

NASA's Space Launch System

Exploration, Science, Security



SLS Block 1B Launching
Crew and Cargo





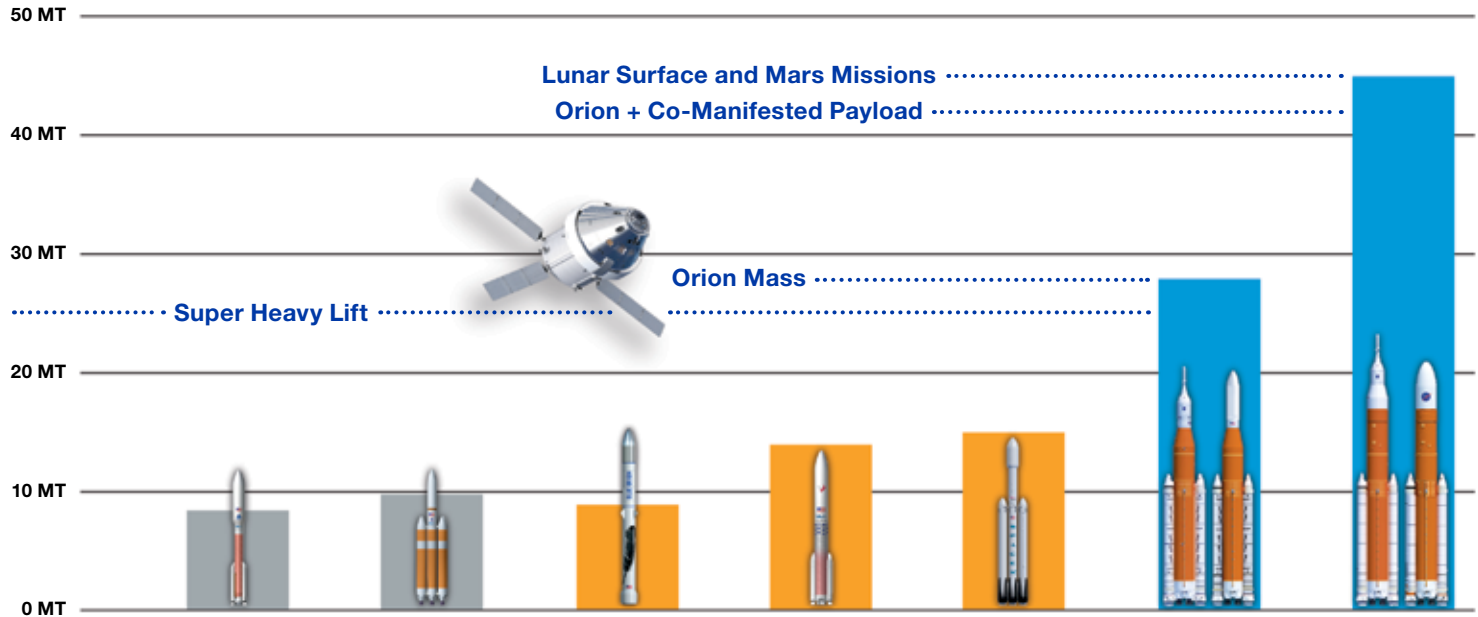
America's Space Launch System (SLS)

Designed and built from the ground up by NASA and its industry partners to enable deep space missions.

SLS: The Most Capable National Asset for NASA Exploration Missions

With the needed performance to establish a robust marketplace in deep space

Performance to Trans-Lunar Injection



MT: Metric Ton

Atlas V
551

Delta IV
Heavy

New
Glenn

Vulcan
Heavy

Falcon
Heavy

SLS
Block 1

SLS
Block 1B

Space Launch System Made in the USA

SLS currently supports 28,000 jobs and more than 1,100 supplier companies in 45 states with \$5.5 billion in SLS Program economic impact.

