



NASA'S FY2020 BUDGET REQUEST

Summary

On March 11, 2019, President Trump requested \$21.019 billion for NASA for FY2020, a cut of \$481 million from the FY2019 enacted level of \$21.500 billion. NASA Administrator Jim Bridenstine, other NASA officials, and text in NASA's budget documentation characterized it as an increase in funding, even though it was a reduction. To create their narrative, they compared it to how much Trump *requested* for FY2019, not how much was appropriated by Congress.

On May 13, 2019, Trump submitted a supplemental request for another \$1.6 billion. The money is to pay for a new effort, announced on March 26, 2019 and later named Artemis, to accelerate the return of American astronauts to the Moon by four years (2024 instead of 2028). That brings the revised FY2020 request to \$22.616 billion.

- NASA is funded in the Commerce-Justice-Science (CJS) appropriations bill (H.R. 3055), which **passed the House on June 25, 2019** as part of a package of five appropriations bills dubbed "Minibus 2." Only minor changes were made to the NASA portion of the bill as reported from the House Appropriations Committee on May 22, 2019 (H. Rept. 116-101). **The bill funds NASA at \$22.315 billion**, an increase of \$815 million over FY2019, and \$1.296 billion more than the original (March 11) budget request. The additional money mostly is for science and education programs Trump wants to eliminate. It ignores the May 13 supplemental request.

For FY2020, NASA is displaying its request in the same format it used in its FY2019 request even though Congress rejected the restructuring last year. The House Appropriations Committee rejected it again for FY2020. With the request in one format and congressional action in another, apples-to-apples comparisons are extremely difficult for three of NASA's appropriations accounts (exploration, space operations, and space technology). Table 1 below is a best attempt.

Table 2 shows NASA's five-year "run-out" – projections through FY2024 – although they are from the original FY2020 request. The Administration has not released a run-out for the revised program including Artemis funding.

Key Issues

The Artemis Moon 2024 Program

On March 26, 2019, Vice President Mike Pence, in his role as chairman of the White House National Space Council, announced that the Trump Administration had a new policy to put American astronauts – the “next man and the first woman” -- at the South Pole of the Moon by 2024.

On May 13, Bridenstine revealed that the program is named Artemis.

In Greek mythology, Artemis is Apollo’s twin sister. The Apollo program saw 12 men land on the Moon from 1969-1972. Naming this new program after a female underscores the Trump Administration’s theme that a woman will be on the first crew to return there in 2024. (It should be noted, however, that for the first time since 2005 there are no women in any of the top jobs at NASA Headquarters.)¹

NASA insists this is not a “return” to the Moon, but going “forward to the Moon” since it will be done differently than Apollo -- with international and commercial partners, using primarily reusable systems to ensure sustainability.

Prior to March 26, NASA was planning to put astronauts on the Moon by 2028. Accelerating it to 2024 means that it would take place during the last year of a second Trump term if he wins reelection. Tying the schedule to a political milestone is controversial, but Bridenstine portrays it as reducing political risk since prior efforts to return to the Moon have failed in part because political winds changed before the programs could be completed.

It is not true in every case. President George H. W. Bush’s 1989 Space Exploration Initiative (SEI) did not die because he left office. It never garnered congressional support in the first place largely because of its estimated cost of \$400-500 billion over 30 years.

It is true, however, that President George W. Bush’s Constellation program to return astronauts to the Moon by 2020 and someday go to Mars was cancelled when Barack Obama became President. An independent review concluded NASA would need an additional \$3 billion per year to do it and the Obama Administration was not prepared to make that investment.

Democrats and Republicans in Congress were furious. The announcement was made as part of the FY2011 budget request on February 1, 2010 with little or no advance warning. At the time, the space shuttle program was ending because of decisions made by the Bush Administration and Obama proposed nothing to replace it or Constellation. The United States was about to become dependent on Russia to take astronauts to and from the International Space Station (ISS), with no post-ISS human spaceflight program on the horizon.

