Vision for Space Exploration

Complete the International Space Station

Safely fly the Space Shuttle until 2010

Develop and fly the Crew Exploration Vehicle (by 2015)

Return to the moon (by 2020)

Sustained and affordable human and robotic program

Develop innovative technologies, knowledge, and infrastructures

Promote international and commercial participation

NASA is building a new spacecraft that will become America's primary vehicle for human space exploration in the next decade. The new spacecraft, Orion, is part of the Constellation Program to send explorers to the moon and onward to other destinations in the solar system.

NASA has established 6 Themes for Exploration

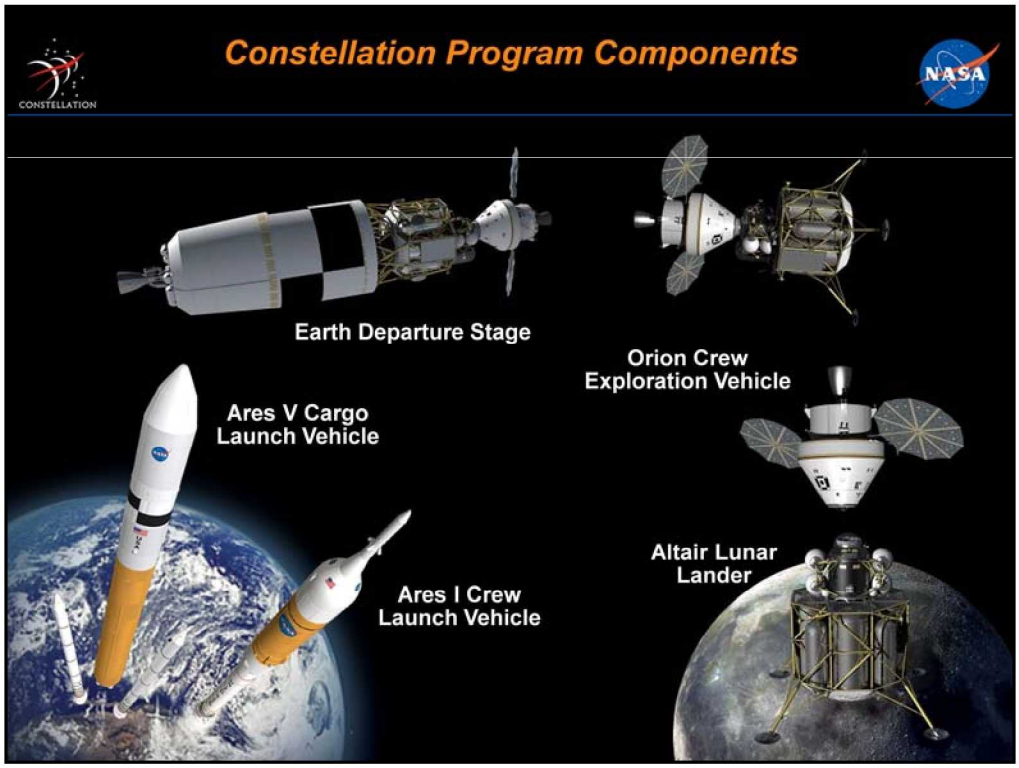
USE THE MOON: Reduce risks and cost and increase productivity of future missions by testing technologies, systems, and operations in a planetary environment other than the Earth

PURSUE SCIENTIFIC: Engage in scientific investigations of the Moon (solar system processes), on the Moon (use the unique environment), and from the Moon (to study other celestial phenomena)

EXTEND PERMANENT HUMAN PRESENCE: Develop the capabilities and infrastructure required to expand the number of people, the duration, the self-sufficiency, and the degree of non-governmental activity

EXPAND EARTH'S ECONOMIC SPHERE: Create new markets based on lunar activity that will return economic, technological, and quality-of-life benefits

ENHANCE GLOBAL SECURTIY: Provide a challenging, shared, and peaceful global vision that unites nations in pursuit of common objectives
ENGAGE, INSPIRE: Excite the public about space, encourage students to pursue careers in high technology fields, ensure that individuals enter the workforce with the scientific and technical knowledge necessary to sustain exploration

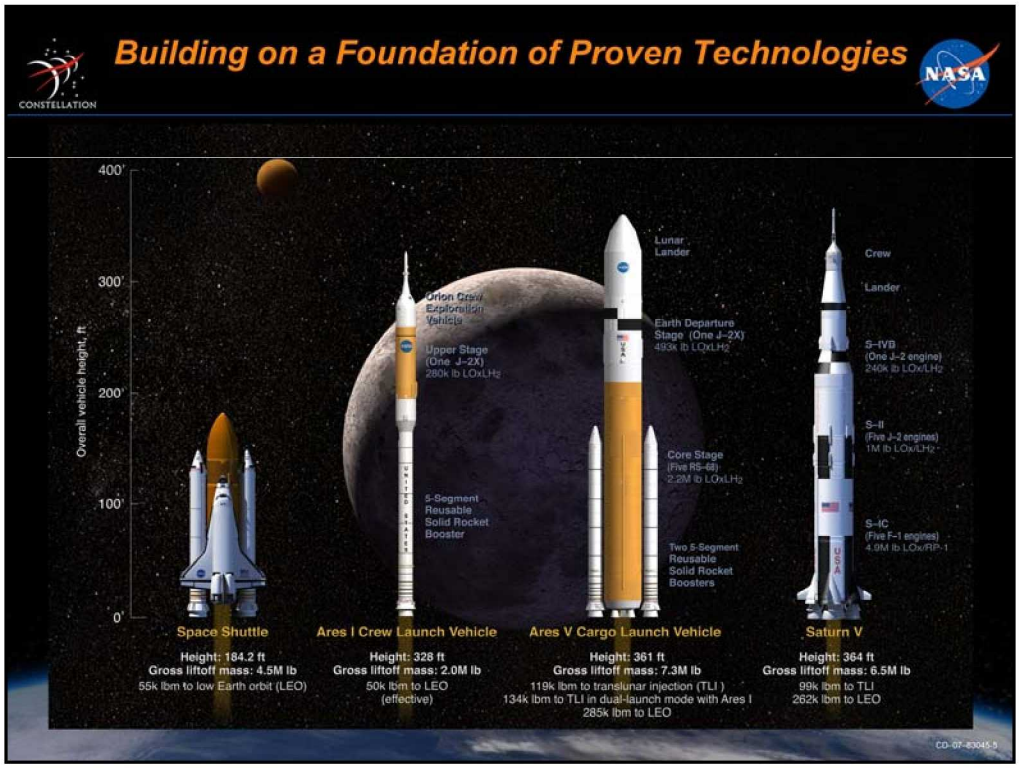


The Orion crew exploration vehicle will be launched into Earth orbit by the Ares I crew launch vehicle. Orion and its launch abort system will be placed at the top of the Ares I rocket to eliminate the threat to the crew from falling debris on launch and ascent.

