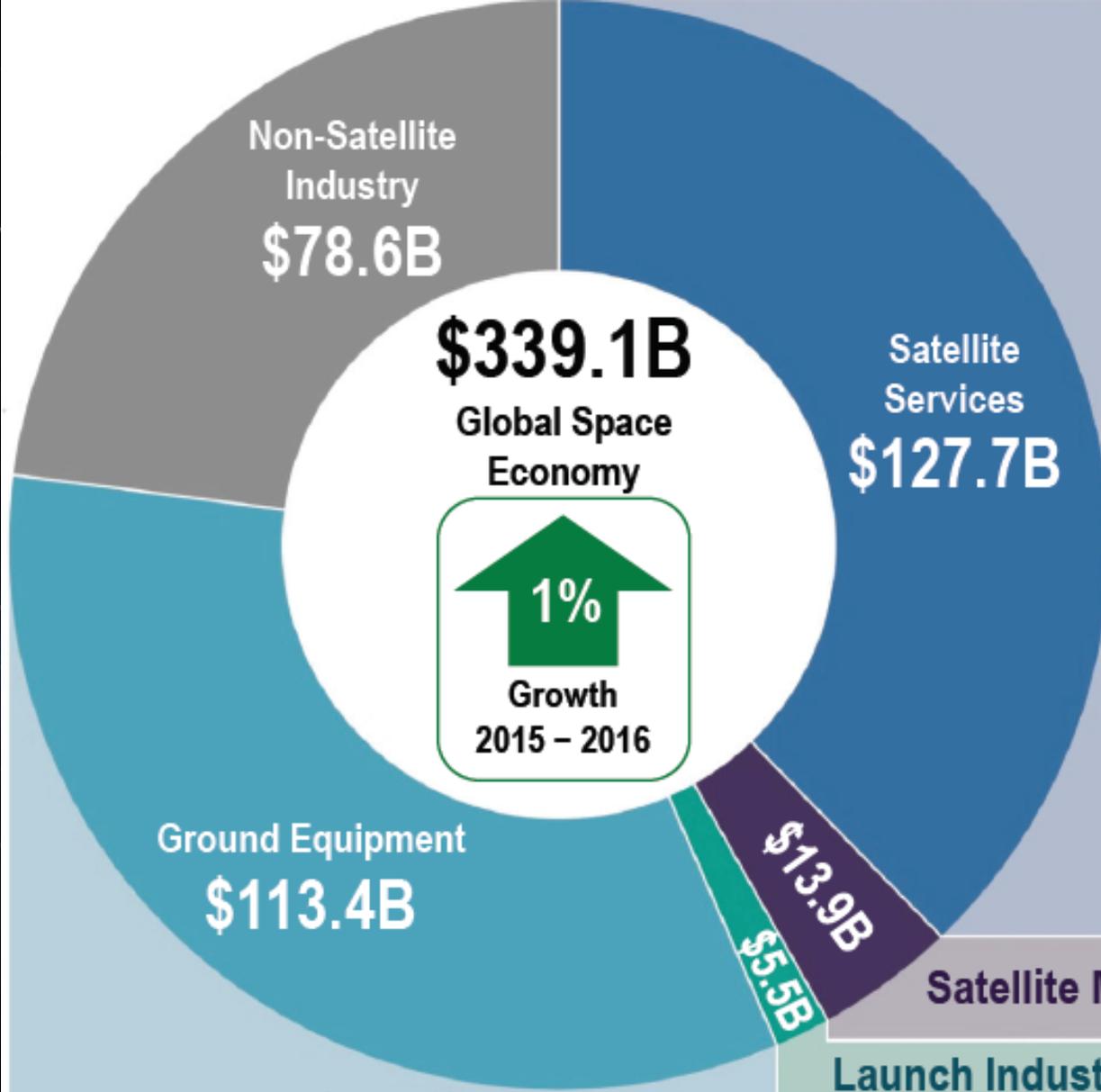




# LEADING HUMAN SPACE EXPLORATION

*Vanessa Wyche, Deputy Director  
NASA Johnson Space Center  
November 2017*

# A GLOBAL INDUSTRY



## Telecommunications

- Television
- Telephone
- Broadband
- Aviation
- Maritime
- Road and Rail

## Earth Observation

- Agriculture
- Change Detection
- Disaster Mitigation
- Meteorology
- Resources

## Science

- Earth Science
- Space Science

## National Security



## Consumer Equipment

- Sat TV, radio, and broadband equipment
- GNSS stand-alone units & in-vehicle systems
- GNSS chipsets (beginning with the 2017 report)

