



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Audit of the Geostationary Operational Environmental Satellite–R Series: Leadership Must Proactively Address Integration and Test Risks to Maintain Revised Launch Schedule

FINAL REPORT NO. OIG-15-030-A

MAY 28, 2015

U.S. Department of Commerce
Office of Inspector General
Office of Audit and Evaluation

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May 28, 2015

MEMORANDUM FOR: Dr. Kathryn D. Sullivan
Under Secretary of Commerce for Oceans and Atmosphere
and NOAA Administrator

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

SUBJECT: *Audit of the Geostationary Operational Environmental Satellite—R Series: Leadership Must Proactively Address Integration and Test Risks to Maintain Revised Launch Schedule—Final Report No. OIG-15-030-A*

Attached is our final report on NOAA's Geostationary Operational Environmental Satellite—R Series (GOES-R). Our objectives were to assess the adequacy of GOES-R development activities as the program completes the ground system and fabrication of flight instruments and the spacecraft, and transitions to system integration and test, per NOAA and NASA standards. We also monitored NOAA's progress in developing and vetting with stakeholders a comprehensive set of trade-off approaches to mitigate launch delays and its oversight of GOES-R systems engineering.

We found the following:

- The lag in progress during the development of the GOES-R satellite system prompted NOAA and NASA officials to postpone the launch date for the first GOES-R satellite from October 2015 to March 2016. The revised launch schedule will still pose a challenge for the program to meet, due to past schedule performance and a complex integration and test process. We believe the delay could leave the GOES on-orbit constellation without a backup satellite for 29 months out of a 33-month period from April 2015 to January 2018.
- The ground segment project did not bring in experienced engineers for key positions until late in the development effort, which contributed to schedule delays and core ground system contract cost increases. In addition, there has been historically inconsistent and inadequate contracting office support, which can decrease NOAA's effectiveness in negotiating changes for a complex, more than \$1.0 billion core ground system.
- The core ground system development is in the midst of a second costly re-plan—because of past problems with flight and ground dependencies, technical communications between flight and ground engineers, and overly optimistic task durations. While the ground segment is not currently on the program's critical path to launch, significant testing remains during integration that involves the flight and ground

segments. It has become imperative that NOAA and its contractor manage integration and test schedule progress to avoid repeating previous problems that resulted in two costly core ground system contract re-plans.

We have summarized NOAA's response to our draft report and included its entire formal response as appendix C. The final report will be posted on OIG's website pursuant to section 8M of the Inspector General Act of 1978, as amended.

In accordance with Department Administrative Order 213-5, please provide us your action plan within 60 days of this memorandum. The plan should outline the actions you propose to take to address each audit recommendation.

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, and refer to the report title in all correspondence.

Attachment

cc: Bruce Andrews, Deputy Secretary
Ellen Herbst, Chief Financial Officer and Assistant Secretary for Administration
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Stephen Volz, Assistant Administrator, National Environmental Satellite, Data,
and Information Services, NOAA
Greg Mandt, GOES-R System Program Director, NOAA
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Report In Brief

MAY 28, 2015

Background

NOAA's GOES have provided data for weather observation, research, and forecasting since 1975. The GOES-R series of satellites will incorporate the first technological advance in GOES instrumentation since the launch of the GOES I-M series, which began in 1994—and will have a longer expected operational life of a minimum of 8 years, versus 5 years for previous GOES series. GOES-R's life-cycle cost is \$10.8 billion through FY 2036; it, along with NOAA's other major satellite programs, comprise the Department's largest investments, accounting for more than 20 percent of its \$9.8 billion FY 2016 budget request.

Why We Did This Review

The overall GOES-R program is managed by NOAA with two integrated NOAA/National Aeronautics and Space Administration (NASA) offices—the ground segment project and the flight segment project—as well as integrated supporting offices such as program systems engineering and program contracts. In September 2014, at a joint NOAA/NASA Program Management Council (PMC) meeting, NOAA leadership approved delaying the first GOES-R satellite's launch date from October 2015 to March 2016, due to late delivery of some flight segment components, and authorized the program to enter into the system assembly, integration and test, launch phase.

Our objectives were to assess the adequacy of GOES-R development activities as the program completes the ground system and fabrication of flight instruments and the spacecraft, and transitions to system integration and test, per NOAA and NASA standards. We also monitored NOAA's progress in developing and vetting with stakeholders a comprehensive set of trade-off approaches to mitigate launch delays and its oversight of GOES-R systems engineering.

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OIG-15-030-A

WHAT WE FOUND

We found that

A GOES-R launch delay has increased length of potential on-orbit backup satellite gap for the GOES constellation. The lag in progress during the development of the first GOES-R satellite prompted NOAA and NASA officials to postpone the launch date from October 2015 to March 2016. The revised launch schedule will still pose a challenge for the program to meet, due to past schedule performance and a complex integration and test process. The delay could leave the GOES on-orbit constellation without a backup satellite for 29 months out of a 33-month period from April 2015 to January 2018.

The ground segment project initially lacked experienced lead engineering managers and consistent contracting office support. Experienced engineers were not hired for key positions until late in the development effort, which contributed to schedule delays and core ground system contract cost increases. In addition, there has been historically inconsistent and inadequate contracting office support, which can decrease NOAA's effectiveness in negotiating changes for a complex, more than \$1.0 billion core ground system.

Planning and communications deficiencies forced two costly re-plans of core ground system development. Development is in the midst of a second costly re-plan—because of past problems with flight and ground dependencies, technical communications between flight and ground engineers, and overly optimistic task durations. While the ground segment is not currently on the program's critical path to launch, significant testing remains during integration that involves the flight and ground segments. NOAA and its contractor must manage integration and test schedule progress to avoid repeating previous problems that resulted in two costly core ground system contract re-plans.

WHAT WE RECOMMEND

We recommend that the NOAA Administrator

1. Establish a communications mechanism among Department of Commerce, NASA, and GOES-R spacecraft and ground system contractors' leadership, to foster rapid identification and resolution of system integration and test issues that could impact the GOES-R launch date.
2. Establish a communications process that ensures stakeholders (including Congress) are provided with current GOES-R product availability schedules, leading up to and after launch.
3. Ensure that future National Environmental Satellite, Data and Information Service (NESDIS) programs leverage NASA, or other organizations', ground systems engineering expertise early in the development cycle.
4. Direct NOAA's Acquisition and Grants Office (AGO) to provide reporting metrics regarding GOES-R ground segment contracting actions or changes at monthly joint NOAA/NASA Program Management Council meetings.
5. Direct NESDIS and NOAA AGO to re-examine GOES-R contracting division staffing approach effectiveness.
6. Ensure that future NESDIS acquisition programs have consistent and adequate contracting officer and specialist support.
7. Direct NESDIS to provide reporting metrics regarding core ground system schedule delays at monthly joint NOAA/NASA Program Management Council meetings.