For missions to the moon, Orion will dock in low Earth orbit with a lunar lander module, Altair, and an Earth departure stage. The Earth departure stage will propel Orion and Altair to the moon.

Once they have reached lunar orbit, astronauts will use the landing craft to travel to the moon's surface.

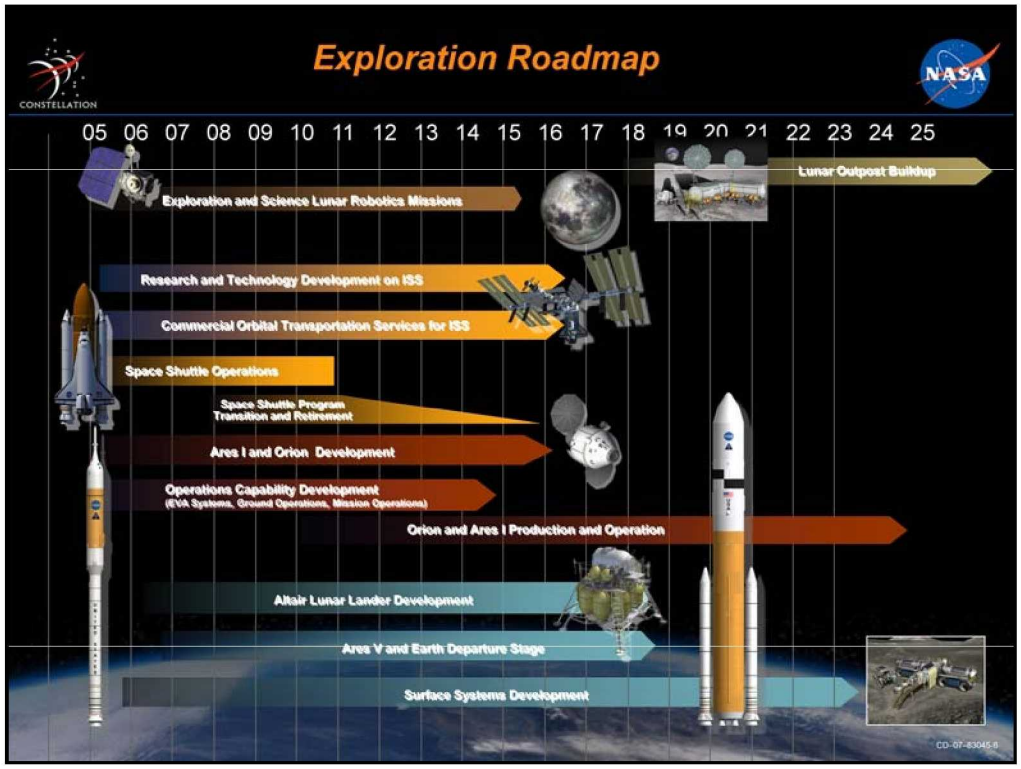
Orion will stay in lunar orbit waiting for the crew to return in a part of the lander called the ascent module. When all the astronauts are back inside Orion, the spacecraft will break out of the lunar orbit and head home to Earth, propelled by the main engine of its service module.



To make these new launch systems safer and simpler, NASA is using proven technologies from the Apollo Saturn V and the Space Shuttle programs. Common propulsion elements between the two systems will reduce operations costs to promote the long-term investigation of Earth's cosmic neighborhood and worlds beyond.

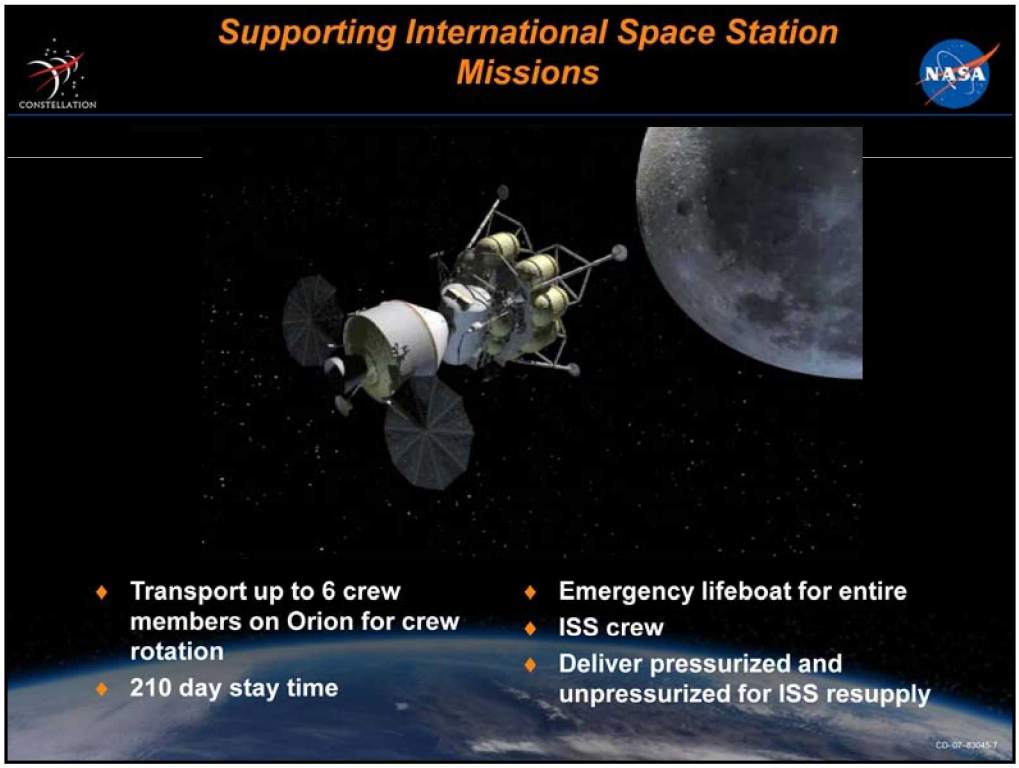
The Ares I includes a first stage evolved from the Shuttle's reusable solid rocket booster and an upper stage powered by a J-2X engine, with heritage from the Saturn V. The Ares I will carry the Orion crew exploration vehicle to Earth orbit.

