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NOAA'S FY2017 BUDGET REQUEST FOR SATELLITES

Congressional leaders reached agreement on a final FY2017 Consolidated Appropriations Act (colloquially referred to as “the omnibus”) that includes funding for NOAA on April 30, 2017. The agreement was codified in H.R. 244, which passed the House on May 3 and the Senate on May 4. President Trump signed the bill into law on May 5, 2017 (P.L. 115-31).

Congress approved \$1,978,761 for NOAA's satellite programs, a small decrease from the request of \$2,062,774.

NOAA and most of the rest of the government were funded by a series of Continuing Resolutions (CRs) for the first 7 months of FY2017 (October 1, 2016-May 5, 2017). The CRs funded NOAA at its FY2016 level, but also permitted the agency to spend money on the Joint Polar Satellite System (JPSS) in a manner so as not to cause a delay in the launch of JPSS satellites.

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 FY2017 budget request is available in NOAA's FY2017 budget “[blue book](#).” The portion of the NOAA/NESDIS budget request covered in this fact sheet is referred to in the blue book as NESDIS Systems Acquisition. The FY2017 request was \$2.063 million.

Congress appropriates funding to NOAA as part of the Commerce-Justice-Science (CJS) appropriations bill. The Senate Appropriations Committee approved its FY2017 CJS bill on April 21, 2016 (S. 2837, S. Rept. 114-239). It approved \$2.029 billion, \$34 million less than the request. The Senate took up the CJS bill in June, but debate was derailed over gun control (the bill also funds the Department of Justice). The House Appropriations Committee marked up its version of the bill on May 24, approving \$2.035 billion. Congress completed action on the FY2017 CJS budget as part of the Consolidated Appropriations Act, as noted above.

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 programs as well as classified satellites for intelligence gathering. This fact sheet covers only NOAA's satellite programs.

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 current polar orbit satellites are called POES – Polar Orbiting Environmental Satellites. Once in orbit, they are given a designation of "NOAA" followed by a number. NOAA-19, the last of the series, was launched in 2009.

NOAA is now developing a new system called Joint Polar Satellite System (JPSS). JPSS is NOAA's replacement for its portion of the NOAA-DOD-NASA National Polar-orbiting Operational Environmental Satellite System (NPOESS) program that was cancelled in 2010 after years of schedule delays and cost overruns. 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 by narrowing the definition of what is included in that estimate. As currently formulated, the JPSS program covers the costs of building and operating only the first two JPSS satellites, JPSS-1 and JPSS-2, plus the money NOAA spent on NPOESS. The next two satellites are in a separate budget line item, Polar Follow On, which is described below.

The first two satellites, JPSS-1 and JPSS-2, are currently expected to be launched in September 2017 and in 2022, respectively. They will be given numbers once they are in orbit. JPSS-1 will become NOAA-20.

NOAA also is part of an international/interagency team trying to build a new constellation of small satellites, COSMIC-2, to enhance the accuracy of forecasts using data from the polar orbiting satellites. Congress, however, wants NOAA to buy the data from commercial sources instead, as discussed below.

Because of the many years between the launch of NOAA-19 and planned launch of JPSS-1, NOAA is using a satellite developed by NASA, Suomi-NPP (S-NPP), as an operational weather satellite even though it was not designed for operational use. S-NPP was launched in 2011. NOAA officials and other policy makers have expressed concern in the past that NOAA-19 and S-NPP might cease functioning before JPSS-1 is launched and a “gap” in weather satellite coverage might occur.

The head of NESDIS, Steve Volz, downplayed the chances of a gap at a [February 12, 2015 congressional hearing](#), but a Government Accountability Office (GAO) witness at the hearing was skeptical of those claims. One of GAO’s concerns is that the JPSS-1 launch date may slip because of late delivery of instruments, especially the Advanced Technology Microwave Sounder (ATMS). The launch date did slip somewhat after that hearing and is now scheduled for late September 2017 (instead of March 2017).

- **JPSS.** For FY2017, NOAA requested \$787.246 million for JPSS, a reduction from the \$808.966 million appropriated in FY2016 because the program passed its peak funding level. The Senate Appropriations Committee approved the requested funding level, as did the House Appropriations Committee. The House committee expressed concern about a possible data gap and requested a briefing by the National Weather Service on associated contingency plans. The final consolidated appropriations bill fully funded the request.
- **Polar Follow On (PFO) and EON-MW.** The next two JPSS satellites are being procured under the PFO program. JPSS-3 is expected to be launched in FY2026 and JPSS-4 in FY2031.

The first PFO request was in FY2016 and was quite controversial (see our [FY2016 NOAA fact sheet](#)), but Congress ultimately approved the full \$370 million request.

The FY2016 request included \$10 million for an Earth Observing Nanosatellite-Microwave (EON-MW) that was variously listed as part of the PFO request or as a separate request, so in some cases the PFO request was listed as \$380 million. Congress denied the \$10 million for EON-MW.

