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NOAA'S FY2018 BUDGET REQUEST FOR SATELLITES

President Trump released his complete FY2018 budget request on May 23, 2017. He proposed a significant decrease in NOAA's satellite acquisition budget, but some of that is a planned reduction due to JPSS and GOES-R ramping down. **The request** for satellite systems in NOAA's Procurement, Acquisition and Construction (PAC) account **was $1,579.5 million** compared to $1,978.8 million appropriated for FY2017, a reduction of $399.3 million.

Congress appropriated **1,857.2 million** instead. That is $277.7 million more than requested and $121.5 million less than FY2017. Most of the increase above the request is for the Polar Follow On program to build the next two polar-orbiting weather satellites. The final amount for FY2018 is higher than either the recommendations of the House Appropriations Committee ($1,467.1 million) or Senate Appropriations Committee ($1,826.5 million).

NOAA was funded in Division B (Commerce-Justice-Science) of the 2018 Consolidated Appropriations Act that was signed into law on March 23, 2018 (H.R. 1625 as amended). For the first six months of FY2018, NOAA and other government agencies were funded by a series of five Continuing Resolutions.

Introduction

The National Oceanic and Atmospheric Administration (NOAA) manages the nation's civilian weather satellite and other operational environmental satellite programs. NOAA is part of the Department of Commerce and has a broad set of missions that include marine fisheries management, ocean and atmospheric research, and operation of the National Weather Service as well as its satellite programs.

NOAA's satellite programs are part of NOAA's National Environmental Satellite, Data and Information Service (NESDIS). The NESDIS budget is separated into two accounts: Operations, Research and Facilities (ORF) and Procurement, Acquisition and Construction (PAC). The PAC account contains funding for acquisition of new satellite systems *and is the only portion of the NESDIS budget tracked in this fact sheet*. NOAA's FY2018 budget request is available in its "Blue Book," posted on the NOAA website.

The House Appropriations Committee approved its version of the FY2018 Commerce-Justice-Science appropriations bill (H.R. 3267), which includes NOAA, on July 13, 2017. The House

bundled it with seven other appropriations bills into H.R. 3354, the Make America Secure and Prosperous Appropriations Act, which passed the House on September 14, 2017. It made a much deeper cut than proposed by the Trump Administration to the PFO program.

The Senate Appropriations Committee strongly supported PFO in its report on its version of the bill (S. 1662, S. Rept. 115-139, July 27, 2017). The Senate never voted on that bill.

As noted, final action was taken in the 2018 Consolidated Appropriations Act, which passed after Congress raised the budget caps imposed by the 2011 Budget Control Act, making more money available for discretionary spending across the government.

NOAA's Satellite Programs

Responsibilities for government weather, land imaging, and earth science satellites are split among several agencies. NOAA manages the nation's civilian weather satellites and, historically, other operational environmental satellite programs. NASA builds and launches earth science satellites for research and technology development purposes. The U.S. Geological Survey operates the government's Landsat land remote sensing satellites. The Department of Defense (DOD) has its own weather satellite program as well as classified satellites for intelligence gathering. This fact sheet covers only NOAA's satellite programs and only procurement, acquisition and construction, not operations (which are in the ORF account).

Weather Satellites

NOAA operates two complementary weather satellite systems, one in polar orbit and one in geostationary orbit.

Polar Orbit

Satellites in polar orbit circle Earth's poles, allowing them to view the entire planet. NOAA's polar orbit satellites have been referred to as POES – Polar Orbiting Environmental Satellites – for decades. Once a POES satellite is in orbit, it is given a designation of "NOAA" followed by a number.

The United States began launching polar orbiting weather satellites in 1960 under NASA's aegis. As the program matured from research and development (R&D) to operations, it was transferred to the Environmental Satellite Services Administration (ESSA), which later became NOAA. The first satellite to be designated NOAA was launched in 1983. The last in that POES series, NOAA-19, was launched in 2009.

In 1994, the Clinton-Gore Administration directed NOAA and DOD to merge their separate civil and military polar orbiting weather satellites programs. That became the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. NASA was part of NPOESS in a technology development role. In 2010, after 16 years of cost overruns and schedule delays, NPOESS was terminated and NOAA and DOD were directed to return to separate systems.

Meanwhile, in 2011 NASA launched the technology demonstration satellite it had been building for NPOESS, which is now designated Suomi-NPP.