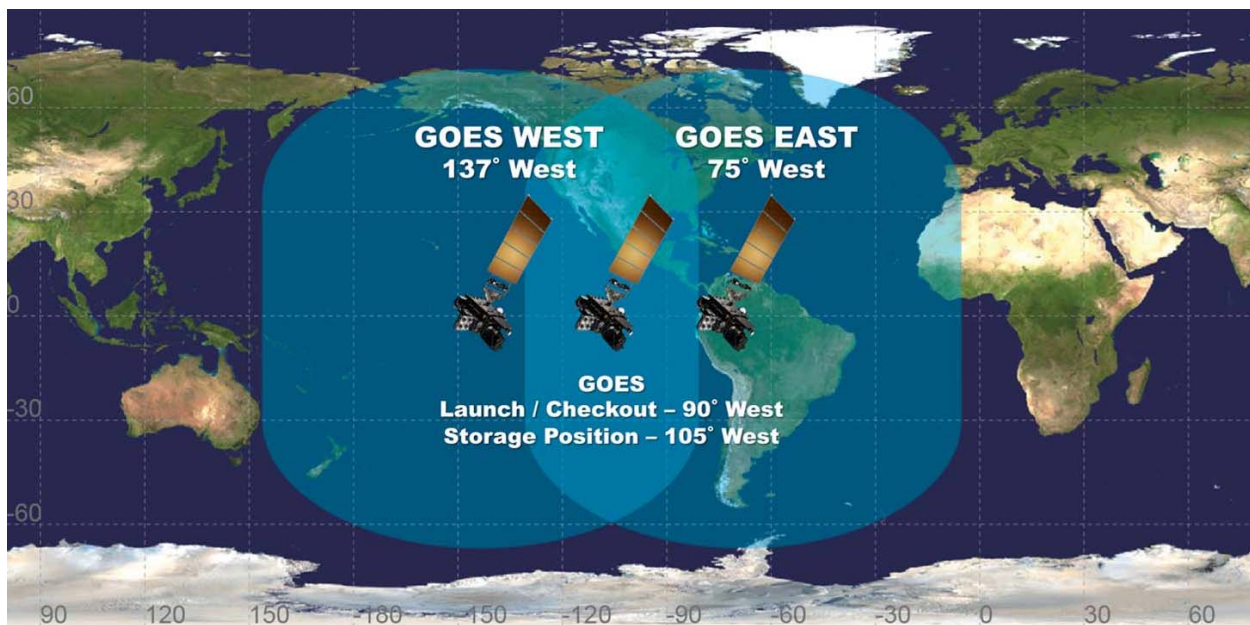
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Introduction

The National Oceanic and Atmospheric Administration’s (NOAA’s) Geostationary Operational Environmental Satellites (GOES) have provided the United States with meteorological data for weather observation, research, and forecasting since 1975. One of the primary functions of NOAA’s National Environmental Satellite, Data and Information Service (NESDIS) is to acquire and manage the nation’s operational environmental satellites. These satellites look for “atmospheric triggers” for severe weather conditions such as tornadoes, flash floods, and hurricanes and monitor the development of storms and track their movements. NOAA’s policy is to have 3 satellites on-orbit (see figure 1). Two GOES satellites maintain a constant view of the Earth from an approximate 22,300-mile orbit, fixed on the eastern and western United States and adjacent oceans and a third satellite is stored on-orbit as a back-up in case either of the active satellites fail. GOES satellites currently in orbit are GOES-13 (GOES-East) and GOES-15 (GOES-West), with GOES-14 as backup.

Figure 1. Location and Area of Coverage of the GOES Fleet



Source: NOAA, GOES-R program documentation

The GOES-R series of satellites (GOES-R, -S, -T, and -U) will incorporate the first technological advance in GOES instrumentation (see appendix B for instrument details) since the launch of the GOES I-M series, which began in 1994. Also, GOES-R series satellites will have a longer expected operational life (“design life”) of a minimum of 8 years, versus 5 years for the previous GOES N-P series. The GOES-R life-cycle cost of \$10.8 billion includes development, deployment of 4 satellites, and operations through fiscal year (FY) 2036. GOES-R, along with NOAA’s other major satellite programs, the Joint Polar Satellite System (JPSS) and newly proposed Polar Follow-On, are the Department’s largest investments, accounting for more than 20 percent of its \$9.8 billion FY 2016 budget request.

The overall GOES-R program is managed by NOAA with two integrated NOAA/National Aeronautics and Space Administration (NASA) offices—the ground segment project and the flight segment project—as well as integrated supporting offices such as program systems engineering and program contracts. NOAA manages the acquisition and development efforts for the entire ground segment—including the facilities; antenna sites; software and hardware for satellite command and control, as well as generating and distributing end-user products; and the remote backup unit for backup of mission-critical functions. NASA manages development and acquisition of the flight segment, which consists of the spacecraft, instruments, launch vehicle and services, and auxiliary communication payloads.

On September 17, 2014, at a joint NOAA/NASA Program Management Council (PMC)¹ meeting, NOAA's Deputy Under Secretary for Operations approved delaying the first GOES-R satellite's launch date from October 2015 to March 2016, due to late delivery of some flight segment components, and authorized the program to enter into the system assembly, integration and test, launch phase.²

¹ The joint NOAA/NASA Program Management Council reviews and assesses selected NOAA programs being developed in partnership with NASA. The PMC is co-chaired by the NOAA Deputy Under Secretary for Operations (DUS/O) and NASA Associate Administrator, with the NOAA DUS/O having final decision authority.

² During this phase, the system components are assembled, integrated, and verified to meet system requirements. By the end of this phase, the system is ready to transition to launch and then operations.

Objectives, Findings, and Recommendations

Our objectives were to assess the adequacy of GOES-R development activities as the program completes the ground system and fabrication of flight instruments and the spacecraft, and transitions to system integration and test, per NOAA and NASA standards. We also monitored NOAA's progress in developing and vetting with stakeholders a comprehensive set of trade-off approaches to mitigate launch delays and its oversight of GOES-R systems engineering (for further details regarding our objectives, scope and methodology, see appendix A).

We found that NOAA's lag in progress during development of the GOES-R satellite system, including late delivery of some flight segment components, increased risk of falling behind schedule and ultimately resulted in the first satellite launch date being delayed by 5 months. The revised schedule remains a challenge, and this delay increases the potential amount of time the GOES fleet could be without an on-orbit backup satellite. We also found that the ground segment project lacked experienced lead engineering managers, for approximately 3 years, until 2012—which contributed to schedule pressure and contract cost increases. Also, limited contracting office support has led to a lengthy negotiation process in finalizing contract changes. Finally, we found that multiple problems with ground system development and ineffective communications between NOAA and its contractor resulted in two costly re-plans, substantially increasing the core ground system contract value.

I. GOES-R Launch Delay Has Increased Length of Potential On-Orbit Backup Satellite Gap for GOES Constellation

The lag in progress during the development of the GOES-R satellite system prompted NOAA and NASA officials to postpone the launch date for the first GOES-R satellite from October 2015 to March 2016. The revised launch schedule will still pose a challenge for the program to meet, due to past schedule performance and a complex integration and test process. We believe the delay could leave the GOES on-orbit constellation without a backup satellite for 29 months out of a 33-month period from April 2015 to January 1, 2018.

A. *Lagging progress precipitated the launch delay*

The immediate reason for the launch delay was engineering and manufacturing defects of some flight components and limited reserve time built into the flight segment schedule. At the July 2014 System Integration Review (SIR),³ the GOES-R Standing Review Board

³ Per NASA's Systems Engineering Handbook (NASA/SP-2007-6105 Rev1) "An SIR ensures that the system is ready to be integrated. Segments, components, and subsystems are available and ready to be integrated into the system. Integration facilities, support personnel, and integration plans and procedures are ready for integration."

