rollback from Launch Pad 39B.

The Moon is seen rising behind NASA's SLS rocket and Orion spacecraft atop the mobile launcher as it rolls out to Launch Complex 39B for the first time, Thursday, March 17, 2022, at NASA's Kennedy Space Center in Florida. Ahead of NASA's Artemis I flight test, the fully stacked and integrated SLS rocket and Orion spacecraft will undergo a wet dress rehearsal at Launch Complex 39B to verify systems and practice countdown procedures for the first launch.

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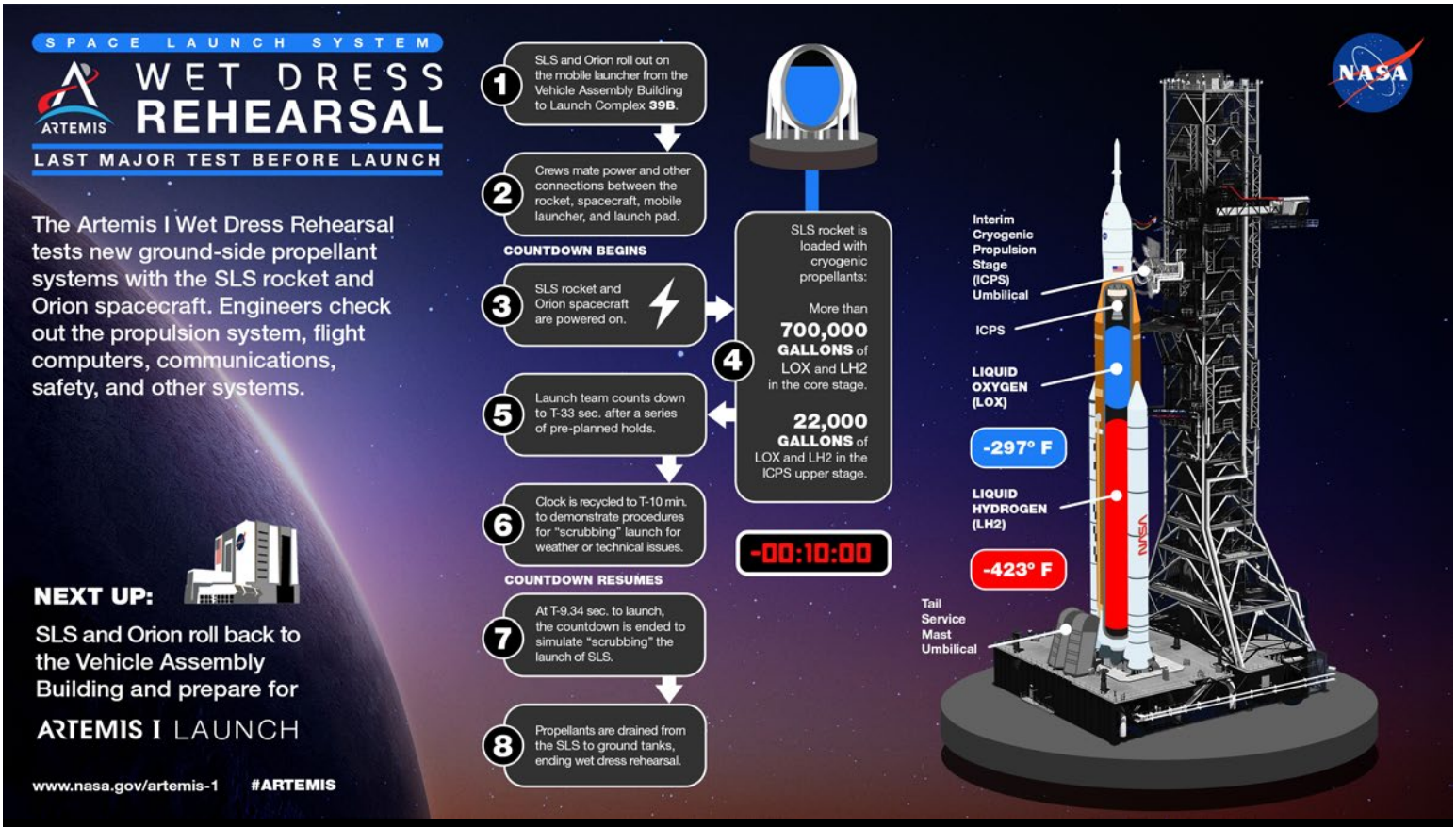


During the wet dress rehearsal, teams at Kennedy will load cryogenic or super-cold propellants into the SLS, conduct a launch countdown, and practice safely removing propellants at Launch Pad 39B.

