National Aeronautics and Space Administration

NASAfacts

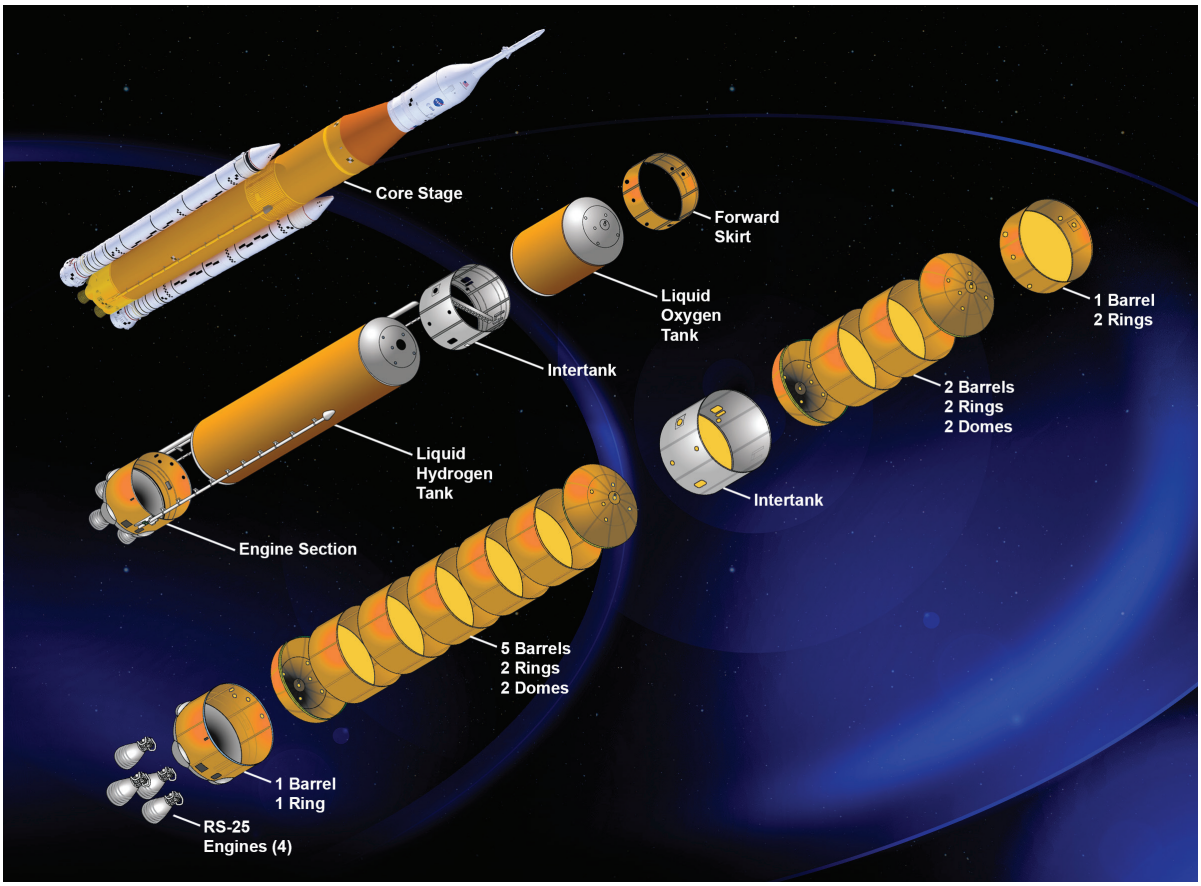
Space Launch System Core Stage

NASA's Space Launch System (SLS) core stage is the world's tallest and most powerful rocket stage. Towering 212 feet with a diameter of 27.6 feet, it will store cryogenic liquid hydrogen and liquid oxygen and all the systems that will feed the stage's four RS-25 engines. It also houses the flight computers and much of the avionics needed to control the rocket's flight. The core stage is designed to operate for approximately 500 seconds, reaching nearly Mach 23 and more than 530,000 feet in altitude before it separates from the upper stage and Orion spacecraft.