The Ares V propulsion includes two reusable solid rocket boosters, much like the booster used in the Ares I's first stage. It also uses five commercial RS–68 engines fueled by a 33-foot-diameter tank, close in size to the Saturn V. The Earth departure stage, which transports the lunar lander and Orion toward the Moon, is powered by a J-2X engine, the same as that used for the Ares I's upper stage.



Information based on a September 25, 2008, industry briefing.

The first crewed flight of the Orion spacecraft aboard an Ares I rocket is scheduled for no later than 2015, when it will fly to the International Space Station. Altair's first landing on the moon with an astronaut crew is planned for no later than 2020.

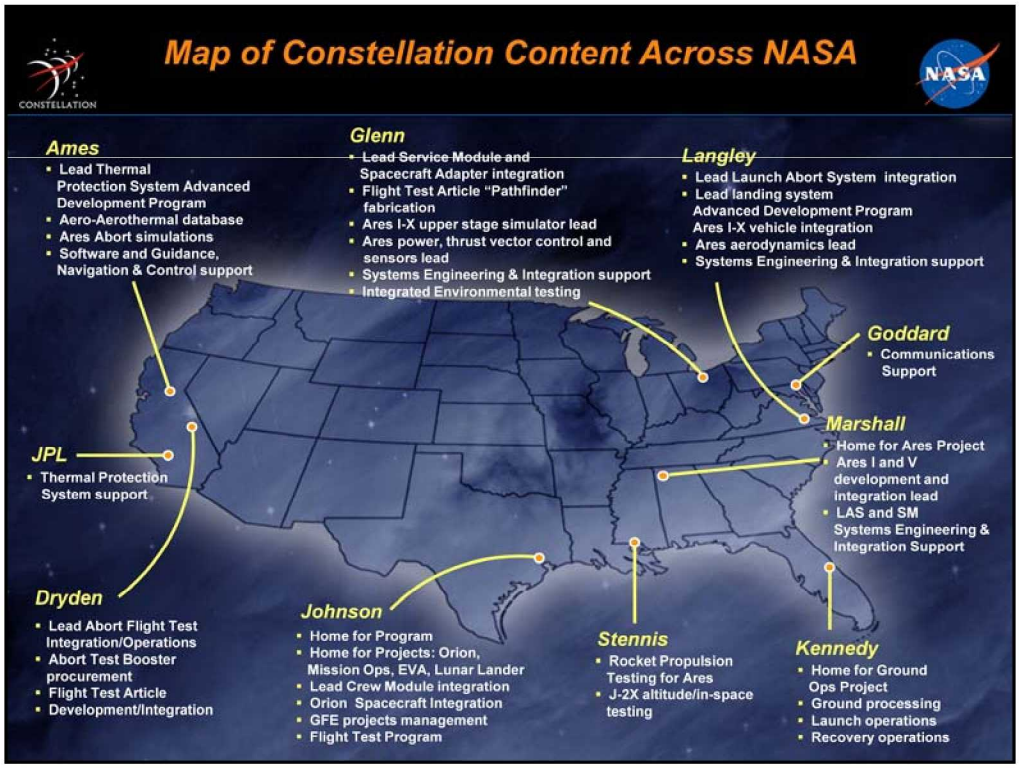


NASA has engaged its workforce to enable the safe and reliable transport of humans to the International Space Station, moon and Mars.

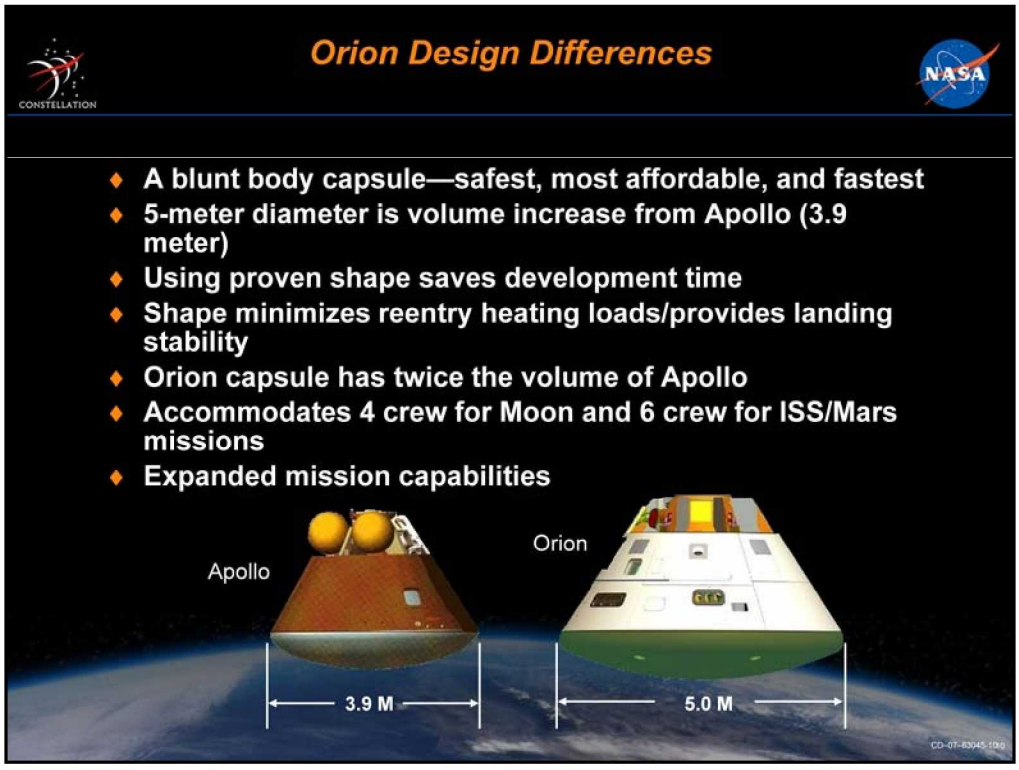
The International Space Station (ISS) is the largest and most complicated spacecraft ever built. It is allowing NASA to conduct scientific research to improve life on Earth and to prepare for long-duration space flights to the moon and other destinations.

