

National Aeronautics and  
Space Administration




**FY 2020**  
**EXPLORE**  
**BUDGET ESTIMATES**  
**BRIEFING BOOK**



## The NASA Charge to the Moon

In keeping with SPD-1, NASA is charged with landing the first American woman and next American man at the South Pole of the Moon by 2024, followed by a sustained presence on and around the Moon by 2028.

NASA will “use all means necessary” to ensure mission success in moving us forward to the Moon.

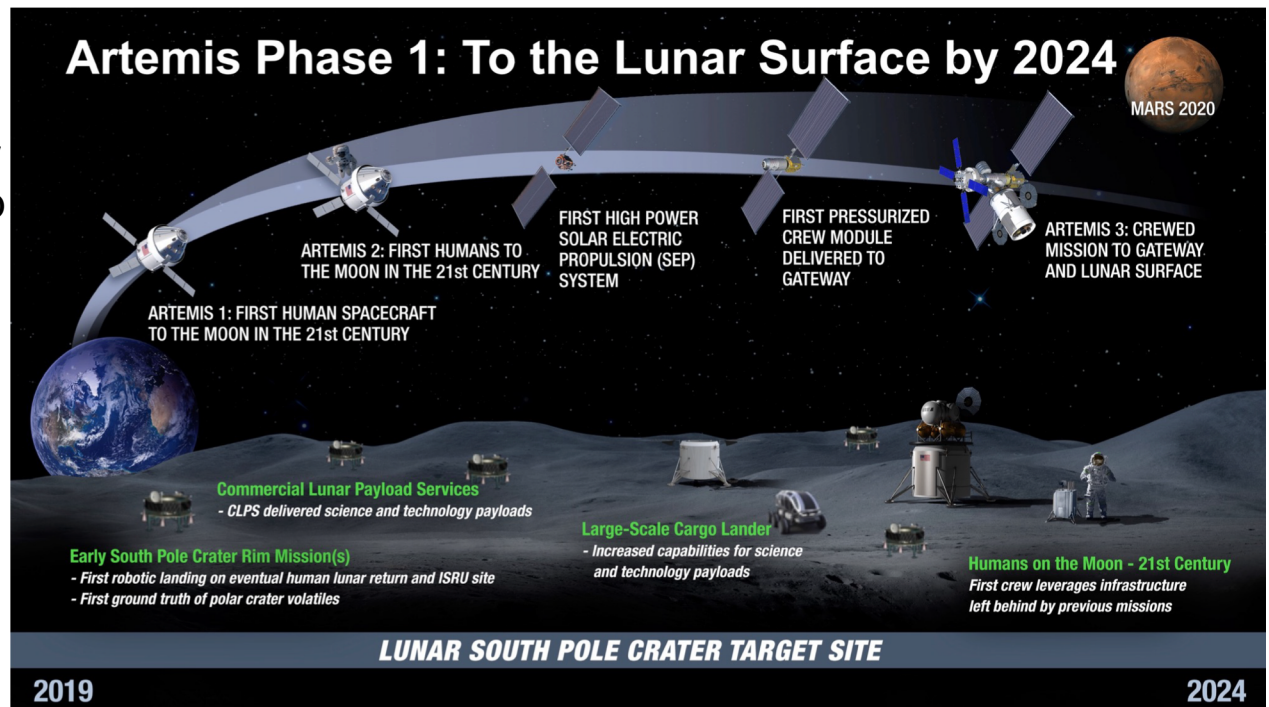
Vice President Mike Pence is standing at a dark blue podium on a stage. He is wearing a dark blue suit, a white shirt, and a red tie. He is looking towards the right of the frame. The podium has a microphone and a small circular seal on the front. In the background, there are large, illuminated structures that appear to be parts of a spacecraft or lunar lander, with blue and white lighting. The overall atmosphere is formal and celebratory.

Vice President Mike Pence speaks about NASA's mandate to return American astronauts to the Moon and on to Mars at the U.S. Space & Rocket Center in Huntsville, Alabama.

