

**WRITTEN STATEMENT BY
VICE ADMIRAL CONRAD LAUTENBACHER, JR. (U.S. NAVY, RET.)
UNDER SECRETARY OF COMMERCE FOR OCEANS AND ATMOSPHERE
AND NOAA ADMINISTRATOR
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE**

**OVERSIGHT HEARING ON
“ENVIRONMENTAL SATELLITES
POLAR-ORBITING SATELLITE ACQUISITION FACES DELAYS; DECISIONS
NEEDED ON WHETHER AND HOW TO ENSURE CLIMATE DATA
CONTINUITY”**

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

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Introduction

Mr. Chairman and members of the Subcommittee, I am Conrad C. Lautenbacher, Jr., Under Secretary for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce (DOC). I appreciate having the opportunity to provide an update of our progress in the development of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Program and discuss the latest Government Accountability Office (GAO) report on the program. I will provide an update on the Program since the June 7, 2007, hearing that reviewed the status of the restructured NPOESS Program.

NOAA's environmental satellite programs are the backbone of the nation's hurricane and severe weather forecasting and warning capabilities. The 30-year record of NOAA's environmental satellites to the global climate record is also well known. NOAA's two major satellite programs each play critical roles in providing environmental information to the nation. NOAA's Geostationary Operational Environmental Satellite (GOES) series is used for short-term weather forecasting and severe storm tracking, while NOAA's Polar-orbiting Operational Environmental Satellite (POES) series provides information that is crucial to long-term weather predictions and climate modeling. In early 2009, NOAA N-Prime, the last of the current NOAA POES series, will be launched.

Status of the NPOESS Program

NOAA's satellite acquisitions are complex and difficult development efforts. I will be the first to acknowledge that the government does not have a strong track record with regard to recent

satellite acquisition development efforts. Through partnerships with the National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD), and our contracts with industry, we have built and are reinforcing our team to successfully complete NPOESS satellite development. We appreciate GAO's long-standing review of the NPOESS Program and the guidance and oversight we have derived from it. NOAA is working hard to develop our satellite programs within established cost and schedule boundaries, and with the performance that the nation requires and expects.

The NPOESS program is funded equally (50:50) by DOC/NOAA and DoD/Air Force annual appropriations. NASA conducts NPOESS Preparatory Project (NPP) risk reduction and data continuity activities, DoD/Air Force manages the acquisition contract, and DOC/NOAA provides overall program management and operation of the system. Through FY 2008, the NPOESS program will have incurred combined program costs of \$4.4 billion. The President's FY 2009 Budget request for the NPOESS Program is \$577 million; of that amount, \$288 million is requested for DOC/NOAA, and \$289 million for DoD/Air Force.

Since the NPOESS Program's restructure and the contract renegotiation, we have completed a number of management changes that have improved oversight:

- Mr. Dan Stockton was selected as the new Program Executive Officer by NOAA with the concurrence of the NPOESS Executive Committee (EXCOM).
- Colonel Ed Phillips was recently selected as System Program Director. He currently serves as the acting System Program Director. Prior to that, he was the NPOESS Deputy Program Executive Officer.
- A restructured NPOESS contract is in place that ties contractor compensation to more objective measures of cost, schedule, and performance.
- The government has replaced the old award fee structure with a clearer performance-based structure.
- The Chief Executive Officers of Northrop Grumman and Raytheon now attend the regularly scheduled NPOESS EXCOM meetings to ensure that the appropriate resources of these corporations are focused on the development and test issues of the program.
- Several key climate sensors have been remanifested (or reinstated) on the NPP and NPOESS satellites.
- A lower risk alternative to the Conical-scanned Microwave Imager/Sounder (CMIS), the Microwave Imager/Sounder (MIS), is being developed by the Naval Research Laboratory. The MIS will be flown on the second (C-2) and third (C-3) NPOESS satellites.
- The current suite of instruments listed in Appendix 1 reflects the progress the government has made since 2006 to continue weather and climate measurements.

