U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON OVERSIGHT
AND
SUBCOMMITTEE ON ENVIRONMENT

HEARING CHARTER

Dysfunction in Management of Weather and Climate Satellites

Thursday, September 19, 2013
10:00AM – 12:00PM
2318 Rayburn House Office Building

Purpose

On Thursday, September 19th, the Subcommittees on Oversight and Environment will hold a joint hearing to conduct on-going oversight of the nation's weather and climate satellite programs. The U.S. Government Accountability Office (GAO) has identified a high probability in degraded weather satellite coverage starting as early as next year, and has designated this data gap as a new high-risk area in a report earlier this year.[1] Given this potential gap in weather satellite coverage, the hearing will address questions about the Administration's priorities in funding weather satellites and research as compared to climate change-monitoring satellites and research.

WITNESS LIST

- **Mr. David Powner,** Director, Information Technology Management Issues, U.S. Government Accountability Office.
- **Ms. Mary Kicza,** Assistant Administrator, Satellite and Information Services, National Oceanic and Atmospheric Administration (NOAA).
- **Mr. Marcus Watkins,** Director, Joint Agency Satellite Division, National Aeronautics and Space Administration (NASA).

Background

Over the last decade, the Committee on Science, Space, and Technology has monitored the development of the Joint Polar Satellite System and its predecessor program, the National Polar-orbiting Operational Environmental Satellite System, which provide vital data to weather

[1] GAO, "High-Risk Series: An Update," GAO-13-283, February 2013, p.21, available at: http://www.gao.gov/assets/660/652133.pdf .

forecasters.[2] However, extreme weather events in the United States during the past year, like Hurricane Sandy and tornados in Oklahoma and elsewhere, have raised questions about whether America's weather monitoring and forecasting ability is as reliable as compared to other countries.[3]

Fueling further concerns about America's weather monitoring and forecasting ability is a potential gap in satellite coverage. NOAA's polar-orbiting and geostationary weather satellites, the Joint Polar Satellite System (JPSS) and Geostationary Operational Environmental Satellite (GOES) system respectively, are a fundamental aspect of our nation's forecasting abilities. For example, in 2010, data from polar-orbiting satellites helped meteorologists predict the arrival of "Snowmageddon" five days in advance, and forecasts of Hurricane Sandy's track might have been hundreds of miles off without information from polar-orbiting satellites, according to a study by the European Centre for Medium-Range Weather Forecasts.[4,5] Unfortunately, development of the next-generation weather satellite has been plagued with problems. The most troubling consequence of these problems is the prospect of coverage and data gaps. Citing ongoing concerns about the potential gaps and their impact, GAO reports:

> "According to NOAA program officials, a satellite data gap would result in less accurate and timely weather forecasts and warnings of extreme events, such as hurricanes, storm surges and floods. Such degradation in forecasts and warnings would place lives, property, and our nation's critical infrastructures in danger."[6]

Costly delays make it more likely that the new satellites won't be ready before the existing satellites reach the end of their projected operational life. JPSS is facing a gap of 17 to 53 months, and funding shortfalls in Fiscal Year (FY) 2012 and FY 2013 forced GOES-R work to be deferred, increasing the chances of a two-imager gap.[7,8] An update on the GOES-R program from NOAA staff last month stated, "there would be at least a 3-month schedule slip in GOES-R due to sequestration."

Overemphasis on Climate Science Endangering Weather Forecasting?

By contrast, funding for climate science satellites and research at NASA has increased by over 40 percent since 2008. The Administration's FY 2014 budget proposal included $1.8 billion for earth science compared to $1.2 billion received in FY 2008.[9] NASA Administrator

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[2] Committee Oversight of NOAA JPSS Weather Satellite Program, available at: http://science.house.gov/committee-oversight-noaa-jpss-weather-satellite-program-previously-npoess#overlay-context=letter/committee-oversight-noaa-jpss-weather-satellite-program-previously-npoess.

[3] Brian Montopoli, "Can We Get Better at Predicting Tornadoes?" CBS News, May 22, 2013, available at: http://www.cbsnews.com/8301-201_162-57585580/can-we-get-better-at-predicting-tornadoes.