NASA's Space Launch System (SLS) rocket with the Orion spacecraft atop arrived at Launch Pad 39B at the agency's Kennedy Space Center in Florida March 18 in preparation for a final test before its Artemis I Moon mission. The uncrewed flight test will pave the way for missions to land the first woman and first person of color on the Moon under Artemis.

Stacked on the mobile launcher and mounted on the crawler-transporter for a journey from the Vehicle Assembly Building to Launch Pad 39B, it took 10 hours and 28 minutes for SLS and Orion to reach the launchpad, which is four miles away. The trip began at 5:47 p.m. Thursday, March 17, and the 322-foot tall, 3.5-million-pound rocket and spacecraft arrived at the pad at 4:15 a.m. on March 18. The final test series, known as wet dress rehearsal, will exercise the Artemis I launch team through operations to load propellant into the rocket's tanks, conduct a full launch countdown, demonstrate the ability to recycle the countdown clock, and drain the tanks to practice the timelines and procedures the team will use for launch.

While most objectives associated with the wet dress rehearsal were met during recent testing, NASA decided to return the rocket to the Vehicle Assembly Building for several repairs and checkouts needed to complete a full wet dress test rehearsal attempt. Following completion of the test, SLS and Orion will return to the VAB for the remaining checkouts before rolling back out to the pad for launch.

Read more on the SLS web site: **go.nasa.gov/2zRmcp1**

NASA TEAM MEMBERS WATCH THE SLS'S DEBUT ON THE GRAVEL CARPET

Employees from NASA, including Marshall and SLS, along with their friends and families experience the first-ever rollout of an SLS rocket.

ROCKS AND ROCKETS: FROM ALABAMA RIVERS TO KENNEDY'S FLORIDA CRAWLERWAY

The crawlerway is a 4.2 mile road of river rocks that paves the way for rockets from the Vehicle Assembly Building to launch pads 39A and 39B at Kennedy. SLS and Orion sit on the mobile launcher atop the crawler-transporter 2 as it travels on the crawlerway for the Artemis missions.