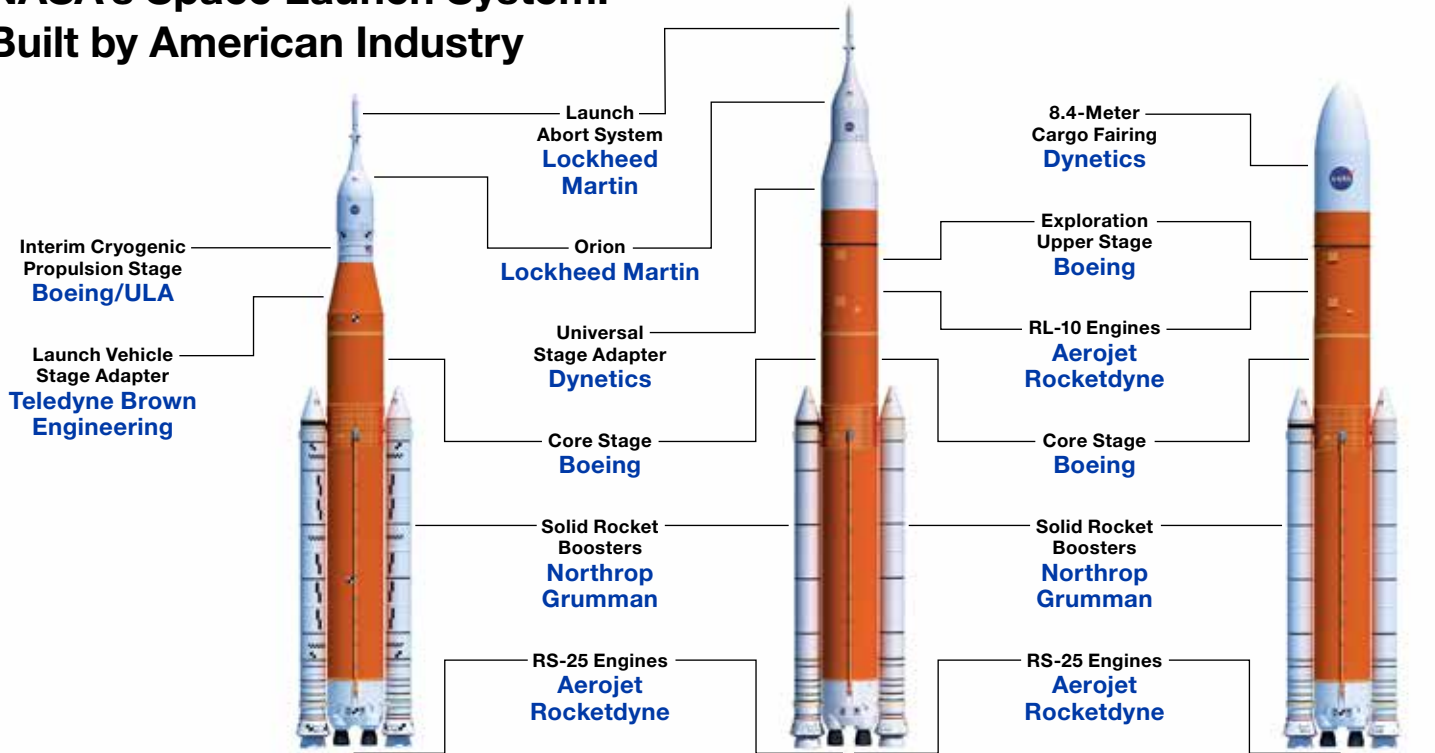


★ NASA Centers and Facilities

■ Supplier States

NASA Economic Impact Study

NASA's Space Launch System: Built by American Industry



SLS
Block 1

SLS
Block 1B Crew

SLS
Block 1B Cargo

More than 42 Metric Tons to Trans-Lunar Injection (TLI)

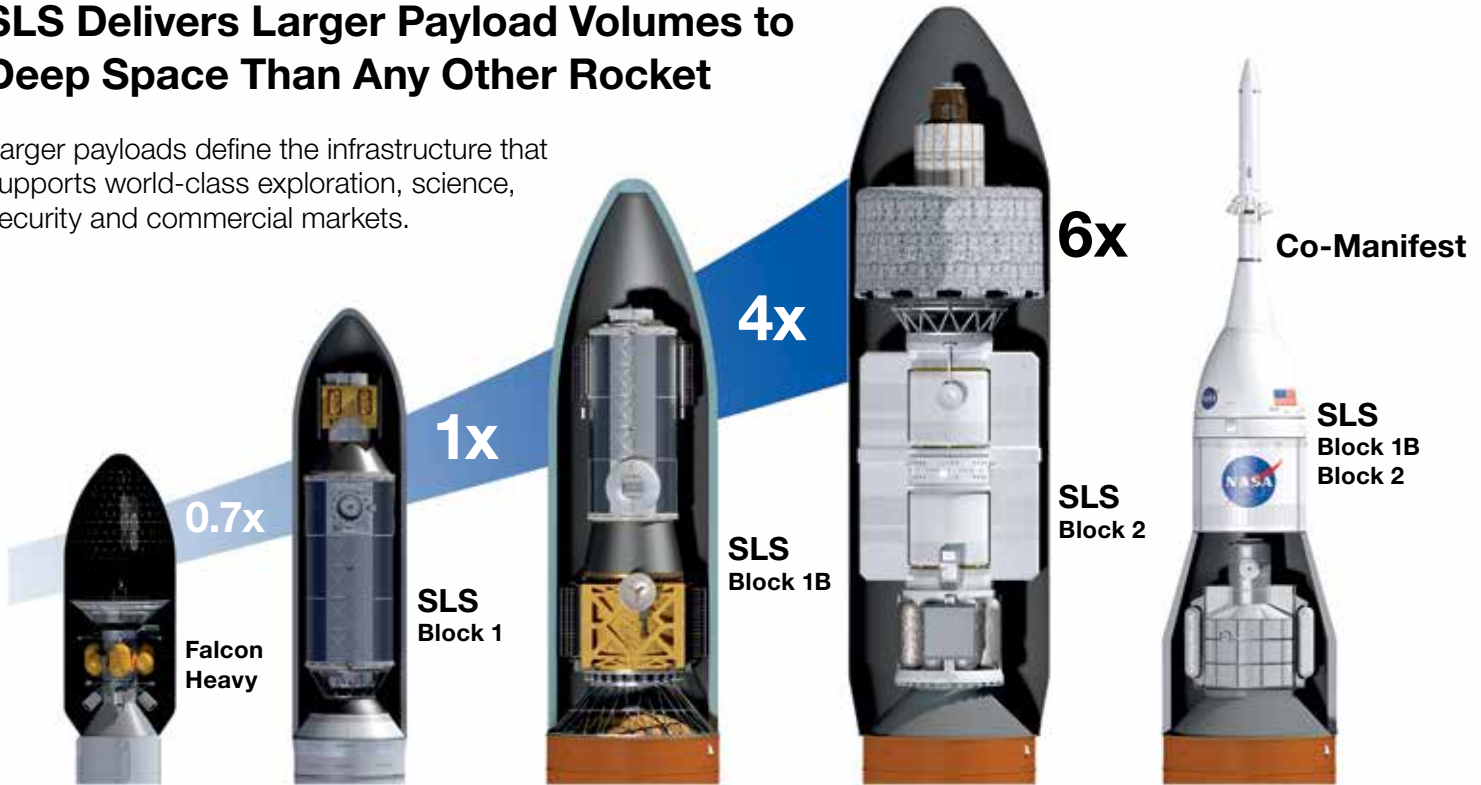
SLS with Exploration Upper Stage (EUS) launches three times more mass to orbit than any other rocket.



America's journey starts with SLS.

SLS Delivers Larger Payload Volumes to Deep Space Than Any Other Rocket

Larger payloads define the infrastructure that supports world-class exploration, science, security and commercial markets.