Following the termination of NPOESS, NOAA initiated the Joint Polar Satellite System (JPSS) program. When JPSS began, NOAA was criticized for its high cost -- $12.9 billion for four satellites (a total that included about $4 billion in sunk costs in NPOESS). NOAA reduced the cost from $12.9 billion to $11.3 billion simply by narrowing the definition of what is included in that estimate. Now the "JPSS program" covers the costs of building and operating only JPSS-1 and JPSS-2 plus the money NOAA spent on NPOESS.

The next two satellites, JPSS-3 and JPSS-4, are in a separate budget line item, Polar Follow On (PFO), which is described below.

JPSS-1 was launched on November 18, 2017. Now that it is in orbit, it has been redesignated NOAA-20.

NOAA also is part of an international/interagency team building a constellation of small satellites, COSMIC-2, to enhance the accuracy of forecasts using data from the polar orbiting satellites, as discussed below.

Because of the many years that would elapse between the launch of NOAA-19 and JPSS-1, NOAA began using NASA's Suomi-NPP (S-NPP) as an operational weather satellite even though it is a technology demonstrator with a design life of only three years. NOAA officials and other policy makers repeatedly expressed concern over the years that NOAA-19 and S-NPP might cease functioning before JPSS-1 was launched and a "gap" in weather satellite coverage might occur. However, that did not occur. NOAA-19, S-NPP and JPSS-1 (NOAA 20) are all currently operational.

- ***JPSS Program.*** The Trump FY2018 budget request for the JPSS program was $775.8 million, a small planned reduction from its FY2017 appropriated level of $787.2 million as funding requirements for development ramp down.

  One programmatic change that was in NASA's budget, rather than NOAA's, was the Trump Administration's proposal to terminate the Radiation Budget Instrument (RBI) that was planned to be flown on JPSS-2. The Administration said RBI was being terminated because of cost growth and technical challenges. RBI would continue measurements of Earth's reflected sunlight and emitted radiation that are made by CERES (Clouds and Earth's Radiant Energy Systems) instruments on several existing satellites. A CERES instrument is on JPSS-1. The RBI issue is tracked in SpacePolicyOnline.com's fact sheet on NASA's FY2018 budget request.

  The House, and the Senate Appropriations Committee, approved the requested amount for JPSS and it is included in the final appropriations bill.

- ***Polar Follow On (PFO)[1].*** JPSS-3 and JPSS-4 are being procured under the PFO program. As of 2016, JPSS-3 was expected to be ready for launch in FY2026 and JPSS-4 in FY2031. See prior year versions of our NOAA budget fact sheets for a discussion of the controversy over the PFO program in FY2016 and FY2017.

  PFO is the NOAA satellite program that would have been most affected by the Trump budget. Congress appropriated $328.9 million for FY2017 and NOAA's FY2017 budget documentation shows that the agency planned to request $586 million in FY2018. Instead, the Trump Administration's budget request was $180 million for FY2018 and future years were listed as "TBD."

  NOAA stated in its FY2018 budget book that it would "initiate a re-plan" for the PFO program and "work to improve its constellation strategy considering all the polar satellite assets to ensure polar weather satellite continuity while seeking cost efficiencies, managing and balancing system technical risks and leveraging partnerships."

  The House Appropriations Committee approved a much deeper cut to PFO than the Trump request. Complaining that NOAA provided insufficient information about the re-plan, the committee provided only $50 million, while adding that it would reconsider if NOAA provided "a new program plan and schedule, to include constellation availability assessments, gap analysis and updated annual and lifecycle cost estimates." The House approved the committee's recommendation.

  The Senate Appropriations Committee took the opposite approach. Calling the proposed cut "perplexing" considering the importance of weather satellites, the committee "strongly" rejected it on the basis that such a reduction would create a "risk this Committee is unwilling to accept." It approved $419 million to keep the program on track.

  The final appropriations bill adopted the Senate position, providing $419 million.

- ***COSMIC-2 GPS Radio Occultation***. The Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC)-2 program is a constellation of 12 very small ("micro") satellites built by NOAA in cooperation with Taiwan and the U.S. Air Force. It is a follow on to COSMIC (also known as Formosat-3), a set of six microsatellites launched in 2006.