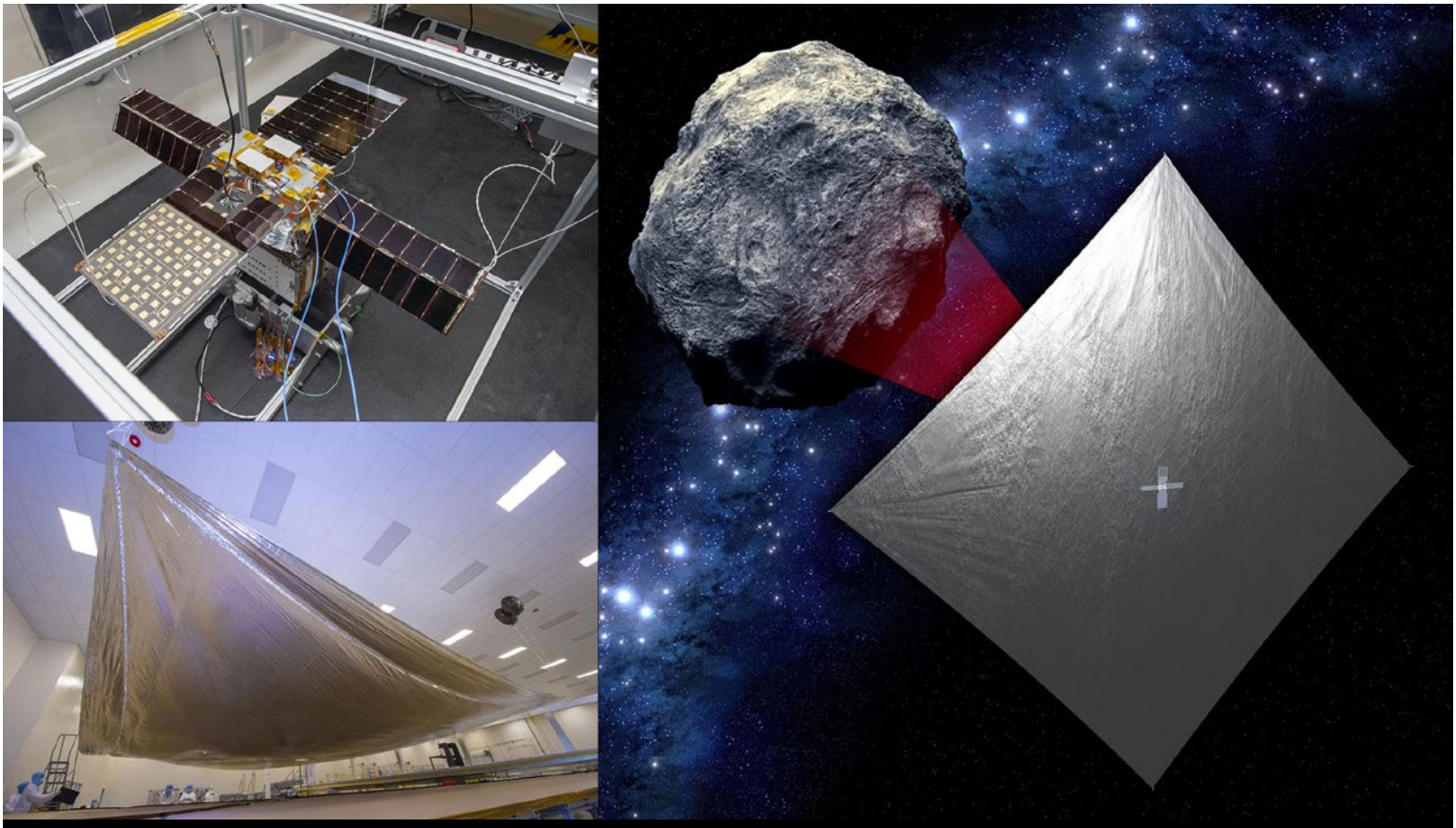
The crawler-transporters have carried integrated rockets and spacecraft on the crawlerway to launch pads 39A and 39B for more than 50 years at Kennedy. SLS integrated with the Orion spacecraft traveled 4.2 miles on the crawlerway from the VAB to Launch Pad 39B for the first time March 17-18, approximately a 10-hour ride with the crawler moving at a top speed of 0.82 miles per hour, for final testing ahead of the Artemis I launch.

From riverbed to crawlerway, the path to space goes through a unique Alabama resource. Alabama river rocks currently pave the path for rockets on the crawlerway Kennedy. This 4.2-mile road of rocks is crucial for launching NASA's missions, specifically the upcoming launch of Artemis I, the uncrewed test flight of SLS and Orion.

A massive pair of machines called crawler-transporters have carried integrated rockets and spacecraft to Pads 39A and 39B for more than 50 years at Kennedy. The initial design called for asphalt roads, but engineers quickly encountered issues. Asphalt couldn't handle the weight of the 6.65-million-pound crawler on its own, much less with the weight of a rocket added to it. The asphalt also proved too sticky and therefore would not allow the crawler-transporter to turn properly, causing damage to its roller bearings. NASA conducted a study to find a material that would allow the crawler to make a proper turn and hold the weight required. The result: river rock.

Read more: **go.nasa.gov/3IXT80m**

NASA SOLAR SAIL MISSION TO CHASE TINY ASTEROID AFTER ARTEMIS I LAUNCH



NEA Scout is composed of a small, shoebox-sized CubeSat (top left) and a thin, aluminum-coated solar sail about the size of a racquetball court (bottom left). After the spacecraft launches aboard Artemis I, the sail will use sunlight to propel the CubeSat to a small asteroid (as depicted in an illustration, right).

Launching with Artemis I, NASA's shoebox-size Near-Earth Asteroid Scout will chase down what will become the smallest asteroid ever to be visited by a spacecraft. It will get there by unfurling a solar sail to harness solar radiation for propulsion, making this the agency's first deep space mission of its kind.