5 x 13 m
(200 m³)

5 x 19 m
(300 m³)

8.4 x 27 m
(1,200 m³)

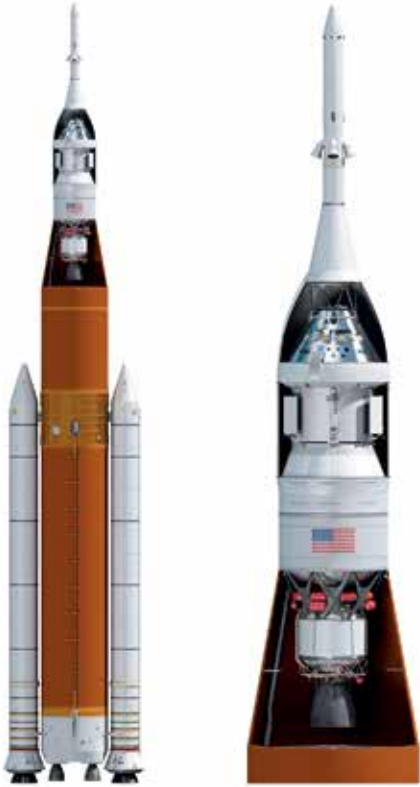
10 x 32 m
(1,800 m³)

8.4 x 10 m
Human Exploration Missions

NASA Lunar Missions: The First Woman and Next Man to the Moon's Surface

SLS is the only rocket that can launch Orion for unprecedented access to the Moon.





Orion Crew Spacecraft

Mission

Launch Orion to deliver the first woman and next man to the Moon.

Mission Purpose

Orion will deliver astronauts to lunar orbit and return them safely to Earth. Crewed missions advance scientific discovery, strengthen our economy, fuel innovation and inspire the next generation of explorers.

SLS Capabilities

SLS investment provides a safe, low-risk, affordable and sustainable pathway to the Moon and Mars and supports NASA human exploration objectives.

SLS Block 1 Lift Capability (Crew): 27 MT to Lunar Orbit

Human Exploration

Super Heavy Lift for Deep Space Missions

The SLS Exploration Upper Stage provides the largest payload capacity and reduced operations complexity for lowest mission risk.





Co-Manifested Payload Launched With Orion

Mission

Launch and deploy a range of payloads in tandem with Orion on deep space missions.

Mission Purpose

Combining missions in a single launch streamlines operations for safety. Large payload capacity simplifies element designs and lowers cost.

SLS Capabilities

Since the retirement of Shuttle, only the SLS Block 1B allows co-manifesting of crew and large payloads. A universal stage adapter supports Orion and provides an enclosed, protected volume for payloads. Only the SLS Block 1B can launch a crewed Orion to the Moon with up to 12 additional metric tons.

SLS Block 1B Lift Capability: Up to 12 MT + 27 MT Orion

Human Exploration

Sustainable Lunar Presence

Only SLS Block 1B makes it possible to deliver a cargo lander and fully outfitted lunar habitat in a single launch.





Lunar Surface Habitat

Mission

Launch a long-term habitat enabling extended crew surface missions to prepare for Mars exploration, accelerate science returns and begin resource extraction.

Mission Purpose

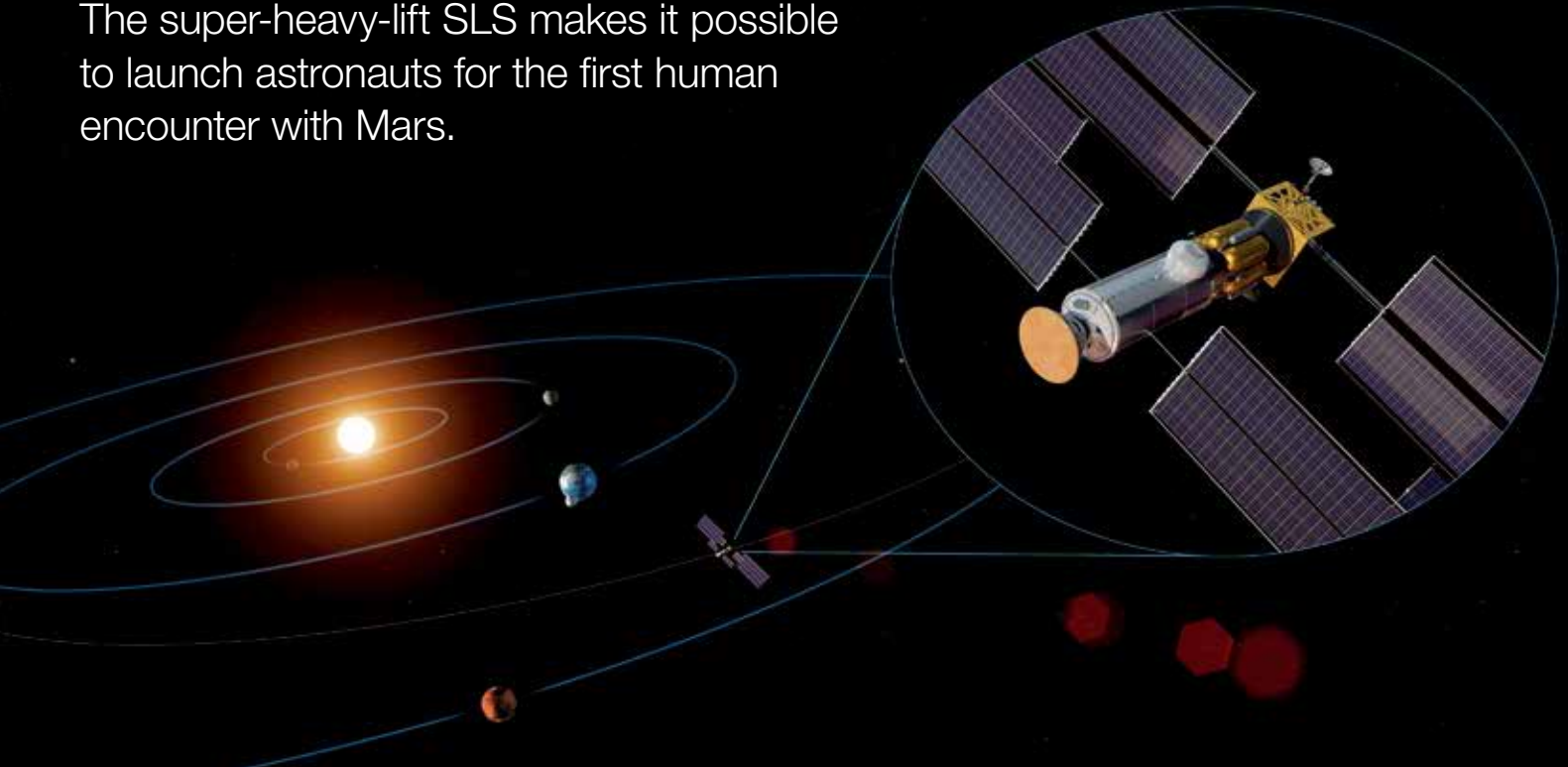
Extended lunar surface stays are pathfinders for longer Mars missions. With protected living and work space and an airlock for surface access, crews can test technologies and study the impacts of low gravity, lunar regolith and radiation exposure. We can practice ways of working far from Earth while near enough for safe, timely return.

