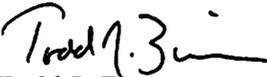




**UNITED STATES DEPARTMENT OF COMMERCE**  
**The Inspector General**  
Washington, D.C. 20230

June 10, 2011

**MEMORANDUM FOR:** Dr. Jane Lubchenco  
Under Secretary of Commerce  
for Oceans and Atmosphere and  
NOAA Administrator

  
Todd J. Zinser

**FROM:**

**SUBJECT:** NOAA's Joint Polar Satellite System Audit Observations

As you are aware, we are conducting an audit of NOAA's Joint Polar Satellite System (JPSS) program. We have also been monitoring the transition from the National Polar-orbiting Operational Environmental Satellite System (NPOESS) to JPSS. A summary of NOAA's polar satellite program before and after NPOESS restructure is presented in table 1 in attachment A. This memorandum is intended to provide you with our current observations concerning the JPSS program in the following areas: funding shortfalls, transition delays, NPOESS Preparatory Project (NPP) launch and ground system status, and the life-cycle cost estimate.

***1. NOAA Expects a Gap in Weather and Climate Observation Data as a Result of Current JPSS Funding Levels***

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

While the JPSS program had some success in early FY 2011 in establishing contracts for most of the instruments, spacecraft, and ground system, this year's funding levels under the continuing resolutions limited program startup activities. For example, NASA was unable to adequately execute these newly established contracts, except for ground system development for NPP, because it lacked funding to hire sufficient technical staff or order long-lead items (long-lead engineering, development work, and parts needing a long-lead time to be acquired/produced) before the satellite launch. As a result, the program was unable to establish a realistic schedule and technical performance capabilities to provide continuity of weather and climate data for the afternoon orbit.



During congressional testimony in February 2011, we identified FY 2011 funding as a risk to the JPSS program and noted a potential gap in continuity of NOAA's polar satellite program based on actual life of satellites, instrument operational status, and other factors.<sup>1</sup> At that time, NOAA assumed the FY 2011 JPSS budget would be \$776 million (the FY 2010 total NPOESS funding level) and requested a continuing resolution (CR) anomaly to provide funding at \$910 million, still short of the \$1,061 million President's budget request. Yet, only \$382 million was enacted for the program under the Full-Year Continuing Appropriations Act, 2011 (see table 2 in attachment A).

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-1. Specifically, the lack of funding has slowed ongoing NASA contract activities that are needed for JPSS-1 development. Therefore, it will take longer to build the satellite than originally intended with the start of operations now projected beyond NPP's design life. A gap will result in a lack of data, reducing accuracy of weather forecasts and causing a break in data needed to maintain a continuous climate record. Based on our analysis of NOAA information and an assumption of a JPSS-1 launch as late as the winter of 2018, we currently estimate that this gap will be between 18 and 30 months in length (see figure 1 on page 3). The actual length of the gap depends on the following four major factors:

1. whether NOAA receives additional funding in FY 2011, and the amount of that funding;<sup>2</sup>
2. the FY 2012 JPSS appropriation;<sup>3</sup>
3. how NOAA prioritizes user needs for national weather and climate data; and
4. the actual life 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 Northrop Grumman contract with limited government oversight and a history of technical issues. Additionally, NASA lacked technical oversight during instrument development, manufacturing, and testing, creating uncertainty as to these instruments' ability to operate as long as the spacecraft's design life. Although NOAA's current gap analysis assumes that NPP will have a 5-year operational life, NOAA recognizes NASA's revised NPP mission success criteria of 3 years of operation, which takes residual risk of instrument performance into account.

To mitigate a gap, NOAA is assessing its options.