## Network Equipment

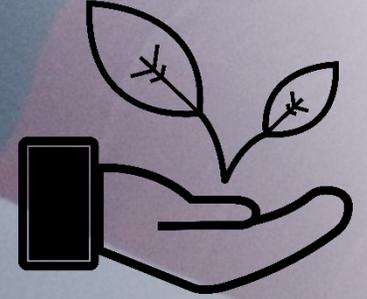
- Gateways
- VSATs
- NOCs
- SNG equipment

# NATIONAL STRATEGIC THEMES

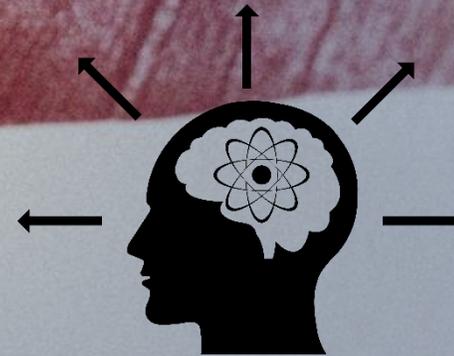


GLOBAL ENGAGEMENT  
AND DIPLOMACY

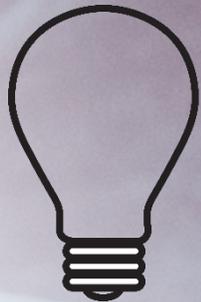
ADDRESSING SOCIETAL  
CHALLENGES



NATIONAL SECURITY