[4] NOAA, *Suomi NPP: Improving U.S. Weather Forecast Accuracy from Space*, December 3, 2012, available at: http://www.nesdis.noaa.gov/npp_launch.html.

[5] European Centre for Medium-Range Weather Forecasts, "Annual Report: 2012," p.5, available at: http://www.ecmwf.int/publications/annual_report/2012/pdf/Annual-report-2012.pdf .

[6] GAO-13-283, February 2013, p. 70.

[7] GAO-13-283, February 2013, p.22.

[8] NOAA NESDIS Independent Review Team Report, July 20, 2012, p.24 & p.27, available at: http://science.house.gov/sites/republicans.science.house.gov/files/documents/NESDIS_IRT_Final_Report.pdf.

[9] NASA annual budgets, available at: http://www.nasa.gov/news/budget/index.html#.UjdB_z9YRws.

Charles Bolden has dubbed 2014 "the year of Earth Science" at NASA.[10] As part of the Administration's FY 2014 budget request, responsibility for sustained climate measurements from the Total Solar Irradiance Sensor (TSIS), the Clouds and Earth's Radiant Energy System (CERES) and the limb soundings from the Ozone Mapping and Profiler Suite (OMPS-L) have been transferred from NOAA's JPSS program to NASA. NASA's FY 2014 budget request includes a one-time $40 million increase to pay for the climate sensors, but Dr. Michael Freilich, Director of NASA's Earth Science Division, has expressed concerns about the long term impact of adding these sensor requirements to NASA without also providing adequate funding.[11] Thirteen different federal agencies fund $2.5 billion annually in climate science research. This hearing will consider the Administration's relative priorities and funding for weather monitoring, forecasts, and research compared to climate monitoring, forecasts, and research.

National Polar-orbiting Operational Environmental Satellite System

In the 1960s, the United States began operating two polar-orbiting meteorological satellite systems: one managed by NOAA and another by the Air Force. Polar-orbiting satellites transverse the globe from pole to pole, with each orbit defined by the time of day they pass over the equator: early morning, late morning, and afternoon. Unlike geostationary weather satellites, which offer persistent coverage over an area, each polar-orbiting satellite makes approximately 14 orbits per day and is able to view the entire earth's surface twice per day.

In 1994, as part of the Clinton-Gore Administration's Reinventing Government initiative, a Presidential Decision Directive required NOAA and the Department of Defense (DOD) to merge the civilian and military polar-orbiting satellite systems into one program, the National Polar-orbiting Operational Environmental Satellite System (NPOESS). To manage the program, DOD, NOAA and NASA formed a tri-agency Integrated Program Office. Overall responsibility for the management of the system and satellite operations was assigned to NOAA. The DOD was responsible for acquisition of the sensors, bus and launch vehicle, while NASA was responsible for facilitating the development and incorporation of new technologies.[12]

By 2009, the life-cycle estimate had grown to at least $14.9 billion for four new satellites, the first of which was projected to launch in 2014. In June 2009, an Independent Review Team (IRT) determined that the NPOESS program had an extremely low probability of success.[13] At a Science and Technology Committee hearing that month, witnesses testified that program leadership had deteriorated to the point that only White House intervention could save NPOESS.

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[10] Southern California Public Radio, "NASA to focus on Earth in 2014," August 19, 2013, available at: http://www.scpr.org/news/2013/08/19/38745/nasa-to-focus-on-earth-in-2014-photos.

[11] Marcia S. Smith, "NOAA Reduces JPSS Costs by $1.6 Billion - How Did They Do It?" *Space Policy Online*, April 29, 2013, available at: http://www.spacepolicyonline.com/news/noaa-reduces-jpss-costs-by-1-6-billion-how-did-they-do-it.

[12] GAO, "Polar-Orbiting Environmental Satellites: Changing Requirements, Technical Issues, and Looming Data Gaps Require Focused Attention," GAO-12-604, June 2012, p.12, available at: http://www.gao.gov/assets/600/591643.pdf.

[13] NPOESS Independent Review Team Report, June 29, 2009, available at: ftp://140.90.120.98/JPSS%20Docs/NPOESS%20JPSS%20Documents%20for%20Transition/Reviews/NPOESS%20IRT/NPOESS%20IRT%20Final%20Report%20vFinal.pdf.