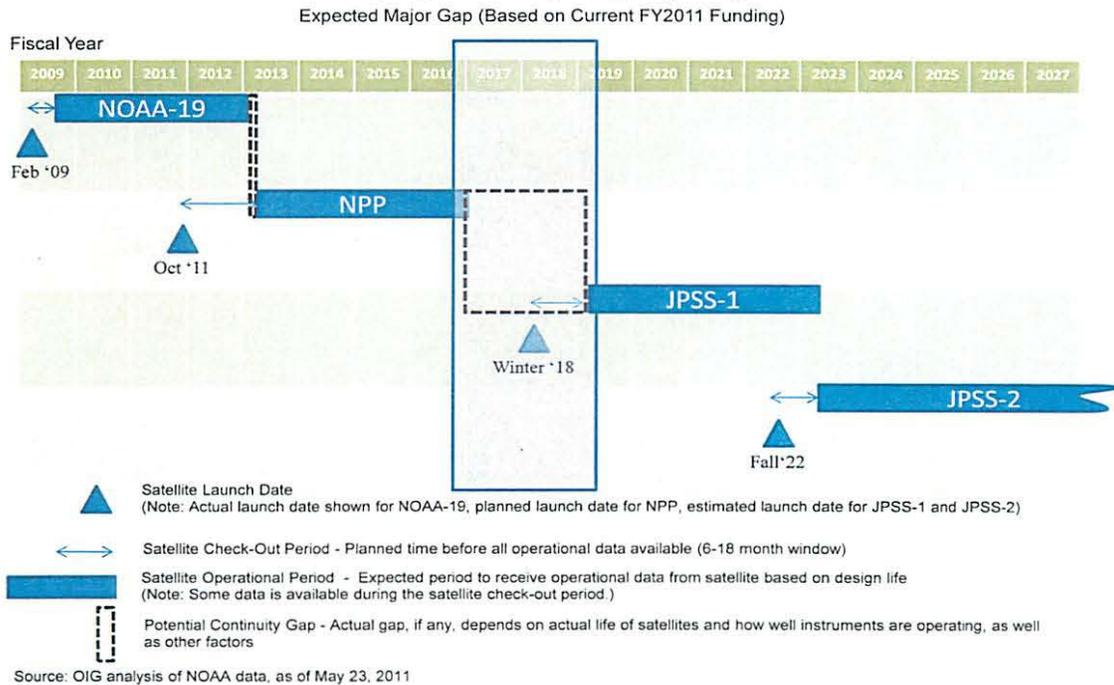
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<sup>1</sup> We testified before the House Committee on Appropriations on the subject of FY 2012 Department of Commerce appropriations and top management challenges on February 9, 2011, and provided answers to the committee's questions for the record on March 15, 2011.

<sup>2</sup> The Department and NOAA have met with OMB and Office of Science and Technology Policy to request assistance in mitigating the gap in satellite coverage by securing additional funds in FY 2011 and the President's budget in FY 2012. At this point in time, no resolution has been forthcoming.

<sup>3</sup> Should NOAA receive its total request for FY 2012 (with no additional funds in FY 2011), then we estimate the gap would be reduced to between 12 and 24 months based on an earlier launch date in 4<sup>th</sup> quarter of FY 2017 for JPSS-1.

**Figure 1. Potential Continuity Gaps in NOAA's Polar Operational Satellite Programs  
(Expected Gap Highlighted)**



## 2. Transition Delays Have Exacerbated an Expected Gap between NPP and JPSS-1

Significant contractual issues have hampered the program from moving forward. In the fall of 2010, NASA established contracts for the instruments and spacecraft in anticipation of transferring the remaining property from the NPOESS contract and moving forward with JPSS development efforts. However, because most of the instruments were still being manufactured under NPOESS, NOAA and NASA have had to work through a cumbersome process with the Air Force in order to implement desired development changes. In particular, one remaining instrument, the Advanced Technology Microwave Sounder (ATMS), which provides critical data to enable accurate weather forecasts, has still not been transferred from the NPOESS contract, and the program has recently submitted urgent changes to the Air Force. Also, when we testified in February, intellectual property settlement had not been completed and this status is unchanged.

## 3. Any Significant Issues Could Delay Launch of NPP, Causing a Potential Near-Term Gap

Currently, NPP is on track to meet its launch schedule. The NPP spacecraft, integrated with all instruments (NPP observatory), completed environmental testing at the end of April. This testing included operation of the observatory in a simulated space environment; the NPP program found no issues that would prevent proceeding with the final portion of the test schedule. The observatory still needs to go through compatibility testing this summer to evaluate the ground system's ability to control the observatory, the flow of data through the ground system after receipt from the observatory, and the creation of weather and climate products from the data.

However, in addition to the gap prior to the first JPSS satellite, there is some potential for a gap between NOAA-19 and NPP (see figure 2 in attachment A). This would occur if, for example,

NOAA-19 experiences an early end of life or failure, the NPP observatory requires an extended post-launch checkout period before all data is operationally available, or the NPP launch is delayed. Also, any significant issues during the rest of the development period could delay the NPP launch and increase cost.

Such a delay could be much longer for reasons to include obtaining a new launch window within the existing Vandenberg Air Force Base launch schedule, and availability of staff and facilities should the delay extend into holiday periods. Additionally, depending on the length of the delay, there is a risk of not maintaining launch vehicle (Delta II) expertise. The cost of such delays, of course, depends on the length of the delay, the nature of the issue, and monthly costs for launch services that vary.<sup>4</sup>

#### ***4. Ground System, Essential for Operation of NPP, Appears Back on Track, but the Compressed Test Schedule Could Jeopardize Data Availability***

At the start of 2010, our technical experts were fully engaged with the JPSS transition team. By spring of that year, we observed that a growing number of unresolved problems with ground system development and testing were not getting adequate attention. Since the ground system must first support the NPP satellite, resolving any issues promptly is vital to maintaining weather and climate data continuity.