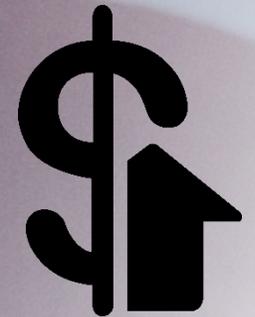


EXPANDING SCIENTIFIC  
KNOWLEDGE

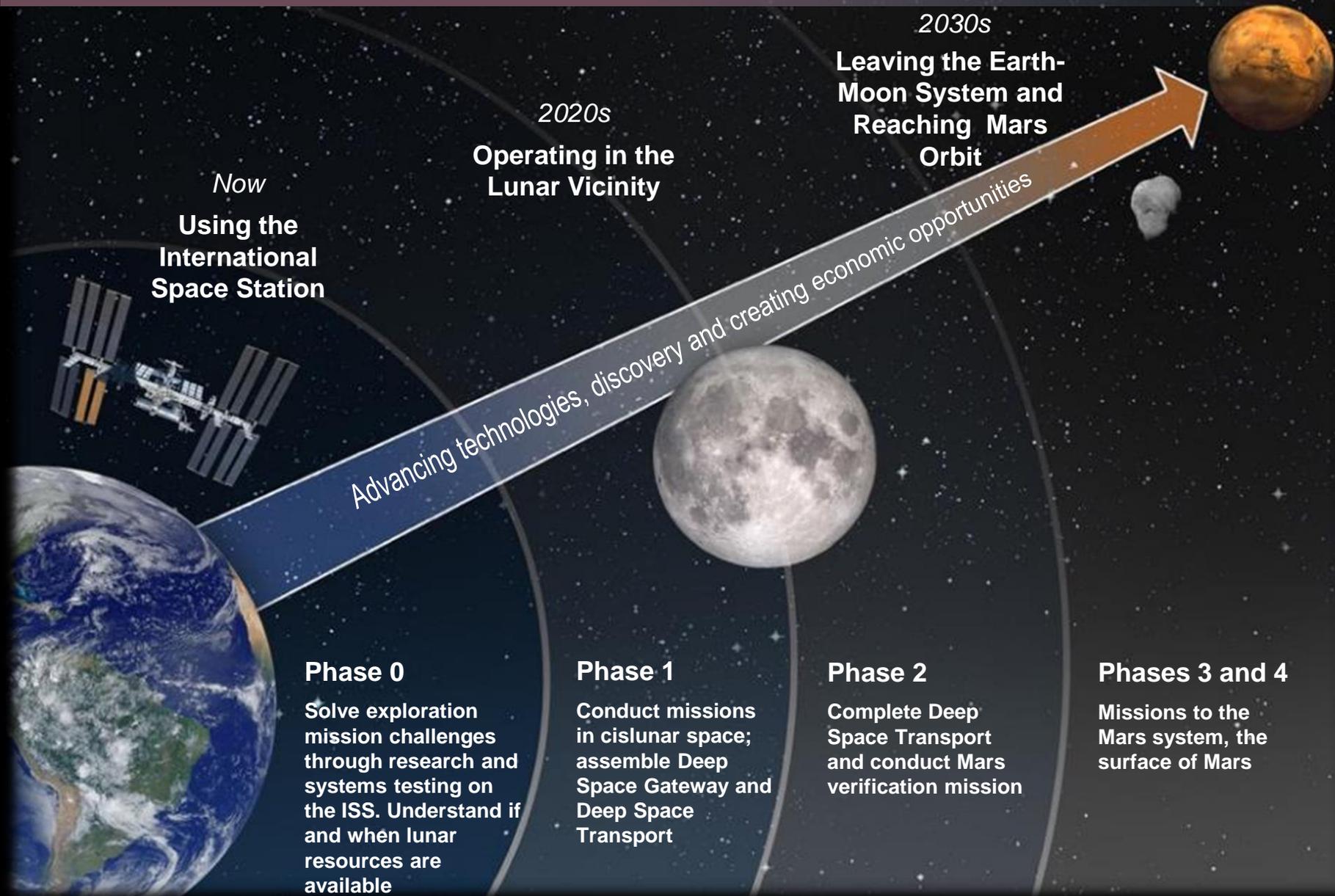


INSPIRATION AND LEADERSHIP

ECONOMIC DEVELOPMENT  
AND GROWTH

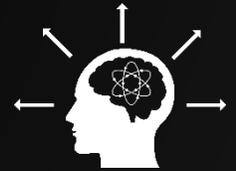


# Exploring Space In Partnership





# THE INTERNATIONAL SPACE STATION



**228  
ISS  