Joint Polar Satellite System

In February 2010, the Office of Science and Technology Policy announced that the program would be split, with NOAA and the DOD creating their own programs, establishing requirements, and transferring existing NPOESS contracts to new programs. Satellites flying in orbits to collect early-morning observations would be developed and launched by DOD, while NOAA's Joint Polar Satellite System would collect observations in the afternoon orbit. The late morning orbit was completely abandoned to the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) Polar System.[14]

In 2010, NOAA estimated that the life cycle costs of the JPSS program would be approximately $11.9 billion. Though data monitoring requirements for the program had not changed, NOAA's JPSS program office made plans to remove key requirements to keep the program within the prescribed budget. Meanwhile, DOD decided to terminate its program and reassess its requirements.[15]

The following table from GAO[16] compares the planned costs, schedule and scope of the three programs over time.

Figure 1: Temporal Comparison of NPOESS and JPSS

Key area	NPOESS program before it was restructured (as of May 2006)	NPOESS program after it was restructured (as of June 2006)	NPOESS program prior to being disbanded (as of February 2010)	JPSS program (as of May 2010)	JPSS program (as of June 2012)
Life cycle range	1995-2020	1995-2026	1995-2026	1995-2024	1995-2028
Estimate life cycle cost	$8.4 billion	$12.5 billion	$13.95+ billion[a]	$11.9 billion (which includes about $2.9 billion spent through fiscal year 2010 on NPOESS)	$12.9 billion (which includes about $3.3 billion spent through fiscal year 2011 on NPOESS and JPSS)
Number of satellites	6 (in addition to S-NPP)	4 (in addition to S-NPP)	4 (in addition to S-NPP)	2 (in addition to S-NPP)	2 (in addition to S-NPP)
Number of orbits	3 (early morning, midmorning, afternoon)	2 (early morning and afternoon; would rely on European satellites for midmorning orbit data)	2 (early morning and afternoon; would rely on European satellites for midmorning orbit data)	1 (afternoon orbit) (DOD and European satellites would provide early and midmorning orbit, respectively)	1 (afternoon orbit) (DOD and European satellites would provide early and midmorning orbit, respectively)
Launch schedule	S-NPP by October 2006 First NPOESS (C1) by November 2009 Second NPOESS (C2) by June 2011	S-NPP by January 2010 C1 by January 2013 C2 by January 2016 C3 by January 2018 C4 by January 2020	S-NPP no earlier than September 2011 C1 by March 2014 C2 by May 2016 C3 by January 2018 C4 by January 2020	S-NPP—no earlier than September 2011 JPSS-1 available in 2015 JPSS-2 available in 2018	S-NPP—successfully launched in October 2011 JPSS-1 by March 2017 JPSS-2 by December 2022
Number of sensors	11 sensors and 2 user services systems	S-NPP: 4 sensors C1: 6 sensors C2: 2 sensors C3: 6 sensors C4: 2 sensors	S-NPP: 5 sensors C1: 7 sensors[b] C2: 2 sensors C3: 6 sensors C4: 2 sensors	S-NPP: 5 sensors JPSS-1: 5 sensors[c] JPSS-2: 5 sensors	S-NPP: 5 sensors JPSS-1: 5 sensors[c] JPSS-2: 5 sensors

Source: GAO analysis of NOAA, DOD, and task force data.

[a]Although the program baseline was $13.95 billion in February 2010, we estimated in June 2009 that this cost could grow by about $1 billion. In addition, officials from the Executive Office of the President stated that they reviewed life cycle cost estimates from DOD and the NPOESS program office of $15.1 billion and $16.45 billion, respectively.

[b]In May 2008, the NPOESS Executive Committee approved an additional sensor—the Total and Spectral Solar Irradiance Sensor—for the C1 satellite.

[c]The five sensors are ATMS, the Clouds and the Earth's Radiant Energy System (CERES), CrIS, OMPS, and VIIRS. NOAA also committed to finding an alternative spacecraft and launch accommodation for the Total and Spectral Solar Irradiance Sensor, the Advanced Data Collection System, and the Search and Rescue Satellite-Aided Tracking System.

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14 GAO-12-604, June 2012, p.1.