# 2020 President's Budget Highlights



- **Provides \$22.6B, including the \$1.6B budget amendment.**
  - \$12.3B to continue building the key components of the Exploration campaign that will send astronauts to the Moon and beyond, including the Space Launch System rocket, a heavy-lift expendable launch vehicle to carry astronauts on board the Orion crew capsule to the Lunar Gateway.
  - ✓ The Lunar Gateway, an outpost orbiting the Moon, focusing on the systems required to support a 2024 human lunar landing.
  - ✓ Commercial launch capabilities to enable regular, low-cost access to the lunar vicinity and surface.
  - ✓ Lunar landers to enable cargo delivery and human access to the lunar surface
  - ✓ Building commercial and international partnerships



# FY 2020 Budget Request (\$M)



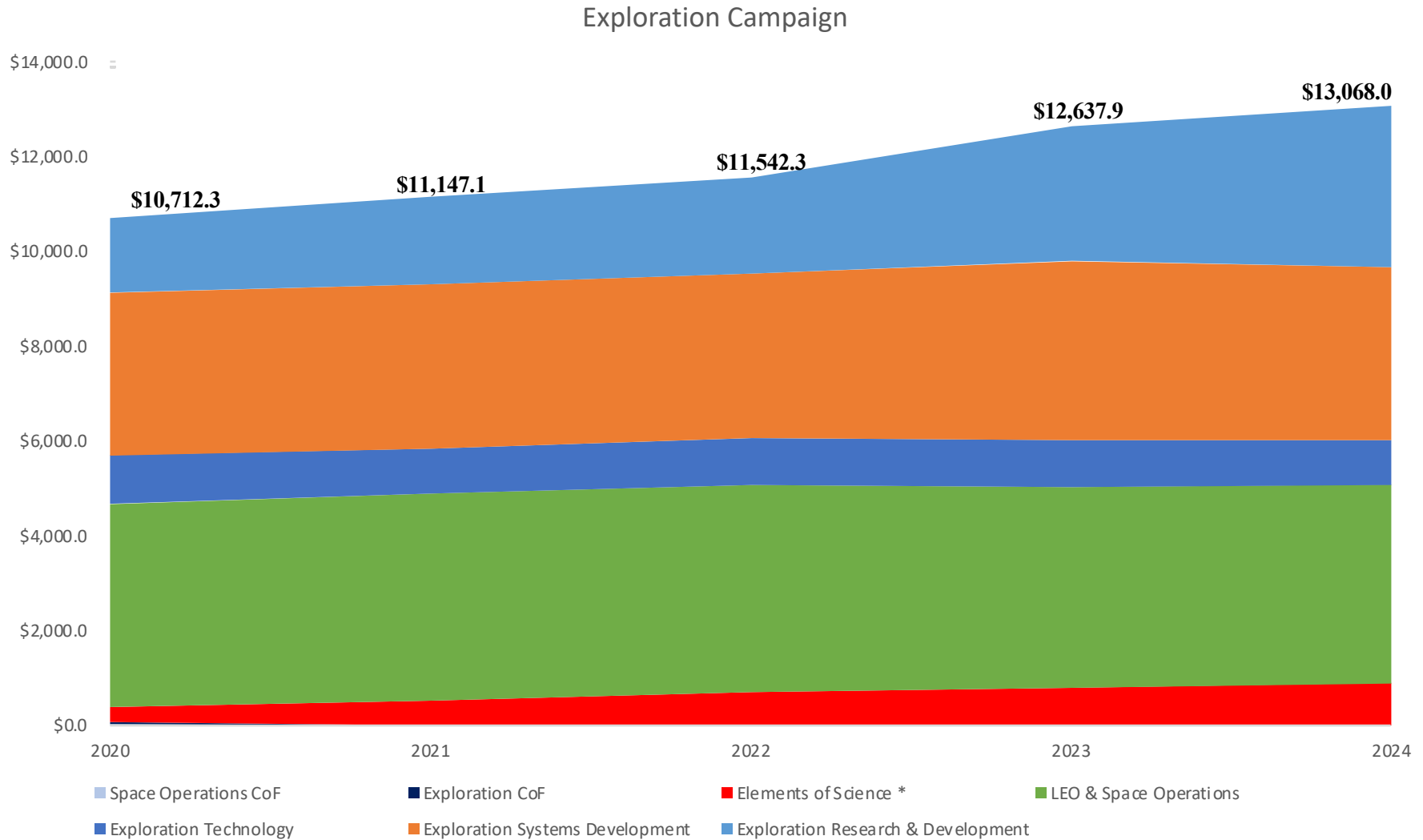
Budget Authority (\$ in millions)	Enacted		NASA FY 2020 Budget Submit						
	2018	2019	2020			2021	2022	2023	2024
			Initial	Amnd.	Total				
Deep Space Exploration Systems	4,790.0	5,050.8	5,021.7	1,374.7	6,396.4	5,295.5	5,481.4	6,639.0	7,042.3
Exploration Systems Development	4,395.0	4,092.8	3,441.7	651.0	4,092.7	3,441.0	3,468.4	3,788.5	3,654.7
Exploration Research and Development	395.0	958.0	1,580.0	723.7	2,303.7	1,854.5	2,013.0	2,850.4	3,387.6
Exploration Technology	760.0	926.9	1,014.3	132.0	1,146.3	976.1	995.4	964.4	943.1
LEO and Spaceflight Operations	4,749.2	4,639.1	4,285.7		4,285.7	4,369.5	4,369.5	4,235.5	4,182.3
International Space Station	1,493.0		1,458.2		1,458.2	1,448.5	1,449.4	1,352.6	1,315.7