VISITORS**

**95  
COUNTRIES  
INVOLVED**

**16 YEARS  
CONTINUOUS  
HABITATION**

**144  
AMERICANS**

**CREW  
FROM  
18  
COUNTRIES**

**16  
ATTACHED  
PAYLOADS**

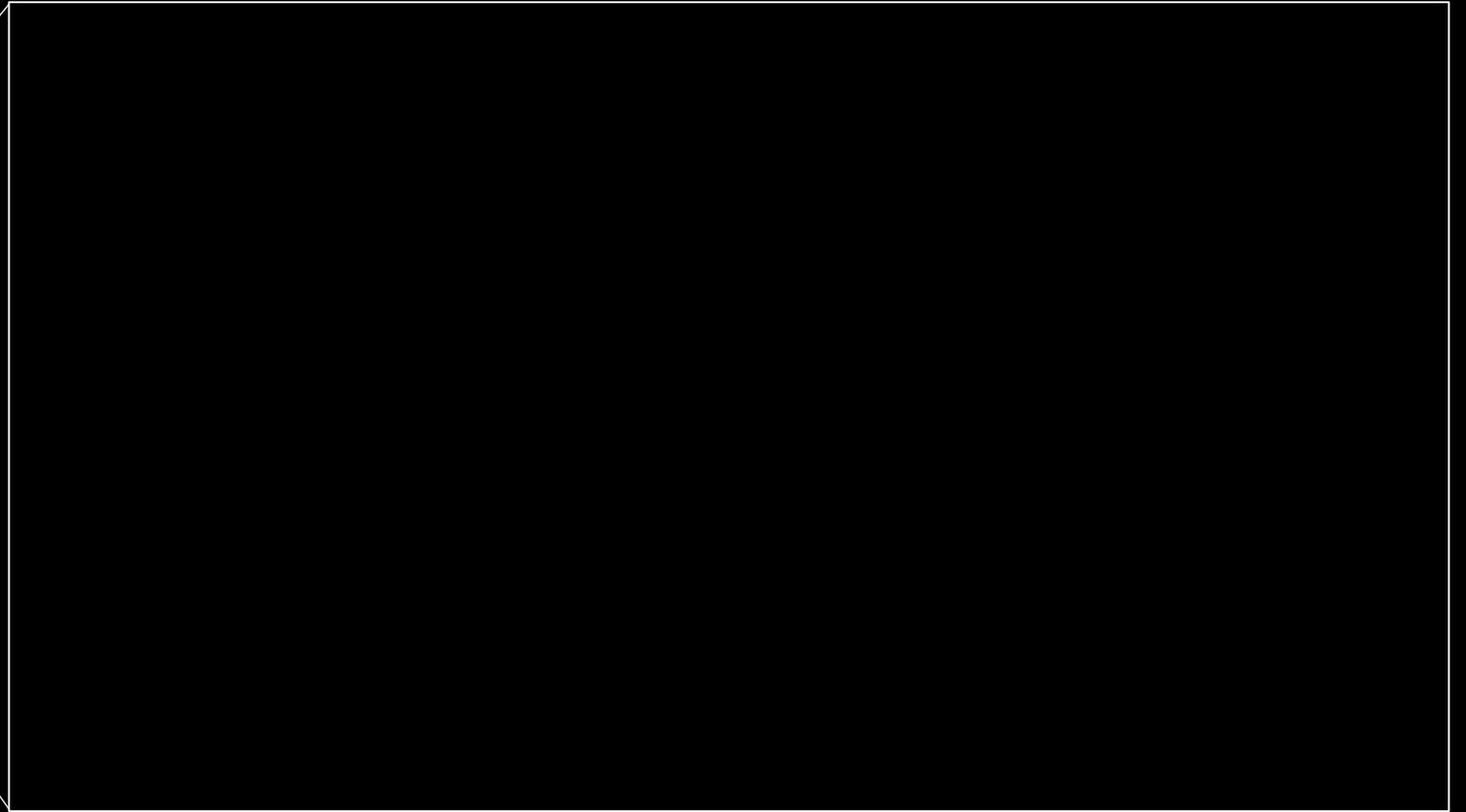
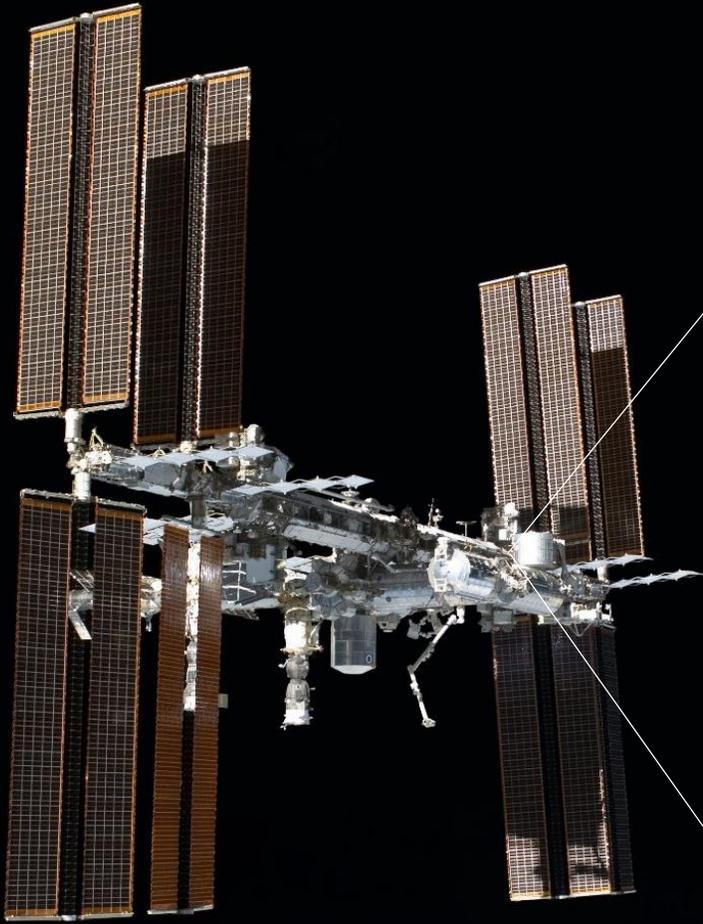
**MORE THAN  
1200  
SCIENTIFIC  
PUBLICATIONS**