15 GAO-12-604, June 2012, p.12.

16 GAO, "Polar Weather Satellites: NOAA Identified Ways to Mitigate Data Gaps, but Contingency Plans and Schedules Require Further Action," GAO-13-676, September 2013, p.15.

By 2011, NOAA and NASA had established separate but co-located JPSS program offices, each with different roles and responsibilities. NOAA is responsible for programmatic activities related to the JPSS satellite development, including managing requirements, budgets and interactions with satellite data users. NASA is responsible for the development and integration of sensors, satellites and ground systems.

The joint NASA and NOAA JPSS team launched the Suomi National Polar-orbiting Partnership (S-NPP) satellite in October 2011, the first of a new generation of satellites. S-NPP will collect remotely-sensed land, ocean and atmospheric data during the afternoon orbit. NOAA and NASA officials are currently working to complete the calibration and validation of the satellite's sensors by October 2013, though according to the GAO, some issues have been encountered during this process that may lead to delays in developing satellite products. (More on this below.)

JPSS Issues

Dysfunctional Oversight of Satellite Programs

According to an Independent Review Team chartered by NOAA/NESDIS to conduct an assessment of the total NOAA satellite enterprise in 2012, Department of Commerce (DOC) and NOAA oversight of the satellite programs is "dysfunctional."[17] The IRT judged that micromanagement, lack of trust, and poor communication have made the oversight and decision making process cumbersome and inefficient.[18]

Governance Model is Inefficient

Unlike the GOES-R governance model, which integrates NOAA and NASA elements into one structure, the JPSS model is made up of two parallel structures. This more complicated model causes confusion, creates inefficiencies, increases costs and decreases the probability of mission success.[19]

Cost Cutting Measures Diminish Capabilities

From January to December 2011, NOAA conducted an independent cost estimate and validated that the cost of the full set of JPSS functions from FY 2012 through FY 2028 would be $11.3 billion. After adding sunk costs of $3.3 billion, the program's life cycle estimate totaled $14.6 billion. This amount is $2.7 billion higher than the $11.9 billion estimate for JPSS after the NOAA and DOD requirements were divided in 2010. The increase is attributed to a program extension of four years, the addition of free flyers,[20] cost growth associated with transitioning contracts from DOD to NOAA, and the program's decision to delay work because

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[17] NOAA NESDIS Independent Review Team Report, July 20, 2012, p.11.
[18] NOAA NESDIS Independent Review Team Report, July 20, 2012, p.12.
[19] NOAA NESDIS Independent Review Team Report, July 20, 2012, p.16.
[20] Free flyers are separate spacecraft intended to integrate and launch key instruments that could not be accommodated on the JPSS satellites.

of budget uncertainties.[21] As part of its FY 2013 budget, NOAA revised the program's scope to focus on weather in order to bring the total costs down to $12.9 billion, and more recently, NOAA made additional changes to bring the overall cost back down to $11.3 billion.[22] It bears noting that cuts also diminish overall program capabilities and can delay data delivery times to customers.

S-NPP Not Yet Fully Operational Due to Delays

The S-NPP is not yet fully operational due to delays in validating the readiness and utility of data products and issues with the JPSS ground systems schedules. The JPSS program had originally intended to be able to deliver 76 precise data products 18-24 months after launching S-NPP. However, only 18 products will be validated for operational use by September 2013, another 35 by September 2014, and another one by September 2015, two years later than planned.[23] The remaining products either do not need to be validated, do not have estimated validation dates, or are being scrapped. GAO also determined that NOAA has failed to directly track whether key users are using S-NPP products or if the products meet users' needs.[24] Lastly, though instrument and spacecraft development is on track, scheduling issues on the JPSS ground system could further delay major program milestones.[25]

JPSS' Integrated Master Schedule is Incomplete

The JPSS program office's June 2013 preliminary integrated master schedule (IMS) lacks the necessary information needed to effectively monitor progress, manage dependencies and accurately forecast completion and launch, according to GAO. Also, several of the supporting schedules such as the ground and spacecraft schedule, contain quality weaknesses which degrade the overall reliability of the IMS. GAO scheduling guidance offers ten best practices to develop high-quality, reliable schedules.[26]