[1] In prior years, NOAA included a request of $10 million for an Earth Observing Nanosatellite-Microwave (**EON-MW**) as part of the PFO budget. The EON-MW concept was to build and launch a very small ("nano") satellite carrying a single microwave instrument that could provide vital measurements in case something went awry with JPSS-1. Congress was lukewarm about the idea. In FY2016 it denied the request. In FY2017 it said EON-MW could proceed as long as it did not interfere with PFO and would have to be paid for within available funds. No mention is made of EON-MW in the FY2018 budget request.

The satellites use signals from the Global Positioning Satellite (GPS) system for radio occultation (dubbed GPS-RO or GNSS-RO[2]) to make measurements of temperature and water vapor throughout the lower parts of the atmosphere. When combined with measurements from polar-orbiting weather satellites, better weather forecasts are enabled.

NOAA's goal is to have at least two sets of six microsatellites in low Earth orbit: one in equatorial orbit and the other in polar orbit. NOAA also funds the ground system for reception and processing of the COSMIC data.

NOAA originally planned to fund the construction of the satellites, but private sector companies have emerged that want to provide RO data on a commercial basis using their own satellites. See prior year versions of this fact sheet information on the request and appropriations for COSMIC-2 and the debate over obtaining such data from commercial sources instead. NOAA has stated that as many as 50,000-100,000 RO measurements per day would be useful and COSMIC provides only 2,000-3,000, so there is ample opportunity for other providers of such data.

The Trump FY2018 budget request also supported acquisition of RO data from commercial sources. It requested $6.1 million for COSMIC ground systems, but none for satellites.

The House, and the Senate Appropriations Committee, approved the request and it was included in the final appropriations bill.

Geostationary Orbit

NOAA's other weather satellite system is in geostationary orbit 35,800 kilometers above the equator where satellites maintain a fixed position relative to a point on Earth. Such weather satellites are especially useful for monitoring tropical regions where hurricanes form.

NOAA keeps one Geostationary Operational Environmental Satellite (GOES) over the eastern region of the United States and adjacent waters and another over the western region. Whatever satellites are in those positions are designated "GOES-East" and "GOES-West." NOAA typically also keeps a spare satellite in between those two positions that can be moved quickly to replace a malfunctioning satellite if necessary (as happened in 2012 and 2013).

NOAA is procuring[3] four new significantly enhanced GOES satellites – a block buy called the GOES-R series. Initially given letter designations (GOES-R, -S, -T and –U), they will change to numbers once they are in orbit.

[2] GPS is the U.S. satellite system for positioning, navigation and timing (PNT) data. Russia, China and Europe have their own systems (GLONASS, Beidou and Galileo). Collectively they are referred to as Global Navigation Satellite Systems (GNSS). The COSMIC-2 satellites can use any of the signals.

[3] NASA serves as the procurement agent for NOAA's satellites. NOAA specifies the requirements and provides the funding while NASA contracts for construction and launch of the satellites.

The GOES-R satellite itself was successfully launched in November 2016 and is now GOES-16. NOAA has placed GOES-16 into the GOES-East position, replacing GOES-13, which has been decommissioned. GOES-15 is GOES-West, with GOES-14 as the spare.

The series is still colloquially referred to as "GOES-R." The next one, GOES-S, was launched on March 1, 2018 and is now GOES-17. It will be positioned in the GOES-West location once it is fully operational.

The FY2018 budget request for the GOES-R series was $519 million, a steep drop from the $753 million appropriated for FY2017, but that is a planned reduction as development ramps down.

The House, and the Senate Appropriations Committee, approved the request and it was included in the final appropriations bill.

Other Operational Environmental Satellites

NOAA also is responsible for other satellite projects in partnership with NASA, the Air Force or other countries to obtain data to forecast "space weather" (DSCOVR), obtain ocean altimetry data (Jason-3), provide search and rescue capabilities via satellite (SARSAT), and collect data from ocean buoys around the globe (A-DCS).

Space Weather

Space weather refers to ejections from the Sun — Coronal Mass Ejections (CMEs) and solar wind — that can overload systems on Earth and in orbit that are critical to daily life, such as the electric grid or communications and navigation satellites. NOAA operates a Space Weather Prediction Center (SWPC) in Boulder, Colorado that alerts the aviation, radio communications, electric power, satellite, and emergency management communities when a severe space weather event is about to occur so officials can take precautions.

