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CONTINUING INDEPENDENT ASSESSMENT OF THE NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM

HEARING

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

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CONTINUING INDEPENDENT ASSESSMENT OF THE NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM

WEDNESDAY, JUNE 17, 2009

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 2:04 p.m., in Room 2318 of the Rayburn House Office Building, Hon. Brad Miller [Chairman of the Subcommittee] presiding.

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Subcommittee on Investigations and Oversight

Hearing on

Continuing Independent Assessment of the National Polar-Orbiting Operational Environmental Satellite System

Wednesday, June 17, 2009
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building

Witness List

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

Mr. Tom Young
Chair
NPOESS Independent Review Team

Ms. Mary Glackin
Deputy Under Secretary for Oceans and Atmosphere
National Oceanic and Atmospheric Administration (NOAA)

HEARING CHARTER

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

Continuing Independent Assessment of the National Polar-Orbiting Operational Environmental Satellite System

WEDNESDAY, JUNE 17, 2009
2:00 P.M.—4:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

Purpose

The Subcommittee on Investigations and Oversight meets on June 17, 2009, for further oversight of the National Polar-Orbiting Operational Environmental Satellite System (NPOESS). The Subcommittee will receive the newest report on the program produced by the Government Accountability Office (GAO) and the findings from the Independent Review Team (IRT) examining the program. NPOESS has been the subject of sustained oversight as the risk that critical weather data might be lost has grown. At this hearing, the Subcommittee will consider alternative steps to limit the continuing deterioration in NPOESS program management and maintain the present schedule of satellite launches.

Program Description

In 1993, the decision was made to bring together the Defense Meteorological Satellite Program satellites operated by the Air Force and the Polar Operational Environmental Satellites run by NOAA, thereby creating the NPOESS program.[1] These satellites were intended to meet needs for weather data by the military services as well as NOAA's National Weather Service. NPOESS also offered the opportunity for NOAA and NASA to assure continuity of the climate data that both agencies are collecting. The Committee's work has shown that the benefits expected from NPOESS have failed to materialize. Instead, the agencies find themselves at risk of losing the flow of global data on weather conditions and climate change that are critical to serving the needs of the United States.

The Committee has held five hearings on the NPOESS program since 2003, documenting cost overruns and schedule delays. A recurring issue has been the ineffectiveness[2] of the program's Executive Committee (EXCOM), which consisted of the heads of the three agencies involved:

- the Administrator of NOAA,
- the Under Secretary of Defense for Acquisition, Technology and Logistics (who delegated responsibility for EXCOM activities to the Secretary of the Air Force); and
- the Administrator of NASA.

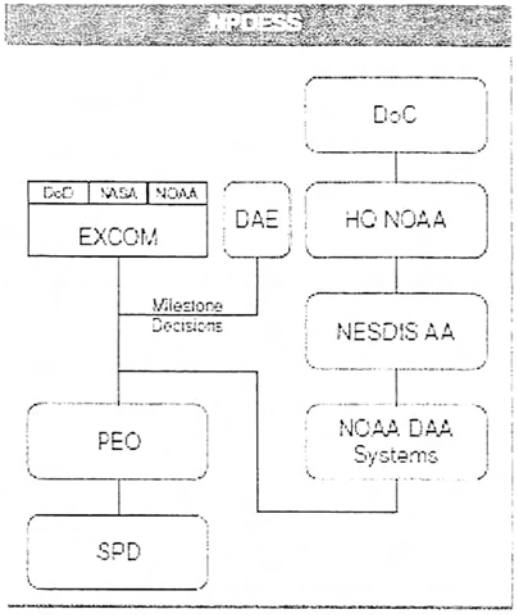
Below is a diagram of the NPOESS management structure (left column) established in response to the so-called Nunn-McCurdy recertification[3] in 2005. A System Program Director (SPD) was placed in charge of the Integrated Program Office (IPO) handling the day-to-day program oversight. A Program Executive Officer

[1] GAO in its report provides a more detailed description of the usefulness of satellites in polar orbits.

[2] In 2005, frustrated by NOAA's inability to respond to the deteriorating conditions within the program, Representatives Gordon and Wu called for the removal of NOAA's Administrator and his deputy. Then-President Bush declined to take that step.

