



# **NASA's Space Launch System: Mars Program Utilization**

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**Space Launch System (SLS) Program**

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“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

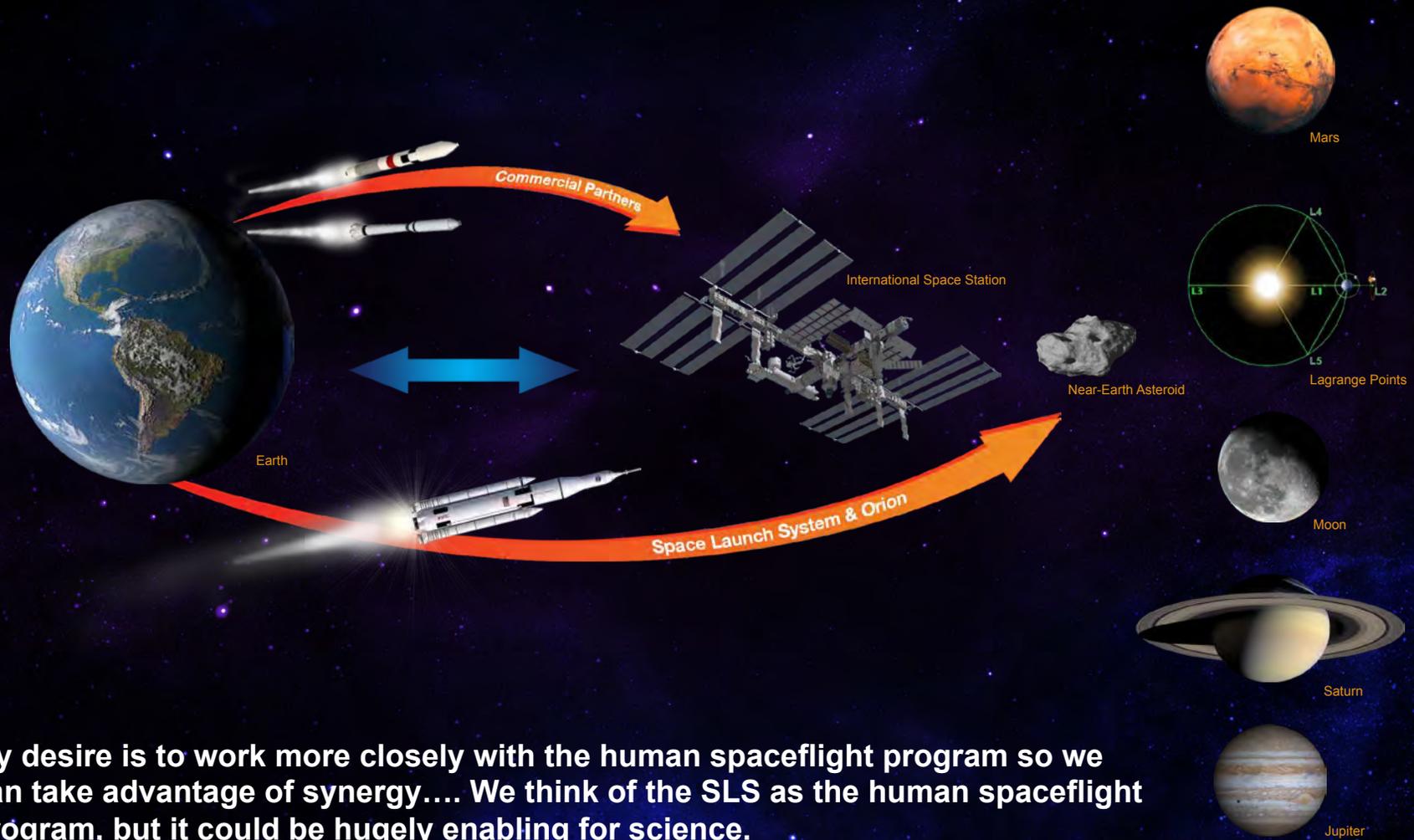


# ***SLS Launches in 2017***

- *Extend and sustain human activities across the solar system.*
- *Expand scientific understanding of the Earth and the universe in which we live.*