Space Transportation	2,345.8		1,828.6		1,828.6	1,854.1	1,814.5	1,746.2	1,727.2
Space and Flight Support (SFS)	910.4		848.9		848.9	891.9	905.7	911.8	914.5
Commercial LEO Development	-	40.0	150.0		150.0	175.0	200.0	225.0	225.0
Science	6,211.5	6,905.7	6,303.7	90.0	6,393.7	6,319.0	6,319.0	5,846.5	5,815.0
Earth Science	1,921.0	1,931.0	1,779.8		1,779.8	1,785.6	1,779.7	1,666.5	1,674.6
Planetary Science	2,217.9	2,758.5	2,622.1	90.0	2,712.1	2,577.3	2,629.4	2,402.4	2,350.9
Astrophysics (includes JWST)	1,384.1	1,496.2	1,197.4		1,197.4	1,317.5	1,140.6	1,085.5	1,079.7
Heliophysics	688.5	720.0	704.5		704.5	638.6	769.3	692.0	709.8
Aeronautics	690.0	725.0	666.9		666.9	673.6	680.3	587.1	587.0
STEM Engagement	100.0	110.0	-		-	-	-	-	-
Safety, Security, and Mission Services	2,826.9	2,755.0	3,084.6		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		2,065.0	2,058.4	2,052.9	1,906.0	1,905.8
Agency Management and Operations	843.5		1,019.6		1,019.6	1,026.2	1,031.7	965.6	965.8
Construction & Envrmtl Compl Restoration	569.5	348.2	600.4		600.4	468.8	468.8	468.8	387.8
Construction of Facilities	483.1		517.5		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	82.9
Inspector General	39.0	39.3	41.7		41.7	42.1	42.5	43.0	43.4
<b>Total</b>	<b>20,736.1</b>	<b>21,500.0</b>	<b>21,019.0</b>	<b>1,596.7</b>	<b>22,615.7</b>	<b>21,229.2</b>	<b>21,441.5</b>	<b>21,655.9</b>	<b>21,872.5</b>

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.

FY 2021 and beyond will be updated in the FY 2021 request to reflect the 2024 landing.

