

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

HEARING CHARTER

**An Insecure Forecast for Continuity of Climate and Weather Data:
The NPOESS Weather Satellite Program**

Thursday, June 19, 2008
10:00 A.M. - 12:00 P.M.
2318 Rayburn House Office Building

Purpose

The Subcommittee on Energy and Environment meets on June 19, 2008, for further oversight on the National Polar-Orbiting Operational Environmental Satellite System (NPOESS). The Government Accountability Office (GAO) will testify on the latest report concerning the troubled weather satellite program and the Administrator of the National Oceanic and Atmospheric Administration (NOAA) will respond. Recent events have once more raised questions about the stability of the program, including a new threat to the most critical instrument and decisions that may create new management risks.

Witnesses

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

Mr. Powner is the head of the GAO team continuously monitoring the NPOESS program since 2001. He will present the latest in the continuing series of reports commissioned by the Committee on this satellite program. He will also respond to changes that have occurred in the program's status since GAO completed work on its review.

*Vice Admiral (Ret.) Conrad Lautenbacher, Administrator
National Oceanic and Atmospheric Administration*

The NPOESS program is fundamental to NOAA's weather missions, and Admiral Lautenbacher, as head of NOAA, shares responsibility for managing the development program. Lautenbacher serves as a member of the program Executive Committee (EXCOM) with representatives of NASA and the Air Force, NOAA's partner agencies. Because the GAO report raises issues requiring action by the EXCOM, Admiral Lautenbacher has been asked to provide NOAA's testimony.

Issues for Discussion

A. *Life-Cycle Cost Increases*

Just over a year ago, the Subcommittee held its previous hearing on the NPOESS program. At the time, efforts were underway to implement decisions imposed on the program after a so-called Nunn-McCurdy review by the Department of Defense. The NPOESS program is being conducted using the Air Force procurement system, and at the point that the program cost estimate rose more than 25 percent beyond the approved baseline, DOD was required by law to execute a program recertification.

In June 2006, the results of this recertification were announced. In brief, the estimate for **acquisition cost rose to \$11.5 billion** (with an additional \$1 billion to cover operating costs, making the **total life-cycle cost \$12.5 billion**). Only **two satellites** were guaranteed to be built, with the **first launch scheduled for 2013**. A decision to buy **two more satellites**, and to **reconsider the program's management structure**, was to be made in **2010**. This contrasted with the previously baselined program, which anticipated purchasing **six satellites** at an **acquisition cost of \$7.4 billion** with a **first launch in 2008**. The capabilities of the satellites were reduced, in that one of the major instruments (the Conical Microwave Imaging Sounder) was removed, to be replaced with a less-capable instrument on the second NPOESS satellite that would be launched in 2016. Also removed were instruments intended to extend the data records for monitoring the Earth's climate, and to track events on the Sun that had the potential to disturb the planet's geomagnetic environment.

Mr. Powner reported to staff in a briefing June 11 that the life-cycle cost for the program has apparently increased **\$1.1 billion**, to **\$13.6 billion**. Based on the data reviewed, he estimates that the NPOESS program expended \$300 million in the last year to deal with the broken frame suffered by the Cross-Track Infrared Sounder (CrIS) during vibration testing, and to address the changes in the cryoradiator for the primary NPOESS instrument, the Visible Infrared Imaging Radiometer Suite (VIIRS). The problems with VIIRS ultimately resulted in another delay in delivery of the flight unit for the NPOESS Preparatory Project (NPP) mission¹, which slipped the launch date to June 2010.

Beyond this, GAO believes that the program life-cycle cost will grow another \$800 million to reflect an updated understanding of the likely operations and support costs. The NPOESS program recently undertook a review of the operations cost estimate, the first since 2002. The DOD's independent cost estimators were also asked to prepare an estimate, which appears to be the first time an independent estimate on operations costs has been conducted. On June 12, NOAA briefed staff that the two estimates are being reconciled to determine what will be incorporated into the program baseline. They were reluctant to provide their own estimate of what that number would be.