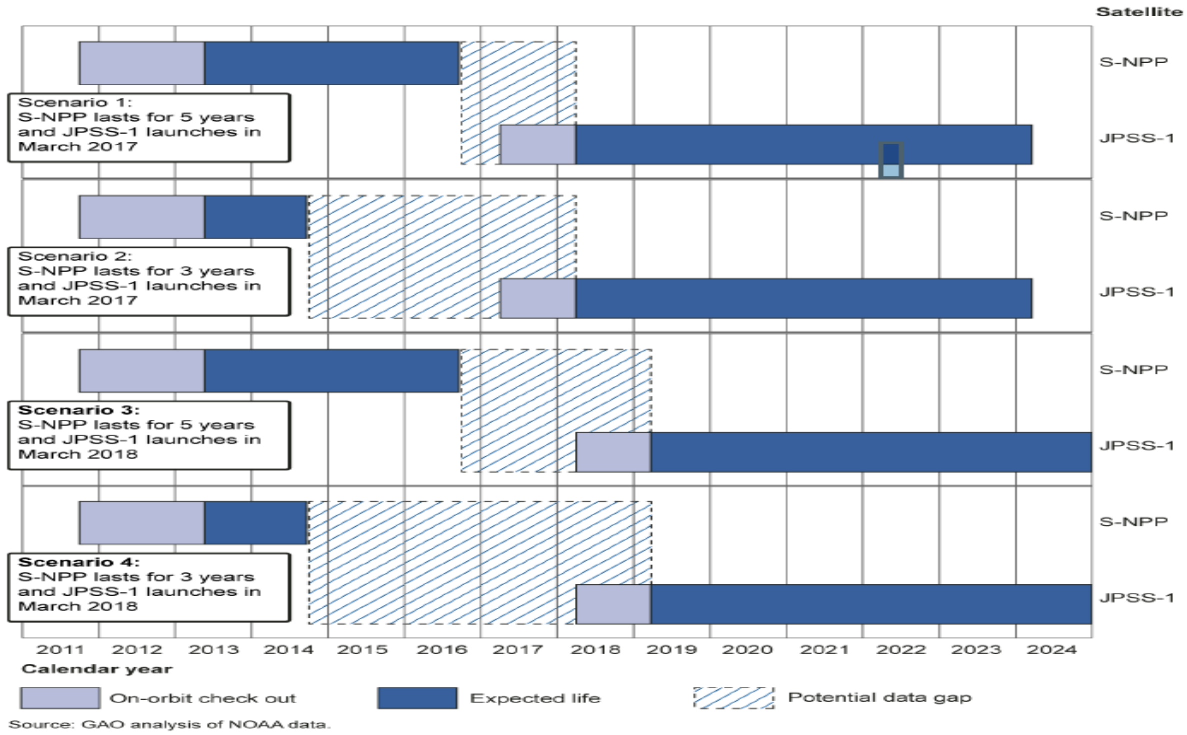
No Comprehensive Contingency Plans to Address Gap Mitigation Shortfalls

When the NPOESS program disbanded in 2010, NOAA anticipated launching satellites in 2015 and 2018. Leading up to the launch of S-NPP, NOAA made changes to ensure that the program stayed on schedule. In doing so, the launch dates for JPSS-1 and JPSS-2 have been pushed back to March 2017 and December 2022, respectively. This would lead to a potential gap in polar weather satellite coverage of between 17 months to three years (see Figure 2).[27] In October 2012, NOAA established a mitigation plan to address the probable gap in polar afternoon satellite data. The plan identifies alternatives for mitigating the risk of a coverage gap and lists the technical, programmatic and management actions necessary to implement the various options. NOAA has not, however, created a complementary, comprehensive

[21] GAO-12-604, June 2012, p.13.
[22] Ibid.
[23] GAO-13-676, September 2013, p.20.
[24] GAO-13-676, September 2013, p.22.
[25] GAO-13-676, September 2013, p.23.
[26] GAO, "Schedule Assessment Guide: Best Practices for Project Schedules," GAO-12-120G, May 2012, available at: http://www.gao.gov/assets/600/591240.pdf.
[27] GAO-12-604, June 2012, p.26.

contingency plan that integrates select strategies and addresses key elements to control the impact of risks should they occur.[28] Until NOAA does so, it may not be prepared to mitigate the looming coverage gap, according to GAO.[29]

