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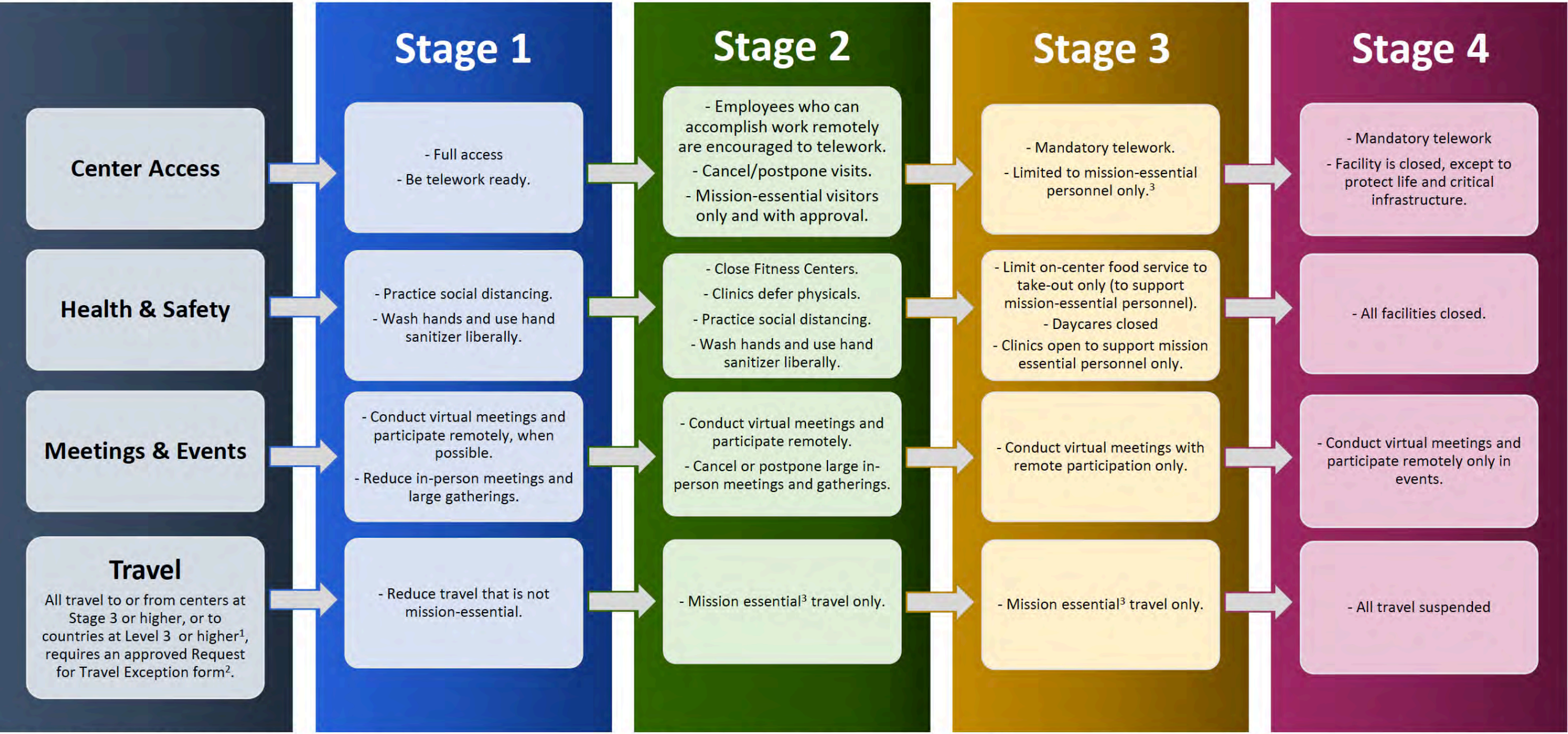
March 20, 2020

NASA Response Framework

* This guidance applies to NASA civil servants. Contract employees should reach out to their contracting officer's representative.