For FY2017, NOAA requested \$393 million for PFO. Like last year, that includes \$10 million for EON-MW, so the PFO request alone was \$383 million as shown on page 35 of NOAA’s budget blue book. That document describes EON-MW as “a risk reduction mission aimed at mitigating the impact of a potential loss of the most critical microwave sounding observations in the event of a launch or instrument failure on JPSS-1.”

Also like last year, the Senate Appropriations Committee approved the full request of \$383 million for PFO, but none for EON-MW. No explanation was provided for denying the \$10 million. The committee also noted that it was still waiting for the Independent Cost Estimate (ICE) of PFO that it directed NOAA to provide in the FY2016 appropriations act. The committee's report on the FY2017 request directed NOAA to provide it no later than 45 days after this appropriations act becomes law (which has not happened yet).

The House Appropriations Committee kept the PFO funding level at last year's \$370 million level pending delivery of the ICE and a life cycle cost for the program. It stated that the \$370 million includes funding for EON-MW, but did not specify how much.

The final consolidated appropriations bill cut \$64 million from PFO, without explanation, providing \$328.9 million. It states that NOAA may proceed with EON-MW within available funds as long as it does not negatively impact PFO.

- ***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 microsattellites launched in 2006.

The satellites use signals from the Global Positioning Satellite (GPS) system for radio occultation (dubbed GPS-RO or GNSS-RO¹) 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 microsattellites 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 and launch of the satellites, but private sector companies have emerged that want to provide RO data on a commercial basis. For FY2016, NOAA requested \$20.1 million – \$10.1 million for the ground system and \$10 million for new satellites – but Congress approved only the ground system because of its interest in the possibility of acquiring future data commercially. 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.

For FY2017, NOAA requested \$16.2 million for COSMIC 2/GNSS RO: \$8.1 million for the ground system and \$8.1 million for RO data from polar orbiting satellites. It said it

¹ GPS is the U.S. satellite system for positioning, navigation and timing (PNT) data. Russia and China have their own systems (GLONASS and Beidou) and Europe is building one (Galileo). Collectively they are referred to as Global Navigation Satellite Systems (GNSS). The COSMIC-2 satellites can use any of the signals.

would pursue the acquisition of the data “either through purchase and integration of commercial data or development of a second set of COSMIC-2 sensors.”

The Senate Appropriations Committee approved only the \$8.1 million for the ground system. Regarding the space-based segment, the committee noted that the Air Force has not committed to providing launch services and no other launch provider has been identified. It encouraged NOAA to use funding from the commercial weather data pilot (discussed below) to obtain the necessary data.

The House Appropriations Committee approved the entire \$16.2 million, but stipulated that none of the money may be obligated until NOAA submits a plan assuring that it has thoroughly reviewed potential commercial sources of the data.

The final consolidated appropriations bill adopted the Senate position: \$8.1 million for the ground system only.

Geostationary Orbit

The 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](#)). The GOES-13 satellite is now GOES-East and GOES-15 is GOES-West, with GOES-14 as the spare.

NOAA is procuring four new 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. GOES-R was successfully launched in November 2016 and is now GOES-16. However, the series is still colloquially referred to as “GOES-R.”

The FY2017 request for GOES-R was \$752.784 million, a reduction from the \$872 million in FY2016 as the program passed its peak funding level. The Senate Appropriations Committee approved the requested funding level, as did the House Appropriations Committee. The final consolidated appropriations bill also provided the requested funding level.

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

- **DSCOVR.** The Deep Space Climate Observatory (DSCOVR) monitors “space weather” caused by particles ejected by the Sun that impact Earth’s atmosphere and can result in satellite failures or power outages on Earth, for example. It was successfully [launched](#) on February 11, 2015 to the Sun-Earth L1 Lagrange point 1.5 million kilometers (about 1 million miles) from Earth.

NOAA requested \$3.745 million for DSCOVR in FY2017, slightly more than the \$3.2 million appropriated for FY2016. NOAA explained that the additional funding was to continue funding for a “tech refresh” of the ground system, anomaly support and IT security upgrades. NOAA said the satellite has experienced more anomalies than anticipated since its launch. The Senate Appropriations Committee, the House Appropriations Committee. The final consolidated appropriations bill all approved that amount.

- **Space Weather Follow-On.** NOAA requested \$2.5 million in FY2016 to begin analyzing alternatives for the next space weather satellite, but Congress appropriated about half that (\$1.2 million).

For FY2017, NOAA again requested \$2.5 million, but it is just the beginning of a program that would see funding increase sharply in the coming years: FY2018, \$53.7 million; FY2019, \$186.1 million; FY2020, \$154.5 million; and FY2021, \$81.5 million. It would pay for two space weather satellites, two launch vehicles, and two sets of sensors (solar wind instruments and compact coronagraphs), with a goal to have one satellite ready to replace DSCOVR at the end of its projected mission life in FY2022.

The Senate Appropriations Committee agreed with the need for a space weather follow on. It approved an increase in FY2017 funding to \$7.5 million and directed NOAA to “accelerate the development of technologies and an architecture study for a series of space weather follow-on flight missions” to implement the White House Office of Science and Technology Policy’s National Space Weather Strategy and Space Weather Action Plan that were released in October 2015. Furthermore, the committee directed NOAA to maintain the multi-year funding profile and schedule outlined above.

