



National Aeronautics and
Space Administration



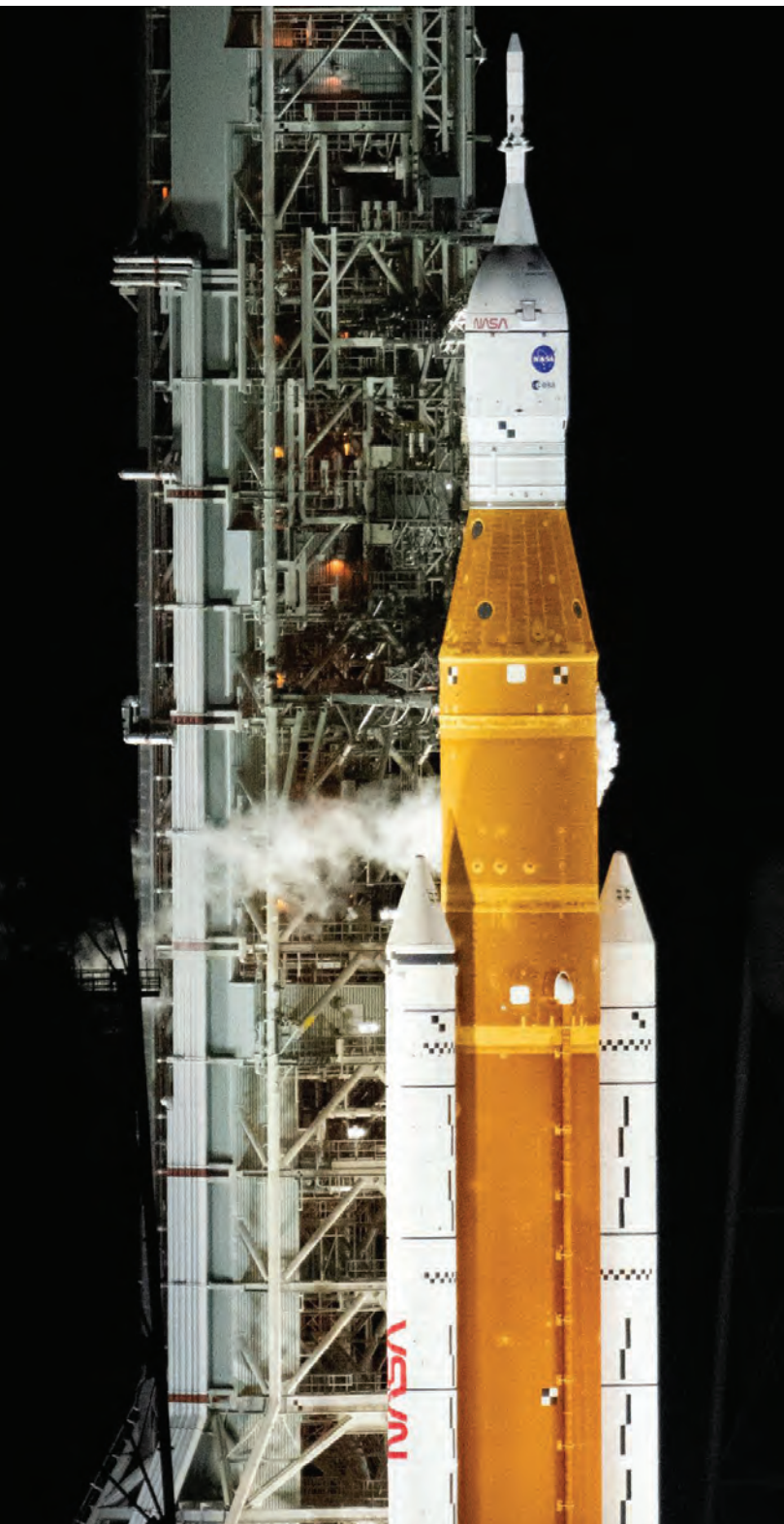
SPACE LAUNCH SYSTEM

MAY – SEPTEMBER 2022

BRINK OF A NEW ERA



ARTEMIS I MOON ROCKET UNDERGOES FINAL TESTS, PREPARES FOR LAUNCH



The Artemis I SLS rocket vents liquid oxygen during the first launch attempt on Aug. 29, 2022, at Kennedy Space Center.



