NASA's Plans for going Forward to the Moon

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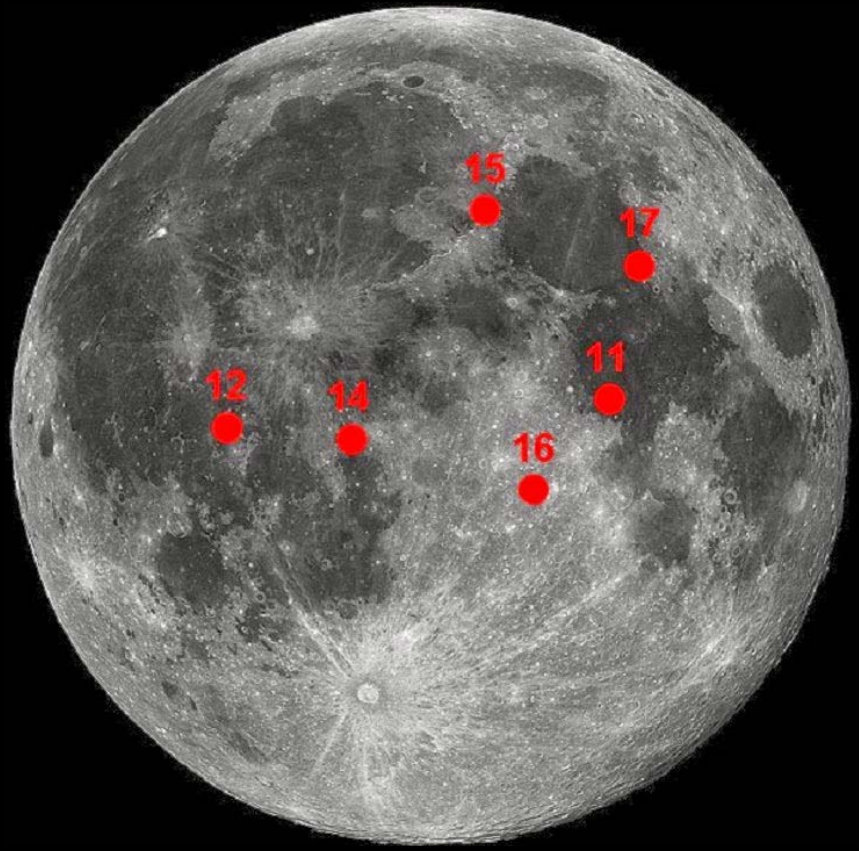
NASA 60th Anniversary