We immediately alerted Commerce and NOAA leadership to our concerns, including the potential delay of the NPP launch because of the issues with the ground system. Specifically, in July 2010, at least 247 issues were being considered for resolution prior to the start of a key NPP compatibility test to demonstrate that the ground system could properly control the satellite. This test, originally scheduled for August 2010, was postponed until January 2011 because the program was unable to complete the significant number of software changes to address these issues prior to testing. Since July 2010, the program has discovered additional issues that also have to be prioritized and their disposition determined before launch.<sup>5</sup>

Additionally, under the current Air Force NPOESS contract with Northrop Grumman, there were barriers preventing the JPSS program from effectively working with the ground system subcontractor (Raytheon) to complete the necessary software changes to resolve these issues. In particular, the delay in transitioning the ground system from the Air Force contract to NASA restricted the program's ability to directly communicate with Raytheon and required the program to go through the Air Force's contracting office in order to direct development work on the ground system. The ground system contract was successfully transferred to NASA September 22, 2010, thereby mitigating this cumbersome communication.

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<sup>4</sup> Examples are rough order-of-magnitude cost estimates. Costs for delays of more than 1 month are not linear with costs for a single-month delay. For example, cost for a single-month delay is \$7.3 million; cost for a 2-month delay is \$12.0 million (less than 2 times as much); and cost for a 5-month delay is \$41.4 million (more than 5 times as much).

<sup>5</sup> According to NOAA, as of June 2011, the number of issues which have not been closed is 69. Of these, all but 7 have been fixed and are awaiting verification at the next compatibility test. Of the remaining 7 outstanding issues still being worked, 5 are under analysis.

In January 2011, we observed the compatibility test that had been postponed from last August. It appeared to have been largely successful; however, the program had not yet finished verifying all the requirements the test intended to assess before it started a second test. This second test was designed to evaluate the flow of data through the ground system after it had been received from the satellite, as well as the creation of products from the data. The test had been scheduled for March 2011, but the program postponed it until April in order to complete a very large number of software changes.

We observed this second test as well and noted several issues, some of which the JPSS program has decided not to address until after launch, which increase the risk of users not receiving weather and climate data products within NPP's planned 18-month checkout period after launch. Also, until the program completes a final compatibility test this summer, the total number of issues that must be resolved during the post-launch checkout period will remain unknown. Additionally, the final compatibility test leaves little time to address any new or remaining issues before the program places a planned 75-day pre-launch freeze on development activities in August 2011. The delays in development and testing that have occurred thus far have compressed the schedule and increased the risk that pre-launch requirements will not be fully verified. Also, any additional post-launch work to address these issues will have to be completed along with the previously planned checkout period activities.

#### ***5. Life-Cycle Cost Estimate and Resulting Budget Requirements Are Uncertain***

Life-cycle cost estimates for major programs are based upon user needs reflected in a formally accepted requirements document; however, in order to be included in the FY 2011 President's budget request, the JPSS budget estimate of \$11.9 billion (pre-FY 2010 through FY 2026) had to be developed in a compressed timeframe without JPSS-specific requirements. (While NOAA had existing NPOESS requirements, it did not have time to create a set of high-level requirements for JPSS.) In March 2010, the program formed a requirements working group, but NOAA's establishment of JPSS requirements (particularly for the ground system) was further delayed because these requirements were dependent on Air Force's definition of its polar satellite program, which did not occur until late August 2010.

With near-final requirements, the JPSS program is developing a cost analysis requirements description (CARD), which is needed to produce an independent cost estimate (ICE). The CARD provides a description of technical and programmatic features of the program and is planned to be completed by July 1, 2011. NOAA's Chief Financial Officer will then produce the ICE. Once the ICE is complete, NOAA will reconcile differences between it and the JPSS program estimate of \$11.9 billion. This process will result in a more certain cost estimate.

We greatly appreciate NOAA's cooperation during our review and the access we have been given to JPSS program activities. If you have any questions or would like to discuss the issues in this memo, please do not hesitate to call me at (202) 482-4661 or Allen Crawley at (202) 482-1855.

