



NASA'S FY2016 BUDGET REQUEST

Overview

For FY2016, President Obama is requesting \$18.529 billion for NASA, an increase of \$519 million (2.9 percent) above the FY2015 appropriated level.

This fact sheet has three tables:

- Table 1 compares what Congress appropriated for FY2015 and the FY2016 President's request. Additional data will be added as the request works its way through Congress.
- Table 2 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 3 consolidates the funding for the Space Launch System (SLS), which is spread across three subaccounts.

Key Issues for FY2016

The President's budget request is a substantial increase above the FY2015 appropriated level, but is in keeping with the increase that Congress provided for FY2015. For that year, the President requested \$17.647 billion, while Congress appropriated \$18.010 billion (see our [fact sheet on the FY2015 NASA budget](#) for details). Some see the request as a glass half full, a great improvement over what was projected for NASA at this time last year. Others see it as a glass half empty because the Obama Administration requested a 6 percent increase for research and development across the government and see NASA's 2.9 percent as too low.

Four key issues may emerge during this year's budget debate: the increase in funding for earth science; the decrease in funding for planetary science; the request for the Asteroid Redirect Mission (ARM); and funding for the Space Launch System (SLS), Orion spacecraft, and commercial crew.

Earth Science

The President is requesting a substantial increase for NASA's earth science budget: \$1.947 billion, a \$174.8 million increase over FY2015. The increase reflects two significant changes: a decision to begin funding for a "multi-decadal sustainable land imaging program" that includes

building and launching the next Landsat satellite; and an administration decision to transfer to NASA from NOAA responsibility for all non-defense satellite earth observation programs other than weather satellites.

Land Imaging. Landsat has a long and tortuous history that is too complex to explain fully in this brief report, but here is its essence. NASA launched the first Landsat satellite (then called Earth Resources Technology Satellite – ERTS) in 1972, with a total of five NASA-built satellites launched by 1984. In the late 1970s, however, the Carter Administration (and the Reagan Administration thereafter) decided the program was sufficiently mature to leave NASA, which focuses on research and development, and transferred it to NOAA (which has operational responsibilities) with the goal of privatizing it. The privatization effort resulted in the construction of Landsat 6, but it was lost in a launch failure, which also ended the privatization effort. Data from Landsat are widely used and a decision was made to continue launching these satellites and the program ultimately was returned to NASA, but with the U.S. Geological Survey (USGS) assuming operational responsibilities for the satellites once they are in orbit. USGS already had been in charge of distributing Landsat data from the Earth Resources Observation and Science Center (EROS) in South Dakota for many years

NASA built Landsat 7 as well as Landsat 8, the newest in the series, which was launched in 2013. The Obama Administration proposed transferring the entire Landsat program to USGS, including responsibility for building Landsat 9 and subsequent satellites. Congress rejected the proposal and the program remained at NASA. NASA became determined to create a long-term “sustainable” program that would provide stability instead of Landsat perennially seeming to be a waif in search of a home. The FY2016 budget request has the first funding this sustainable program, which includes money to begin building Landsat 9 for launch in 2023; a separate “free flyer” for launch in 2019 to ensure continuity of thermal infrared (IR) data; and investments in new technology and system innovation to reduce the cost of future Landsats.

NASA’s earth science program is viewed as a potential lightning rod for climate change skeptics on Capitol Hill, so a substantial increase may provoke intense debate. However, Sen. Barbara Mikulski (D-MD), the top Democrat on the Senate Appropriations Committee (and its Commerce-Justice-Science subcommittee that funds NASA) is a strong supporter of earth science at NASA. On the authorization side, Sen. John Thune (R-SD), chairs the Senate Commerce, Science and Transportation Committee that oversees NASA, and the EROS Center is in his state, so he may be more familiar than others with the utility of Landsat data. Thus, the Landsat portion of the increase may encounter smoother sailing than other earth science activities.

Responsibilities of NASA Versus NOAA. The division of responsibilities between NASA and NOAA for weather and climate satellite research and observations also has a long and complex history. NOAA has been responsible for operational civilian weather satellites for decades, but its interest in climate observations from satellites has grown. Beginning in 1994, it became one of the two major agencies (DOD being the other) that tried to merge the defense and civil weather satellite programs in the National Polar-orbiting Operational Environmental Satellite System (NPOESS), to which a number of climate sensors were added over the years.