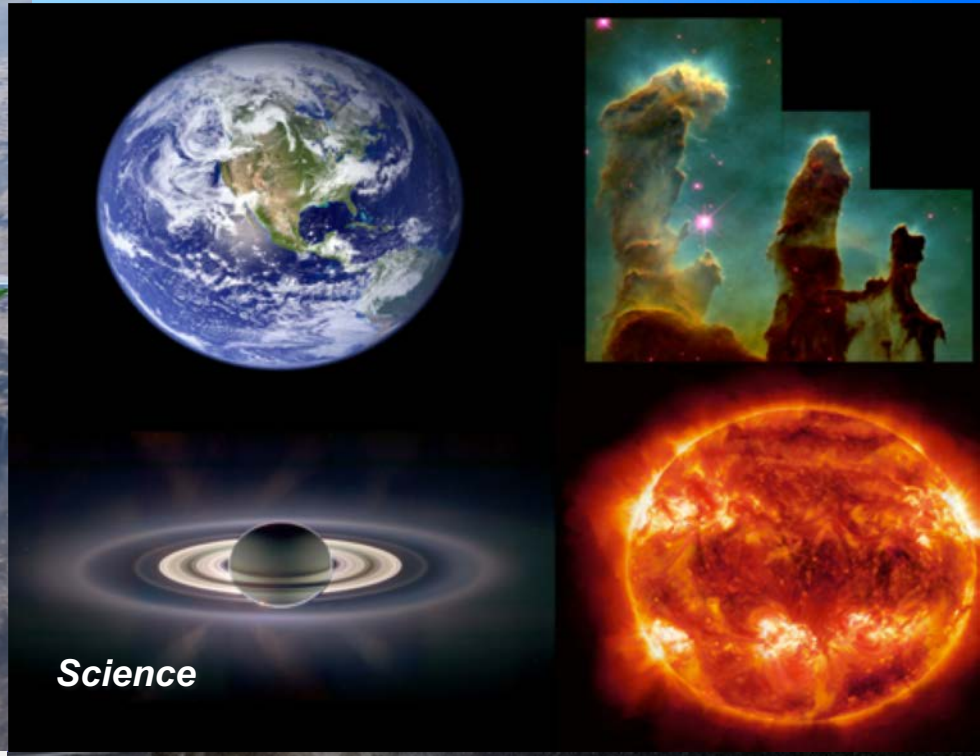
Apollo Lunar Exploration Program

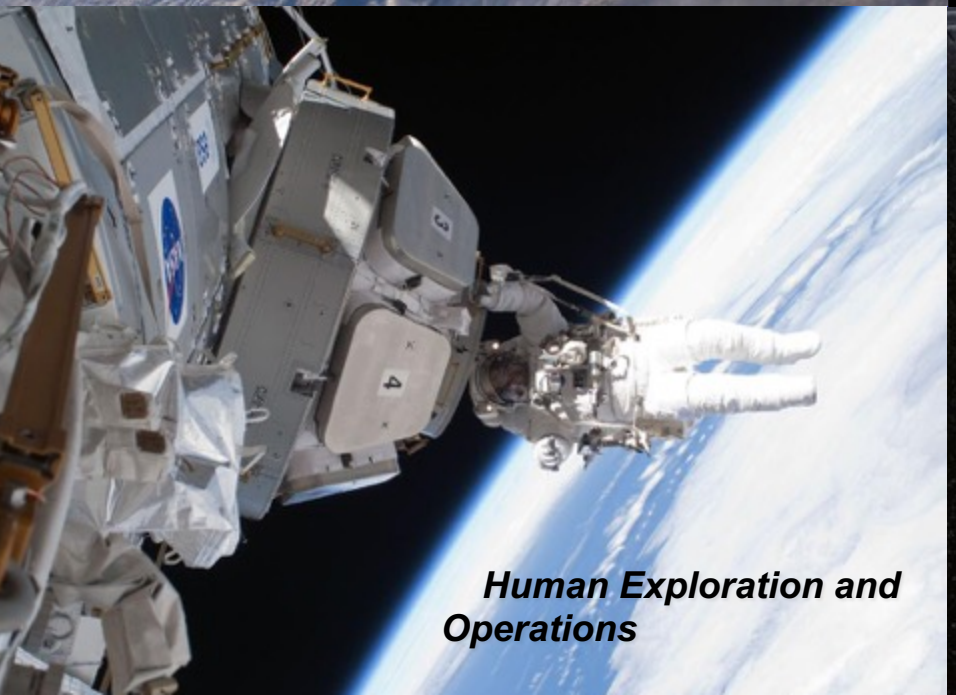


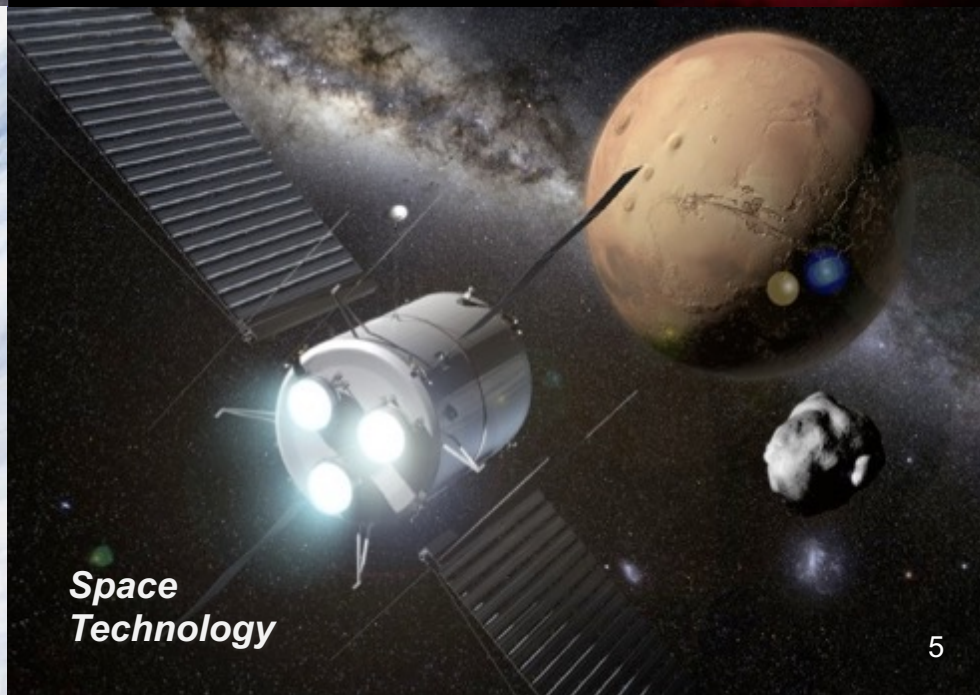
Spinoffs

- **Since 1976, *Spinoff* has highlighted NASA technologies that benefit life on Earth in the form of commercial products – nearly 2,000 in total.**

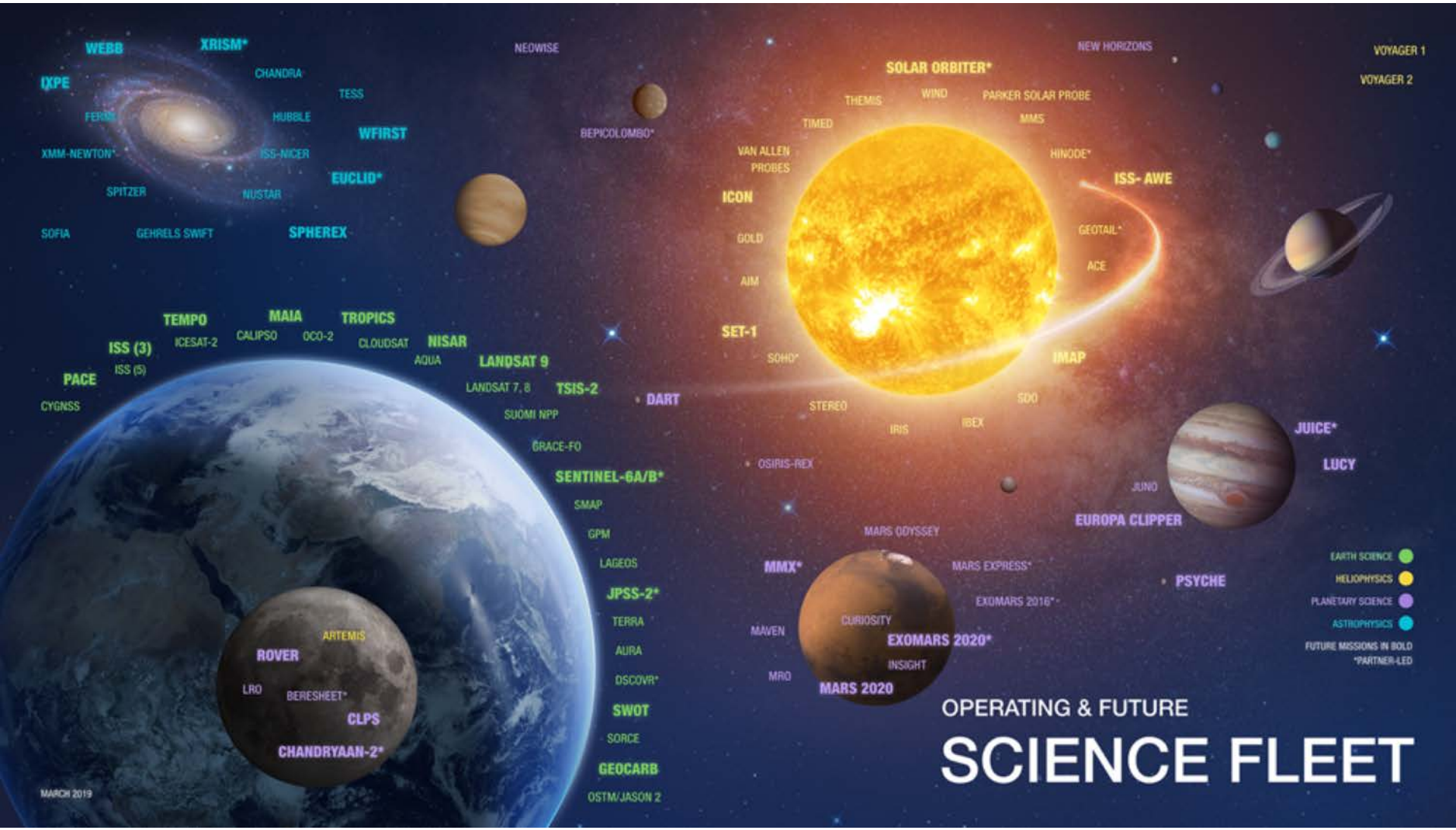

Aeronautics


Science


Human Exploration and Operations


Space Technology

NASA's Science Program



Space Policy Directive-1

Reinvigorating America's Human Space Exploration Program

"Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities.