(SRB)⁴ indicated that the flight segment schedule had barely adequate margins to manage multiple flight and ground segment risks, including a complex integration and test plan.

We included earlier reports of ground segment schedule risks in our March 2014 memorandum to alert senior NOAA management to the continuing lag in development of the ground system. We expressed concern that, if not promptly addressed, the lag could delay the launch of GOES-R, scheduled at that time for October 2015.⁵ Based on our past performance schedule review, we estimated the earliest the ground system would be ready would be in March 2016, or 5 months after the scheduled launch date.

Likewise, at a May 2014 special briefing to NOAA Administrator Dr. Kathryn Sullivan, the co-chair of the GOES-R Ground Segment Integrated Independent Review Team⁶ also found the ground system's newest re-aligned schedule to be "unrealistically aggressive" —and stressed that, in order not to delay the launch, the ground segment project and ground system contractor should identify and complete development of the minimal set of mission management functions needed to safely launch the spacecraft.

Integration and test are typically periods of peak spending—and when schedule delays are most costly.

Given that there is only approximately one year left until the new scheduled launch date,

Departmental, NOAA, and NASA leadership need to work with GOES-R spacecraft and ground system contractors' leadership to ensure that clear and proactive communications occur in identifying and resolving problems during the integration and test phase in accordance with the contracts.

B. Delayed launch increases the likelihood of a potential on-orbit backup coverage gap

NOAA's policy is to maintain an 80 percent or higher probability of having two-imager⁷ coverage in the GOES fleet. However, the 5-month launch delay from October 2015 to March 2016 decreased from 64 percent to 57 percent the probability of full coverage when GOES-R is ready for operations in September 2016, after 6 months of post-launch testing.

⁴ The GOES-R Series SRB is comprised of expert NASA and NOAA personnel, independent of the program, who evaluate the program for managerial and technical issues at mission milestone reviews, as well as progress toward meeting program cost, schedule, and capability commitments.

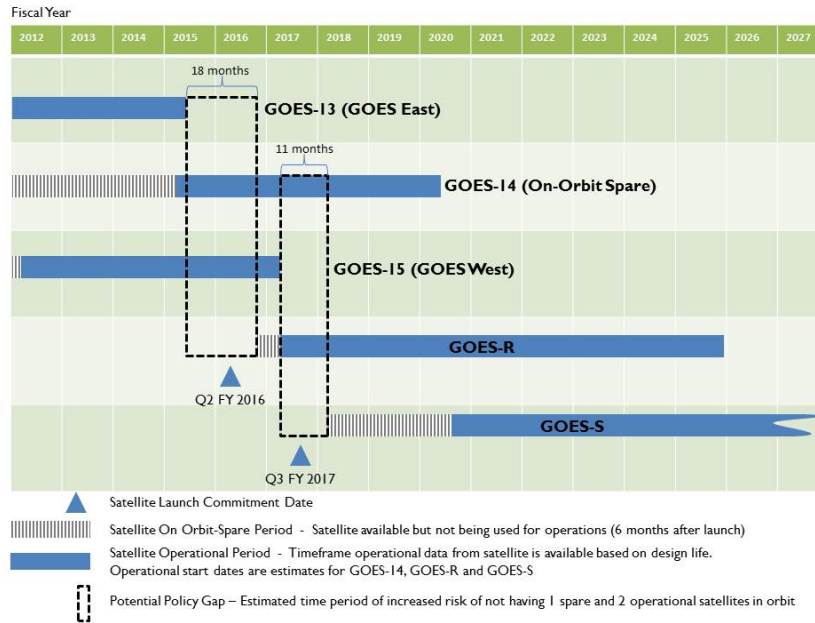
⁵ U.S. Department of Commerce Office of Inspector General, March 6, 2014. Interim Memorandum re: *Audit of NOAA's Geostationary Operational Environmental Satellite-R Series Core Ground System Observations*, OIG-14-014-M. Washington, DC: DOC OIG

⁶ The GOES-R Series flight and ground segment project Integrated Independent Review Teams are comprised of NASA and NOAA personnel who are independent of the program, who evaluate the program at project milestones reviews, with an emphasis on assessing the areas of risk.

⁷ An imager is a satellite instrument that measures and maps the Earth and its atmosphere. Imager data are converted by computer into pictures.

Even if GOES-R and GOES-S are launched as currently planned, there may not be an on-orbit backup available for 29 months out of a 33-month period from GOES-13 (operating as GOES-East) end of design life in April 2015 until GOES-S is ready for operations beginning January 1, 2018, after 6 months of post-launch testing (see figure 2).

Figure 2. Potential Policy Gaps for GOES Operational Satellites



Source: OIG analysis of NOAA information as of December 2014

NOAA’s geostationary policy is to have three satellites in orbit—two operational satellites and one on-orbit spare for backup. The spare policy is intended to prevent gaps in coverage such as the one that occurred between 1989 and 1993, until NOAA could borrow a satellite from the European Organisation for the Exploitation of Meteorological Satellites. In 1998, the GOES-9 satellite failed, but NOAA had an on-orbit spare to replace it. The most recent malfunction was in September 2012, when the GOES-East satellite (GOES-13) was placed on standby due to anomalies in its instruments. In response, NOAA temporarily activated the on-orbit spare (GOES-14) to collect data until service was restored to GOES-13.

C. Revised program schedule is still challenging for flight segment integration and test

Even with the delayed launch, the program schedule is still a challenge for NOAA to meet. The SRB chair calculated that milestones on the GOES-R flight segment development schedule had slipped an average of 8 months over a 20 month period (i.e., a 40 percent historical slip rate) and warned that, even with the addition of 5 months to the schedule, the program is still under significant time pressure.

The integration and test of the GOES-R satellite could take longer than planned because it is the first satellite in the series to be tested—and the technical risk reduction from

utilizing the contractor's commercial spacecraft, originally designed for communications instead of remote sensing, was overestimated. Use of this spacecraft has led to numerous complex assembly, integration, and testing activities unique to GOES-R. For example, the spacecraft is not access friendly; it is cumbersome to swap failed electronic boxes out and then back into the spacecraft.

With a schedule the SRB chair called "very fragile," there are not a lot of options for how to make up lost time at this late stage of the program. Schedule delays are more likely to delay launch. The flight portion of the integration and test flow of activities has already been streamlined. In addition, the spacecraft contractor, who is responsible for integrating the instruments and spacecraft, has been working at full capacity with three work shifts 7 days a week since December 1, 2014. Further streamlining of the schedule is unlikely.

We identified a concern in our April 2013 report that cutbacks to testing activities could result in changes to operational performance of the spacecraft or its instruments.⁸ At the September 2014 joint NOAA/NASA PMC meeting, the program identified several integration and test activities that could be eliminated or deferred if necessary to prevent launch delays. If activities are reduced, NOAA needs to inform stakeholders whether cutbacks will affect operational performance.

D. Ground system needs to be ready for end-to-end testing

The program has identified as a risk the possibility that ground system mission management capability (in particular, the release of Mission Management Flight Ready software to ensure health and safety of the GOES-R satellite) will not be ready for use by the Mission Operations Support Team⁹ 10–12 weeks before the start of the fourth end-to-end test originally planned for July 2015. However this test has now slipped to September 2015 because of flight segment delays. This is the final test of launch, post-launch, normal, and contingency operational procedures before the satellite is shipped to the launch site.