Detecting CMEs requires an instrument called a coronagraph that blocks out the light from the Sun so it can see the Sun's corona where the CMEs originate. NOAA currently obtains that data from an aging European spacecraft positioned at the Sun-Earth L1 Lagrange point: the Solar Heliospheric Observatory (SOHO), launched in 1995.

Solar wind is detected by NASA's Advanced Composition Explorer (ACE), launched in 1997, and the NOAA/NASA/Air Force Deep Space Climate Observatory (DSCOVR), launched in 2015. They also are positioned at Sun-Earth L1, which is 1.5 million kilometers (1 million miles) from Earth.

- **Deep Space Climate Observatory (DSCOVR)**. DSCOVR was successfully launched on February 11, 2015 and is now operational. Therefore NOAA's FY2018 budget request moves **DSCOVR into the Operations, Research and Facilities (ORF) account. This fact sheet does not cover NOAA's ORF account**, in part because funding figures are not broken out sufficiently in ORF to identify funding for specific programs like this**.**

For completeness, however, a description of DSCOVR remains part of this fact sheet this year.

DSCOVR has four instruments. Two face towards the Sun and monitor the solar wind -- particles ejected by the Sun that impact Earth's atmosphere and can result in satellite failures or power outages on Earth. The other two were provided by NASA and face towards Earth: the Earth Poly-Chromatic Imaging Camera (EPIC) that provides a constant daylight view of Earth that anyone can view in real time; and the National Institute of Standards and Technology Advanced Radiometer (NISTAR) that measures radiation emitted by Earth.

DSCOVR originated in the Clinton Administration where it was championed by Vice President Al Gore. His goal was to have a satellite that provided a constant view of Earth to help remind everyone of the fragility of the planet and its climate. He named the spacecraft Triana, but it was harshly criticized by Republicans in Congress and dubbed "Goresat." After a review by the National Academy of Sciences, science instruments were added to make it more scientifically valuable, but President George W. Bush suspended the program when he took office. The satellite remained in storage throughout most of the Bush term, but was resurrected, renamed, and launched during the Obama Administration.

The text of NOAA's FY2018 ORF budget documentation stated that NOAA is requesting an increase of $2.4 million for DSCOVR, but it is not clear if that is above the FY2017 appropriated level ($3.745 million) or the amount NOAA projected last year that would be needed for FY2018 ($3.86 million). Neither NOAA's budget Blue Book nor the House and Senate Appropriations Committees' reports on the CJS bill provide the level of detail that specifies funding for DSCOVR.

The Trump Administration supports NOAA's Sun-facing instruments on DSCOVR, but wants to terminate NASA's earth-facing instruments. That issue is discussed in SpacePolicyOnline.com's fact sheet on NASA's budget request.

- **Space Weather Follow-On**. NOAA requested small amounts of money in FY2016 and FY2017 (see prior year versions of this fact sheet) to begin analyzing alternatives for the next space weather satellite to replace DSCOVR.

  In its FY2017 request, NOAA outlined a plan to acquire two new satellites, two sets of sensors, and two launches, with the goal of launching the first of the two in FY2022 before the end of DSCOVR's design lifetime.

  NOAA requested $2.5 million for FY2017 and Congress doubled it to $5 million. The projected request for FY2018 was $53.7 million, ramping up to $186.1 million in FY2019, $154.5 million in FY2020, and then down to $81.5 million in FY2021.

  The Trump FY2018 budget request did not support that plan, however. The request for Space Weather Follow-on was only $500,000.

The FY2018 request included $4.9 million for System Architecture and Advanced Planning (SAAP) to complete the NOAA Satellite Observing System Acquisition (NSOSA) study and associated grant work. NSOSA began in FY2016 to allow NOAA to develop a future satellite architecture for weather, space weather and environmental remote sensing requirements beyond 2028. NOAA proposed a new plan in 2018, which is discussed in SpacePolicyOnline.com's fact sheet on NOAA's FY2019 budget request and in this article.

Congressional interest in space weather is growing. On May 2, 2017, the Senate passed the Space Weather Research and Forecasting Act (S. 141) to focus attention on the issue, although it focuses on agency roles and responsibilities, not funding.

The House Appropriations Committee significantly increased funding for the space weather follow on compared to the request, approving $8.545 million instead of the $500,000 requested. The House approved the committee's recommendation.