Cost increases and schedule delays in NPOESS led to its cancellation, and cost increases in NOAA’s replacement program, the Joint Polar Satellite System (JPSS), prompted sharp rebukes

even from supporters in Congress. Congress has made clear in recent years that it wants NOAA to focus on weather, not climate, and to reduce the percentage of NOAA's budget devoted to satellites versus its other responsibilities.

Under this proposal in the FY2016 budget, NOAA will retain responsibility for weather satellites (JPSS and GOES-R), radio occultation satellites (COSMIC-2), and space weather satellites (DSCOVR is scheduled for launch in February 2015). For more information on NOAA's satellite programs, see our [fact sheet](#).

NOAA has been trying to determine how to launch three instruments that were intended to be flown on NPOESS. One of those, the Total and Spectral Solar Irradiance Sensor (TSIS), has been in limbo for several years, but in the FY2016 budget would be assigned to NASA instead of NOAA. NASA plans to place TSIS-1 on the International Space Station instead of launching it as a stand-alone satellite. NASA would also take on responsibility for any future ocean altimetry satellites in the Jason series (NOAA's Jason-3 is scheduled for launch this spring).

Past attempts to shift programs from NOAA to NASA have resulted in opposition from some NASA supporters in Congress who see it as a drain on NASA's budget. Others oppose climate science research more generally and may regard the increase in NASA's budget for earth science unjustified. [NASA told SpacePolicyOnline.com](#) via email on February 2, 2014 that approximately \$54 million of the \$174.8 million increase requested for the earth science program in FY2016 is attributable to the shift of activities from NOAA to NASA.

Planetary Science

The President is requesting \$1.361 billion for planetary science, a decrease of \$76.6 million compared to the FY2015 appropriations. Planetary science is very popular on both sides of Capitol Hill and any decrease is certain to cause complaints. The new chairman of the House Appropriations CJS subcommittee, Rep. John Culberson (R-TX), is a very strong supporter of planetary science, especially a robotic mission to Europa, a moon of Jupiter that is thought to have a liquid ocean under its icy crust. NASA did not plan to launch a mission to Europa because of budget constraints, but Culberson has been one of the leaders in Congress adding money to NASA's budget for each of the past three years to work on such a project. In FY2015, for the first time, NASA requested a small amount for Europa – \$15 million – which Congress increased to \$100 million. The FY2016 request is for \$30 million and almost certainly will be increased by Congress. The question is whether it will add money to funding for the Science Mission Directorate (SMD) or reduce other SMD accounts to compensate.

Asteroid Redirect Mission (ARM)

President Obama's proposal two years ago to send a robotic probe to a small asteroid and redirect it into a retrograde orbit around the Moon where it would be visited by astronauts to retrieve a sample and return it to Earth has been controversial since it began. This is not a line item in NASA's budget and the money for it is spread across the Science Mission Directorate (SMD), the Space Technology Mission Directorate (STMD) and the Human Exploration and Operations Mission Directorate (HEOMD). ARM is part of an "Asteroid Initiative" that includes other funding in the Office of the Chief Technologist.

It is very difficult to track the money for this program since it is located in so many places and not identified in NASA's budget documents or congressional appropriations bills. Table 2 displays the figures provided to SpacePolicyOnline.com by NASA on February 2, 2015. This year, NASA stresses that most of the money is not specifically for ARM, but is being "leveraged" from activities that NASA would engage in even if ARM did not exist. NASA counts only \$38 million in the HEOMD budget for formulation and the \$7 million in the Office of Chief Technologist for the Asteroid Grand Challenge as "direct" funding.

ARM involves locating asteroids, developing high power solar electric propulsion (SEP), and developing a robotic probe (powered by SEP) and capture system to either bag a small asteroid or pluck a boulder from a larger asteroid and nudge it into lunar orbit. NASA calls those Option A and Option B, respectively, and has not made a choice yet as to which it will pursue.

ARM is likely to remain controversial during the FY2016 budget debates, especially since NASA has missed two self-imposed deadlines for choosing between the two options. A media teleconference was scheduled on December 17, 2014 where NASA Associate Administrator Robert Lightfoot was to announce whether it would pursue Option A or B. In the six hours between when the teleconference was announced and when it was held, however, NASA changed its mind and Lightfoot said more time was needed to decide. NASA officials then repeatedly said the choice would be announced in mid-January 2015, but it was not. At a February 2, 2015 budget briefing, NASA Chief Financial Officer (CFO) David Radzanowski said he did not know when a decision would be made. It could be days, it could be when the Mission Concept Review (MCR) is held, or it could be later, he said: "I just don't have a time" when that decision will be made.