"GOES-R end-to-end testing focuses on the validation and compatibility of space and terrestrial hardware, software, and communications interfaces in a mission operations context, prior to launch. . . . End-to-end testing is intended to facilitate early identification of issues before launch, for example; interface inconsistencies, unintended design or operational features, database errors (values and inconsistencies), and system timing errors."

GOES-R Series Program Verification and Validation Plan, November 2014

⁸ DOC OIG, April 25, 2013. *Audit of Geostationary Operational Environmental Satellite-R Series: Comprehensive Mitigation Approaches, Strong Systems Engineering, and Cost Controls Are Needed to Reduce Risks of Coverage Gaps*, OIG-13-024-A. Washington, DC: DOC OIG.

⁹ The team is formed by the flight project to focus on mission operations, from pre-launch planning and development, through launch and orbit raising, post-launch testing, and transition to sustaining operations.

While the ground segment project delivered the mission management capability to the NOAA test site in May 2015, there are challenges that could affect ground system readiness for launch. During a site acceptance test, the ground segment project identified an issue with components that are affecting performance of the antennas that will send and receive data from the satellites. The project also identified a risk with degradation of core ground system performance when running real-time anti-virus software. The project will have to resolve the issue and mitigate the risk to prevent any delay in ground system readiness from impacting the first satellite's launch readiness.

The ground segment project has prioritized requirements (see table 1). If ground system development falls behind schedule again, the ground segment project has identified contingencies called "off-ramps" that would move development of functions not essential for a safe launch (i.e., P2 and P3) to after launch or remove the function altogether. However, delaying development of functions until after launch could delay the satellite becoming fully operational when it is needed for weather observations.

Table 1. Ground System Priorities

Priority	Capability
P1	Health and safety of one GOES-R satellite
P2	Product generation and distribution, including key performance parameter (KPP) products for Advanced Weather Interactive Processing System (AWIPS)
P3	Other capabilities, including multi-satellite operations

Source: GOES-R program documentation

Priority 1 capabilities must be completed to safely launch GOES-R. Priority 2 and 3 capabilities—including cloud and moisture imagery products, which are the program's key performance parameters (KPP)—can be developed after launch.

Work the GOES-R program defers until after launch could impact calibration and validation activities during post-launch test, post-launch product testing, implementation, and sustainment. It is possible that availability of some GOES-R data products could be delayed if other, higher-priority work must be completed first, similar to an issue we identified in our 2011¹⁰ and 2012¹¹ JPSS audit reports. As such, NOAA needs to keep its stakeholders informed of product availability issues if delays occur, similar to the online matrix NOAA's Center for Satellite Applications and Research has for JPSS products algorithm maturity.

¹⁰ DOC OIG, September 30, 2011. *Audit of the Joint Polar Satellite System: Challenges Must Be Met to Minimize Gaps in Polar Environmental Satellite Data*, OIG-11-034-A. Washington, DC: DOC OIG.

¹¹ DOC OIG, September 27, 2012. *Audit of the Joint Polar Satellite System: Continuing Progress in Establishing Capabilities, Schedules, and Costs Is Needed to Mitigate Data Gaps*, OIG-12-038-A. Washington, DC: DOC OIG.

Recommendations

We recommend that the NOAA Administrator

- I. Establish a communications mechanism among Department of Commerce, NASA, and GOES-R spacecraft and ground system contractors' leadership, to foster rapid identification and resolution of system integration and test issues that could impact the GOES-R launch date.
 2. Establish a communications process that ensures stakeholders (including Congress) are provided with current GOES-R product availability schedules, leading up to and after launch.
- II. **Ground Segment Project Initially Lacked Experienced Lead Engineering Managers and Consistent Contracting Office Support**

The ground segment project did not bring in experienced engineers for key positions until late in the development effort, which contributed to schedule delays and core ground system contract cost increases. In addition, there has been historically inconsistent and inadequate contracting office support, which can decrease NOAA's effectiveness in negotiating changes for a complex, more than \$1.0 billion core ground system.

A. *Late infusion of experienced ground system engineers contributed to schedule delays and contract cost increases*

Although the GOES-R program has one of the Department's largest and most complex satellite ground systems, with a contract value now exceeding \$1.0 billion, we found that the ground segment project did not have system engineers in leadership positions until 2012, three years after the contract was awarded. This lack of hands-on expertise in developing and delivering ground systems in time for launch contributed to schedule delays that led to a costly re-alignment of ground system releases, increasing core ground system contract cost.

The ground system includes 10 antennas (6 new and 4 upgraded) across 3 ground station sites—and will process a large volume of environmental data remotely sensed by a next generation imager that can sense more spectral bands, has higher spatial resolution, and more rapid scan capabilities than the current imager. In addition, a new instrument, the Geostationary Lightning Mapper, is expected to provide earlier warning of tornadoes by detecting cloud-to-cloud lightning.

The new ground system engineering management leadership positions were staffed from NASA Goddard Space Flight Center's (GSFC's) pool of experienced engineers. Staffing started in the fall of 2012, when the ground segment project became increasingly concerned about the contractor's progress, and was substantially completed by June 2013, when the ground segment project and contractor began the re-alignment of the release development schedule.

This new team of lead engineers used their experience from successfully delivering previous ground systems in time for launches to implement mitigation activities to the core ground system that had fallen 11 months behind schedule, which threatened to delay the GOES-R launch. The engineers' activities included the production and implementation of a new development plan (or re-alignment), reduction of unnecessary testing, and improved communications with the ground system contractor.

- **Re-aligned development plan.** The new ground segment project engineering management team, working with the ground system contractor, re-aligned system development by isolating mission management capabilities (which are essential for launch) from other elements of the ground system and prioritized their development. Also, "off-ramp" schedule contingencies were identified that would eliminate capabilities, or defer them until after launch, in case development fell behind schedule.
- **Streamlined testing.** The new engineering team found that ground system contractor testing could take less time by reducing the number of unneeded and redundant tests: they determined that some tests of higher level requirements were not necessary because they were similar to tests of composite lower level requirements. The team also curtailed the contractor's automated testing—which was conducted to reduce schedule risk—only because it was producing questionable results. Finally, the team instructed the ground system contractor to move testing of mission management functions (in particular, the Mission Management Flight Ready software release) from the contractor's facility to NOAA's Satellite Operations Facility. As a result, tests could be run in an operational "as you fly" environment, and the contractor could use more efficient "day-in-the-life" scenario-based testing instead of testing requirements one at a time (ground segment project engineers told us that there are too many requirements to test them all individually).
- **Improved communications.** Finally, the new engineering team helped improve communications with the contractor, which had been a persistent problem since the start of the ground system contract. The ground segment project initiated better contractor management through weekly meetings to review schedule progress and assess the timely use of contingencies (i.e., off-ramps). The team also helped the contractor develop more informative monthly status reports.

The core ground system is not currently on the program's critical path¹² for launching the first GOES-R satellite, but significant government requirements testing at NOAA sites remains. Although NOAA manages the GOES-R ground segment project, it has only recently started to build ground system development expertise within NESDIS for a newly proposed common ground enterprise.¹³ NOAA should examine the

¹² The *critical path* is the sequential series of tasks with the longest duration through the project end date. Any task in the critical path that slips off-schedule will cause the project deadline to slip.

