

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT**

HEARING CHARTER

**Continued Oversight of
NOAA's Geostationary Weather Satellite System**

Thursday, April 23, 2009
10:00 A.M. - Noon
2318 Rayburn House Office Building

Purpose

The Government Accountability Office (GAO), at the request of the Committee, has submitted its latest report on the progress of the new GOES-R series of geostationary weather satellites being developed by the National Oceanic and Atmospheric Administration (NOAA). On April 23, 2009, the Subcommittee on Energy and Environment will take testimony from GAO, NOAA and the National Aeronautics and Space Administration (NASA) on the status of the program and the GAO's findings and recommendations.

Witnesses

Mr. David Powner, Director, Information Technology Management Issues, Government Accountability Office

Mr. Powner is the head of the GAO team that has supported the Subcommittee's oversight of NOAA's major satellite programs for the past five years. He will discuss the findings and recommendations on NOAA's management of the GOES-R satellite program in the report it will release at the hearing.

Ms. Mary Ellen Kicza, Assistant Administrator for Satellite and Information Services, NOAA

Ms. Kicza leads the National Environmental Satellite, Data, and Information Systems (NESDIS) at NOAA, operating the geostationary weather satellites and leading the development of the new GOES-R series. A former NASA official, Ms. Kicza assumed responsibility for NOAA satellite development in November 2006. She will describe the current status of the GOES-R program and give NOAA's response to the GAO report.

Mr. George Morrow, Director of Flight Projects Directorate, Goddard Space Flight Center, National Aeronautics and Space Administration

Mr. Morrow's office is currently managing the development or implementation of 40 space and Earth science missions at Goddard. Before a short stint in the private sector, he oversaw technical management of the *Hubble* Space Telescope and served as Project Manager for the *Aqua* satellite. Morrow has held his current position since September 2007.

Background

Western Hemisphere Weather Sentinels

NOAA depends on its GOES satellites to detect and track weather systems affecting the Western Hemisphere. The satellites hold position in geosynchronous orbit (22,300 miles above the Earth) where their speed matches the Earth's rotational velocity. The Severe Storm Center uses GOES to track tornadoes, hailstorms and other weather events threatening life and property over land. For the Hurricane Center, GOES shows developing storms in the areas of the oceans where there are no other observational sensors.

A prototype satellite was launched in 1974; the first GOES satellite went into orbit in 1975. Today, normal practice has two GOES satellites in orbit simultaneously, with one focused on each of the U.S. coasts (GOES-11 and GOES-12). A third (GOES-13) is also kept in space as a spare to assure uninterrupted coverage.

GOES – The Recent Chronicle

The current GOES-R development program is the third major procurement for GOES satellites since NOAA assumed responsibility for funding its own geostationary operational satellites in 1982. In the previous instances, NOAA purchased five GOES-Next satellites in the period from 1985-2001, and then contracted for four GOES-N satellites for the years 1998-2001. The first GOES-N model launched in May 2006 to be the on-orbit spare¹, GOES-O is awaiting launch next month and GOES-P has been completed and is in storage. GOES-Q was cancelled in 2002 because the existing satellites were performing well past their expected lifetimes.

In the original plan for the GOES-R program NOAA intended to spend **\$6.2 billion** for the life-cycle period 2007-2020. This would purchase **four satellites**. It would also fund development of two new major instruments, the Advanced Baseline Imager (ABI) and the Hyperspectral Environmental Suite (HES), as well as upgraded models of the space weather sensors. The first satellite would be launched in **2012**.

The Committee became concerned about the progress of the GOES program when NOAA's other satellite development effort, the National Polar-Orbiting Operational Environmental Satellite System (NPOESS), was forced to undergo a Nunn-McCurdy recertification. The GAO team studying NPOESS was asked to determine if GOES was proceeding down a similar path. By September 2006, as GAO made its first report, there were important changes announced. Estimated cost grew to **\$11.4 billion**. NOAA reacted by **eliminating two satellites and the HES instrument, and pushing first launch back to December 2014**. The President's FY2008 budget request now listed the life-cycle cost estimate reflected in the President's FY2008 budget request as **\$6.96 billion** for the years 2003-2028.

The Subcommittee heard from NOAA at its hearing in October 2007 that an independent review team (IRT) felt changes needed to be made in the agency's plan for managing

¹ While on the ground, GOES satellites have a letter designation based on the order in which they were built. After launch, checkout and acceptance testing in orbit, it is changed to a number. Therefore, GOES-N is now identified as GOES-13.

the program. NOAA had intended to assume overall responsibility for procurement of the entire satellite system, including the spacecraft, instruments, ground systems and integration. The IRT questioned NOAA's ability to do this. Instead it recommended that NOAA divide the program. NASA would manage the space segment (which included the spacecraft bus and launch vehicle) and NOAA would do the same for the ground segment (communications, satellite control and data management). The IRT argued that this would allow NOAA to benefit from the expertise in both agencies. To reflect these changes, NOAA and NASA had signed a Memorandum of Understanding in June 2007, and would agree on a Management Control Plan in December 2007.

