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Fact Sheet
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NASA'S FY2017 BUDGET REQUEST

Overview

President Obama's FY2017 budget request for NASA is complicated. It contains both "discretionary" and "mandatory" components that together total $19.025 billion. That is the figure NASA uses in its budget presentations and is $260 million less than the $19.285 billion appropriated by Congress for FY2016.

Of the $19.025 billion, $18.262 billion is requested for appropriated funds from the discretionary portion of the federal budget – the source of NASA's funding since the agency opened its doors in 1958. Another $663 million would come from the mandatory portion of the federal budget that funds Social Security and Medicare, for example. This is a budgetary strategy the Obama Administration is using this year to try and obtain a total of $4 billion for research and development (R&D) funding in several federal agencies above the budget caps that the President and Congress agreed to last year. A final $100 million for NASA would come from a tax the President wants to levy on oil companies. This unique approach is discussed below.

This fact sheet has five tables:

- Table 1 compares what Congress appropriated for FY2016, the FY2017 President's request using the numbers in NASA's budget presentations that total $19.025 billion, and congressional action.
- Table 2 shows the FY2017 request separated into its discretionary ($18.262 billion) and mandatory ($763 million) components.
- Table 3 shows the funding levels in the FY2016-2017 NASA authorization bill (H.R. 2039) approved by the House Science, Space and Technology Committee on April 30, 2015 on a party-line vote. No further action has taken place.
- Table 4 shows NASA's funding for its "Asteroid Initiative," which includes the Asteroid Redirect Mission (ARM). Those activities are not grouped together in NASA's budget documents and are spread across several NASA Headquarters organizations. This table brings it all together using data provided by NASA.
- Table 5 consolidates the funding for the Space Launch System (SLS), which is spread across three subaccounts.

In brief, the Senate Appropriations Committee approved $19.306 billion for NASA, $21 million more than FY2016. The House Appropriations Committee recommended $19.508 billion, $223 million more than FY2016.

By Marcia S. Smith

NASA's Budget Request: $18.3 Billion or 19 Billion?

NASA unquestionably is requesting $19.025 billion for FY2017, but only $18.262 billion of that is through the appropriations process.

Another $663 million is from mandatory spending that the President wants to redirect to NASA as part of a budget strategy to fund federal R&D programs in excess of budget caps that he and Congress agreed to in October 2015. A White House Office of Science and Technology Policy (OSTP) fact sheet says "$4 billion of the overall $152 billion investment in R&D [in FY2017] is new mandatory funding" that ensures adequate R&D investments. Several other agencies or offices are also requesting funding in this manner.[1]

A further $100 million is from a tax the President wants to levy on oil companies to fund a 21st Century clean transportation initiative. All $100 million would go to NASA's aeronautics program.

The $18.262 billion in appropriated funds plus the $763 million from other sources brings the total to $19.025 billion from the Administration's perspective.

Explaining the distinction between the $18.262 billion and $19.025 billion is complicated and probably not very important in the long run since the President's request is just that, a request, and Congress will make its own decisions on how much money to allocate to NASA. There is an appropriations process to do that, proceeding through hearings, markups, and bills eventually voted on in the House and Senate.

However, the $763 million is in excess of the budget caps, which would make it challenging for appropriators to find the extra money within the funds they are able to control. Appropriations committees do not have jurisdiction over mandatory spending. In fact, there is no evident congressional process for getting money to NASA separate from appropriations. Considering how difficult it is just to pass appropriations bills, getting an additional amount of money through other legislation that would be crafted through an unknown, untried process in an election year when the congressional schedule is tightly constrained (the House is scheduled to meet for a total of 111 days this year) is a pretty high hurdle.

Absent the $763 million, however, the request is a dramatic reduction – $1 billion – from the FY2016 funding level. Such a cut would have deleterious effects particularly on NASA's science and exploration programs as shown in Table 2 below. In recent years, Congress has added money for science and exploration above the President's request and perhaps that is how it will play out this year. Ultimately, it is all a matter of priorities. The Obama Administration made its choices when it crafted the request, asking for $1 billion less for NASA than FY2016 as part of the regular appropriations process and creating an untried mechanism to try and make up

[1] The American Institute of Physics (AIP) FYI newsletter identifies the other agencies as: the Department of Energy's Office of Science, the National Science Foundation, the National Institute of Standards and Technology, the science and technology portion of the Department of Defense budget, the National Oceanic and Atmospheric Administration, and the National Institutes of Health (NIH).

some of the difference by shifting money from mandatory spending. Congress will make its own decisions in the months ahead. NASA is popular on Capitol Hill, but this year will be a difficult test of how it stacks up compared to other congressional priorities.

For those who are interested, the next two pages provide more information and analysis of the President's novel budgetary proposal. For those who are not, a discussion of key issues likely to arise as Congress considers the request begins on page 5.

Discretionary Versus Mandatory Funding. The federal budget is divided into mandatory and discretionary spending. Mandatory spending, as the term implies, must be spent because of laws already in force that set out requirements for the funds to be paid, such as Social Security or Medicare payments to people eligible for benefits. Mandatory spending also includes interest that must be paid on the national debt, for example.