1. For the latest CDC international travel information, go to https://www.cdc.gov/coronavirus/2019-ncov/travelers/index.html
2. The Request for Travel Exception form is available on the NASA People website.

3. Mission Essential is defined as: work that must be performed to maintain mission/project operations or schedules AND cannot be performed remotely/virtually; OR work that has a justifiable impact on the safety of human life or the protection of property, AND there is a reasonable likelihood that the safety of human life or the protection of property would be compromised by a delay in the performance of the work.

Coronavirus (COVID-19) Response – Agency & SMD

Agency

- Agency leadership continues to monitor developments regarding coronavirus (COVID-19) around the nation, closely following the advice of health professionals and the White House Coronavirus Task Force to keep our workforce safe
- Effective March 17, all centers and facilities elevated to Stage 3 of NASA's Response Framework. All employees and contractors moved to mandatory telework until further notice. Mission-essential personnel will continue to be granted access onsite

Science Mission Directorate (SMD)

- There will be impacts, and we don't yet know the extent. We're working with each mission and project in detail based on where they are in development process
- Priority is everyone's safety and protecting hardware and integrity of data for operating missions
- Conducted status assessment of all 47 flight projects in the SMD Portfolio
- Most missions are in development phases early enough (phases A-B-early C) that bulk of the work can be done virtually
- Missions in integration and testing (I&T) will continue to the extent possible with small teams
- Will work with our domestic and international partners to refine the prioritization of our projects, especially those in I&T
- Have consulted with the NASA Chief Medical Officer and have protocols for working in clean rooms
- Anticipate impact to solicitations and evaluations

Coronavirus (COVID-19) Response – ROSES 2020

- We know that progress on funded research may slow and in some cases even stop due to necessary telework and lack of access to facilities and labs, and other family obligations
- SMD understands this potential outcome and will work with the research community and its institutions to mitigate any impacts and to make plans, when possible, for a way forward
- AISR and ICAR proposal due dates shifted to April 17th
- Step-1 proposals for EW, SSO, and YORPD will be postponed
- Considering converting all Step-1 proposals due within the next 30 days into mandatory NOIs to alleviate pressure on Sponsored Projects Offices
- SMD's policy on late proposals will be applied leniently on a case-by-case basis
- Expect that research progress may slow or stop; SMD is prepared to rephase or no-cost extend awards as needed on a case-by-case basis
- Encouraging all to continue to pay graduate students, post-docs, and lab staff
- Watch the NSPIRES email lists for up-to-the-minute changes in due dates or policies

Coronavirus (COVID-19) Response – Stay Updated

- This is a new and unprecedented situation
- We recognize everyone's personal and professional challenges at this time
- As the situation evolves, we will continue to communicate with all of you, whether through this type of venue or other modes
- In the meantime, please continue to follow agency updates:
  - Web: nasa.gov and nasapeople.nasa.gov/coronavirus
  - Twitter: @NASA and @JimBridenstine