As a part of the future planning for the program, the NPOESS Integrated Program Office (IPO) has begun the Alternative Management Study which will develop the options and assessments for viable competing management structures for the NPOESS program. The Alternative Management Study will support future acquisition strategies for the EXCOM consideration.

A few of the NPOESS instruments continue to face challenges, but with the Program Managers and Systems Engineers who are now in place, I and the NPOESS EXCOM believe that the Program is better positioned to proactively identify, contain, and manage these challenges as they arise.

The table below lists the instruments on NPP and the C-1 satellite.

NPOESS Preparatory Project (NPP) Launch: 2010	NPOESS C-1 Launch: 2013
Visible/Infrared Imager Radiometer Suite (VIIRS)	VIIRS
Cross track Infrared Sounder (CrIS)	CrIS
Advanced Technology Microwave Sounder (ATMS)	ATMS
Ozone Mapper/Profiler Suite (OMPS) Nadir and Limb	OMPS (Nadir)
Clouds and Earth's Radiant Energy System (CERES)	CERES
	Total Solar Irradiance Sensor (TSIS)
	Space Environment Monitor (SEM)
	Search and Rescue (SARSAT)
	Advanced Data Collection System (A-DCS)

The Visible/Infrared Imager/Radiometer Suite (VIIRS) continues to be our most challenging instrument to develop, and as such receives a great deal of management and oversight by the government and NPOESS contractor team. We have implemented a number of changes based on the lessons learned during the events that lead to the 2006 restructuring of the Program and on the issues we have encountered since then. The tri-agency partners have instituted rigorous management and engineering reviews to address and resolve problems in an orderly fashion, while at the same time not posing undue risk to the overall Program. With respect to the current challenges with the VIIRS instrument, the Program Executive Officer and System Program Director, with assistance from NASA, are working with the NPOESS contractors to focus the appropriate attention and resources to address the VIIRS development challenges.

As the Committee recently learned, the NPOESS program uncovered some potentially significant fastener design flaws with VIIRS in the past few weeks. Although we are cautiously optimistic that technical assessments will result in minimal impact, the worst case scenario could cause a several month delay to the delivery of VIIRS to NPP, which could lead to a further launch delay for NPP.

The Cross-track Infrared Sounder (CrIS) is undergoing extensive planning and preparation for final sensor checklist items to be complete in time for delivery for NPP integration at the end of July 2008. The Ozone Mapping and Profiler Suite (OMPS) -Limb and -Nadir instruments that will fly on NPP have been integrated and a test of the sensors has been completed.

With respect to the ground system, the IPO continues to make progress on “SafetyNet”, a system of globally distributed ground data reception stations that will receive data from NPOESS satellites and immediately relay these data to the four Weather Centrals - NOAA/National Environmental Satellite, Data and Information Service; Air Force Weather Agency; Fleet Numerical Meteorology and Oceanography Center; and Naval Oceanographic Office. The SafetyNet agreements are on schedule and there are no outstanding obstacles that would prevent completing the global ground system network.

Development of the Integrated Data Processing Segment (IDPS) continues on-track. The IDPS will process environmental data products beginning with the NPOESS Preparatory Project (NPP) and continuing through the lifetime of the NPOESS system. The IDPS must process a data volume significantly greater than the current POES and DMSP systems and within significantly reduced processing times. The IDPS recently completed factory acceptance test readiness review.

Coordination of Tri-agency Acquisition Decision Memoranda

The IPO continues to coordinate among the tri-agency partners, DoD/Air Force, NASA, and DOC/NOAA, to conclude and finalize the documents required by the June 2006 Acquisition Decision Memorandum. Six documents remain to be completed. While getting these remaining documents finalized has not hindered our ability to manage and implement the NPOESS Program thus far, they have been challenging to coordinate through a tri-agency process. However, the EXCOM remains committed to completing them. At this time, the six outstanding documents are the:

- Fee Management Plan
- Acquisition Program Baseline
- Acquisition Strategy Report
- Test and Evaluation Master Plan
- Two-Orbit Program
- NPOESS Tri-Agency Memorandum of Agreement

The program is working to secure final clearance on the documents by later this year.