¹³ The new office within NESDIS will develop a consolidated common ground enterprise architecture. This resulted from a recommendation of the 2012 Satellite Enterprise Independent Review Team to establish a core

shortcomings experienced during core ground system development to ensure expert lead engineers are put in place early in future programs, such as the NESDIS common ground enterprise. A similar concern was raised by the GOES-R Standing Review Board at the July 2014 System Integration Review, where it advised the Program Office to use more GSFC engineers on the flight segment.

B. Core ground system contract has had inconsistent and inadequate contracting office support

The GOES-R series contracts division provides procurement authority and expertise for planning and contracting matters while ensuring program compliance with the Federal Acquisition Regulation and Departmental, NOAA, and NASA acquisition regulations, policies, and procedures. As outlined in the GOES-R Management Control Plan, the division is staffed as a matrix support activity with personnel from NOAA's Acquisition and Grants Office (AGO) working ground segment contracts and NASA's GSFC contracts office staff handling flight segment contracts. The contracts division is located with the GOES-R Series Program Office at GSFC. This structure is intended to foster sharing of contracting staff resources between agencies. The GOES-R program's matrix contracting office approach, however, has resulted in inconsistent contracting officer coverage and insufficient contracting specialist support, which is needed to effectively manage and negotiate the contract and its changes—initially valued at approximately \$736 million and now valued at more than \$1.0 billion.

NOAA is responsible for procuring and managing contracts for developing the GOES-R ground system and purchasing the NOAA ground station site antennas. NASA is responsible for flight segment contracts.

The core ground system cost-plus-award-fee contract has had multiple engineering changes implemented since award in May 2009. Changes include an \$89 million re-plan submitted in September 2011 and definitized in March 2013, as well as another re-plan with potentially greater cost that was submitted in December 2013 and is still being negotiated. As we noted in our April 2013 audit report, delaying the time to definitize reduces the contract amount that can be negotiated since funds are being expended during the undefinitized period.¹⁴ In addition, NOAA stated that the prolonged amount of time to definitize contract changes is a direct result of the lack of resources in the program office and AGO to support day-to-day operations.

We found that, from May 2010 to July 2014, there had been at least 8 different NOAA AGO contracting officers negotiating ground segment changes for the project. The contracting officer assigned during the second re-plan was only able to work part-time on the GOES-R program, due in part to having to negotiate another large dollar NOAA acquisition. The NASA contracting officers supporting flight segment contracts were not used in supporting the core ground system contract. NOAA AGO managers noted that filling the GOES-R contracting officer ground segment position has been a challenge in

competency of system engineering, implement engineering standards and configuration control, and establish integrated management of the ground enterprise.

¹⁴ See DOC OIG, OIG-13-024-A, 18, 25.

part because of competing public and private sector job markets in the Washington, DC, area.

NOAA has not effectively negotiated contract changes associated with the core ground system.¹⁵ By the end of June 2014, NOAA had hired a dedicated contracting officer to support a newly structured ground segment contracting team—consisting of the AGO NESDIS portfolio manager hired in June 2014 and based in Seattle, a contract specialist that was transferred from Seattle to GSFC in July 2014, a contractor administrator specialist who had worked on the program since fall 2010, and a new support contractor serving as a cost analyst. However, on November 7, 2014, the contractor administrator was reassigned by AGO and will not be replaced. Also, the cost analyst was replaced in February 2015. The contracting officer, AGO manager, and most recently assigned cost analyst had to become familiar with the numerous proposed changes to ground segment contracts, resulting in a more difficult negotiation of the second re-plan and contributing in part to a lengthy definitization process—which has taken over a year and is not complete. This level of key personnel turnover can decrease NOAA's effectiveness in negotiating contract changes in the best interest of the government. As a result, changes to the contract in January 2014 to incorporate the second re-plan's delivery schedule, period of performance, and statement of work are still not definitized.

With the first scheduled GOES-R satellite launch quickly approaching, and the potential for additional contract changes and cost increases during the integration and test phase, NOAA AGO should present reporting metrics regarding pending contracting actions or changes, definitization progress, and any contracting office staffing concerns at the monthly joint NOAA/NASA PMC meetings. In addition, NOAA should examine the effectiveness of having a matrixed AGO contracting officer and specialist approach on its major systems acquisitions and other significant programs, such as NESDIS common ground enterprise.

Recommendations

We recommend that the NOAA Administrator

3. Ensure that future NESDIS programs (e.g., common ground enterprise) leverage NASA, or other organizations', ground systems engineering expertise early in the development cycle.
4. Direct NOAA AGO to provide reporting metrics regarding GOES-R ground segment contracting actions or changes (e.g., definitization progress, staffing concerns) at monthly joint NOAA/NASA Program Management Council meetings.
5. Direct NESDIS and NOAA AGO to re-examine GOES-R contracting division staffing approach effectiveness.

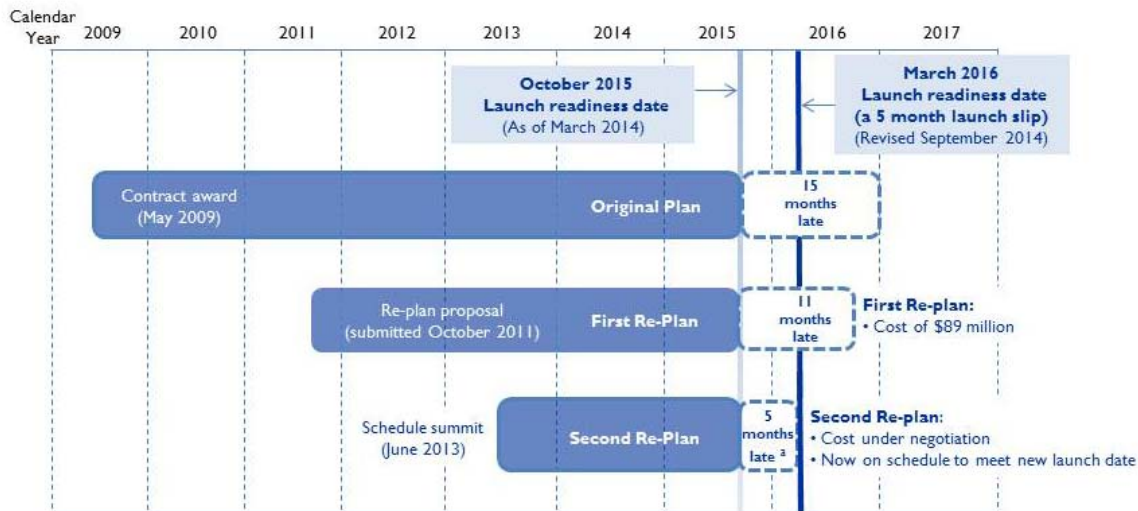
¹⁵ Per Federal Acquisition Regulation 43.204(b), unpriced contract change orders should be definitized in the shortest practicable time.

- 6. Ensure that future NESDIS acquisition programs (e.g., common ground enterprise) have consistent and adequate contracting officer and specialist support.

