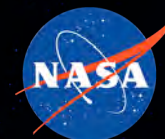


National Aeronautics and Space Administration



Space Launch System Status

Todd A. May, Program Manager
Garry M. Lyles, Chief Engineer

May 2012

“To reach for new heights...

and reveal the unknown so that what we do and learn
will benefit all humankind.”

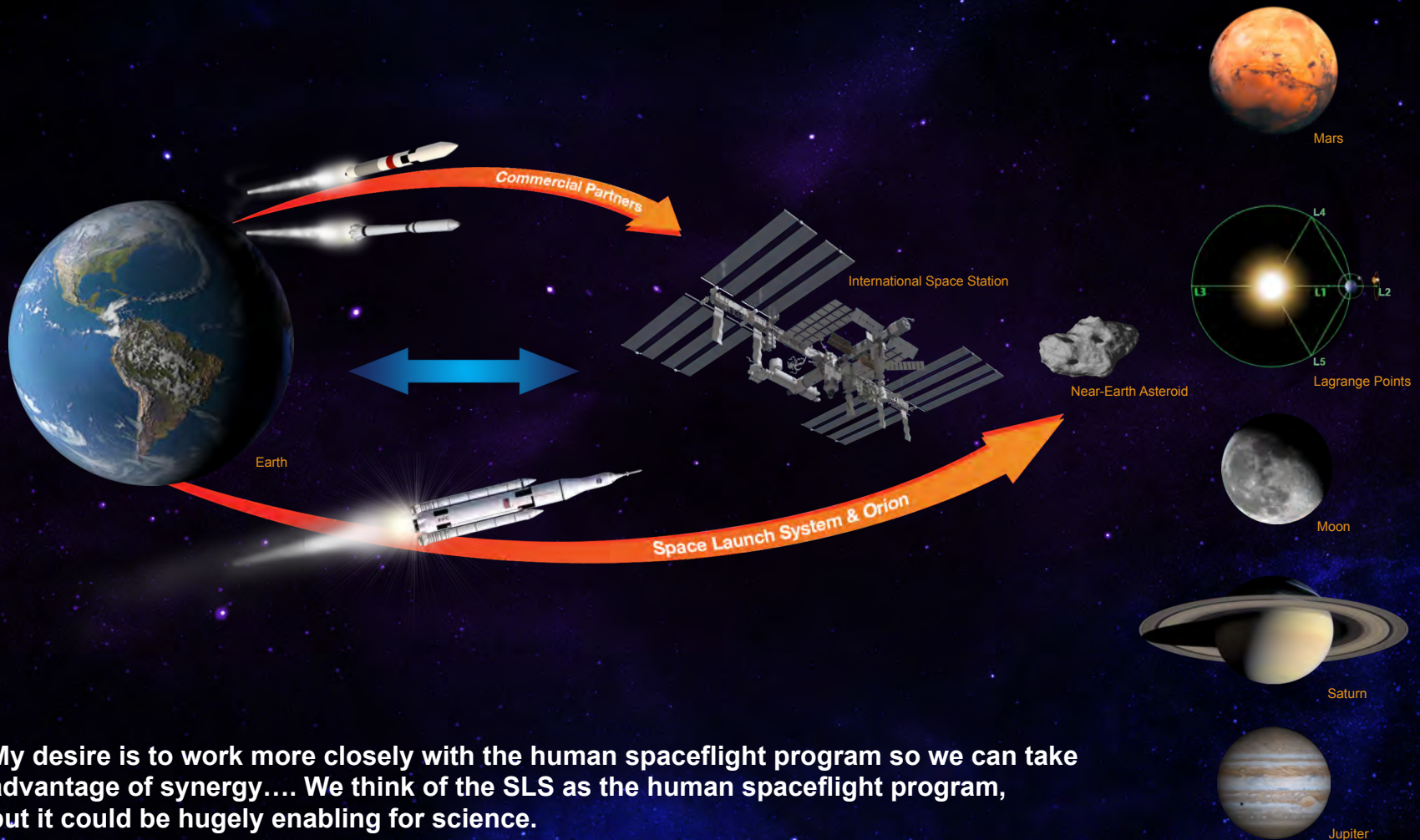
National Aeronautics and
Space Administration



SLS Launches in 2017

*“Extend and sustain human activities
across the solar system.”*
NASA 2011 Strategic Plan

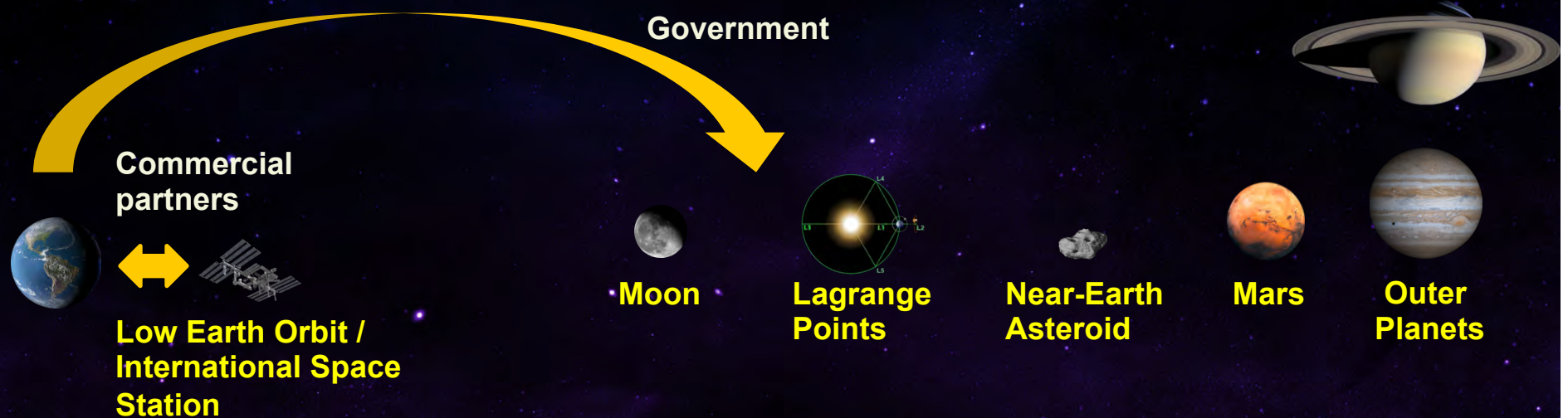
The Future of Exploration



My desire is to work more closely with the human spaceflight program so we can take advantage of synergy.... We think of the SLS as the human spaceflight program, but it could be hugely enabling for science.

— John Grunsfeld, Associate Administrator
NASA Science Mission Directorate
Nature, Jan 19, 2012

The Future of Exploration



Development

- Proven capabilities
- Proven market potential
- Understood risks and hazards
- Known costs
- Predictable return on investment
- Refining known engineering
- Using existing technology
- Existing infrastructure
- Mature research infrastructure

Exploration

- New capabilities
- Undetermined market potential
- Undefined risks and hazards
- Indeterminate costs
- Indeterminate (or zero) ROI on indeterminate timeline
- Engineering existing hardware for new environment or developing new technologies
- No infrastructure
- Unique, groundbreaking research

A National Asset for Stakeholders and Partners

Incremental steps to steadily build, test, refine, and qualify capabilities that lead to affordable flight elements and a deep space capability.

Mars: 33,900,000 mi
54,556,000 km

Planetary Exploration

- Mars
- Solar System

Exploring Other Worlds

- Low-Gravity Bodies
- Full-Capability Near-Earth Asteroid Missions
- Phobos/Deimos

Into the Solar System

- Interplanetary Space
- Initial Near-Earth Asteroid Missions
- Lunar Surface

Extending Reach Beyond LEO

- Cis-Lunar Space
- Geostationary Orbit
- High-Earth Orbit
- Lunar Flyby & Orbit

Initial Exploration Missions

- International Space Station
- Space Launch System
- Orion Multi-Purpose Crew Vehicle
- Ground Systems Development & Operations
- Commercial Spaceflight Development

Moon: 237K mi / 381K km

ISS: 237 mi / 381 km

Surface Capabilities Needed

Advanced Propulsion Needed

High Thrust In-Space Propulsion Needed

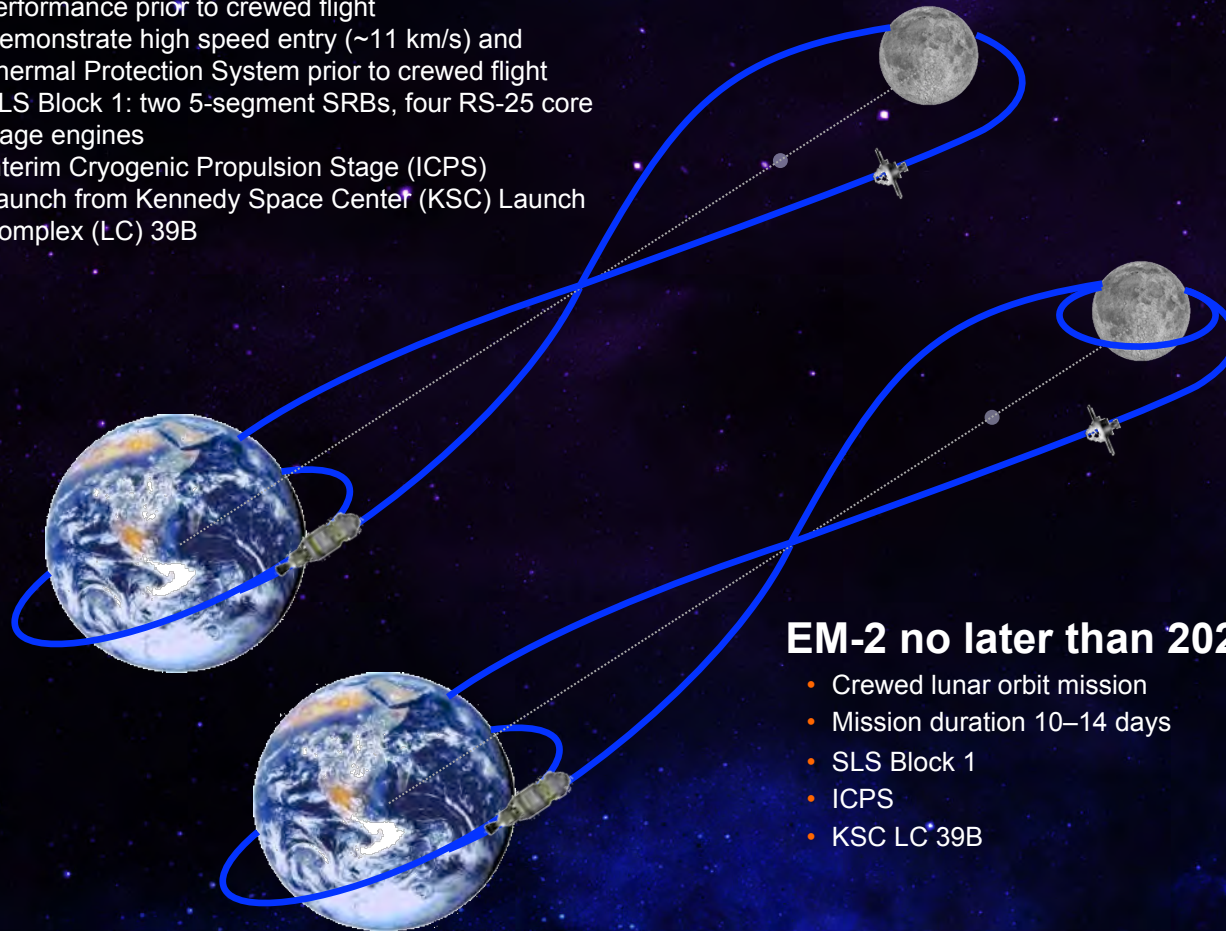
Long Duration Habitat Needed

SLS — Going Beyond Earth's Orbit

Initial Exploration Missions (EM)