The Senate Appropriations Committee approved $5 million, noting that space weather monitoring is very important, but urging NOAA to consider using lower cost satellites similar to NASA's Explorer program.

The final appropriations bill adopted the House position, providing $8.545 million.

Other Programs

- **Jason-3**. Jason-3 was successfully launched in January 2016. Like DSCOVR, it is now operational and therefore NOAA's FY2018 budget request transfers it **to the Operations, Research and Facilities (ORF) account. This fact sheet does not cover programs funded in the ORF account**, in part because the budget is not broken out in sufficient detail to track specific programs like this. For completeness, however, a description of Jason-3 will continue to be part of this fact sheet this year.

  This is the third in a series of Jason satellites that provide ocean altimetry data following on the success of the Topex/Poseidon satellite. That satellite and the first two Jasons were experimental and funded by NASA and its French counterpart, CNES. Data collection transitioned into an operational mode and since NOAA historically was responsible for operational environmental satellites, Jason-3 was funded by NOAA and its European counterpart the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). NASA and CNES remained involved as partners.

  In the FY2016 budget request, however, the Obama Administration proposed that NASA assume responsibility for all non-military environmental satellites other than weather and space weather. Therefore, future ocean altimetry satellites are to be funded by NASA; the expectation is that they will continue to be international.

NOAA will still fund Jason-3 operations, however. As noted, this is now funded in NOAA's ORF account, which states that an increase of $3.138 million is requested, but it is not clear if that is above the $4.357 million appropriated in FY2017 or the $7.651 million projected to be needed for FY2018 in last year's request. Neither NOAA's budget Blue Book nor the House or Senate Appropriations Committees' reports on the CJS bill provide the level of detail that specifies funding for Jason-3.

- **Cooperative Data and Rescue Services (CDARS, formerly SIDAR)**. In FY2015 and FY2016, NOAA requested funds for a Solar Irradiance, Data and Rescue (SIDAR) program to replace the Polar Free Flyer (PFF) in NOAA's FY2014 budget request, which was zeroed by Congress. The goal was to find a way to launch three instruments – Total and Spectral Solar Irradiance Sensor (TSIS), Advanced Data Collection System (A-DCS), and Search and Rescue Satellite-Aided Tracking (SARSAT) – that were intended to be launched on the cancelled NPOESS satellites (explained earlier). The JPSS spacecraft that replaced NPOESS are too small to accommodate these three instruments and NOAA has been trying to find an alternative way to get them into orbit.

  SIDAR was not popular in Congress and the TSIS sensor ultimately was transferred to NASA, which decided to attach it to the International Space Station instead of building a dedicated spacecraft (it was launched in December 2017).

  By FY2016, what remained in this line item was funding for A-DCS and SARSAT. The SARSAT system relays emergency locator signals from people, aircraft, and marine vessels in distress to a mission control center that notifies appropriate authorities and provides their exact location. NOAA used to put the devices on its polar-orbiting weather satellites, but is migrating them to GOES and to DOD's Global Positioning Satellite (GPS) system. A-DCS collects data from buoys in the ocean. Both are international programs.

  For FY2017, the account's name was changed to CDARS (the NOAA budget book does not describe this request in the text, but it is listed in the tables), although the House Appropriations Committee still referred to it as SIDAR. The FY2017 request was $500,000 and Congress appropriated that amount.

  The Trump FY2018 budget request also was $500,000. The House Appropriations Committee recommended the requested amount and the House approved it.

  The Senate committee provided 10 times that amount, $5 million, without explanation.

  In the final appropriations bill, $21.65 million is provided, also without explanation.

Commercial Weather Data Pilot

Congress directed NOAA to initiate a commercial weather data pilot program in the FY2016 appropriations act to determine if weather data from commercial companies can be utilized in

NOAA's weather models. Language in the accompanying explanatory report directed NOAA to seek to enter into at least one pilot contract, through a competitive process, to assess the potential viability of commercial weather data in its weather modeling and forecasting. NOAA officials expressed concern about whether commercial data will be accurate, reliable, timely, and can be validated. The pilot program is intended to answer those questions.

NOAA was required to submit an implementation plan for the pilot program. It provided the report to Congress in March 2016 and made it public in April. The pilot program will focus on radio occultation (RO) data, discussed earlier. See prior year versions of this fact sheet for funding in FY2016 and FY2017.

