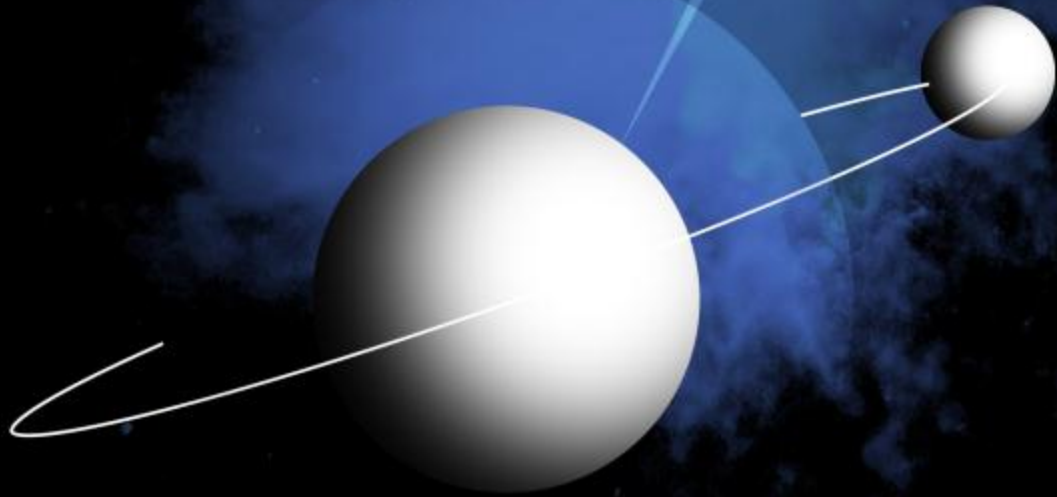




Space Launch System America's Flagship for Exploration




Todd May, Program Manager

April 10, 2014



A Deeper Purpose, A Bolder Mission

A composite image of space. The top half is filled with numerous brown, irregularly shaped asteroids of various sizes against a dark blue starry background. In the lower half, a bright yellow sun is partially visible on the left. In the center, the Earth is shown with blue oceans and white clouds. To the right of Earth is the Moon, and further right is the reddish-orange planet Mars. A small satellite with solar panels is visible in the space between Earth and Mars.

