U.S. DEPARTMENT OF COMMERCE
Office of Inspector General

National Oceanic and Atmospheric Administration

Audit of the Joint Polar Satellite System: Challenges Must Be Met to Minimize Gaps in Polar Environmental Satellite Data

Final Report No. OIG-11-034-A
September 30, 2011

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Office of Audit and Evaluation

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Office of Inspector General
Washington, D.C. 20230

September 30, 2011

MEMORANDUM FOR: Dr. Jane Lubchenco
Under Secretary of Commerce and Administrator
for the National Oceanic and Atmospheric Administration

FROM: Allen Crawley
Assistant Inspector General for Systems Acquisition
and IT Security

SUBJECT: *Audit of the Joint Polar Satellite System: Challenges Must Be Met to Minimize Gaps in Polar Environmental Satellite Data*
Final Report No. OIG-11-034-A

Attached is our final audit report on the ongoing development of the Joint Polar Satellite System (JPSS). Our objective for this audit was to assess the adequacy of JPSS development and acquisition activities intended to maintain continuity of weather and climate data obtained from polar orbit. To do so, we evaluated the completeness of development and testing leading up to the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) launch, the impact of development modifications (such as changes to test schedules), and preparations for post-launch data production. We also examined activities at the JPSS programmatic level that had ramifications for the continuity of polar satellite coverage beyond NPP.

We found that while NPP remains on track to launch in October 2011, there are still several risks to using NPP's data operationally. First, the availability of some data for operational use will be delayed. Second, the ground system supporting NPP is not as robust as a typical operational system. It is expected that there will be a gap in coverage between NPP and the first JPSS satellite (JPSS-1) and budget challenges have presented difficulties for the program. Under continued funding uncertainty, the program needs to do further work to define its operational baseline, prioritize requirements, and plan for tradeoffs when funding shortfalls occur. Efforts to mitigate the impact of a coverage gap should be coordinated across NOAA's line offices. Lastly, the program only recently completed the transition of the Advanced Technology Microwave Sounder to a NASA contract, but this and other instrument contracts must be finalized.

We have received your response to our draft report. We modified this final report as needed to address your comments, summarized the comments in the report, and included the response as an appendix to the report. The report will be posted on OIG's website pursuant to section 8L of the Inspector General Act of 1978, as amended.

Under Department Administrative Order 213-5, you have 60 calendar days from the date of this memorandum to submit an audit action plan to us. The plan should outline the actions you propose to take to address each audit finding and recommendation.

We would like to extend our thanks to NOAA for the courtesies shown our staff during our fieldwork. Please direct any inquiries regarding this report to me at (202) 482-1855 or Fred Meny, Director, Satellites and Weather Systems, at (202) 482-1931.

Attachment

cc: Mary M. Glackin, Deputy Under Secretary for Operations, NOAA
Mary E. Kicza, Assistant Administrator, National Environmental Satellite, Data, and Information Service, NOAA
Mack Cato, Director, Office of Audit and Information Management, NOAA
Geovette E. Washington, Deputy General Counsel, Department of Commerce

Report In Brief

U.S. Department of Commerce Office of Inspector General

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Why We Did This Review

Our objective for this audit was to assess the adequacy of NOAA's JPSS development and acquisition activities intended to maintain continuity of data obtained from polar orbit, including the completeness of pre-launch development and testing, the impact of development modifications (such as changes to test schedules), and preparations for post-launch data production. We also examined activities at the JPSS programmatic level that had ramifications for the long-term continuity of polar satellite coverage.

Background

NOAA's environmental satellite operations and weather forecasting are designated *primary mission-essential functions* of the Department of Commerce because they directly support government functions the President has deemed necessary to lead and sustain the nation during a catastrophic emergency. But NOAA's current constellation of polar and geostationary operational environmental satellites is aging, and its capabilities will degrade over time. As a result, the risk of gaps in critical satellite data is increasing.

The JPSS program is the result of a 2010 restructuring of the NPOESS program, which had a long history of delays and cost overruns. As a result of these delays, the NPP satellite, which was originally intended to demonstrate new instruments, will now be used operationally to maintain data continuity.

National Oceanic and Atmospheric Administration

Audit of the Joint Polar Satellite System (JPSS): Challenges Must Be Met to Minimize Gaps in Polar Environmental Satellite Data (OIG-11-034-A)

What We Found

1. While the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) remains on track for an October 2011 launch, late development of the ground system (equipment for controlling the satellites and receiving and processing satellite data) has delayed the schedule for post-launch data production. In addition, NPP's ground system is not as robust as a typical operational system, increasing the risk of data loss and disruptions to satellite control during severe weather events.
2. Our examination of program-level activities confirms a coverage gap that NOAA expects to occur between NPP's end of life and the operational date of the first JPSS satellite. This gap will result in degraded weather forecasts and a break in the climate record.
3. The process for defining JPSS' operational baseline of capabilities, costs, and schedule has been prolonged, resulting in uncertain life-cycle cost estimates and budget requirements during a period when decision makers needed clarity in these areas.
4. The transition of instrument contracts from the control of the NPOESS program to JPSS has just been completed, but delays in finalizing the contracts could lead to further cost increases and schedule degradation.

What We Recommended

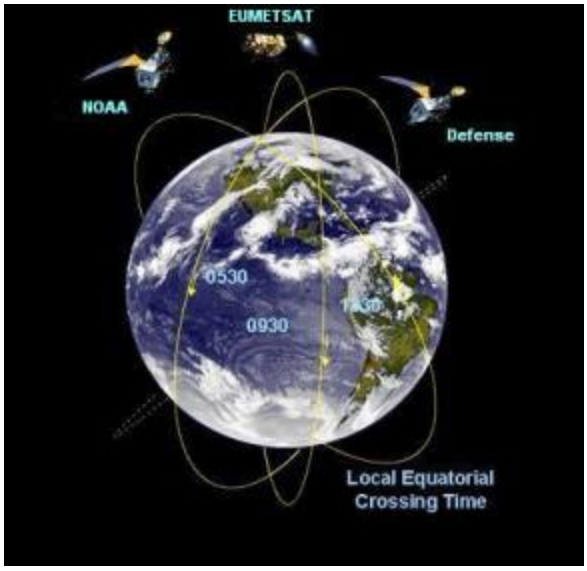
1. NOAA should take steps to mitigate risks of using NPP data operationally by determining the availability of additional resources to support preparations for post-launch data production. Management should determine the feasibility of establishing an alternate mission management center and an additional station to which satellite data may be transmitted.
2. NOAA should also adequately oversee planning and coordination between the JPSS program and external entities to ensure the adequacy of JPSS development activities.
3. NOAA should coordinate efforts from across its line offices to minimize the degradation of weather and climate forecasting during gaps in satellite coverage.
4. To more efficiently manage the JPSS program under continued budget uncertainty, NOAA should provide decision makers with data illustrating the consequences of limiting satellite observational capabilities. NOAA should prioritize all of JPSS' requirements and develop a plan for making adjustments in response to funding shortfalls.
5. To fully transition from NPOESS to JPSS, contracts with instrument vendors must be finalized.

Contents

Introduction

The National Oceanic and Atmospheric Administration's (NOAA's) polar-orbiting operational environmental satellites[1] provide critical data for civilian and military use by the United States and its international partners through global observations of conditions that affect weather and climate. The satellites also provide data on environmental indicators such as vegetation, active fires, and dust storms. In addition, NOAA's current operational satellites include sensors that detect signals from emergency beacons and transmit them to search and rescue organizations.