The target is 2020 GE, a near-Earth asteroid (NEA) that is less than 60 feet (18 meters) in size. Asteroids smaller than 330 feet (100 meters) across have never been explored up close before. The spacecraft will use its science camera to get a closer look, measuring the object's size, shape, rotation, and surface properties while looking for any dust and debris that might surround 2020 GE.

Because the camera has a resolution of less than 4 inches (10 centimeters) per pixel, the mission's science team will be able to determine whether 2020 GE is solid – like a boulder – or if it's composed of smaller rocks and dust clumped together like some of its larger asteroid cousins, such as asteroid Bennu.

Read more: **go.nasa.gov/3Ahstrl**

MARSHALL WOMEN ENGINEERING NASA'S RETURN TO THE MOON

Meet five of the women at Marshall who are engineering NASA's return to the Moon with flight software that will control the rocket for Artemis missions.

In honor of Women's History Month, NASA celebrated the many contributions women have made to the nation, world, and beyond, including five women at Marshall who develop flight software that controls the rocket for Artemis missions to the Moon. These engineers developed and tested SLS software that tells the rocket how to operate for the first 8 minutes of the Artemis I mission during its launch and ascent to orbit.

Their work continues Marshall's legacy of propelling NASA exploration through engineering. The engineers include Shawna Broussard, an engineer who also works in the avionics test facility; Shaun Phillips, SLS flight software project lead; Linda Brewster, Avionics and Software Test Facility branch chief; Deanna Whitehead, Flight and Ground Software and Simulation Division chief; and Marlyn Terek, Software Development branch chief and former flight software design team leader (pictured left to right). Read more: **go.nasa.gov/3tlz0sE**

NASA, AEROJET ROCKETDYNE COMPLETE TESTING FOR MODERNIZED RS-25 ENGINE

NASA completed developmental engine testing March 30 with a full-duration RS-25 hot fire to support future engines that will launch SLS astronauts deeper into space than ever before. Operators fired RS-25 engine No. 0525 for about eight-and-a-half minutes (500 seconds) and up to 113% power level on the Fred Haise Test Stand at NASA's Stennis Space Center near Bay St. Louis, Mississippi.

The March 30 hot fire completed the fourth developmental test series and sets Aerojet Rocketdyne, lead contractor for NASA's SLS engines, on pace to produce new RS-25s for future flights. For SLS missions beyond Artemis IV, Aerojet Rocketdyne is modernizing production of new RS-25 engines, while also reducing costs by 30 percent. The new engines will include components manufactured with state-of-the-art fabrication techniques, such as additive manufacturing, or 3D printing. These new components have been tested during the developmental series completed at Stennis.

Read more: **go.nasa.gov/3u8T0Gz**

NASA JOINS FOUR MAJOR SLS ROCKET PARTS TO FORM ARTEMIS II CORE STAGE

The Artemis II core stage liquid hydrogen tank is mated to the forward assembly at NASA's Michoud Assembly Facility completing structural assembly of four-fifths of the core stage.

NASA joined the Artemis II SLS core stage forward assembly with the 130-foot liquid hydrogen tank on March 18. This completes assembly of four of the five large structures that make up the core stage that will help send the first astronauts to lunar orbit on Artemis II. The 66-foot forward assembly consists of the forward skirt, liquid oxygen tank, and the intertank, which were mated earlier. Engineers inserted 360 bolts to connect the forward assembly to the liquid hydrogen tank to make up the bulk of the stage. Only the engine section, which is currently being outfitted and includes the main propulsion systems that connect to the four RS-25 engines, remains to be added to form the completed core stage.

All parts of the core stage are manufactured by NASA and Boeing, the core stage lead contractor at the agency's Michoud Assembly Facility in New Orleans. Currently, the team is building core stages for three Artemis missions. The first core stage is stacked with the rest of the SLS rocket, which will launch the Artemis I mission to the Moon this year. The core stage and the twin solid rocket boosters together will produce 8.8 million pounds of thrust to send NASA's Orion spacecraft, astronauts, and supplies beyond Earth's orbit to the Moon. The SLS rocket and the Orion spacecraft form the foundation for Artemis missions and future deep space exploration.

Read more: **go.nasa.gov/3x7TyOC**

NASA BUILDS WELDING TEST ARTICLE FOR SLS EXPLORATION UPPER STAGE

Welders inspect completed work on a section of the SLS EUS weld confidence article.