Beginning with missions beyond low-Earth orbit, the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations."

FY 2020 Budget Request ($M)

Budget Authority ($ in Millions)	Fiscal Year 2018	2019	2020	2021	2022	2023	2024
Deep Space Exploration Systems	$4,790.0	$5,050.8	$5,021.7	$5,295.5	$5,481.4	$6,639.0	$7,042.3
Exploration Systems Development	$4,395.0	$4,092.8	$3,441.7	$3,441.0	$3,468.4	$3,788.5	$3,654.7
Exploration Research & Development	$395.0	$958.0	$1,580.0	$1,854.5	$2,013.0	$2,850.4	$3,387.6
Exploration Technology	$760.0	$926.9	$1,014.3	$976.1	$995.4	$964.4	$943.1
LEO and Spaceflight Operations	$4,749.2	$4,639.1	$4,285.7	$4,369.5	$4,369.5	$4,235.5	$4,182.3
International Space Station	$1,493.0		$1,458.2	$1,448.5	$1,449.4	$1,352.6	$1,315.7
Space Transportation	$2,345.8		$1,828.6	$1,854.1	$1,814.5	$1,746.2	$1,727.2
Space and Flight Support (SFS)	$910.3		$848.9	$891.9	$905.7	$911.8	$914.5
Commercial LEO Development	$0.0	$40.0	$150.0	$175.0	$200.0	$225.0	$225.0
Science	$6,211.5	$6,905.7	$6,303.7	$6,319.0	$6,319.0	$5,846.5	$5,815.0
Earth Science	$1,921.0	$1,931.0	$1,779.8	$1,785.6	$1,779.7	$1,666.5	$1,674.6
Planetary Science	$2,217.9	$2,758.5	$2,622.1	$2,577.3	$2,629.4	$2,402.4	$2,350.9
Astrophysics	$850.4	$1,191.6	$844.8	$902.4	$965.2	$913.5	$907.7
Heliophysics	$688.5	$720.0	$704.5	$638.6	$769.3	$692.0	$709.8
James Webb Space Telescope (JWST)	$533.7	$304.6	$352.6	$415.1	$175.4	$172.0	$172.0
Aeronautics	$690.0	$725.0	$666.9	$673.6	$680.3	$587.1	$587.0
STEM Engagement	$100.0	$110.0	$0.0	$0.0	$0.0	$0.0	$0.0
Safety, Security, and Mission Services	$2,826.9	$2,755.0	$3,084.6	$3,084.6	$3,084.6	$2,871.6	$2,871.6
Center Management and Operations	$1,983.4		$2,065.0	$2,058.4	$2,052.9	$1,906.0	$1,905.8
Agency Management and Operations	$843.5		$1,019.6	$1,026.2	$1,031.7	$965.6	$965.8
Construction & Envrmtl Compl Restoration	$569.5	$348.2	$600.4	$468.8	$468.8	$468.8	$387.8
Construction of Facilities	$483.1		$517.5	$385.9	$385.9	$385.9	$304.9
Environmental Compliance and Restoration	$86.4		$82.9	$82.9	$82.9	$82.9	$82.9
Inspector General	$39.0	$39.3	$41.7	$42.1	$42.5	$43.0	$43.4
NASA Total	**$20,736.1**	**$21,500.0**	**$21,019.0**	**$21,229.2**	**$21,441.5**	**$21,655.9**	**$21,872.5**

FY 2018 reflects funding amounts specified in Public Law 115-41, Consolidated Appropriations Act, 2018, as adjusted by NASA's FY 2018 Operating Plan. Table does not reflect emergency supplemental funds also appropriated in FY 2018, totaling $81.3 million.

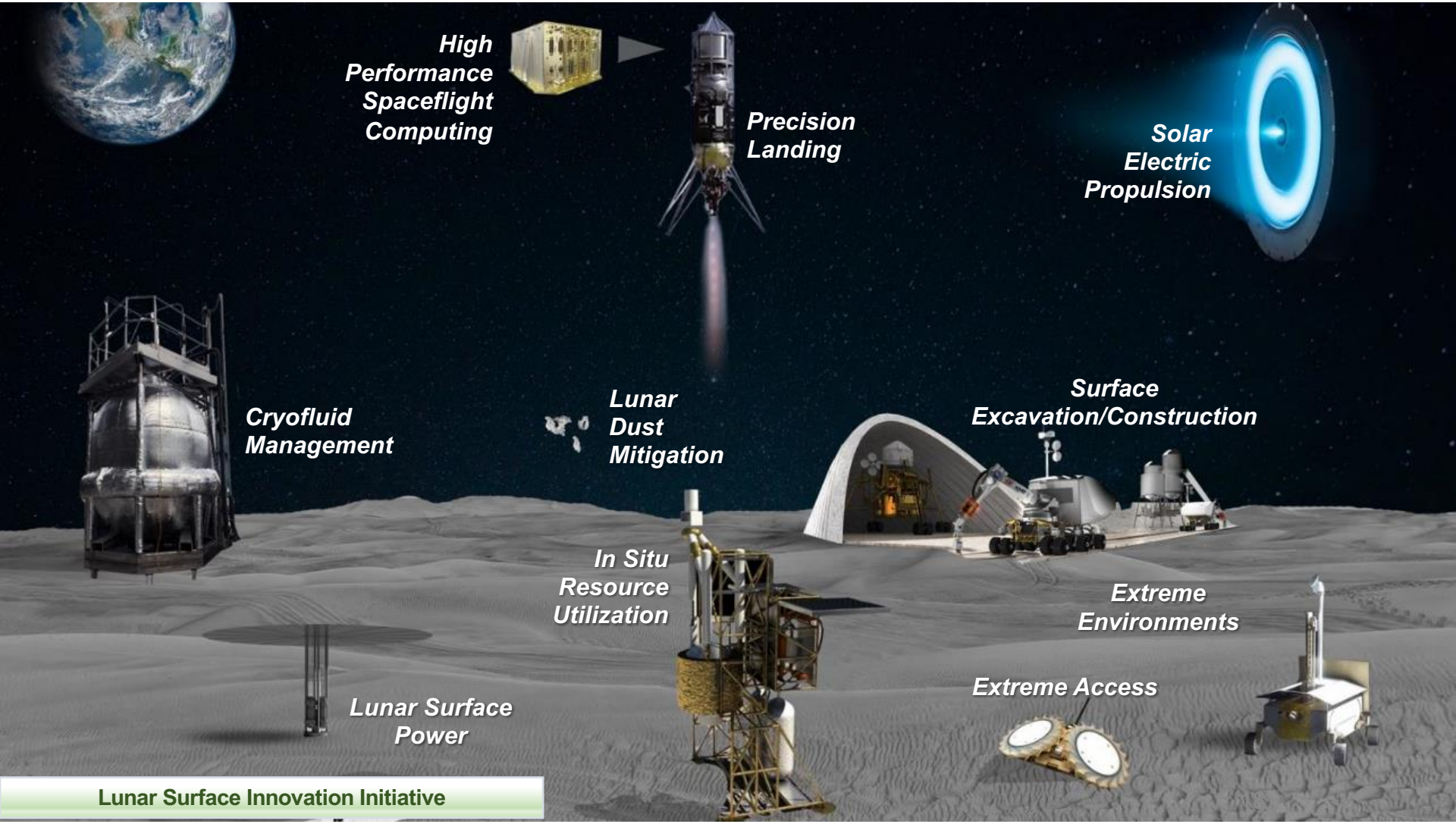
FY 2019 reflects funding as enacted under Public Law 116-06..