Figure 1. Polar-Orbiting Satellites



The three orbits of polar operational environmental satellites.
Source: OIG, adapted from NPOESS illustration

With the earth rotating beneath, polar-orbiting satellites pass over the north and south poles while continuously circling the planet, viewing the entire earth's surface twice a day over the course of approximately 14 orbits. Three polar operational environmental satellite constellations will collectively provide, for any location on the globe, observations that are generally refreshed at 6-hour intervals (figure 1): Department of Defense satellites that cross the equator in the early morning, European satellites[2] that cross in the midmorning, and NOAA satellites that cross in the early afternoon (referred to as the early-morning, mid-morning, and afternoon orbits). Polar-orbiting satellite sensors capture higher spatial resolution data than geostationary satellites due to a lower orbit, and are a significant part of the global observing system, a major component of numerical weather prediction. Observations from polar satellite sensors constitute the most important data for 3-day and longer forecasts of significant weather events—advance warnings that protect lives and property.

NOAA's current constellation of satellites is nearing its end of life, and replacement satellites are needed to maintain continuity of observations in the afternoon orbit. NOAA's Joint Polar Satellite System (JPSS) program, for which the National Aeronautics and Space Administration (NASA) is the systems integrator, will acquire and develop the next-generation polar satellite system for the afternoon orbit, including a common ground system[3] that will also operate Defense satellites and share data with international satellite programs. In February 2010, the

[1] NOAA's *operational satellites* are distinct from research satellites in that they make consistent contributions to weather and climate prediction and NOAA launches new operational satellites as they reach the end of their design lives. NASA's research satellites demonstrate new technologies and attempt to advance scientific capabilities. Successfully demonstrated capabilities can be made part of operational satellites thereafter.
[2] European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT).
[3] A *ground system* consists of equipment for controlling the satellites and for receiving and processing satellite data.

White House's Office of Science and Technology Policy announced its decision[4] to have NOAA, in partnership with NASA, establish the JPSS program as part of a restructuring of the National Polar-orbiting Operational Environmental Satellite System (NPOESS), a tri-agency (Defense, NOAA, and NASA) program, which had a long history of cost overruns and schedule delays during its efforts to develop the next generation of satellites for all three orbits.

As a result of NPOESS' delays, the NPOESS Preparatory Project (NPP) satellite, a NASA research and risk reduction satellite originally intended to demonstrate new instruments, will now be used operationally to maintain continuity of data from the afternoon orbit. NPP is scheduled to launch in late October 2011 and is designed to last 5 years, but whether its instruments will last as long as its design life is unclear.

The first satellite developed under the JPSS program, JPSS-1, will be a near-clone of the NPP satellite, although it will be built to more rigorous engineering standards that reflect operational needs. It is currently targeted to launch in the first quarter of FY 2017 and will not be operational until after the end of NPP's design life in November 2016. Therefore, NOAA is predicting a gap in the continuity of polar satellite data from the afternoon orbit.

Effectively managing the development and acquisition of NOAA's environmental satellite systems is one of the Department's top management challenges.[5] In a June 10, 2011, memorandum to the NOAA Administrator, we detailed our preliminary observations, based on our fieldwork up to that point, in the following areas: funding challenges, NPOESS-to-JPSS transition delays, NPP launch and ground system status, and the program's life-cycle cost estimate.[6] We have further developed those observations, along with new information, into the findings and recommendations presented in this report.

Our objective for this audit was to assess the adequacy of JPSS development and acquisition activities intended to maintain continuity of data obtained from polar orbit, including the completeness of development and testing leading up to the NPP launch, the impact of development modifications (such as changes to test schedules), and preparations for post-launch data production; our results in these areas are detailed in our first finding. We also examined activities at the JPSS programmatic level that had ramifications for the continuity of polar satellite coverage beyond NPP; the results of that work are captured in findings II and III. Our audit scope, objectives, and methodology are described in appendix A.

As a result of our audit, we concluded that while NPP, as part of the JPSS program, remains on track for an October 2011 launch, schedule compression during development and acquisition activities has increased the risk that the continuity of data from the afternoon orbit cannot be maintained after the current operational satellite reaches its end of life. In addition, our examination of program-level activities confirmed an expected coverage gap between NPP and JPSS-1. The process for defining JPSS' operational baseline of capabilities, costs, and schedule

[4] The White House Office of Science and Technology Policy, February 1, 2010. *Restructuring the National Polar-orbiting Operational Environmental Satellite System* (fact sheet). Washington, D.C.
[5] U.S. Department of Commerce Office of Inspector General, December 20, 2010. *Top Management Challenges Facing the Department of Commerce* (OIG-11-015). Washington, D.C.: Department of Commerce OIG.
[6] U.S. Department of Commerce Office of Inspector General, June 10, 2011. *NOAA's Joint Polar Satellite System Audit Observations* (OIG-11-029-M). Washington, D.C.: Department of Commerce OIG.

has been prolonged. And the transition of instrument contracts from the NPOESS program's control to the JPSS program's control has not been completed, which could lead to further cost and schedule degradation.

Findings and Recommendations

I. NOAA Should Take Steps to Mitigate Risks of Using NPOESS Preparatory Project Data Operationally

Data from the NPP satellite, which was originally a research and risk reduction mission, will now be used operationally to maintain continuity of weather and climate data from the afternoon orbit. Recent efforts by NASA's NPP team (including contractors) have put the satellite on track to launch in late October 2011. But late development of the ground system has compressed the mission schedule and delayed the schedule for post-launch data production. In addition, NPP's ground system is not as robust as a typical operational system.

A. Late Ground System Development, Communication and Coordination Challenges, and Staff Reductions Have Delayed Availability of Some NPP Data

Delays in ground system development have postponed efforts to ensure that the ground system's software matches science algorithms for creating data products. At a technical review in June 2011, the ground system's contractor, Raytheon, indicated that the ground system's data processing segment will be able to support post-launch work to calibrate NPP instruments' output and validate the scientific quality of key data records (a process called *calibration and validation*). A significant number of other data records, however, will not be supported until a ground system upgrade, which is planned for March 2012.

In addition, JPSS' communication and coordination challenges with NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) Center for Satellite Applications and Research (STAR), as well as inadequate staffing within STAR, have led to a longer post-launch schedule for activities needed to ensure data products will meet science objectives. STAR's mission is to accelerate the transfer of satellite observations into operations. Yet its role, responsibility, accountability, and authority with respect to the JPSS program (including NPP) have not been agreed to. Further, STAR's FY 2011 staffing level was lower than planned. As a result, initial calibration and validation is now projected to take 24 months post-launch—6 months longer than originally planned. Our review of the program's schedule found that it could take even longer for some data records to be sufficiently validated for operational use. According to the schedule, some 24 products will take from 27 to 42 months post-launch to reach a stage where their accuracy has been established in a systematic and statistically robust way, representing global conditions.

B. NPP's Ground System Lacks Some Features of Operational Satellite Systems

NPOESS-era delays in the deployment of an operational satellite system led the NPOESS executive committee in 2009—at the recommendation of an independent review team—to decide to use NPP data for operational purposes to maintain continuity of satellite data in the afternoon orbit. But no additional requirements were levied on NPP as a result. Unlike NOAA's existing

operational satellite systems,[7] NPP has only a single mission management center for controlling the satellite. Until a backup has been established, control of the satellite is at risk of severe events (for example, natural disasters, large-scale telecommunications outages, or equipment failures), however unlikely, that could disrupt the mission management center's ability to control the satellite. Program officials told us they have commissioned studies to develop an alternate mission management center and hope to have one ready well in advance of the JPSS-1 launch.