Discretionary spending is the money that Congress chooses to spend (or not) each year. Congress has a process in place to set and allocate those funds through a Budget Resolution that then translates into how much money each of the 12 appropriations subcommittees may spend. Appropriators decide how to allocate the funds after holding hearings and markups. The resulting appropriations bills then are voted on by the full House and Senate and ultimately signed into law (or vetoed) by the President. For more on congressional procedures, see our "What's a Markup" fact sheet.

NASA Chief Financial Officer David Radzanowski explained during a media teleconference the day the budget was released (February 9, 2016) that mandatory spending consumes approximately three-quarters of the federal budget, with discretionary spending making up the other quarter.

Since it opened its doors in 1958, NASA has received its funding from the discretionary part of the budget through the appropriations process.

For the first time, this year the White House is seeking to partially fund NASA and several other R&D agencies or offices by redirecting money from the mandatory side of the budget. It is unclear as to how that would happen. Appropriations committees have no control over mandatory spending and what committees or congressional process would be responsible for considering the President's proposal to move money from one category to the other and make it available to an agency to spend is not explained in the budget request.

Why is the Administration Doing This? The underlying reason for this approach to budgeting is to find a way to fund NASA and other federal R&D agencies above the budget caps that President Obama and Congress agreed to in October 2015. The $18.3 billion request for NASA fits within the caps. The $19 billion does not, but is what NASA and the White House argue is necessary to continue the programs approved in FY2016.

In one sense, the Administration's proposal is reminiscent of its Opportunity, Growth and Security Initiative (OGSI) in the FY2015 budget. However, in that case, the Administration proposed extra funding above the budget caps in a separate proposal. NASA requested a "base" budget that did not include the OGSI funding, while explaining how it would spend the OGSI

funds if they were approved. Congress ignored the OGSI and acted on the base budget request. This time, the extra funds are integrated into the base budget request.

OMB's Explanatory Documents. The authoritative source for the President's budget request is the White House Office of Management and Budget (OMB) and its Budget of the U.S. Government: Fiscal Year 2017 book and associated tables and reports.

OMB's Table S-11, "Funding Levels for Appropriated ('Discretionary') Programs by Agency," clearly shows that the President's request for NASA is $18.3 billion in appropriated funds.

Text on page 28 of that report, however, states that the total request is $19 billion, including $763 million in "mandatory" spending. Table 29-1 in the associated Analytical Perspectives shows where that $763 million is in NASA's request. The lines are annotated as "legislative proposal, subject to PAYGO, mandatory."[2]

The Budget of the U.S. Government document has a chapter entitled "Cuts, Consolidations, and Savings" that states that the request includes "117 cuts, consolidations, and savings proposals, which are projected to save over $14 billion in 2017." That is comprised of $5.9 billion in savings under the discretionary part of the budget and $8.2 billion in savings in mandatory spending. Some of those savings would be redirected to other purposes as detailed in Table S-9 of the OMB document. There is no linkage between any specific cut and increase. Table S-9 simply is a long list of projected savings and expenditures that shows NASA receiving $664 million to be spent over three years ($325 million in FY2017, $283 million in FY2018, and $56 million in FY2019).

Separately, President Obama is proposing a 10-year "21st Century Clean Transportation System" funded by a $10-per-barrel fee to be paid by oil companies. OSTP Director John Holdren explained at his February 9 budget briefing that NASA's aeronautics program would receive part of those funds – $100 million in FY2017 – to develop a low carbon emission aircraft. (This $100 million appears on page 377 of Table 29-1, instead of under the Aeronautics heading on page 374.)

The $664 million to be obtained from cuts to mandatory spending and redirected to NASA, plus the $100 million for NASA's aeronautics program from the 21st Century Clean Transportation System, are what comprise the $763 million (the $1 million difference is due to rounding) that OMB collectively describes as "mandatory."

Will it Work? Does it Matter? How realistic it is that any of that $763 million will ever actually exist, not to mention the process by which Congress would allocate it to NASA if it did, are open questions. For example, the President's clean transportation initiative was summarily rejected by congressional Republicans as soon as it was announced. As for moving mandatory funds into the discretionary category to use for R&D, the American Institute of Physics FYI newsletter (see footnote 1) reports that Rep. Tom Cole (R-OK), chairman of the House appropriations subcommittee that funds NIH, said the proposals "are simply unacceptable budget gimmicks that irresponsibly rely on mandatory spending."

[2] OMB's Table 29-1 shows both Budget Authority (BA) and outlays (O). This fact sheet deals only with BA, not O.

In the long run, does it matter whether the request is $18.3 billion or $19 billion? As already discussed, it is hard to say.

Congress has substantially increased NASA funding above the President's request for the past two years demonstrating that it makes its own decisions, guided more by the amount of money appropriators are allowed to spend pursuant to congressional Budget Resolutions than by the President's request.

The Republican chairmen of the House and Senate Budget Committees, which write the Budget Resolutions, have made it clear they consider the President's budget request irrelevant. They issued a press release before the budget was released announcing they would break with tradition and not even invite the Director of OMB to appear before their committees to explain it.

Still, NASA knows better than anyone how much money it needs to execute the programs that the President and Congress have directed it to pursue, so its budget submission should carry quite a bit of weight.