**“We reach for new heights
and reveal the unknown for the
benefit of humankind.”**



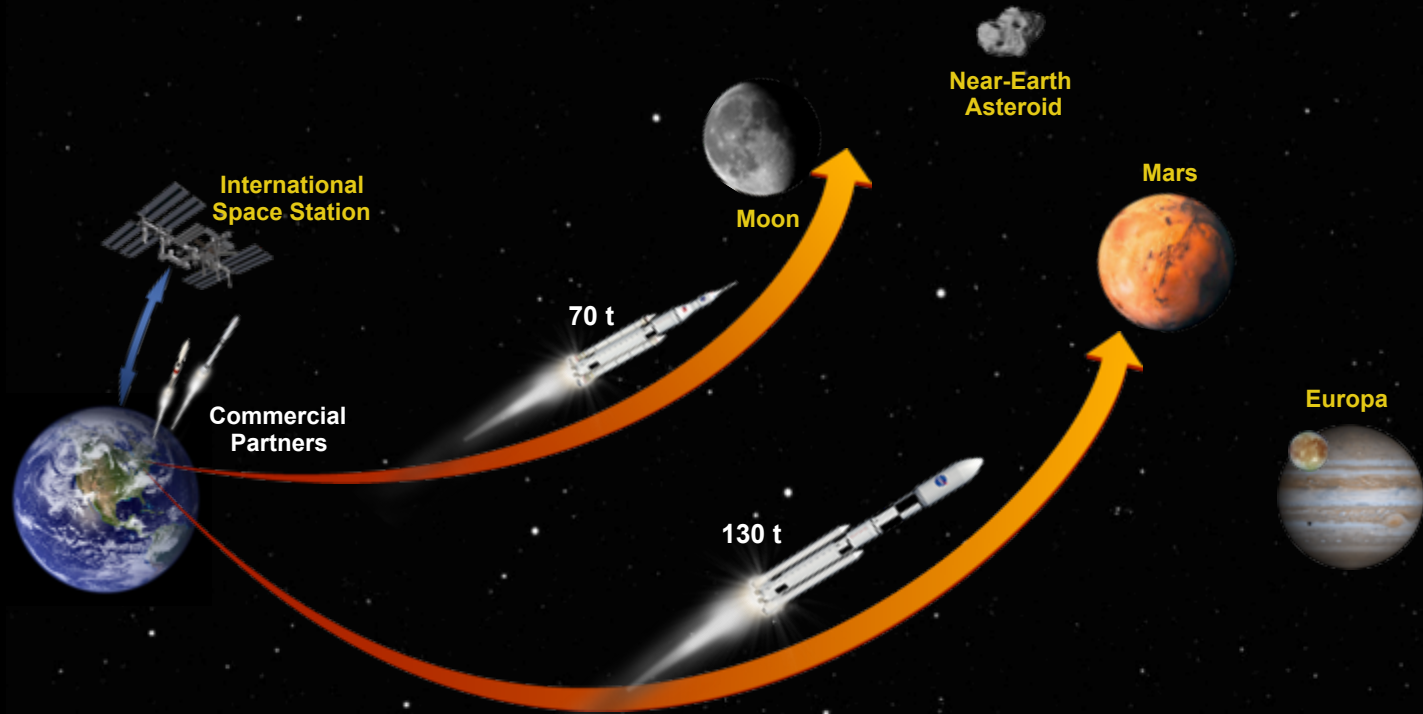
What's Past Is Prologue



NASA's greatest accomplishments are
the things we are about to do



**Working
together**
so we
can go
farther



With our partners launching to orbit,
we can begin a new era of exploration.



**EARTH
RELIANT**

**Going
Farther,
Learning
More**

**PROVING
GROUND**

**EARTH
INDEPENDENT**

**Making the giant leap to Mars
requires a series of new spaceflight firsts.**



NASA's Space Launch System



The vehicle that will begin the journey
is taking shape as we speak.



Proven
success.
Greater
power.

Stage Adapters:

The Orion stage adapter will be the first new SLS hardware to fly.

Core Stage:

Newly developed for SLS, the Core Stage towers more than 200 feet tall

RS-25 Engines:

Space Shuttle engines for the first four flights are already in inventory



Orion:

Carries astronauts into deep space

Interim Cryogenic Propulsion Stage:

Based on the Delta IV Heavy upper stage; the power to leave Earth

Solid Rocket Boosters:

Built on Space Shuttle hardware; more powerful for a new era of exploration



**'Stack it.
I'm
ready.'**
—Tony
Antonelli



After an in-depth technical review,
the SLS Program is ready to build.