NPP's ground station has the system's only science data downlink (the means to transmit a signal from the satellite to the ground station). With only a single downlink, disruptions to the antenna and ground equipment could result in the loss of operational data. At NPP's flight operations review, the independent review team noted that not receiving a single orbit's worth of data could cascade into a data loss, adding that NASA's Earth Observing System research satellites have missed several downlinks in successive orbits with a single ground station (the NPP satellite can store data from 3.5 orbits, approximately 6 hours' worth, before it must be overwritten). JPSS program officials told us that the ground station has redundancy in terms of antennas and equipment. But while the ground station may be robust, the use of a single ground station in a single geographic location is not consistent with NOAA's existing polar and geostationary operational environmental satellite systems, which use more than one location. Adding a second, geographically distinct science data downlink could improve NPP's data timeliness (the time from observation by the satellite to when the data has been processed by the ground system) and increase its contribution to weather forecasting.

C. Ground System Issues Accumulated While Management Focused on Instrument Delays

During our audit survey work in 2010, we noted a growing number of unresolved problems with ground system development and testing. From our viewpoint, while NOAA leadership was aware of the ground system issues, its attention had previously been focused on resolving development delays of two key instruments, the Visible/Infrared Imager Radiometer Suite (VIIRS) and the Cross-track Infrared Sounder (CrIS).

Due to both the instrument delays and significant software builds required to resolve the ground system problems, a key compatibility test of the ground system's control and communication with the satellite was postponed from August 2010 to January 2011. A second compatibility test that focused on the flow of data through the system and the creation of data products was also postponed. We learned that the large software builds had been delayed, in part due to significant staffing cuts the program imposed on Raytheon in order to preserve the remaining available funds—reduced by monies reserved for NPOESS contract termination liability—through the end of fiscal year 2010.

Given that the ground system must first support the NPP satellite, in the summer of 2010 we alerted Commerce and NOAA leadership to our concerns, including the potential delay of the NPP launch and a gap in data continuity. The program responded by adding resources and

[7] For example, NOAA's current polar operational environmental satellites are controlled from a satellite operations facility in Maryland, while command and data acquisition stations elsewhere in the country provide instructions to and receive data from the satellites; one of these stations also serves as the backup control center. Additionally, through an agreement with EUMETSAT, satellite data can be sent and received through antennas and ground support equipment at a site in Europe. NOAA's geostationary operational environmental satellites have similar redundancies (multiple ground stations and a backup control center), and the next generation of geostationary satellites includes plans for the same.

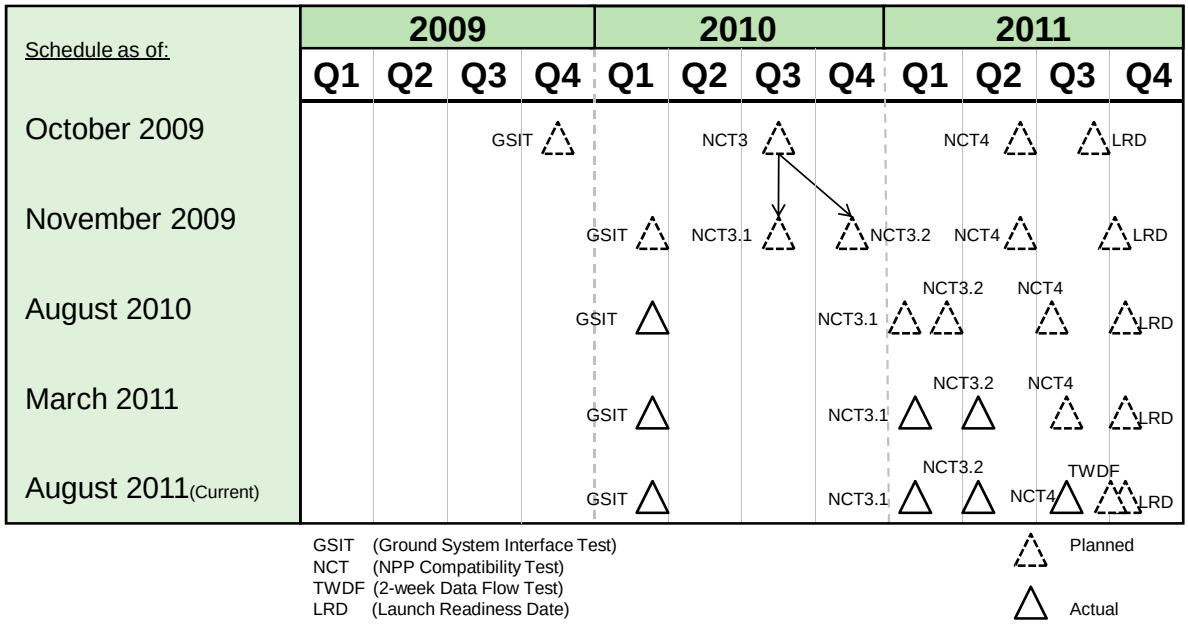
program-level attention to ground system development. As we noted in our June 2011 memorandum to the NOAA Administrator, delay in transitioning the ground system contract to NASA added communication and coordination challenges to the program's oversight and direction of Raytheon's work. With the contract transitioned in late September 2010, those impediments were removed.

D. NPP's Schedule Compression Introduced Additional Risks

With the delays in ground system/satellite compatibility tests, the NPP team had little schedule margin for fixing critical or urgent issues that were identified during testing and that must be resolved before launch. In addition, the project team postponed analysis of test results in order to plan and prepare for successive ground system tests before the prelaunch freeze of the system's configuration. In part due to fixes planned for post-launch software releases, some requirements' verification will be postponed until after launch, potentially delaying the operational use of NPP data.

Figure 2 depicts major ground system test schedule changes over the past 2 years. As illustrated in the chart, test events (in particular, NPP compatibility test [NCT] 3 parts 1 and 2, and NCT 4) moved closer to the launch readiness date and closer together over time. The primary causes of this schedule compression were delivery delays of instruments made under the NPOESS contract, an accumulation of ground system issues, and not enough contractor staffing for the large software build.

Figure 2. Ground System Test Schedule Changes Over Previous 2 Years (Calendar Years Shown)



Source: OIG adaptation of NPP's recent ground system test schedule history

Another factor that contributed to the schedule compression was the need to increase the duration of tests in order to adequately stress the ground system as data flows through it. At two comprehensive mission reviews in January and June 2011, NASA's independent review team

recommended that the project put the ground system under stress with a minimum 2-week continuous data flow test, longer if possible. The intent was to determine how the various segments operated under load, where the system bottlenecks were, what conditions would trigger data loss, and if any mitigating steps could be taken to prevent problems. It was clear that the recommendation was focused on preparing to use NPP data operationally.

Responding to this recommendation and the need to retest some requirements and fixes to system discrepancies that had not been fully tested, the project recently scheduled two additional tests late in the mission schedule, including a 14-day data flow test. In order to leave room in the schedule for a planned mission rehearsal, however, the test was scheduled for September 27 to October 10, to be completed just 15 days before launch. Any system fixes required to mitigate issues identified in these tests would accumulate with already scheduled post-launch ground system work requests, which could delay the work necessary for post-launch data production.

Finally, NPP experienced test-readiness delays caused by the unpreparedness of certain external systems. These systems interface with the ground system, and their ability to ingest satellite data is part of NPP/JPSS mission requirements. Six weeks before NCT 3 part 2 occurred, the project team learned that operationally configured versions of NOAA's Comprehensive Large Array-data Stewardship System (CLASS, which will archive NPP/JPSS data) and the NPOESS Data Exploitation system (NDE, which will further process and distribute NPP/JPSS data to NOAA users) would not be ready in time for the test. NOAA and NASA had to determine the effects of using non-operationally configured versions of CLASS and NDE for NCT 3 part 2, as well as to coordinate schedules for further test activity. The project later postponed NCT 4 to ensure CLASS would have an operational version built in time to support that test. The postponement of NCT 4 further compressed the NPP schedule.