A Budget Increase Towards 2024

This FY 2020 budget amendment provides an increase of $1.6 billion above the President's initial $21 billion budget request to accelerate our return to the lunar surface. This additional investment is a down payment on NASA's efforts to land humans on the Moon by 2024, and is required to achieve that bold objective. It's the boost NASA needs to move forward with design, development and exploration.

- *Human Lunar Landing System: This budget includes $1 billion to enable NASA to begin supporting the development of commercial human lunar landing systems three years earlier than previously envisioned to bring humans to the Moon's surface by 2024.*
  - *This acquisition strategy will allow NASA to purchase an integrated commercial lunar lander that will transport astronauts from lunar orbit to the lunar surface and back.*
  - *Focusing Gateway development on capabilities needed to support a lunar landing of 2024 allowed a scope reduction of $321 million. This budget amendment shifts potential development of additional Gateway capabilities into the future.*
- *Space Launch System Rocket and Orion Spacecraft: With an additional $651 million for SLS and Orion, this budget supports the most powerful rocket in the world and our new spacecraft to ultimately take the astronauts to the staging point for reaching the lunar surface, the Gateway in lunar orbit.*
- *Exploration Technology: An additional $132 million for technologies that will support NASA to advance key precursor capabilities on the lunar surface. This includes various exploration technologies like solar electric propulsion and a demonstration converting polar ice to water.*
- *Science: An augmentation of $90 million to enable increased robotic exploration of the Moon's polar regions in advance of a human mission.*