GAO's estimate came before NOAA informed staff of yet another threat to VIIRS that is under investigation. While preparing the unit for testing, some of the screws used to assemble the instrument were found to have their heads sheared off. Initial indications are that the posts into which the screws are inserted were manufactured improperly and so the screws did not seat properly. There is a possibility that the entire VIIRS instrument may have to be disassembled to install all new posts. If this is indeed the case, NPP will once again be delayed and there will be a further cost impact. The NOAA briefers hoped this will be avoided. In either case, this is not a

¹ This precursor satellite, funded by NASA, was originally intended to allow NPOESS operators to practice with the major instruments before introducing them into the operational constellation. It has now taken on the additional function of carrying on climate monitoring responsibilities after the expected loss of NASA's *Aqua* satellite.

technical issue that results from efforts to push technology. Despite the multiple layers of oversight that have been applied to the VIIRS instrument for some years, these surprises continue to occur and the program continues to be held hostage. It is interesting to note that this backsliding has occurred in the period following the transfer of the former NPOESS Program Executive Officer, Air Force Brigadier General Susan Mashiko, against the warning in GAO's previous report. Despite the fact that she was replaced by the System Program Director, Dan Stockton, it cannot be ruled out that these changes allowed slack to creep back into the program.

B. The EXCOM relationships

GAO once again notes that major management documents have yet to be finalized and recommends that this be done as quickly as possible. The agencies received a new incentive to accomplish this goal. On April 30, 2008, the Program Acquisition Executive, Under Secretary for Defense for Acquisitions, Logistics and Technology John Young, informed the program that failure to finalize all documents by August 31, 2008 would result in a cutoff of DOD funds.² (see attached) Loss of DOD funding, by direction of the Committee on Appropriations, would require the Department of Commerce to cut an equal amount of funding. That would, of course, be a crippling blow to the program.

The NPOESS program is a unique entity, in that it receives its budget from two co-equal sources and is governed by an Integrated Program Office (IPO) where NOAA has program management responsibilities, the Air Force directs acquisition activities and NASA contributes technical support and manages the NPP mission. The Nunn-McCurdy recertification of NPOESS in 2006 was driven by the goal of maintaining existing levels of operational weather capability. The staff was briefed on June 18 by Josh Hartman, the staff specialist for space and intelligence matters for Mr. Young, to describe the genesis of the memorandum. In brief, he described the memorandum as an effort to instill greater discipline into the NPOESS program. The continuing failure to complete agreements on the program management documents resulted in the establishment of the funding cut-off deadline of August 31, 2008. Mr. Hartman agreed with GAO that the process had consumed an excessive amount of time, and Mr. Young's direction is intended to focus minds.

Of particular interest was the discussion about the current status of these documents. In our briefing with NOAA, the message seemed to be that many documents were awaiting clearance by the Air Force. GAO seemed to have a similar view. Mr. Hartman, however, provided a chart he had received from Program Executive Officer Dan Stockton showing that decisions need to be made by NASA and NOAA as well. GAO's testimony highlighted issues relating to the new Memorandum of Agreement that is to define agency roles in the reconstituted program. There was indication that DOD was asking for changes after the other agencies had finished. Mr. Hartman agreed that DOD had not communicated effectively with its partners, but that there were statutory responsibilities for DOD that required certain language to be included and that he felt this had not been clear to NOAA and NASA.

Mr. Hartman also discussed the requirements changes for NPOESS instruments described in Young's letter. These result from a June 2006 agreement with the program user groups to prioritize schedule and cost over performance when conflicts arose among those three elements. One of the Nunn-McCurdy decisions was to allow instrument performance to fall back to a level equal to the performance of instruments on the existing satellites (DOD's Defense Meteorological Satellite Program or NOAA's Polar-Orbiting Environmental Satellites). Again, Mr. Hartman stated that the discussions underway to convert that decision into the actual numbers for inclusion in the program baseline had dragged on and needed resolution. The effect of Mr. Young's

² Young, John. Memorandum for the Secretary of the Air Force, Joint Chiefs of Staff/J-* and Program Executive Office, Environmental Sensing. *Subject: National Polar-orbiting Operational Environmental Satellite System (NPOESS) Acquisition Decision Memorandum.* Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Department of Defense, Washington, D.C. April 30, 2008.

