Testimony of

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Weathering Change: Need for Continued Innovation in Forecasting and Prediction

Chairman Begich, Ranking Member Snowe, and Members of the Subcommittee:

I appreciate the opportunity to testify today about the challenges NOAA faces in its efforts to develop and launch its new environmental satellites while minimizing expected data gaps.

For the past 50 years, NOAA, in partnership with the National Aeronautics and Space Administration (NASA), has been responsible for developing and operating polar and geostationary environmental satellite systems. 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 catastrophe. 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 increases for gaps in critical satellite data.

Between 1995 and early 2010, NOAA partnered with the Department of Defense (DoD) and NASA in the development of the National Polar-orbiting Operational Environmental Satellite System (NPOESS), which was at that time the planned replacement system for NOAA's Polar Operational Environmental Satellite System and DoD's Defense Meteorological Satellite Program. The original NPOESS program was to develop six satellites, with first launch planned for 2009 and an estimated life-cycle cost of $6.5 billion through 2018. By late 2009, however, the program had reduced its scope to four satellites; the first launch was delayed until 2014, while its life-cycle cost estimate had escalated to $14 billion through 2026.

In February 2010, the White House's Office of Science and Technology Policy announced its decision to have NOAA, in partnership with NASA, establish the Joint Polar Satellite System (JPSS) program as part of a NPOESS restructuring due to its long history of cost overruns and schedule delays. At that time, the JPSS program planned to launch two satellites—at an

estimated cost of $11.9 billion—to collect data for short- and long-term weather and climate forecasting through 2026. In order to be included in the FY 2011 President's budget request, NOAA had to develop the JPSS budget estimate so quickly that—while NOAA had existing NPOESS requirements in place—it did not have time to formally approve high-level requirements for JPSS. In September 2011, NOAA notified Congress that it had recently completed its high-level JPSS requirements, was refining its cost estimate, and planned to incorporate updated baselines (cost, schedule, and performance) in the upcoming FY 2013 budget submission.

The Senate Committee on Appropriations has proposed funding JPSS with $921 million in FY 2012 while the House of Representatives appropriations bill recommends $901 million. Both bills fall short of the President's $1.07 billion budget request for JPSS, which the program maintains is necessary to ensure the first JPSS satellite's (JPSS-1's) launch date in the first quarter of 2017.

Given its history, this critical program requires strong program management and close oversight to minimize further delays and prevent interruptions in satellite coverage. Our work has identified these near-term priorities for NOAA as it manages JPSS:

- complete the data checkout for the NPOESS Preparatory Project (NPP) and
- strengthen program management and systems engineering to mitigate JPSS coverage gaps.

Preventing Near-Term Coverage Gaps: from NOAA-19 to NPP

JPSS-1 will be preceded in orbit by the NPP satellite, originally a NASA-led risk reduction effort to test NPOESS' new instruments in flight. NOAA will now use NPP to maintain continuity of climate and weather forecast data between NOAA's current polar-orbiting operational environmental satellite (NOAA-19) and JPSS-1. Despite recent efforts by NASA's NPP team (including contractors) to meet the satellite's scheduled launch date, late development of the ground system has compressed the mission schedule—and delayed the schedule for data product availability.

Since we issued our September 30, 2011, report on JPSS, NASA successfully launched NPP on October 28 and reports that satellite checkout activities, such as instrument activation, are proceeding according to schedule. Once checkout completes, NASA will turn the satellite over to the JPSS program to calibrate the instruments and validate the scientific quality of data products; ultimately, the JPSS program will hand over satellite operations to NOAA.

After the launch, NOAA originally planned to make NPP operationally ready in 18 months, which coincides with the end of the design life of NOAA-19 (approximately March 2013). This plan left little room for contingencies. Both NOAA and our office have identified a number of risks that, if not properly mitigated, could cause further delays in NPP operational readiness and degradation of NOAA's weather and climate forecasting capability:

- ***Potential coverage gap.*** According to the ground system's contractor, Raytheon, the ground system will not be able to support the validation of a significant number of data records until after a system upgrade, planned for March 2012. In addition, NOAA has not finalized coordination between the NPP/JPSS program and NOAA's Center for Satellite Applications and Research (STAR), which is critical to transferring satellite observation into operations. Consequently, NOAA has extended its projection for readiness from 18 to 24 months after launch, which could lead to a gap in operational data between NOAA-19 and NPP if NOAA-19 stops functioning properly at the end of its design life.

- ***Insufficient number of ground station locations.*** Unlike NOAA's existing operational satellite systems, NPP has only a single mission management center for controlling the satellite, and 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). NOAA and JPSS program officials have commissioned studies to develop an alternate mission management center and hope to have one ready well in advance of the JPSS-1 launch. Program officials indicated that the ground station has redundancy in terms of antennas and equipment. However, while there is redundancy, 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.

- ***Postlaunch ground system development challenges.*** NASA conducted two major ground system/NPP satellite compatibility tests in 2011; the first test had been delayed when ground system software builds took longer than expected to produce. Both tests experienced further delays and compressed the remaining work schedule for the NPP launch. NASA has also postponed analysis of some test results and requirements verification. Further, in response to an independent review team's recommendations, the project completed a stress test in late September and early October to evaluate NPP's operational readiness—any system fixes required to mitigate identified concerns would add to the postlaunch data production workload.

In order to reduce the risk of a data gap between NOAA-19 and NPP, NOAA management needs to provide sufficient oversight to enable communication and coordination between the JPSS program and STAR. Further, it must balance instrument calibration and data validation activities (needed to produce operational data) with other ground system development tasks. NOAA should also determine the feasibility of establishing an alternate mission management center and an additional science data downlink for NPP as soon as possible.