The only certainty is that without the amount of money represented by those mandatory funds, NASA would be subject to a significant budget cut in FY2017.

In the following discussion, comparisons to "the request" are to the $19.025 billion figure that NASA displays. It should be noted, however, that the Senate and House Appropriations Committees do not agree with NASA's formulation and express their comparisons to the $18.262 billion figure. One must be very careful reading NASA's request, this report, and the committees' reports whenever comparisons to "the request" are made.

Key Issues

The budget request seems certain to fuel the same debates as those of the past several years over earth science, planetary science, and the future of human spaceflight – the Space Launch System (SLS), Orion, commercial crew, and the Asteroid Redirect Mission (ARM). These issues are explained in previous editions of this report and much of the background will not be repeated here. **Congressional action on these issues is described later in this report under the heading "NASA FY2017 Appropriations - Congressional Action."**

Earth Science

The Administration is proposing another increase in NASA's earth science program despite objections from congressional Republicans that NASA should focus on understanding and exploring the universe, not Earth. While many of the congressional critics are climate change skeptics, the argument is rarely couched in those terms. Instead, the line of reasoning is that other federal agencies study the Earth, but only NASA sends probes to other places in the solar system, launches telescopes into space, or supports human exploration of space. They argue those are NASA's core missions, not earth science. Supporters of NASA's earth science program note that the 1958 National Aeronautics and Space Act that created NASA lists

"expansion of human knowledge of phenomena in the atmosphere and space" first among the agency's objectives.

Sen. Barbara Mikulski (D-MD), the top Democrat on the Senate Appropriations Committee, is an ardent supporter of NASA's earth science program (much of which is executed by NASA's Goddard Space Flight Center in Maryland). She has successfully defended the earth science program against dramatic cuts and is expected to do so again this year. She is retiring at the end of this Congress, however, so others will have to take up the gauntlet in the future.

Planetary Science and the Europa Mission

Congress is a strong supporter of NASA's planetary science program on a bipartisan basis. Attempts by the Administration to cut funding for planetary science in recent years have been firmly rejected.

One program – robotic exploration of Jupiter's moon Europa -- has particularly enthusiastic support from Rep. John Culberson (R-TX) who chairs the House appropriations Commerce-Justice-Science subcommittee that funds NASA.

Culberson has added substantial amounts to NASA's budget over the past three years to initiate a Europa mission even though NASA had no plans to do so. That has not deterred Culberson, who led the effort to fund Europa at $175 million in FY2016 ($30 million was requested). NASA is working on a mission design for an orbiter that would be launched in the late 2020s on an Evolved Expendable Launch Vehicle (EELV). Culberson wants a lander in addition to the orbiter and launch in 2022 on the Space Launch System, which is much larger than an EELV and could allow the spacecraft to reach Europa in a shorter period of time. He included language in NASA's FY2016 appropriations bill to that effect.

Despite Congress's interest in planetary science, the Administration is proposing an overall reduction from FY2016 either with or without the mandatory funds. Regarding Europa, it requests only $49.7 million (of which $33 million is from the mandatory category), compared to the $175 million in FY2016; recommends against accelerating the mission from the late 2020s to 2022 because of the detrimental impact it could have on the rest of NASA's science portfolio; and proposes using an EELV, not SLS, for launch (though use of SLS is not precluded).

As required by Congress, NASA did submit a budget projection for how much it would cost to launch a Europa mission by 2022, but it is for NASA's current orbiter mission, not adding a lander: $194 million in FY2017, $272 million in FY2018, $456 million in FY2019, $678 million in FY2020, and $482 million in FY2021.

SLS/Orion

The FY2017 budget request continues the long standing tension between Congress and the Obama Administration over the relative priority of building the Space Launch System (SLS) and Orion spacecraft to take astronauts beyond low Earth orbit (LEO) versus development of "commercial crew" systems to take them back and forth to the International Space Station (ISS), which is in LEO. That history is explained in editions of this fact sheet from earlier years and will not be repeated here.

For FY2017, the Administration is once again requesting significantly less funding for SLS and somewhat less funding for Orion than Congress appropriated for FY2016 (see Table 1). SLS, for example, would get $1.3 billion under NASA's proposal, $700 million less than FY2016. NASA insists that the funding level will allow it to meet its commitment to launch the first SLS in 2018 and the second in 2023, while still working towards the possibility of moving the 2023 launch up to 2021 thanks to the additional funds Congress provided in FY2016. Congress also wants NASA to build the Exploration (or Enhanced) Upper Stage (EUS), which is needed for most SLS missions, now rather than waiting. The FY2016 appropriations bill directed NASA to spend $85 million in FY2016 on EUS. For FY2017, NASA insists that it will continue with its plan to build an interim upper stage (Interim Cryogenic Propulsion Stage) first.

These decisions are certain to be controversial. SLS is a key congressional priority for both Republicans and Democrats involved in NASA funding. Sen. Richard Shelby (R-AL) is the prime advocate for SLS, which is managed by Marshall Space Flight Center in Huntsville, AL. He chairs the Senate Appropriations Commerce-Justice-Science (CJS) subcommittee.