The main components are:

1. The launch abort system
2. The crew exploration vehicle (Orion)
3. The service module
4. The jettison panels
5. The spacecraft adapter



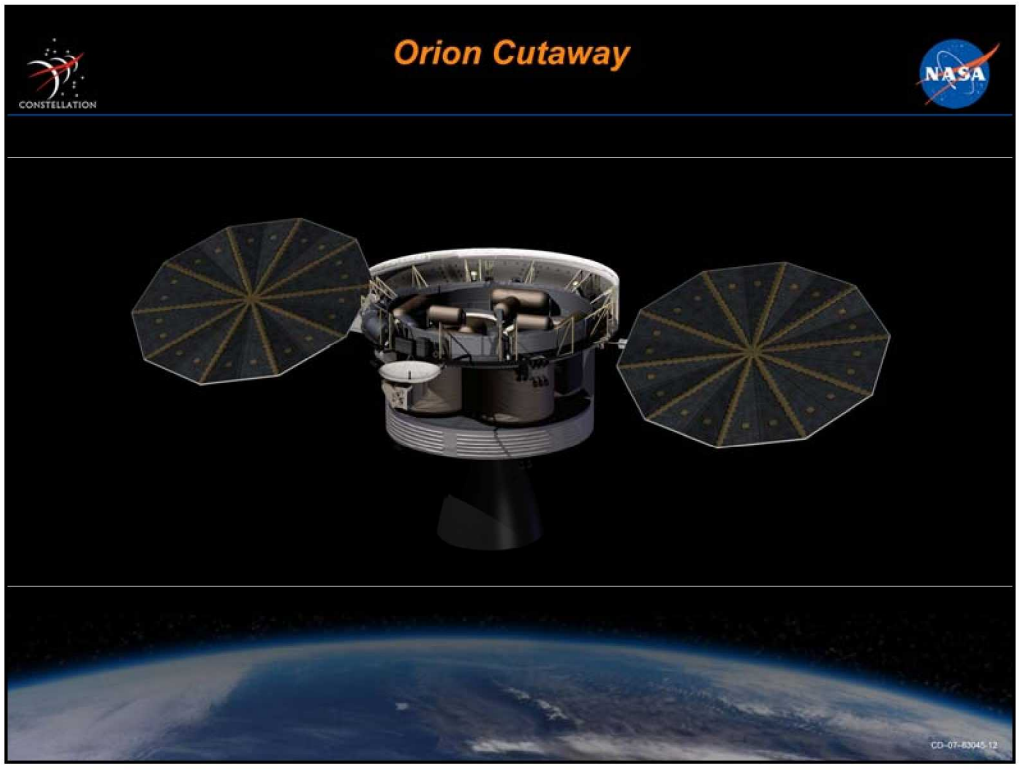
KEY POINTS:
Constellation Program work is distributed across the country.
This chart shows areas of responsibility at the 10 NASA centers.
Contractors have facilities at many other locations that also support Constellation.



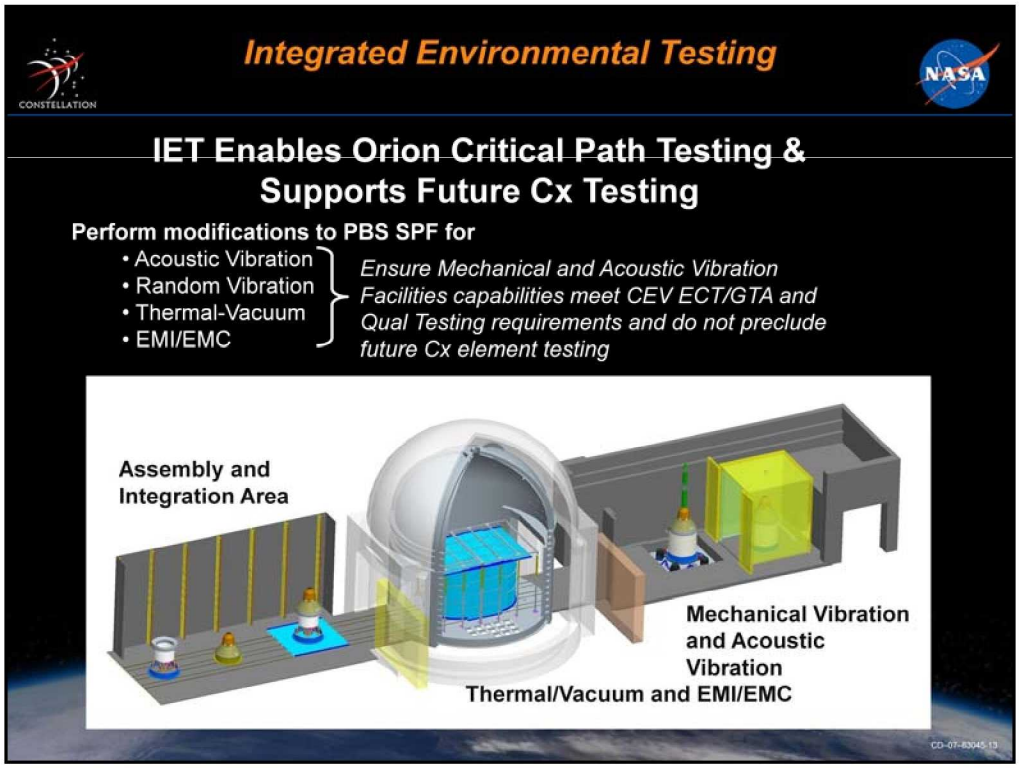
Orion will be similar in shape to the Apollo spacecraft, but larger, with 2–1/2 times the volume of the Apollo capsule.