As noted earlier, the FY2018 Trump budget supports acquisition of data from commercial sources although it requests only $3 million, a reduction from the $5 million appropriated for FY2017.

The House Appropriations Committee doubled the request, approving $6 million. The committee said the increase was to ensure that NOAA has the needed resources "to thoroughly assess commercial data opportunities." It also directed NOAA to "publish acceptance standards and verification procedures for commercial data as soon as practicable in each procurement process." The House approved the committee's recommendation.

The Senate committee reduced the requested amount by $1 million, providing $2 million, with no explanation for the cut.

The House position was adopted in the final appropriations bill, providing $6 million.

Other NESDIS Satellite-Related Activities

The PAC account in NESDIS also funds satellite ground services; systems architecture and advanced planning; and projects, planning and analysis.

"Satellite CDA" is sometimes listed as part of the NESDIC PAC account. It is a construction project and therefore not tracked in this fact sheet or included in the following table since neither NOAA nor the House Appropriations Committee include in theirs. Only the Senate Appropriations Committee includes it.

NOAA's FY2018 Budget Request for Satellite System Acquisition (in $ thousands)

Program	FY2015 enacted	FY2016 enacted	FY2017 enacted[4]	FY2018			
				Request	House passed	Senate Cmte (note 2)	Final
GOES-R	980,838	871,791	752,784	518,532	518,532	518,532	518,532
Jason-3	23,175	7,458	4,357	note5	note 5	note 5	note 5
JPSS	916,267	808,966	787,246	775,777	775,777	775,777	775,777
Polar Follow On (PFO) (EON-MW Note 3)	N/A	380,000 (370,000) (0)	328,900	179,956	50,000	419,000	419,000
Coop Data/Rescue Services (CDARS)	7,300	500	500	500	500	5,000	21,650
DSCOVR	21,100	3,200	3,745	note 5	note 5	note 5	note 5
Space Wx FO	N/A	1,200	5,000	500	8,545	5,000	8,545
COSMIC-2 (ground system) (new sats/data)	6,800	10,100 (10,100) (0)	8,100 (8,100) (0)	6,100	6,100	6,100	6,100
Satellite Grnd Services	50,000	54,000	54,000	53,000	57,325	53,000	57,325
Sys Architecture & Adv Planning	3,000	3,929	3,929	4,929	4,929	4,929	4,929
Projects, Planning & Analysis	25,200	25,200	25,200	37,185	39,391	37,185	39,391
Commercial Weather Data Pilot	--	3,000	5,000	3,000	6,000	2,000	6,000
TOTAL	2,033,680	2,159,344	1,978,761	1,579,479	1,467,099	note 2 1,826,523	1,857,249

Source: FY2015 and FY2016 enacted and FY2017 request data from Department of Commerce budget documents. FY2018 House and Senate committee numbers are from the committees' reports. The House CJS bill was originally H.R. 3267, H. Rept. 115-231. It was later incorporated into H.R. 3354, a bundle of eight FY2018 appropriations bills that passed the House on September 14, 2017. The Senate bill is S. 1662, S. Rept. 115-139.
Note 1: Text and numbers in parentheses are subsets. NA = not applicable.

Note 2: This fact sheet does not track spending for the other NESDIS budget account, Operations, Research and Facilities (ORF), so the totals shown here may not conform to other sources. The ORF budget funds satellite OPERATIONS rather than acquisition and is not tracked in this fact sheet. The Senate Appropriations Committee report usually includes another line – "satellite CDA facility" – that is not tracked in this fact sheet because it is a construction project, not a satellite system. The House Appropriations Committee report separates the satellite CDA facility from the other spending. For FY2018, the Senate approved $2.45 million for the Satellite CDA facility so the total that shows in its table ($1,828.972 million) is higher than what is shown here.
Note 3: The Earth Observing Nanosatellite-Microwave (EON-MW) project was variously listed in NOAA budget documents as part of PFO or separately.
Note 4: For action on the FY2017 request, see the FY2017 version of this fact sheet.
Note 5: In the FY2018 budget request, Jason-3 and DSCOVR are funded in the Operations, Research and Facilities (ORF) account instead of PAC. This fact sheet covers only satellite programs in the PAC account, so they are no longer included in this table, though they are discussed in the text for completeness.