During our field work, we observed that communications and coordination between NASA's NPP systems integration and test team and NOAA's external system owners improved as the stakeholders incorporated lessons learned from earlier tests into those that followed. Given the ground system's longstanding requirements to interface with and provide data to the external systems, however, a broader, more inclusive systems engineering approach was needed at an earlier point in the mission schedule. This will continue to be a challenge for the JPSS program as the ground system evolves to support more satellites and include additional U.S. military and international partners.

II. NOAA Must Act to Minimize Expected Gap Between NPP and JPSS-1

NOAA is predicting a gap in the continuity of polar satellite data from the afternoon orbit between NPP and JPSS-1. Our analysis suggests the expected gap decreased after the program received additional funds through departmental reprogramming late in FY 2011 and the outlook for FY 2012 funding improved. The expected gap remains significant, however, and will result in degraded weather forecasts and a break in the climate record. NOAA's process for establishing the program's operational baseline[8] was prolonged, resulting in uncertain life-cycle

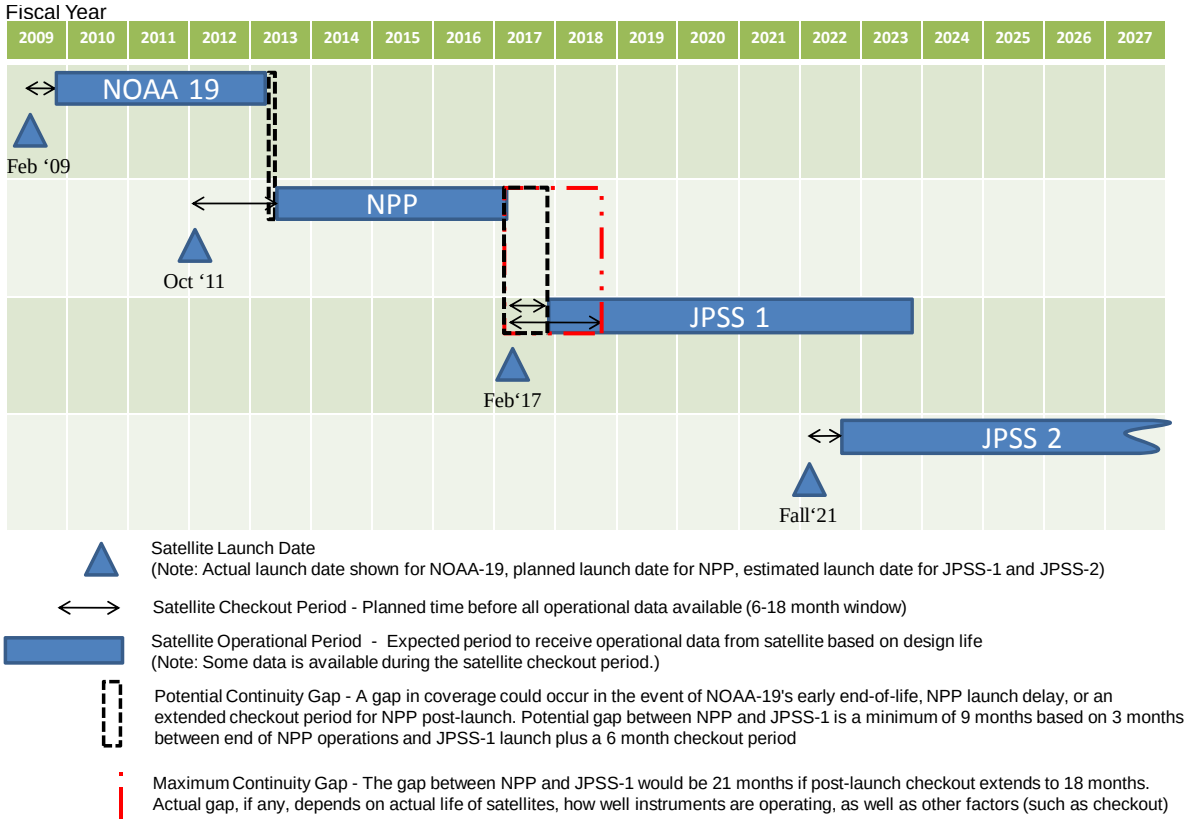
[8] An *operational baseline* is an operationally significant performance level between the threshold and objective that is expected to be delivered by the program. *Threshold* refers to the minimally acceptable level of performance that must be achieved, while *objective* represents a level above the threshold that would better meet user needs and is realistically achievable with current technology. The *system baseline* refers to capabilities on contract.

cost estimates and budget requirements during a period when decision makers needed clarity in these areas.

A. Current Gap Analysis Indicates Improvement in Satellite Coverage, but a Significant Expected Gap Between NPP and JPSS-1 Remains

Based on the current FY 2011 funding level, NOAA expects a gap in weather and climate observations between NPP's end of life and the operational date of JPSS-l. A gap will result in a lack of data, reducing the accuracy of weather forecasts and causing a break in data needed to maintain a continuous climate record. Since our June memo, the JPSS program reported a total of $109 million in additional FY 2011 funding. With increased funding also likely in FY 2012 and the launch date fixed at February 2017, we expect a gap between 9 and 21 months in length (figure 3), an improvement over the expected 18-to-30-month gap we reported in our June memo.

Figure 3. Potential Continuity Gaps in Afternoon Orbit



Source: OIG analysis of NOAA data, as of August 22, 2011

We used a launch date of February 2017—rather than the program's current projected launch date in the first quarter FY 2017—due to continued budget uncertainty in FY 2012 and beyond, which could delay acquisition and development activities. NOAA officials told us a 6-month post-launch checkout period was necessary to achieve an interim operational capability to produce the data records that are most important for numerical weather prediction. Other

important data records would not be available to users until JPSS-1 instruments were fully checked out, a process that could last considerably longer than 6 months.

In our analysis, we used a checkout period ranging from 6 months up to a possible 18 months to achieve full operational capability. A checkout period of longer than 6 months is likely because JPSS-1 instruments will have manufacturing changes from the models flown on NPP and, in all probability, NPP will no longer be operational, leaving the JPSS-1 mission without a direct means for comparison. The actual length of the gap will depend on a number of factors, including the FY 2012 JPSS appropriation, how NOAA prioritizes user needs for national weather and climate data, and the actual life span of the NPP spacecraft and instruments. The NPP spacecraft was designed to last 5 years and carries enough fuel to last 7 years. However, most of the NPP instruments were managed and developed under the NPOESS contract with Northrop Grumman; the NPOESS program had limited government oversight and a history of technical issues. As a result, NASA lacked technical oversight during instrument development, manufacturing, and testing—creating uncertainty as to the instruments' ability to operate as long as the spacecraft's design life.

We continue to identify a potential near-term gap between NOAA-19 (the current satellite) and NPP. Such a gap would occur if NOAA-19 experiences an early end of life or instrument sensor failure, the NPP launch is delayed, or the NPP satellite and instruments require an extended post-launch checkout period before all data is operationally viable.