Space Technology for 2024 and Beyond



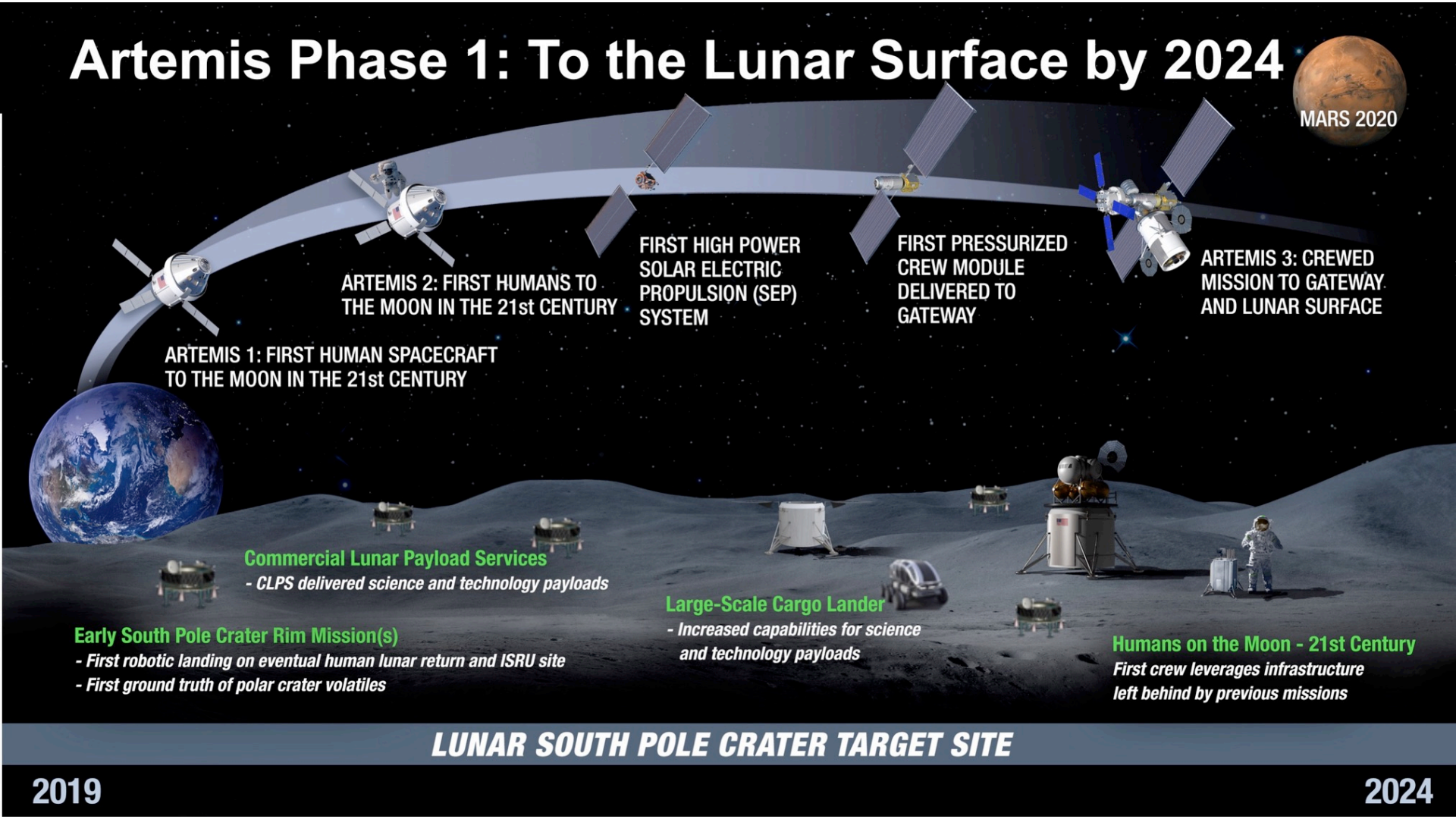
Lunar Surface Innovation Initiative

Transportation to the Moon

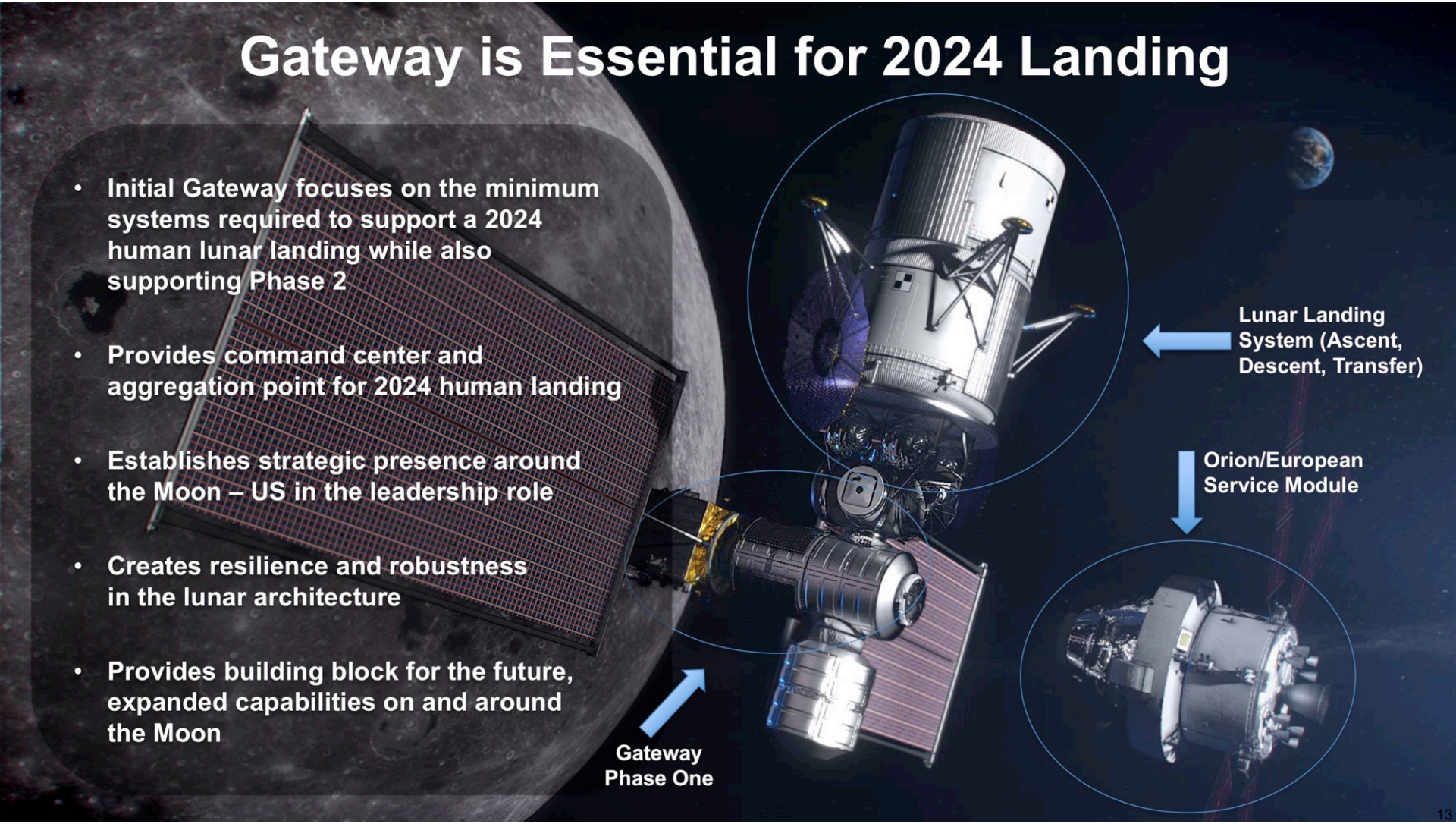
DEEP SPACE EXPLORATION SYSTEM

Recent Accomplishments

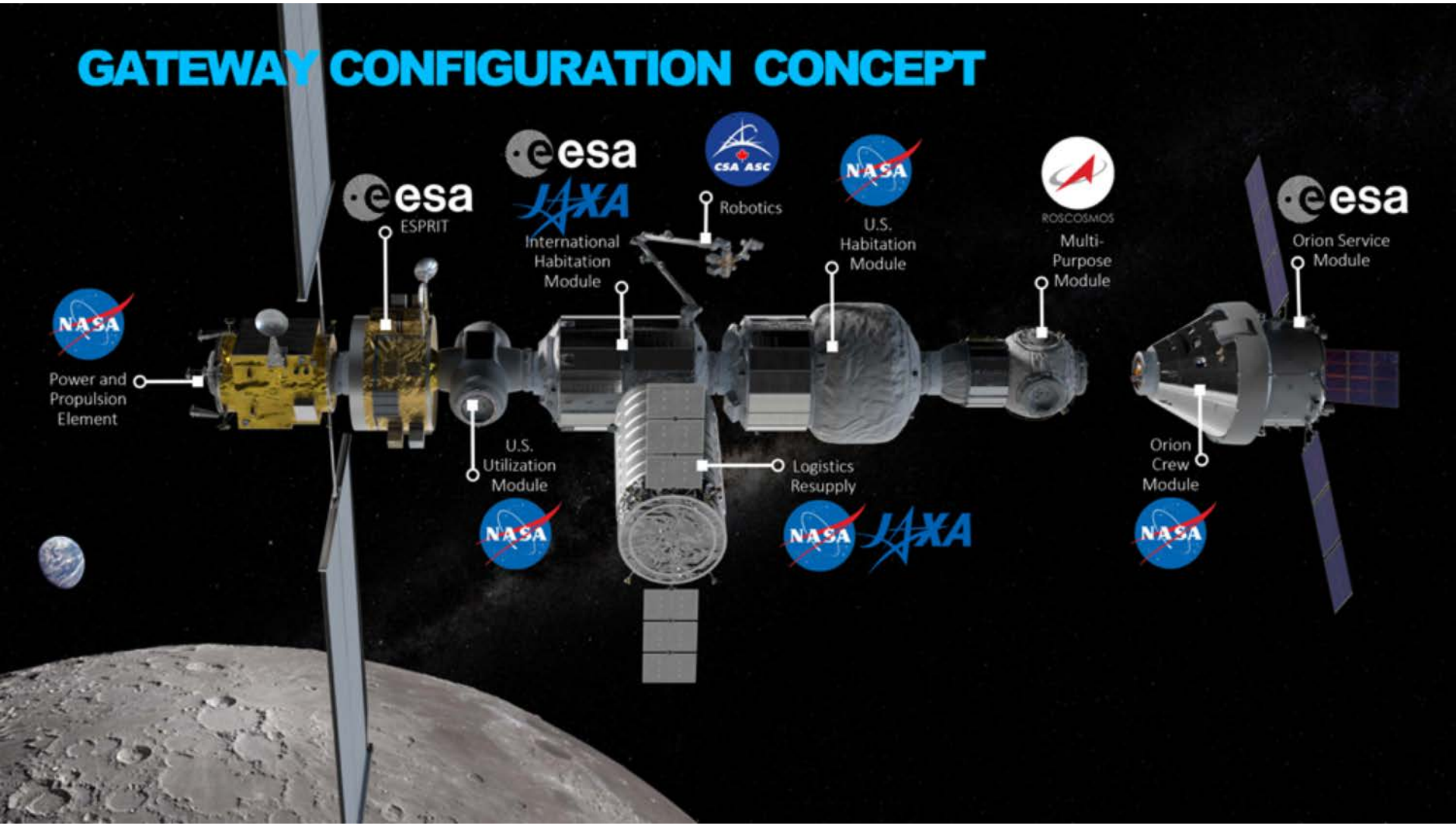
To the Lunar Surface by 2024



Gateway Role for 2024 Landing



MCB Concept – March 2019



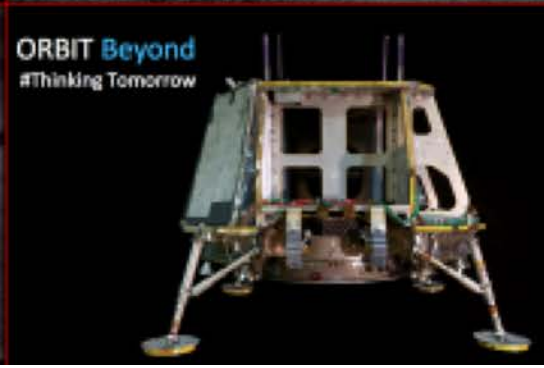
Transformative Lunar Science

- **Based on the decadal survey, a SSERVI white paper identified top areas of lunar science, including**