For the instruments, NASA would manage their development for NOAA and provide the finished devices as Government equipment to the space segment contractor. NASA would also handle the integration of the instruments with the spacecraft. ABI was the first contract awarded (September 2004), as it was expected to involve numerous technical challenges. By the time of the hearing, the three space weather sensors had been awarded. Selection of the contractor for the Geostationary Lightning Mapper (GLM) followed in December 2007.

Since that hearing, there have been some additional significant changes. In its FY2009 budget request, NOAA said that launch of GOES-R had slipped to **April 2015** because the FY2008 Omnibus Appropriation had reduced funding below the level NOAA expected. In the *Major Satellite Program Annual Report* for FY2009, NOAA provided a new program baseline cost estimate of **\$7.672 billion**. The award for the space segment contract was made to Lockheed Martin, in December 2008, but work came to a halt when Boeing protested the award. Currently, NASA is reconsidering the proposals. The ground system Request for Proposals was released in May 2008, with NOAA hoping to make an award by June. GAO's new report indicates that some of the expected performance standards in the ground segment contract have been reduced. Further discussion appears below

GAO's GOES-R Snapshot

There are two major facets in GAO's new report on GOES-R. GAO credits the program with progress in many areas listed as concerns in previous reports. Even so, GAO identifies items of risk in program controls and management of the instruments where the program continues to fall short of best practices.

Over the course of the GOES-R program, the expected capabilities of the satellites have been reduced as the increasing costs of the program led to elimination of one major instrument (HES) and other changes in scope. The Subcommittee asked GAO to evaluate the effect of these changes on NOAA's ability to produce the products expected by its users. In the second part of this report, GAO finds that the plan for restoring the lost capability is stalled and that GOES-R may fall short of user expectations.

I. Continuing Cost Risks

GAO, in its previous testimony, indicated that the GOES-R program office was projecting the life-cycle cost for the two-satellite program was \$6.9 billion, while an independent estimate projected it would ultimately be \$9.3 billion. By the time the estimates were reconciled, GAO believed, there would be an increase in the estimate. This has indeed

occurred; NOAA completed reconciliation of the two estimates and now states the baseline is \$7.6 billion – very close to GAO’s prediction.

However, in Section 112(f) of the 2008 Consolidated Appropriations Act, the Appropriations Committees established a statutory baseline for the GOES-R program of **\$6.96 billion**. Thus, there has been a ten percent growth in the baseline, half of the growth necessary to trigger a report to Congress and a set of reviews leading to an action plan responding to the increased costs, a report on alternatives and their associated costs and a report on the impact of the cost growth on other NOAA programs. In such a situation, NOAA is likely to reduce the capabilities of the satellites yet again.

GAO notes in its report that the primary instrument - the imager – is only half-completed after five years, has been showing cost growth (\$30 million) and a delay in some scheduled work. NOAA indicates that this can be accommodated by the instrument project, as they had considered the contractor’s proposal optimistic and so provided an increased budget in the program plan. In the three years since GAO first began reporting these variances, the cost variance has grown by \$24 million and the schedule variance by \$8 million. These are discouraging trends.

The ABI has already been re-baselined once for cost and schedule (February 2007) and again for schedule in March 2008. Yet GAO’s report indicates that the ABI integrated baseline review failed to consider significant items such as schedule milestones or the contractor’s management processes. In its first recommendation, GAO urges NOAA to add these to future reviews before any subsequent re-baselining. NOAA agreed to do so. Again, GAO raised similar concerns on these program control issues three years ago.

GAO goes on to fault NOAA for lack of documentation regarding the cost and schedule variances reported on the imager and the lightning mapper. NOAA responded that they were reviewing the variances with the contractors, but not recording the information. Of course, the lack of information on the decisions resulting from these conversations might be crucial in resolving later technical problems. NOAA agreed with GAO’s second recommendation to be more diligent in documenting information on variances.

GAO lists the ABI as a continuing cost risk, while it considers GLM a high schedule risk.

II. The Boeing Protest and Schedule Risk

On December 2, 2008, the Lockheed Martin proposal won the contract for the GOES-R space segment. Following agency debriefings, however, the Boeing Company filed a protest with GAO, asserting that they had a superior offer. Further action to finalize the contract, as well as initial work, was suspended pending GAO’s decision. On February 17, 2009, NASA informed GAO that it had decided to reconsider the proposals and GAO dismissed the protest. The source evaluation board has reviewed the bids to make a new recommendation, with the intent to issue an award next month. Because this continues to be an active procurement, NASA and NOAA will sometimes be limited in their responses in order to shield "source selection" and other proprietary information protected by law and regulation. GAO also placed a protective order on information related to the protest, and it appears that elements of the order remain in force. This may also affect what information the agencies may provide.