FY21 Budget Agency Highlights

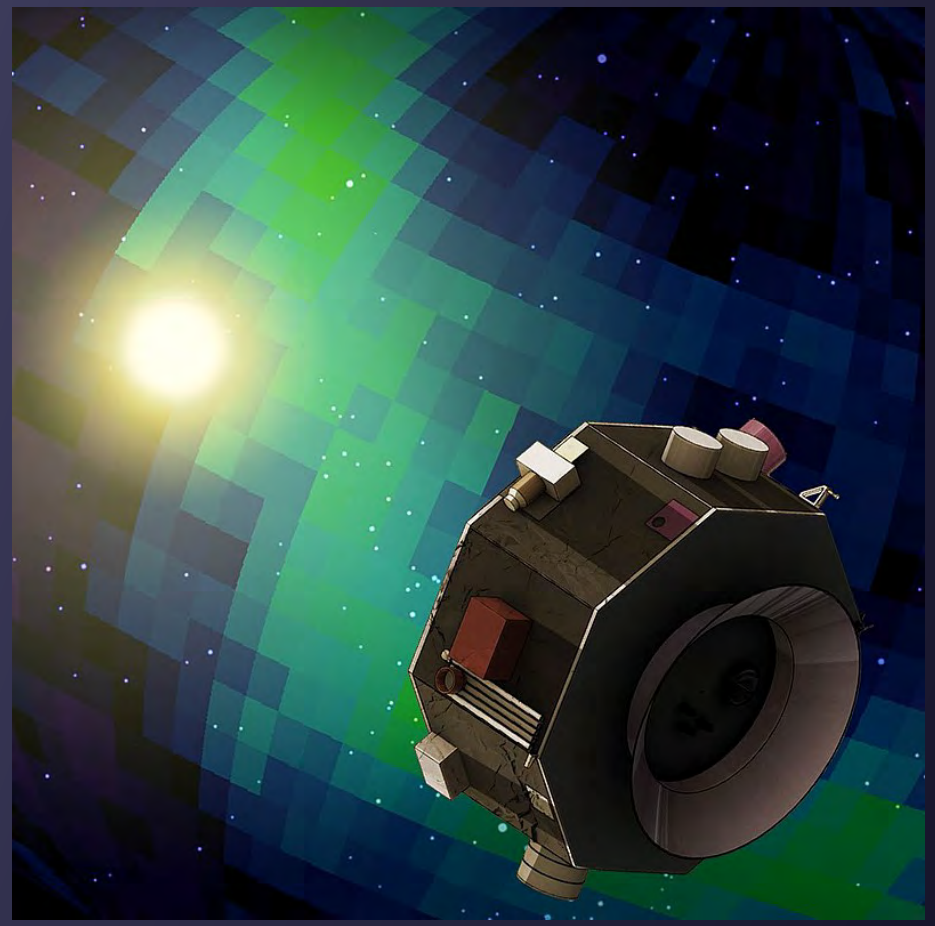
- One of the strongest budgets in NASA's history, investing more than $25 billion dollars for America's future in space; funding proposed represents an increase of about 12% over the FY20 level
- Keeps the agency on track to land the first woman and the next man on the Moon by 2024, and helps prepare for human exploration of Mars
- Budget supports decadal priorities such a Mars Sample Return mission, Europa Clipper, and development of new Earth observation missions

FY21 Budget Strategy

- Support Artemis
- Implement a Balanced and Integrated Science Program
- Advance Compelling Science Program with Highest National Priorities
- Execute Innovative Partnerships