EM-1 in 2017

- Un-crewed circumlunar flight – free return trajectory
- Mission duration ~7 days
- Demonstrate integrated spacecraft systems performance prior to crewed flight
- Demonstrate high speed entry (~11 km/s) and Thermal Protection System prior to crewed flight
- SLS Block 1: two 5-segment SRBs, four RS-25 core stage engines
- Interim Cryogenic Propulsion Stage (ICPS)
- Launch from Kennedy Space Center (KSC) Launch Complex (LC) 39B

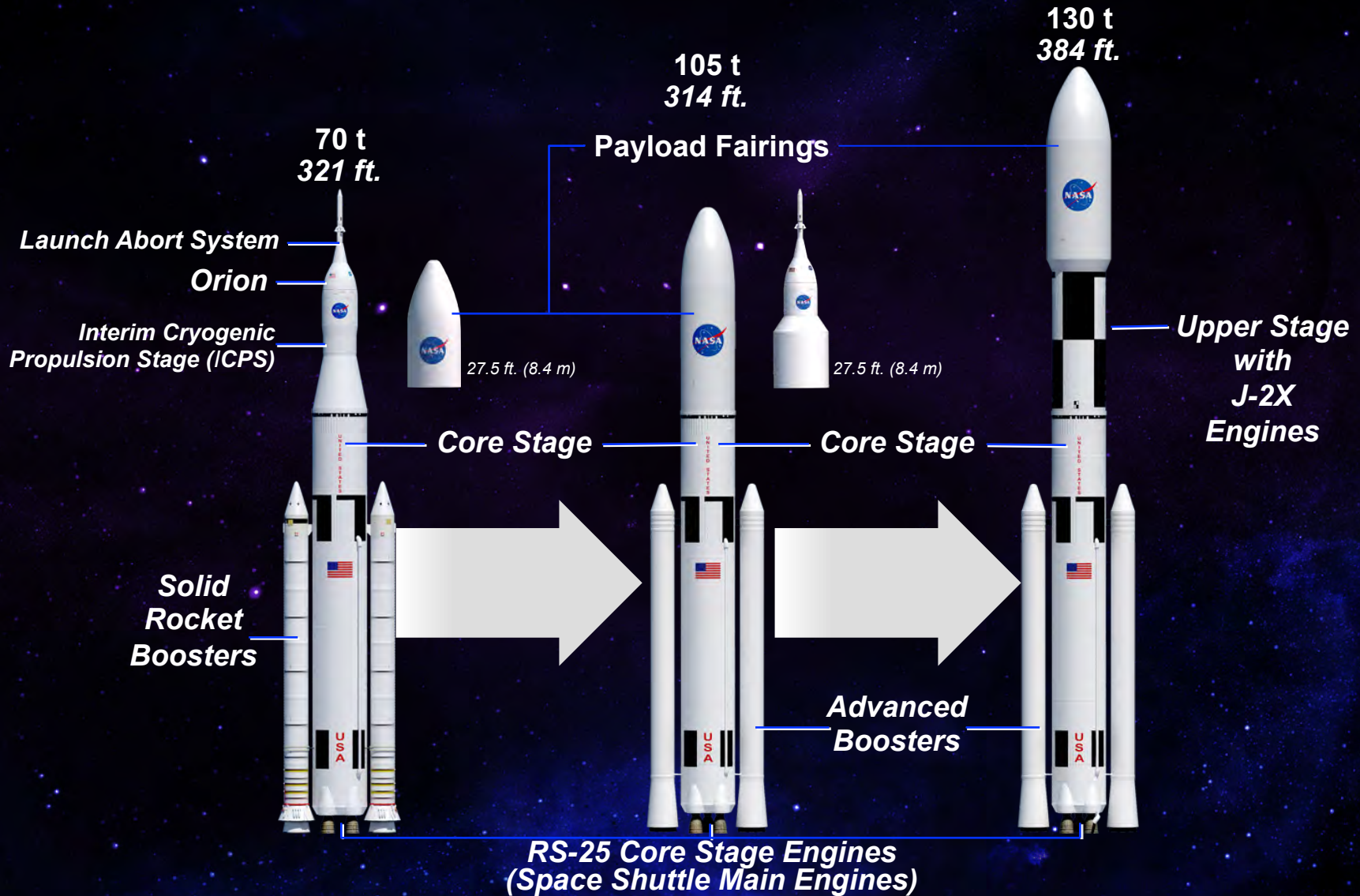


EM-2 no later than 2021

- Crewed lunar orbit mission
- Mission duration 10–14 days
- SLS Block 1
- ICPS
- KSC LC 39B