Status of Restoring Key Climate Sensors

As discussed earlier, the 2006 decision to restructure the NPOESS Program removed (or “demanifested”) several planned sensors that would have sustained key, long-standing climate measurements. The table in Appendix 2 lists the current status of those demanifested sensors. Since this decision, Office of Science Technology Policy (OSTP) and the Office of Management and Budget have worked closely with NASA and NOAA and the climate science community to understand the implications of the loss of these climate sensors for climate and ocean research activities, and to identify options for retaining key measurement capabilities from this group of planned sensors.

As a result of these assessments and information provided in the 2007 National Research Council Decadal Survey on Earth Sciences, the Administration concluded that the highest near-term priorities (listed in relative priority order) are to sustain the datasets of the following five key climate measurement capabilities:

- Total solar irradiance
- Earth radiation budget
- RADAR altimetry
- Ozone vertical profile
- Aerosols

In addition to continuing these critical measurements, the Administration also recognized the importance of stewardship of the climate data records that will be derived from these instruments.

The Administration developed a plan to implement this assessment and requested a \$74 million budget initiative in the President's FY 2009 Budget Request. These funds will be used to support the development of CERES and TSIS in time for their respective launches on NPP and C-1. Specifically, the FY 2009 funds would be applied to the development of the sensors in the following manner:

- \$38 million for development of CERES for NPP and C-1, which will provide continuity for Earth radiation budget measurements,
- \$28 million for development of TSIS for C-1, which will provide continuity for total solar irradiance measurements, and
- \$8.0 million for development of data record stewardship to provide long-term science support for the data derived from climate instruments.

This plan complies with the 2006 restructure of the NPOESS Program that requires sensors be restored only if they are funded separately from the joint DOC/NOAA-DoD/Air Force annual appropriations for NPOESS. In this plan, NOAA is responsible for full funding to develop these instruments with NASA providing technical and acquisition assistance on a cost reimbursable basis from NOAA.

The plan includes two of the five key measurements detailed in the priority list above. NOAA and NASA have determined that near-term continuity of the other three measurements can be fulfilled through existing plans detailed below:

- Continuity of RADAR altimetry measurements can be fulfilled through the Jason 2 mission scheduled for launch this month. Plans for a follow-on satellite (Jason 3) are currently being evaluated.
- Aerosol measurements can be fulfilled with the 2009 launch of the Aerosol Polarimeter Sensor on the NASA GLORY mission.

- Ozone vertical profile data requirements can be addressed by the NPOESS EXCOM's 2007 decision to remanifest Ozone Mapping and Profiler Suite Limb sensor (OMPS-Limb) with the OMPS-Nadir sensor onto NPP.

While these efforts address the most immediate needs for climate sensor continuity, it is recognized that a longer term strategy for climate sensor continuity must also be addressed. NOAA and NASA are continuing to work together to identify the longer term strategy, taking into account current and future national and international assets. The results of these efforts will continue to be vetted with the science community and reflected in outyear budget recommendations.

Status of Demanifested Space Weather Sensors

In addition to the climate sensors discussed above, the Space Environmental Sensor Suite, which includes five space weather sensors, was demanifested from the NPOESS program in 2006. In June 2007, OSTP requested that the Office of the Federal Coordinator for Meteorology convene an interagency group to provide an assessment of the impact of demanifesting these space weather sensors. NOAA, NASA, and the Air Force participated in this assessment. The assessment and report focused on evaluating whether and how to restore these space weather measurements in a two phase approach:

Phase I: Assess the impacts of the 2006 NPOESS restructure decisions and the potential loss of NASA's Advanced Composition Explorer (ACE) mission on U.S. space weather-related activities.

Phase II: Examine possible options to address these impacts and to restore the capability lost.