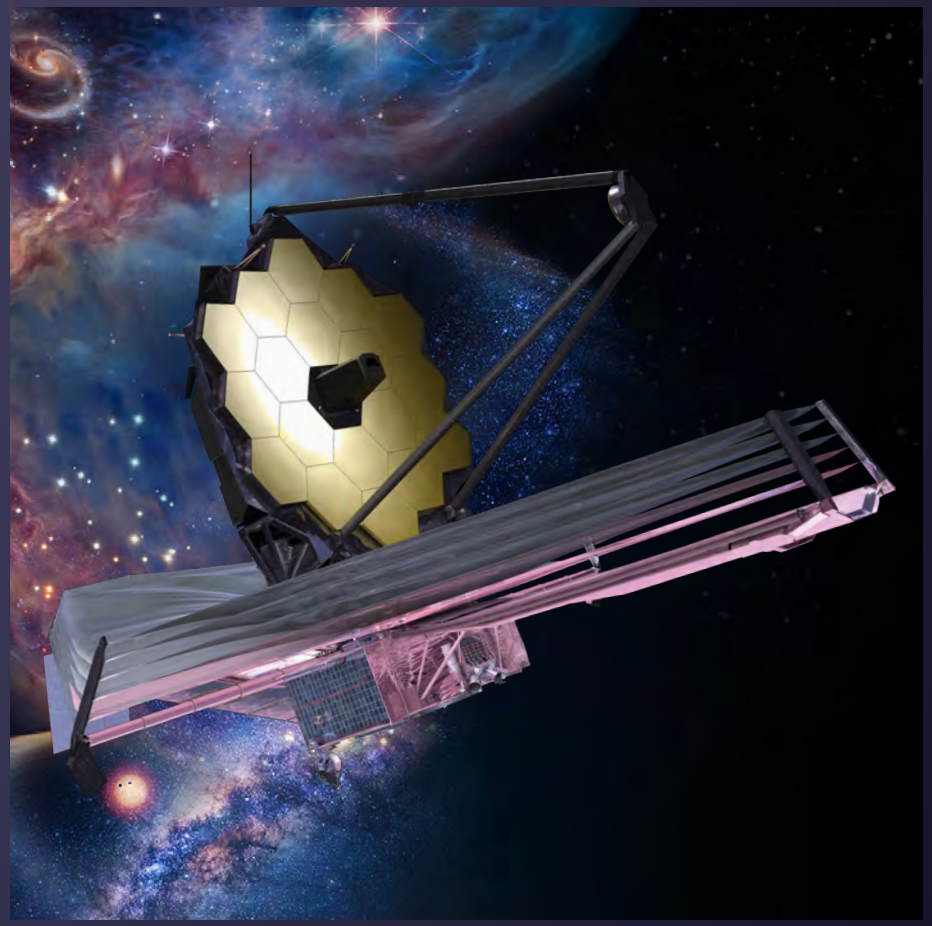
Support Artemis

- Support the Artemis program with enhanced lunar science and technology demos, and a strengthened collaboration between science and human exploration
- Enable development of more than 15 missions (including lunar, Mars, and heliophysics) that inform Artemis work
- Bolster crucial lunar science with Commercial Lunar Payload Services initiative, leveraging commercial partnerships to deliver science and tech payloads beginning in 2021 to virtually anywhere on the Moon, including the poles and far side
- Begin the search for polar ice by 2023 with Volatiles Investigating Polar Exploration Rover (VIPER)
- Provide valuable precursor experience for human exploration of Mars with bold new missions such as Mars Sample Return and Mars Ice Mapper



Implement a Balanced and Integrated Science Program

- Over 40 missions in formulation and development in FY 2021, including over 25 small missions
- Planetary portfolio includes development of Europa Clipper, Mars Sample Return, Discovery, New Frontiers, and Planetary Defense missions
- Earth Science implements first Designated Observables mission, fully funds Earth Venture portfolio, advances technology innovation, and furthers SWOT and NISAR partnerships
- Heliophysics supports IMAP, Explorers, and begins work on GDC for launch as early as 2026



Advance Compelling Science with Highest National Priorities

- Execute program informed by Decadal Surveys
- Continue activities for Planetary Defense, to both prevent Near Earth Object (NEO) impacts on Earth and identify NEOs of potential threat to Earth. Enhance NEO identification capability through the continued development of the NEO Surveillance Mission
- Prioritize astrophysics funding for competed small missions and research; fully fund Webb for launch in 2021
- Revitalize Heliophysics fleet with historic number of missions on orbit and in development making critical observations of the near-Sun environment to improve the capability to study and predict space weather to protect our astronauts, our satellites, and power grids on Earth

Execute Innovative Partnerships

- Pursue science on future commercial and international lunar and Mars missions
- Purchase Earth Science observation data from commercial sector small satellite constellations to provide a cost-effective means to augment and/or complement observations acquired by NASA
- Leverage data and expertise through interagency partnerships to achieve missions; provide data and products to support operational agencies
- Remain the preferred partner across the globe in all levels of NASA science experience, ~400 SMD agreements, comprising nearly 60% of NASA international agreements
- Enable science learners across the U.S. through over 200 community-based organizations

Cost Performance of Recently Launched Missions

NASA Science is providing reliable cost estimates for its missions, contributing to program stability