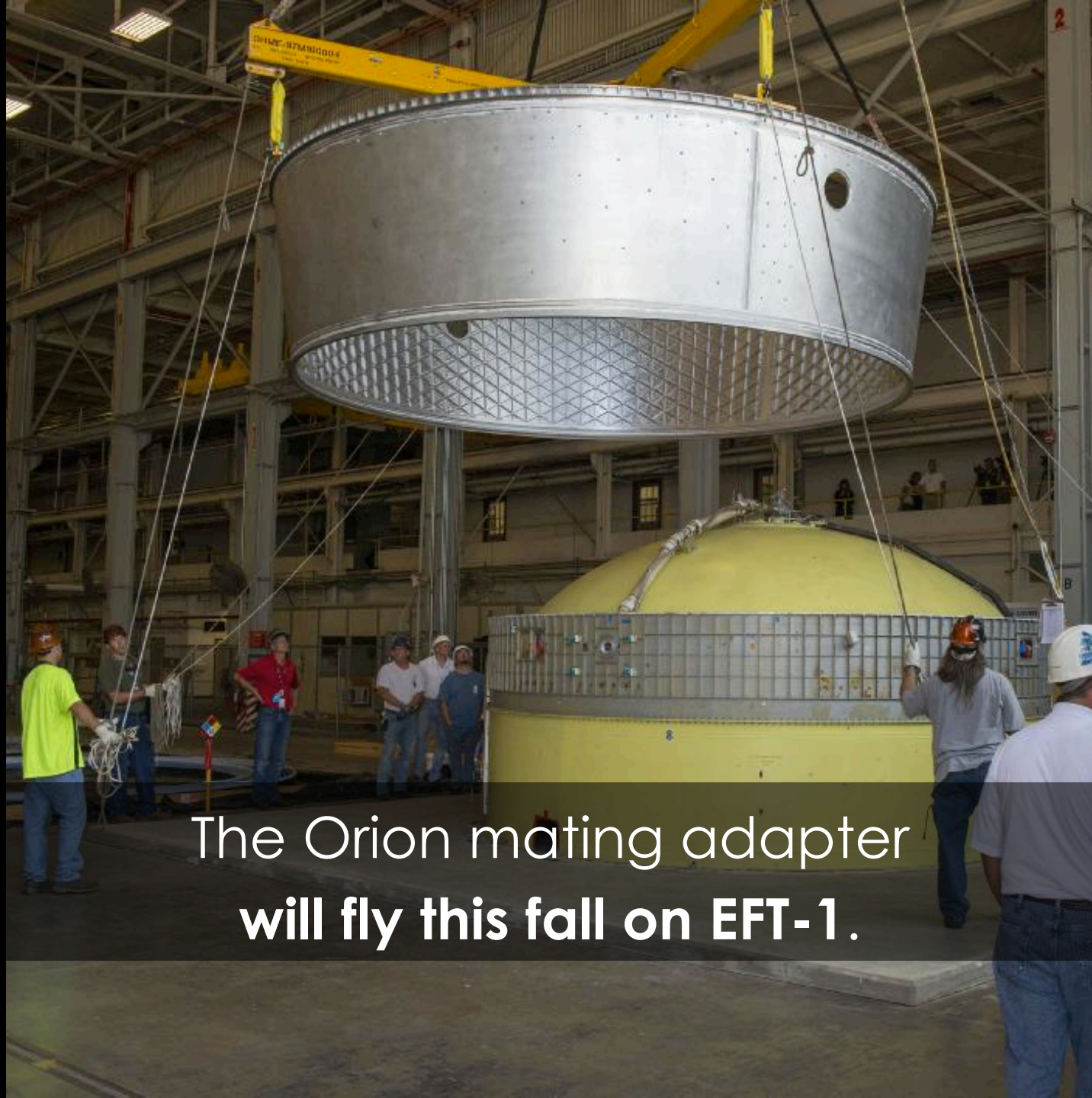
**Core
Stage**
is taking
shape



New tooling is installed at Michoud and confidence welding has begun.



Our first
payload
adapter
hardware
is ready
to fly



The Orion mating adapter
will fly this fall on EFT-1.



Test stand upgrades have been made
for **RS-25 test firings this summer.**

Testing is
soon for
RS-25
engines



New
upgrades
are being
tested for
**Solid
Rocket
Boosters**



**Three successful test firings
demonstrated the five-segment motor.**



SLS's first launch will send Orion
farther than Apollo ever traveled.



First flight
in

**December
2017**



SLS is the
first step
in the
journey
to Mars



Going to Mars will be difficult.
SLS provides the power that it takes.



The
biggest
challenges
aren't
always
technical.



The SLS team is making great progress.
Help us share our story.

Man cannot discover
new oceans
unless he has the
courage to lose
sight of the shore.



Join us on
the journey

www.nasa.gov/sls
www.twitter.com/nasa_sls
www.facebook.com/nasasls
www.instagram.com/explorenasa



Exploration Mission-1

Distant Retrograde Orbit



SIMULATED LAUNCH
ABORT SYSTEM (LAS)

ORION CREW
MODULE (CM)

LAUNCH VEHICLE/
STAGE ADAPTER

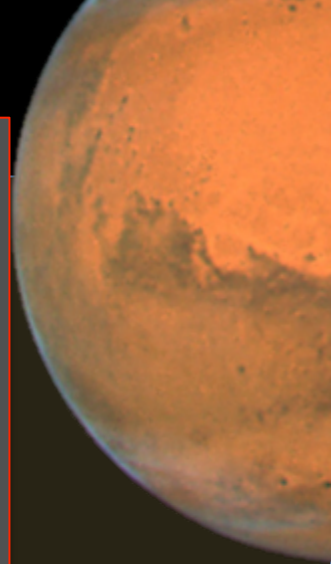
CORE STAGE

SOLID ROCKET
BOOSTERS (2)

RS-25
ENGINES (4)