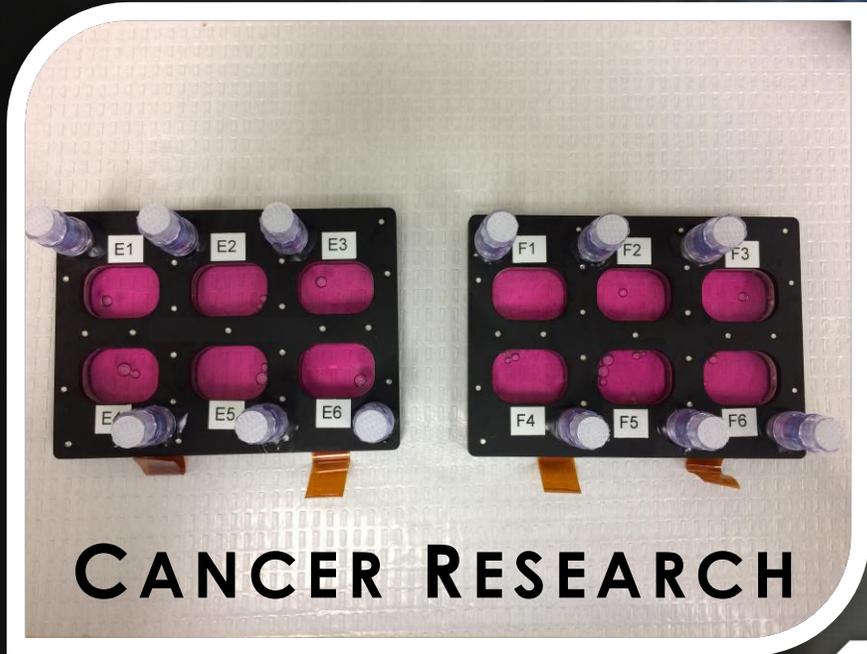
# EXPEDITION 53



# A NATIONAL LABORATORY



# SCIENCE & TECHNOLOGY ABOARD THE ISS



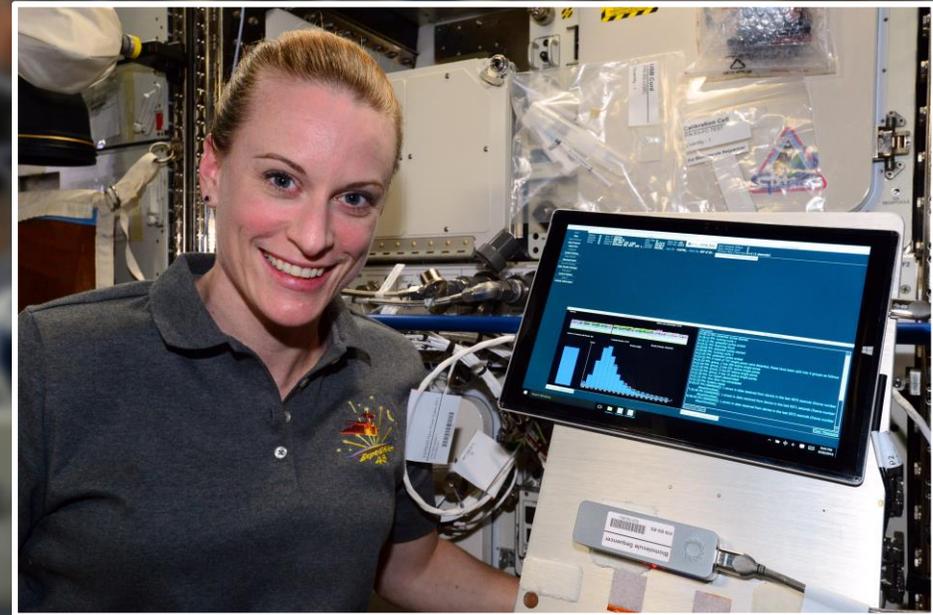
# ISS AS AN EXPLORATION TESTBED

## EVERYWEAR



*The EveryWear assistant is an ambulatory data collection system that makes use of wearable sensors connected to a space station iPad tablet computer, which itself, is wirelessly synchronized with computers on the ground.*

## BIOMOLECULE SEQUENCER



*The Biomolecule Sequencer investigation has demonstrated, for the first time, that DNA sequencing is feasible in an orbiting spacecraft.*