The Phase I report was provided to OSTP earlier this year. The main findings were that the 2006 restructuring of the NPOESS program:

- reduced support of Environmental Data Records from 12 to 5,
- may cause monitoring and warning capabilities to revert to pre-1980 levels, and
- put precision Global Positioning System (GPS) users at risk.

Additionally, the loss of NASA's ACE data was deemed critical as it would eliminate the ability to predict the onset of geomagnetic storms. At this time, NASA has instituted a fuel management strategy that may allow ACE to continue to perform until 2020. However, since there is no ACE replacement in development, this single source of data remains an area of concern for NOAA and the space weather community. While OSTP has not formally initiated Phase II of the assessment, it is expected to do so later this year.

In addition, the Committee was informed last month that NOAA is currently working to mitigate the loss of some space weather observation capabilities on three of four of its on-orbit geostationary satellites. NOAA is currently relying on GOES-10, the oldest geostationary satellite on orbit, to monitor solar flares, an observation important to users of satellite and high

frequency communications and GPS. Plans for future mitigation following the end of the satellite's service are being planned in partnership with NASA.

Government Accountability Office (GAO) Recommendations for Executive Action

GAO has provided regular reviews of the NPOESS Program and we appreciate the perspective GAO professionals provide. We have met with GAO and provided information and feedback on its most recent report and believe that existing efforts underway will support the closure of these recommendations.

Recommendation number one: *In order to bring closure to efforts that have been underway for years, we are making recommendations to the Secretaries of Commerce and Defense and to the Administrator of NASA to establish plans on whether and how to restore the climate and space sensors removed from the NPOESS Program by June 2009, in cases where the sensors are warranted and justified.*

NOAA concurs with the recommendation and continues to work with OSTP, OMB, NASA, and the climate science community to restore the climate sensors that were demanifested from the NPOESS Program in 2006. While the NPOESS Program continues to face challenges, the tri-agency NPOESS EXCOM, on the advice of the NPOESS Program Executive Officer, approved remanifesting OMPS-Limb and CERES onto NPP, and remanifesting TSIS onto the first NPOESS C-1 satellite. Meeting the required deadlines to integrate these instruments onto NPP and NPOESS C-1 requires full funding of the DOC/NOAA and DoD/Air Force NPOESS Program, and the NOAA climate sensor and climate data record budget requests. An FY 2009 continuing resolution that did not provide full funding for the \$74 million for climate sensors would threaten the development of the TSIS and CERES sensors and potentially put into question whether they would be ready for integration onto the NPOESS C1 mission. Restoration of the other measurements will occur in the later years, as previously discussed.

Restoration of the space weather sensors is being modeled after the collaborative interagency process with OSTP and OMB that was used to assess the demanifested climate sensors. NOAA continues to work closely with user communities affected by space weather to ensure that its plans address user requirements. NOAA is also working closely with NASA to maximize the utility of the ACE satellite. In the interim, NOAA has requested input from the aerospace industry and several suggested concepts and proposals are being evaluated as potential commercial opportunities for data purchases, secondary payload opportunities, and commercially provided satellites to meet projected NOAA observational requirements.

Recommendation number two: *In addition, we are reemphasizing our prior recommendation that the appropriate NASA, NOAA, DoD executives immediately finalize key acquisition documents.*

NOAA concurs with this recommendation and has been working with the tri-agency NPOESS EXCOM to reach the agreements required to complete the six outstanding Acquisition Decision Memorandum documents. Recently, the Under Secretary of Defense for Acquisition, Technology, and Logistics issued an extension until August 2008 to complete the documents.

The NPOESS Program Executive Officer has made completing this task one of his top priorities and the EXCOM Principals and their staffs are supporting his efforts.

Conclusion

In conclusion, I appreciate the Committee's continued interest in the success of NOAA's satellite programs. It is widely acknowledged that satellites are very complicated and difficult systems to design, build, and operate. However, their capabilities play a key role in NOAA's mission to observe and predict the Earth's environment and to provide critical information used in protecting life and property.

We are making significant strides in developing better processes for designing and acquiring our satellites. We currently have well functioning operational satellites with backup systems in place, and we are working on the next generation that will provide significant improvements in our ability to forecast the weather and monitor the climate. I would be happy to answer any questions you may have.