¹ Shana Dale became the first female Deputy Administrator in 2005 when Mike Griffin was Administrator during the second term of George W. Bush’s Administration. She was followed by Lori Garver and Dava Newman through 2017 under Charlie Bolden during the Obama Administration. Women also have served as NASA Chief Scientist as recently as 2016. Women do hold the top jobs at two of the 10 NASA Centers –Jody Singer at Marshall Space Flight Center and Janet Kavandi at Glenn Research Center. It is notable that NASA Administrator Jim Bridenstine publicly advocated for Kavandi to be named his Deputy, but the White House chose former Senate staffer Jim Morhard.

Reacting to the criticism, Obama made a speech on April 15, 2010 at Kennedy Space Center where he said his goal was to send humans to Mars, bypassing the Moon since we had already been there. His goal was to put astronauts in orbit around Mars in the 2030s, with landings at an unspecified time in the future. The first step would be sending astronauts to an asteroid, which eventually became the Asteroid Redirect Mission where an asteroid was to be robotically diverted into lunar orbit and studied by astronauts there.

The mid-sized Ares I and Saturn V-class Ares 5 rockets under development for Constellation were cancelled, but in the 2010 NASA Authorization Act, Congress directed NASA to build a different Saturn V-class rocket – the Space Launch System (SLS) – and a Multi-Purpose Crew Vehicle (MPCV) to send astronauts to the Moon or other “deep space” destinations. NASA chose to retain the Orion spacecraft that was already under development for Constellation at the MPCV.

Thus, during the Obama Administration, development of the rocket and crew spacecraft needed to send people beyond low Earth orbit continued at a rate of about \$4 billion per year. Some argue that the only real difference between Constellation and the Obama-era SLS/Orion program was the design of the rocket and the destination – an asteroid instead of the Moon as a steppingstone to Mars.

Trump cancelled Obama’s Asteroid Redirect Mission without fanfare or complaint soon after he was inaugurated. It had never garnered very much political or scientific support.

In December 2017, Trump issued Space Policy Directive-1 (SPD-1), restoring the Bush-era goal of putting astronauts back on the lunar surface before going to Mars.

By that point, NASA had spent six years working on the SLS and more than a decade developing Orion (since FY2006). It also had a notional design for a Deep Space Gateway in lunar orbit to serve as a transfer point for astronauts headed Mars. After SPD-1, it was redesignated as just “Gateway” that first could be used as a transfer point for astronauts traveling to the lunar surface.

Under this scenario, SLS/Orion will ferry astronauts to and from the Gateway, with lunar landing vehicles stationed at the Gateway to take people down to the surface and back. Until March 26, 2019, the human return to the lunar surface was notionally planned for 2028.

This year is the 50th anniversary of the first Apollo lunar landing, Apollo 11, on July 20, 1969. Human spaceflight enthusiasts are anxious to get back to the Moon and on the way to Mars.

In March 2019, however, SLS prime contractor Boeing notified NASA of yet another delay in the planned first launch. That test launch, without a crew, originally scheduled for 2018, already had slipped to December 2019-June 2020. Now it would be delayed again.

NASA and the White House did not take the news lightly. Bridenstine [told](#) the Senate Commerce, Science, and Transportation Committee, which authorizes NASA’s activities, on March 13 that the agency was looking at commercial alternatives to SLS such as SpaceX’s Falcon Heavy. Considering that the SLS program is managed at NASA’s Marshall Space Flight Center in Huntsville AL, and the senior Senator from Alabama, Richard Shelby (R), chairs the Senate Appropriations Committee and is an unabashed supporter of SLS, the action seemed politically doomed from the start.

Then, on March 26, Pence spoke at Marshall Space Flight Center. In another surprise move, he announced an acceleration, not a delay, in the Moon program. The Trump Administration's new policy is to land "the next man and the first woman" at the South Pole of the Moon by 2024. Without naming Boeing, he issued strong words of warning that contractors who could not meet that schedule would be replaced. He was equally direct with NASA – if the agency could not meet that date, the agency, not the goal, would have to change.

Despite the rhetoric, NASA quickly [concluded](#) it was not technically viable (never mind politically) to replace SLS with commercial rockets and still meet the 2024 schedule.

It is the SLS core stage that is proving more difficult to build than Boeing or NASA imagined. They are trying to find ways to save time, some of which are controversial, such as a proposal to shorten or eliminate the "Green Run" test where all four engines would be integrated into the core stage and fired for the full 8 minutes they will have to work during an actual launch.