# Commercial Service Providers on the ISS

- UTC : Sabatier  UTC Aerospace Systems  
Where ingenuity takes off
- NanoRacks: Internal & External platforms; sat deployers; airlock 
- SpaceX, Orbital ATK: Cargo  
- Teledyne Brown Engineering: External precision pointing platform 
- Bigelow Aerospace: Bigelow Expandable Activity Module 
- Boeing, SpaceX; Crew 
- HNu nanoPoint: Microfluidics cell culture platform 
- Alpha Space: External materials exposure platform 
- BioServe: Space Biology platforms and services 
- Kentucky Space: Multilab space biology platform 
- Red: Ultra High Def digital cinema camera 
- Techshot: Bone densitometer, centrifuge facility 
- Made In Space: Additive Manufacturing facility 



# COMMERCIAL CARGO



ORBITAL ATK CYGNUS



SIERRA NEVADA DREAMCHASER

SPACE X DRAGON

# COMMERCIAL CREW



SPACEX



BOEING



# Fostering Commerce in Space

## Commercial Research on the ISS



# NEW COMMERCIAL SPACE PARADIGM

## NSG 8-Verticals of NewSpace™



↑  
 “Enable Commercialization of LEO”

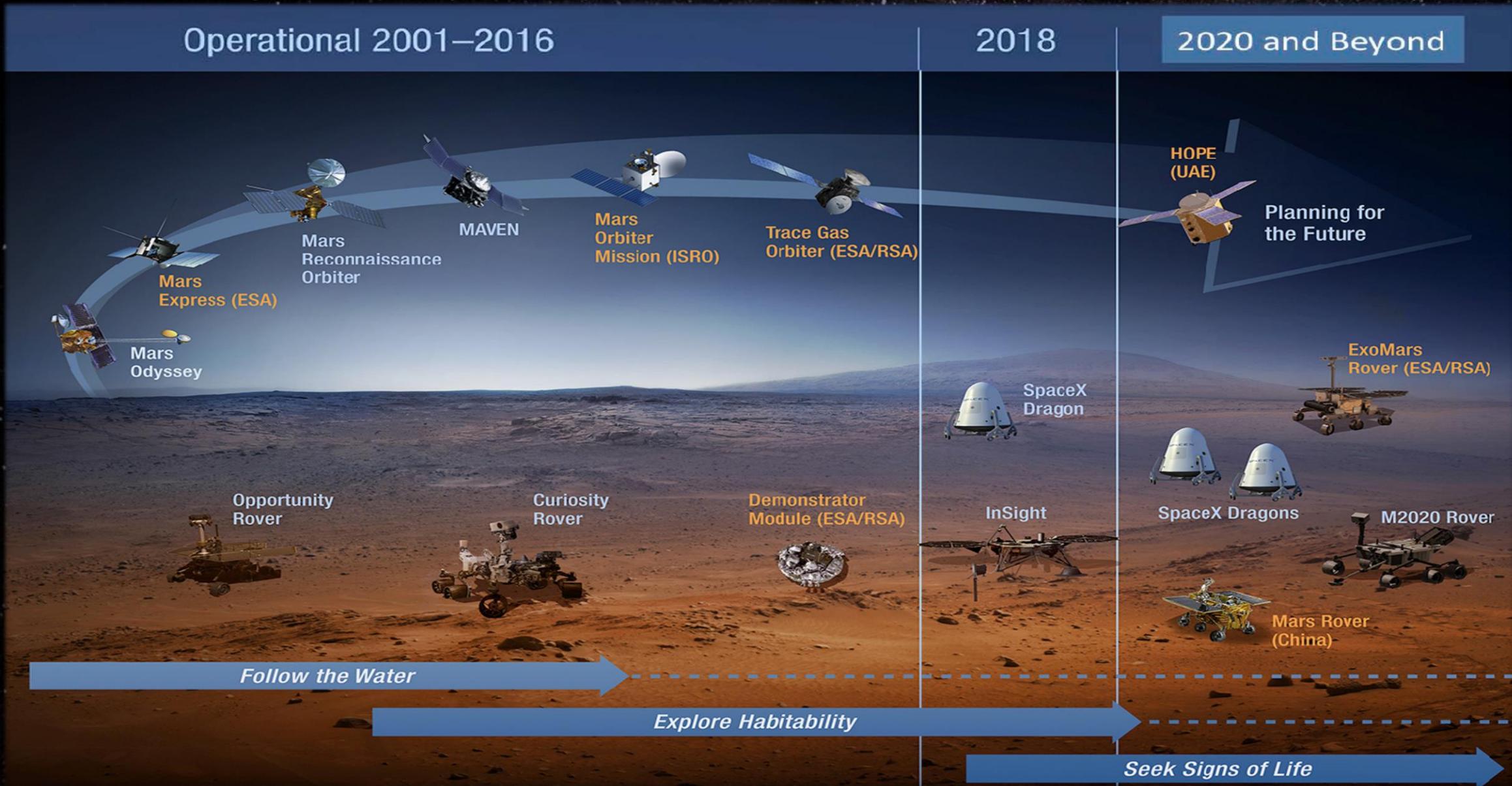
↑  
 “Expand Relevance”