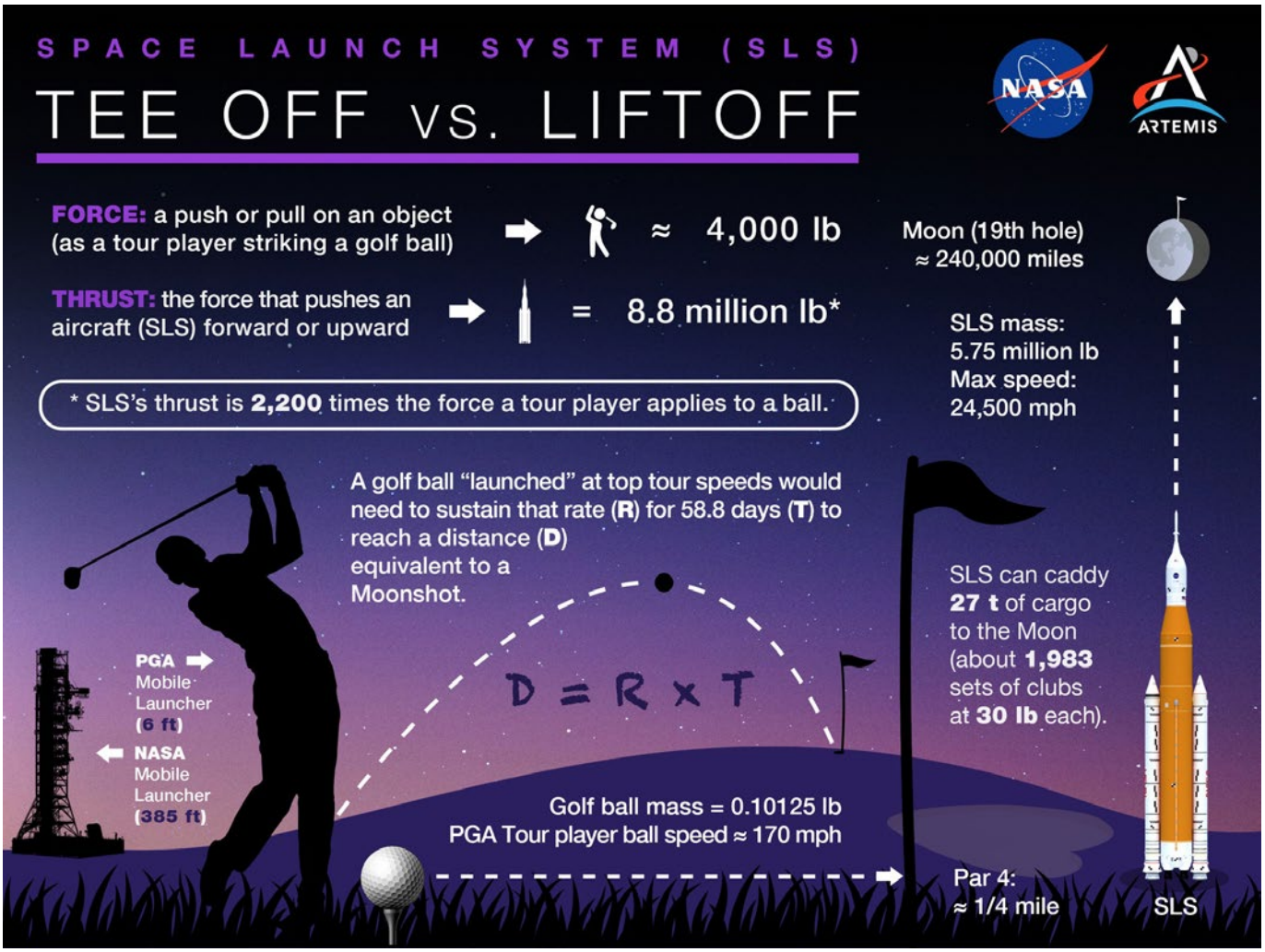
NASA completed manufacturing of a hydrogen tank barrel that will be tested as a weld confidence article for the SLS's Exploration Upper Stage (EUS). Weld confidence articles help establish welding procedures and interfaces between the tooling and hardware, and ensure the structural integrity of the welds. Starting with the Artemis IV mission, the EUS will provide the power to send astronauts in Orion and heavy cargo on a precise trajectory to the Moon.