Commercial Crew

The request for commercial crew is slightly less than FY2016 as development funding tails off, but is still substantial: $1.185 billion in FY2017 versus $1.244 billion in FY2016. Republicans and Democrats in Congress have argued for years that the Administration favors the commercial crew program, which was a Presidential initiative, over SLS and Orion, which Congress directed NASA to build in the 2010 NASA authorization act. Until now, commercial crew and SLS/Orion have competed for funds within the Exploration part of NASA's budget. In FY2016, however, Congress moved commercial crew out of Exploration and into Space Operations, so the competition is less direct now.

Congress agrees with the goal of the commercial crew program – to restore America's ability to launch people into space using American rockets from American soil, which has not been possible since the space shuttle was terminated in 2011. However, skepticism remains that the commercial crew program will succeed and the government will end up paying much more than expected. Commercial crew is a Public Private Partnership (PPP) where the government and private sector share development costs and the government guarantees a certain market for the resulting services. The goal is to reduce costs, but if NASA continues to be the only market, it is not clear how that will be achieved.

FY2016 was the first year Congress appropriated the full amount requested for commercial crew. NASA hopes to see the first test launches of the two commercial crew systems – SpaceX's Crew Dragon and Boeing's CST-100 Starliner -- in FY2017, which could motivate Congress to provide full funding in FY2017, too.

Asteroid Redirect Mission (ARM)

President Obama's proposal to send astronauts to an asteroid by 2025 as the next step in human space exploration has been described in earlier editions of this report. It has evolved over time and the current plan is for a robotic probe to be sent to an asteroid, pick up a boulder from its

surface, and move the boulder into a Lunar Distant Retrograde Orbit where it will be visited by astronauts in an Orion spacecraft by 2025.

This Asteroid Redirect Mission (ARM) has been controversial since it began, although Congress has not prohibited NASA from proceeding with it.

ARM involves a number of tasks, from locating asteroids to developing high power solar electric propulsion (SEP) to developing a robotic probe (powered by SEP) and capture system to pluck a boulder from an asteroid's surface and move it to lunar orbit, and finally the systems to take astronauts to collect a sample and bring it back to Earth.[3] Thus it involves many different parts of NASA and the funding is very difficult to track.

Table 4 displays figures provided to SpacePolicyOnline.com for FY2014-2016 by NASA in February 2015. The request for FY2017 was explained in response to a question during a NASA FY2017 budget teleconference on February 9, 2016.

NASA describes ARM in two parts: the Asteroid Redirect Robotic Mission (ARRM) and the Asteroid Redirect Crewed Mission (ARCM). ARRM must be launched first in order to obtain and move the boulder into lunar orbit. NASA is requesting $66.8 million in the Human Exploration and Operations Mission Directorate (HEOMD) for ARRM in FY2017, almost twice what HEOMD requested last year. NASA officials had been saying that ARRM would be launched in 2020, but during the February 9, 2016 budget teleconference, it was revealed that the launch is now expected in 2023, which could make it a challenge to meet President Obama's goal of humans interacting with an asteroid by 2025, although he will no longer be in office at the time. ARM is still in its formulation phase, so the agency has not made definitive commitments on cost or schedule yet, though NASA Administrator Charlie Bolden has repeatedly stated that it will cost no more than $1.25 billion.

Congress supports development of SEP, which can be used for many missions, not just ARM, and the search for asteroids funded in the Science Mission Directorate, but is lukewarm, at best, about the idea of moving part of an asteroid to lunar orbit where it can be visited by astronauts. It is harshly criticized by some Republicans as a waste of money and Democrats do not defend it. The House Science, Space, and Technology Space Subcommittee held a hearing on February 4, 2016 where criticism of ARM and other NASA human spaceflight plans resumed.

[3] One goal of ARM is to return a sample of an asteroid to Earth, but ARM should not be confused with NASA's OSIRIS-REx robotic mission that also will return an asteroid sample to Earth. OSIRIS-REx is scheduled for launch in September 2016 and the sample should be back on Earth in 2023.

NASA FY2017 Appropriations – Congressional Action

NASA's appropriations are part of the Commerce-Justice-Science (CJS) bill, one of 12 appropriations bills on which Congress is supposed to act in each fiscal year. The House and Senate Appropriations Committees have CJS subcommittees.

The Senate and House Appropriations Committees sharply criticized and rejected the Obama Administration's "gimmick" of combining mandatory and discretionary funding in its request. Ultimately it did not matter since both committees recommended funding levels are greater than the President's total request, but it complicates comparisons between the committees' recommendations and the President's request.

The committee reports compare their recommended funding levels to the President's request WITHOUT the mandatory spending – the $18.262 billion request, not the $19.025 billion request (see Table 2). One therefore must take care in reading the committees' reports whenever they state that the amount recommended is in comparison to "the request."

To avoid confusion, t**he only comparisons in the narrative below are to the current (FY2016) funding level, not to either version of the FY2017 request**.

Senate. The Senate CJS subcommittee held its NASA hearing on March 10, 2016 and marked up the CJS bill on April 19. The full committee marked up the bill on April 21. The funding figures that were approved are shown in Table 1.

In total, it recommended $19.306 billion, $21 million more than the FY2016 funding level.