Radzanowski also revealed a delay in the MCR. It was scheduled for February 26, 2015, but he said it would be pushed back, perhaps to late March.

The NASA Advisory Council (NAC) has been intensely asking questions about the cost of the portion of the mission that involves redirecting the asteroid. It wants an independent cost estimate (ICE) for Options A and B before the choice ("downselect") is made, but NASA has declined to do so, saying it will do an ICE only afterwards in accordance with standard NASA procedures. NAC is concerned that if the cost grows beyond NASA's current \$1.25 billion estimate, it could delay achieving NASA's long term goal – sending humans to Mars. NAC does not see the relevance of moving an asteroid to that goal.

With ARM controversial even within the space community, it is not surprising that Congress remains unconvinced. NASA is proposing to spend \$220 million on the Asteroid Initiative this year, but is stressing that all but \$38 million of that total would be spent even if the ARM mission did not exist.

SLS/Orion and Commercial Crew

This year's budget request is likely to continue the long standing tension between Congress and the Obama Administration over the relative priority of building SLS and Orion versus commercial crew.

Congress directed NASA to build SLS and Orion in the 2010 NASA Authorization Act. They want the agency to focus on sending humans beyond low Earth orbit (LEO) – eventually to Mars – not only on utilization of the International Space Station, which is in LEO.

In 2010, NASA was advocating a public-private partnership to build commercial crew transportation systems to take astronauts to and from the ISS. The compromise reached in the 2010 NASA Authorization Act allowed NASA to proceed with commercial crew while at the same time it began in a new “heavy lift” launch vehicle – the Space Launch System – and crew spacecraft – Orion – to take crews beyond LEO. Members of the House and Senate have complained each year since then that the Administration favors commercial crew over SLS/Orion and routinely adds money for SLS/Orion and cuts funding for commercial crew.

This year seems no different. NASA is requesting significantly less for SLS and Orion than Congress appropriated for FY2015, and is requesting a substantial increase for commercial crew, as shown in Table 1. NASA’s Radzanowski said that if Congress does not provide the full \$1.2 billion for commercial crew, NASA will have to renegotiate its fixed price contracts with Boeing and SpaceX and would not be able to guarantee that the systems will be ready by the end of 2017 as currently planned. Until the commercial crew systems are available, NASA will continue to be dependent on Russia to ferry astronauts to and from ISS. NASA has not had an ability to launch people into space since the space shuttle was terminated in 2011.

NASA FY2016 Appropriations

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. In the House, it is chaired by Rep. John Culberson (R-TX) and Rep. Chaka Fatta (D-PA) is the ranking member. In the Senate, the CJS subcommittee is chaired by Sen. Richard Shelby (R-AL) and the ranking member is Sen. Barbara Mikulski (D-MD). Mikulski is also the ranking member of the full committee.

NASA Authorization Bill

(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 Committee and Senate Commerce, Science, and Transportation Committee. The 2010 NASA Authorization Act (P.L. 111-267) is the most recent NASA authorization law. Its funding recommendations covered only through FY2013, but the policy provisions of the law remain in effect until and unless they are repealed or replaced.

The House passed a new NASA authorization bill last year, but the Senate did not act on it. The bill died at the end of the 113th Congress, so efforts will begin anew in this Congress. Rep. Lamar Smith (R-TX), chairman of the House SS&T Committee, said on January 27, 2015 that he anticipates that his committee will act on a new NASA authorization bill during this Congress. The Senate Commerce Committee’s plans have not been announced.

