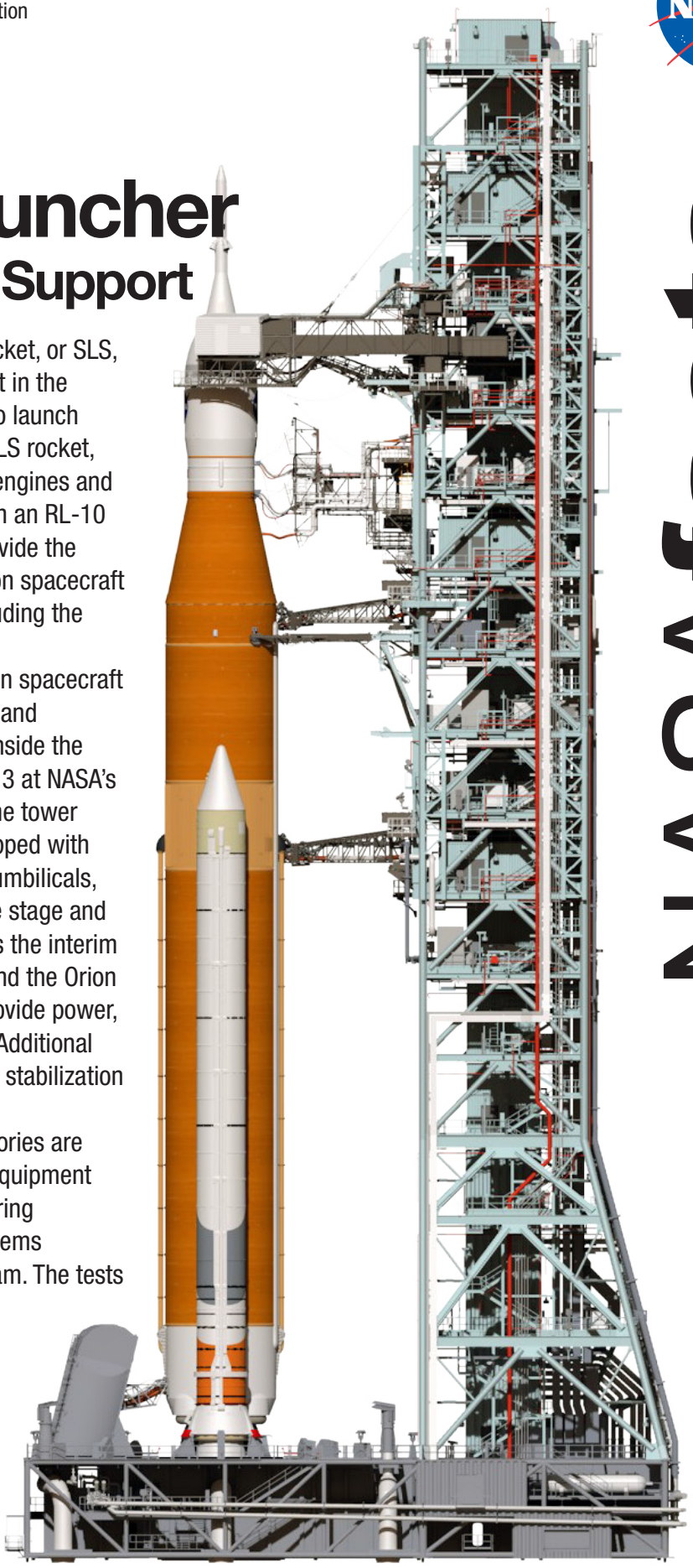
NASAfacts

Mobile Launcher
Umbilicals and Support

NASA's Space Launch System rocket, or SLS, will be the most powerful rocket in the world, and will have the capability to launch humans beyond Earth's orbit. The SLS rocket, powered by four RS-25 core stage engines and two solid rocket boosters, along with an RL-10 in-space propulsion engine, will provide the energy necessary to launch the Orion spacecraft on to deep-space destinations, including the journey to Mars.