memorandum is to direct the program to continue pursuing the instrument performance levels laid out in the program specifications. Should it happen that trying to achieve those program improvements would result in schedule slips or cost increases, the EXCOM would decide when to authorize reducing the performance to so-called "legacy" level. Admiral Lautenbacher's response³ expresses concern that the guidance is not completely clear where the performance boundaries lie and requests that this be clarified. (see attached)

GAO provided the new Decision Memorandum and NOAA's response to Committee staff on June 11. They came as something of a surprise, and an effort was made to include Mr. Young as a witness at the hearing. He declined, due to the late date. The staff's meeting with Mr. Hartman allowed some insight into Mr. Young's intentions. Mr. Hartman disagreed that DOD has been seeking to escape from its commitment and stated Mr. Young hopes that greater discipline will allow the program as we know it to be completed. Had his memorandum been provided to the Committee earlier, he might have been able to make those points directly. Admiral Lautenbacher should be asked why the Committee did not receive the memorandum from NOAA in May, leaving it to GAO to bring it to our attention only a week before the hearing.

The staff's meeting with Mr. Hartman also revived the issue of the effectiveness of the Executive Committee in managing the NPOESS program. Mr. Hartman has been participating in EXCOM meetings since he started working in Mr. Young's office last August. The EXCOM, he said, seemed to spend a great deal of time on status reports, and he often found that he left meetings wondering what had been accomplished. The languid pace of completing the management documents and executing the needed requirements changes in the program baseline reflected the difficulty the EXCOM had in reaching decisions. In the NOAA briefing, Mr. Stockton was asked directly if the funding cutoff reflected a feeling that the program need a "kick in the pants" to overcome procrastination. He said no. Yet this was precisely Mr. Hartman's explanation for the language in the memorandum.

The Executive Committee is always presented to the Committee as the final decision point for NPOESS decisions that cannot be made elsewhere. Yet Mr. Hartman's description seems to show that it has reverted to the ineffective body that earned Committee criticism during the Nunn-McCurdy process. At that time, it appeared that EXCOM members were not even aware of how far the situation had deteriorated. Mr. Hartman believes that the EXCOM can accomplish its intended function with appropriate leadership - which Mr. Young appears to be willing to supply if necessary. There may also be other alternatives the Committee should consider.

C. Alternative management

The NPOES program was tasked, as part of the Nunn-McCurdy decision, to evaluate possible alternative management structures in time to determine if Northrop Grumman should be replaced as system contractor in 2010. According to GAO's report, the resulting study was completed last September. Mr. Young asked for a status report on this effort in May and directed that it be completed by August 31. Admiral Lautenbacher should be asked to discuss the possible alternatives that the program has identified, and describe the risks and benefits the program can expect. A decision to change would be made at the time that the decision to transition from engineering to production is expected. This will also entail choosing to purchase the third and fourth NPOESS satellites. That decision is somewhat foreordained, given that nothing has been put in place to develop a follow-on system. Whether to then continue buying NPOESS satellites or inaugurate a new development program should be explored.

D. Ground system security standards

³ Lautenbacher Conrad C., Jr.. Letter to the Honorable John J. Young, Jr.. Office of the Under Secretary of Commerce for Oceans and Atmosphere, Department of Commerce, Washington, D.C.. May 16, 2008.

GAO also highlights in its report that NOAA and the Air Force disagree on the level of security standards to be applied to the ground segment of NPOESS. The Department of Defense established the original security requirements for the ground-side elements. NOAA now believes that newer Federal Information Processing Standards should be applied. According to GAO, adopting NOAA's position would have a cost impact in the "hundreds of millions" of dollars. GAO's report indicates that the rework and retesting to implement new standards could affect the cost and schedule of what has to date been the lowest-risk part of the NPOESS program. Admiral Lautenbacher should explain why the benefits of making this late change - with its attendant risk - are worth the costs. He should also explain how such costs will be met if the decision is to go forward.

E. Climate sensor recovery

Dr. John Marburger, Director of the Office of Science and Technology Policy (OSTP), testified at last year's hearing about the process underway to recover from the loss of the climate sensors. Both NOAA and NASA had collaborated on an analysis of the threats to climate monitoring posed by the loss of these sensors aboard NPOESS. The Subcommittee was concerned that OSTP might be moving too slowly; teams developing some of the climate sensors were preparing to disband.