To assess the impacts of a gap in polar satellite data from the afternoon orbit, we interviewed officials from the National Centers for Environmental Prediction (NCEP),[9] including its Director. NCEP has completed five studies of significant weather events in which forecasts with all available data were compared with forecasts that were denied data from afternoon orbit polar satellites. Two of the case studies concluded that weather forecasts at 5, 4, and 3 days before the event were significantly degraded without afternoon orbit data. At 2 and 1 days, other sources of data (such as weather balloons) had more positive contributions to the forecast, reducing the effects of the loss of afternoon orbit data. In the remaining three studies, the forecasts were largely unchanged as other data sources provided critical atmospheric signals for those weather events. NCEP officials concluded that the case studies, along with statistical studies of the relative importance of various data sources in forecasting, underscore the need for continuity of both afternoon and morning orbit polar satellite coverage. Forecasts at 3 days and beyond are particularly reliant on polar satellite data, and the accuracy of forecasts of significant weather events at these timeframes is crucial to protecting lives and property.

Anticipating a gap in data from the afternoon orbit, NCEP officials told us they have been working with Defense to improve the data from its satellites in the early-morning orbit. Additionally, NCEP is working to use data from NOAA's next generation geostationary satellite, which is currently scheduled to launch in October 2015; according to NOAA, however, the National Weather Service does not believe this data would mitigate the loss of polar satellite data from the afternoon orbit. Separately, NESDIS officials told us they were considering additional international sources that may provide some compensating data, but currently there are no alternative sources of afternoon orbit data beyond NPP. However, in our observations of

[9] NCEP is an office within NOAA's National Weather Service.

NOAA's Program Management Council[10] meetings, there was little evidence that these efforts were being tracked or coordinated across NOAA's line offices.

B. Funding Challenges Restricted Acquisition and Development, Delayed Satellite Launch Dates, and Created the Expected Gap

When the transition from NPOESS to JPSS began in February 2010, the NPOESS contract, managed by the Air Force Space and Missile Systems Center, was still funding the instruments and ground system. The Air Force was required to set aside $84 million (half from the Air Force and half from NOAA) in termination liability costs on the NPOESS contract for FY 2010. As a result, the remaining FY 2010 NPOESS funds of approximately $682 million were inadequate to support both the ongoing development work and necessary JPSS transition activities, which included establishing the majority of NASA contracts, transitioning physical property to NASA contracts, and fully staffing the JPSS program office as planned.

In early FY 2011, the JPSS program had some success establishing contracts for most of the instruments, spacecraft, and ground system. But the series of continuing resolutions in FY 2011 that were enacted before Congress passed a full-year appropriation reduced funding—to $382 million or 36 percent of the requested $1.061 billion—and persisted for most of the fiscal year, limiting program startup activities. For example, NASA was unable to adequately execute the newly established contracts, except for ground system development for NPP, because it lacked funding to hire sufficient technical staff or order long-lead items (engineering, development work, and parts needing a long lead time to be acquired or produced).

By the spring of 2011, the program began to predict a gap in polar satellite coverage in the afternoon orbit stemming from projected delays in launch dates for JPSS-1 and JPSS-2 based on various funding scenarios at levels below and up to the President's budget request. NOAA leadership communicated with Congress and the White House in an effort to restore funding and get the program on track to minimize any gaps.[11] In the fourth quarter of FY 2011, Congress approved an $89 million request that allowed the transfer of funds from other NOAA and Census programs to JPSS. As of mid-August, the JPSS program reported a total of $109 million (including the $89 million) was available, allowing work on JPSS-1 to commence.

The outlook for FY 2012 funding appears to have improved, with the report accompanying the House of Representatives appropriations bill recommending $901 million for the program (84 percent of the request included in the President's budget), although other NOAA programs will experience cuts.[12] Despite the possible increase of JPSS funding, budget uncertainty is likely to continue. NOAA, in its communications with Congress, the White House, and the Department, should provide complete, objective and understandable data that illustrates the consequences of limiting satellite and other programs that contribute to weather and climate prediction and have national security and safety implications.

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[10] Chaired by NOAA's Deputy Under Secretary for Operations, the Program Management Council convenes monthly to assess programs' and projects' performance in terms of cost, schedule, and technical achievement.
[11] The Inspector General also identified funding as a risk to JPSS and noted a potential gap in continuity of NOAA's polar satellite program during testimony before the House Committee on Appropriations on February 9, 2011.
[12] The Commerce, Justice, Science, and Related Agencies Appropriations Act of 2012, H.R. 2596 112th Cong. (2011), overall provides NOAA with just over $4.5 billion—$55 million below the FY 2011 NOAA appropriation. H.R. REP. NO. 112-169 (2011) details recommended funding levels for several NOAA programs, including JPSS.

C. JPSS Program's Baseline Capabilities, Costs, and Schedule Need to Be Finalized

Eighteen months after the decision to restructure NPOESS, NOAA had not formally approved JPSS' high-level performance requirements. Given that JPSS requirements derive predominantly from legacy NPOESS requirements, the delay in defining an operational baseline for the system left life-cycle cost estimates and resulting budget requirements uncertain longer than necessary, at a time when decision makers needed certainty to address extraordinary fiscal challenges.

Life-cycle cost estimates for major programs are based upon user needs reflected in a formally accepted requirements document. In order to be included in the FY 2011 President's budget request, however, the JPSS budget estimate of $11.9 billion (pre-FY 2010 through FY 2026) had to be developed in a compressed timeframe without formally approved JPSS-specific requirements.

In March 2010, NOAA formed a working group to establish JPSS requirements. But the process was delayed because the requirements were dependent, in part, on the Air Force's definition of its polar satellite program, which did not take place until August 2010. Program officials told us that further delays were due to the fact that stakeholders felt they did not have sufficient input into the working group process; as a result, multiple iterations of the requirements document were necessary to gain concurrence. While Defense observed and provided input on the requirements, it was not a formal signatory to the high-level requirements document. NOAA officials indicated that the delay in finalizing program requirements was independent of the program's funding shortfalls and budget uncertainty.

In June 2011, a contractor completed the cost analysis requirements description (CARD) with near-final—but not formally approved—requirements. The CARD describes technical and programmatic features of the program and will be used to develop formal life-cycle cost estimates. According to program officials, aspects of JPSS omitted from the near-final version of the requirements—specifically, the program's responsibilities for supporting NOAA's archiving system—were nevertheless described in the CARD (typically, a program would have an approved requirements document prior to the development of a CARD). The CARD was supporting the development of an independent cost estimate and NOAA's own estimate; the two estimates would then be reconciled.

While formal life-cycle cost estimates were being developed, continued uncertainty over funding spurred the program to task NASA with considering contingencies that prioritized some of the most important requirements while maintaining a launch readiness date no later than February 2017. But JPSS should formally prioritize *all* of its requirements, not just the subset in this contingency exercise, so that it can efficiently adjust the program's performance capabilities or launch dates, if needed, in response to year-to-year funding variances. In what will likely be a prolonged period of budget uncertainty, fully prioritized requirements would allow decision makers to readily make tradeoffs.

Further, the program should develop a plan to accommodate requirements that may have to be removed or relaxed when annual funding falls short of the program's budget but that could be recouped in future appropriations. Officials told us that their general approach in response to funding shortages would be to preserve spacecraft and instrument work at the expense of ground system capability, which could later be restored with additional funding in future fiscal years.

Careful planning is necessary, however, to avoid a repeat of ground system delays in 2010 that threatened to delay NPP's launch (described in finding I above) and could affect the critical path of future JPSS milestones.

III. JPSS Program Needs to Overcome NPOESS-to-JPSS Transition-Related Challenges

While new satellites will be acquired for JPSS-1 (an NPP near-clone) and JPSS-2 (to be competitively bid), with one exception the ground system and instruments that were already under development for NPOESS have been transitioned to the restructured program. The instruments will be delivered and integrated onto the new spacecraft, and the ground system will support both JPSS (beginning with the NPP satellite) and the next generation of Defense satellites.