Figure 2: Potential Gaps in Polar Satellite Data in the Afternoon Orbit[30]



Free Flyers

One of the largest uncertainties associated with the current JPSS program is what NOAA plans to do with free flyers. Free flyers are separate spacecraft intended to integrate and launch key instruments that could not be accommodated on the JPSS satellites. Once a part of the JPSS program, NOAA has now established a separate and new Polar Free Flyer program,[31] but it is uncertain what the exact manifests will be, what the cost estimates will be for the bus or ride share contribution, what the sensor development or launch schedule will be, and what launch vehicle NOAA will use or what mission they will share. Until the free flyer program is further defined, the uncertainty associated with it could complicate the definition of requirements for the JPSS program.

Geostationary Satellite System

In addition to polar-orbiting satellites, NOAA also operates Geostationary Observational Environmental Satellites (GOES). NOAA's GOES satellites operate from a geosynchronous

[28] NOAA NESDIS Independent Review Team Report, July 20, 2012, p.21.
[29] GAO-13-676, September 2013, p.41.
[30] GAO-13-676, September 2013, p.18.
[31] GAO-13-676, September 2013, p.48.

orbit 22,300 miles above the Earth, which means they orbit the equatorial plane of the Earth at a speed matching the Earth's rotation. This vantage point allows the satellites to essentially 'hover' continuously over one position on the surface of the earth, and serve as a fixed eye on the continental United States with limited coverage of the polar regions.

The GOES system operated by NOAA utilizes two satellites – one fixed on the eastern United States and the other on the western United States. At any given time, the GOES system also includes a third on-orbit 'spare' called into duty either as an emergency back-up to the primary satellites, or naturally sequenced into operations once an older satellite's service has degraded.

The next-generation of the GOES satellites, known as the GOES-R, is under development. GOES-R is expected to significantly improve weather data and will be able to transmit that data at faster rates more frequently. Both improvements will enhance the quality and timeliness of information to the user.

In the original 2006 plan for the GOES-R program, NOAA estimated the life-cycle cost to be $6.2 billion for the period of 2007-2020 and an expected launch date in 2012. This would allow for the purchase of four satellites and included the development of two new major instruments, the Advanced Baseline Imager (ABI) and the Hyperspectral Environmental Suite (HES), as well as upgraded space weather sensors.[32] By September 2006, however, costs were escalating to a reported $11.4 billion. To reduce overall costs, NOAA significantly de-scoped the program by eliminating two of the four planned satellites and by cancelling the plans for the HES. The agency estimated the new program would cost $7 billion and would launch in December 2014.[33] In May 2007 (only 8 months later), NOAA changed its estimated life cycle cost to $7.67 billion. According to GAO, the ABI instrument – designed to provide imagery and radiometric information of the Earth's surface, atmosphere and cloud cover – experienced technical problems. In an effort to manage risks, significant capabilities were removed from the ABI, resulting in an instrument that is significantly less capable than what was originally planned.

Life cycle cost estimates for the GOES-R series now stand at $10.9 billion through 2036 – an increase of $3.2 billion over the estimate for a two satellite system in May 2007. The first of the series is scheduled to launch in October 2015, though NOAA program officials have recently acknowledged that the launch date may be delayed by six months.[34,35]

The following table demonstrates key changes to the program since August 2006:

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[32] GAO, "Geostationary Weather Satellites: Design Progress Made, But Schedule Uncertainty Needs to be Addressed," GAO-12-576, June 2012, p.8, available at: http://www.gao.gov/assets/600/591914.pdf.
[33] Ibid.
[34] Ibid.
[35] GAO, "Geostationary Weather Satellites: Progress Made, but Weaknesses in Scheduling, Contingency Planning, and Communication with Users Need to be Addressed," GAO-13-597, September 2013, p.25.