Mitigating Longer-Term Coverage Gaps: from NPP to JPSS-1

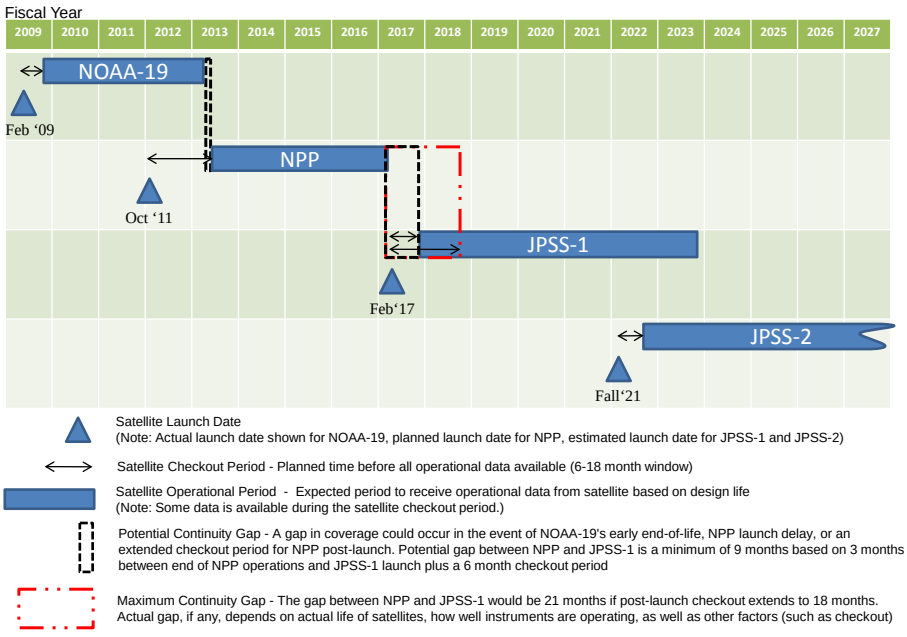
NOAA expects a gap in weather and climate observations between NPP's end of design life and the operational date of JPSS-l. NPP's projected end of design life is November 2016, NOAA plans to launch JPSS-1 in the first quarter of 2017,[1] and there is a minimum 6-month checkout

[1] NOAA projected a JPSS-1 launch in the first quarter of FY 2017, pending (1) the program receiving the full President's budget request for FY 2012 ($1.07 billion) and beyond and (2) no FY 2012 continuing resolution beyond the first quarter of FY 2012.

period before key data products from JPSS-1 will become operational. We project that, due to continued budget uncertainty and probable FY 2012 funding somewhat below the President's budget request, the JPSS-1 launch date will be no earlier than February 2017. Based on a February 2017 launch, the gap would last at least 9 months (3 months from November to February, plus the additional 6 months for checkout). Should checkout take 18 months (as NOAA predicts NPP's will), the gap would extend a total of 21 months (see figure 1). NOAA's studies have found that its weather forecasting at 5, 4, and 3 days before an event could be significantly degraded during the coverage gap period.

JPSS-1 will require a checkout period longer than 6 months to achieve full operational capability (versus an interim capability to produce key data products). Full checkout could be prolonged because JPSS-1 instruments will have manufacturing changes from the models flown on NPP—and, in all probability, NPP will no longer be operational when JPSS-1 is on-orbit, thus leaving the JPSS-1 mission without a direct, and more efficient, means for comparison.

Figure 1. Potential Continuity Gaps in Afternoon Orbit



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

We have identified the following areas that require senior management attention to help ensure JPSS-1 operational readiness and minimize the potential impact of the coverage gap:

- ***Prioritize all JPSS requirements,[2] develop reliable cost estimates to support future funding requests, and systematically communicate planned actions and progress with decision makers.*** NOAA is currently developing a revised life-cycle cost estimate. Additionally, NOAA tasked NASA with developing contingencies that prioritize some of the most important requirements and maintain a launch readiness date no later than

[2] High-level requirements include the number of spacecraft, the instruments needed, the observational data to be provided, the timeliness of data delivery, and data distribution methods, among others.

February 2017. We believe the JPSS program 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. 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 could be recouped in future appropriations. Finally, due to the importance and complexity of the JPSS program, NOAA must establish a program baseline (cost, schedule, and requirements) as soon as possible—and keep the Department and Congress informed of its planned actions and progress against this baseline to facilitate decision making.

- ***Coordinate NOAA response, in case NPP does not live through its 5-year design life.*** The NPP spacecraft was designed to last 5 years and carries enough fuel to last 7 years. However, most of its instruments were managed and developed under the NPOESS contract, which received limited government oversight and had a history of technical issues. Additionally, under the NPOESS contract, NASA lacked technical oversight during the instrument development, manufacturing, and testing phases, creating uncertainty about the instruments' ability to operate for the length of the spacecraft's design life. For these reasons, NASA's revised criteria for NPP mission success called for only 3 years of operability. Although NOAA's current analysis assumes that NPP will have a 5-year operational life, NOAA understands that a residual risk of a shorter life expectancy remains due to the lack of oversight during the development of most of NPP's instruments. In order to sufficiently prepare for an expected gap in polar satellite data from the afternoon orbit, NOAA should coordinate efforts from across its line offices to minimize the degradation of weather and climate forecasting during gaps in coverage.

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In conclusion, Mr. Chairman, we have provided (and will continue to provide) our independent assessment of the JPSS program. We look forward to NOAA's action plan to address recommendations in our September 30 audit report. The hope is that, when closing the looming satellite coverage gaps, NOAA finds innovative solutions—and can convey them, in a timely fashion, to Congress and other stakeholders. This concludes my prepared statement, and I will be pleased to respond to any questions you or other Subcommittee members may have.