NASA's Aerospace Safety Advisory Panel is strongly urging NASA to retain the test, but as of the date of this fact sheet, a decision has not been made.

In the meantime, NASA is trying to win support from Congress to pay for the Moon-by-2024 Artemis program. That is a challenge because the Trump Administration will not say how much it will cost in each fiscal year, which is how Congress appropriates money.

Bridenstine told a congressional committee on April 2, a week after Pence's speech, that he would submit a budget amendment by April 15. It was not provided until May 13, however, four days before the House Appropriations Committee was to begin marking up the FY2020 Commerce-Justice-Science (CJS) appropriations bill that funds NASA.

The request, \$1.6 billion, is only for FY2020. No estimates for the other four years, FY2021-2024, were provided at the time. Subsequently, Bridenstine told CNN that it would cost \$20-30 billion to accelerate the program, but that is not an official Administration figure. He repeatedly acknowledges that taking money from other parts of NASA to pay for Artemis will create partisan and parochial discord that will doom the program. That means the money would be in addition to what NASA planned to request in those years – roughly \$21-22 billion annually.

However, Bill Gerstenmaier, the head of NASA's human spaceflight program, told the NASA Advisory Council (NAC) on May 31, 2019 that while he knows how much new money is needed for Artemis, he also knows NASA will not be getting it all as an addition to its top line. Formulating the \$1.6 billion supplemental request was "easy" because not only was no money taken from other NASA programs, but it was spread around. Some went to science and some to space technology. He does not expect that to be true in the future.

When we get to [FY2021], I don't think we're going to be able to get the entire budget as new money to the topline. We're gonna have to look at efficiencies and a mix of cuts internal to the agency. That's where it's going to be hard." NASA's Bill Gerstenmaier at May 31, 2019 NAC meeting

That is an understatement. Not only will NASA have to do it internally, but convince its external stakeholders, especially Congress, to agree.

The House CJS subcommittee on May 17, and the full committee the following week, totally ignored the supplemental request and the Artemis program. Instead, they criticized NASA for prioritizing human spaceflight over science and education programs in the original request. The committee-approved bill increased NASA's total budget compared to the original request, with the largest increase going to science (see Table 1). The House passed the bill with only minor changes on June 25, 2019.

Those are just the first steps in what will be a long appropriations process, but are not encouraging for Artemis.

Science

Even without Artemis, the House Appropriations Committee complained in its report on the FY2020 CJS appropriations bill that the Trump Administration wants to terminate science and education programs in order to shift its priorities to human spaceflight.

The FY2020 request continues the Administration's effort to terminate some of NASA's Earth science, astrophysics, and education programs despite Congress rejecting those attempts for the past two years. The Administration and Congress also disagree on some aspects of a robotic mission to Jupiter's moon Europa.

Earth Science

In FY2020, the Administration is once again proposing termination of the PACE and CLARREO-Pathfinder Earth science missions, as well as NASA's Carbon Monitoring System program.²

- **PACE**, the Plankton, Aerosol, Clouds and Ocean Ecosystem spacecraft, will provide high quality global observations about ocean health and its relationship to airborne particles and clouds. Among other things, the data would be used for fisheries management and responding to harmful algae blooms. Launch is currently planned for 2022-2023. PACE is being built and tested at NASA's Goddard Space Flight Center in Greenbelt, MD.
- **CLARREO Pathfinder** will be attached to the International Space Station (ISS). CLARREO is the Climate Absolute Radiance and Refractivity Observatory. In 2016, a decision was made to focus on a technology demonstration mission first – CLARREO Pathfinder, a Reflected Solar Spectrometer that will be attached to the ISS around 2023. CLARREO Pathfinder is managed by NASA's Langley Research Center in Hampton, VA.
- **Carbon Monitoring System.** The \$10 million/year CMS program, created by Congress in the report to accompany the FY2010 Consolidated Appropriations bill (P.L. 111-117, H. Rept. 111-366), primarily funds grants to help develop the capacity to monitor, report and verify biogeochemical processes to better understand the major factors driving

² For the prior two years, the Trump Administration also tried to cancel OCO-3 and the Earth-facing instruments on the DSCOVR spacecraft. Congress did not agree. OCO-3 was launched in April 2019. DSCOVR has been in space since 2015 and the proposal was to turn off two of its instruments for political reasons (they originated with then-Vice President Al Gore).

climate change. The Trump Administration tried to end the program after Congress failed to explicitly fund it in the FY2018 appropriations bill, but Congress did explicitly fund it in FY2019.