The Artemis I Space Launch System (SLS) rocket and Orion spacecraft stand at Launch Pad 39B during sunrise on Aug. 31, 2022.



SLS Chief Engineer Dr. John Blevins, center, works with members of the launch team in Firing Room 2 at Kennedy's Launch Control Center during the cryogenic propellant loading demonstration test on Sept. 21, 2022.

NASA and the human spaceflight community are on the brink of a new era of deep space exploration. The Artemis I mission will be the first flight of NASA's new Space Launch System (SLS) rocket and Orion spacecraft. Artemis I was [rolled out to the launch pad on Aug. 16-17](#) for its maiden voyage. During that Aug. 29 launch attempt, due to a sensor issue, teams were not able to confirm a proper chilldown of the four RS-25 engines, with engine 3 showing higher temperatures than the other engines. Teams also saw a hydrogen leak during tanking. A second launch attempt was performed on Sept. 3, but was called off due to another, separate hydrogen leak during tanking operations.

Following the Sept. 3 scrub, platforms were assembled around the tail service mast umbilical and the seal on the quick disconnect was replaced between the liquid hydrogen fuel feed line on the mobile launcher and the SLS rocket while at the launch pad. The team then performed a [cryogenic demonstration test](#) to evaluate the new seal on a "quick disconnect" assembly and test updated propellant loading and pre-launch procedures. Teams completed all the test objectives and prepared for a third launch attempt. The decision was made to roll back to the Vehicle Assembly Building ahead of the approaching Hurricane Ian to allow team members to address the needs of their families and to protect the integrated rocket and spacecraft system. [Roll back](#) occurred on Sept. 26-27. Teams are now preparing for launch opportunities beginning on Nov. 14, 2022.

Follow along with progress of the Artemis I mission at the Artemis blog: blogs.nasa.gov/artemis/

NASA COMPLETES WET DRESS REHEARSAL PRIOR TO ARTEMIS I LAUNCH ATTEMPTS

NASA analyzed the data from the wet dress rehearsal conducted Monday, June 20 and determined the testing campaign was complete and teams could then complete final preparations for launch in August. Teams rolled the integrated SLS rocket and Orion spacecraft for Artemis I as well as the mobile launcher from the Vehicle Assembly Building to Launch Pad 39B at NASA's Kennedy Space Center in Florida on June 5-6. During the test campaign, teams were able to validate the timelines and procedures for launch, including loading cryogenic, or super cold, propellant into the rocket's tanks. The rehearsal focused on two primary objectives and several secondary objectives to help ensure the team was ready to launch the Artemis I flight test.

Following [completion in June](#), Artemis I was rolled back to the Vehicle Assembly Building and prepared for flight. Flight preparations included installing the flight termination system batteries. Teams then rolled SLS and Orion back to the Vehicle Assembly Building at Kennedy on July 2 for final launch preparations ahead of the August launch period.

Read more: go.nasa.gov/39WRb8d

A full Moon is in view from Launch Complex 39B at Kennedy Space Center on June 14, 2022, during the wet dress rehearsal test campaign.



ENGINEERS CHILL SPACE LAUNCH SYSTEM ROCKET ENGINES BEFORE LAUNCH



The four RS-25 engines on SLS produce more than 2 million pounds of thrust. The four RS-25 engines last fired during the core stage Green Run hot fire test at NASA's Stennis Space Center near Bay St. Louis, Mississippi, in March 2021.