Crew Module couch area exposed

Diameter – 16.5 ft. (5 m)
Pressurized volume (total) – 690.6 ft3
Habitable volume (net) – 316 ft3
Propellant – hydrazine
Oxygen/nitrogen/water – 51.2 lbs
Landing weight – 18,345 lbs
Can be reused up to 10 flights



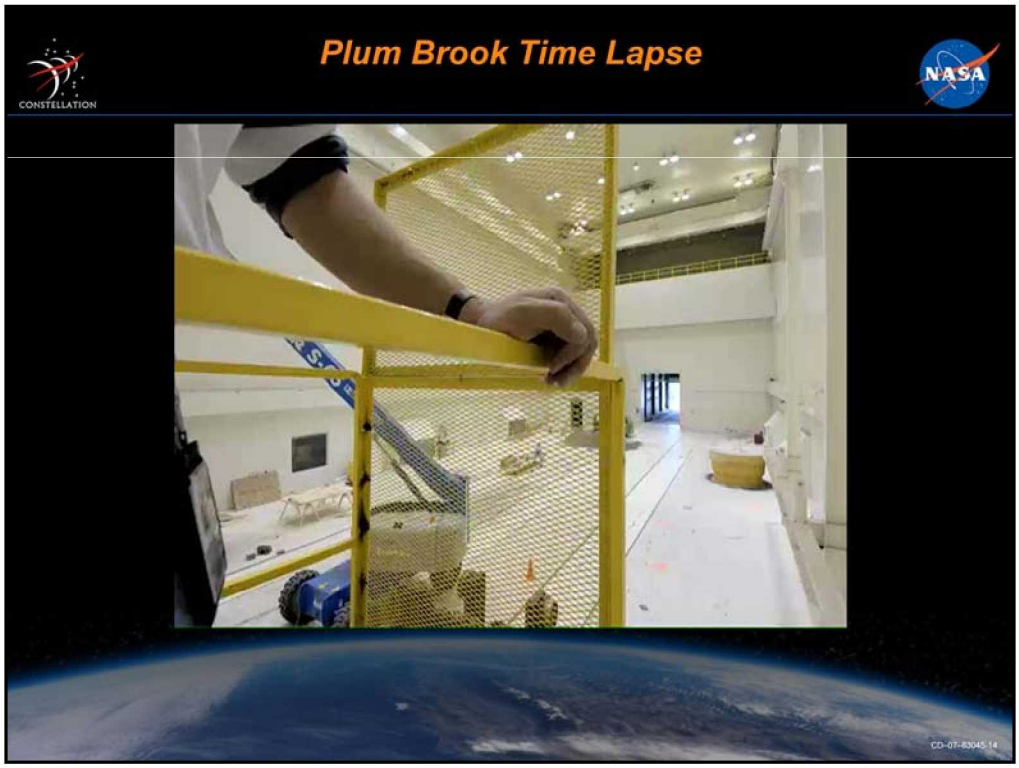
Orion will use 5.5m (18ft) in diameter radial UltraFlex solar arrays. Recent tests validated the UltraFlex array's acceleration capability, up to 2.7g, required for Orion's lunar missions. Smaller-scale arrays are powering NASA's Phoenix Lander that is on Mars.



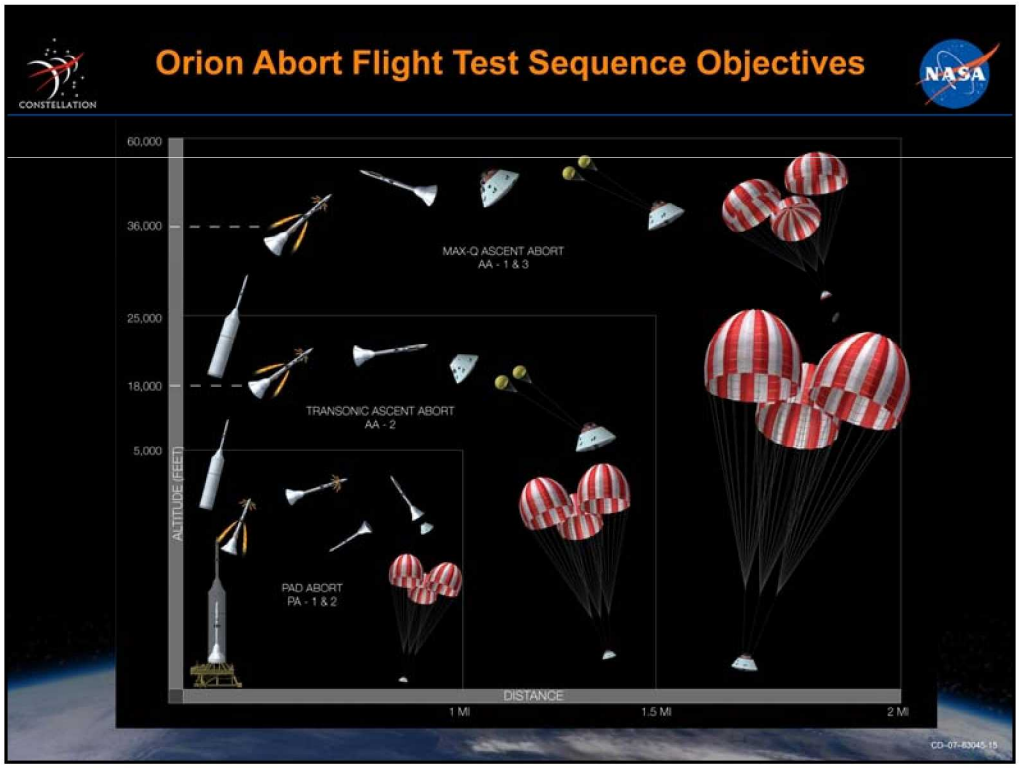
The NASA Glenn Research Center operates the Plum Brook Station—a vast complex over 10 square miles near Sandusky, Ohio. Plum Brook Station is home of the SPF which houses the world's largest space environment simulation chamber.