SLS Capabilities

Only SLS with Exploration Upper Stage (EUS) can deliver — in a single launch — a cargo lander and fully outfitted surface habitat stocked for a 60-day mission. A turnkey system reduces risk, schedule and mission complexity.

SLS “Go” for 2033 Crewed Mars Flyby

Every 15 years, Mars and Earth orbits present the unique opportunity for a free-return flyby of Mars. The super-heavy-lift SLS makes it possible to launch astronauts for the first human encounter with Mars.



Mars 2033: First Crewed Flyby of the Red Planet

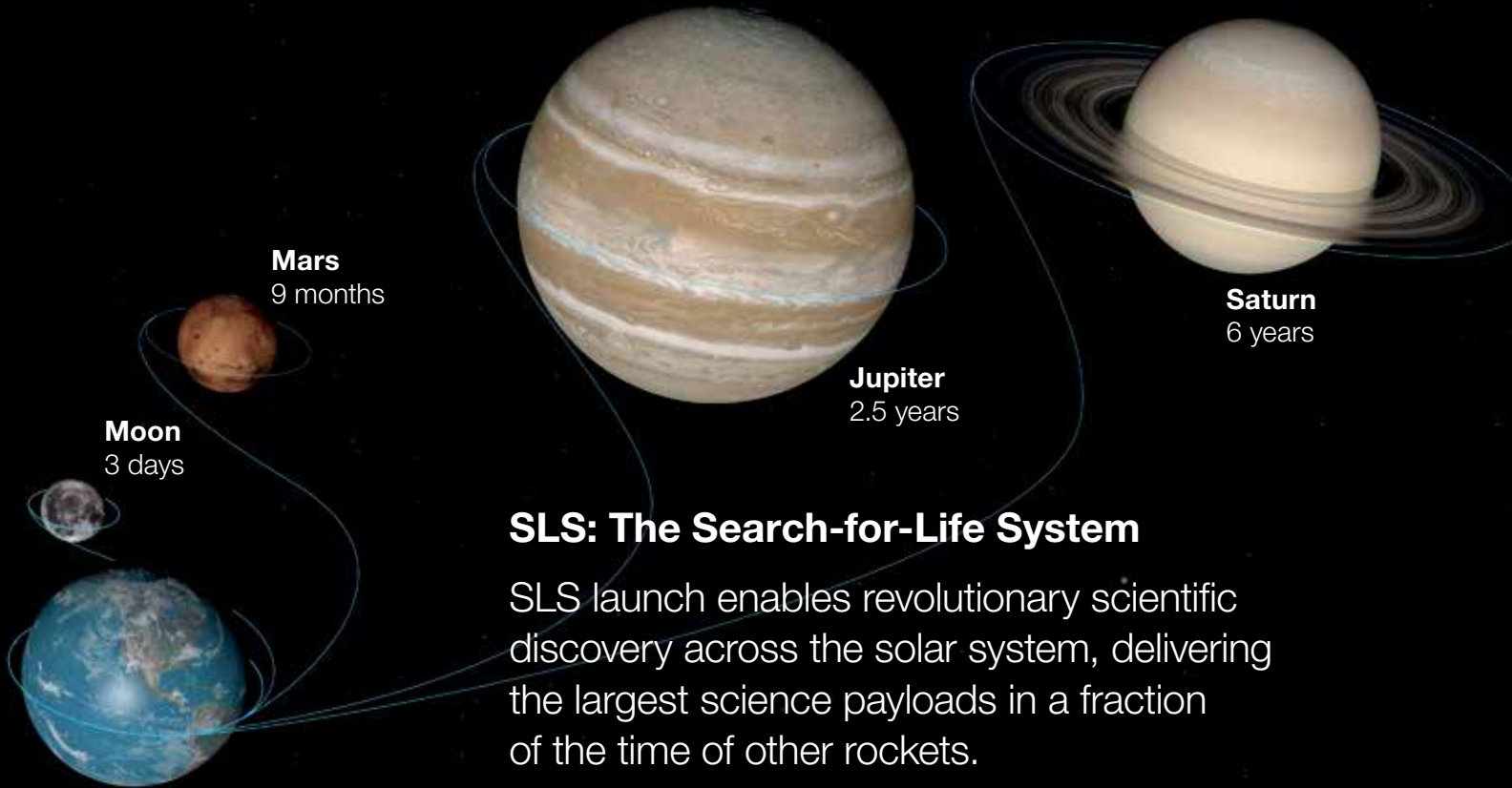
SLS makes this possible by launching the necessary elements and simplifying the mission.



Sustainable Mars Presence

A 2033 crewed Mars flyby launched by SLS enables firsthand human experience and critical data to later land humans and build a long-term sustainable outpost.