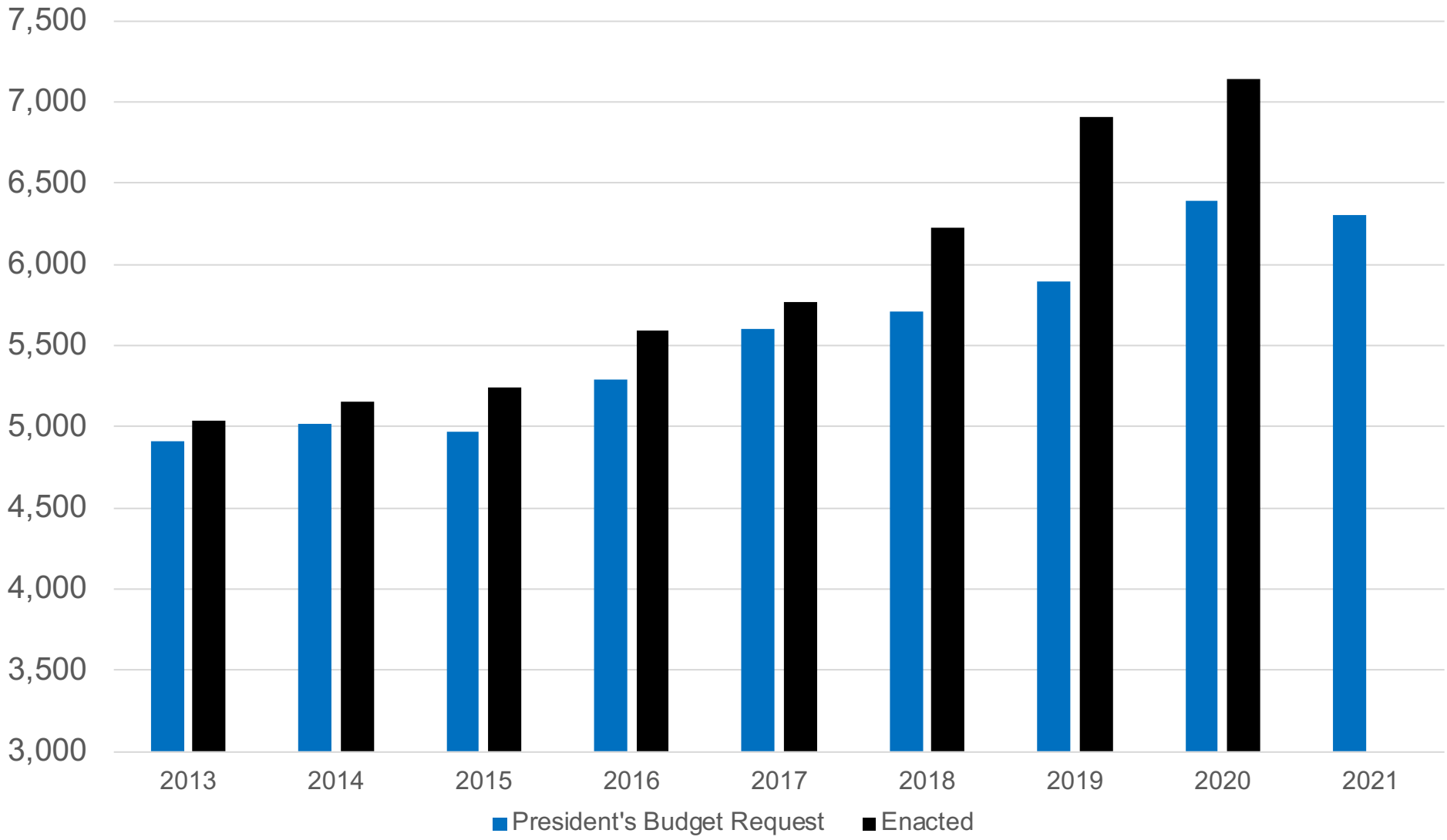
	KDP-C Baseline	Actual/ Estimated	Actual vs. Original
NuSTAR	109.9	116.0	6%
Landsat 8	583.4	502.8	-14%
IRIS	140.7	143.0	2%
LADEE	168.2	188.2	12%
MAVEN	567.2	472.0	-17%
GPM	555.2	484.3	-13%
OCO-2	249.0	320.3	29%
SMAP	485.7	454.3	-6%
MMS	857.3	875.3	2%
Astro-H	44.9	71.2	59%
OSIRIS-REx	778.6	620.8	-20%
CYGNSS	151.1	127.1	-16%
SAGE-III	64.6	88.2	37%
TSIS-1	49.8	19.8	-60%
TESS	323.2	273.4	-15%
InSight	541.8	635.8	17%
GRACE-FO	264.0	238.1	-10%
Parker	1055.7	955.7	-9%
ICESat 2	558.8	713.2	28%
GEDI	91.2	85.5	-6%
OCO-3	62.5	62.2	-1%
ICON	196.0	205.4	5%
SOC	376.6	279.8	-26%
Total	8275.3	7932.5	-4%

