

A space-themed background featuring a large view of Earth's blue and white atmosphere on the left, the Moon in the upper right, and a bright star with a lens flare in the lower left.

NASA-Johnson Space Center Engineering Directorate Overview

Mike Hess

Associate Director *of* Engineering

Johnson Space Center



JSC is the heart of . . .
the operations,
Scientific,
and engineering community
that leads at the frontier of human
space exploration,
where technical challenges are most
daunting and risks are highest

Main Site: Houston, TX
Civil Servants ~3100
On/near site ~11,000

Additional Facilities:
White Sands, NM
Neutral Buoyancy Lab
Ellington Field, TX

ENGINEERING DIRECTORATE

Lauri Hansen, Director

Kevin Window, Deputy Director

Michael Hess, Associate Director

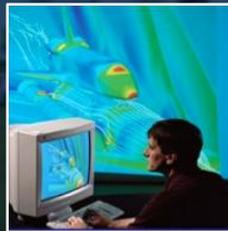
Trish Petete, Associate Director Commercial Space



**Crew & Thermal
Systems**



**Avionic
Systems**



**Aeroscience &
Flight
Mechanics**



**Structural
Engineering**



**Propulsion
& Power**



**Software,
Robotics, &
Simulation**

A high-angle photograph of the International Space Station (ISS) in orbit above Earth. The station's complex structure, including multiple modules and large solar panel arrays, is clearly visible against the blue and white background of the planet. The solar panels are arranged in a symmetrical pattern around the central truss structure.

The Engineering Directorate has a proven record of solving complex engineering challenges and finding **innovative solutions** to difficult problems

JSC has a large variety of technical disciplines, and can **leverage** various resources at any given time

One stop shop!

Engineering Directorate Priorities

- **ISS:** Sustaining Engineering, Systems Management, Visiting Vehicle Certification, Utilization as Test Bed, GFE spares/replacements/upgrades
- **Orion/MPCV:** Systems and GFE Design, Development, Test and Integration
-
- **Exploration Class Spacecraft Systems Development**
 - Advanced Engineering Systems (AES)
 - Office of the Chief Technologist Projects
- **Commercial Cargo and Crew**
 - Insight/oversight/certification
 - Inline support