The House Appropriations Committee rejected the proposed terminations in the FY2020 request. Instead it increased funding for NASA's Earth science program from the \$1,779.8 million requested to \$2,023.1 billion. It restores \$147 million for PACE, \$26 million for CLARREO-Pathfinder, and \$10 million for the Carbon Monitoring System.

Astrophysics: WFIRST

The Trump Administration is trying again to cancel the Wide-Field Infrared Survey Telescope (WFIRST), the follow-on to the James Webb Space Telescope (JWST), which itself is the follow-on to the Hubble Space Telescope. WFIRST's purpose is to advance research into dark energy and dark matter and discover new planets orbiting other stars (exoplanets).

NASA's priorities for astronomy and astrophysics, as well as other space and Earth science disciplines, are set by Decadal Surveys performed every 10 years (a decade) by expert committees established by the National Academies of Sciences, Engineering, and Medicine. WFIRST was identified as the top priority for a large "flagship" space telescope by the most recent Decadal in 2010. Its initiation was delayed because the money designated for WFIRST had to be reallocated to pay for cost overruns on JWST.

WFIRST has encountered its own challenges largely due to design changes dictated by NASA in excess of what the Academies recommended, but support in the scientific community remains strong. (See [last year's report](#) on the FY2019 NASA budget request for more information on WFIRST and JWST.)

When the Trump Administration proposed terminating WFIRST last year, it said the money was needed instead for the human exploration program to return astronauts to the Moon (expected in 2028 at that time), although some would fund smaller astrophysics programs. This year, NASA officials attributed the decision both to the need to pay for the Moon program as well as ever increasing costs of JWST, which breached its \$8 billion development budget cap by 10 percent in 2018.

Congress rejected the proposal to terminate WFIRST in the FY2019 request. The House Appropriations Committee also rejected it for FY2020, providing \$510.7 million to keep it on track for launch in 2025 or 2026.

Planetary Science: Europa

Planetary science was a top priority of Rep. John Culberson (R-TX), who chaired the House Appropriations CJS subcommittee for four years before losing his reelection race in 2018. During his time as chairman, he required NASA to begin a program to send two spacecraft – an orbiter and a lander – to Jupiter's moon Europa, which some scientists believe has a liquid ocean under an icy crust that may have the conditions to harbor microbial life.

NASA did not plan to build any Europa missions, but Congress has the power of the purse and Culberson convinced his colleagues to direct NASA to do so. He actually wrote into law, not just in report language as is common, that Europa Clipper (the orbiter) had to be launched by

2023 on the Space Launch System (SLS), and a Europa Lander by 2025 also on SLS.³ Culberson proudly would say that they are the only two NASA missions that must be built and launched by law. (Report language is directive, but does not have the force of law.)

NASA reluctantly agreed to build Europa Clipper and it is under development, but it has not agreed to build Europa Lander. It also will not commit to using SLS as the rocket, since it is very expensive. NASA says in its FY2020 budget request that it will launch Europa Clipper in 2023, as required, but wants to use a commercial rocket. It asserts that will save \$700 million. NASA officials also agree, however, that they will follow the law.

With Democrats now in control of the House, Rep. José Serrano (D-NY) chairs the CJS subcommittee. His enthusiasm for the Europa missions appears to parallel Culberson's. (Serrano was the Ranking Member when Culberson was chair. Culberson is now a lobbyist who told [Politico](#) that he intends to lobby on behalf of the NASA missions he advocated in Congress.)

The House Appropriations Committee again directed NASA to build both Europa Clipper and Europa Lander, and again included in the law that they be launched by SLS in 2023 and 2025 respectively. The committee provided the requested funding levels for the two missions: \$592.6 million for Clipper and nothing for the Lander. It explained that the \$195 million appropriated for the Lander in FY2019 was sufficient also for FY2020, but it expects NASA to provide adequate funding in FY2021 and beyond. During markup, Rep. Kay Granger (R-TX), the top Republican on the full Appropriations Committee, expressed concern that no funding for the Lander was included in the bill.