SLS is an advanced, super heavy-lift launch vehicle that will provide an entirely new capability for science and human exploration beyond Earth's orbit. With unmatched payload mass and volume capability, SLS is the only rocket that can send the Orion spacecraft, astronauts, and a large cargo to the Moon on a single mission. This reduces the number and complexity of in-space operations and increases the chances of mission success.

The core stage serves as the backbone of the rocket, supporting the weight of the payload, upper stage, and crew vehicle, as well as the thrust of its four RS-25 engines and two five-segment solid rocket boosters attached to the engine and intertank sections.

The core stage is the same diameter as the space shuttle external tank and is covered with an orange spray-on foam to insulate the cryogenic propellants. The stage is made up of 10 major barrel sections, four dome sections and seven rings. Each cylindrical barrel section consists of eight aluminum panels that



vary in length and height. Those components are welded or bolted to form five major components: the liquid hydrogen and liquid oxygen tanks, engine section, intertank and forward skirt. Those five major components are joined to form the completed core stage.

The core stage, largest ever built by length and volume, is being manufactured at NASA's Michoud Assembly Facility in New Orleans using state-of-the-art manufacturing equipment. Michoud is a unique advanced manufacturing facility where NASA has built spacecraft components for decades, including the space shuttle's external tanks and Saturn launch vehicles.

Boeing is the prime contractor for the SLS core stage, including its avionics. Structurally identical versions of four of the five major core stage sections (engine section, intertank, liquid hydrogen and liquid oxygen tanks) are being tested under simulated flight-like stresses at NASA's Marshall Space Flight Center in Huntsville, Alabama.

The core stage contains the vehicle's avionics, including flight computers, cameras, batteries, power and data handling, sensors and other electronics. Flight computer software testing and qualification is underway at Marshall. Hardware and software integration is ongoing to ensure implementation of safe, highly reliable avionics and software on SLS.

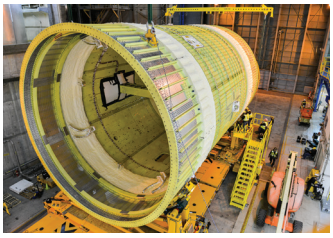
The B-2 test stand at NASA's Stennis Space Center near Bay St. Louis, Mississippi -- originally built to test Saturn rocket stages that propelled humans to the Moon – has been renovated to test the massive SLS core stage. The core stage will be installed on the stand for vibration testing, propellant fill and drain testing, and hot-fire testing. In preparation for shipping the flight core stage to Stennis for testing and then to NASA's Kennedy Space Center for launch, NASA developed a core stage "pathfinder" the same size, shape and weight as the real core stage that is used to test transportation and moving equipment and handling operations.

Core Stage Facts

Length	Approximately 212 feet (64.6 meters)
Diameter	27.6 feet (8.4 meters)
Empty Weight	Approximately 188,000 lbs (85,275 kg)
Capacities	Up to 537,000 gallons (2 million liters), (317,000 pounds) liquid hydrogen (LH2) and 196,000 gallons (742,000 liters), (1.86 million pounds) liquid oxygen (LOX)
Material	Aluminum 2219

SLS's first flight test, called Exploration Mission-1, will feature a Block 1 configuration, capable of sending 209,439 pounds (95 metric tons) to low Earth orbit (LEO) and more than 57,320 pounds (26 metric tons) to the Moon. The Block 1 vehicle will carry an un-crewed Orion crew capsule beyond the moon. The next planned evolution of SLS, Block 1B, would use a more powerful exploration upper stage (EUS), with a capability of 231,485 pounds (105 t) to LEO and up to approximately 88,000 pounds (40 t) to the Moon, enabling more ambitious missions.

A later evolution, Block 2, would use improved boosters and engines to provide 286,601 pounds (130 t) payload to LEO and more than 99,208 pounds (45 metric tons) payload to the Moon. In each configuration, SLS will continue to use the same core stage. Marshall manages the SLS Program for the agency.



Core Stage Intertank Structural Test Article (STA)

Core Stage Liquid Hydrogen Tank for EM-1

Liquid Oxygen Tank for EM-1

Forward Skirt Complete

Engine Section STA

For more information on SLS, visit:

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