Asteroid Redirect Mission Provides Capabilities For Deep Space/Mars Missions



High Efficiency Large Solar Arrays

Solar Electric Propulsion (SEP)

In-space Power and Propulsion:

- High Efficiency Solar Arrays and SEP advance state of art toward capability required for Mars
- Robotic ARM mission 50kW vehicle components prepare for Mars cargo delivery architectures
- Power enhancements feed forward to Deep Space Habitats and Transit Vehicles

EVA:

- Build capability for future exploration through Primary Life Support System Design which accommodates Mars
- Test sample collection and containment techniques including planetary protection
- Follow-on missions in DRO can provide more capable exploration suit and tools

Exploration EVA Capabilities

Crew Transportation and Operations:

- Rendezvous Sensors and Docking Systems provide a multi-mission capability needed for Deep Space and Mars
- Asteroid Initiative in cis-lunar space is a proving ground for Deep Space operations, trajectory, and navigation.

Deep Space Rendezvous Sensors & Docking Capabilities

Global Exploration Roadmap 2.0



2013

2020

2030

International Space Station



General Research and Exploration Preparatory Activities

Note: ISS partner agencies have agreed to use the ISS until at least 2020.

Commercial or Government Low-Earth Orbit Platforms and Missions

Robotic Missions to Discover and Prepare



Mars Sample Return and Precursor Opportunities

Human Missions Beyond Low-Earth Orbit



Explore Near-Earth Asteroid

Extended Duration Crew Missions

Humans to Lunar Surface

Missions to Deep Space and Mars System

Sustainable Human Missions to Mars Surface

Human Exploration Building Blocks and Pathways

Develop Fundamental Building Blocks/Capabilities

- SLS
- Orion
- EVA
- SEP/Space Tugs
- AR&D Sensors
- Docking Systems
- Long Cruise Habitat

On to Mars

At Mars

- Crewed
- Pre-positioned consumables
- Orbit Mars or Phobos/Deimos
- Possible crewed flyby in 2033