  - Establish the period of giant planet migration
  - Provide absolute chronology for Solar System events
  - Use the vantage from lunar far side to view universe at key wavelengths
  - Understand sources of water and the water cycle on the Moon
  - Characterize the lunar interior (core, mantle, crust)
  - Evaluate solar wind interactions with the lunar surface and extend the record of extreme space weather events of the past

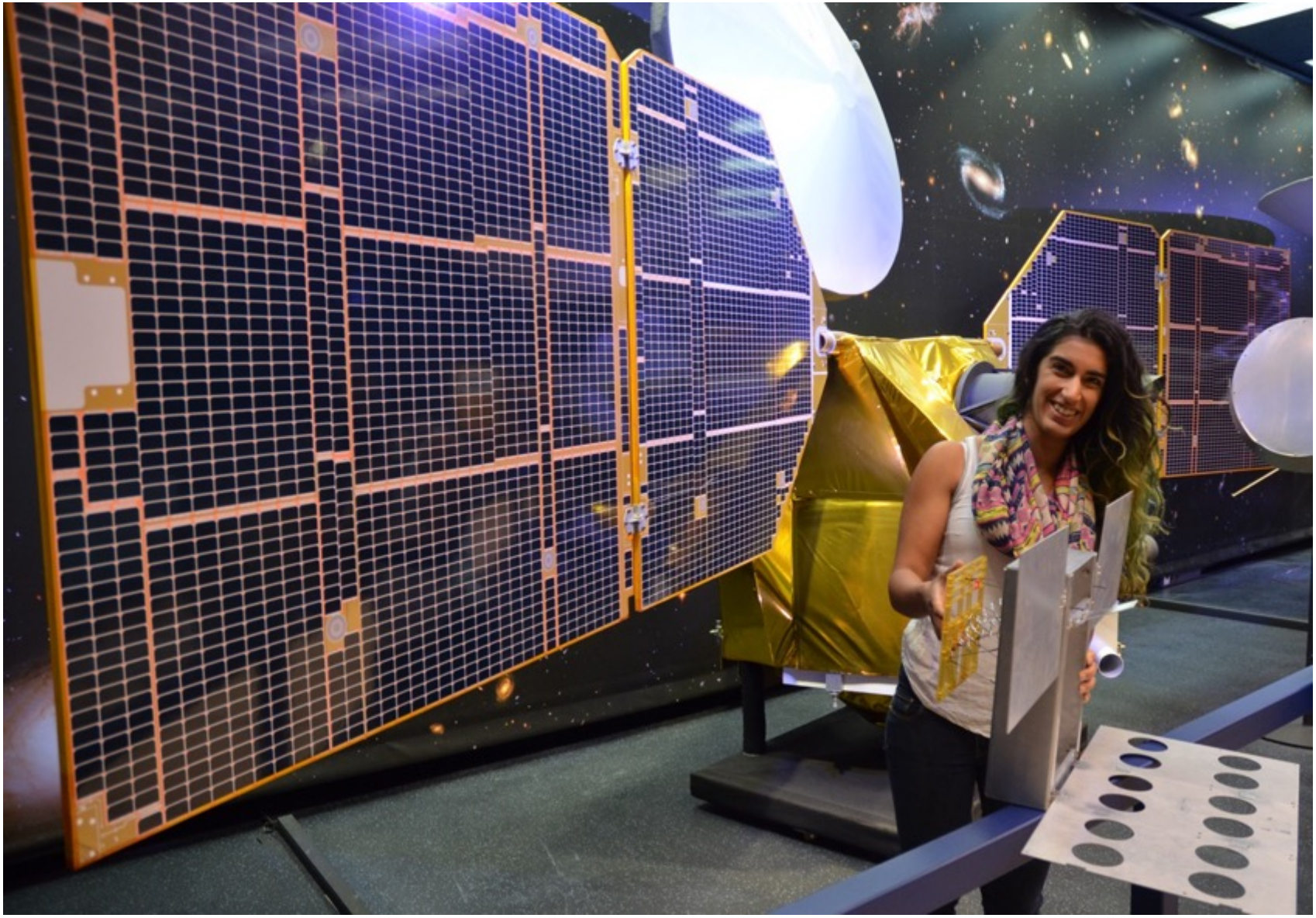
Commercial Lunar Payload Services (CLPS)