Co-Development of Deep Space Exploration Capabilities

“Mutually Beneficial Partnerships”

↓

# PREPARE FOR FUTURE HUMAN EXPLORERS



## DEEP SPACE EXPLORATION

Deep space exploration is the means to extend human presence beyond low Earth orbit into cislunar space and on to Mars. We seek answers to fundamental science questions about the origins and dynamics of our solar system, the availability of resources, opportunities for human habitation, and even our human destiny beyond Earth.

JSC leads the way to deep space by integrating science and engineering to develop...

...how we *travel* to get out there



Spaceflight architecture, mission planning, and surface systems

...how we *work* out there



Space suits, surface operations, and training in mission relevant environments

## Answers are out there

Science. Resources. Opportunities. Destiny.

### JSC Technology Focus Areas

Environmental Control and Life Support  
Space Suit upgrades  
Space Radiation Protection  
Robotics and Autonomous Systems

Entry Descent and Landing  
In-Situ Resource Utilization  
Human System Research

...how we *explore* out there



Science in cislunar space and on planets, moons, and asteroids

JSC is home to NASA Astromaterials and a leader in planetary science.

...and, how we *live* out there



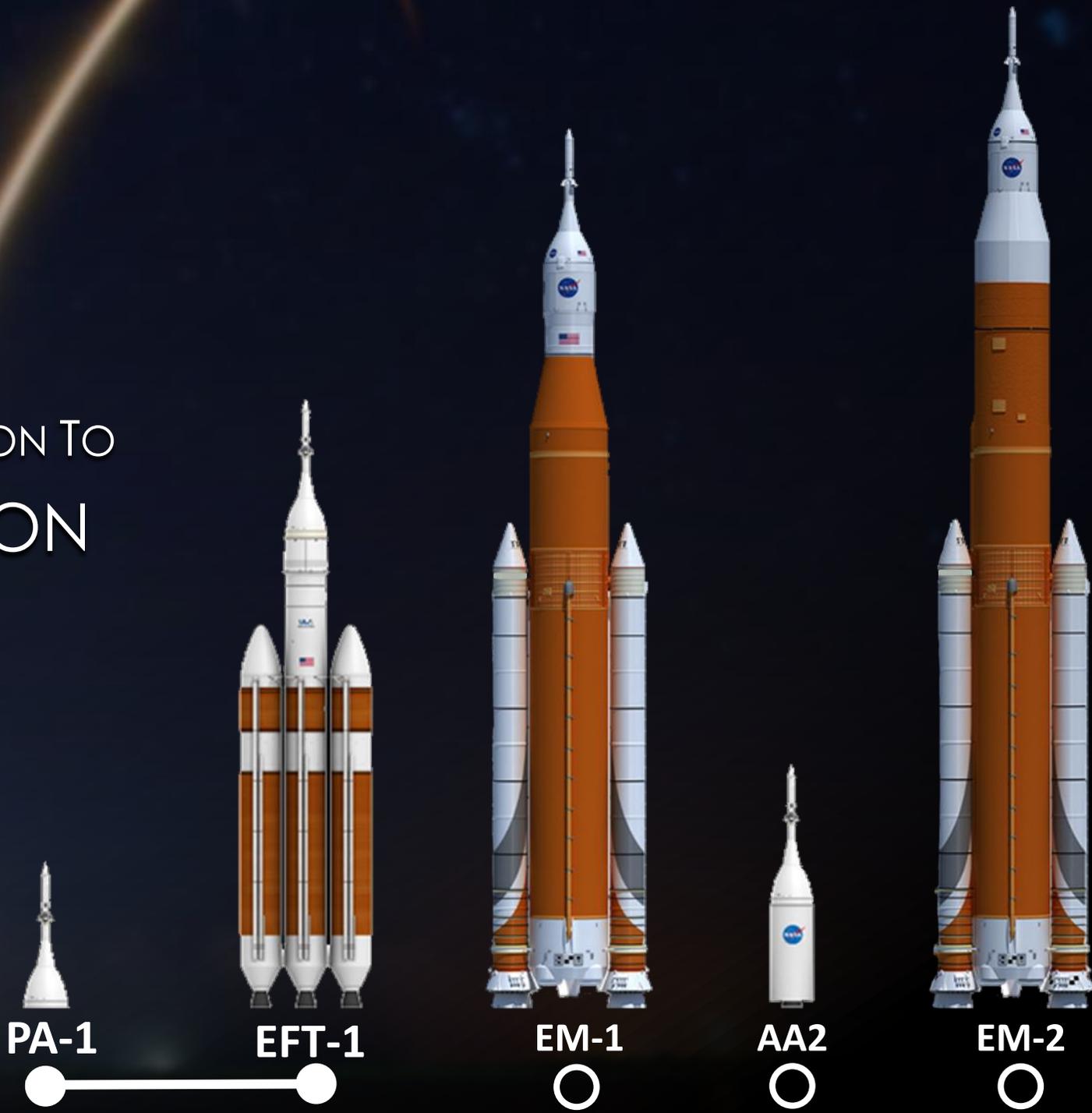
Deep space habitats, human health & performance, and in-situ resource utilization

