

NASA STENNIS SLS *GREEN RUN* TESTING



WHAT WAS GREEN RUN?

Green Run is the term used for the **FIRST “FULL-UP” TEST** of the SLS (Space Launch System) core stage and all of its integrated systems. The testing replicated the launch procedure, even to the point of firing the stage’s **FOUR RS-25 ENGINES SIMULTANEOUSLY**, as during an actual flight, generating 1.6 million pounds of combined sea-level thrust.

WHAT IS THE SLS CORE STAGE?

NASA is building the SLS to carry astronauts on deep space missions to the **MOON** as part of its **ARTEMIS MISSIONS** and, ultimately, to Mars. The core stage is the first stage of the rocket that helps to power liftoff.

WHY WAS IT TESTED?

The SLS had yet to fly prior to 2022. In 2020-21, it was tested prior to its maiden flight in order to identify and address any issues earlier rather than later, to increase the probability of successful missions, and to **ENSURE ASTRONAUT SAFETY**.

WHAT HAPPENED NEXT?

Following the final hot fire test, operators performed necessary **REFURBISHMENT WORK** on the SLS core stage and began putting systems into flight configuration. The stage traveled on NASA’s **Pegasus** barge to NASA’s Kennedy Space Center to be mated with other SLS stages and elements. The full rocket then was moved to a launch pad and prepped for launch of the Artemis I mission.

HOW WAS IT TESTED?

The SLS **CORE STAGE** was installed vertically in the B-2 position of the Thad Cochran Test Stand at NASA’s Stennis Space Center in January 2020. It was anchored in place and all systems connected.

A series of tests then were conducted to ensure stage systems were functioning as needed.

These tests included:

- powering up the core stage’s electronic **AVIONICS SYSTEM**.
- performing propulsion system and engine checks.
- conducting hydraulics and **THRUST VECTOR CONTROL SYSTEM** tests.

The thrust vector control system test ensures operators can gimbal engines during a hot fire, just as they must move during launch to maintain the rocket’s needed trajectory.

During testing, operators established and confirmed the correct **“POWER UP” PROCEDURE** for the stage to ensure that all systems and equipment came on line as needed.

The test team conducted a **“SIMULATED” COUNTDOWN**, in which operators walked through the hot fire procedure without actually flowing propellants through the core stage systems.

A **“WET DRESS REHEARSAL”** was conducted in which propellants were flowed. The test team proceeded all the way up to the point of actual engine ignition before concluding the exercise. Various anomalies were introduced during the exercise to train the team in identifying and addressing issues that may arise during hot fire.

The concluding **HOT FIRE** tested the core stage just as it must operate at launch. All four RS-25 engines fired for eight-plus minutes to produce a combined 1.6 million pounds of sea-level thrust.

Front Image: The Space Launch System core stage installed on the Thad Cochran Test Stand at NASA Stennis