Commercial Lunar Payload Services

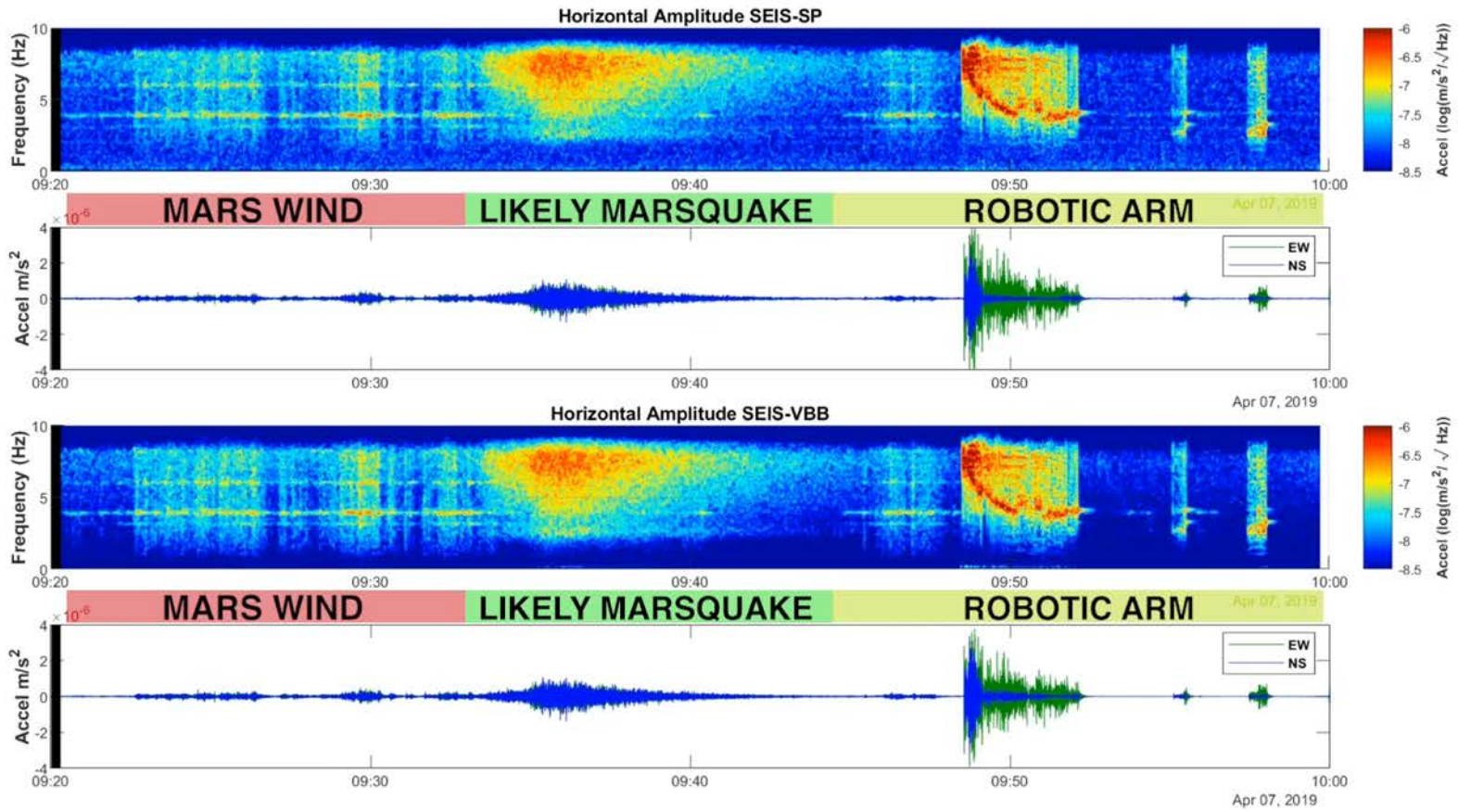
- US commercial providers of space transportation services,
- 10-year multi-vendor catalog for payload missions