Moon
3 days

Mars
9 months

Jupiter
2.5 years

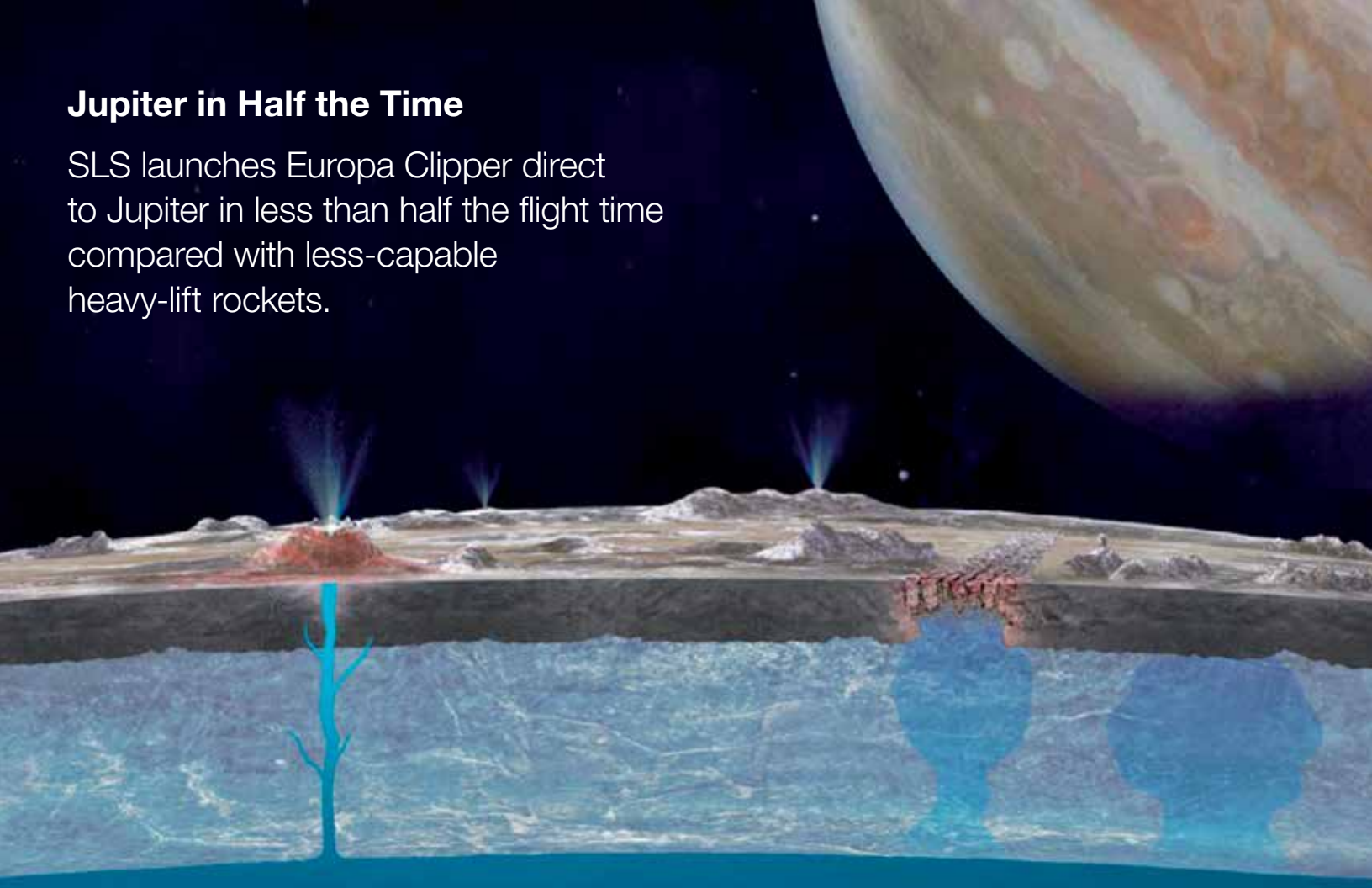
Saturn
6 years

SLS: The Search-for-Life System

SLS launch enables revolutionary scientific discovery across the solar system, delivering the largest science payloads in a fraction of the time of other rockets.

Jupiter in Half the Time

SLS launches Europa Clipper direct to Jupiter in less than half the flight time compared with less-capable heavy-lift rockets.





Europa Clipper

Mission

Deliver spacecraft to Jupiter, enabling repeatable flybys of its moon Europa in the ongoing search for life within the solar system.

Mission Purpose

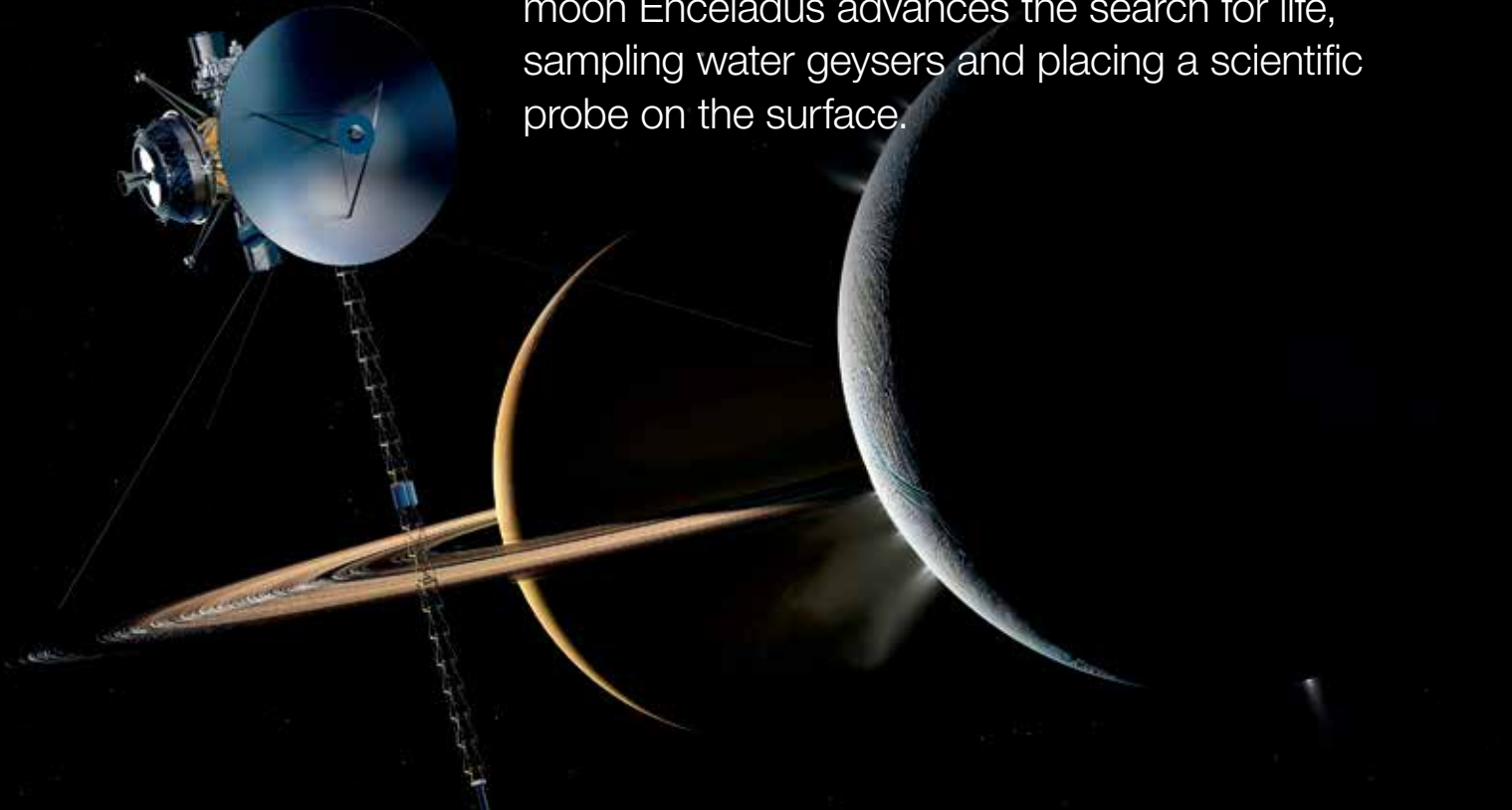
Europa Clipper will investigate the moon's ice shell, a potential subsurface liquid ocean, and surface-ice-ocean exchange processes. Resulting data will advance our understanding of Europa's composition, geologic features and chemical makeup.