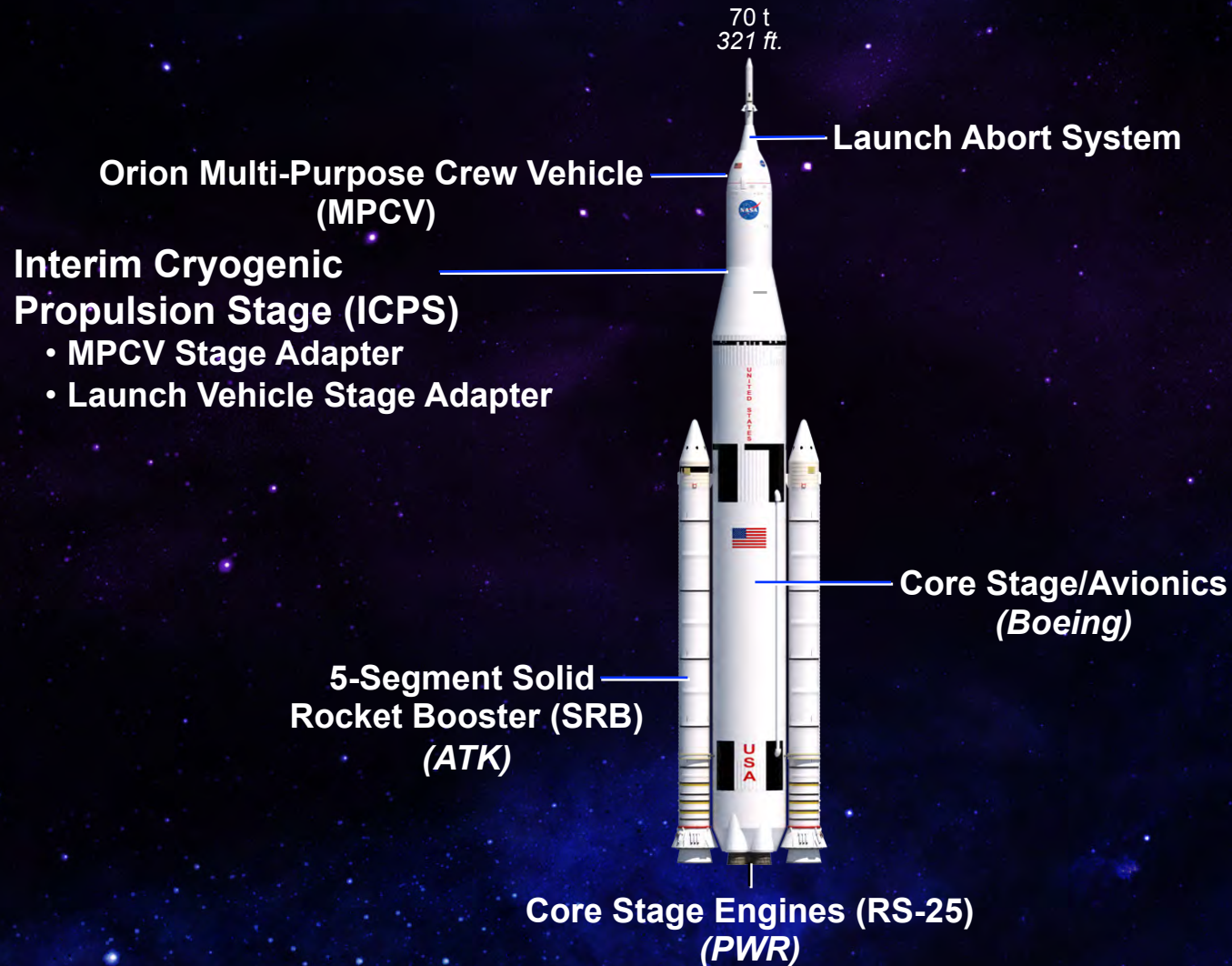
SLS Architecture Block Upgrade Approach



Starting with Available Assets and Evolving the Design

SLS 70 Metric Tons: *First Flight 2017*

INITIAL CAPABILITY, 2017-21



Exploration Flight Test-1 Mission Overview





*SLS will launch from
Kennedy Space Center
in 2017*



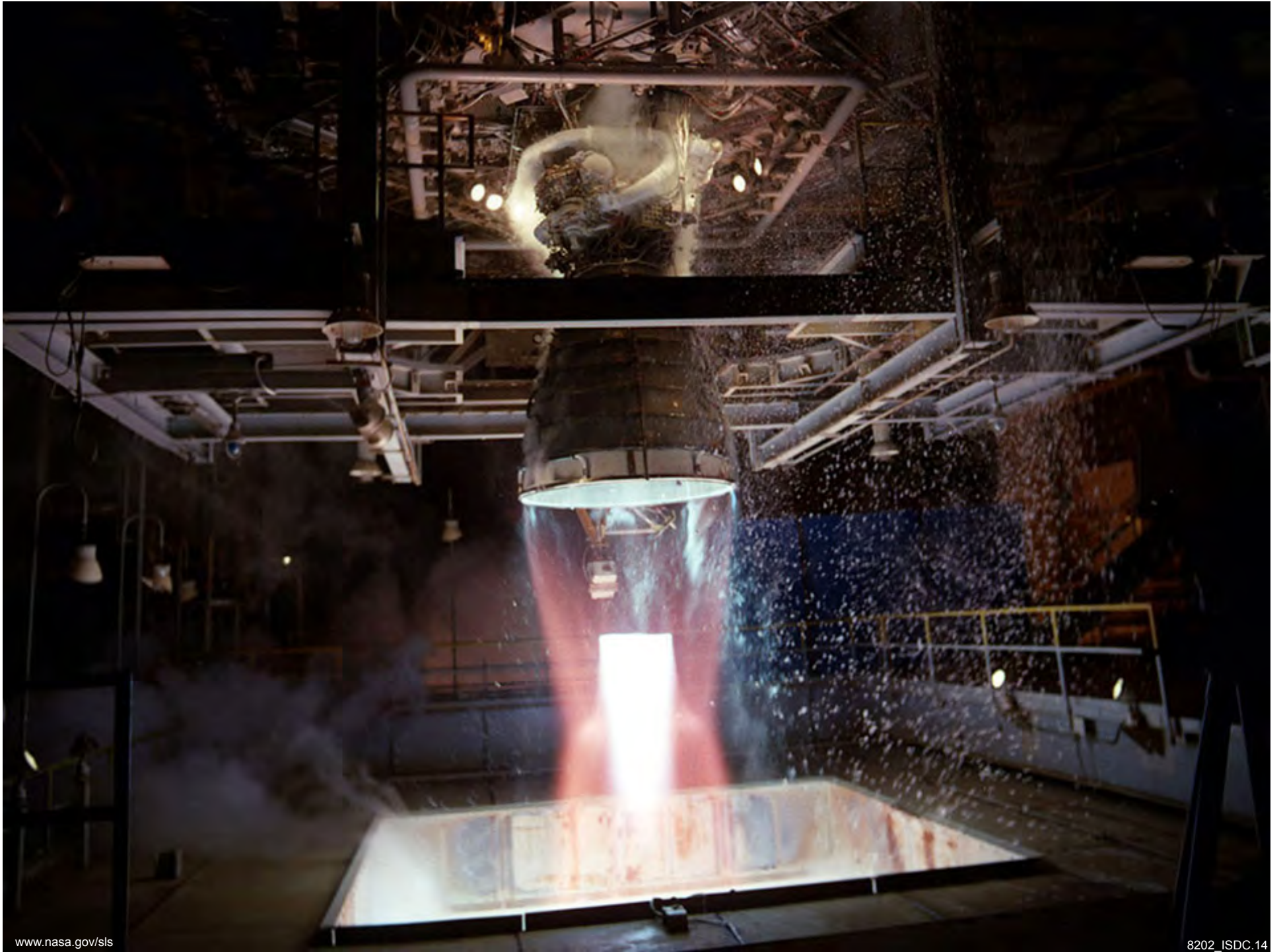
**Core Stage
Engine (RS-25)**



Space Shuttle Main Engine packed into a container for shipment to Stennis Space Center

Space Shuttle Main Engines being received at Stennis Space Center, Mississippi







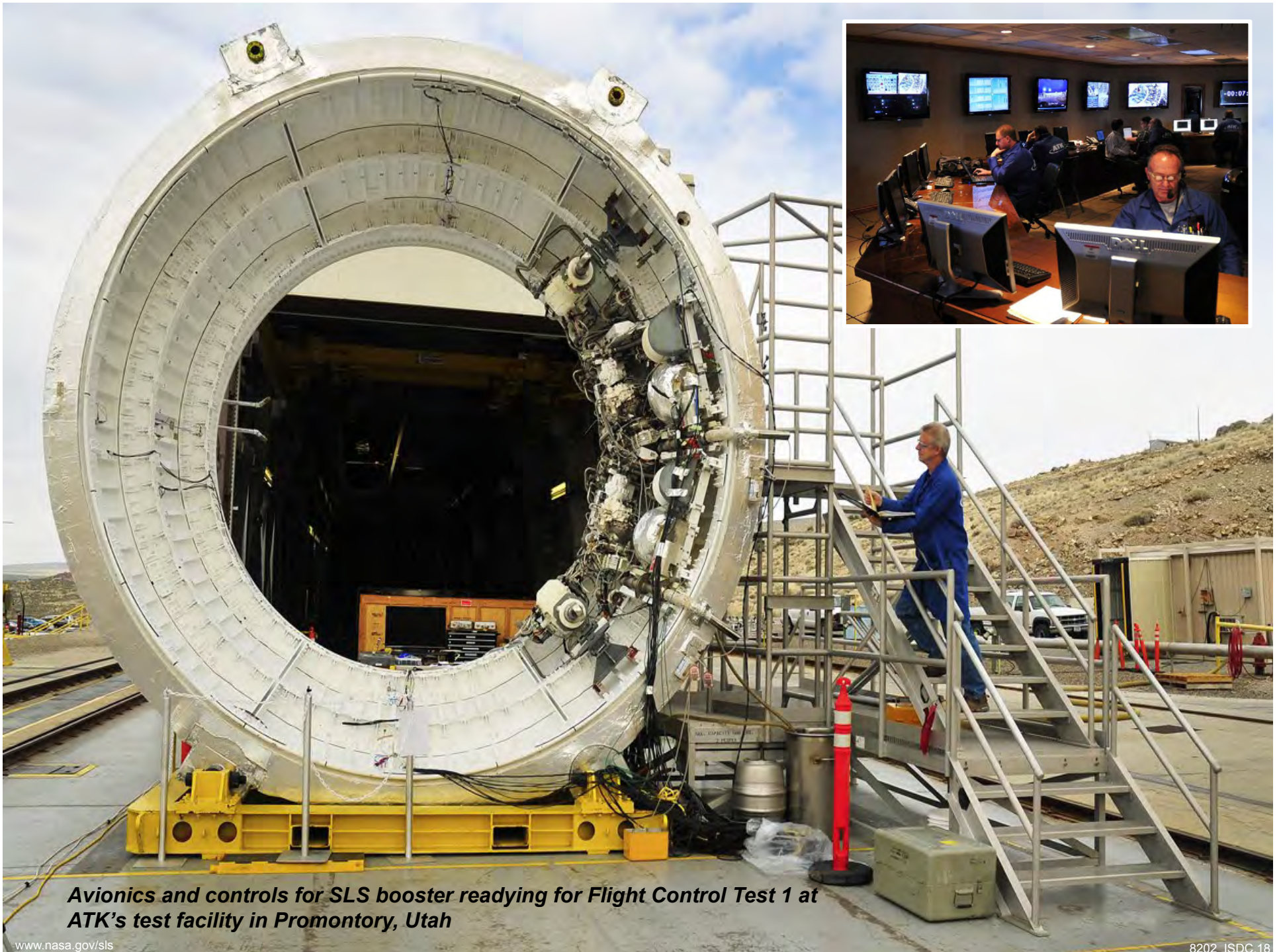
**Solid Rocket Booster awaiting
Development Motor Test 3 at
ATK's Promontory, Utah Test
Site, September 8, 2011**