III. Planning and Communications Deficiencies Forced Two Costly Re-Plans of Core Ground System Development

The core ground system development is in the midst of a second costly re-plan—because of past problems with flight and ground dependencies, technical communications between flight and ground engineers,¹⁶ and overly optimistic task durations. As noted in our in March 2014 interim audit memorandum to NOAA’s Administrator, we estimated the earliest the core ground system would be completed was March 2016, or 5 months after the October launch readiness date. However, since our memorandum, NOAA revised the launch readiness date to March 2016 because of flight segment problems. As a result, we now believe that the core ground system has a greater likelihood of having all capabilities implemented before launch (see figure 3).

Figure 3. OIG Estimate of the Core Ground System Completion Date, Based on Progress Made in Implementing Core Ground System Re-Plans



Source: OIG analysis of NOAA data.

^a In March 2014, OIG estimated the core ground system to be 5 months behind schedule based on the launch readiness date of October 2015. OIG’s projection of months remaining to develop the core ground system on October 2015 assumed (1) that the contractor would be able to start the second re-plan immediately when it was determined that development was 11 months behind schedule (at the June 2013 schedule summit) and (2) that development time could be regained at the same rate as was regained by the first re-plan (i.e., 4 months regained over 20 months’ duration).

While the ground segment is not currently on the program’s critical path to launch, significant testing remains during integration that involves the flight and ground segments. It has become imperative that NOAA and its contractor manage integration and test schedule

¹⁶ Prior to late 2012, government and contractor engineers were not effectively communicating flight and ground intersegment dependencies.

progress to avoid repeating previous problems that resulted in two costly core ground system contract re-plans.

A. Contractor ineffectively planned for intersegment dependencies in original and first re-plan

As reported in our 2013 audit, the ground system contractor did not adequately factor into its development plan the flexibility needed to accommodate delays in flight segment deliverables.¹⁷ According to GOES-R program and GSFC engineers, delays in flight segment deliverables are typical on satellite programs and should be factored into the ground system development plan. The availability of the deliverables is dependent on the pace of development of flight components, whose maturation can be slow and difficult to predict. Some of these flight segment deliverables are provided to the ground system contractor as government furnished property (GFP).¹⁸

Intersegment Dependency Example

The core ground system contractor needs information about the commands to control the spacecraft and instruments in order to implement them in the ground system for satellite operators.

Largely due to GFP issues, in 2011 the contractor re-planned the development of the ground system,¹⁹ increasing contract costs by \$89 million. However, this re-plan was ineffective because it did not isolate mission management from other ground system capabilities as discussed in Finding II, part A. Following the original plan would have resulted in the ground system being completed 15 months after the scheduled launch date (slated then for October 2015), and the first re-plan would have still resulted in development being late by 11 months.

B. Flight and ground segment projects coordination was ineffective until late 2012

In conjunction with the 2011 re-plan, GOES-R program systems engineering initiated a process for flight and ground segment contractors to coordinate availability and need dates for GFP and other information, which were recorded in the Giver-Receiver Inter-segment Database (GRID).²⁰ However, this GRID process did not include the appropriate engineers to effectively coordinate GRID items until late 2012. At that time, the flight segment project manager instituted a change to have the flight and ground engineers responsible for the items in the GRID attend coordination meetings with the relevant flight segment contractor and ground system contractor.

¹⁷ See DOC OIG, OIG-13-024-A, 9.

¹⁸ The GOES-R program is responsible for flight and ground segment products—and, in effect, the flight and ground segment integrator—because it issued separate contracts for flight and ground segment components.

¹⁹ The 2011 re-plan essentially divided large blocks of software code into smaller code increments and large system releases into smaller builds. The contractor had more flexibility to shift engineers from increments and builds that could not proceed because flight deliverables were delayed to those increments and builds that had the needed flight segment information.

²⁰ The Giver-Receiver Inter-segment Database is used to map out flight and ground project dependencies.

C. Contractor task duration assumptions were too optimistic

As reported in our 2014 memorandum²¹ the ground system contractor made overly optimistic assumptions about task duration in its 2011 re-plan. Ground system project engineers measured how long it took the contractor to verify the requirements for the first mission management release and found that it took nearly 80 percent more time than the contractor's estimate. Specifically, the contractor needed 16 hours to verify each requirement, 7 hours more than the 9 hours allocated per requirement in the schedule. Projections for verifying approximately 3,000 mission management requirements based upon this rate revealed that the ground system would not be completed until September 2016, slipping the scheduled launch date by 11 months.

D. Schedule delays necessitated a second costly re-plan

Even with the first re-plan in place, problems with schedule delays persisted due to issues with GFP and the underestimation of task duration. The ground segment project tried to mitigate GFP issues—for example, by freezing updates to certain GFP items (e.g., instrument algorithms for generating weather products). However, in June 2013, an in-depth review of the ground system schedule revealed that development was still behind schedule. The contractor, in conjunction with the ground segment project, had to re-plan development for a second time (also called second re-plan or re-alignment). See table 2 for a summary of mitigation strategies. This re-alignment emphasized development of functions essential for a safe launch. The cost of the re-alignment is being negotiated but may cost more than the 2011 re-plan, increasing the overall value of the contract.

Table 2. Mitigation of Schedule Delays

Strategies	Rationale
<i>Re-aligned release schedule</i>	Prioritized development of mission management functions by isolating them from other ground system capabilities
<i>Off-ramps or contingencies</i>	To defer or eliminate requirements, in case development fell behind schedule
<i>Streamlined testing</i>	To allow the new ground system engineering team to shorten time spent verifying requirements
<i>Frozen GFP updates</i>	For example, delayed instrument algorithm updates to allow ground system development to move forward

Source: OIG analysis of GOES-R program and contractor documentation

According to documentation from the core ground system contractor, most of the 2013 re-alignment was due to unavoidable development delays, beyond the scope of the

²¹ See DOC OIG, OIG-14-014-M, 3.

2011 re-plan, caused by late and incomplete GFP deliveries²² (see table 3). However, the 2011 re-plan was flawed because it did not completely de-couple launch essential functions (e.g., mission management from product generation) and was still dependent on GFP, including GFP not needed to safely launch the satellite.

Table 3. Contractor's Issues With GFP

GFP Source	Issues Cited by Contractor
Instrument contractors	Weather product algorithm packages had frequent updates, inconsistencies, and incomplete test data
NOAA Algorithm Working Group	Lengthy process to resolve issues with weather product algorithm packages
Instrument contractors	Delayed delivery of instrument memory management definitions
Spacecraft contractor	Spacecraft simulator errors, frequent updates of spacecraft software and a spacecraft database

Source: OIG analysis of contractor documentation

E. Collaboration and reporting between the ground system contractor and the ground segment project was inadequate prior to system integration and test

On November 2, 2014, NOAA permanently filled its NESDIS assistant administrator position, which also serves as the GOES-R core ground system contract's fee determination official. The previous assistant administrator—in that role from the award of the core ground system contract until retirement from federal service in July 2014—noted in contractor award fee letters that risks exist with spacecraft information dependencies (e.g., software, databases) and emphasized that these dependencies are typical during development of a major satellite and ground system program. The former assistant administrator also expressed concern that the contractor did not discuss with sufficient clarity and detail the project technical and schedule risks associated with ground system development. Consequently, that former assistant administrator expected the contractor to anticipate these risks arising and proactively mitigate them.

With the change in NESDIS leadership, we believe that the newly appointed assistant administrator should review past problems OIG and the Government Accountability Office have identified with the core ground system, along with contract award fee determination information, and work with the ground segment project and its contractor to manage and report status of system integration and test risks to NOAA/NASA leadership.