After NASA and lead contractor Boeing completed manufacturing of the test tank barrel at Michoud Assembly Facility, technicians moved it from the Vertical Weld Center where it was built to the Vertical Assembly Center for further processing. Engineers will cut the barrel into small sections for mechanical testing and analysis that will help verify the parameters that will be used to build the rocket stage.

Read more: **go.nasa.gov/3vDglkf**

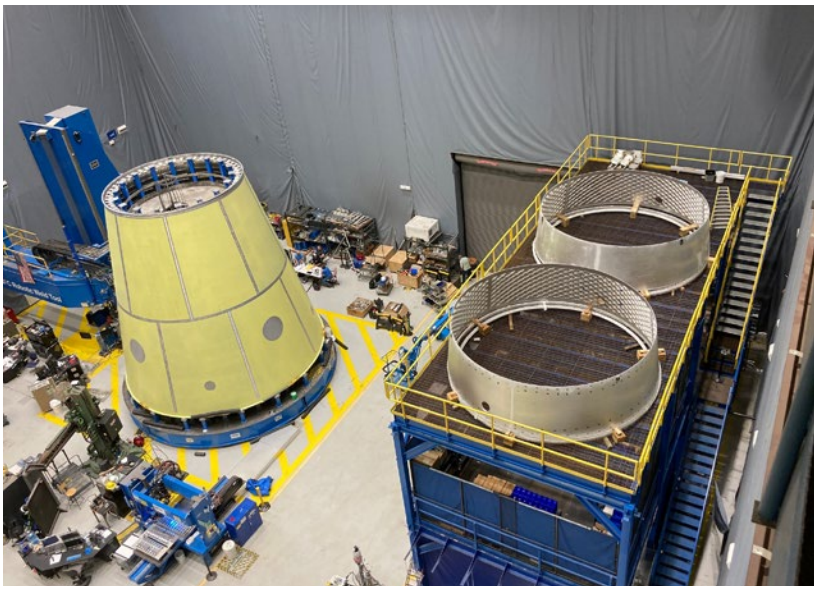
WHAT'S NEW IN SLS SOCIAL MEDIA

TEE OFF VS LIFTOFF



Did you know the Space Launch System for NASA Artemis I can caddy 27 tons of cargo to the Moon? See how PGA.com compares the SLS to golf. Read more here: **go.nasa.gov/3Ke6KVW**

HARDWARE FOR ARTEMIS II AND ARTEMIS III COMES TOGETHER AT MARSHALL



Crews from Teledyne Brown Engineering, Inc. and NASA's Marshall Space Flight Center are manufacturing the cone-shaped launch vehicle stage adapters and Orion stage adapters for Artemis II and Artemis III. The adapters serve as vital connection points for the core stage, ICPS, and Orion spacecraft. Read more: **go.nasa.gov/3NMEmfB**

SLS ON THE ROAD

Brian Matisak, SLS Block 1 Deputy Manager in the Systems Engineering & Integration Office, spoke at the Travel Bloggers Conference at the U.S. Space & Rocket Center on February 25. Matisak briefed the 50 attendees from various segments of travel media on SLS and Artemis.

Andy Schorr, manager of Spacecraft/Payload Integration and Evolution Office, delivered a talk to the Huntsville-Madison County Historical Society on March 13 at the downtown Huntsville branch of the Huntsville Madison County Public Library. Schorr gave an update on the current status of SLS and Artemis, as well as the plan for future Artemis missions.