Figure 3: Key Changes to the GOES-R Program[36]

	August 2006 (baseline program)	September 2006	November 2007	February 2011
Number of satellites	4	2	2	4
Instruments or instrument changes	• Advanced Baseline Imager • Geostationary Lightning Mapper • Magnetometer • Space Environmental In-Situ Suite • Solar Imaging Suite (which included the Solar Ultraviolet Imager, and Extreme Ultraviolet/X-Ray Irradiance Sensor) • Hyperspectral Environmental Suite	• Advanced Baseline Imager • Geostationary Lightning Mapper • Magnetometer • Space Environmental In-Situ Suite • Solar Ultraviolet Imager • Extreme Ultraviolet/X-Ray Irradiance Sensor	No change	No change
Number of satellite products	81	68	34 baseline 34 optional	34 baseline 31 optional
Life cycle cost estimate (in then- year dollars)	$6.2 billion—$11.4 billion (through 2034)	$7 billion (through 2028)	$7.67 billion (through 2028)	$10.9 billion (through 2036)[a]
Estimated launch dates for GOES-R and S	GOES-R: September 2012 GOES-S: April 2014	GOES-R: September 2012 GOES-S: April 2014	GOES-R: December 2014 GOES-S: April 2016	GOES-R: October 2015 GOES-S: February 2017

Source: GAO analysis of NOAA data.

[a]Based on NOAA's fiscal year 2012 budget submission, $7.64 billion of this cost estimate was for the first two satellites in the series, GOES-R and GOES-S. The cost for the remaining two satellites—GOES-T and GOES-U—was estimated at $3.22 billion.

GOES-R Issues

Reporting on Reserves Is Not Sufficiently Detailed or Transparent

Senior level management are not regularly briefed on the status of program reserve funding. GAO has previously reported that, "in order to oversee GOES-R contingency funding, senior managers should have insight into the amount of reserves set aside for each satellite in the program and detailed information on how reserves are being used…"[37] According to GAO, without regular, detailed briefings on reserve funding and budgeting information, executives will not be able to make the most optimal, well-informed decisions.

Missed Milestones and Scheduling Deficiencies Increase Likelihood of a Delayed Launch

Successive missed milestones and delays will allow the program less time to respond to unforeseen problems as the launch date approaches. Figure 4 highlights key milestones and the extent of delays. Though NOAA has adopted some GAO recommendations on managing program schedules,[38] issues remain.[39] Program schedules provide a road map for systematic execution and a means to monitor progress and identify potential problems. Without more reliable schedule planning, program milestones will likely continue to be missed.

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36 GAO-13-597, September 2013, p.10.
37 GAO-13-597, September 2013, p.22.
38 GAO-12-576, June 2012, p.23.
39 GAO-13-597, September 2013, Pp.28-29.

Figure 4: GOES-R Program Delays[40]

Program milestone	Date planned (as of Apr 2012)	Date completed or planned (as of Mar 2013)	Delay
Mission operations review	January 2013	January 2014	12 months[a]
End-to-end test #1	February 2014	May 2014	3 months
End-to-end test #2	May 2014	August 2014	3 months
End-to-end test #3	August 2014	December 2014	4 months
Flight operations review	September 2014	January 2015	4 months
End-to-end test #4	December 2014	March 2015	3 months
End-to-end test #5	July 2015	July 2015	No change

Source: GAO analysis of NOAA data.

Note: [a] Program officials stated that they had erroneously scheduled the mission operations review too soon, and moved the date by 9 months to better reflect when the review was needed. Therefore, only 3 of the 12 months were attributable to a delay.

