BBC

THE ROCKET TO RETURN HUMANS TO THE MOON

NASA's Space Launch System gets ready for blast off

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Shooting for the Moon

NASA's newest rocket, the Saturn V-sized Space Launch System, will take human exploration beyond low-Earth orbit once more

When the Space Shuttle programme shut down in 2011, NASA was left unable to launch heavy payloads into orbit. But that will soon change as the agency prepares to launch its Space Launch System (SLS) in March or April of this year. The SLS will eventually carry payloads of up to 45 tonnes to lunar orbit and is a key part of the Artemis programme, NASA's endeavour to send the first woman to the lunar surface by 2025.

Initially, the SLS's first test launch was due in 2016, but the system proved more challenging than expected. Even after six years' delay, the 2022 SLS is not the final version. The first three launches will use the Block 1 design shown here, followed by a Block 1B version with a more powerful upper stage, before being replaced by a Block 2 design with even more thrust. But even in Block 1, SLS will produce 15 per cent more thrust than the Saturn V.

Currently, NASA's budget allows one SLS a year to be produced at most. The first three have all been earmarked for the Artemis programme and, with a successful test this spring, NASA will begin to stage increasingly ambitious deep space missions – both human and robotic – to the Moon, Mars and beyond.

SLS Block 1 by numbers

Height: 98m
Weight: 2.6 million kg
Payload weight to low-Earth orbit: 95 tonnes
Payload weight to the Moon: 27 tonnes
Thrust: 39 million newtons
Solid fuel: Polybutadiene acrylonitrile
Liquid fuel: Oxygen and hydrogen
Top speed: 39,500km/h

Solid Rocket Boosters (SRBs)

Once the command to ignite the SRBs is given by the onboard computer, a booster charge fires down the length of the rocket, which in turn ignites the solid rocket propellant.

Core Stage

Contains the liquid fuel that feeds the four RS-25 engines. It burns through 2 million litres of liquid hydrogen (orange tank) and almost 750,000 litres of liquid oxygen (blue tank) in eight minutes to reach low-Earth orbit.

Four RS-25 engines

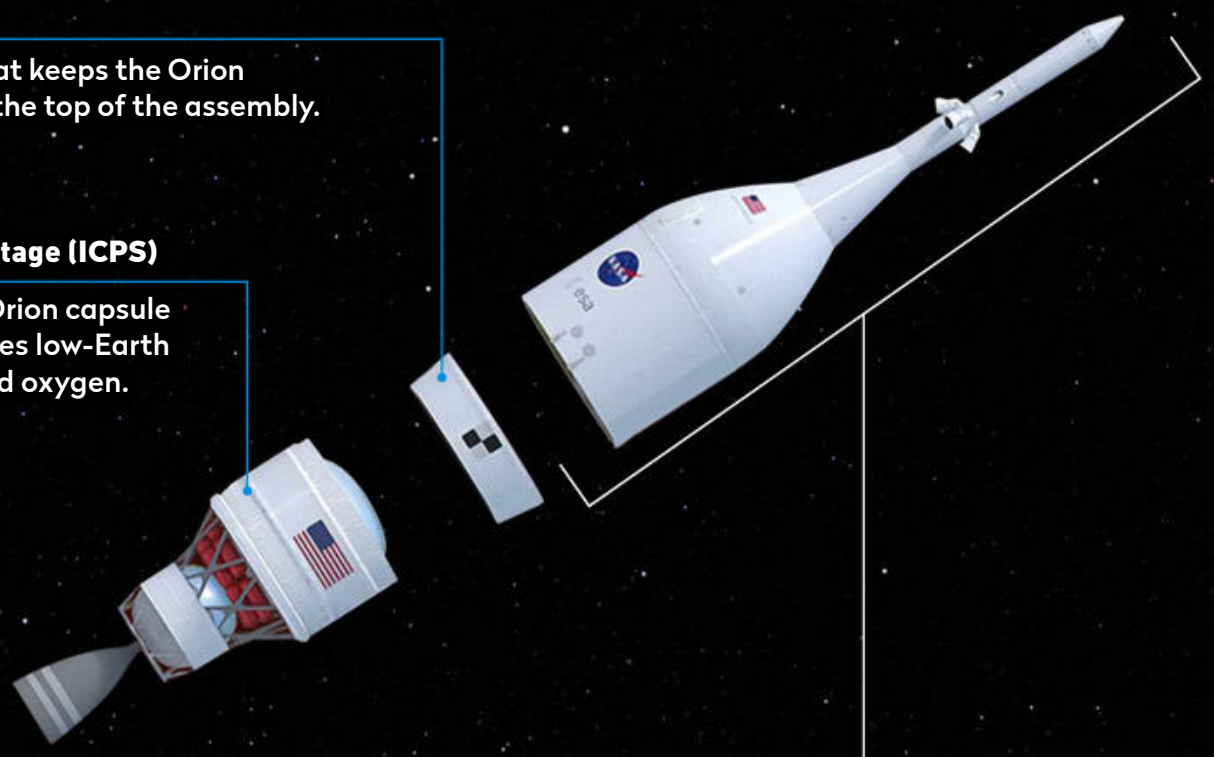
Originally designed for use on the Space Shuttle, these provide propulsion for the entirety of the rocket's ascent and have a 'gimbal bearing', which keeps the rocket on course.