A. Advanced Technology Microwave Sounder Contract Transition Was Delayed

While the instruments and ground system were under the NPOESS contract, the JPSS program had to work through a cumbersome process with the Air Force to direct development. The ground system, CrIS, and Ozone Mapping and Profiler Suite (OMPS) contracts were transitioned in the fall of 2010 to NASA-awarded JPSS contracts, but the VIIRS transition was delayed until April 2011 and the Advanced Technology Microwave Sounder (ATMS) remained under the NPOESS contract, making NASA's efforts to reduce these instruments' residual risks from NPOESS development more difficult.

As of mid-August, ATMS—built by Northrop Grumman Electronic Systems, a subsidiary of NPOESS' contractor, Northrop Grumman—remained on the NPOESS contract. Urgent changes needed by the JPSS program had been submitted through the Air Force, but without a direct contractual relationship the program had limited access to the contractors' boards, meetings, and data, and limited insight overall—problems that are reminiscent of those associated with NPOESS.[13]

ATMS will provide critical data to enable accurate weather forecasts, but negotiations for transitioning the instrument had stalled. One factor complicating the transition was a dispute over claimed interests in intellectual property. The dispute has taken new form and may result in monetary relief being paid by the government.

As an alternative to transferring ATMS to a NASA contract, JPSS prepared for the possibility of finishing and taking delivery of the instrument under the current NPOESS contract, if necessary. In that case, ATMS would have been built to fly with the NPOESS satellite and NASA would have then needed to modify the ATMS interface to fit JPSS-1. This approach would have entailed more risk, but may have been necessary to avoid JPSS-1 schedule delays.

[13] See for example, the following reports: U.S. Department of Commerce Office of Inspector General, May 2006, *Poor Management Oversight and Ineffective Incentives Leave NPOESS Program Well Over Budget and Behind Schedule: OIG-17794*; and United States Government Accountability Office, May 2010, *Agencies Must Act Quickly to Address Risks That Jeopardize the Continuity of Weather and Climate Data: GAO-10-558*.

After we issued our draft report, NOAA reported that ATMS was transitioned to a NASA letter contract[14] in September 2011.

B. Other Instrument Contracts Have Not Been Finalized

While NASA had transitioned most of the NPOESS instruments to NASA letter contracts, there were delays in agreeing on final contract terms. NASA has reported that contract negotiations for OMPS, VIIRS, and CrIS have taken longer than expected. Therefore, further changes needed for instruments to conform to NASA standards and reduce risks could be delayed, with consequences for the JPSS-1 mission.

Recommendations

To mitigate the risks of using NPP data operationally, we recommend that NESDIS' Assistant Administrator

1. Determine the availability of additional resources to support calibration and validation.
2. Ensure sufficient management oversight of communication and coordination between JPSS and NESDIS STAR.
3. Determine the feasibility of establishing an alternate mission management center and an additional science data downlink for NPP as soon as possible.

To ensure the adequacy of JPSS development activities going forward, NOAA's Deputy Under Secretary for Operations should

4. Maintain adequate oversight and awareness of all segments that could adversely affect the critical path to launch and timelines for post-launch data production. In particular, the Program Management Council should keep sufficient focus on ground system development to ensure it does not jeopardize the mission schedule and operational needs.
5. Ensure that the planning and coordination necessary to meet mission objectives occurs between JPSS and external entities.

In order to sufficiently prepare for an expected gap in polar satellite data from the afternoon orbit, NOAA's Deputy Under Secretary for Operations should

6. Coordinate efforts from across its line offices to minimize the degradation of weather and climate forecasting during gaps in coverage. A NOAA-wide view will help senior management ensure the adequacy of efforts and facilitate improvements.

In order to more efficiently manage the JPSS program under continued budget uncertainty, NESDIS' Assistant Administrator should

[14] A *letter contract* is a written preliminary contract that authorizes the contractor to immediately begin manufacturing supplies or performing services.

7. Develop a mechanism that provides executive and legislative decision makers, on a recurring basis, complete, objective and understandable data that illustrates the consequences of limiting satellite observational capabilities.

8. Prioritize all JPSS requirements (beyond those already prioritized in NASA's contingency exercise) and develop a plan for requirements that could be relaxed or removed due to near-term funding constraints and added back in future years if funding is restored. Such a plan should include steps to manage uncertainty with at-risk requirements, such as maintaining contractual relationships during shortfalls or avoiding termination liability through appropriate contractual safeguards.

In order to complete the transition from NPOESS and move the JPSS program forward, NOAA's Deputy Under Secretary for Operations should

9. Ensure that the JPSS program finalizes contracts with instrument vendors.

Summary of NOAA Comments and OIG Response

In responding to our draft report, NOAA concurred with all of our recommendations. It also included editorial comments and suggested factual and technical changes in regards to certain aspects of our findings. See appendix B for the complete response.

OIG Response

We are pleased that NOAA concurred with all of our recommendations.

With regard to NOAA's editorial comments about NPP and the ground system, we understand the historical context of NPP as it relates to JPSS. While NPP was designed and built as a research mission, it will be the only polar satellite in the afternoon orbit that can provide critical observations for a significant period of time. So, in addition to its data, the NPP satellite and its ground system will be used operationally and, therefore, risk should be assessed accordingly. Further, our findings focus only on the most critical features the ground system lacks (an alternate mission management center and additional science data downlinks) and for which it would appear that mitigating action is appropriate.

Our discussion of the issues with CLASS and NDE test readiness simply related the fact that coordination with these external entities is necessary to avoid negatively affecting the schedule for ground system development. NOAA concurred with our recommendation 5 in this regard and has established a monthly review of the development of the NESDIS enterprise required to support JPSS.

We have reviewed all of NOAA's recommended changes for factual and technical information and incorporated them into the final report where appropriate. We acknowledge NOAA's point that the NPP spacecraft design life is a limiting factor but, as we describe in the report, so too are the instruments. As further evidence on this point, we note that NASA's requirements for NPP call for only a subset of instruments to function for only 3 years and do not require long-term production of key data records for the mission to be considered fully successful.

Regarding NOAA's comments on our assessment of preparations for post-launch data production, we have a firm basis for this aspect of our finding. The NPP team's status reports to management have reported STAR's support for the JPSS ground system as an issue and indicate communication problems and the fact that there was no agreement on the role for STAR with respect to JPSS. We interviewed JPSS officials to confirm that communication and coordination between the two entities was an issue that was having consequences for calibration and validation preparations and needed management's attention. NOAA agreed with our recommendation 2 in this regard.

We have further substantiated our use of the February 2017 launch date for JPSS-1 under finding II. We have also updated finding III to reflect that ATMS has been transitioned from NPOESS to a NASA letter contract. The ATMS contract, like the other instrument contracts, will need to be finalized to completely resolve the transition issues.

Appendix A: Objectives, Scope, and Methodology

Our objective was to determine the adequacy of the Joint Polar Satellite System's (JPSS') development activities intended to maintain continuity of weather forecast and climate data obtained from polar orbit. As part of this objective, we determined the completeness of technical approaches used in developing and testing the flight and ground project segments; assessed the impacts of development modifications and project risks on JPSS' cost, schedule, and technical performance; and determined the adequacy of preparations for post-launch data production.