Regarding the issues highlighted in this report, the committee took the following actions:

- Approved $1.984 billion for earth science, $63 million more than FY2016. Of that amount, $130 million is for Landsat 9, with a target launch date of 2020. Also, $90 million is specified for the PACE mission.
- Approved $1.356 billion for planetary science, a reduction of $338 million compared to current spending. Support for a Europa mission is expressed, but no dollar amount is specified. A report from NASA is required on whether it is better to launch a lander and orbiter together or separately. The total includes $387.7 million for Mars 2020; $60 million for Near Earth Object Observations (of which $16.1 million is for AIDA-DART); $44 million for OSIRIS-REx; and $14 million for data analysis for the New Horizons mission that flew by Pluto last year.
- Approved $2.150 billion for SLS, $150 million more than FY2016. Of that amount, $300 million is for EUS. Orion was funded at $1.3 billion, $30 million more than FY2016.
- Approved $1,184.8 million for commercial crew.
- The report is silent on ARM.

House. The House CJS subcommittee held a hearing on NASA's Ocean Worlds program on March 3, 2016 and on the entire NASA budget on March 15. The subcommittee marked up its version of the appropriations bill on May 18 and the full committee released the draft of the

accompanying report (with details on its recommendations) on May 23. Full committee markup is scheduled for May 24.

The House committee's draft report recommends $19.508 billion, an increase of $223 million above the FY2016 appropriation.

Regarding the issues highlighted in this report, the committee took the following actions:

- Recommended $1.690 billion for Earth Science, $231 million less than FY2016. It directs NASA to focus on the science priorities in the most recent earth science Decadal Survey and to prioritize funding for Landsat 9, adding that NASA and its partners should evaluate commercially available data in the event there is a data gap in the Landsat program.
- Recommended $1.846 billion for planetary science, $215 million more than FY2016. Regarding the mission to Europa, the committee recommended $348 million for "Outer Planets and Ocean Worlds," of which not less than $260 million is for the Europa Orbiter and Lander, with launch of the orbiter in 2022 and the lander in 2024.
- Recommended $2.0 billion for SLS, the same as the FY2016 appropriation. Of the $2 billion, no less than $250 million is for the EUS. NASA is directed to submit a long term plan for using SLS, including to launch the Europa orbiter and lander. Orion would receive $1.350 billion, $80 million more than FY2016. The committee states that nothing in the bill or report "shall be construed as directing NASA to proceed with any human spaceflight until all of the risks have been retired."
- Expressed concern that some milestones in the commercial crew program have slipped and required a number of reports on the status of the program, the planned "operational tempo" including numbers of astronauts per flight and per provider, how many seats are for international partners, and the cost and need to reserve seats on foreign partner capsules (i.e, Russian Soyuz spacecraft) in 2018 and beyond. The committee's report does not specify how much funding is provided for commercial crew. It is part of the Space Operations portion of the NASA budget, which is funded at $4.890 billion, $139 million less than FY2016, but it is a broad account that includes funding for the International Space Station, commercial cargo, and space and flight support so how much, if any, of that reduction would be applied to commercial crew cannot be ascertained.
- Recommended zero funding for planning for ARM. Instead, it directed NASA to develop plans for returning humans to the Moon before sending them to Mars. SpacePolicyOnline.com published an article on the committee's recommendation on May 23, 2016.

In other matters of particular note, the committee –

- Encouraged NASA to make funds available for external competitive funding to **study well-preserved and easily accessible impact craters** in the United States to provide researchers and educators the simultaneous opportunity to expand our understanding of the history of Earth and the solar system and to show students research in action as part of STEM education.

- Directed NASA to submit within one year of the bill's enactment an **interstellar propulsion technology assessment report** with a draft conceptual roadmap. Efforts to develop interstellar propulsion are to be focused on enabling a scientific probe to be launched to Alpha Centauri in 2069, the 100th anniversary of the Apollo 11 landing on the Moon, and achieving a cruise velocity of 0.1c (one tenth the speed of light). Propulsion concepts may include fusion-based implementations, matter-antimatter annihilation reactions, multiple forms of beamed energy approaches, and immense "sails" that intercept solar photons or the solar wind.
- Recommended $25 million for **additive manufacturing** technology research for use in rocket engines and structures.
- Recommended no less than $35 million for **nuclear thermal propulsion technology**.
- Recommended no less than $45 million for suborbital and orbital technology demonstration of **small launch technology platforms** able to carry a 200-300 kilogram satellite to low Earth orbit.
- Recommended no less than $75 million for development of a demonstration deep space habitation module.
- Required NASA to submit a report no later than 180 days after enactment of the law detailing ongoing and planned low-cost missions, including by commercial companies, academia and international space agencies, to **explore and characterize the lunar surface and sub-surface,** particularly in-situ water resources to support future robotic and astronaut operations.
- Continued language from prior appropriations bills prohibiting NASA or the White House Office of Science and Technology Policy from engaging in bilateral activities with **China** unless authorized by Congress. The committee now requires that the FBI (in addition to NASA or OSTP) certify that the activities pose no risk of technology transfer or involve knowing interactions with officials involved in violating human rights.

NASA Authorization Bills

(Not sure of the difference between an appropriation and an authorization? See our "What's a Markup" Fact Sheet.)