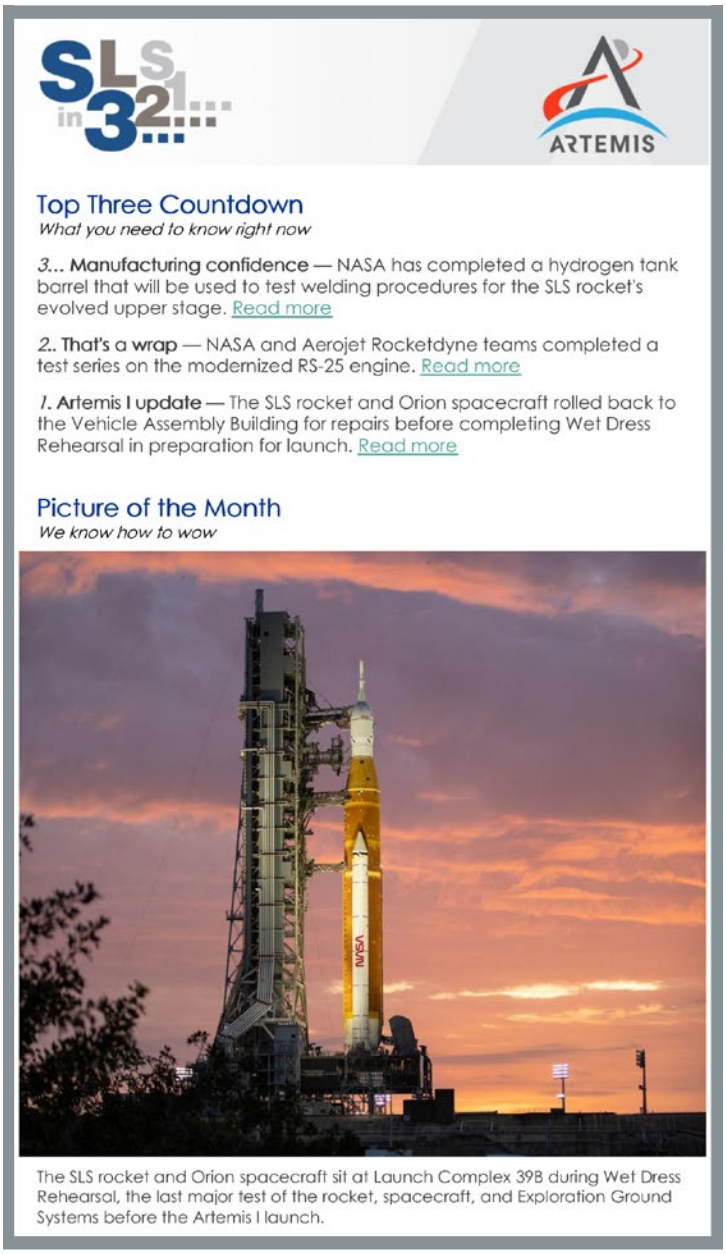
SPACEFLIGHT PARTNERS:
Moog

LOCATION: *Elma, New York*

WHAT THEY DO FOR SLS:
Moog hardware is used in many key systems on SLS and Orion, including propulsion, life support, steering, and communications. Moog actuation systems steer the core, booster, and upper stage rocket engines, as well as the Orion Launch Abort System Attitude Control Motor. On future Artemis missions, Moog will provide the electromechanical actuation system for Orion and EUS thrust vector control systems.

Moog also provides many different propulsion controls. On the SLS ICPS RL10 engine, the team provides the main inlet valves for both the oxidizer and fuel systems. On the EUS, Moog will provide these valves, along with propellant utilization motors and electronics for the four RL10 engines and multiple propellant system isolation relief and vent valves.

GET THE LATEST SLS UPDATES SENT TO YOUR INBOX EACH MONTH!


SLS in 3..2..1...

ARTEMIS

Top Three Countdown
What you need to know right now

3... **Manufacturing confidence** — NASA has completed a hydrogen tank barrel that will be used to test welding procedures for the SLS rocket's evolved upper stage. Read more

2.. **That's a wrap** — NASA and Aerojet Rocketdyne teams completed a test series on the modernized RS-25 engine. Read more

1. **Artemis I update** — The SLS rocket and Orion spacecraft rolled back to the Vehicle Assembly Building for repairs before completing Wet Dress Rehearsal in preparation for launch. Read more

Picture of the Month
We know how to wow

The SLS rocket and Orion spacecraft sit at Launch Complex 39B during Wet Dress Rehearsal, the last major test of the rocket, spacecraft, and Exploration Ground Systems before the Artemis I launch.

Every day, the SLS rocket gets closer to launch. Get updates in your inbox each month by subscribing to SLS in 3..2..1.

FOLLOW THE PROGRESS OF NASA'S NEW LAUNCH VEHICLE FOR DEEP SPACE:

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