²² Because of the ongoing and sensitive negotiations between NOAA and the contractor regarding the final cost of the second re-plan, OIG did not conduct interviews with the contractor. Please see appendix A for a more detailed explanation of this decision.

Recommendation

We recommend that the NOAA Administrator

7. Direct NESDIS to provide reporting metrics regarding core ground system schedule delays (e.g., re-work, regression testing) at monthly joint NOAA/NASA Program Management Council meetings.

Summary of Agency Response and OIG Comments

In response to our draft report, NOAA concurred with all of our recommendations and reported on some of the activities it has or will take to implement the recommendations. NOAA also included technical comments to the draft report, from which we made changes to the final report where appropriate. We have included NOAA's formal response as appendix C.

Appendix A: Objectives, Scope, and Methodology

This audit was initiated in June 2013, with fieldwork ending in December 2014. Our objectives were to (1) assess the adequacy of GOES-R development activities, as the program completes the ground system and fabrication of flight instruments and the spacecraft, and transitions to system integration and test and (2) monitor NOAA's progress in developing and vetting with stakeholders a comprehensive set of trade-off approaches to mitigate launch delays and its oversight of GOES-R systems engineering.

The scope of our review included the assessment of the integration and test schedule for flight and ground segments based on past schedule performance. We also assessed the impact of the lack of engineering expertise and contracting office support for the core ground system contract, based on the complexity and cost of the satellite ground system. In addition, we assessed the core ground system development by analyzing the planning, communication, and assumptions by the contractor and program management.

We reviewed significant program management activities and internal controls within the context of our audit objectives and employed a comprehensive methodology to achieve those objectives. Specifically, we

- reviewed and assessed the impact of issues and risks with the program;
- reviewed NOAA/NASA standards and program status documentation;
- interviewed NOAA, NASA, and contractor personnel, as well as observed selected program and project-level reviews locally and at contractor facilities;
- reviewed recommendations made by NOAA's standing review board and independent review teams;
- observed program activities and examined documentation supporting cost, schedule, and contractor performance, including the GOES-R core ground system contract file and re-alignment proposal; and
- examined other internal control documentation, including GOES-R Management Control Plan, System Review Plan, Verification and Validation Plan, and the core ground system contractor's Software Management Development Plan.

The GOES-R contracting officer and the contractor are still in the process of negotiating the final cost of the second re-plan to the core ground system contract. Negotiations are estimated to be completed by the summer of 2015. Because negotiations are still ongoing, OIG did not conduct interviews with the contractor. The Senate Report 113-181, FY 2015 Departments of Commerce and Justice, and Science, and Related Agencies Appropriations Bill (S. 2437), instructs OIG to "include interviews with all parties to the project or program in question, including, but not limited to, contractors responsible for projects under review." However, OIG attended and observed the ground segment project monthly status reviews provided by

the contractor to the GOES-R program. These reviews provided detailed progress information on both technical and contractual activities needed to support NOAA's revised launch readiness date of March 2016 for the first GOES-R satellite.

Although we could not independently verify the reliability of all the information we collected, we compared it with other available supporting documents to determine data consistency and reasonableness. Based on these efforts, we believe the information we obtained is sufficiently reliable for this report.

We conducted our review under the authority of the Inspector General Act of 1978, as amended, and Department Organization Order 10-13, dated April 26, 2013. 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 that provides 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: GOES-R Suite of Instruments

Instrument	Functional Purpose
Advanced Baseline Imager (ABI)	As the primary instrument, the ABI will enable forecasters to use the higher resolution images to track the development of storms in their early stages; it will offer a wide range of applications related to weather, oceans, land, climate, and hazards such as fires, volcanoes, hurricanes, and storms that cause tornadoes.
Geostationary Lightning Mapper (GLM)	The GLM will provide early indication of storm intensification over land and ocean areas, severe weather events, and improved tornado warning lead time of up to 20 minutes or more, as well as data for long-term climate variability studies. NOAA anticipates that the GLM will have immediate applications to aviation weather services, climatological studies, and severe thunderstorm forecasts and warnings.
Space Environment In-Situ Suite (SEISS)	The SEISS sensors will monitor the proton, electron, and heavy ion fluxes at geosynchronous orbit; assess radiation hazard to astronauts and satellites; and provide warnings of high flux events which will mitigate damage to radio communications.
Solar Ultraviolet Imager (SUVI)	The SUVI will allow users to observe the sun in the extreme ultraviolet (EUV) wavelength range, characterize complex active regions of the sun, and solar flares and eruptions—space weather that could disrupt power utilities, communication and navigation systems, and potentially damage orbiting satellites and the International Space Station.
Extreme ultraviolet and X-ray Irradiance Sensors (EXIS)	The EXIS will monitor solar flares that can disrupt communications and degrade navigational accuracy, affecting satellites, astronauts, high latitude airline passengers, and power grid performance.
Magnetometer (MAG)	The MAG will provide measurements of the space environment magnetic field that controls charged particle dynamics potentially dangerous to spacecraft and human spaceflight. In addition, it will provide alerts and warnings to many customers, including satellite operators and power utilities.

Source: OIG adapted from GOES-R program documentation



UNITED STATES DEPARTMENT OF COMMERCE
The Deputy Under Secretary for Operations
Washington, D.C. 20230

MAY 20 2015

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

FROM: 
VADM Michael S. Devany
Deputy Under Secretary for Operations

SUBJECT: *Audit of Geostationary Operational Environmental Satellite-R
Series: Leadership Must Proactively Address Integration and Test
Risks to Maintain Revised Launch Schedule*
Draft OIG Audit Report

Thank you for the opportunity to comment on the Office of the Inspector General's draft audit report evaluating the Geostationary Operational Environmental Satellite-R Series. We previously submitted a response to your office on May 8, 2015, in which we agreed with all recommendations and explained completed and proposed actions to address each recommendation. Based on subsequent requests from your office, we coordinated with your staff to provide additional information and have attached another revised response.

We look forward to receiving your final report and will further expound on completed and planned actions when we submit our detailed audit action plan.

Our specific comments on the report's findings and recommendations are attached.

Attachment



Department of Commerce
National Oceanic and Atmospheric Administration
Comments to the OIG Draft Report Entitled
“Audit of Geostationary Operational Environmental Satellite-R Series:
Leadership Must Proactively Address Integration and
Test Risks to Maintain Revised Launch Schedule”
(April 10, 2015)

General Comments

The Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft report on the Geostationary Operational Environmental Satellite-R (GOES-R) series.

Section B, Page 10, first paragraph, third and fourth sentences: “The contracts division is located with the GOES-R Series Program Office at GSFC. This structure is intended to foster sharing of contracting staff resources between agencies.”

The co-location of NOAA and NASA contracting staff is to facilitate smoother operations in support of the GOES-R program and was never intended to share contracting staff resources among the two agencies.

Page 10, second paragraph, third sentence: “As we noted in our April 2013 audit report, delaying time to definitize reduces the contract amount that can be negotiated since funds are being expended during the undefinitized period.”

It is the nature of major systems acquisition to have changes that must be expedited to protect project schedule. AGO will continue to practice sound business judgement and follow federal regulations when undefinitized actions must occur to ensure NOAA mission success.

Page 11, first full sentence at top of page: “The NASA contracting officers supporting flight segment contracts were not used in supporting the core ground system contract.”