One focus of our fieldwork included those activities needed for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) launch. In particular, we examined the ground system/satellite compatibility tests and the resolution of the ground system issues we initially identified in our audit survey work. Another focus was at the JPSS programmatic level, where transition- and funding-related challenges threatened to delay JPSS-1 and JPSS-2 satellites' launch readiness dates and lead to gaps in polar satellite coverage. The audit scope necessarily included a review of NPOESS history, including its restructuring into separate civilian and defense programs that began in late 2009 and became official in February 2010. Even prior to our audit survey work, we regularly attended monthly Transition Team meetings, which began in February 2010 and continued through April 2011.

Our fieldwork included attending various Department, National Oceanic and Atmospheric Administration (NOAA), JPSS program, and NPP project reviews, such as

- Department of Commerce Quarterly Satellite Briefing and Joint Review Board;
- NOAA Program Management Council;
- National Aeronautics and Space Administration (NASA) Goddard Space Flight Center monthly status reviews;
- JPSS Transition Team and Requirements Working Group;
- the JPSS program concept review;
- monthly ground system program management reviews;
- NPP test readiness reviews for NPP compatibility test (NCT) 3 parts 1 and 2, and NCT 4;
- post-NCT after-action reviews;
- an NPP flight operations review; and
- an algorithm operability verification review.

We closely observed NCT 3 parts 1 and 2, and attended preparation meetings for NCT 4. We reviewed daily and weekly status reports of NPP's project team, including those pertaining to satellite environmental testing and discrepancy resolution.

In addition, we interviewed various JPSS program officials and individuals from NASA's NPP team. We also interviewed NOAA officials from the National Environmental Satellite, Data, and Information Service/NPOESS Data Exploitation and the National Centers for Environmental Prediction. We reviewed and analyzed program documentation, test plans and procedures, test reports, and system discrepancy reports. We determined the data was sufficiently reliable for purposes of this report.

We conducted our fieldwork from November 2010 through August 2011. Locations we visited include NOAA headquarters in Silver Spring, Maryland; the JPSS program office in Lanham, Maryland; the NOAA Satellite Operations Facility, in Suitland, Maryland; Raytheon's facility in Aurora, Colorado; Ball Aerospace Technology Corporation's facility in Boulder, Colorado (where the NPP satellite was integrated and tested); and NCEP headquarters in Camp Springs, Maryland.

We performed this audit under the authority of the Inspector General Act of 1978, as amended, and Department Organization Order 10-13, dated August 31, 2006. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix B: Response to OIG's Draft Report

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
CHIEF ADMINISTRATIVE OFFICER

September 26, 2011

MEMORANDUM FOR: Allen Crawley
Assistant Inspector General for Systems Acquisition and IT Security

FROM: William F. Broglie
NOAA Chief Administrative Officer

SUBJECT: Draft OIG Report – *Audit of the Joint Polar Satellite System: Challenges Must Be Met to Minimize Gaps in Polar Environmental Satellite Data*

Thank you for the opportunity to comment on the Office of the Inspector General's draft report of its review of the Joint Polar Satellite System program. Our specific comments on the report's findings and recommendations are attached.

Attachment

Department of Commerce
National Oceanic and Atmospheric Administration
Comments on the Draft OIG Report Entitled
"Audit of the Joint Polar Satellite System: Challenges Must Be Met to Minimize Gaps in Polar Environmental Satellite Data"
(Draft Report September 12, 2011)

General Comments

The Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to review the Office of Inspector General's (OIG) draft report on the Joint Polar Satellite System (JPSS). As stated in the OIG report, the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) remains on track to launch in October 2011, but there are still several risks with the project. The findings pertaining to JPSS and the NPP mission are accurately portrayed in their capacity as a NOAA operational mission and a National Aeronautics and Space Administration (NASA) research mission, respectively. However, the report focuses first on the development of the ground system for NPP and offers findings that presuppose the ground system is an operational system when, in fact, it was never planned to be. The report should describe the development of the ground system as an acquisition process whose goal is a fully operational system in time for JPSS by fiscal year (FY) 2017.

NOAA Response to OIG Recommendations

Recommendation 1: "Determine the availability of additional resources to support calibration and validation."

NOAA Response: NOAA concurs with this recommendation. NOAA will review current calibration/validation plans and ensure data required for Numerical Weather Prediction and Key Performance Parameters are validated for operational use as a priority. In addition, resources required to complete all calibration/validation work within 18 months will be identified. NOAA has already identified $7 million in additional FY 2012 funds for calibration and validation activities.

Recommendation 2: "Ensure sufficient management oversight of communication and coordination between JPSS and NESDIS STAR."

NOAA Response: NOAA concurs with this recommendation. A signed Management Control Plan between NOAA and NASA will help to articulate roles and responsibilities between the two organizations. In addition, NOAA is undertaking two actions to improve coordination and communications. First, an Algorithm Transition Plan is being developed to outline roles and responsibilities and eventual transfer of responsibilities for algorithm development, maintenance, and calibration and validation work. Second, a JPSS Coordination Group, with representation from STAR, other NESDIS line offices and key user communities is being established to facilitate communications among the various stakeholders.

Recommendation 3: "Determine the feasibility of establishing an alternate mission management center and an additional science data downlink for NPP as soon as possible."

NOAA Response: NOAA concurs with this recommendation. NOAA has already started to address these issues. Specifically, two concurrent efforts are underway to address the need for an alternate mission management center as well as an alternate data processing site. An Alternate Common Ground System Working Group comprising NOAA and NASA representatives has been established to identify the requirements, and plan for an alternate processing facility required by NIST 800-53. In addition, JPSS has funded the NESDIS CIO's Division to initiate a study to identify a site for a NESDIS consolidated backup facility to address needs for GOES-R, JPSS and current operations.

Recommendation 4: "Maintain adequate oversight and awareness of all segments that could adversely affect the critical path to launch and timelines for post-launch data production. In particular, the Program Management Council should keep sufficient focus on ground system development to ensure it does not jeopardize the mission schedule and operational needs."

NOAA Response: NOAA concurs with this recommendation.

Recommendation 5: "Ensure that the planning and coordination necessary to meet mission objectives occurs between JPSS and external entities."

NOAA Response: NOAA concurs with this recommendation. NESDIS has established a monthly status review that will review the development of the NESDIS enterprise required to support JPSS (including the development of NDE). This information is also provided to the NOAA Program Management Council which will consider effects on the NOAA enterprise.

Recommendation 6: "Coordinate efforts from across its line offices to minimize the degradation of weather and climate forecasting during gaps in coverage. A NOAA-wide view will help senior management ensure the adequacy of efforts and facilitate improvements."

NOAA Response: NOAA concurs with this recommendation.

Recommendation 7: "Develop a mechanism that provides executive and legislative decision makers, on a recurring basis, complete, objective and understandable data that illustrates the consequences of limiting satellite observational capabilities."

NOAA Response: NOAA concurs with this recommendation. NOAA already provides monthly and/or quarterly briefings to the Department of Commerce, Executive Office of the President offices, and key Congressional committee staffers on the status of its satellites programs. These briefings can be expanded to include objective and understandable data illustrating the consequences of limiting satellite observational capabilities. In preparation for this effort, NOAA has already commissioned a study out of its Program, Planning and Integration office to evaluate the economic value of JPSS data.

Recommendation 8: "Prioritize all JPSS requirements (beyond those already prioritized in NASA's contingency exercise) and develop a plan for requirements that could be relaxed or removed due to near-term funding constraints and added back in future years if funding is restored. Such a plan should include steps to manage uncertainty with at-risk requirements, such as maintaining contractual relationships during shortfalls or avoiding termination liability through appropriate contractual safeguards."