The chamber's wide-ranging capabilities have been extensively used to test launch vehicle payload fairings, orbital hardware including International Space Station systems, and planetary landing systems like the Mars Pathfinder and the Mars Exploration Rovers' airbag systems. SPF will serve as the primary location for Integrated Environmental Testing (IET) of the Orion Crew Exploration Vehicle (CEV) Ground Test Article and Qualification vehicle. SPF's unique capabilities will permit complete environmental testing of the Orion CEV in a single facility at a single location.

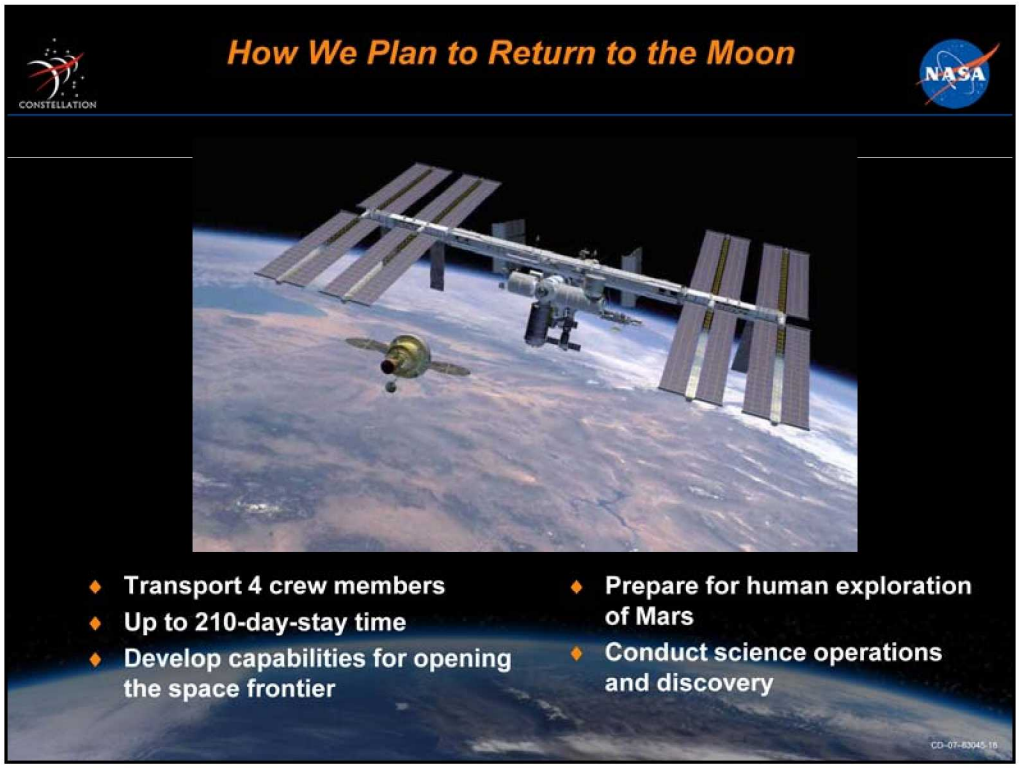
This "one-stop shopping" capability reduces project risk by eliminating the need to ship the vehicle to different locations to complete the gamut of testing required for design and production necessary for human space flight. For more information go to exploration.nasa.gov.



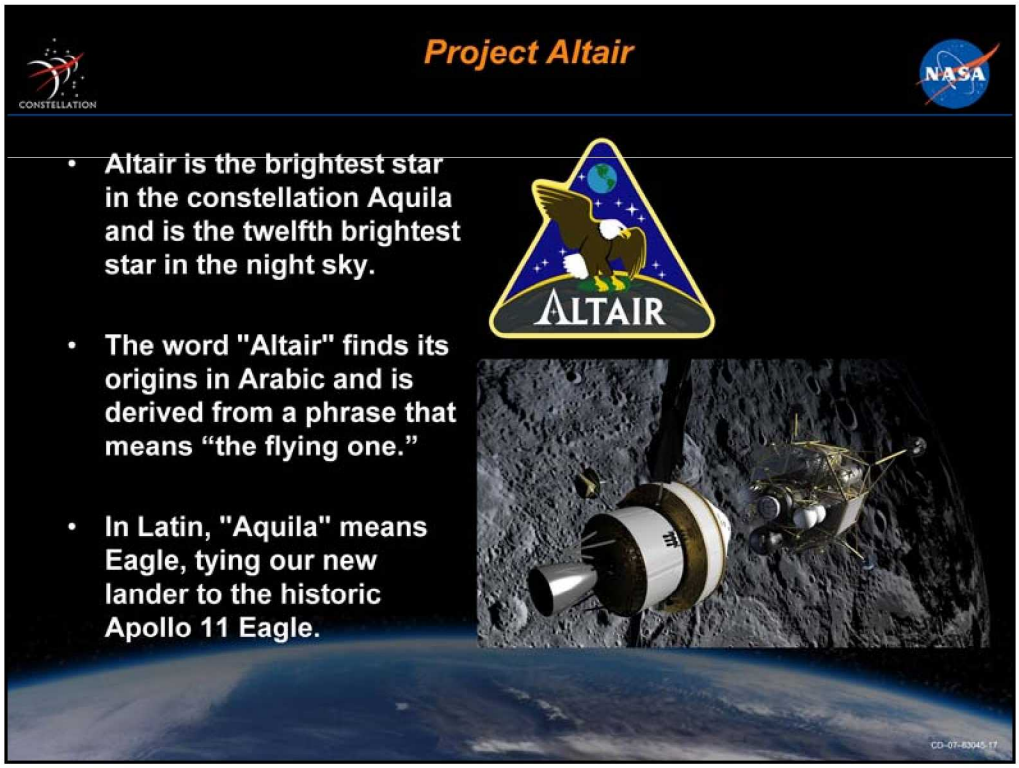
Last October, a $50 million renovation project began at Plum Brook, home of the world's largest thermal vacuum chamber. The upgrade to the two separate vibration chambers— The Reverberant Acoustic Test Facility (RATF) and the Mechanical Vibration Facility (MVF) — will support vibration and acoustic testing of the Orion Crew Exploration Vehicle, exposing it to the shakes, rattles and rolls of a spaceflight.