**Appendix 1 NPOESS Instruments
(as of June 2008)**

Instrument	Function	Status
Visible Infrared Imager/Radiometer Suite (VIIRS)	Collects visible infrared data of the Earth's atmosphere, ocean, and land such as clouds, snow, ice, and sea surface temperature	In Development
Crosstrack Infrared Sounder (CrIS)	Measures vertical distribution of temperature, moisture, and pressure in the atmosphere	In Development
Ozone Mapping and Profiler Suite (OMPS)	Collects data on distribution of ozone in the Earth's atmosphere	In Development
Advanced Data Collection System (ADCS)	Collects and redistributes data from remote sites. Monitors species migration	Government Furnished Equipment (GFE) instrument to IPO
Cloud and Earth's Radiant Energy System (CERES)	Measures both solar-reflected and Earth-emitted radiation from the top of the atmosphere to the Earth's surface	In Development
Advanced Technology Microwave Sounder (ATMS)	Senses data on temperature and moisture profiles	In Development
Space Environment Monitor (SEM)	Collects data on the space environment	Development to begin in FY 2008
Search and Rescue Satellite Aided Tracking (SARSAT)	Detects and locates aviators, mariners, and land-based users in distress	GFE instrument to IPO
Microwave Imager/Sounder (MIS)	Measures atmospheric temperature and pressure, and the velocity and direction of the ocean and wind currents	Development to begin in FY 2008
Total Solar Irradiance Sensor (TSIS)	Measures total and spectral density of solar radiation on the earth	Development to begin in FY 2009. GFE instrument to IPO

Appendix 2
Status Of The Climate Sensors Demanifested During 2006 Restructuring
of the NPOESS Program

Sensor	Current Status
Aerosol Polarimetry Sensor (APS)	NASA is developing an APS instrument which is scheduled to be launched on the GLORY mission. APS has experienced developmental challenges that have delayed the launch date from December 2008 to 2009. NOAA is monitoring that developmental process closely before making a decision to move forward on this sensor.
RADAR Altimeter	Ocean Surface Topography Mission on the Jason-2 satellite (OSTM/Jason-2) is scheduled for launch in June 2008. OSTM/Jason-2 will continue satellite altimetry measurements from the Jason mission. NOAA, NASA, the French Space Agency (CNES), and EUMETSAT are collaborating to provide operational support for Jason-2. NOAA will support data processing, archiving and distribution of products that its users require. NOAA is evaluating options for operational continuity for altimetry data with a satellite follow-on (Jason 3). Details are still being negotiated.
Survivability Sensor	This sensor was specific to Department of Defense requirements, and is not a priority for NOAA. NOAA is not pursuing this instrument.
Total Solar Irradiance Sensor	TSIS measurements are important to NOAA. Development of the TSIS instrument is the most immediate priority. The NPOESS Executive Committee (EXCOM) recently decided to place the TSIS instrument on C1, the first NPOESS satellite.
Conical-scanned Microwave Imager/Sounder (CMIS)	The NPOESS Integrated Program Office (IPO) recently announced a partnership with the U.S. Naval Research Laboratory (NRL) to develop the first MIS sensor. The NRL plans to move production of additional MIS sensors for subsequent NPOESS launches to an industry partner, should this prove more cost-effective.
Earth Radiation Budget Sensor	The EXCOM recently decided to place the Clouds and the Earth's Radiant Energy System (CERES) instrument on the NPOESS Preparatory Project. This will assure continuity of measurements between NASA research satellites and first NPOESS spacecraft's CERES instrument.
Ozone Mapper/Profiler Suite (OMPS)	In April 2007, NOAA and NASA jointly announced that it would add the OMPS-Limb portion of the sensor back to the OMPS-Nadir portion on NPP.
Space Environmental Sensor Suite	The White House Office of Science Technology Policy is working with NOAA, NASA and DoD to study various options to acquire these data.