Science missions launched since the requirement for a 70% JCL have *underrun* Phase C/D budget commitments by a net 4%

Science Budget Request Summary ($M)

	Actual FY 19	Request FY 20	Enacted FY 20	Request FY 21	Out-years FY 22	FY 23	FY 24	FY 25
Science	**6,886.6**	**6,393.7**	**7,138.9**	**6,306.5**	**6,553.5**	**6,575.7**	**6,705.2**	**6,766.9**
Earth Science	**1,931.0**	**1,779.8**	**1,971.8**	**1,768.1**	**1,878.2**	**1,846.1**	**1,834.5**	**1,984.6**
Earth Science Research	454.1	447.9		447.3	471.9	494.1	528.5	530.3
Earth Systematic Missions	932.7	719.2		608.3	706.1	695.6	640.7	797.3
Earth System Science Pathfinder	223.8	275.4		338.9	301.2	251.6	241.8	234.4
Earth Science Data Systems	202.0	214.4		245.4	259.9	263.2	278.7	277.7
Earth Science Technology	63.4	69.6		74.2	82.8	84.6	86.4	86.4
Applied Sciences	55.1	53.3		53.9	56.3	57.0	58.5	58.5
Planetary Science	**2,746.7**	**2,712.1**	**2,713.4**	**2,659.6**	**2,800.9**	**2,714.9**	**2,904.8**	**2,830.7**
Planetary Science Research	276.6	266.2		305.4	288.6	285.1	295.2	286.7
Planetary Defense	150.0	150.0	160.0	150.0	147.2	97.6	98.0	98.0
Lunar Discovery and Exploration	188.0	300.0	300.0	451.5	517.3	491.3	458.3	458.3
Discovery	409.5	502.7		484.3	424.4	434.8	570.1	505.8
New Frontiers	93.0	190.4		179.0	314.3	332.8	326.9	285.0
Mars Exploration	712.7	546.5	570.0	528.5	588.4	671.2	798.7	855.3
Outer Planets and Ocean Worlds	793.6	608.4		414.4	370.7	239.4	192.3	171.7
Radioisotope Power	123.3	147.9	147.9	146.3	150.1	162.8	165.4	169.8
Astrophysics	**1,191.1**	**844.8**	**1,306.2**	**831.0**	**891.2**	**1,000.9**	**959.7**	**975.5**
Astrophysics Research	222.8	250.7		269.7	279.1	327.2	314.9	331.1
Cosmic Origins	222.8	185.3		124.0	123.2	120.0	122.4	122.4
Physics of the Cosmos	151.2	148.4		143.9	160.8	155.3	169.8	154.1
Exoplanet Exploration	367.9	46.4		47.2	50.4	47.6	51.6	52.2
Astrophysics Explorer	226.5	214.1		246.2	277.7	350.8	301.0	315.6
James Webb Space Telescope	**305.1**	**352.6**	**423.0**	**414.7**	**175.4**	**172.0**	**172.0**	**172.0**
Heliophysics	**712.7**	**704.5**	**724.5**	**633.1**	**807.8**	**841.8**	**834.1**	**804.1**
Heliophysics Research	248.9	237.0		230.5	218.7	225.2	224.0	224.5
Living with a Star	135.3	107.6		127.9	134.5	246.4	225.5	233.3
Solar Terrestrial Probes	180.5	177.9	183.2	126.3	262.2	202.6	195.6	115.5
Heliophysics Explorer Program	147.9	182.0	182.0	148.4	192.4	167.6	189.0	230.8