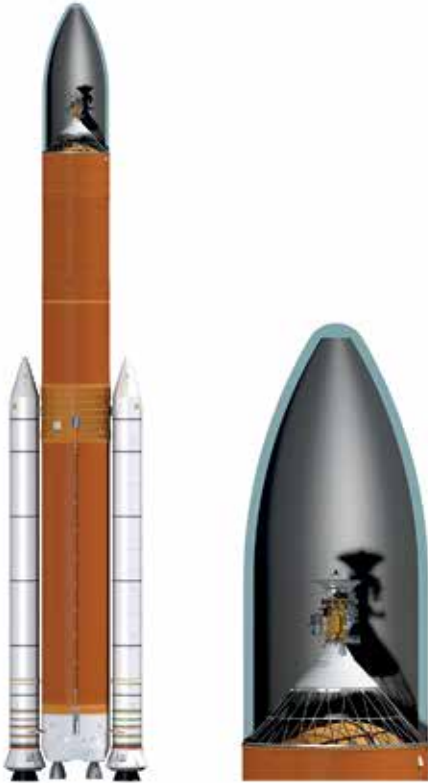
SLS Capabilities

SLS provides a direct launch to Jupiter, reaching orbit in less than half the time of missions on other launch vehicles. By maximizing and accelerating science returns, SLS ensures U.S. leadership and discovery firsts.

Where There's Water, There May Be Life

SLS launch of a robust spacecraft to Saturn's moon Enceladus advances the search for life, sampling water geysers and placing a scientific probe on the surface.





Enceladus Orbiter

Mission

Launch an orbiter to Saturn's moon Enceladus to make scientific investigations in search of extraterrestrial life, sample water geysers and release a surface probe.

Mission Purpose

Saturn's gravity exerts strong tidal forces that melt ice inside Enceladus, causing an underground ocean and water cryovolcanoes. Enceladus' oblong orbit means variations in the gravitational pull, regularly distorting Enceladus' shape and flexing and heating the interior. The Enceladus orbiter will investigate eruptions and sample water geysers where life could be present.

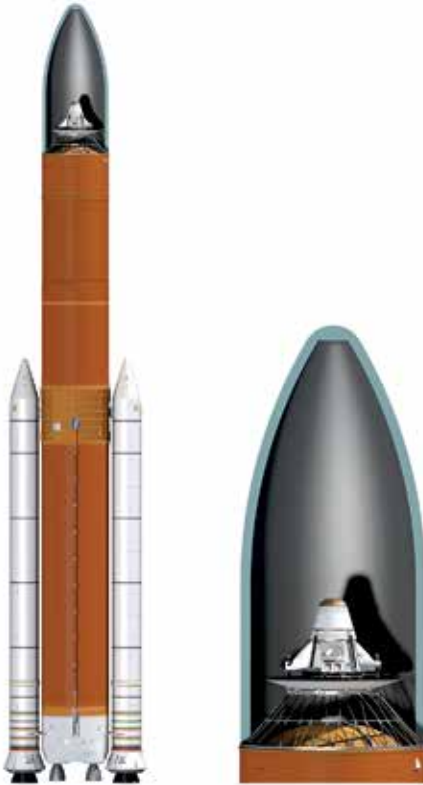
SLS Capabilities

SLS can launch a 4.1 metric ton high-science mission to reach Enceladus with more mass and in only six years — faster than any other rocket.

Exploring the Surface of Saturn's Moon Titan

SLS launch of a lander
investigates Titan's atmosphere
and surface features, including
large hydrocarbon lakes, in search
of living, organic matter.





Titan Lander

Mission

Launch a spacecraft to investigate Saturn's moon Titan and its hydrocarbon lakes.

Mission Purpose

The SLS Block 1B launcher can send 4.1 metric tons toward Saturn with an outbound trip time of six years. The spacecraft will enter Titan's thick nitrogen atmosphere and descend near one of Titan's hydrocarbon lakes. A rover will investigate the surface and shoreline, while the lander investigates the atmosphere. Titan is the only known body in the solar system, other than Earth, with liquid lakes.

SLS Capabilities

Only the SLS Block 1B can inject a large spacecraft on a six-year direct transfer to Saturn — with more mass and faster than any other rocket.



Reaching Unexplored Regions of Space

SLS launches a robust, high-science-return spacecraft to explore areas never before seen on Neptune and Triton, inspiring the next generation of explorers and scientists.



Neptune Science Orbiter

Mission

Launch an orbiter for scientific investigations to characterize Neptune and its largest moon, Triton.