NASA's authorization ("oversight") committees are the House Science, Space, and Technology (SS&T) Committee and Senate Commerce, Science, and Transportation Committee. The 2010 NASA Authorization Act (P.L. 111-267) is the most recent NASA authorization act. Its funding recommendations covered only through FY2013, but the policy provisions remain in effect until and unless they are repealed or replaced.

House-Passed 2015 NASA Authorization Act. The House passed a one-year FY2015 NASA authorization (H.R. 810) on February 10, 2015 under suspension of the rules. It was virtually identical to the 2014 NASA Authorization Act that passed the House in 2014 other than substituting the amounts appropriated for NASA for FY2015 for those appropriated for FY2014. The Senate never acted on either the 2014 or 2015 bills.

House Committee-Approved NASA Authorization Act for 2016 and 2017 (H.R. 2039). The House Science, Space, and Technology Committee approved H.R. 2039 on April 30, 2015. Debate was highly partisan primarily because of substantial proposed cuts to NASA's earth

science program and the bill was approved on a party-line vote. No further action has taken place. It would authorize funds for FY2016, which is now underway, and FY2017.

The policy provisions of H.R. 2039 are virtually identical to those in H.R. 810 (the FY2015 NASA authorization act that passed the House). The funding provisions are completely new, however. As shown in Table 3, the funding recommendations are complicated because the bill recommends funding at two different levels depending on whether or not the budget caps set in the 2011 Budget Control Act (BCA) are removed.

- The first set of funding recommendations assumes the BCA caps are lifted. A press release from committee Republicans refers to those levels as "**aspirational**."
- The second set assumes the BCA caps are not lifted; the press release calls that set "**constrained**."
- A third scenario is mentioned – where the funding falls somewhere in between – in which case any additional funds would be applied proportionately among all of NASA's funding accounts.

The budget caps for FY2016 and FY2017 were, in fact, lifted in October 2015, so the "aspirational" levels would apply if this bill becomes law. More information comparing the bill to the President's FY2016 request is in last year's version of this fact sheet. Comparisons between what is H.R. 2039 for FY2017 and the President's request for FY2017 will be added to this report if there is more action on this or another NASA authorization bill.

Table 1: NASA's FY2017 Budget Request and Congressional Action (in $ millions, see notes below)

			Authorization			Appropriations		
Account	**2016 Approps**	**2017 Req (note 2)**	**House (note 3)**	**Senate**	**Final**	**House Cmte (draft)**	**Senate Cmte**	**Final**
Science	**5,589.4**	**5,600.5**				**5,597.0**	**5,395.0**	
Earth Science	*1,921.0*	*note 4 2,032.2*				*1,690.0*	*1,984.0*	
Planetary Science	*1,631.0*	*1,518.7*				*1,846.0*	*1,355.9*	
Astrophysics	*730.6*	*note 4 781.5*				*792.9*	*note 4 807.0*	
JWST	*620.0*	*569.4*				*569.4*	*569.4*	
Heliophysics	*649.8*	*698.7*				*698.7*	*678.7*	
Education	*note 4 37.0*	*note 4*				*NA*	*note 4*	
Aeronautics	**640.0**	**790.4**				**712.0**	**601.0**	
Space Technology	**686.5**	**826.7**				**739.2**	**686.5**	
Exploration	**4,030.0**	**3,336.9**				**4,183.0**	**4,330.0**	
Expl Sys Dev	*3,680.0*	*2,859.5*				*3,779.0*	*3,934.0*	
(Orion)	*(1,270.0)*	*(1,119.8*				*(1,350.0)*	*(1,300.0)*	
(SLS)	*(2,000.0)*	*(1,310.3)*				*(2,000.0)*	*(2,150.0)*	
(Expl Ground Sys)	*(410.0)*	*(429.4)*				*(429.0)*	*(484.0)*	
Expl R&D	*350.0*	*477.3*				*404.0*	*396.0*	
Space Operations	**5,029.2**	**5,075.8**				**4,890.3**	**4,950.7**	
ISS	*not specified*	*1,430.7*				*not specified*	*not specified*	
Space Trans	*N/A*	*2,757.1*				*not specified*	*not specified*	
(Cmrcl Crew)	*(1,243.9)*	*(1,184.8)*				*not specified*	*(1,184.8)*	
(Crew and Cargo) note 5	*not specified*	*(1,572.8)*				*not specified*	note 5 *(1,028.0)*	
Space & Flt Sprt	*not specified*	*887.4*				*not specified*	*not specified*	
Education	**115.0**	**100.1**				**115.0**	**108.0**	
Safety/Security/MS	**2,768.6**	**2,836.8**				**2,835.4**	**2,796.7**	
CECR	**388.9**	**419.8**				**398.0**	**400.0**	
Inspector General	**37.4**	**38.1**				**38.1**	**38.1**	
TOTAL	**19,285.0**	**19,025.1**				**19, 508.0**	**19,306.0**	