Land on Mars

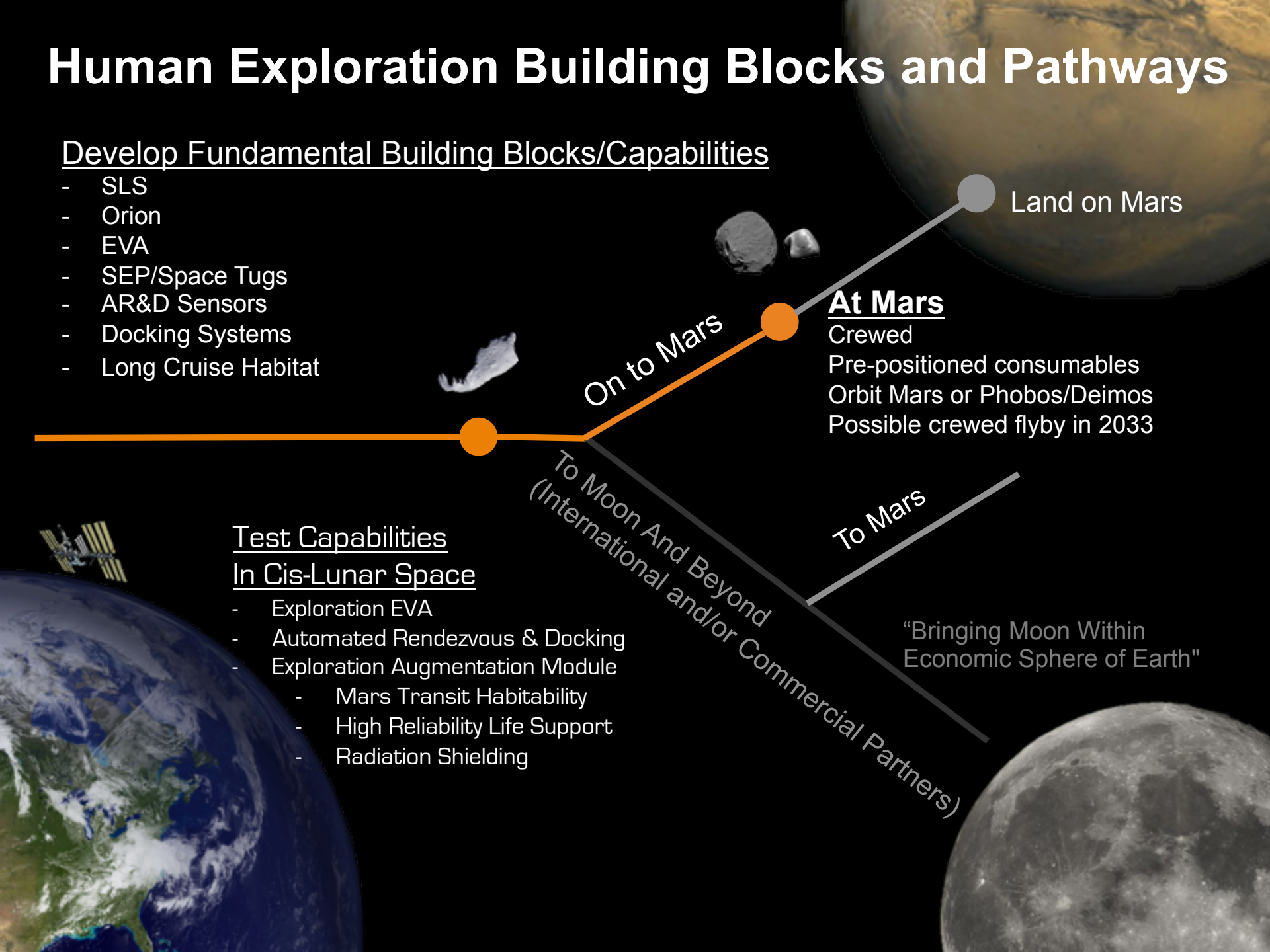
Test Capabilities In Cis-Lunar Space

- Exploration EVA
- Automated Rendezvous & Docking
- Exploration Augmentation Module
 - Mars Transit Habitability
 - High Reliability Life Support
 - Radiation Shielding

To Moon And Beyond
(International and/or Commercial Partners)

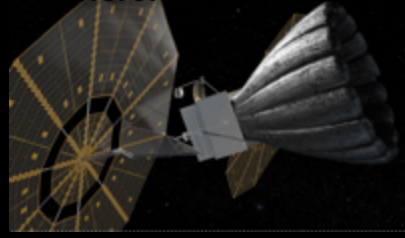
To Mars

"Bringing Moon Within
Economic Sphere of Earth"





Asteroid Rendezvous

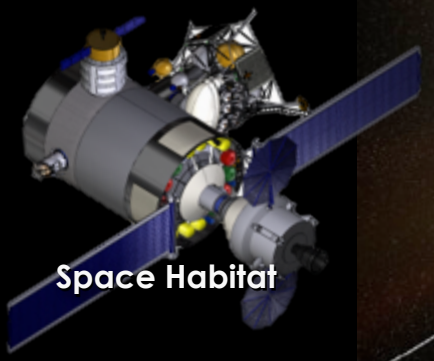


Deep Space Telescope



GEO Servicing

Versatile enough for a universe of possibility



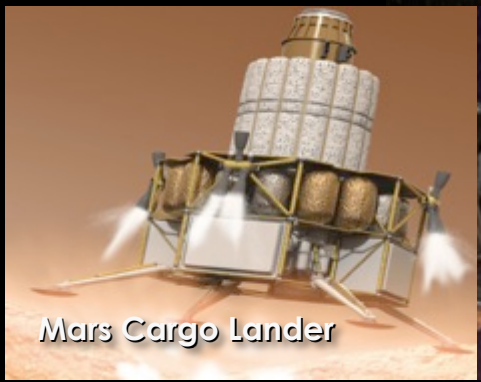
Space Habitat



Solar Probe



Mars Sample Return



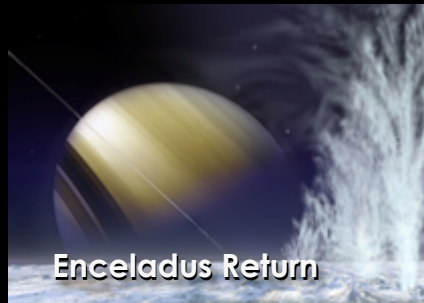
Mars Cargo Lander



Humans to Mars



Europa Clipper



Enceladus Return



Uranus Spacecraft



Interstellar