*Development Motor Test 3
ATK Promontory, Utah
Test Site, September 8, 2011*

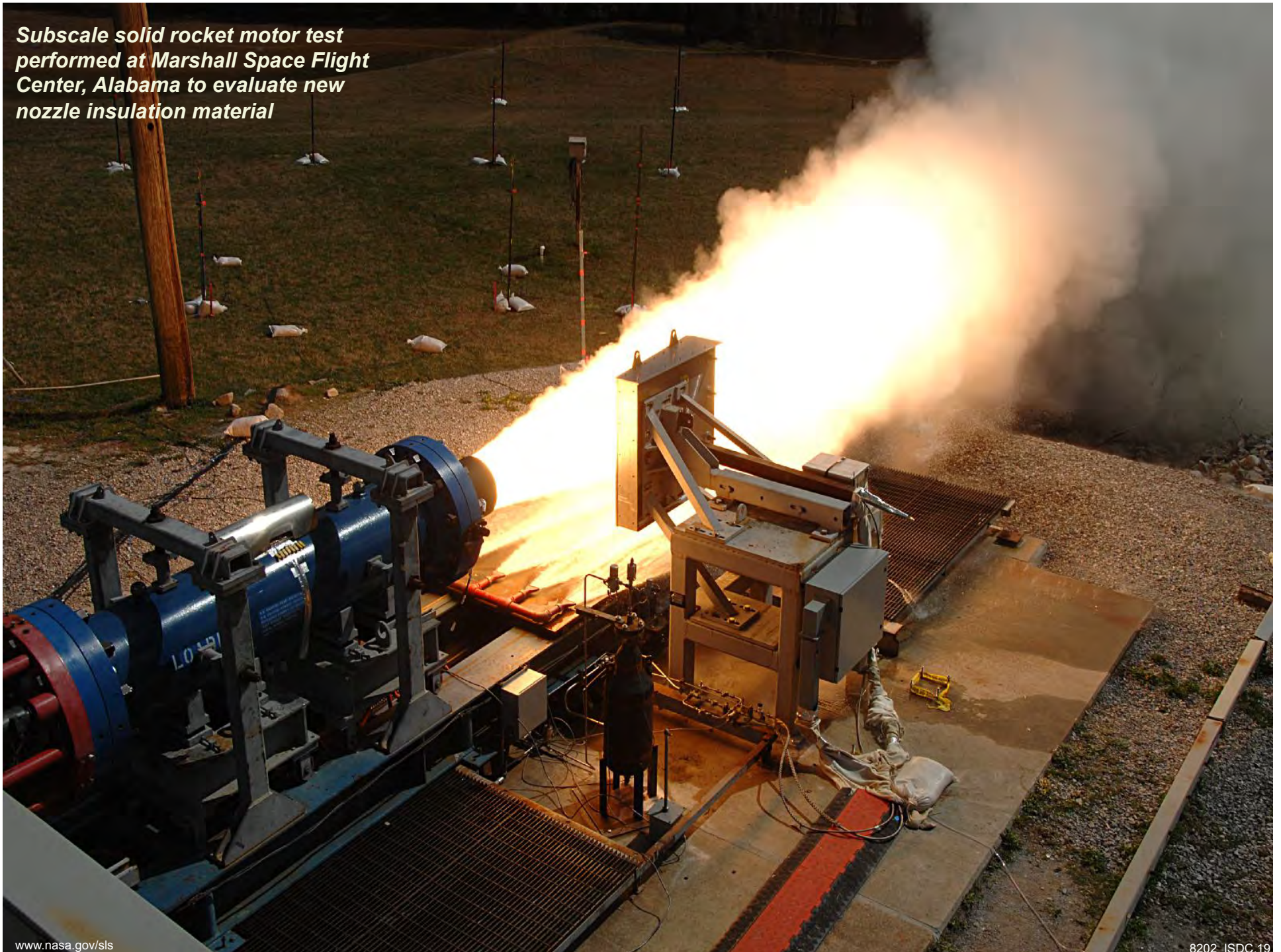


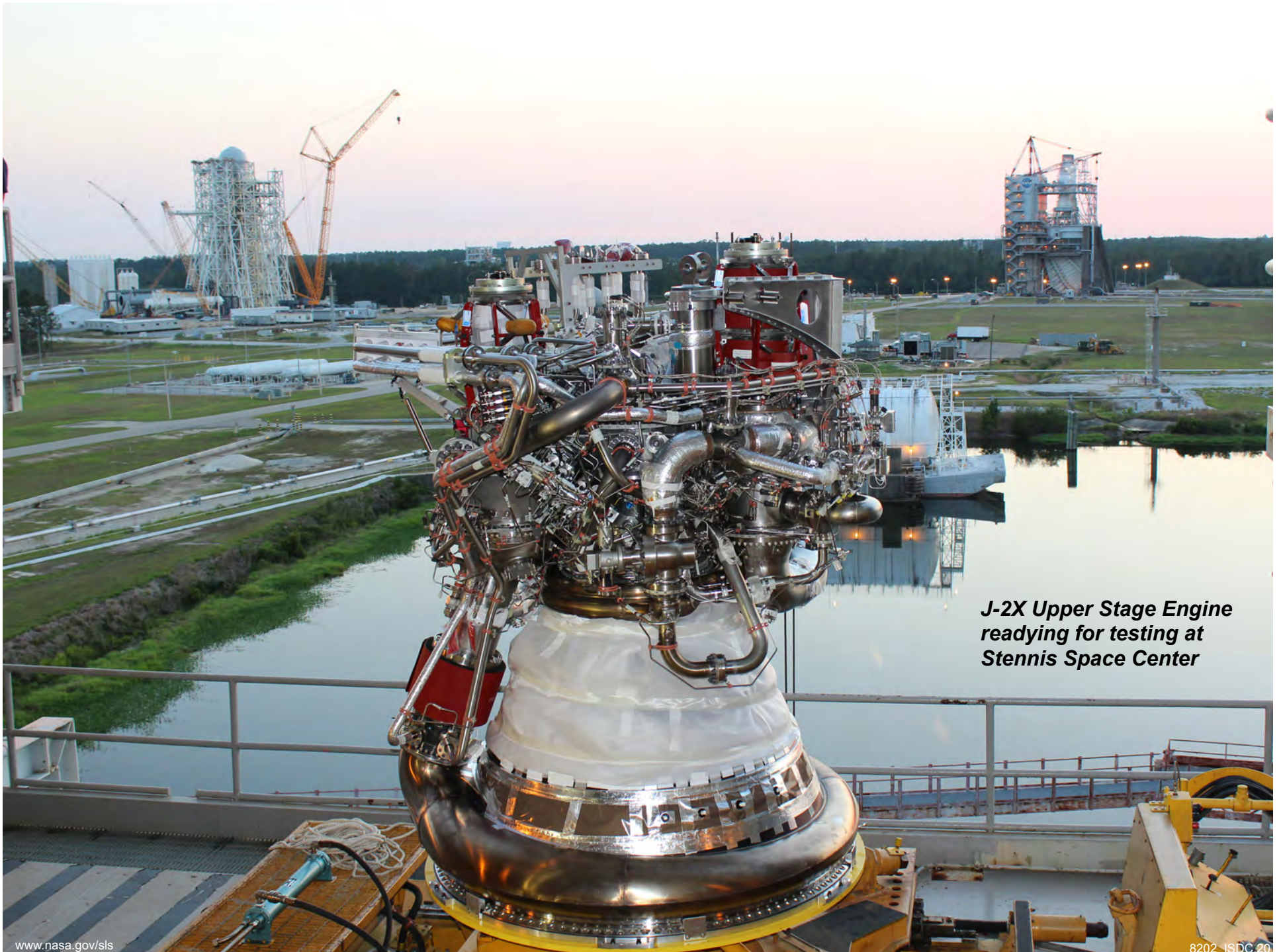
Motor casings for Qualification Motor 1 are inspected at ATK's facility in Brigham City, Utah



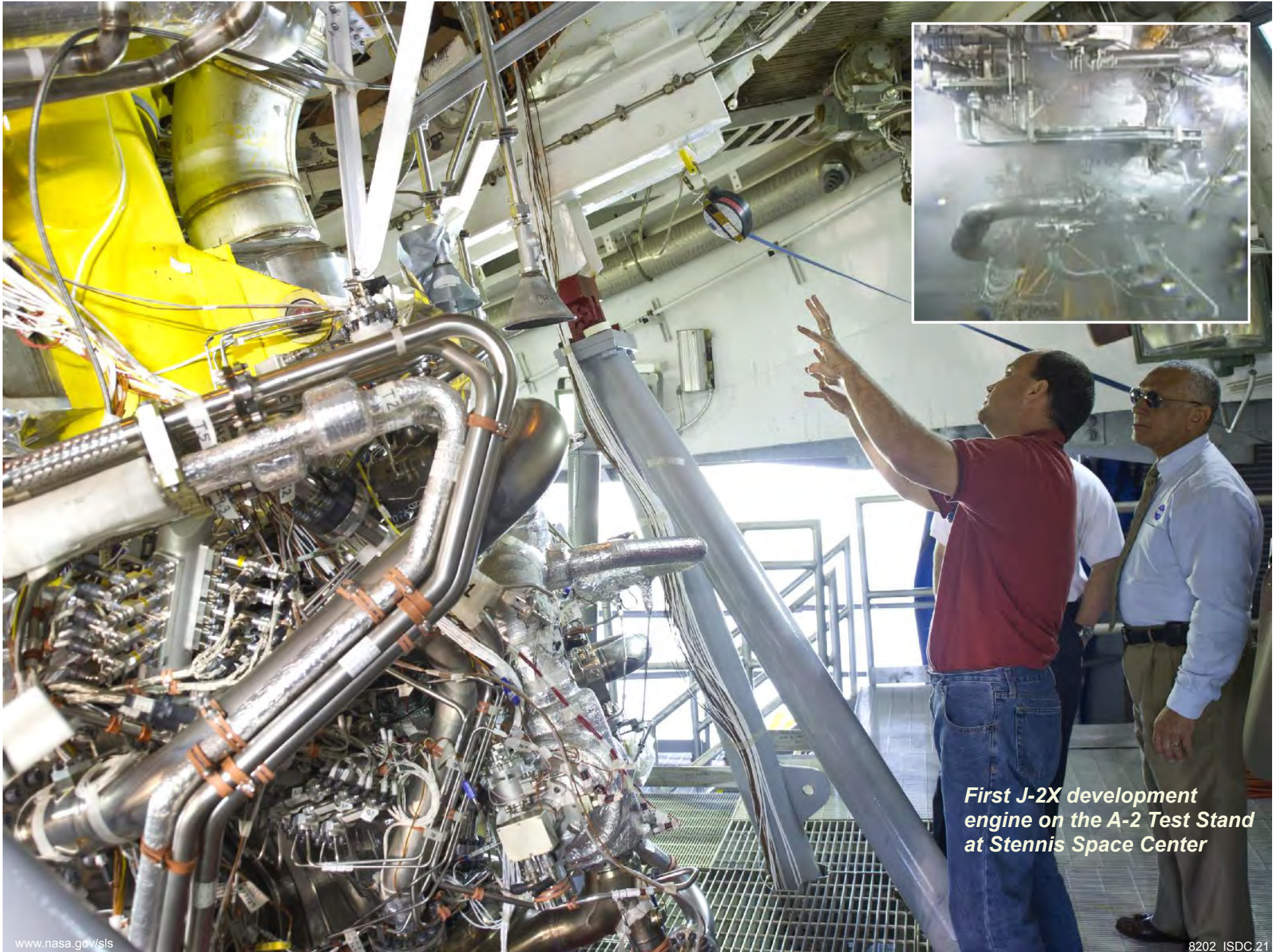
Avionics and controls for SLS booster readying for Flight Control Test 1 at ATK's test facility in Promontory, Utah

Subscale solid rocket motor test performed at Marshall Space Flight Center, Alabama to evaluate new nozzle insulation material





***J-2X Upper Stage Engine
readying for testing at
Stennis Space Center***



First J-2X development engine on the A-2 Test Stand at Stennis Space Center



*J-2X Upper Stage Engine
test at Stennis Space Center,
Mississippi*

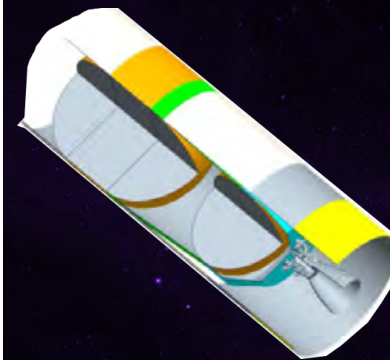


*J-2X Upper Stage Engine
subscale injector test at
Marshall Space Flight
Center, Alabama*