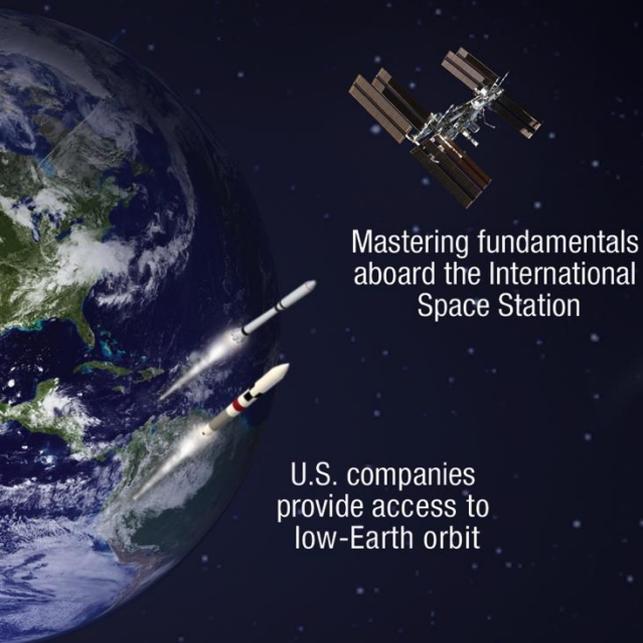
HUMAN EXPLORATION

NASA's Path to Mars



EARTH RELIANT

MISSION: 6 TO 12 MONTHS
RETURN TO EARTH: HOURS



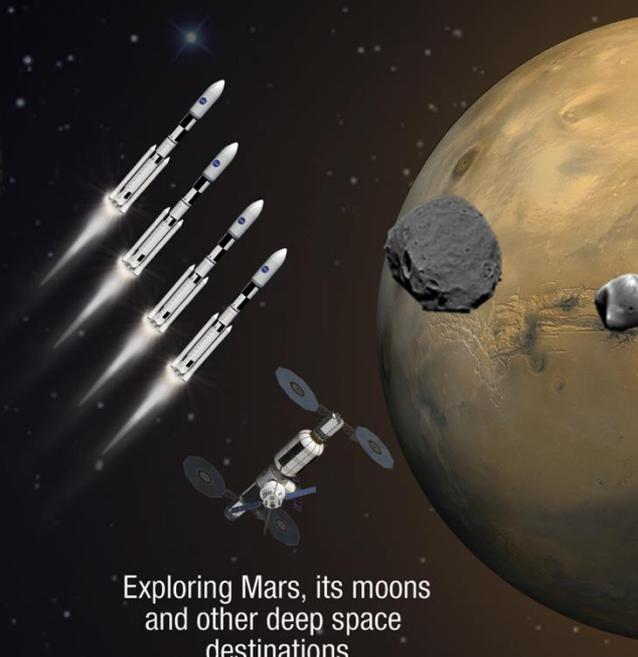
PROVING GROUND

MISSION: 1 TO 12 MONTHS
RETURN TO EARTH: DAYS



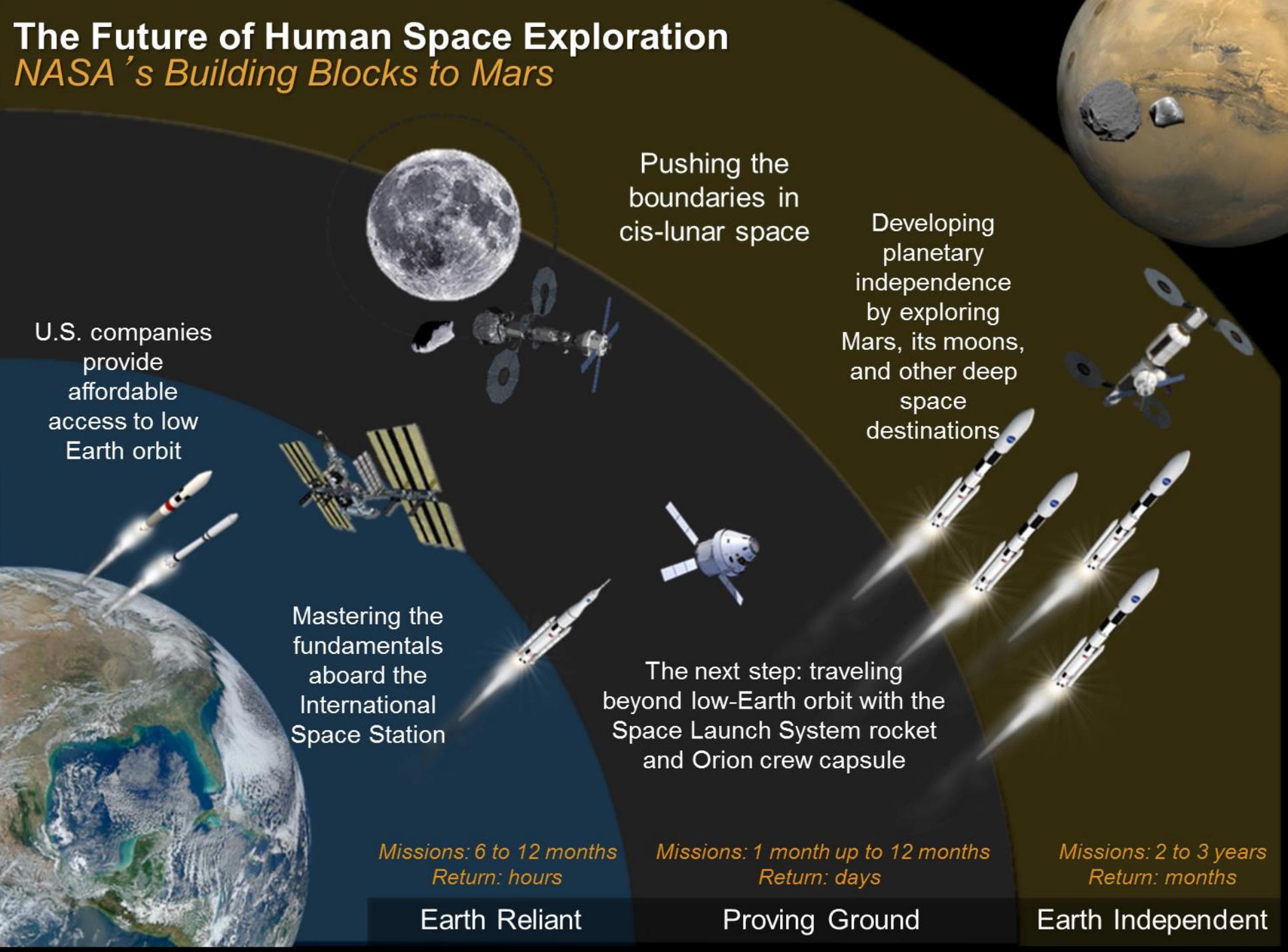
MARS READY

MISSION: 2 TO 3 YEARS
RETURN TO EARTH: MONTHS



The Future of Human Space Exploration

NASA's Building Blocks to Mars



U.S. companies provide affordable access to low Earth orbit

Mastering the fundamentals aboard the International Space Station

Pushing the boundaries in cis-lunar space

Developing planetary independence by exploring Mars, its moons, and other deep space destinations

The next step: traveling beyond low-Earth orbit with the Space Launch System rocket and Orion crew capsule

*Missions: 6 to 12 months
Return: hours*

*Missions: 1 month up to 12 months
Return: days*

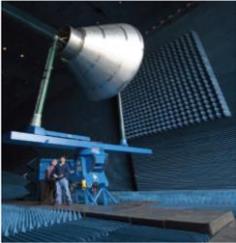
*Missions: 2 to 3 years
Return: months*

Earth Reliant

Proving Ground

Earth Independent

Avionics Systems



- Human System Interfaces
- Wireless and Comm Systems
- Processors, Networks, and Instrumentation
- Radiation and EEE Parts

Crew & Thermal Systems



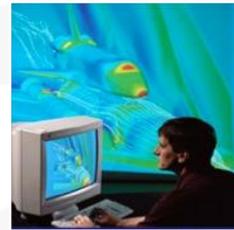
- Environmental Control and Life Support System
- Active Thermal Control
- EVA Spacesuits & Equipment
- Habitation Systems

Structural Engineering



- Human Rated Spacecraft Structures
- Spacecraft Mechanical Systems
- EDL Thermal
- Advanced Materials & Monitoring

Aeroscience & Flight Mechanics



- Entry, Descent, & Landing
- Autonomous Rendezvous & Docking
- Automated Guidance, Navigation, & Control
- Advanced Analytical Tools

Software, Robotics, & Simulation



- Robotics IVA/EVA & Mobility
- Crew Exercise
- Spacecraft Software (MPCV, etc.)
- ISS GFE Software
- Simulation, Training, and Analysis

Propulsion & Power



- Pyros
- In Situ Resource Utilization
- Energy Storage and Distribution
- LOX Methane Propulsion
- Advanced Propulsion Physics



out of the box
thinking

finding **solutions**
in other people's
toolbox





collectively most challenging problems can be successfully **solved!**



~~Problems~~
Solutions