Notes: (1) 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. Figures for FY2016 are from the Consolidated Appropriations Act and could change in NASA's operating plan. Figures for FY2017 are from NASA budget documents at www.nasa.gov/budget. Figures for Senate Appropriations Committee action are from its report on the bill.
(2) The figures in this column are from NASA's budget documentation, but as explained in the text and shown in Table 2, the President's request to Congress for appropriated funds is $18.3 billion. The remaining funds for FY2017 that are reflected in this column ($763 million) would come from non-appropriated funds that NASA hopes to receive from other parts of the federal budget and President Obama's clean transportation system initiative. Since NASA displays its request as inclusive of the $763 million, SpacePolicyOnline.com will do so as well for now. NOTE THAT THE SENATE AND HOUSE APPROPRIATIONS COMMITTEES DID NOT FOLLOW THIS MODEL. WHEN THEY COMPARES THEIR ACTIONS TO "THE REQUEST," IT IS TO THE $18.262 BILLION REQUEST SHOWN IN TABLE 2.
(3) The House Science, Space and Technology Committee approved a FY2016-FY2017 NASA authorization bill in 2015. The bill has not passed the House or Senate. If there is additional congressional action on that or another FY2017 NASA authorization bill, those funding figures will be added to this table. Table 3 below shows what the authorization amounts are in the House committee-approved bill.
(4) For FY2017, NASA incorporates funding for education-related activities in SMD within the astrophysics budget ($25 million) and the earth science budget ($6 million). Congress routinely breaks SMD education funding out into a separate line item, as shown here for FY2016. However, for FY2017, the Senate Appropriations Committee followed NASA's lead and allocated $42 million for education as part of the astrophysics budget.
(5) The NASA request in this line is labeled "crew and cargo" and pays not only for commercial cargo flights to ISS, but payments to Russia for taking U.S., European, Japanese and Canadian crews to and from ISS on Soyuz spacecraft. The language in the Senate report refers only to $1.028 billion provided for cargo. No mention is made of the Soyuz payments. Since the report does not specify the amounts for line items such as ISS or Space and Flight Support, it may be that it allocated more for this line than shown in the report, or it is providing NASA flexibility on how to spend the other funds in this account.

Table 2: NASA's FY2017 Budget Request: Discretionary versus Mandatory (see text for more information, in $ millions)

	FY2016 approps	2017 Request		
Account		**Total (incl Mandatory)**	**Mandatory**	**Total (without Mandatory)**
Science	**5,589.4**	**5,600.5**	**298.0**	**5,302.5**
Earth Science	*1,921.0*	*2,032.2*	*60.0*	*1,972.2*
Planetary Science	*1,631.0*	*1,518.7*	*128.0*	*1,390.7*
Astrophysics	*730.6*	*781.5*	*85.0*	*696.5*
JWST	*620.0*	*569.4*	--	*569.4*
Heliophysics	*649.8*	*698.7*	*25.0*	*673.7*
Education	*37.0*	--	--	--
Aeronautics	**640.0**	**790.4**	**155.9**	**634.5**
Space Technology	**686.5**	**826.7**	**136.1**	**690.6**
Exploration	**4,030.0**	**3,336.9**	**173.0**	**3,163.9**
Expl Sys Dev	*3,680.0*	*2,859.6*	*173.0*	*2,686.5*
Expl R&D	*350.0*	*477.3*	--	*477.4*
Space Operations	**5,029.2**	**5,075.8**	**--**	**5,075.8**
Education	**115.0**	**100.1**	**--**	**100.1**
Safety/Security/MS	**2,768.6**	**2,836.8**	**--**	**2,836.8**
CECR	**388.9**	**419.8**	**--**	**419.8**
Inspector General	**37.4**	**38.1**	**--**	**38.1**
TOTAL	**19,285.0**	**19,025.1**	**763.0**	**18,262.1**

Source: Total (including Mandatory) and Mandatory columns are from NASA's budget documentation. Total (without Mandatory) calculated by SpacePolicyOnline.com.
Note: Text and figures *in italics* are subsets.

Table 3: House NASA Authorization Act for 2016 and 2017 (H.R. 2039)
(in $ millions)