NASA is partnering with private industry to develop deep space habitation concepts.

# ORION



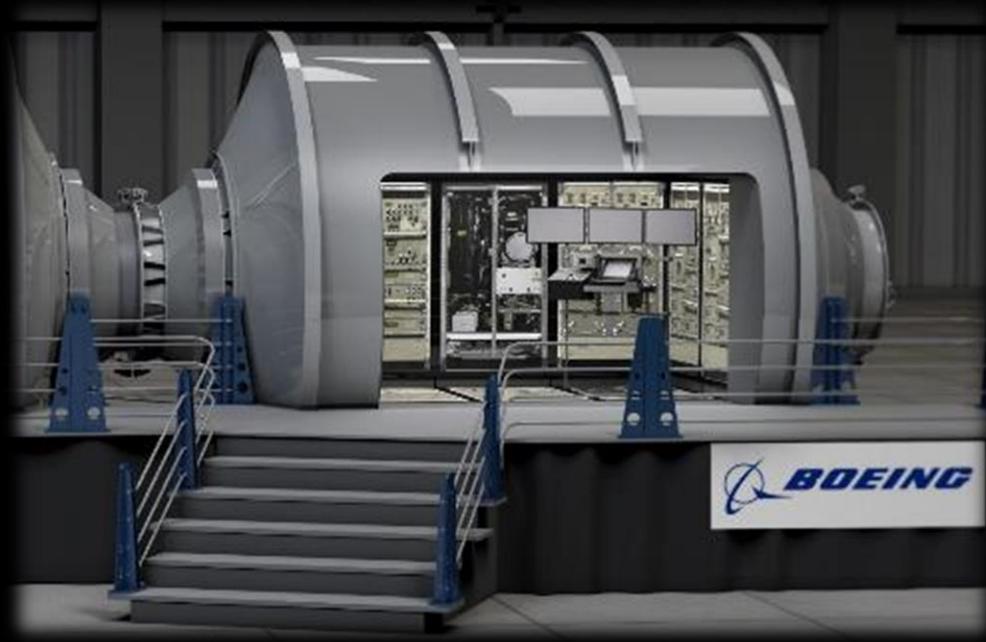
# ORION AND SLS PROGRESSION TO FIRST CREWED MISSION



# HUNDREDS OF SUPPLIERS MAKING ORION SUCCESSFUL



# NEXTSTEP HABITATION BAA PHASE 2 SELECTED PROPOSALS





Sign Up For Our  
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[www.nasa.gov/jscdirectornews](http://www.nasa.gov/jscdirectornews)



International Space Station  
NASA's Johnson Space Center

NASA's Orion Spacecraft  
NASA Commercial Crew Program



@Space\_Station  
@NASA\_Johnson

@NASA\_Orion  
@Commercial\_Crew



@iss  
@nasajohnson

@explorenasa

NASA'S JOURNEY TO MARS