Since last year's hearing, decisions have been made to bring forward and refurbish the last CERES (Clouds and Earth's Radiant Energy System) sensor from the first NPOESS satellite to fly on NPP. A new CERES sensor will then be built for the first NPOESS flight. Another sensor, the Total Solar Irradiance Sensor (TSIS), was restored to the first NPOESS satellite. NOAA had requested funds to begin the CERES changes in the FY08 budget, but this was lost in the final omnibus appropriation. The agency cobbled together funds to permit steps to be taken to support an October 1, 2008 start. The agency also intends to begin the new TSIS sensor program on the same day, with delivery contemplated for December 2011.

Success at restoring the CERES and TSIS sensors now depends on NOAA's request for \$74 million in its FY09 budget. This is the first installment of what is intended to be a five-year, \$74 million level-of-effort program. GAO notes in its report that a plan for the long-term restoration of the nation's climate-monitoring capability is still lacking, and that the sensors announced to date only deal with the most immediate near-term threats of gaps in climate data. NOAA indicated that the level-of-effort proposal is intended to provide that missing plan, to develop additional sensors and to place them into operation. The agency has expressed concern that the contemplated continuing resolution may upset the progress made so far.

Much still remains to be dealt with in terms of the capabilities lost from the NPOESS sensors. For example, the Aerosol Polarimetric Sensor (APS) program has now arrived at much the same spot that TSIS found itself in last year. APS will fly the prototype sensor on the upcoming *Glory* mission for NASA. A new design, it has been difficult to achieve the targets for precision and accuracy needed to meet the promised specifications and NASA has been frustrated with Raytheon's performance.⁴ Recently, however, the instrument has been meeting its test goals and is on track for delivery. The contract is therefore running down and the instrument team is likely to break up. NOAA told staff that the agency intends to evaluate the performance of the sensor before deciding whether to purchase more. This is consistent with the recommendations from OSTP's analysis, but means that there will likely be no option to fly a new sensor for some years after the end of the *Glory* mission. This will likely affect efforts to provide a more accurate understanding of the impacts atmospheric aerosols have on climate.

F. Space weather sensor recovery

⁴ APS is being built by the same Raytheon division responsible for the VIIRS instrument.

The second set of sensors demanifested from NPOESS in 2006 monitor the so-called "space weather" phenomena generated in solar flares and coronal mass ejections. These events can, under the right circumstances, affect satellite communications, overwhelm signals from the Global Positioning System, increase long-term cancer risks for airline crews and pilots flying in the polar regions or bring down power grids. The Air Force is particularly concerned because of the difficulty in discerning between natural interference with satellite command and control and deliberate efforts to impede communications as prelude to an attack.

In January, the Office of the Federal Coordinator of Meteorology (OFCM) submitted its analysis of the impacts to the space weather program occasioned by the loss of the NPOESS space weather sensors to OSTP. The report concludes that "[t]here are no planned missions to replace the space environmental sensing capabilities removed from NPOESS. A loss of continuity of critical measurements will occur when existing on-orbit operational systems complete their missions during the next decade." They judge that anticipated losses range from "moderate" (for plasma, which can determine how badly communications are affected by solar events) to "extreme" (in the case of the Electron Density Profile measurement, without which it is harder to determine what is happening to satellites). While the sensors would not be available in time to monitor the approaching peak in the Sun's 11-year cycle, they would arrive on station to carry through the next. NOAA states that they are now discussing a follow-on mission with NASA and the Air Force.

While unrelated to the NPOESS sensors, the OFCM also noted that the primary early-warning space weather sensor, NASA's Advanced Composition Explorer (ACE), has passed its tenth anniversary. Originally designed for a two-and-a-half year mission, it continues in service to allow NOAA to provide advance warnings of one-half to one hour for solar events that will affect the earth's atmosphere and magnetic field. Such warnings to airlines, power companies and communications firms give enough time to take steps to reduce disruptions in vital services. ACE is the latest instance of the lack of long-term planning for developing improved operational capabilities from research programs. Further, in May NOAA reported that the X-Ray Sensor on all of the newer Geostationary Operational Environmental Satellites had failed. The agency is currently depending on the last working sensor on the oldest (GOES-10) satellite to track solar flares and working to obtain equivalent data from other missions.