Table 1: NASA's FY2016 Budget Request and Congressional Action
(in \$ millions, see notes below)

Account	2015 Appro	2016 Req	Authorization			Appropriation		
			House	Senate	Final	House	Senate	Final
Science	5,244.7	5,288.6						
<i>Earth Science</i>	<i>1,772.5</i>	<i>1,947.3</i>						
<i>Planetary Science</i>	<i>1,437.8</i>	<i>1,361.2</i>						
<i>Astrophysics</i>	<i>684.8</i>	<i>709.1</i>						
<i>JWST</i>	<i>645.4</i>	<i>620.0</i>						
<i>Heliophysics</i>	<i>662.2</i>	<i>651.0</i>						
<i>Education</i>	<i>42.0</i>	<i>see note 5</i>						
Aeronautics	651.0	571.4						
Space Technology	596.0	724.8						
Exploration	4,356.7	4,505.9						
<i>Expl Sys Dev</i>	<i>3,245.3</i>	<i>2,862.9</i>						
<i>(Orion)</i>	<i>(1,194.0)</i>	<i>(1,096.3)</i>						
<i>(SLS)</i>	<i>(1,700.0)</i>	<i>(1,356.5)</i>						
<i>(Expl Ground Sys)</i>	<i>(351.3)</i>	<i>(410.1)</i>						
<i>Commercial Spflt</i>	<i>805.0</i>	<i>1,243.8</i>						
<i>Expl R&D</i>	<i>306.4</i>	<i>399.2</i>						
Space Operations	3,827.8	4,003.7						
<i>ISS</i>	<i>not specified</i>	<i>3,105.6</i>						
<i>Space & Flt Sprt</i>	<i>not specified</i>	<i>898.1</i>						
Education	119.0	88.9						
Safety/Security/MS	2,758.9	2,843.1						
CECR	419.1	465.3						
Inspector General	37.0	37.4						
TOTAL	18,010.2	18,529.1						

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. Figures for NASA's FY2015 appropriations are from the joint explanatory statement to accompany the FY2015 Consolidated and Further Continuing Appropriations Act (the "CROmnibus). Figures for the FY2016 request are from NASA budget materials at <http://www.nasa.gov/budget>. The budget account "Safety, Security and Mission Services" previously was called Cross-Agency Support. Congress changed the name in the FY2015 appropriations bill.

(2) CECR = Construction, Environmental Compliance and Restoration. CoF = Construction of Facilities. NA = not applicable.

(3) The Asteroid Initiative is not specifically identified in NASA's budget documents. Funding is spread through the Human Exploration and Operations Mission Directorate, the Space Technology Mission Directorate, the Science Mission Directorate, and the Office of Chief Technologist. See table 2.

(4) The Space Launch System (SLS) is funded in three different accounts. For convenience, table 3 delineates that funding.

(5) In the FY2015 budget, 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 2: Funding for the Asteroid Initiative, Including the Asteroid Redirect Mission (ARM)
(in \$ millions)**

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

Notes: Figures in this table are from a chart provided to SpacePolicyOnline.com by NASA on February 2, 2015. That chart listed only the FY2015 requested figure, not the FY2015 appropriated level. The final funding for FY2015 must be approved by Congress when it sees NASA’s operating plan.

The figures in this chart differ somewhat from how NASA has described funding for ARM in the past, so is not directly comparable to the tables in earlier versions of this fact sheet.

For FY2016, NASA distinguishes 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.

HEOMD = Human Exploration and Operations Mission Directorate. SMD = Science Mission Directorate. STMD = Space Technology Mission Directorate

**Table 3: Funding for the Space Launch System
(in \$ millions)**

Account: Subaccount	FY2014 Enacted	FY2015 Request	House Appropriations (passed)	Senate Appropriations (committee)	Final FY2015	FY 2016 Request
Exploration: Exploration Systems Development/ SLS	1,600.0	1,380.3	1,600.0	1,700.0	1,700.0	1,356.5
Exploration: Exploration Systems Development/ Exploration Ground Systems	318.2	351.3	315.0	351.3	351.3	410.1
CECR: Exploration Construction of Facilities	*139.3	52.3	52.3	**52.3	*not specified	10.0
TOTAL	2,057.5	1,783.9	1,967.3	2,103.6		

Notes: CECR = Construction, Environmental Compliance and Restoration.

* The \$139.3 figure for FY2014 CECR is from NASA's FY2016 budget request and is slightly less than the \$142 million figure included in the explanatory statement accompanying the FY2014 Consolidated Appropriations Act or the explanatory statement. The total for FY2014 enacted is adjusted accordingly. The FY2016 budget request does not show how much was appropriated for FY2015 in the CECR account. It will be added if and when it becomes publicly available.
 ** The Senate committee report for the FY2015 appropriations bill, S. Rept, 113-181, does not break down the spending in the CECR account, but says that it is the same as the request, so this table shows the requested amount.