President's Science Budget Request and Enacted



Science Mission Directorate

Planetary Science

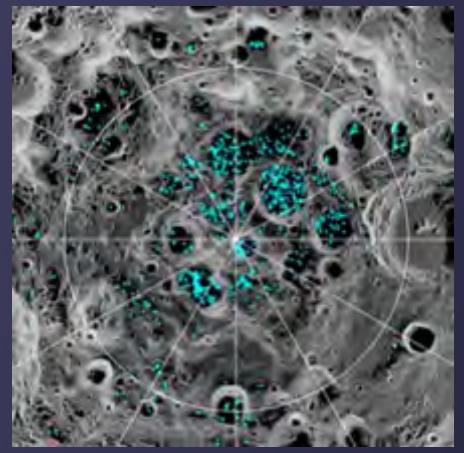
Planetary Science Budget Features

What's Changed

- Proposes Clipper launch in 2024 on a commercial vehicle, which saves over $1.5 billion and makes an SLS available to support an Orion launch to the Moon
- Dragonfly selected as next New Frontiers mission with launch readiness date in 2026
- Increases Commercial Lunar Payload Services based on awards to date
- Increases SmallSat future opportunities within the Discovery Program
- Increases R&A to maintain adherence to Decadal recommendation
- Begin Ice Mapper planning with international and commercial partners

What's the Same

- Enables a Mars Sample Return launch in 2026
- Implements Mars 2020, DART, Dragonfly, Psyche and Lucy as well as instruments on ExoMars 2020, JUICE and MMX
- Enables Discovery selection(s) in 2021 and New Frontiers 5 AO release in 2022
- No funding for Europa Lander
- Maintains Nation's radioisotope power system capability



Lunar Discovery & Exploration Program

- Foundational to Artemis missions, leads the Nation's return to the lunar surface in 2021, leveraging an innovative and rapid acquisition approach to commercial lunar delivery services, building to a cadence of two deliveries per year
- Implements an integrated science strategy of the Moon through robotic and human exploration collaboration, and interagency and international participation
- Leverages future platforms including SmallSats, the Gateway, and Human Landing System to enable interdisciplinary science and technology development opportunities
- Develops and delivers the first lunar south pole rover to investigate water ice in advance of Artemis Mission III, landing the first woman and next man to the lunar surface

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Astrophysics

Astrophysics Budget Features

What's Changed

- Astrophysics Pioneers initiated for SmallSats and major balloon missions
- SPHEREx selected as next Astrophysics Medium Explorer
- CASE selected as Explorer Mission of Opportunity on ESA's ARIEL mission
- Extends Fermi, NICER, NUSTAR, Swift, TESS, XMM per 2019 Senior Review
- Proposes termination of SOFIA due to its high cost and lower scientific productivity than other missions

What's the Same

- Webb proceeding toward launch in 2021
- Provides no funding for WFIRST space telescope; instead, focuses on completing Webb
- Spitzer operations ended January 2020
- Hubble, Chandra, and other operating missions continue
- IXPE, GUSTO, XRISM, Euclid, and SPHEREx development on track and within budget
- CubeSat initiative and balloon campaigns within healthy research program
- Science Activation at $45.6M/year

Science Mission Directorate

Heliophysics

Heliophysics Budget Features

What's Changed

- PUNCH, TRACERS and AWE established as new mission lines
- MIDEX AO released in July 2019
- ICON launched in October 2019
- Explorers and STP Missions of Opportunity Step-1 selections completed
- Funding profile established for IMAP (planning for accelerated launch vehicle procurement to support combined IMAP and rideshare payload)
- Allocated funding for GOLD Extended Operations
- Space Weather Science and Application program budget will enable the development of a sensor package on the Power and Propulsion Element (PPE) on Gateway in support of Artemis
- Enables potential Phase A start for GDC in FY21