# Exploration Campaign Funding Original FY 2020 Request

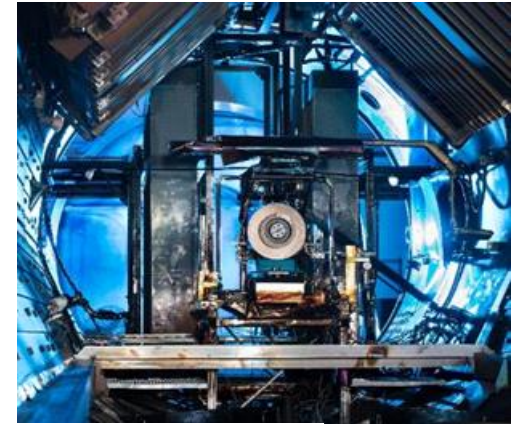
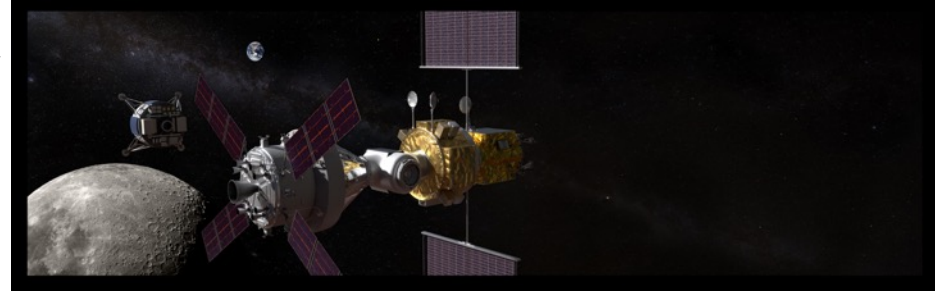


\* Includes Lunar Discovery and Exploration Program and Mars Sample Return

# 2020 Budget Highlights



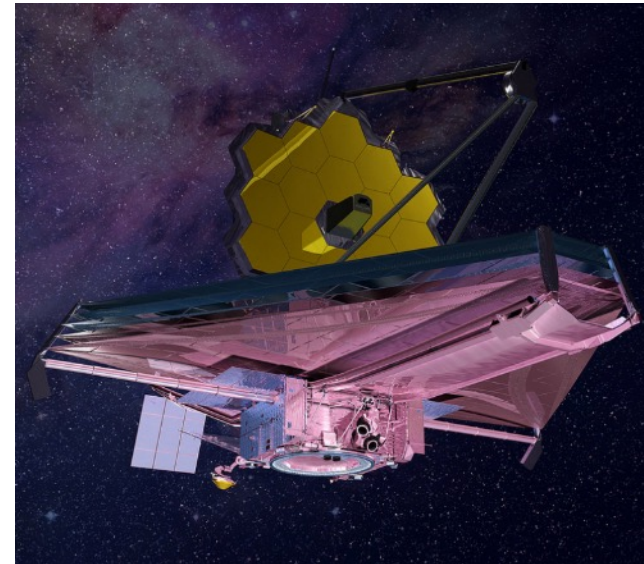
- Develops and grows emerging technology and commercial capabilities to deliver science and technology payloads to the Moon in preparation for exploration and further enhance human lunar lander capabilities.
- The Lunar Surface Innovation Initiative (LSII) serves as a catalyst for enabling critical technologies required for humans to successfully operate on the lunar surface. These include surface power and in situ resource utilization.
- Develops lunar robotic rover capabilities to support science and resource utilization investigations, and technology.
- Drives toward a vibrant, U.S-led economy in Earth orbit funding the International Space Station as well as new commercial space capabilities that will facilitate a transition to a more robust and cost-effective approach to human space activities near the Earth.



# Highlights (*continued*)



- Continues robotic exploration of the Solar System including funding for the next Mars rover launch in 2020 and a Europa Clipper mission to launch in 2023.
- Initiates a Mars Sample Return Mission to retrieve samples from Mars, and return those samples with the first launch from another planet.
- Continues exploring the universe with launch of James Webb Space Telescope in 2021. Provides no funding for WFIRST space telescope while Webb is still being built.
- Enables our wide-ranging science work on many fronts, which continues to lead the world in its size, scope, and scientific output.
- Consistent with prior budgets, provides no funding for PACE, CLARREO-PF, and the Office of Science, Technology, Engineering, and Mathematics (STEM) Engagement.