*J-2X Upper Stage Engine
Powerpack test, Stennis
Space Center, Mississippi*

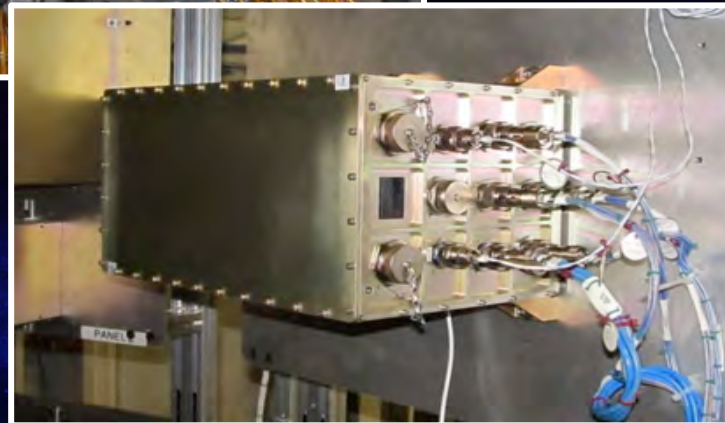
Stages and Avionics



Upper Stage



Core Stage





*Barrel section buckling test,
Marshall Space Flight Center,
Alabama*



Design for Orion Multi-Purpose Crew Vehicle Stage Adapter completed for EFT-1 mission