However, the Subcommittee's immediate concern is the effect of the protest on the GOES-R program schedule. In March 2008, the IRT was already concerned that the lack of contracts for the space and ground segment "...has impacted potential schedule margins," and there was a "[n]eed to move forward without delay to get Flight and Ground Segment procurements underway."² NOAA noted in June that the proposals for both segments had been issued and that the anticipated award dates preserved adequate schedule margin, assuming no budget problems.³ With the protest, however, the current first launch in April 2015 now threatens to slip. Should a delay materialize, the risk increases that NOAA will violate its current operational requirement for a spare satellite in orbit around 2015.

The GOES-R program now has to assume that NASA's coming decision on the space segment contract will face a new protest. Should the original choice of Lockheed Martin be sustained, Boeing can be expected to renew its challenge. Changing to Boeing will likely draw complaints from an aggrieved Lockheed Martin. Risks of a protest after the ground segment contract award may have also increased. This will create more pressure on the program.

III. Disappearing Capabilities

As the GOES-R program has progressed, the improvements users expected in its performance have been eroding. The 2006 decision to drop the HES sensor to help restrain the projected \$5 billion cost growth in program estimates, contributed a great deal to the loss of 13 products (from 81 to 68) GOES-R was expected to produce. It also meant that GOES-R would not retain at least the same level of atmospheric sounding data now flying on the current satellites.

The Subcommittee asked GAO to evaluate NOAA's efforts to mitigate these losses and to find alternate means to provide the reduced capabilities. In this report, GAO describes the initial plan to use the ABI – with other data sources – to supply sounding products equivalent to the existing capability. This will require some tradeoffs; the ABI should produce more data faster, but the readings in four product categories will not be as precise as the current instrument.

Having developed the plan, NOAA briefed the proposal to parts of its user community. According to GAO, these users were willing to accept the alternative, but this appeared to rest on NOAA's assurance that the data would be updated ("refreshed") much more often than it is today. Yet GAO also states that these "refresh rates" were among the requirements that became optional requests as NOAA readied the ground segment Request for Proposal in 2007. NOAA stated that the users were informed as this change was made. It is unclear whether users understand all the ramifications of the change.

GAO also notes that NOAA also has reduced the number of products now expected from GOES-R by half, to 34. Despite declaring that the lost products remain priorities for

² *Geostationary Operational Environmental Satellite Series-R (GOES-R) Key Decision Point (KDP) C/D Readiness Report by GOES-R Independent Review Team (IRT)*, March 18, 2008, p.

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³ *Ibid.*, p. 20.

the agency, GAO reports "...NOAA has not defined plans or a timeline for implementing any of the options or for addressing the requirements for advanced products. Further, agency officials were unable to estimate when they would establish plans to fulfill the requirements." As a result, the report's third recommendation urges NOAA to establish such a plan and process. Again, NOAA has agreed with the recommendation.

NOAA states that planning is underway to prepare some kind of improved sounder that could be flown aboard two future satellites, the GOES-T and -U satellites. However, these two satellites are not part of the current procurement and budgets have not been developed or approved for them within the GOES-R program. Preliminary steps to provide resources for that development may be included in the FY2011 budget request. This was first offered as an option in April 2007 in the wake of HES's cancellation. The competitors for the HES instrument at the same time also argued that enough progress had been made to consider flying a prototype of the next-generation sounder aboard GOES-S, but NOAA declined.

This situation raises a question: just how well does NOAA work with its user communities when setting priorities among the many competing requirements that affect design of its satellite instruments? In his 2006 written statement to the Committee, former Administrator Launtenbacher described:

“...a group consisting of the NOAA users of the satellite data.... As we designed the original concept for GOES-R, the user group developed the initial requirements and meets regularly to assess the extent to which the preliminary designs meet the requirements. This group is critical as we move forward with finalizing sensors and the satellite system to ensure GOES-R will meet NOAA's requirements for data and products....”⁴

GAO's discussion of NOAA's user interactions does not appear to be referring to this group. Without the continuing contributions of users knowledgeable about the evolution of the GOES-R space and ground systems, it is possible that the increased investment in GOES-R may produce satellites little advanced from current models. GAO hopes to examine this in greater detail in its next assignment.

⁴ U.S. Congress. House. *GAO Report on NOAA's Weather Satellite Program*. Hearing Before the Committee on Science. 109th Congress; Serial 109-66. September 29, 2006; p. 19.