# Highlights *(continued)*



- Supports transformative aeronautics technology research to boost U.S. technological and economic leadership and support high quality American jobs including continued development of the X-59 QueSST flight demonstrator to help usher in a new era of U.S. led supersonic transportation.
- Maintains robust investment in air traffic management improvements that will safely increase air traffic capacity, reduce flight delays, and enable safe, robust UAS integration.
- Replenishes resources for mission enabling services and operations, including critical investments in maintaining test facilities, advancing cybersecurity protections, and ensuring safe and reliable operations for NASA's objectives in space, science, aeronautics, and technology.

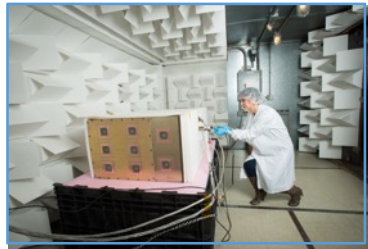






# Backup

# Anticipated Accomplishments in FY 2020



## Exploration Research & Development

Continues development of Gateway as part of Artemis serving as a staging point to enable access by landers to the surface of the Moon; Researches human health to understand how crew can live safely away from Earth for long durations; Develops habitation capabilities and systems



## James Webb Space Telescope

Continues testing and integration of OTIS to spacecraft; on schedule for March 2021 launch

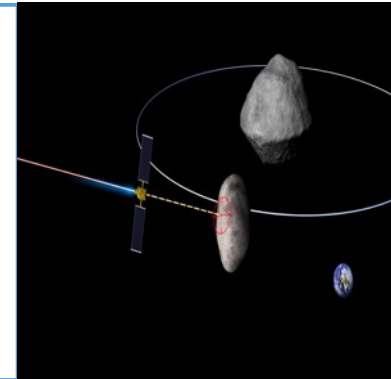


## Deep Space Exploration Systems

Continues delivery of hardware for integration and testing for the upcoming EM-1 and EM-2 launches

## Other Science

Use of emerging commercial lunar lander capabilities to deliver payloads to surface of the Moon. Selects next New Frontiers mission, Heliophysics Small Explorer, Astrophysics Medium Explorer and suite of Earth Venture Suborbital-3 investigations.



## Commercial Crew

Boeing and SpaceX are on course for certification of their transportation systems and to begin regularly flying operational missions to meet ISS crew rotation obligations.



## Exploration Technology

Launch and demonstrate 7 critical technologies: laser comm, MOXIE, MEDA, MEDLI2, TRN, Astrobeer and Lunar flashlight. Complete SEP CDR and start LSII



## Urban Air Mobility

Accelerates research supporting Urban Air Mobility (UAM)

# FY 2020 Amendment (\$M)



Budget Authority (\$ in millions)	NASA FY 2020 Budget Amendment
<b>Deep Space Exploration Systems</b>	<b>1,374.7</b>
<b>Exploration Systems Development</b>	<b>651.0</b>
Orion	140.5
Space Launch System	510.5
<b>Exploration Research and Development</b>	<b>723.7</b>
Gateway	(321.1)
Advanced Cislunar and Surface Capabilities	1,044.8
<b>Exploration Technology</b>	<b>132.0</b>
Technology Maturation	48.0
Technology Demonstration	34.0
Solar Electric Propulsion	15.0
Small Spacecraft, Flight Opportunities & Other Tech Demo	19.0
SBIR and STTR	50.0
<b>Science</b>	<b>90.0</b>
<b>Planetary Science</b>	<b>90.0</b>
Lunar Discovery and Exploration	90.0
<b>Total</b>	<b>1,596.7</b>