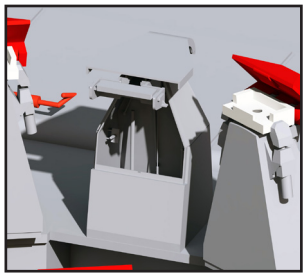
Prior to rollout for launch, the Orion spacecraft will be stacked atop the SLS rocket and processed on the mobile launcher inside the Vehicle Assembly Building High Bay 3 at NASA's Kennedy Space Center in Florida. The tower on the mobile launcher will be equipped with several connections, called launch umbilicals, which will connect to the SLS's core stage and twin solid rocket boosters as well as the interim cryogenic propulsion stage (ICPS) and the Orion spacecraft. These umbilicals will provide power, communications, coolant, and fuel. Additional accessories will provide access and stabilization to the rocket and spacecraft.

The launch umbilicals and accessories are being tested at Kennedy's Launch Equipment Test Facility by the center's Engineering Directorate and NASA's Ground Systems Development and Operations Program. The tests will ensure each launch accessory is functioning properly and is ready for installation on the mobile launcher tower. During launch, each accessory will release from its connection point, allowing the rocket and spacecraft to lift off safely from the launch pad.



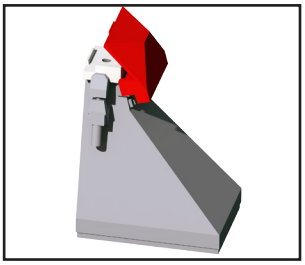
Aft Skirt Umbilicals

Two aft skirt electrical umbilicals, or ASEUs, will connect to the SLS rocket at the bottom outer edge of each booster and provide electrical power and data connections to the SLS rocket until it lifts off from the launch pad. The ASEUs will act like a telephone line and carry a signal to another subsystem on the mobile launcher called the Launch Release System. This system is critical because it will distribute the launch signal to the rest of the launch accessories and the SLS boosters will actually initiate the launch release command.



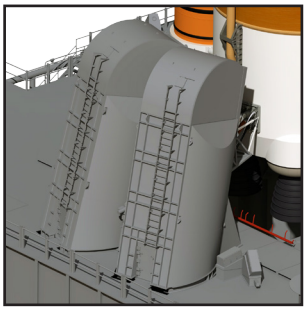
Aft Skirt Purge Umbilicals

Two aft skirt purge umbilicals, or ASPUs, also will connect to the SLS rocket at the bottom outer edge of each booster to remove potentially hazardous gases and maintain temperature range of components through a heated gaseous nitrogen purge to the cavity of each booster's aft skirt. The ASPUs will be connected during stacking operations in the Vehicle Assembly Building and will remain connected until released during liftoff.



Tail Service Mast Umbilicals

Two tail service mast umbilicals, or TSMUs, will connect from the zero-level deck on the mobile launcher to the SLS rocket core stage aft section. The TSMUs are about 33 feet tall. They will provide liquid oxygen and liquid hydrogen fluid lines and electrical cable connections to the SLS core stage engine section to support propellant handling during prelaunch operations. The TSMUs will tilt back before launch to ensure a safe and reliable disconnect and retract of all umbilical hardware away from the rocket during lift-off.

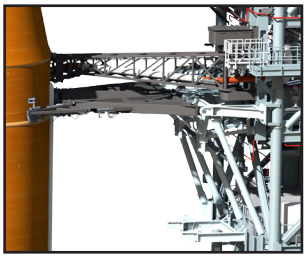


Core Stage Inter-tank Umbilical

The core stage inter-tank umbilical, or CSITU, is a swing arm umbilical that will connect to the SLS core stage inter-tank. The inter-tank umbilical's main function is to vent gaseous hydrogen from the core stage. The arm also provides conditioned air, pressurized gases and power and data connection to the core stage. The CSITU will be located at the 140-foot level on the mobile launcher tower, between the Core Stage liquid hydrogen and liquid oxygen tanks, and will swing away before launch.