The House Appropriations Committee approved the requested funding level. The final consolidated appropriations bill split the difference and provided \$5 million, doubling the requested amount.

Other Programs

- **Jason-3.** 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. Jason-3 was successfully [launched](#) in January 2016.

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, and for FY2017, requested \$4.357 million. The Senate Appropriations Committee did not provide any funding for Jason-3 in the PAC account, however. While expressing its support for the program, the committee stated that now that the satellite is in orbit, it expects NOAA to request funding for data analysis and processing in the Operations, Research and Facilities (ORF) account, not PAC. It does not appear that the committee added any money to the NESDIS ORF account for this purpose, however.

The House Appropriations Committee approved the requested amount. The final consolidated appropriations bill also approved the request.

- **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 is to find a way to launch three instruments – Total 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 was transferred to NASA. By FY2016, what remained in this line item was funding for A-DCS and SARSAT. Congress approved the \$500,000 request.

For FY2017, the account's name was changed to CDARS and \$500,000 was again requested. (The NOAA budget book does not describe this request in the text, but it is listed in the tables.) The Senate Appropriations Committee approved the \$500,000. The House Appropriations Committee also approved the requested amount although it refers to it with last year's title -- "Solar Irradiance, Data and Rescue." The final consolidated appropriations bill approves the \$500,000 with the CDARS name.

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. It included \$3 million for FY2016 for that purpose.

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. The \$3 million is to purchase, evaluate and calibrate such data. 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.

For FY2017, NOAA requested \$5 million. The Senate Appropriations Committee approved \$3 million, with no explanation as to why the full amount was not approved. The House Appropriations Committee recommended \$6 million, saying it ensures NOAA has the necessary resources "to thoroughly assess commercial data opportunities." The final consolidated appropriations bill approved the requested amount, \$5 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.

The funding levels for those activities are shown in the table below.

As explained in note 3 to the table, it does not include one activity that the Senate Appropriations Committee typically lists as part of NESDIS PAC funding – the "Satellite CDA" program. It is a construction project and therefore not covered in this fact sheet.

**NOAA's FY2017 Budget Request for Satellite System Acquisition
(in \$ thousands)**

Program	FY2015 enacted	FY2016 enacted	FY2017			
			Request	House Cmte	Senate Cmte (note 3)	Final
GOES-R	980,838	871,791	752,784	752,784	752,784	752,784
Jason-3	23,175	7,458	4,357	4,357	note 5	4,357
JPSS	916,267	808,966	787,246	787,246	787,246	787,246
Polar Follow On (PFO) (EON-MW ^{Note 4})	N/A	380,000 (370,000) (0)	393,000 (383,000) (10,000)	^{note 6} 370,000 (note 6) (note 6)	383,000 (383,000) (0)	328,900 (note 6)
Coop Data/Rescue Services (CDARS)	7,300	500	500	^{note 7} 500	500	500
DSCOVER	21,100	3,200	3,745	3,745	3,745	3,745
Space Wx FO	N/A	1,200	2,500	2,500	7,500	5,000
COSMIC-2 (ground system) (new sats/data)	6,800	10,100 (10,100) (0)	16,200 (8,100) (8,100)	16,200	8,100 (8,100) (0)	8,100 (8,100) (0)
Satellite Grnd Services	50,000	54,000	59,025	58,025	54,000	54,000
Sys Architecture & Adv Planning	3,000	3,929	4,929	4,929	3,929	3,929
Projects, Planning & Analysis	25,200	25,200	33,488	28,700	25,200	25,200
Commercial Weather Data Pilot	--	3,000	5,000	6,000	3,000	5,000
TOTAL	2,033,680	2,159,344	2,062,774	2,034,986	2,029,004	1,978,761

Source: Budget request data from Department of Commerce budget documents. Senate Appropriations Committee figures from S. Rept. 114-239. House Appropriations Committee figures from draft report released May 23, 2016.

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.

Note 3: The Senate committee report includes another line – “satellite CDA facility” – for \$2,228,000 that is not tracked in this fact sheet because it is a construction project, not a satellite system. Including it would raise this total to \$2,031,232,000. The House Appropriations Committee report separates the satellite CDA facility from the other spending. The final omnibus appropriations bill also lists it separately (\$2,228,000).

Note 4: The Earth Observing Nanosatellite-Microwave (EON-MW) project is variously listed in NOAA budget documents as part of PFO or separately.

Note 5: The Senate committee expressed its support for JASON-3, but said that since the satellite is now in orbit, it expects NOAA to fund any associated analysis and processing of the data in its Operations, Research and Facilities (ORF) account, not PAC.

Note 6: The House Appropriations Committee provided \$370 million and says it “includes funds for” EON-MW, but does not specify how much. The final omnibus appropriations bill states that NOAA may proceed with EON-MW within available funds as long as it does not impact PFO.

Note 7: The House Appropriations Committee report refers to this with last year’s title -- “Solar Irradiance, Data and Rescue.”