The SLS core stage rocket engines are high-performance machines that are exposed to extremely low temperatures and extremely high temperatures and pressures during fueling and flight. During launch, more than 700,000 gallons of liquid hydrogen and liquid oxygen must be delivered from the SLS core stage tanks to the four RS-25 engines at a consistent temperature and pressure. Liquid hydrogen fuel flows into the engines at the extreme super cold, or cryogenic, temperatures of minus 423 degrees Fahrenheit and liquid oxygen at minus 297 degrees Fahrenheit.

Before this massive amount of propellant is delivered to the engines, SLS engineers chill the engines to thermally condition them to receive the propellant. The engine thermal conditioning is "kick started" by delivering liquid hydrogen to the engines at the same time the liquid hydrogen core stage tank is being filled. By doing this early in the launch countdown, engineers can evaluate data and ensure that the engine components are sufficiently saturated with super cold liquid hydrogen that chills them before they proceed with terminal count down leading to launch.

Read more: go.nasa.gov/3xX5FOj

NASA COMPLETES TEST FIRING OF FUTURE ARTEMIS BOOSTER MOTOR



A single solid rocket booster motor fires up at Northrop Grumman's test facility in Promontory, Utah, on July 21, 2022.

Teams from the SLS Program and Northrop Grumman successfully fired a ground-based version of a booster for NASA's mega Moon rocket at Northrop Grumman's test facility in Promontory, Utah, July 21.

Secured horizontally in a test stand, the single five-segment booster motor fired for just over two minutes and produced 3.6 million pounds of thrust. The booster for the test, called Flight Support Booster-2 (FSB-2), is the same size and has the same power as a booster used for launch. Together, the twin solid rocket boosters on SLS produce more than 75% of the initial thrust for an Artemis launch. NASA and Northrop Grumman, the SLS booster lead contractor, are using the test data to evaluate improvements and new materials in the boosters for missions after Artemis III.

The latest booster firing demonstrated the performance of a new motor ignition system and thrust vector control, or steering, system. It also tested new motor components, materials, and processes that may be used to replace obsolete materials and also in the development of the next-generation boosters under the booster obsolescence and life extension effort that supports Artemis IX and beyond.

Read more: go.nasa.gov/3CfFe95

SUBSCALE BOOSTER MOTOR FOR FUTURE ARTEMIS MISSIONS FIRES UP AT MARSHALL



NASA engineers complete a sub-scale solid rocket motor test June 1, 2022, at NASA's Marshall Space Flight Center in Huntsville, Alabama.

Engineers successfully fired a 2-foot-diameter, sub-scale solid rocket booster June 1 at NASA's Marshall Space Flight Center. The test, conducted in Marshall's East Test Area, produced 92,000 pounds of thrust and was done as part of the booster obsolescence and life extension (BOLE) effort, providing an upgraded booster design for the evolved configuration of the SLS rocket for Artemis IX and beyond. The BOLE booster will be a larger and more powerful solid rocket motor to make the SLS rocket capable of sending heavier payloads to the Moon and beyond.

The test was the second in the series to evaluate the new motor design with an added half segment, a new propellant, a new aft dome design, and a new nozzle design. The [first test](#) was completed Dec. 2, 2021, and produced 76,400 pounds of thrust.

Read more: go.nasa.gov/3RcCH3C

ARTEMIS SPOTLIGHT



MARK VACCARO

Mark is the manager of the structures and assembly team for the SLS solid rocket boosters.

For many NASA employees, playing a role in space exploration fuels their passion for the work they do. For Mark Vaccaro, that passion comes from seeing structures and components come together to become new, powerful machines. As manager of the structures and assembly team for the SLS solid rocket boosters, Vaccaro oversees the integration of the boosters with SLS, the most powerful rocket NASA has ever built. He has helped get booster hardware ready for the Artemis I launch at Kennedy Space Center in Florida. He also leads the teams at Kennedy's Booster Fabrication Facility where the aft skirt and forward assembly hardware are being prepared for three additional Artemis missions.