*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

# 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

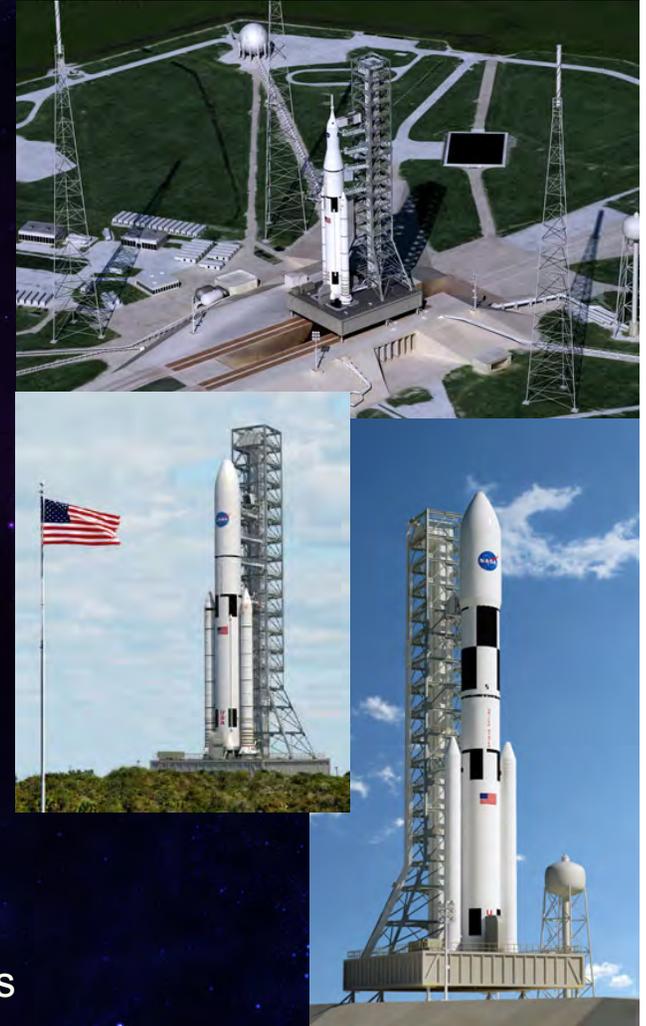
High Thrust In-Space Propulsion Needed

Long Duration Habitat Needed

# SLS — Going Beyond Earth's Orbit

# SLS Driving Objectives

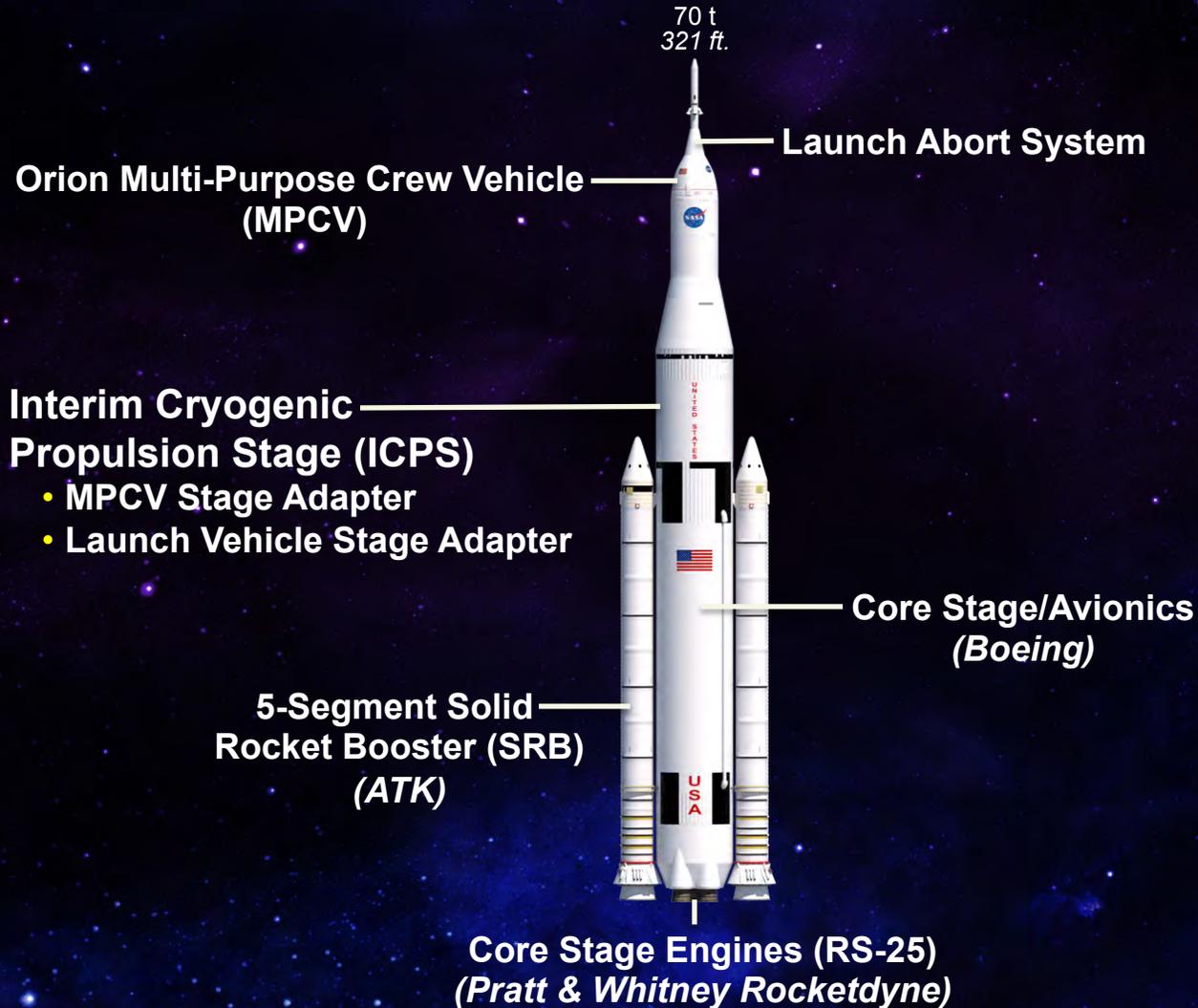
- ◆ **Safe: Human-Rated**
- ◆ **Affordable**
  - Constrained budget environment
  - Maximum use of common elements and existing assets, infrastructure, and workforce
  - Competitive opportunities for affordability on-ramps
- ◆ **Sustainable**
  - Initial capability: 70 metric tons (t), 2017–2021
    - Serves as primary transportation for Orion and exploration missions
    - Provides back-up capability for crew/cargo to ISS
  - Evolved capability: 105 t and 130 t, post-2021
    - Offers large volume for science missions and payloads
    - Modular and flexible, right-sized for mission requirements