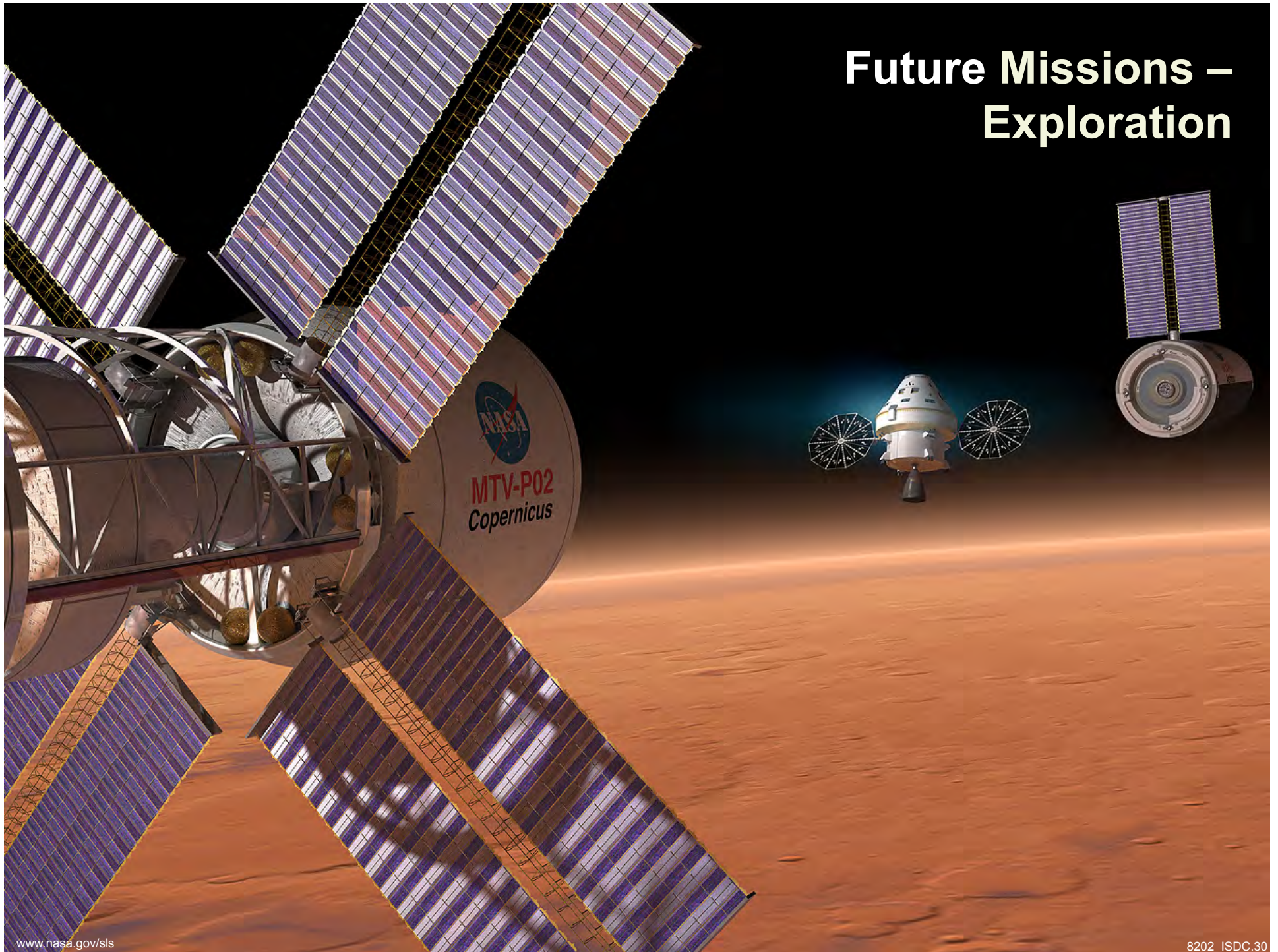
Orion MPCV Stage Adapter



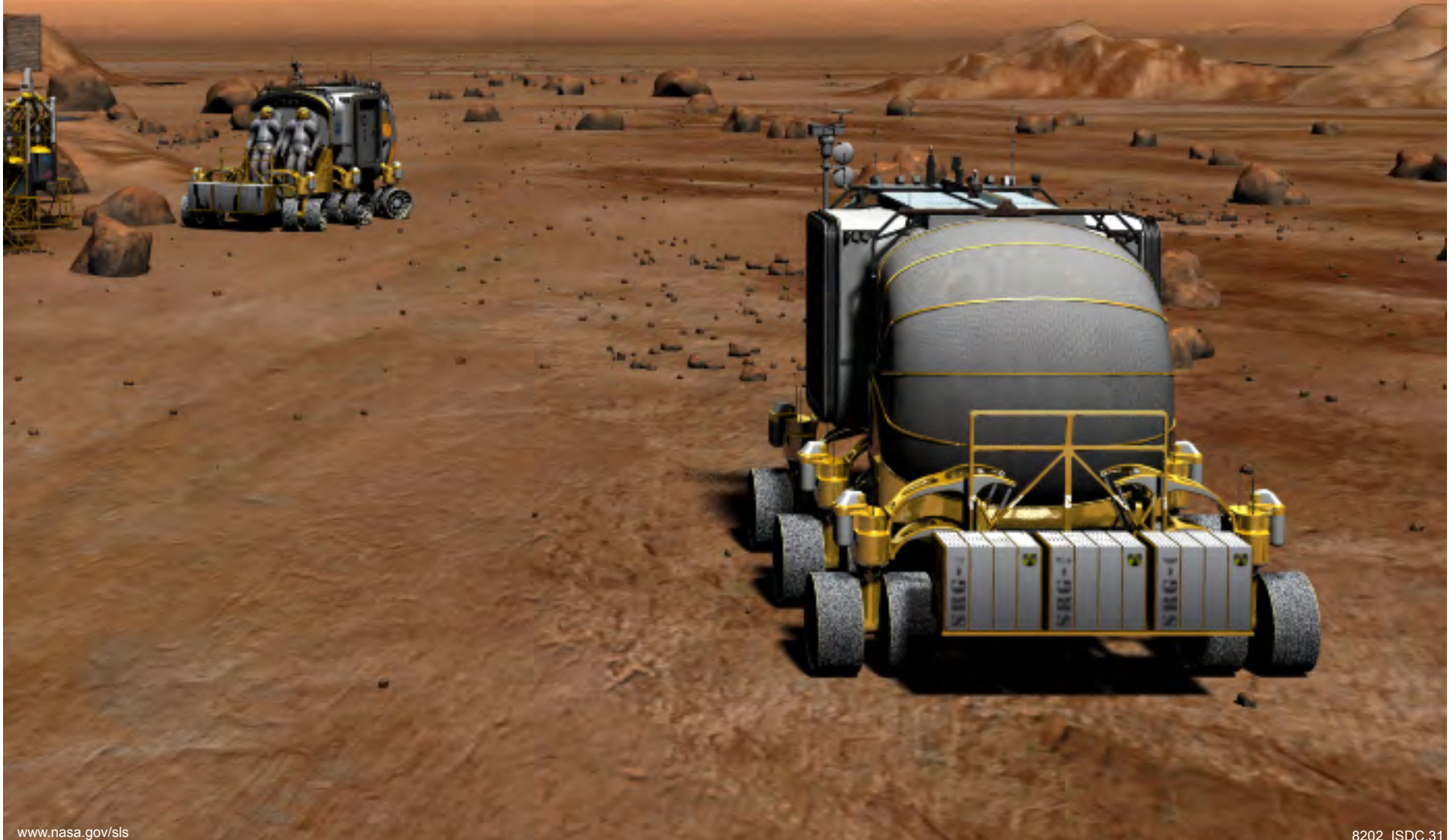


***First ring forging preparation by
ATI/Ladish Forging, Cudahy,
Wisconsin***

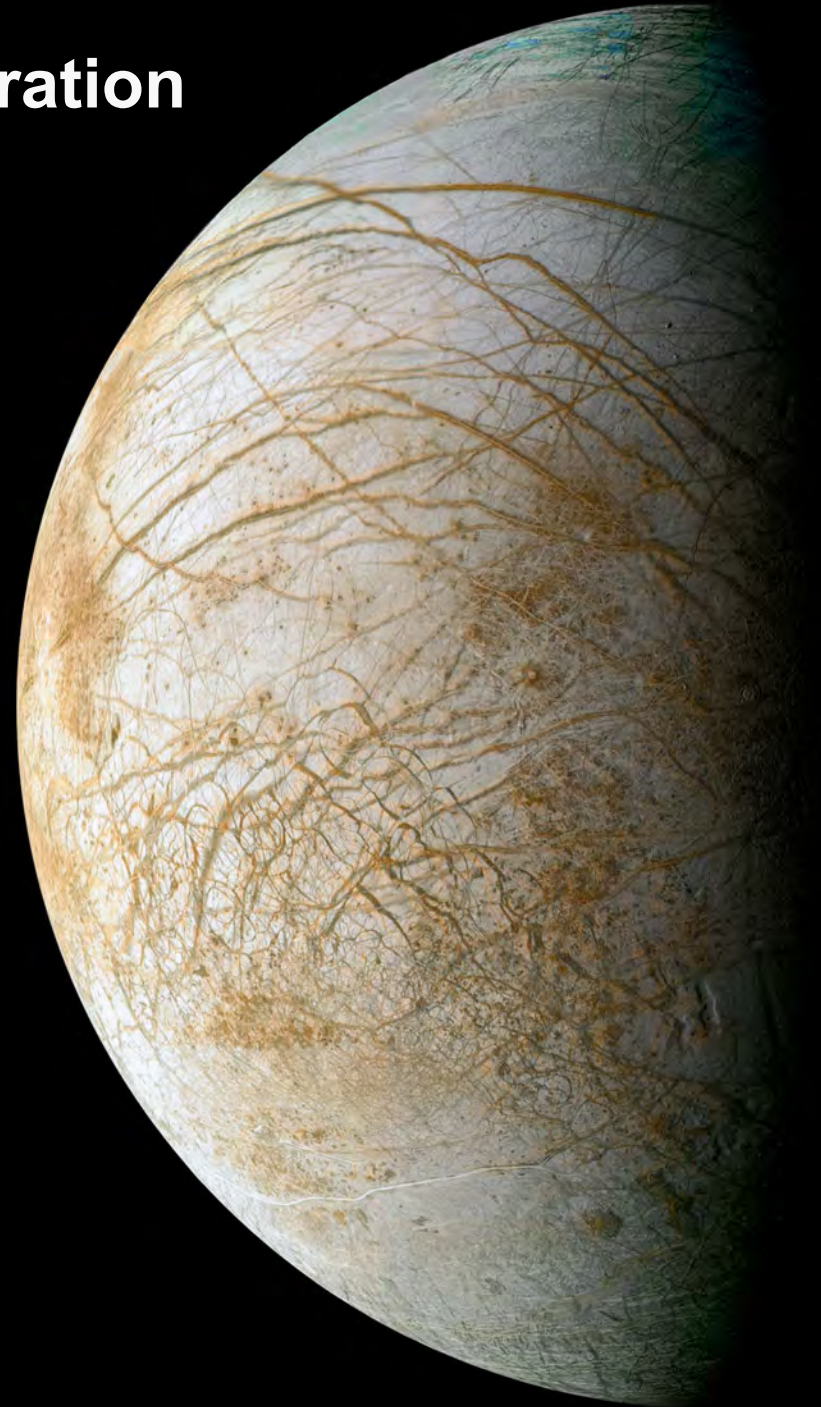
Future Missions – Exploration



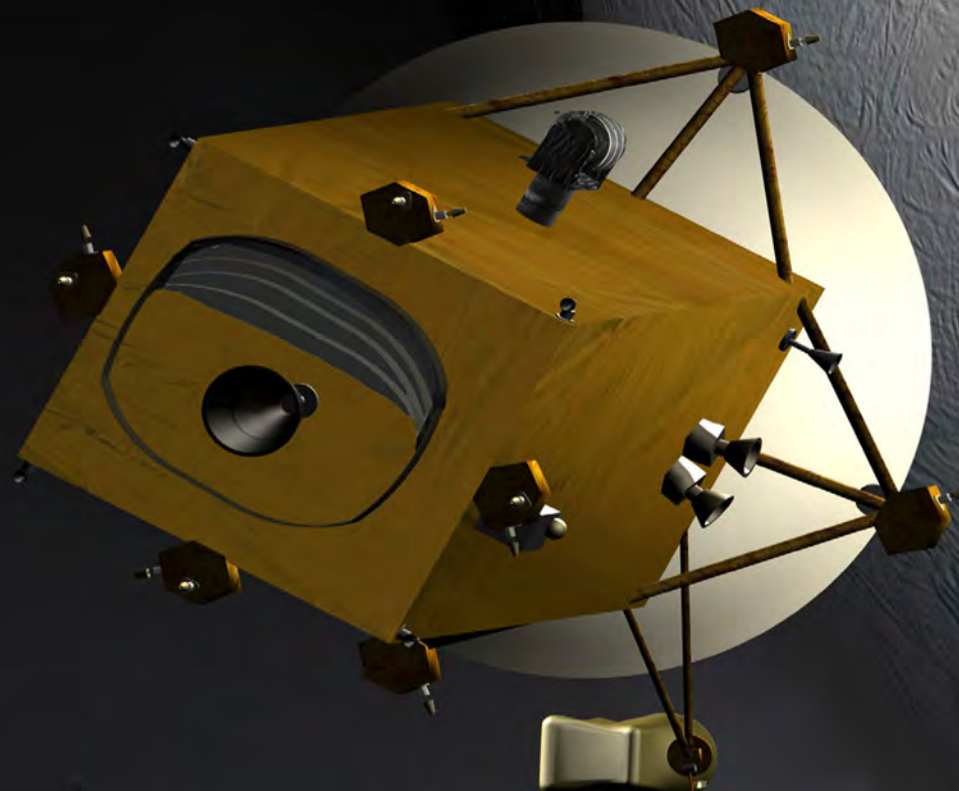
Future Missions – Exploration



Future Missions – Exploration



Future Missions – Exploration



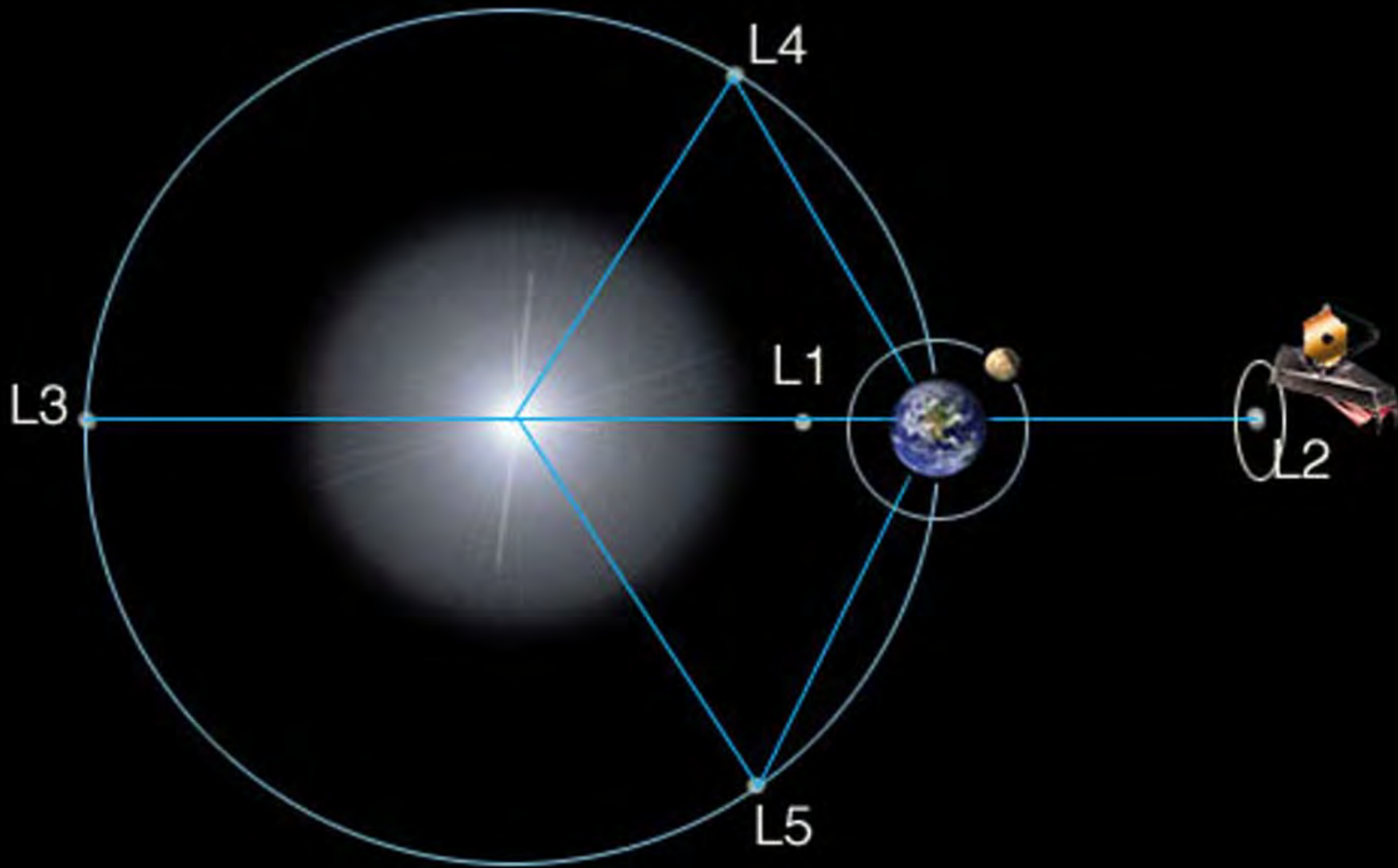
Future Missions – Exploration



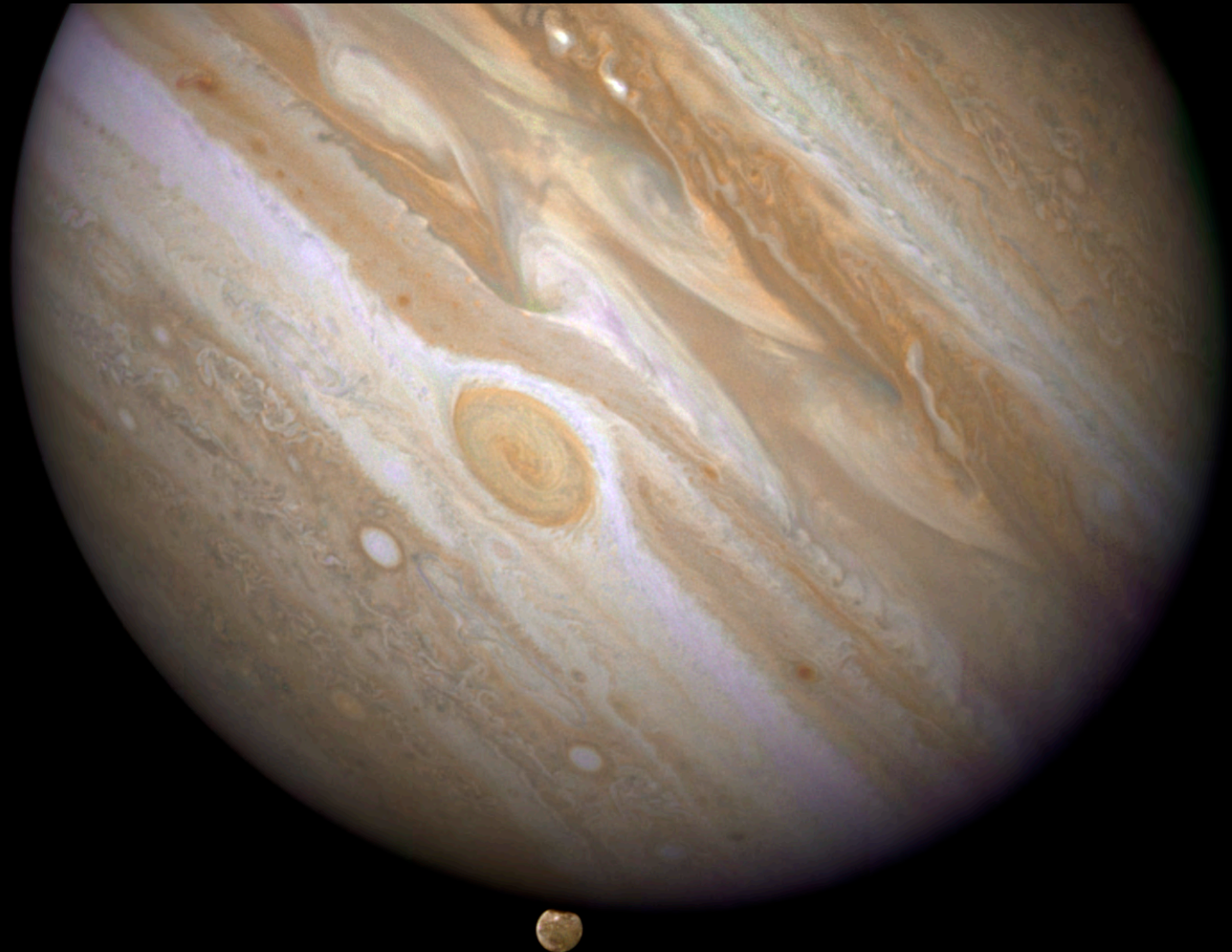
Future Missions – Exploration