NASA recently recognized Vaccaro's work by awarding him a 2022 Outstanding Leadership Medal. Another reward was getting to see the SLS rocket and Orion spacecraft up close as the stack rolled out of the Vehicle Assembly Building for the first time in March.

Read more: go.nasa.gov/3Emeu0U

NASA'S SUPER GUPPY DELIVERS ROCKET TEST ARTICLE TO MARSHALL



Teams at Marshall unload the Orion stage adapter structural test article from NASA's Super Guppy cargo airplane Aug. 10, 2022.

After performing triple duty in the [Integrated Structural Test](#), testing at Lockheed Martin near Denver, and in [modal testing](#) in the Vehicle Assembly Building at Kennedy prior to preparation for Artemis I, the Orion stage adapter structural test article returned home to Marshall where it was manufactured. Teams at Marshall unloaded the Orion stage adapter structural test article from NASA's Super Guppy cargo airplane Aug. 10. The 5-foot-tall, 18-foot-diameter test article is structurally identical to the flight version of the Orion stage adapter, which connects the rocket's interim cryogenic propulsion stage to the Orion spacecraft. The test article will be stored at Marshall, where it will continue to serve as an engineering resource.

The Super Guppy is capable of hauling loads of more than 48,000 pounds and boasts a cargo compartment 25 feet tall, 25 feet wide, and 111 feet long. Its unique, hinged nose can open to 110 degrees, allowing NASA teams to load and unload large hardware pieces and other oversized cargo from the front end of the craft.

Read more: go.nasa.gov/3Cef7Pz

ARTEMIS II ROCKET ENGINES ARRIVE AT NASA'S MICHLOUD ASSEMBLY FACILITY



Teams deliver the four RS-25 engines that will help power Artemis II to Michoud Assembly Facility.

In September, teams delivered the four RS-25 engines that will help power Artemis II, the first crewed mission of NASA's Artemis missions and second flight of SLS, to NASA's Michoud Assembly Facility in New Orleans. Later this year, the engines will be installed into the Artemis II core stage, which is in the final phase of assembly at Michoud, where it was manufactured. Trucks transported the engines in special containers from NASA's Stennis Space Center near Bay St. Louis, Mississippi, where they were upgraded with new controllers.

Together, the four RS-25 engines will produce more than 2 million pounds of thrust during ascent to help send Artemis II astronauts beyond Earth's orbit to a lunar flyby. Technicians from NASA and Aerojet Rocketdyne, the prime contractor for the engines, will store the engines at Michoud and prepare them for integration into the engine section at the bottom of the rocket's 212-foot core stage. Prior to engine installation, teams will use a pathfinder engine to practice the intricate process of installing each engine on the stage.

Read more: go.nasa.gov/3y5Ln4Z

WHAT'S NEW IN SLS SOCIAL MEDIA

ARTEMIS I Q&A WITH NASA'S SPACE LAUNCH SYSTEM MOON ROCKET EXPERT



SLS Associate Program Manager Dr. Sharon Cobb, right, joins SLS social media specialist Alyssa Lee for a Facebook Live prior to the first Artemis I launch attempt in August from Kennedy Space Center. Cobb and Lee discussed the anticipation surrounding the Artemis I launch and major milestones in the Artemis I mission. Watch here: go.nasa.gov/3yeZLRW

NEW VIEW OF SLS ENGINES GIMBALLING

A new video shows the RS-25 engines gimbaling during the wet dress rehearsal test in June. The engines on SLS will move during flight to help steer the rocket and maintain a trajectory toward the Moon.