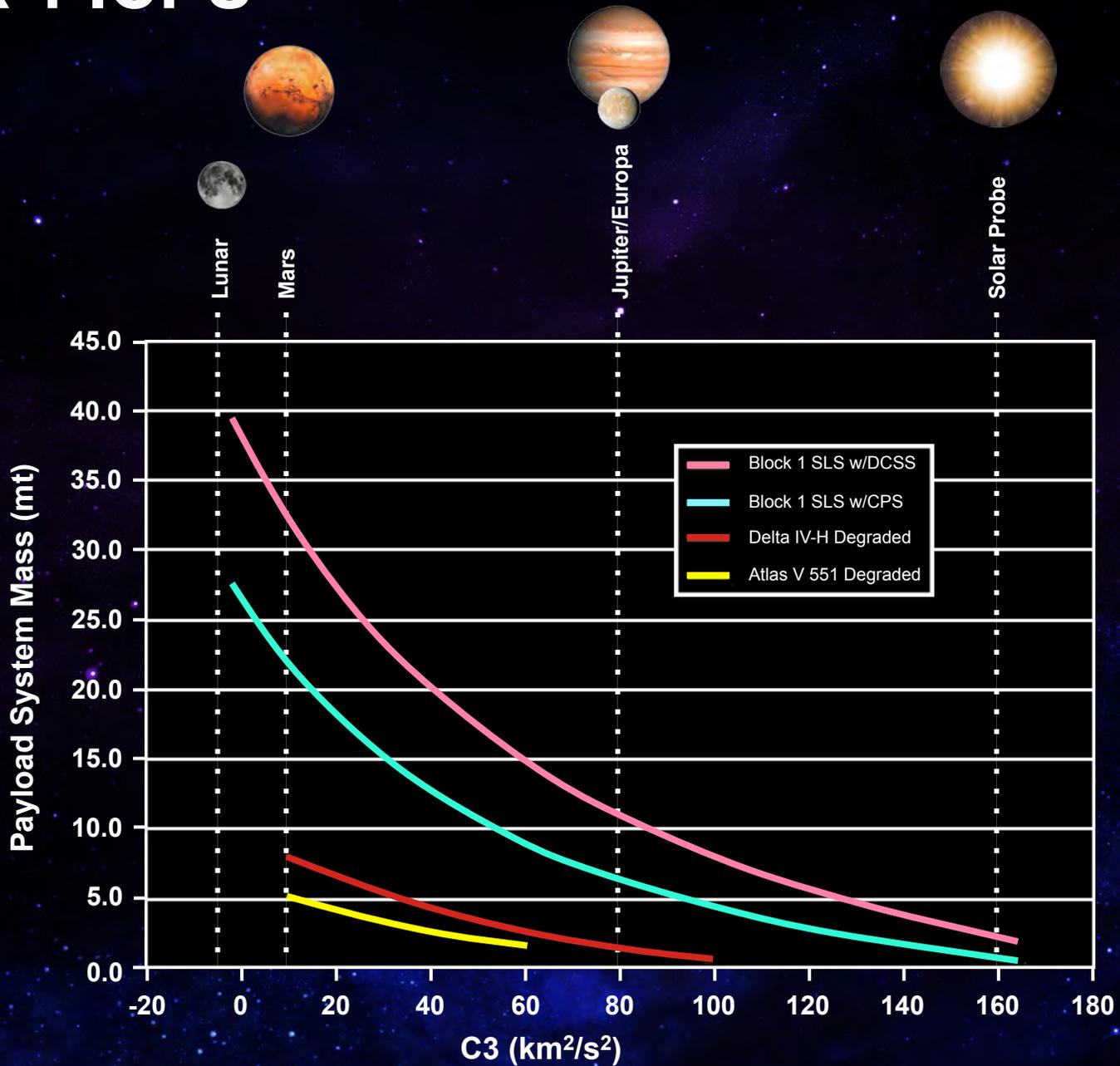
*Flexible Architecture Configured for the Mission*