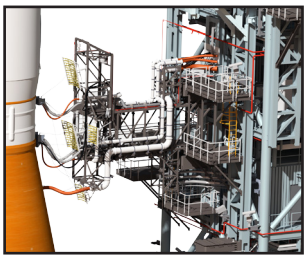
Core Stage Forward Skirt Umbilical

The core stage forward skirt umbilical, or CSFSU, will be located at the 180-foot level on the mobile launcher tower, above the liquid oxygen tank. The CSFSU is an umbilical that will swing into position to provide connections to the core stage forward skirt of the SLS rocket, and then swing away before launch. CSFSU's main purpose is to provide conditioned air/GN2 to the SLS Core Stage Forward Skirt cavity.



Interim Cryogenic Propulsion Stage Umbilical

The interim cryogenic propulsion stage umbilical, or ICPSU, will be located at about the 240-foot level on the mobile launcher tower. The swing arm ICPSU will supply fuel/oxidizer, environmental control systems, pneumatics and electrical connections to the interim cryogenic propulsion stage of the SLS rocket. The engine, just like the core stage engines, uses fuel (hydrogen) and oxidizer (oxygen) to create thrust. The umbilical also will provide hazardous gas leak detection, and swing away before launch.



Orion Service Module Umbilical

The Orion service module umbilical, or OSMU, will connect from the mobile launcher tower to the Orion service module. The umbilical will be located at the 280-foot level of the tower and, prior to launch will transfer liquid coolant for the electronics and purge air/GN2 for environmental control to the Orion service module that houses these critical systems to support the spacecraft. The umbilical also will provide purge air/GN2 for environmental control to the Launch Abort System. The OSMU will tilt back before launch.

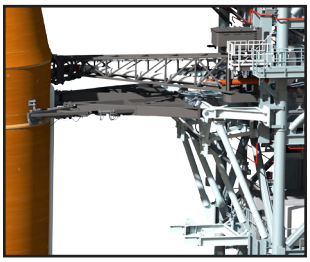
Launch Accessories

Crew Access Arm

The crew access arm, or CAA, will be located at the 274-foot level on the mobile launcher tower. The CAA will rotate from its retracted position and interface with the SLS rocket at the Orion crew hatch location to provide entry in and exit from the Orion crew module. It will provide a safe and unobstructed pathway for entry and exit during processing operations in the Vehicle Assembly Building, and processing and launch operations at Launch Pad 39B. The access arm will provide a clean and controlled work area for personnel and equipment entering the crew module, provide an emergency egress path for flight and ground personnel during emergency conditions, and provide access to the Orion crew module and service module servicing panels for fuel service panel bridge wire checks and contingency servicing and de-servicing operations. On future human missions, the CAA will provide entry and exit for astronauts. The CAA will retract from the Orion spacecraft before launch.

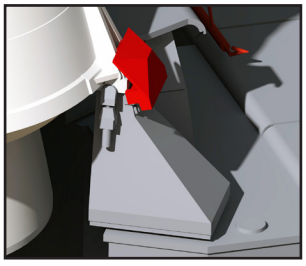
Vehicle Stabilizer System

The vehicle stabilizer system, or VSS, will be located at the 200-foot level of the mobile launcher tower, and will provide a structural interface to the SLS core stage. The VSS will help reduce core stage vehicle motion during rollout to the launch pad, processing operations, high wind events at the pad, and the launch countdown. The stabilizer will drop down and away from the SLS before launch.



Vehicle Support Posts

Eight support posts will support the load of the solid rocket boosters, with four posts for each of the boosters. The support posts are five feet tall and each weigh about 10,000 pounds. They will be located on the deck of the mobile launcher and will be instrumented with strain gages to measure loads during vehicle stacking, integration, rollout and launch. The posts will structurally support the SLS rocket through T-0 and liftoff.



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National Aeronautics and Space Administration

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