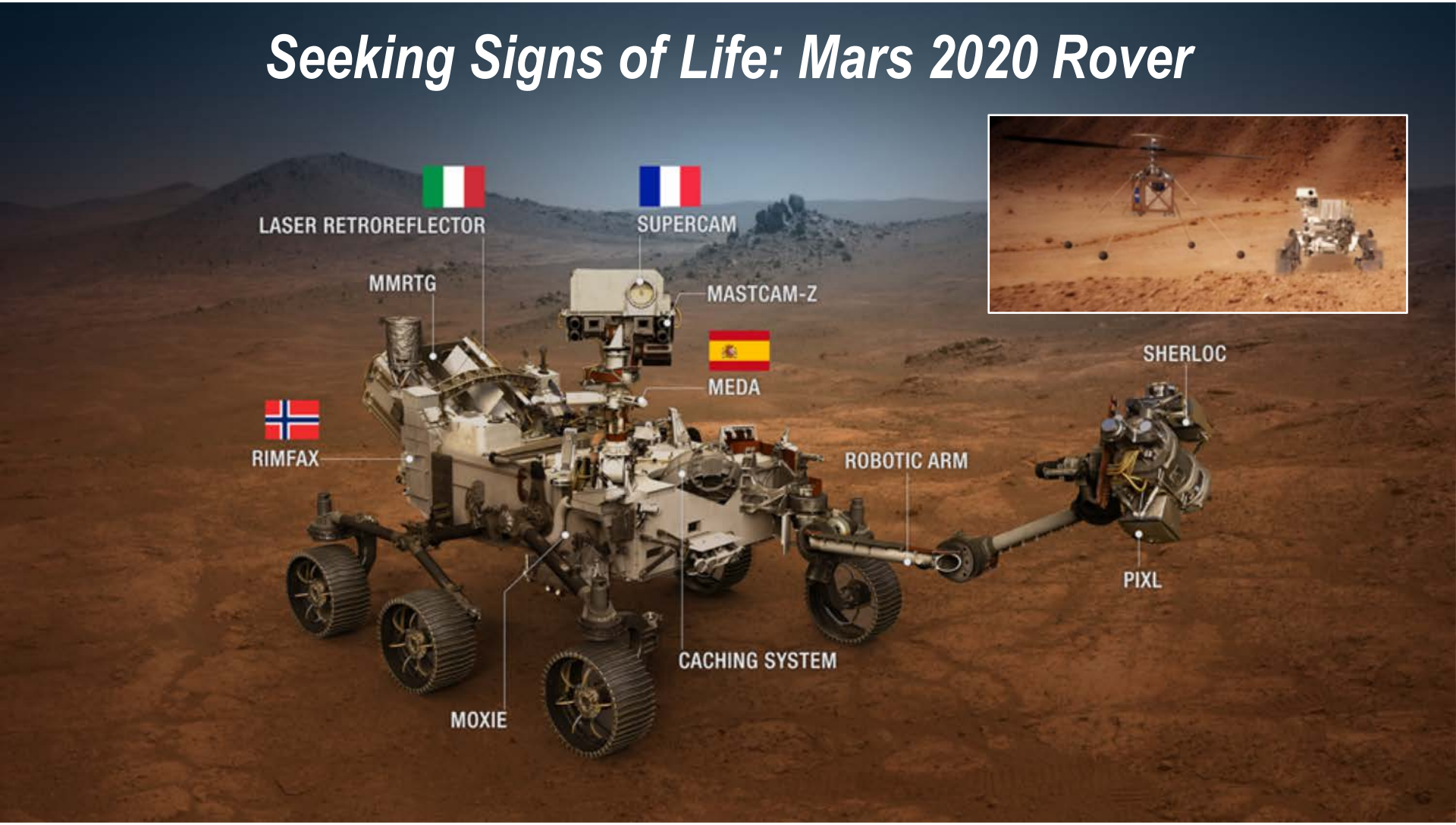
CubeSats



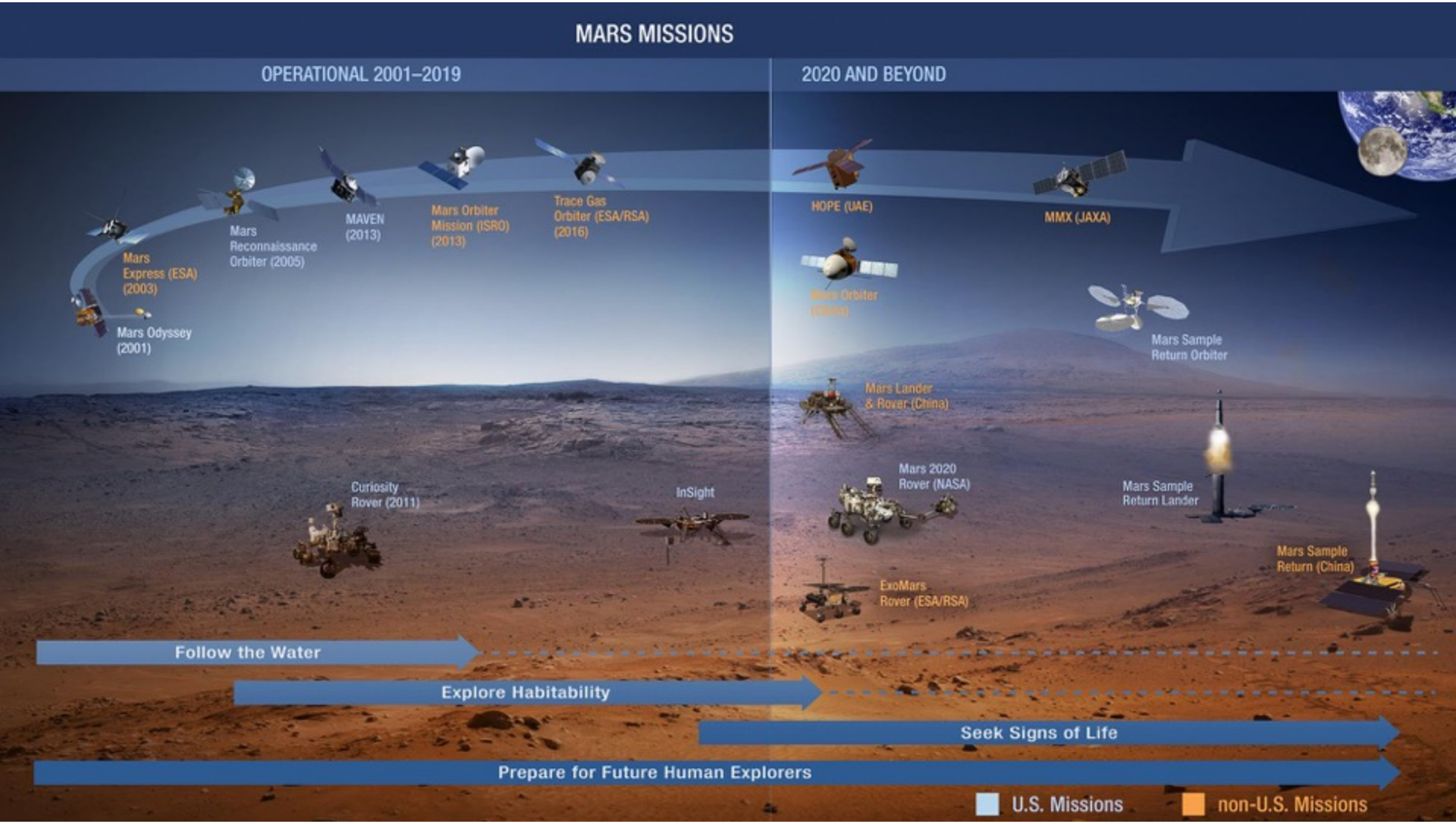
InSight Results



Seeking Signs of Life: Mars 2020 Rover



Missions to Mars



Mars

Vistas of opportunity and discovery