NASA's Office of STEM Engagement

NASA funds education activities both through its Office of STEM Engagement (formerly the Office of Education) and as part of science missions in the Science Mission Directorate (SMD). Generally speaking, these efforts are part of an effort to encourage students to study Science, Technology, Engineering and Math (STEM) fields, which has been supported on a bipartisan basis in the White House and Congress for many years.

The Trump Administration, however, tried to eliminate NASA's Office of Education and its programs in FY2018 and FY2019. The effort was soundly rejected by Congress (which renamed it STEM Engagement), but the Administration is making the same request this year.

The four programs within this office are:

- **National Space Grant and Fellowship Program**, a national network of 850 affiliates in colleges, universities, industry, museums, science centers, and state and local agencies in all 50 states plus the District of Columbia and Puerto Rico that fund fellowships and scholarships for students in STEM fields.
- **Experimental Program to Stimulate Competitive Research (EPSCoR)** that provides seed funding to enable 27 jurisdictions (24 states plus Guam, Puerto Rico and the U.S. Virgin Islands) to develop academic research enterprises directed toward long-term, self-

³ Originally the dates were 2022 and 2024, but by the time of the FY2019 appropriations act, they slipped by one year each.

sustaining, nationally-competitive capabilities in aerospace and aerospace-related research.

- **Minority University Research and Education Program (MUREP)** that enhances the capabilities of Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs) through grants with the goal of recruiting underrepresented and underserved students into STEM fields through completion of undergraduate or graduate degrees.
- **STEM Education and Accountability Projects (SEAP)** for internal and external innovative education programs by NASA Centers, the Jet Propulsion Laboratory (JPL), and third parties.

The House Appropriations Committee again rejected the proposal to eliminate these activities. The committee approved a total of \$123 million: \$48 million for Space Grant; \$25 million for EPSCoR; \$37 million for MUREP; and \$13 million for SEAP.

NASA Budget and Agency Reorganization

NASA is again proposing a change in its budget account structure even though Congress rejected it for FY2019. The proposal this year is slightly different, but fundamentally is intended to separate human spaceflight operations in low Earth orbit (e.g. the International Space plus efforts to encourage companies to build new LEO space facilities) from the development of systems to send humans beyond LEO. Currently both development and operations are managed by the Human Exploration and Operations Mission Directorate (HEOMD).

Last year, the proposal included elimination of NASA's Space Technology Mission Directorate (STMD), created by the Obama Administration to focus attention on developing cross-cutting technologies that are applicable to human spaceflight, science, or aeronautics rather than mission specific. The restructuring would have redirected most of the money into technology specifically for human spaceflight.

Congress rejected both the proposal to eliminate STMD and the budget restructuring last year and the House Appropriations Committee did so again this year. Indeed, a number of projects funded in STMD are of special interest to members of Congress from districts or states where the work is done, such as the Restore-L satellite servicing technology demonstration project and nuclear thermal propulsion development.

The new NASA-preferred budget accounts are shown in Tables 1 and 2. NASA wants to remix the Exploration and Space Operations accounts and what it wants to keep of STMD into three new accounts:

- **Deep Space Exploration Systems**, combining much of what was in the old Exploration account (SLS, Orion, Exploration Ground Systems) with Advanced Exploration Systems, including new activities associated with Artemis;
- **Exploration Technology**, essentially what remains of STMD (last year the proposal included merging Exploration Research and Development into this account, but NASA has dropped that aspect); and
- **LEO and Space Flight Operations**, combining what previously was in the Space Flight Operations account plus the new Commercial LEO Development line item to help commercial companies building LEO infrastructure.

In an unmistakable symbolic change, all three human exploration accounts are listed ahead of science, which has been first since FY2004.

In separating human spaceflight operations from development, NASA wanted to name the new organization that would oversee development programs as the “Moon to Mars Mission Directorate.” Congress rejected all those proposals in May 2019, however. NASA is now considering a reorganization within HEOMD.