Mission Purpose

Neptune and Triton are scientifically interesting, yet-to-be-explored bodies in our solar system. Similar in size, density, temperature and chemistry to Pluto, Triton reflects up to 95% of the sunlight that strikes it. Surface features are formed of water ice, with eruptions at low cryogenic temperatures. Polar caps and wind streaks can be seen on Triton's surface.

SLS Capabilities

Only the SLS can launch the significant mass of a high-science mission to Neptune.



Fastest Ride to Interstellar Discovery

SLS goes farther and faster to deliver the Interstellar Explorer beyond the solar system in 15 years — half the flight time of other design concepts.



Interstellar Explorer

Mission

Significantly reduce travel time for the 18 billion mile trip to interstellar space (200 times the distance from the Earth to the sun), launching for the first time in more than 50 years a spacecraft destined to go beyond our solar system.

Mission Purpose

Interstellar exploration beyond the sun's influence unlocks the keys to the origins of the solar system. By characterizing interstellar gas, low-energy cosmic rays, dust and magnetic fields, we can understand the influence of the sun on the interstellar medium.

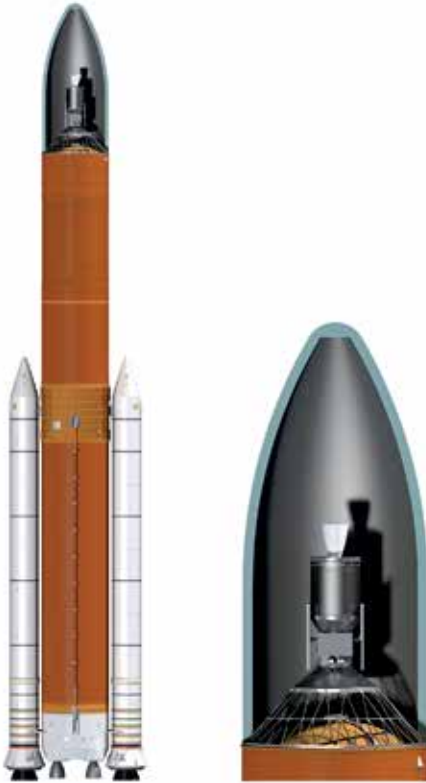
SLS Capabilities

SLS reaches interstellar space in 15 years, going farther and faster than any other rocket.



Protecting Our Planet From Asteroids

SLS delivers the Exploration Upper Stage with attached solar electric propulsion to an Earth-threatening asteroid and exerts a gravity tug to push its path well clear of Earth.



Planetary Defense: Apophis Asteroid

Mission

Launch SLS Block 1B Exploration Upper Stage (EUS) to reach Apophis by 2029 to demonstrate asteroid deflection capability to prevent potential Earth impact from this or other asteroids.

Mission Purpose

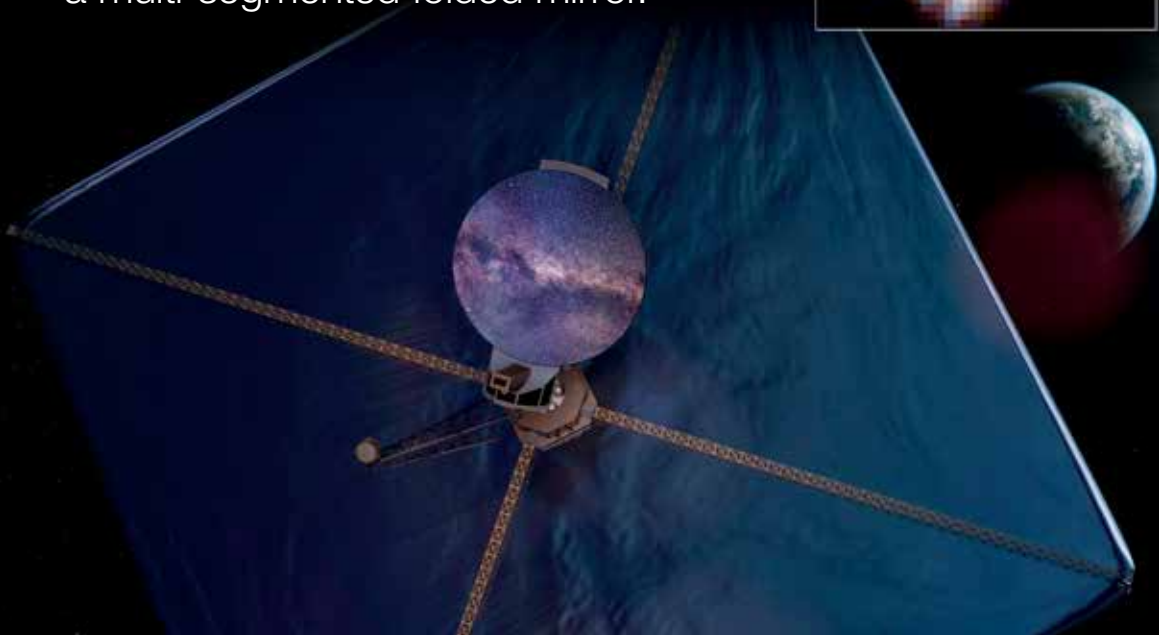
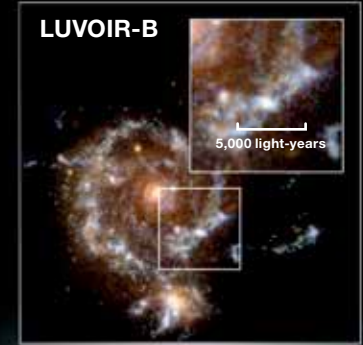
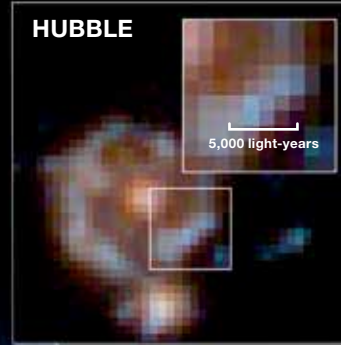
By interacting with Apophis and exerting a gravity tug, a heavy spacecraft can deflect a large asteroid to demonstrate SLS' capability for planetary defense.