- Propulsion system burns can be initiated in one–third of the time budgeted for Apollo.
- Abort landings can be better controlled, with free–fall time being a key parameter.
- Test Designation – 57AS
- 7.5% model/3 configurations
- Tested in GRC 8X6 aero-acoustic tunnel
- 100 Pressure Sensors on Model
- 57AS confirms the same quiet levels for ALAS11-rev3 for both nominal ascent and unpowered abort situation



For missions to the moon, Orion will dock with a lunar landing module and Earth departure stage in low Earth orbit. The Earth departure stage will propel Orion and the module to the moon. Once they have reached the moon's orbit, astronauts will use the lunar landing craft to travel to the moon's surface. Orion will stay in the lunar orbit awaiting return of the crew. The astronauts will return to the orbiting Orion using a lunar surface ascent module. When the crew has reunited with the Orion spacecraft, the service module main engine will provide the power that Orion needs to break out of the lunar orbit and return to Earth.



Descent module

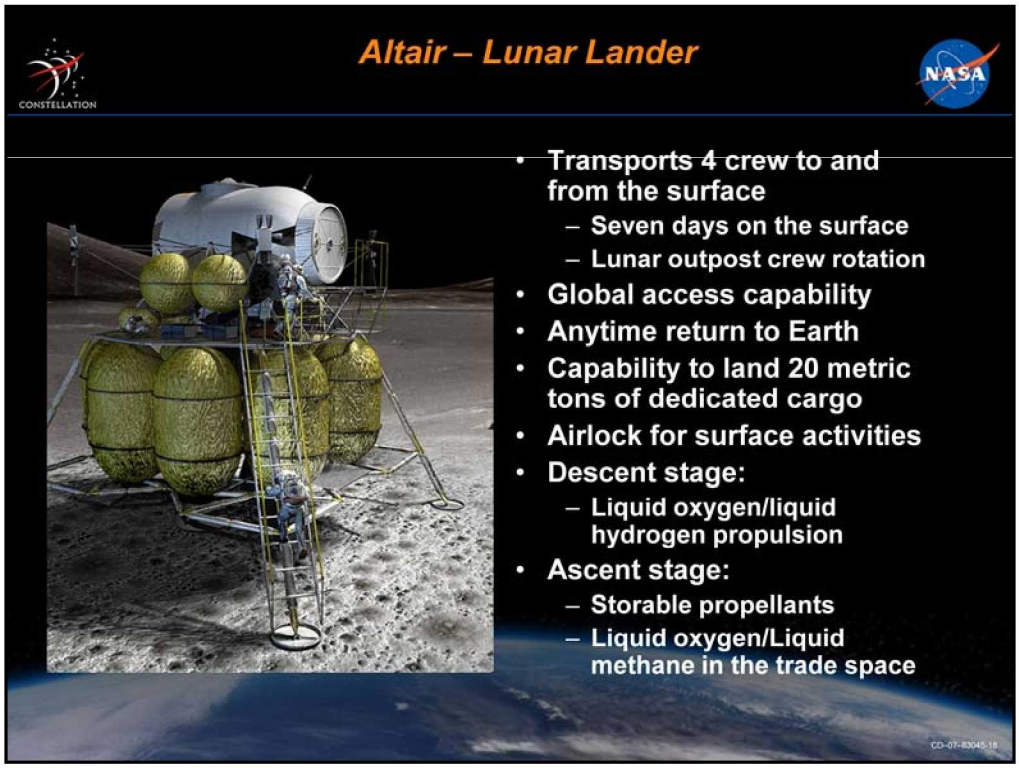
Propulsion for LOI and powered descent
Power during lunar transit, descent, and surface ops
Platform for lunar landing/liftoff of ascent module

Ascent module

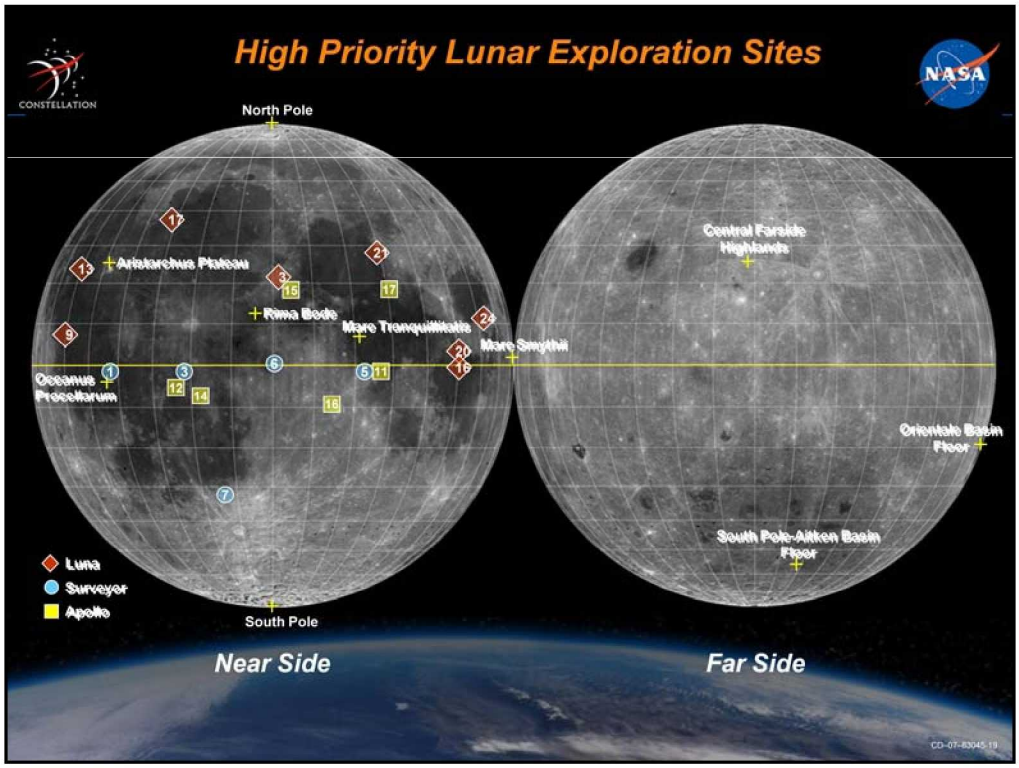
Propulsion for ascent from lunar surface
Habitable volume for four during descent, surface, and ascent operations
Contains cockpit and majority of avionics