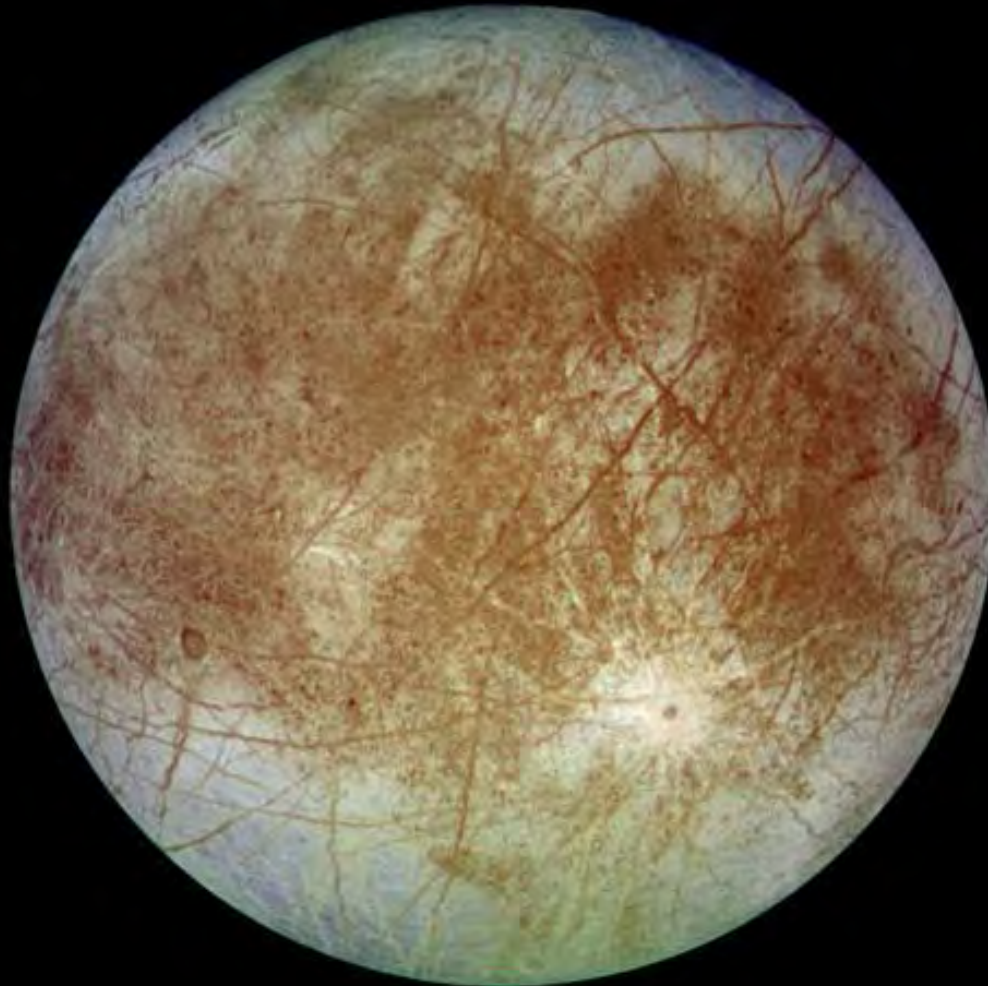
Future Missions – Exploration



Future Missions – Planetary



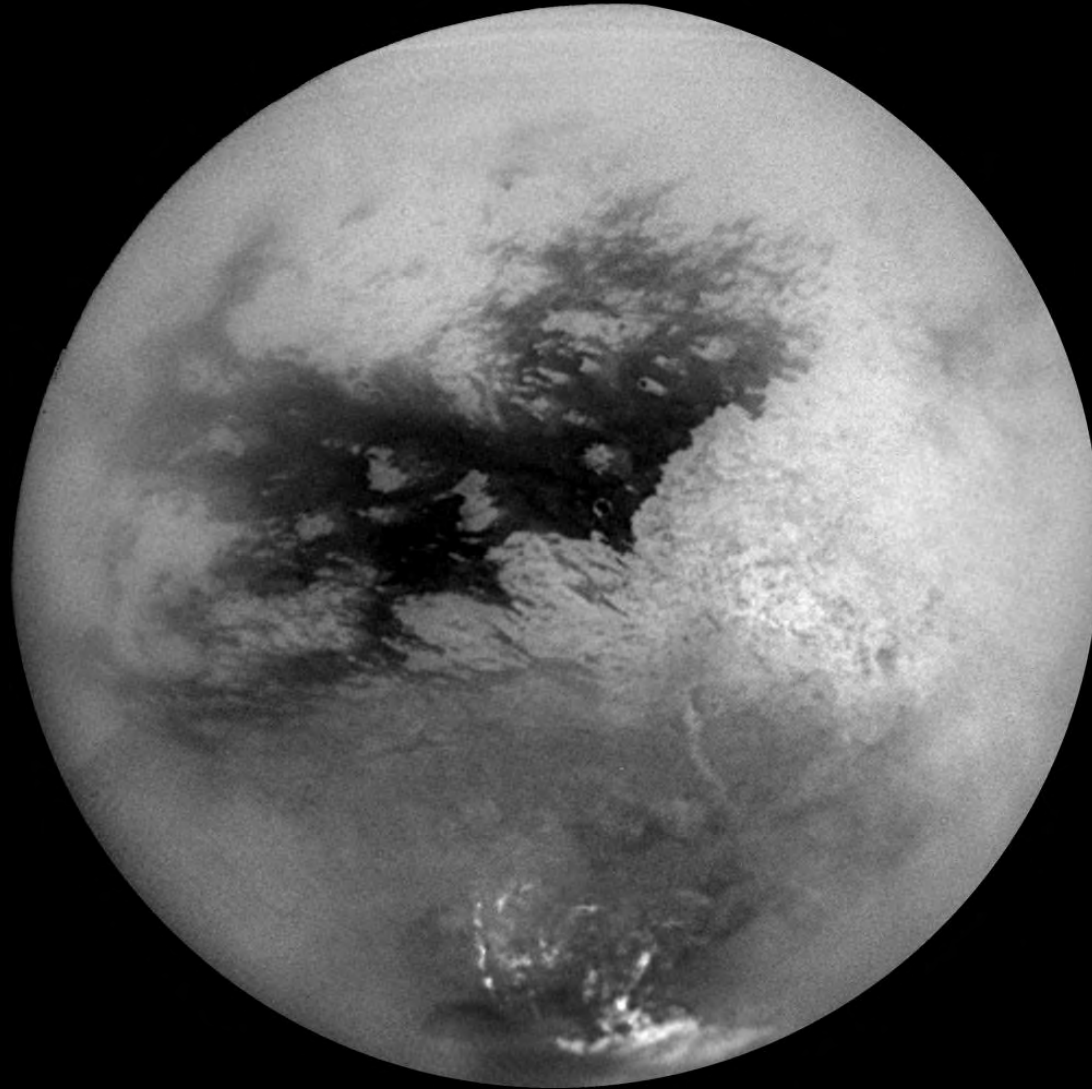
Future Missions – Planetary



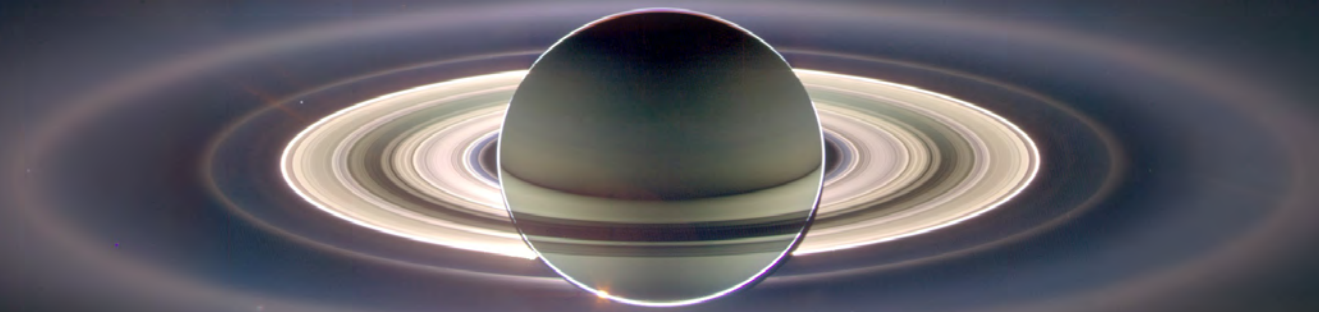
Future Missions – Planetary



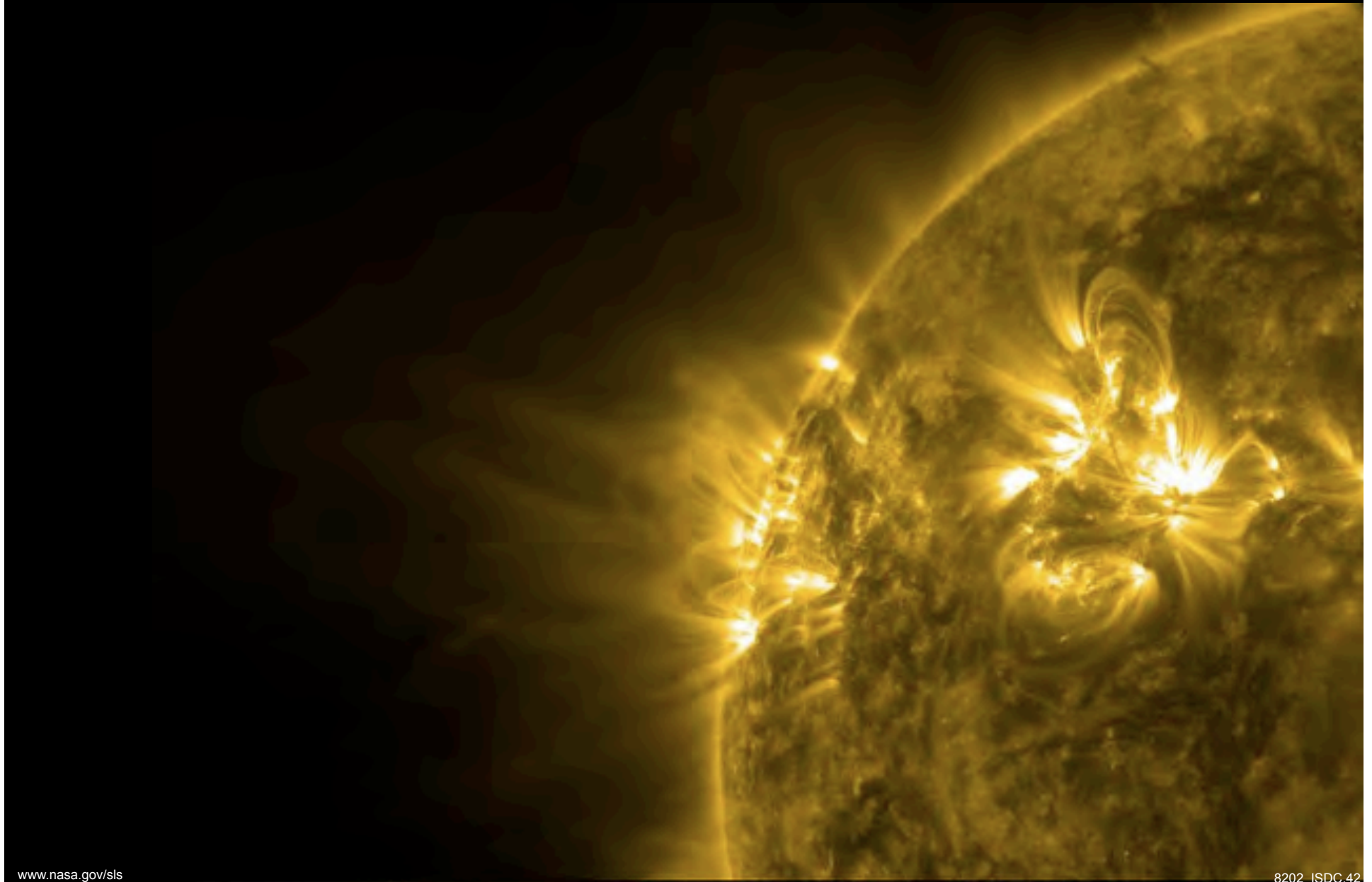
Future Missions – Planetary



Future Missions – Planetary



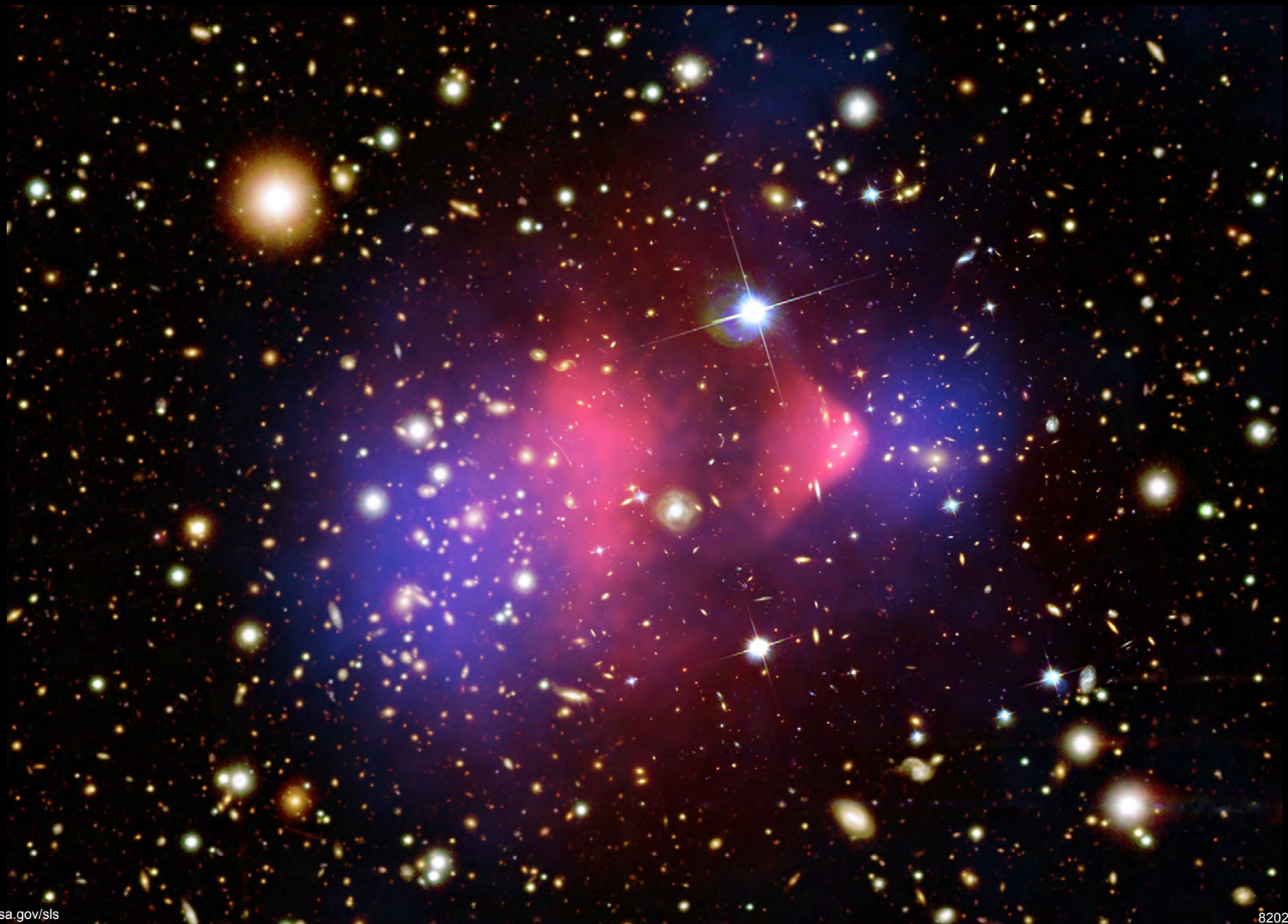
Future Missions – Solar



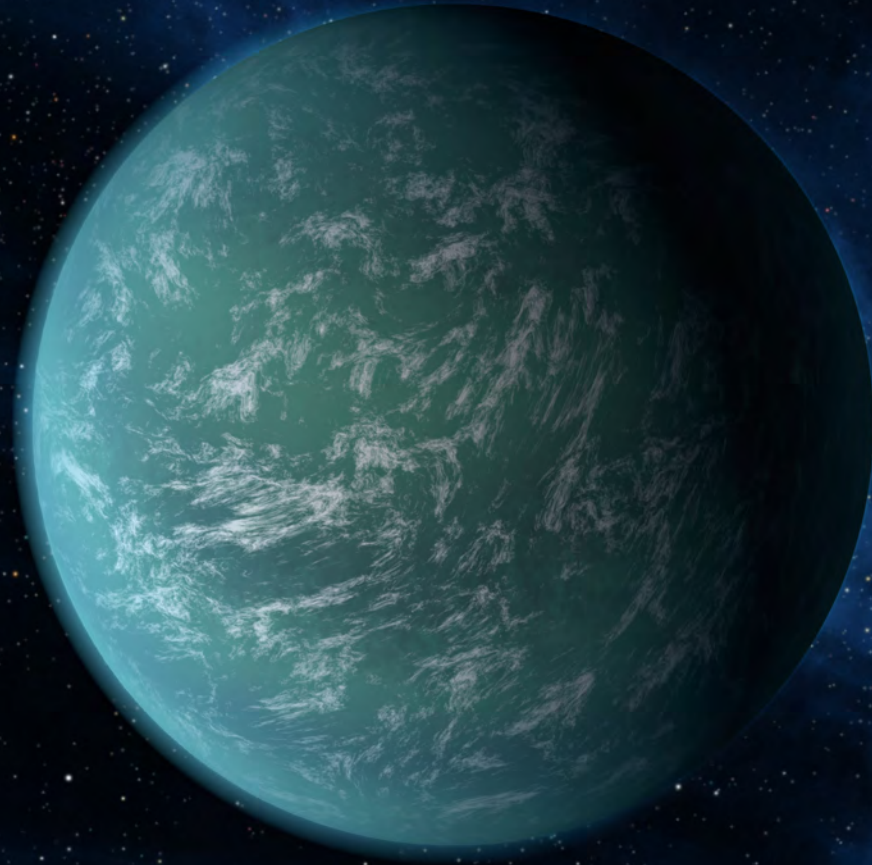
Future Missions – Astronomy



Future Missions – Astronomy




Future Missions – Astronomy



For More Info: www.nasa.gov/sls



Building a Platform for Global Space Exploration

A composite image of the solar system. In the upper left, a bright yellow Sun glows. To its right, Earth is shown with a satellite orbiting it. Further right, Mars is depicted with its reddish surface and a small moon. The foreground is filled with numerous brown, rocky asteroids of various sizes. The background is a deep blue space filled with stars.

*Somewhere, something incredible
is waiting to be known.*

— Carl Sagan