Orion stage adaptor

A ring-shaped device that keeps the Orion spacecraft attached to the top of the assembly.

Interim Cryogenic Propulsion Stage (ICPS)

The ICPS is used to propel the Orion capsule towards the Moon once it reaches low-Earth orbit. It uses liquid hydrogen and oxygen.

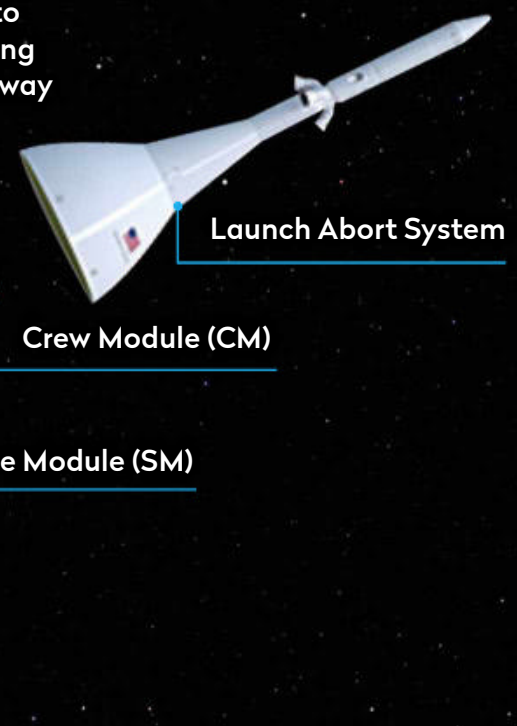


Launch Vehicle Stage Adaptor (LVSA)

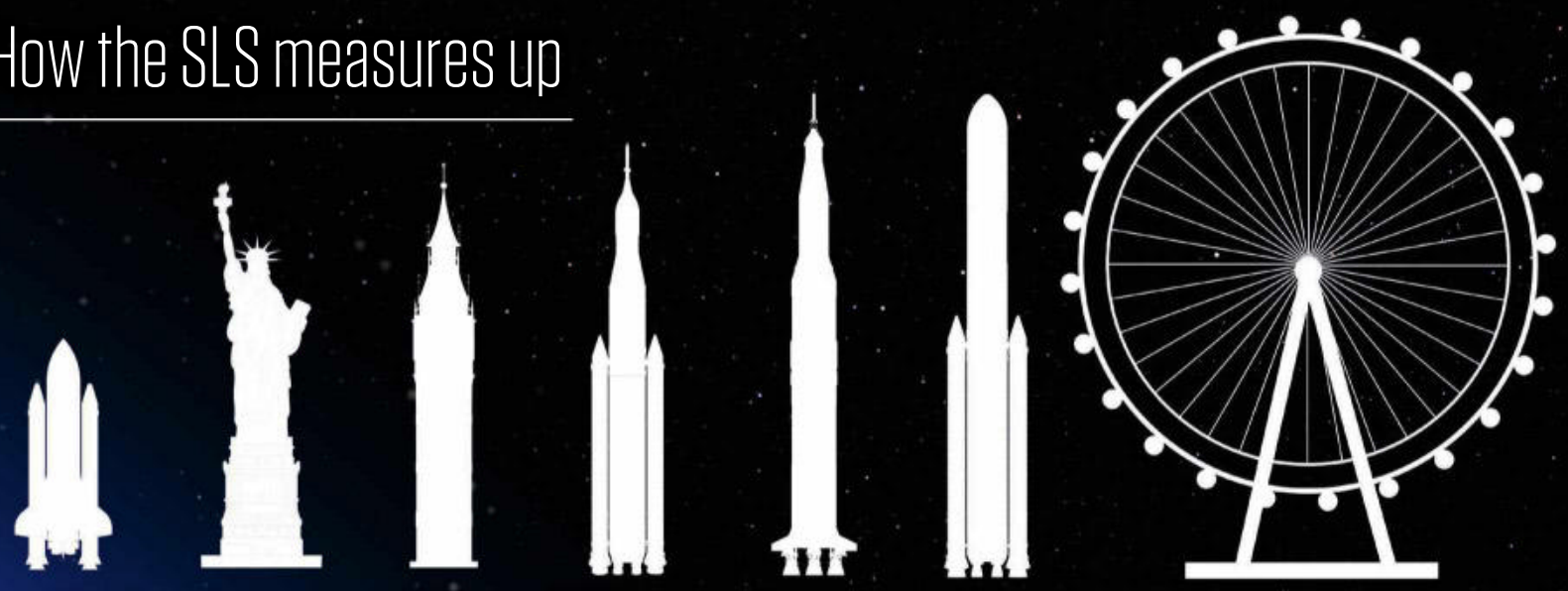
A 9m-tall cone that connects the upper and lower stage, encasing the ICPS (Interim Cryogenic Propulsion Stage).

Orion spacecraft

The Orion spacecraft will begin its journey attached to the top of the Core Stage. Its Crew Module (CM) is designed to ferry up to six astronauts beyond low-Earth orbit. If something goes wrong at launch, the Launch Abort System (LAS) will carry the CM away from danger. The LAS and the Core Stage will detach once the spacecraft reaches low-Earth orbit, along with the protective panels. The ICPS will then fire, sending the spacecraft towards the Moon.



How the SLS measures up



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