# SLS 70 Metric Tons: First Flight 2017

**INITIAL CAPABILITY, 2017-21**



# Block 1 ICPS



# SLS Benefits for Mars Exploration

## *Less Risk*



Increased lift capacity

Increased payload margin

## *Less Expensive Mission Operations*



High-energy orbit

Shorter trip times

## *Increased Design Simplicity*



Volume and mass capability

Fewer origami-type payload designs needed to fit in the fairing

## *Increased Mission Reliability and Confidence*



Volume and mass capability

Fewer deployments and critical operations

***Safe, Affordable, Sustainable***

# SLS: Being Built Today in the U.S.A.



Subscale solid rocket motor test, Marshall Space Flight Center, AL, March 2012.



Stages Industry Day at Michoud Assembly Facility, New Orleans, Nov 2011.



5-Segment Solid Rocket Booster development motor test, Promontory, UT, Sep 2011.



Kennedy Space Center (KSC) currently is preparing Launch Complex 39B for SLS/Orion operations.



Installing the J-2X powerpack in test stand at SSC.



RS-25 Core Stage Engine in the KSC Engine Processing Facility, 2011.



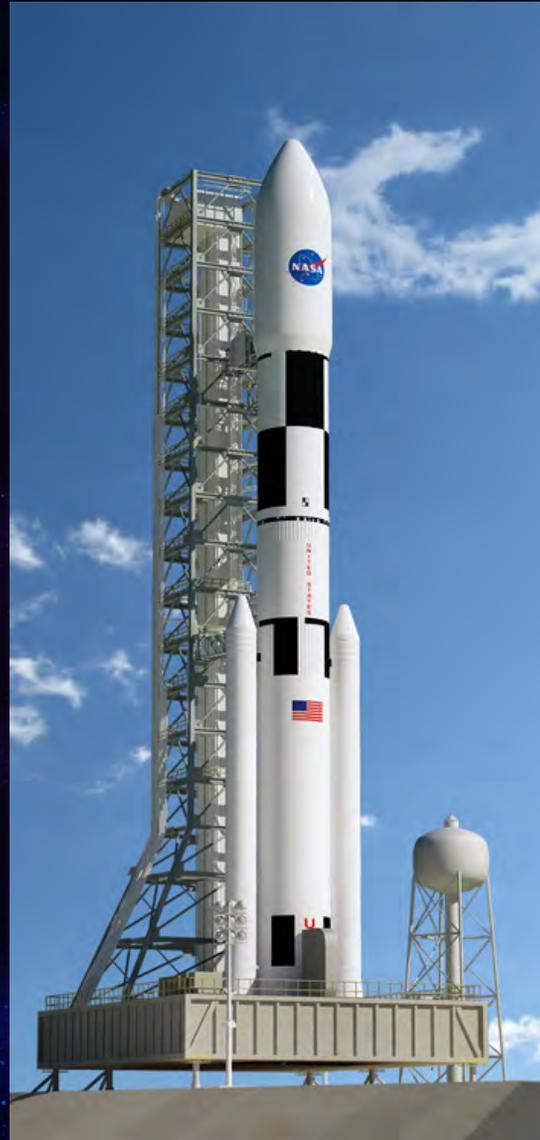
J-2X Upper Stage Engine powerpack test, Stennis Space Center (SSC), MS, Feb 2012.



Meeting with Space Campers at U.S. Space & Rocket Center, Huntsville, AL, Feb 2012.

# An Unprecedented Platform for Mars Exploration

For More Information



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[www.nasa.gov/sls](http://www.nasa.gov/sls)