NOAA Response: NOAA concurs with this recommendation. NOAA has already identified the need to recruit additional system engineering staff to assist in the management of its JPSS requirements. NOAA has a rigorous process for collecting and validating the requirements across the NOAA line office, led by the NOAA Office of Technical Planning and Integration for Observation (TPIO). NESDIS has begun to engage TPIO to further prioritize the requirements for JPSS.

Recommendation 9: "Works with the Air Force and other parties to expeditiously transfer the ATMS contract to NASA and NOAA. Should the "finish and deliver" option become necessary, NOAA's Program Management Council should ensure that an adequate risk analysis has been performed to ensure mission success, safety, and avoidance of cost overruns."

NOAA Response: NOAA concurs with this recommendation. The ATMS contract has already been transitioned to a NASA contract, pursuant to an Interagency Agreement between NOAA and NASA.

Recommendation 10: "Finalize contracts with instrument vendors."

NOAA Response: NOAA concurs with this recommendation. The CrIS, OMPS and JPSS-1 spacecraft contracts are expected be finalized by the end of September. The VIIRS contract is targeted for January 2012.

Recommended Changes for Factual/Technical Information

Page 2, second paragraph:
The design life of the NPP instruments is 7 years, but the spacecraft is designed for 5 years of operations, which is the limiting factor. The report should clearly state this difference.

Page 2, third paragraph, first sentence:
The JPSS-1 spacecraft will be a "near-clone" of NPP. In addition to more rigorous engineering standards, which will extend its life to seven years, it will replace obsolete sub-systems and introduce additional communication capabilities such as a Ka-band downlink.

Page 2, third paragraph, second sentence:
The assumptions behind the report's assertion of the February 2017 launch date for JPSS-1 should be identified. Specifically, the funding assumptions, that NOAA must receive the FY 2012 President's Budget Request funding level for JPSS within the first quarter of FY 2012 to maintain a first quarter FY 2017 launch readiness date, associated with the launch dates should be listed or footnoted. NOAA has not set a "No-Later-Than" date.

Page 4, second paragraph, third sentence:
The sentence that states, "A significant number of other data records, however, will not be supported until a ground system upgrade, which is planned for March 2012" is misleading. It should be rewritten to "Lower priority products will have their known deficiencies addressed in the first upgrade to the ground system, which is now planned for March 2012."

Page 4, third paragraph:
STAR received approximately half of the funding requested for JPSS. The Calibration and Validation (Cal/Val) program required approximately $30 million to complete, yet only received $13 million. At the end of FY 2011, an additional $7 million was received, but only $4 million could be obligated due to the last minute receipt of the funds. Prior to FY 2011 funding issues, intensive Cal/Val for all products was expected to take 24 months prior. Critical funding required to maintain schedule was not received and the amount of time needed to fully validate has extended past 24 months for low priority products. The additional funding received in late FY 2011 was insufficient to recover schedule. It did however, allow for STAR to restore personnel toward requested FY 2011 levels to assist in transition activities in fall 2011 rather than spring 2012 for high priority System Definition Review teams.

Statements describing the role of STAR within the JPSS / NPP program and the supposed communication and coordination challenges are not based on a thorough assessment. To our knowledge, no STAR person or responsible office was ever interviewed for this report.

Page 5, first paragraph:
The specific vulnerabilities of the JPSS ground system should not be publicized. Openly stating that the U.S. weather forecasting capability can be severely degraded by attacking one of several specific facilities leaves the facilities open to compromise. The Department of Defense treats similar information regarding their systems at the highest level of classification. Recommend that this topic be treated more generically without the mention of specific facilities and their locations.

Page 6, first paragraph; Page 12, second, third, fifth, sixth, and seventh paragraphs; Page 14, second paragraph:
Please substitute the word "transition" for the word "transfer" whenever referring to the transition of subcontracts to the JPSS program. The instrument and ground system subcontractors were not "transferred" from the NPOESS contract. The work was transitioned to new NASA letter contracts via a termination for convenience action.

Page 7, third paragraph, line 5:
The word "Date" should be replaced with the word "Data."

Page 8, second paragraph, second sentence:
The program has received $89.7 million in additional FY 2011 funds not $109 million. There were unexpended funds on the NPOESS contract which are being used to fund limited activity via the U.S. Air Force – this activity is expected to end in FY 2012.

Page 8, second paragraph, fourth sentence and throughout report as appropriate:
The program's current plans are to launch JPSS-1 in Quarter 1 FY 2017, rather than the February 2017 date listed in the report. There are several other locations in this report where the launch date is misstated. When this change is made, the expected gap using the OIG methodology (assuming NPP operates through its five-year design life and a 6-18 month Cal/Val period for JPSS-1) should be 6-18 months, rather than the 9-21 months the report states.

Page 8, Figure 3:
The figure should show the launch date of JPSS-1 as Quarter 1 FY 2017 and make the associated changes to the analysis of the length of the gap.

Page 8, Figure 3:
The existing Page 8, Figure 3 clarification should be replaced with the following:
The scale of the chart is labeled as fiscal year and the triangle launch dates are placed correctly for fiscal year, but the labels underneath are listed in calendar year. Using the fiscal year scale, NOAA-19 launch should be identified as "Q2 FY 2009," NPP should be "Q1 FY 2012," JPSS-1 should be "Q1 FY 2017," and JPSS-2 should be "Q1 FY 2022."

Page 9, last paragraph
The report implies that geostationary satellite data could mitigate the impact of a NPP-JPSS data gap for global polar-orbiting data. The National Weather Service does not believe such mitigation is realistic.

Page 11, second paragraph, second sentence:
It is accurate that the FY 2011 budget had to be developed in a compressed time-frame; however, it was not developed *without* JPSS-specific requirements, it was developed without having the time to properly estimate the financial impact of JPSS-specific requirements.

Page 11, sixth paragraph, second sentence:
To clarify the statement it should read "to preserve spacecraft and instrument work at the expense of ground system *capability*". NOAA appreciates the current state of the ground system and will not threaten its further development.

Page 12, second paragraph and Section A and several other sections throughout the report:
The ATMS instrument has been transitioned to NASA – the report should be updated to reflect its new status.

Editorial Comments

Page 2, second paragraph; Page 4, Finding I; and for the remainder of the document:
NPP will be launched by NASA as a NASA mission, managed by the NASA Goddard Space Flight Center, and will later be transferred to NOAA for operation from NOAA's Satellite Operations Facility (NSOF). NOAA intends to use NPP's data operationally for short and long-term weather forecasting and environmental monitoring. NPP is not an operational satellite nor is the ground system as built for NPP.

As NPP was a risk-reduction mission and consistent with plans coordinated with the IPO, NDE and CLASS were not scheduled to have operational versions of their systems in place prior to launch – it was always planned to have these capabilities installed after launch. The upgrades to support NCT testing were made in response to requests from the NPP project.
Given the ground system development in preparation for the launch of NPP does not require all of the elements of an operational ground system nor were there plans to implement the elements of an operational ground system; NESDIS recommends that all discussion of implementing elements associated with an operational ground system be deleted.

Further discussion about the various phases of testing of the NPP ground system (e.g., NCT3 part 1) should be consolidated and summarized for this report. The finding seems to be lost in the details of this section and would be better served if described in the context of the complex multi-year process of developing the ground system instead of focusing on a single year during which both a transition of work from the now-defunct NPOESS program coincided with the implementation of a severely under-funded program.

When discussing the "ground system," it would be helpful if the OIG report would distinguish between the data transmission capabilities of the ground system and the satellite product capabilities. While both are necessary in serving users, budget pressures and implementation strategies can impact these two areas differently.

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