Continued Technical Issues Could Cause Further Delays

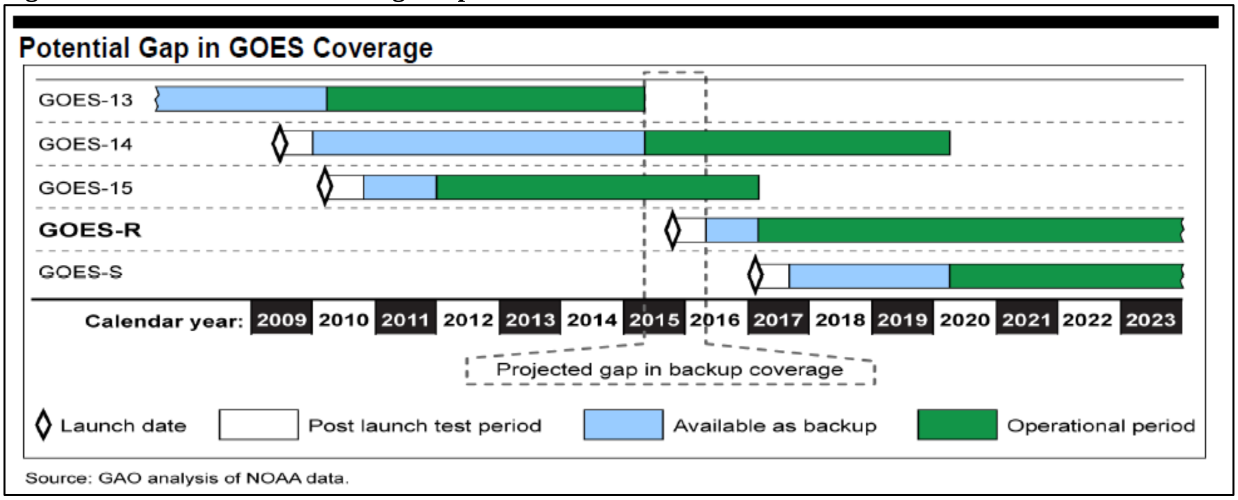
Technical issues on flight and ground projects could cause further delays. For instance, an electronics board in the Geostationary Lightning Mapper (GLM) emitted unexpectedly high levels of radiation during testing. If this problem cannot be fixed, the instrument's performance would be degraded. Program officials have considered excluding the GLM from the first GOES satellite, which would significantly reduce the satellite's functionality. The GLM is intended to continuously monitor total lightning activity day and night over much of the western hemisphere, thus improving advance notice of extreme weather and increasing warning lead times. Key consumers of GOES products have said that they'd rather have the launch delayed than proceed without the GLM.[41]

Delays Increase Risk of Satellite Data Gap

NOAA's policy is to always have two operational satellites and one back-up in orbit. However, in April 2015, NOAA expects to retire one of its operational satellites (GOES-13) and move the back-up (GOES-14) into operation.[42] There will be no backup satellite until GOES-R is launched. According to a June 2012 GAO report, the likelihood of the first GOES-R satellite launching by October 2015 is less than 50 percent.[43] Once GOES-R is launched, it would first have to complete a post-launch test and calibration phase that lasts approximately six months before becoming operational. As previously mentioned, program officials acknowledged that the launch date will likely be delayed by six months. With a potential gap in the afternoon orbit of the polar-orbiting program and the possibility of gaps in all of the polar-orbits, a further gap in geostationary coverage exacerbates the hazardous risks to Americans from NOAA's inability to monitor and forecast weather events.

[40] GAO-13-597, September 2013, p.24.
[41] GAO-13-597, September 2013, p.25.
[42] GAO-13-597, September 2013, p.30.
[43] GAO-12-576, June 2012, Pp.32-33.

Figure 5: Potential GOES Coverage Gap[44]



Incomplete Contingency Plans

To prepare for a probable two-imager gap, NOAA has established contingency plans that are generally in line with government and industry best practices, but weaknesses remain. For instance, the satellite plan does not account for the impact on users due to the loss of capabilities under contingency operations. According to the GAO, NOAA has generally done a poor job of communicating with satellite data users regarding changes to GOES-R requirements and capabilities.[45] Also, NOAA's contingency plans do not identify alternative solutions for preventing the launch delay of GOES-R on October 2015.[46] A recent DOC Office of Inspector General (OIG) audit corroborates GAO's findings and states, "NOAA needs to develop a comprehensive plan to mitigate the risk of potential launch delays and communicate to users and other stakeholders changes that may be necessary to maintain the first GOES-R satellite's launch readiness date."[47]

[44] GAO-13-597, September 2013, p.31.
[45] GAO-13-597, September 2013, Pp.47-48.
[46] GAO-13-597, September 2013, Pp.45-46.
[47] Department of Commerce Office of Inspector General, "Audit of Geostationary Operational Environmental Satellite-R Series: Comprehensive Mitigation Approaches, Strong Systems Engineering, and Cost Controls Are Needed to Reduce Risks of Coverage Gaps," OIG-13-024-A, April 25, 2013, p.4, available at: http://www.oig.doc.gov/OIGPublications/OIG-13-024-A.pdf.