Airlock

Accommodates 2 astronauts per ingress/egress
Connected to ascent module via short tunnel
Remains with descent module on lunar surface

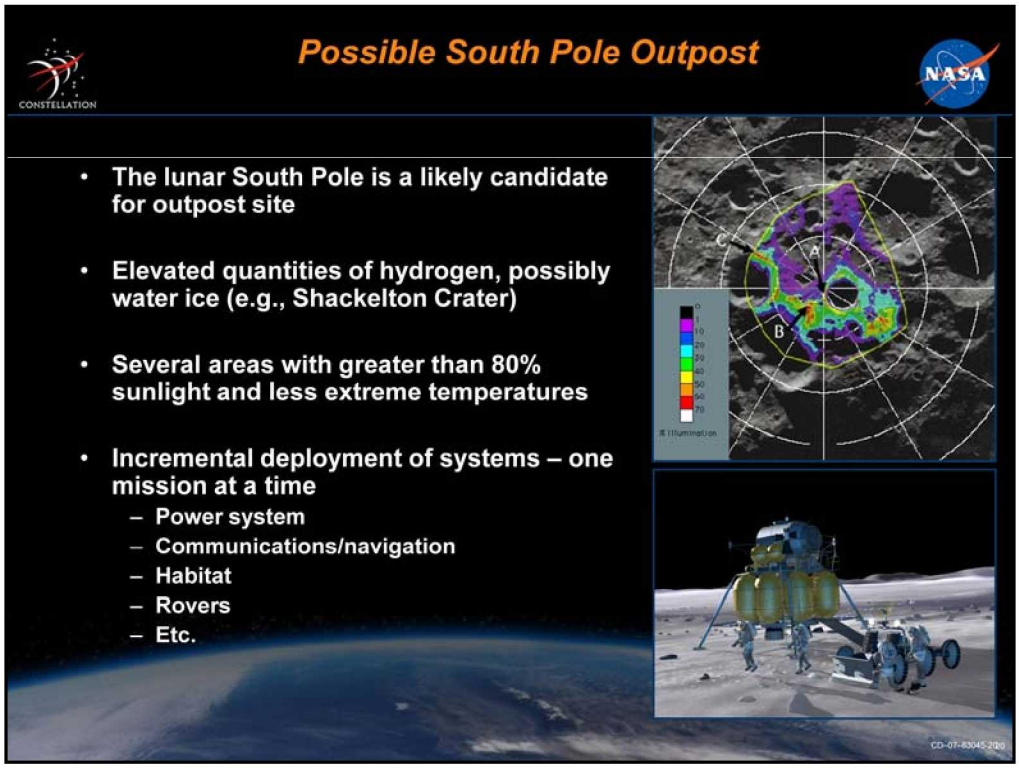


Altair will be capable of landing four astronauts on the moon, providing life support and a base for weeklong initial surface exploration missions, and returning the crew to the Orion spacecraft that will bring them home to Earth. Altair will launch aboard an Ares V rocket into low Earth orbit, where it will rendezvous with the Orion crew vehicle.



NASA's Lunar Reconnaissance Orbiter, or LRO, is scheduled to launch April 24 aboard an Atlas V rocket. The orbiter will carry seven instruments to provide scientists with detailed maps of the lunar surface and enhance our understanding of the moon's topography, lighting conditions, mineralogical composition and natural resources. Information gleaned from LRO will be used to select safe landing sites, determine locations for future lunar outposts and help to mitigate radiation dangers to astronauts.

Note: Apollo was equatorial and “front-side” only.



Accompanying the Lunar Reconnaissance Orbiter will be the Lunar Crater Observation and Sensing Satellite, a mission that will impact the moon's surface in its search for water ice. Right now the Shackelton Crater at the South Pole, the largest basin in the solar system, is being targeted for possible water. It is also in almost constant sunlight. The Shackelton crater lies entirely within the rim of the immense South Pole–Aitken basin, which is the largest known impact formation in the Solar system.

Recently, two NASA instruments traveled to the moon to begin a two–year mission of mapping the lunar surface. The Moon Mineralogy Mapped will assess mineral resources, and the Miniature Synthetic Aperture Radar, or Mini-SAR, will map the polar regions and look for ice deposits. Data from the two instruments will contribute to NASA's increased understanding of the lunar environment as it implements the nation's space exploration policy, which calls for robotic and human missions to the moon.

The Moon Mineralogy Mapped is a state-of-the-art imaging spectrometer that will provide the first map of the entire lunar surface at high spatial and spectral resolution, revealing the minerals that make up the moon's surface. Scientists will use this information to answer questions about the moon's origin and geological development, as well as the evolution of terrestrial planets in the early solar system. The map also may be used by astronauts to locate resources, possibly including water, that can support exploration of the moon and beyond.

The Mini-SAR data will be used to determine the location and distribution of water ice deposits on the moon. Data from the instrument will help scientists learn about the history and nature of objects hitting the moon, and the processes that throw material from the outer solar system into the inner planets.

It is planned that one day Mars-bound vehicles will be assembled in low-Earth orbit. Orion will be the Earth entry vehicle for lunar and Mars returns.

For more information go to:

www.nasa.gov