**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**

**Attachment A: Polar Satellite Summary, Budget Snapshot and Potential Continuity Gaps**

***Table 1. Summary of NOAA's Polar Satellite Program Before and After Restructure***

<b>Key Area</b>	<b>NPOESS</b>	<b>JPSS</b>	<b>Comments</b>
Number of satellites	4 (Post Nunn-McCurdy <sup>a</sup> )	2	6 satellites prior to Nunn-McCurdy; development and operation through 2026
Life-cycle cost estimate (\$ millions, as of date)	\$12,520 <sup>b</sup> Feb 2008	\$11,929 Feb 2010	Air Force will now fund/develop Defense Weather Satellite System; cost is not yet determined
Cost share for program development and operation	Approximately 50/50 split between Air Force and NOAA	NOAA responsible for 100% of development costs; operations costs shared	Air Force satellites will be operated by JPSS ground system
NPP Purpose	Risk reduction	Operational use of data	Change is result of need to preserve data continuity
Acquisition agent	Air Force	NASA	NPOESS managed by Integrated Program Office (Air Force, NOAA, and NASA). NOAA-program management; Air Force-acquisition; and NASA-development/incorporation of new technologies.

Source: OIG Summarization of NPOESS/JPSS Program Documentation and Budget Estimates

<sup>a</sup> The Nunn-McCurdy provision (10 U.S.C. § 2433) requires the Secretary of Defense to notify Congress when unit costs for a major acquisition program grow by 15 percent over its baseline estimates. In November 2005, the Department of Defense's Cost Analysis Improvement Group showed that cost growth for NPOESS had exceeded 25 percent, triggering the Nunn-McCurdy certification requirement.

<sup>b</sup> By December 2008, it was clear this estimate was not attainable given that the NPOESS acquisition program baseline had grown to nearly \$14 billion.

**Table 2: Budget Snapshot—Before and After Restructure (\$ millions)**

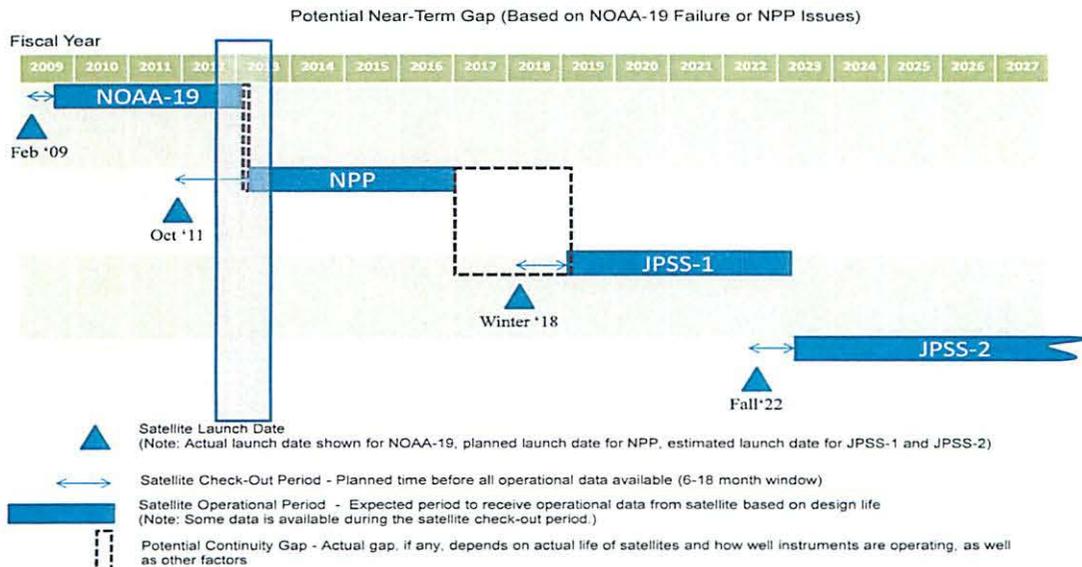
Fiscal Year	NPOESS <sup>a</sup>		JPSS <sup>b</sup>		Comments
	Air Force	NOAA	Air Force	NOAA	
2009	\$290	\$288	N/A	N/A	
2010	\$384	\$382	N/A	N/A	Portion of NOAA share applied to JPSS based on restructure
2011	\$421 Plan before restructure	\$420 Plan before restructure	\$0	\$1,061 Request	JPSS funded at \$382, leaving \$679 shortfall; NOAA requested a CR anomaly to provide funding at \$910, but assumed a budget of \$776 that was required to prevent significant change to the program
2012	\$417 Plan before restructure	\$416 Plan before restructure	\$0	\$1,160 Request	
<b>Total through 2026</b>	<b>\$6,270</b>	<b>\$6,250</b>	<b>\$0</b>	<b>\$11,929</b>	
<b>NPOESS total</b>	<b>\$12,520</b>				

Source: OIG Summarization of NPOESS/JPSS Budget Estimates

<sup>a</sup> Based on NPOESS FY2009 President’s Budget Request, February 2008

<sup>b</sup> Based on JPSS FY2011 President’s Budget Request, February 2010

**Figure 2. Potential Continuity Gaps in NOAA’s Polar Operational Satellite Programs (Near-Term Potential Gap Highlighted)**



Source: OIG analysis of NOAA data, as of May 23, 2011