SLS Capabilities

Only SLS Block 1B, with its massive EUS, can deflect Apophis before its 2029 close-Earth passage and reduce mission timeline by 2.5 years.

Putting Deep Space in Focus

SLS launch of LUVOIR's 8-meter diameter optic telescope mirror as a single piece eliminates the complexity and cost of deploying a multi-segmented folded mirror.





Large Space-Based Observatories

Mission

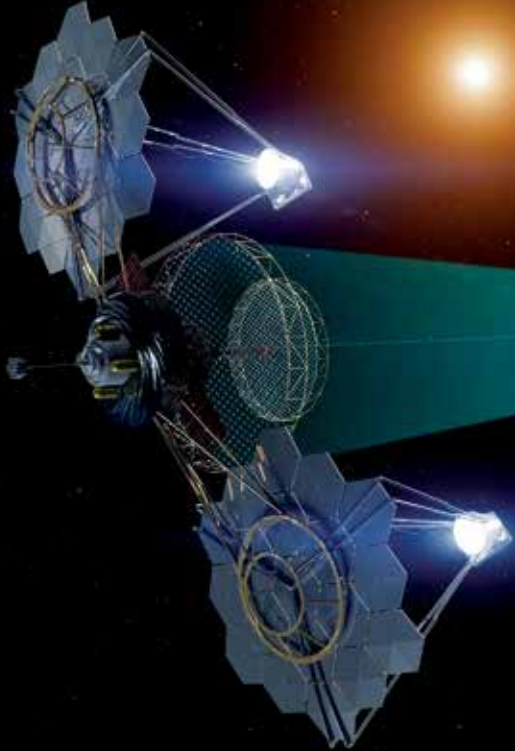
Launch missions to observe exoplanets with applications for imaging and spectroscopy of solar system bodies in unprecedented detail and clarity.

Mission Purpose

Large space-based telescopes, including the Large Ultraviolet Optical Infrared Telescope (LUVUIR) can launch on SLS. With more than 40 times the fidelity of the Hubble Space Telescope, the observatories will be designed to image habitable exoplanets.

SLS Capabilities

Only the SLS Block 1B has a large enough payload fairing and sufficient lift to place large space-based observatories in the required orbit. For example, an 8-meter monolithic optic variation, LUVUIR-B, can be launched to a Sun-Earth L2 orbit.

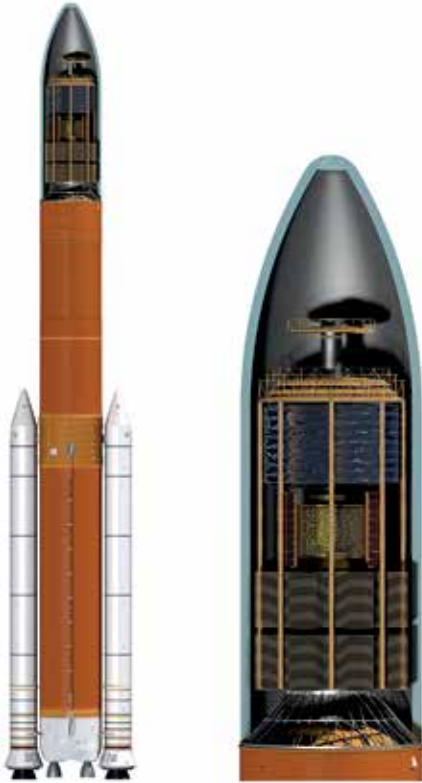


Creating New Commercial Markets

The power of SLS makes it possible to harness the power of the sun to provide clean energy for Earth.



Space Solar Power



Commercial Space Solar Power

Mission

Launch a solar power plant to Earth orbit to provide constant electrical power to U.S. metropolitan areas and remote installations.


Mission Purpose

Space solar power provides a clean, constant source of power, day and night, in all weather conditions. Generated in space, power is safely beamed to a ground station for distribution into the U.S. electricity grid.

Solaren Corp. has patented a space solar power plant, enabled by the volume and lift of the SLS Block 1B. In addition to powering U.S. homes, transportation and industry, the power plant can unlock the multitrillion-dollar electricity market to commercial U.S. export of clean, renewable energy.

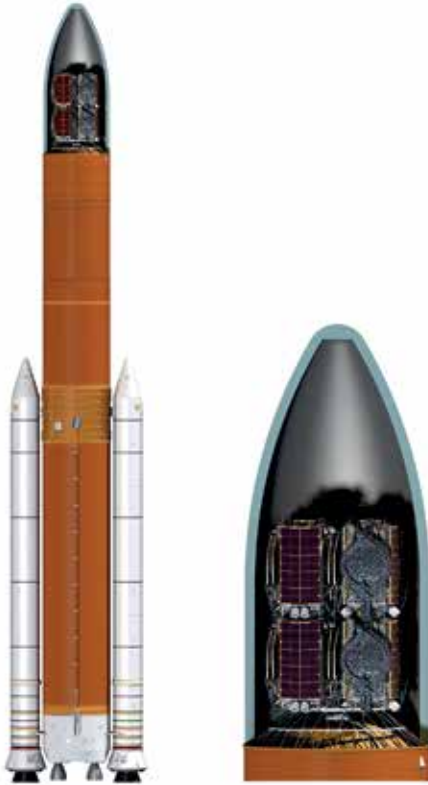
SLS Capabilities

Only the SLS Block 1B has a large enough payload fairing and sufficient lift to place Solaren's prototype solar power satellite into orbit.



National Security

SLS projects U.S. power into deep space with the world's most powerful rocket to deliver unmatched capability to orbit.



National Security

Mission

Leverage NASA investment in SLS super-heavy-lift capability for national security, and reduce launch availability risk for existing programs.

Mission Purpose

A “Whole of Government” approach benefits the U.S. government by minimizing duplication. With more than triple the performance of any other rocket, SLS provides capability for the Department of Defense and other agencies supporting national security objectives. SLS performance extends operating reach, provides resilience for existing systems and allows rapid reconstitution of constellations.

SLS Capabilities

SLS Block 1B has performance margin to launch the heaviest and most demanding missions envisioned for national security. SLS Block 1B provides alternative launch for national security heavy lift, enabling assured access to space.

www.boeing.com/sls

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