What's the Same

- Operating science missions continue with minor changes for extended missions to adjust for inflation
- Support for a robust CubeSat and Technology program
- Support for research (competed PI - ROSES) selections and awards, including DRIVE implementation (selections made in 2019)
- Support for data facilities and archives, and mission operations services

Science Mission Directorate

Earth Science

Earth Science Budget Features

What's Changed

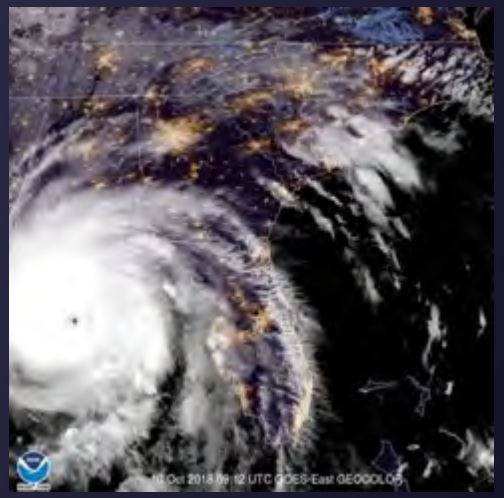
- Initiates first Designated Observables mission in FY21
- Selection of GLIMR as next Earth Venture Instrument (EVI-5)
- Confirmation of the GeoCarb mission
- Additional resources to develop satellite data products (e.g., soil moisture, land surface change, and water/ice data) that will benefit multiple agencies, as recommended by the Satellite Needs Working Group
- Sentinel-6A renamed "Sentinel-6 Michael Freilich" (recently retired ESD director)

What's the Same

- Supports 22 on-orbit missions, including instruments operating on the ISS
- SWOT, NISAR, Sentinel-6 Michael Freilich/B, Landsat 9, TEMPO, GeoCarb, and MAIA remain on schedule for launch in budget window from FY21-FY25
- Maintains regular cadence of Venture Class solicitations (suborbital, mission, instrument); supports the first Earth Venture Continuity mission selection
- Sustainable Land Imaging supports the development of the next generation of Landsat observing systems as well as a focused program of land imaging technology studies
- Robust research and applied science programs, SmallSat/CubeSat investments, and commercial data buy activities
- Like FY18-20 Presidential Budget Requests, provides no funding for PACE and CLARREO-PF, as current ocean climate monitoring capabilities exist

Science Mission Directorate

Joint Agency Satellite Division



Joint Agency Satellite Division Overview

Strategic Objective

- Ensure excellence in the Nation's operational weather satellites by applying NASA's expertise in systems engineering and program and project management to satellite and ground system development

Recent Accomplishments

- Extended the life of Deep Space Climate Observatory (DSCOVR) by developing innovative gyro-less attitude control software
- Delivered radiator assembly for GOES-T Advanced Baseline Imager (ABI) with new design to prevent thermal control anomaly seen on GOES-17 ABI
- Completed assembly and test of Advanced Technology Microwave Sounder (ATMS) instrument for JPSS-2
- Released solicitation for Space Weather Follow On L1 (SWFO-L1) spacecraft and received proposals for SWFO-L1 instruments
- Began pre-formulation activities for Geostationary and Extended Orbits (GEO-XO) Program, representing the next generation of operational weather satellites beyond low earth orbit

Science Mission Directorate

Science Activation

Science Activation Across the Nation

By the Numbers*

54 exhibits
developed and distributed to curated organizations

4600 libraries
84 State and local libraries selected to received tailored science content

350 hands-on toolkits
developed and distributed to science centers and museums

423 subject matter experts
ensure accurate and timely science content

1.9 million registered educators
received 197 digital Earth and Space resources through PBS LearningMedia

220 leveraged partnerships

* Through 2019


EXPLORE
with us