Table 1: NASA's FY2020 Budget Request
(in \$ millions, see notes below)

Account (Note 2)	FY2019 Enacted	FY2020 Request			Authorization			Appropriations		
		FY2020 Initial	FY2020 Suppl	FY2020 Revised	House	Senate	Final	House-passed	Senate	Final
Deep Space Expl Syst	5,050.8	5,021.7	1,374.7	6,396.4				Note 3 5,129.9		
<i>Expl Sys Development</i>	4,092.8	3,441.7						4,167.8		
<i>(Orion)</i>	(1,350.0)	(1,266.2)						1,425.0		
<i>(SLS)</i>	(2,150.0)	(1,775.4)						2,150.0		
<i>(Expl Grnd Sys)</i>	(592.8)	(400.1)						592.8		
<i>Exploration R&D</i>	958.0	1,580.0						Note 3 962.1		
<i>(Ady Expl Systems)</i>	N/A	(255.6)								
<i>(Cislunar/Surf Capblty)</i>	N/A	(363.0)								
<i>(Gateway)</i>	N/A	(821.4)								
<i>(Human Rsrch Prog)</i>	N/A	(140.0)								
Exploration Technology	926.9	1,014.3	132.0	1,146.3				Note 3 1,291.6		
LEO & Spcflt Ops	4,639.1	4,285.7						Note 3 4,285.7		
ISS	N/A	1,458.2								
<i>Space Trans (for ISS)</i>	N/A	1,828.6								
<i>Space & Flt Spprt</i>	N/A	848.9								
<i>Cmrcl LEO Developmnt</i>	N/A	150.0								
Science	6,905.7	6,303.7	90.0	6,393.7				7,161.3		
<i>Earth Science</i>	N/A	1,779.8						2,023.1		
<i>Planetary</i>	N/A	2,622.1						2,713.4		
<i>Astrophysics</i>	N/A	844.8						1,367.7		
<i>JWST</i>	375.1	352.6						352.6		
<i>Heliophysics</i>	N/A	704.5						704.5		
Aeronautics	725.0	666.9						700.0		
STEM Engagement	110.0	0.0						123.0		
Safety, Security, MS	2,755.0	3,084.6						3,084.6		
CECR	348.2	600.4						497.2		
Inspector General	39.3	41.7						41.7		
TOTAL	21,500.0	21,019.0	1,596.7	22,615.7				22,315.0		

Note 1: Sources: Request: NASA FY2020 budget documentation available on NASA’s budget website and FY2020 Supplemental Budget Request May 13, 2019 (available on OMB’s website). Congressional action: congressional bills and reports.

Columns may not add due to rounding. Text and numbers in *italics* are subtotals. Text and numbers in *(italics in parentheses)* are sub-subtotals.

N/A = not applicable or not available.

CECR = Construction and Environmental Compliance and Restoration.

Note 2: NASA reconfigured its budget accounts in its FY2019 request, but Congress rejected that request. Nonetheless, NASA again presented its FY2020 request in the new format. The House Appropriations Committee has rejected the new structure again this year (the Senate committee has not acted yet.) Thus, it is difficult to compare the requested budget with congressional action on it.

Note 3: As explained in Note 2, the House Appropriations Committee uses NASA’s original account structure. The content of the budget line items may not be identical between what NASA requested and Congress is appropriating as shown in this table. For example, the House Appropriations bill has an “Exploration” account, a “Space Technology” account, and a “Space Operations” account, instead of “Deep Space Exploration Systems,” “Exploration Technology,” and “LEO and Spaceflight Operations.” The proposed funding amounts at the top level appear to match with the accounts as shown in the table, but insufficient data is available publicly to know how it breaks down at lower levels.