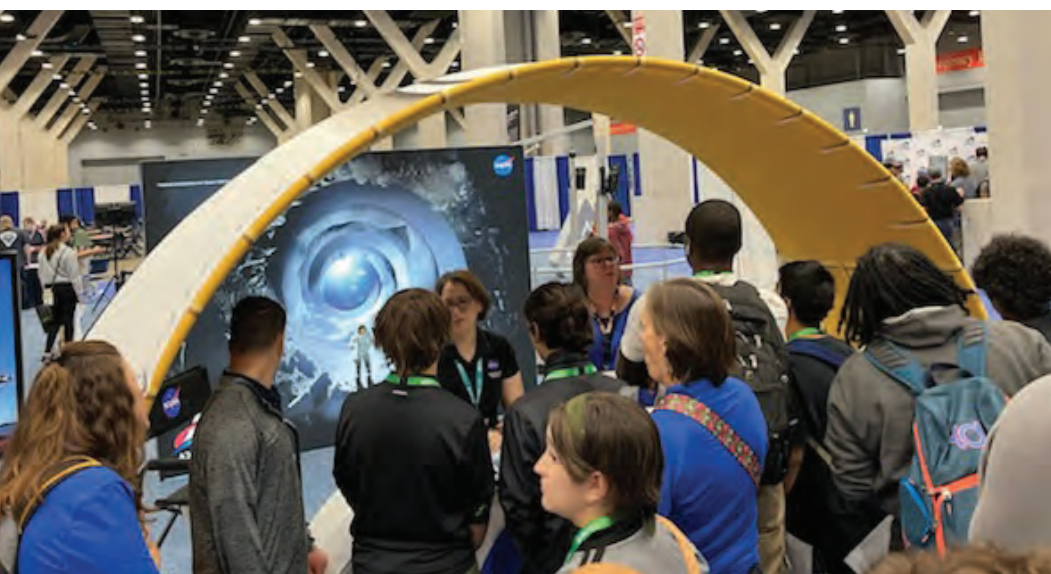
Watch here: go.nasa.gov/3SY71A6



SLS ON THE ROAD



SLS Chief Engineer Dr. John Blevins, seated left, participated in a panel discussion on NASA's Artemis initiative, SLS, and the Artemis I mission at EAA AirVenture in Oshkosh, Wisconsin, in July. Alongside Blevins on the panel were retired NASA astronauts Doug Hurley and Karen Nyberg, seated center and right respectively. SLS Communications Strategist Will Bryan moderated the discussion, which was attended by 300 people and livestreamed.



SLS communication strategists Whitney Sheppard and Twila Schneider spoke to students attending the International Manufacturing Technology Show (IMTS) Smartforce Student Summit in Chicago in September about SLS and Artemis.

SPACEFLIGHT PARTNERS:

Precision Fabricating & Cleaning Company, Inc. (PFC)

LOCATION: Cocoa, Florida

WHAT THEY DO FOR SLS:

Precision Fabricating & Cleaning Company, Inc. (PFC) has been in business for more than 50 years supporting America's space program, from the early Apollo and Gemini days, throughout the Space Shuttle Program, and now to the Moon and beyond. As part of its continued support, PFC is building a variety of ground support equipment in Cocoa, Florida. Spaceflight requires unique and complex fabricating and precision cleaning skills, tasks, processes, and equipment that PFC has experience providing to NASA.



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

A screenshot of the 'SLS in 3.2.1' newsletter. At the top left is the 'SLS in 3.2.1' logo, and at the top right is the 'ARTEMIS' logo. The main content includes a 'Top Three Countdown' section with three items: 'Objectives met', 'On the mark', and 'Safe inside'. Below this is a 'Picture of the Month' section featuring a photograph of a lightning strike at the Kennedy Space Center launch pad. The photo shows a bright lightning bolt striking the ground near the launch pad structure, with the ocean and sky in the background. A timestamp '09/12/2022 22:01:50 880907 (UTC)' is visible in the bottom right corner of the photo. Below the photo is a caption: 'Cameras stationed at NASA's Kennedy Space Center Launch Complex 39B record a lightning strike on Sept. 12. The lightning protection system at the pad protects the SLS rocket, Orion spacecraft, and supporting infrastructure from lightning strikes.'

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



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