The GOES-R program is a major systems acquisition that is the responsibility of and under the management of NOAA with NASA as a support partner. That relationship was memorialized in a set of Interagency Agreements (IAA) that delineated roles and responsibilities and the separation of duties remain appropriate at this time.

Page 11, second paragraph, first sentence:

“NOAA has not effectively negotiated contract changes associated with the core ground system.” Contract changes negotiated by NOAA are effective and resulted in fair and reasonable pricing. It is noted the Draft Report included a footnote addressing Federal Acquisition Regulation (FAR) definitization schedule; as stated above, NOAA adheres to the FAR.

Page 11, second paragraph, third sentence:

“However, on November 7, 2014, the contractor administrator was reassigned by AGO and will not be replaced.”

Staffing is regularly reviewed as part of Human Capital Planning. The level of staffing changes as the program moves through the acquisition cycle. AGO will continue to monitor resources to

devote the staffing level required to effectively manage the program.

Page 11, second paragraph, fourth sentence:

“Also, the cost analyst was replaced in February 2015.”

As noted above, staffing is regularly reviewed as part of Human Capital Planning. The level of staffing changes as the program moves through the acquisition cycle. AGO will continue to monitor resources to devote the staffing level required to effectively manage the program.

Page 11, third paragraph, last sentence:

“In addition, NOAA should examine the effectiveness of having a matrixed AGO contracting officer and specialist approach on its major systems acquisitions and other significant programs, such as NESDIS common ground enterprise.”

As requirements change and program design matures, AGO will work with the Program Office to ensure resources are properly aligned.

Recommended Changes for Factual/Technical Information

The correct title used throughout the Draft Report should be Contract Specialist, not Contracting Specialist.

Page 4, fourth paragraph:

Please add the following text to the end of the sentence: “in accordance with contract requirements.”

Page 7, first paragraph:

The paragraph is inaccurate in that it implies that recent issues with the GOES-R antenna components and ground system real-time anti-virus software could affect end-to-end testing. GOES-R end-to-end testing between the spacecraft and ground system is not dependent on the resolution of these issues; end-to-end testing can proceed if these issues are unresolved. However, it is accurate to state that these issues could impact overall ground system readiness, if not resolved or if sufficient work-arounds are not in place. Both issues are actively being mitigated/addressed and good progress is being made.

Page 7, second paragraph and Table 1:

The text in the paragraph implies that Table 1 depicts the list of candidate ground system off-ramps. Table 1 does not list off-ramps; instead, it provides the broad categories for ground system development priorities. The paragraph confuses off-ramps with development priorities. Suggest rewriting the paragraph to state the Project has prioritized requirements using Table 1. Then, make the association that off-ramps have been identified to move development on functions not essential for launch (i.e. Priority 2/Priority 3 capabilities) so that Priority 1 capabilities can be completed in time for launch.

Page 7, last paragraph:

Of the eight remaining candidate off-ramps, there are only two that have the potential to impact calibration / validation (cal/val) post-launch product testing - implementation, or sustainment. However, if either of these off-ramps were executed, the Program would not execute them in a way that would have a significant impact on cal/val, post-launch product testing, implementation or sustainment.

Page 9, last paragraph:

It is incorrect to state “significant requirements testing at NOAA sites remains” when referring to the core ground system. The core ground system contractor has completed 90 percent of the contractual requirements verification as of March 2015.

Section B, Page 10, first paragraph, last sentence:

It is inaccurate to state that the contracts matrix approach to GOES-R is what resulted in the inconsistent and insufficient Ground System support. There are many cases where contracts staff are matrixed to a project with no issues. The issue was the consistency/change-over of the contracts staff and the percentage of time they were allocated to the Program (e.g. full-time versus part-time).

Contracting support for the GOES-R program is strong and has consistently served the program well. AGO established the matrix approach. The contracting officer (CO) is part of and reports to AGO to ensure procurement integrity and only reports to GOES-R for programmatic consistency.

Page 10, second paragraph, last sentence: “In addition, NOAA stated that the prolonged amount of time to definitize contract changes is a direct result of the lack of resources in the program office and AGO to support day-to-day operations.”

It should be noted that the complexity and difficulty associated with analysis of a detailed estimate-to-complete (ETC) proposal is directly related to the time constraints associated with definitization rather than staffing levels.

NOAA Response to OIG Recommendations

Recommendation 1: “We recommend that the NOAA Administrator establish a communications mechanism among Department of Commerce, NASA, and GOES-R spacecraft and ground system contractors’ leadership, to foster rapid identification and resolution of system integration and test issues that could impact the GOES-R launch date.”

NOAA Response: Concur. NOAA and NASA have already established joint meetings with the GOES-R spacecraft and ground system contractor’s leadership to foster improved dialogue for rapidly identifying and resolving system integration and test issues that could impact the GOES-R launch date. These meetings, which were instituted in Spring 2015, include senior managers from both NOAA and NASA and occur on a monthly basis. Summaries of those are conveyed to NOAA and DOC senior management during regular tag-ups, monthly meetings, and quarterlies.

Recommendation 2: “We recommend that the NOAA Administrator establish a communications process that ensures stakeholders (including Congress) are provided with current GOES-R product availability schedules, leading up to and after launch.

NOAA Response: Concur. GOES-R Series Program has well-established communications with stakeholders to include quarterly reporting with DOC, OMB, and Congress. In addition, GOES-R publishes a quarterly newsletter on GOES-R. NESDIS will continue to evaluate its stakeholder communications and provide current GOES-R product availability schedules, leading up to and after launch.

Recommendation 3: “We recommend that the NOAA Administrator ensure that future NESDIS programs (e.g., common ground enterprise) leverage NASA, or other organizations ground systems engineering expertise early in the development cycle.

NOAA Response: Concur. NESDIS is and will continue to leverage expertise from other organizations to include NASA early in the development cycle.

Recommendation 4: “We recommend that the NOAA Administrator direct NOAA AGO to provide reporting metrics regarding GOES-R ground segment contracting actions or changes (e.g., definitization progress, staffing concerns) at monthly joint NOAA/NASA Program Management Council meetings.

NOAA Response: Concur. AGO currently has reporting metrics and will work with the Program Office to include these data (relative to GOES-R ground segment contracting actions or changes) as the APMC requests.

Recommendation 5: “We recommend that the NOAA Administrator direct NESDIS and NOAA AGO to re-examine GOES-R contracting division staffing approach effectiveness.

NOAA Response: Concur. AGO continuously reviews its staffing as part of its Human Capital Plan to ensure staffing is adequate based on all program requirements. We will continue to review the effectiveness of efforts to ensure staffing for the GOES-R and other programs are properly allocated to meet the mission.

Recommendation 6: “We recommend that the NOAA Administrator ensure that future NESDIS acquisition programs (e.g., common ground enterprise) have consistent and adequate contracting officer and specialist support.

NOAA Response: Concur. AGO continuously reviews its staffing as part of its Human Capital Plan and staffing has been determined to be adequate based on all program requirements. As the program matures, AGO will re-evaluate staffing levels to match the requirements.

Recommendation 7: “We recommend that the NOAA Administrator direct NESDIS to provide reporting metrics regarding core ground system schedule delays (e.g., re-work, regression testing) at monthly joint NOAA/NASA Program Management Council meetings.