Table 2: Projected NASA Budget FY2020-2024 (Out-Years) in March 11, 2019 Budget Request
(in \$ millions, does NOT reflect the Artemis program)

Account	President's Request	Projections			
	FY2020	FY2021	FY2022	FY2023	FY2024
Deep Space Expl Syst	5,021.7	5,295.5	5,481.4	6,639.0	7,012.3
<i>Expl Sys Development</i>	<i>3,441.7</i>	<i>3,111.0</i>	<i>3,168.4</i>	<i>3,788.5</i>	<i>3,654.7</i>
<i>(Orion)</i>	<i>(1,266.2)</i>	<i>(1,245.7)</i>	<i>(1,146.7)</i>	<i>(1,119.3)</i>	<i>(1,000.0)</i>
<i>(SLS)</i>	<i>(1,775.4)</i>	<i>(1,837.5)</i>	<i>(1,933.0)</i>	<i>(2,221.2)</i>	<i>(2,253.3)</i>
<i>(Expl Grnd Sys)</i>	<i>(400.1)</i>	<i>(357.8)</i>	<i>(388.7)</i>	<i>(448.1)</i>	<i>(401.3)</i>
<i>Exploration R&D</i>	<i>1,580.0</i>	<i>1,854.5</i>	<i>2,013.0</i>	<i>2,850.4</i>	<i>3,387.6</i>
<i>(Adv Expl Systems)</i>	<i>(255.6)</i>	<i>(239.8)</i>	<i>(188.3)</i>	<i>(146.7)</i>	<i>(130.1)</i>
<i>(Cislunar/Surf Capblty)</i>	<i>(363.0)</i>	<i>(647.0)</i>	<i>(967.7)</i>	<i>(1,775.9)</i>	<i>(2,360.0)</i>
<i>(Gateway)</i>	<i>(821.4)</i>	<i>(827.7)</i>	<i>(717.0)</i>	<i>(787.8)</i>	<i>(757.5)</i>
<i>(Human Research Prog)</i>	<i>(140.0)</i>	<i>(140.0)</i>	<i>(140.0)</i>	<i>(140.0)</i>	<i>(140.0)</i>
Exploration Technology	1,014.3	976.1	995.4	964.4	943.1
LEO & Spcflt Ops	4,285.7	4,369.5	4,369.5	4,235.5	4,182.3
<i>ISS</i>	<i>1,458.2</i>	<i>1,448.5</i>	<i>1,449.4</i>	<i>1,352.6</i>	<i>1,315.7</i>
<i>Space Trans (for ISS)</i>	<i>1,828.6</i>	<i>1,854.1</i>	<i>1,814.5</i>	<i>1,746.2</i>	<i>1,727.2</i>
<i>Space & Flt Spprt</i>	<i>848.9</i>	<i>891.9</i>	<i>905.7</i>	<i>911.8</i>	<i>914.5</i>
<i>Cmrcl LEO Developmnt</i>	<i>150.0</i>	<i>175.0</i>	<i>200.0</i>	<i>225.0</i>	<i>22.50</i>
Science	6,303.7	6,319.0	6,319.0	5,846.5	5,815.0
<i>Earth Science</i>	<i>1,779.8</i>	<i>1,785.6</i>	<i>1,779.7</i>	<i>1,666.5</i>	<i>1,674.6</i>
<i>Planetary</i>	<i>2,622.1</i>	<i>2,577.3</i>	<i>2,629.4</i>	<i>2,402.4</i>	<i>2,350.9</i>
<i>Astrophysics</i>	<i>844.8</i>	<i>902.4</i>	<i>965.2</i>	<i>913.5</i>	<i>907.7</i>
<i>JWST</i>	<i>352.6</i>	<i>415.1</i>	<i>175.4</i>	<i>172.0</i>	<i>172.0</i>
<i>Heliophysics</i>	<i>704.5</i>	<i>638.6</i>	<i>769.3</i>	<i>692.0</i>	<i>709.8</i>
Aeronautics	666.9	673.6	680.3	587.1	587.0
STEM Engagement	0.0	0.0	0.0	0.0	0.0
Safety, Security, MS	3,084.6	3,084.6	3,084.6	2,871.6	2,871.6
CECR	600.4	468.8	468.8	468.8	387.8
Inspector General	41.7	42.1	42.5	42.5	43.0
TOTAL	21,019.0	21,229.2	21,441.5	21,655.9	21,872.5

Notes: Source: NASA FY2020 budget documentation, March 11, 2019. NASA says the total is 1 percent inflationary growth per year. Does not reflect any changes the Administration is planning to pay for the Artemis program. Columns may not add due to rounding. Text and numbers in *italics* are subtotals. Text and numbers in (*italics in parentheses*) are sub-subtotals. N/A = not applicable. CECR = Construction and Environmental Compliance and Restoration.