# NASA Mission Launches (Fiscal Years 2019 – 2024)



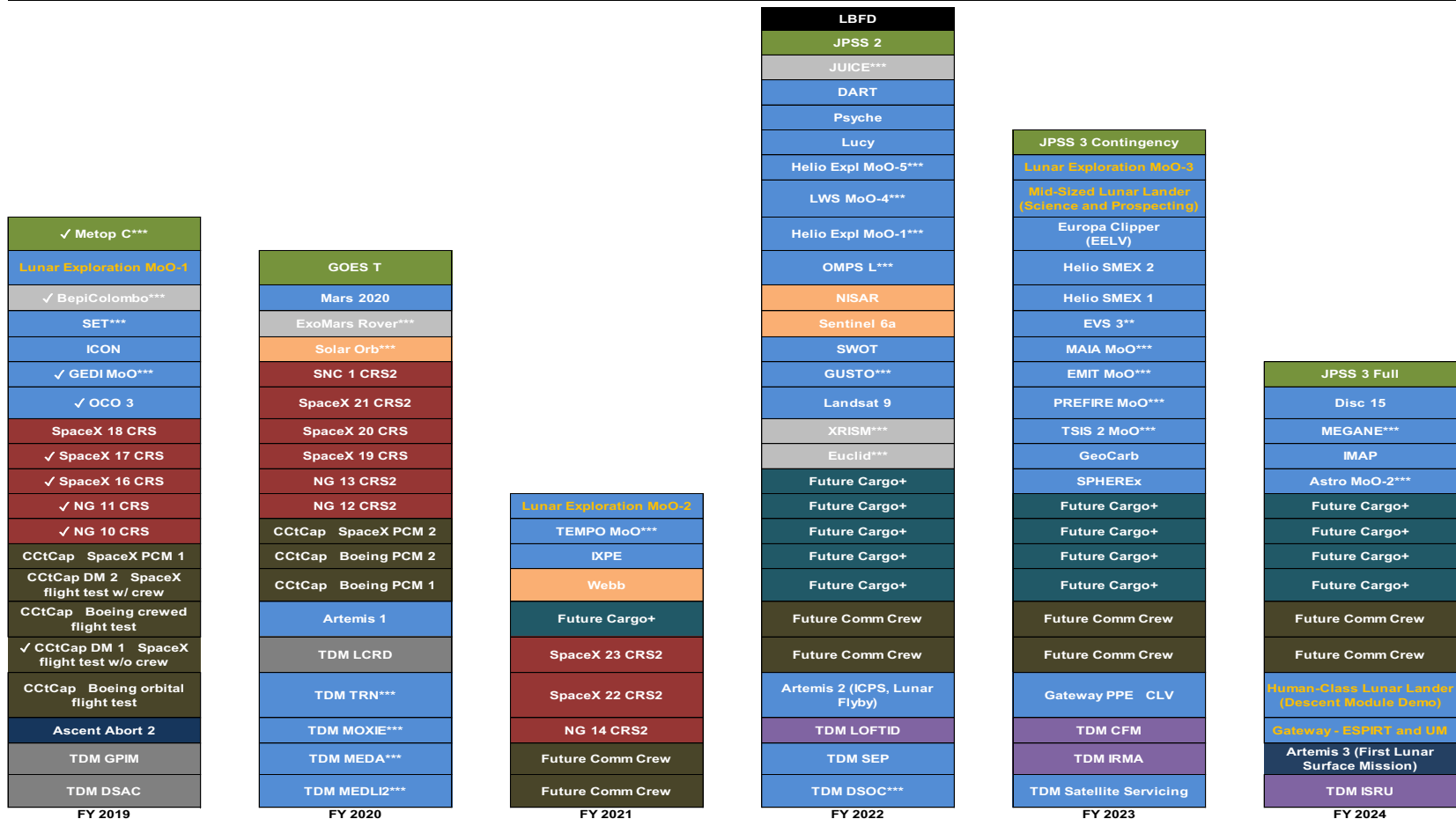
- NASA Mission on US ELV
- Reimbursable Mission for NOAA  
\*\*\*\* NASA does not directly manage/control
- Joint NASA-Int'l Partner Mission
- Int'l Mission with NASA contribution
- Joint NASA-USAF Mission
- Joint NASA-Public/Private Partnership

- Exploration Systems Development Mission
- Commercial Crew Mission
- Commercial Resupply Services Mission
- Future Commercial Resupply Mission
- Aeronautics Mission

New lunar missions in orange text

- ✓ Mission successfully launched
- ✗ Mission unsuccessful

\*\* Ground-based elements (includes suborbital) block of 5 missions  
 \*\*\* Instrument only  
 + Future CRS Capabilities unknown, will be updated after award of CRS-2 when cargo delivery capabilities are known



Dates reflect Agency Baseline