National Aeronautics and Space Administration

NASA**facts**

Space Launch System RS-25 Core Stage Engines

Powering America's Exploration of Deep Space: The Engines Behind NASA's Space Launch System

NASA's Space Launch System (SLS), the most powerful rocket in the world, will be driven by engines that combine proven performance with advanced engineering and technology. The SLS will launch astronauts on missions into deep space and eventually to Mars.

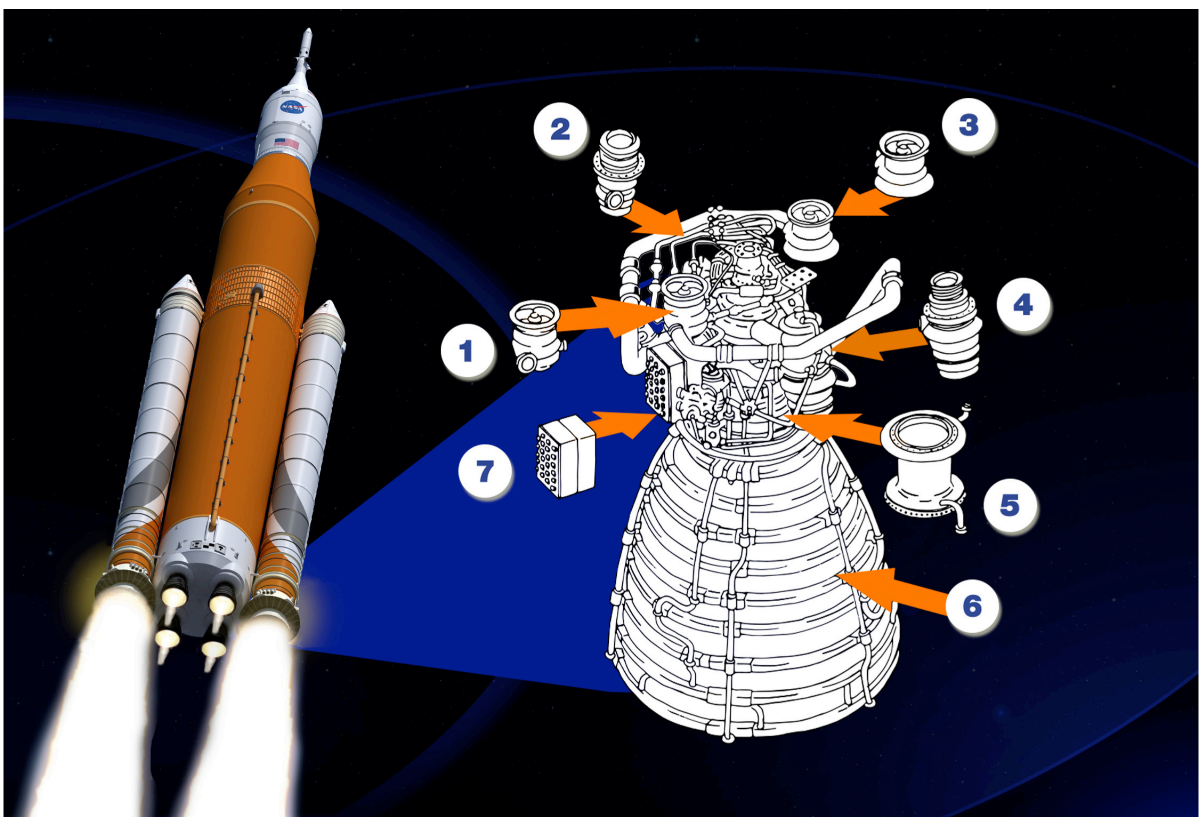
The SLS Program is taking advantage of hardware and cutting-edge manufacturing techniques developed for the space shuttle and other exploration programs. These are being integrated with new designs and new technologies, significantly reducing development and operations costs.

SLS is designed to be flexible and evolvable, to meet a variety of crew and cargo mission needs. An initial 70-metric-ton (77-ton) configuration, referred to as Block 1, will use four RS-25 engines for the core stage, along with two solid rocket boosters.

RS-25 Core Stage Engine Evolution

The RS-25 is the engine that powered the space shuttle during 30 years of operation. The RS-25 is one of the most tested large rocket engines in history, with more than 3,000 starts and more than 1 million seconds of total ground test and flight firing time.

The SLS Program has an inventory of 16 RS-25 flight engines, built by Aerojet Rocketdyne of Sacramento, California. The engines are available for the first four SLS missions, and two development engines are available for ground tests. These



RS-25 Rocket Engine Call-outs: 1-4 - Turbo Pumps, 5 - Main Combustion Chamber, 6 - Nozzle, 7 - Engine Controller engines are being adapted to SLS performance requirements, including improvements like nozzle insulation and a new electronic controller.

The next planned evolution of the SLS, Block 1B, would use a more powerful exploration upper stage to enable more ambitious missions and a 105-metric-ton lift capacity.

While a later evolution, Block 2, would add a pair of advanced solid or liquid propellant boosters, to provide a 130-metric-ton (143-ton) lift capacity. In each configuration, SLS will continue to use the same core stage and four RS-25 engines.

For the SLS, the engines will be operated at 109 percent thrust versus 104.5 percent thrust commonly used for the space shuttle. Significantly, the engine was certified for flight at that level during the shuttle program.

The engines are compact and high performance. At full throttle, each of the four liquid hydrogen/liquid oxygen-fueled engines will produce 512,000 pounds of vacuum thrust, generating 10 times the equivalent thrust-to-weight power density of the largest commercial jet engine.

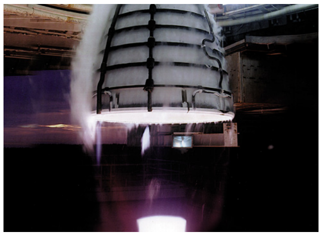
During liftoff, the 70-metric-ton configuration of SLS will have 8.8 million pounds of thrust -- 15 percent more than the Saturn V rockets that launched astronauts on journeys to the moon.

NASA is working with Aerojet Rocketdyne to restart production of a more affordable variant of the RS-25 tested and certified for flight at a higher thrust level. This future engine will use a simplified design and new manufacturing and inspection technologies and processes that reduce handling and support labor, hardware defects and production time.

One of the most promising technologies is selective laser melting. This technology, a form of 3-D printing, uses a high-energy laser and metal powder to produce parts more quickly and at lower cost than possible with conventional manufacturing methods. Because they are not welded, these printed parts are structurally stronger and more reliable, resulting in a safer vehicle.

RS-25 Engine Facts

Thrust..............................	512,000 pounds
Size/Weight	14 feet x 8 feet, 7,775 lbs.
Operational Thrust	109%
Operational Time	8 minutes
Operating Temp. Range...	- 423 to + 6000 degrees F



For more information about SLS, visit:

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