Account	2015 Appropriated	2016 Request	House Auth 2016 (see note 2)		House Auth 2017 (see note 2)	
			Aspirational	Constrained	Aspirational	Constrained
Science	**5,244.7**	**5,288.6**	**4,951.7**	**4,678.6**	**4,935.3**	**4.678.6**
Earth Science	*1,772.5*	*1,947.3*	*1,450.0*	*1,198.5*	*1,450.0*	*1,198.5*
Planetary Science	*1,437.8*	*1,361.2*	*1,500.0*	*1,500.0*	*1,500.0*	*1,500.0*
Astrophysics	*684.8*	*709.1*	*730.7*	*709.1*	*730.7*	*709.1*
JWST	*645.4*	*620.0*	*620.0*	*620.0*	*569.4*	*620.0*
Heliophysics	*662.2*	*651.0*	*651.0*	*651.0*	*685.2*	*651.0*
Education	*42.0*	*see note 3*	*not specified*	*not specified*	*not specified*	*not specified*
Aeronautics	**651.0**	**571.4**	**571.4**	**571.4**	**580.0**	**571.4**
Space Technology	**596.0**	**724.8**	**596.0**	**500.0**	**596.0**	**500.0**
Exploration	**4,356.7**	**4,505.9**	**4,953.1**	**4,845.4**	**5,268.0**	**4,845.4**
Expl Sys Dev	*3,245.3*	*2,862.9*	*3,310.0*	*3,310.0*	*3,681.5*	*3,310.0*
(Orion)	*(1,194.0)*	*(1,096.3)*	*(1,200.0)*	*(1,200.0)*	*(1,349.6)*	*(1,200.0)*
(SLS)	*(1,700.0)*	*(1,356.5)*	*(1,700.0)*	*(1,700.0)*	*(1,899.6)*	*(1,700.0)*
(Expl Ground Sys)	*(351.3)*	*(410.1)*	*(410.0)*	*(410.0)*	*(432.3)*	*(410.0)*
Commercial Spflt	*805.0*	*1,243.8*	*1,243.8*	*1,136.1*	*1,184.8*	*1,136.1*
Expl R&D	*306.4*	*399.2*	*399.2*	*399.2*	*401.7*	*399.2*
Space Operations	**3,827.8**	**4,003.7**	**3,992.5**	**3,950.4**	**3,992.5**	**3,950.4**
ISS	*not specified*	*3,105.6*	*not specified*	*not specified*	*not specified*	*not specified*
Space & Flt Sprt	*not specified*	*898.1*	*not specified*	*not specified*	*not specified*	*not specified*
Education	**119.0**	**88.9**	**119.0**	**119.0**	**119.0**	**119.0**
Safety/Security/MS	**2,758.9**	**2,843.1**	**2,843.1**	**2,843.1**	**2,843.1**	**2,843.1**
CECR	**419.1**	**465.3**	**465.3**	**465.3**	**436.1**	**465.3**
Inspector General	**37.0**	**37.4**	**37.0**	**37.0**	**37.0**	**37.0**
TOTAL	**18,010.2**	**18,529.1**	**18,529.1**	**18,010.2**	**18,807.0**	**18,010.2**

Note 1: Columns may not add due to rounding. Numbers in *italics* are subsets. Numbers in *(italics enclosed in parentheses)* are sub-subsets.

Note 2: The bill (H.R. 2039) authorizes amounts for FY2016 and FY2017 under two scenarios. In a press release, the committee refers to them as "aspirational" and "constrained." The higher "aspirational" levels assume that the budget caps in the 2011 Budget Control Act (BCA) are removed by Congress. The lower "constrained" levels assume the BCA caps remain in place.

Note 3: In the FY2015 appropriations bills, Congress broke out funding for education within the Science Mission Directorate (SMD) as a separate line item. The FY2016 request includes $20 million in the Astrophysics line item for education and outreach for the entire directorate.

Table 4: Funding for the Asteroid Initiative, Including the Asteroid Redirect Mission (ARM) (in $ millions)

Purpose	FY2014 Enacted	FY2015 Request	FY2016 Request	FY2017 Request
"Direct" Funding (see notes)				
ARM Formulation (HEOMD)	0	0	38	67.8
Asteroid Grand Challenge and related activities (Office of Chief Technologist)	7	7	7	~1
"Leveraged" Funding (see notes)				
Asteroid Detection (SMD)	40.5	40	50	50
Solar Electric Propulsion (STMD)	39	93	69	66.7
EVA Suits, In-Space Robotic Servicing (HEOMD and STMD)	40	40	56	~32
TOTAL	126.5	180	220	217

Notes: (1) Figures in this table for FY2014- 2016 are from a chart provided to SpacePolicyOnline.com by NASA on February 2, 2015. Data for FY2017 were provided in a NASA budget media teleconference on February 9, 2016. Some of the numbers were described as approximations and are designated here as ~, but the total of $217 million was stated definitively. Congress does not specify funding for ARM is its reports on appropriations bills so appropriated levels after FY2014 are not included.
(2) In FY2016, NASA distinguished between "direct" and "leveraged" funding for ARM, where direct funding is specifically related to the Asteroid Initiative (which includes ARM) while "leveraged" funding is for NASA activities that would be undertaken even if the Asteroid Initiative did not proceed.
(3) HEOMD = Human Exploration and Operations Mission Directorate. SMD = Science Mission Directorate. STMD = Space Technology Mission Directorate

Table 5: Funding for the Space Launch System: NASA Request versus Congressional Appropriations (in $ millions)

	FY2014	FY2015		FY2016		FY2017
Account: Subaccount	**Enacted**	**Request**	**Final**	**Request**	**Final**	**Request (incl mandatory)**
Exploration: Exploration Systems Development/ SLS	1,600.0	1,380.3	1,700.0	1,356.5	2,000.0 (incl $85 M for EUS)	1,310.5
Exploration: Exploration Systems Development/ Exploration Ground Systems	318.2	351.3	351.3	410.1	410.0	429.4
CECR: Exploration Construction of Facilities	*139.3	52.3	*67.9	10.0	*10.0	8.8
TOTAL	**2,057.5**	**1,783.9**	**2,119,2**	**1,776.6**	**2,410.0**	**1,748.7**

Notes: CECR = Construction, Environmental Compliance and Restoration. EUS is the Exploration Upper Stage, which is needed for certain SLS missions. NASA did not request EUS funding in FY2016.
* The $139.3 figure for FY2014 CECR is from NASA's FY2016 budget request . CECR funding figures for FY2015, FY2016 and FY2017 are from NASA's FY2017 budget book, p. EXP-19.