[3] As set forth in the Memorandum of Agreement governing the NPOESS program, the Air Force is managing the acquisition of the satellites. It is therefore subject to Department of Defense regulations for major defense programs. When such programs exceed approved baseline costs by more than 25 percent, recertification is required by 10 U.S.C. 2433 et seq.

(PEO) became the direct liaison to the EXCOM. This was to simplify reporting information to the EXCOM and execution of resulting decisions.



With the reassignment of the first PEO, Air Force Brigadier General Susan Mashiko, the EXCOM sought a replacement and ultimately settled on her System Program Director, Dan Stockton. In assuming his new position, Mr. Stockton retired from the Air Force and became a NOAA employee. The new System Program Director, Ed Phillips, also transitioned from the Air Force to a NOAA civil service position. As a result, they also serve within the Department of Commerce management structure (right column), communicating through the National Environmental Satellite Data and Information Services (NESDIS) division of NOAA.

According to the reports to be presented at this hearing, this management structure is still failing to provide the leadership needed for NPOESS program success. This leads to the obvious question: Is there hope of repairing the flaws in the organization? If not, what should replace it?

Witnesses

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

Mr. Powner is the head of the GAO team 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.

Mr. Tom Young, Chair, NPOESS Independent Review Team (IRT)

Mr. Young served as the president of the Martin Marietta Corporation until its merger with Lockheed Corporation; he then served as Executive Vice President of Lockheed Martin until retiring in 1995. Mr. Young also served as Director of NASA's Goddard Space Flight Center earlier in his career. In recent years, he has lent his expertise to numerous program reviews and mishap investigations in the space program. He testifies today as Chair of the Independent Review Team constituted by the NPOESS Executive Committee (EXCOM) to offer advice on recovering from the severe technical and managerial problems in the program.

Ms Mary Glackin, Deputy Administrator, National Oceanic and Atmospheric Administration (NOAA)

The NPOESS program is fundamental to NOAA's weather missions, and was also expected to contribute to the agency's monitoring of climate and space weather phenomena. During the transition to the Obama Administration, Ms. Glackin has served as NOAA representative to the EXCOM, and has been coordinating with representatives of NASA and the Air Force to deal with the problems that continue to beset the program. Ms. Glackin has been asked to provide NOAA's responses to the reports prepared by the previous witnesses. She will also describe the progress of discussions now underway to plot a future course for the program.

Background

A. Helping NPOESS Succeed

The NPOESS program exists to collect data needed by NOAA, DOD and NASA to forecast weather, help military units minimize weather impacts on operations, and understand the influence of Earth's climate. According to the IRT report, however, the "customers" have very different views on "how much is enough." DOD is quite satisfied with the performance of those instruments currently flying and sees little need for significant investments in improvements. For NOAA and NASA, on the other hand, such improvements are needed to achieve their mission goals. The IRT states, "*These differences are straining interagency relationships and are impacting how people do their jobs, even down to the lowest levels of the IPO.* **The IRT believes that this program will not survive if this particular problem is not addressed immediately**." [emphasis added] The IRT follows with the statement that this ". . . *can only be resolved at the White House level.*"

Whatever decision the White House makes on the question of what NPOESS will do bears heavily on one of the major recommendations the IRT offers as part of its "Path Forward." The Team states that the program needs support from the space system experts at either NASA's Goddard Space Flight Center or the Air Force Space and Missile Command. The team believes that, given the fact that NPOESS is critical to NOAA's mission areas, NOAA should recast the program to work with Goddard much as it is doing with the Geostationary Operational Environmental Satellite upgrade (GOES–R). However, if the White House defines the NPOESS program to be more in line with the DOD view that NPOESS is little more than a replacement for the current polar-orbiting satellites, then either organization would be acceptable. Whatever the case, the present Integrated Program Office would continue in some fashion and would be expected to work closely with whichever organization is selected. The Committee's interest in NOAA and NASA activities argues for support of the IRT's preference for a NOAA–NASA partnership. Mr. Young also emphasizes that full control of the program resources must be vested in the revamped acquisition organization.

The IRT also believes that the current contractors should be retained. In the Nunn-McCurdy restructuring, studies were begun to determine if the prime contract with Northrop Grumman should be changed or terminated. These studies criticized Northrop Grumman and the Raytheon Space and Airborne Systems team building the Visible/Infrared Imaging Radiometer Suite (VIIRS) for poor performance. The Independent Review Team received detailed presentations on the results from these studies, which concluded that Northrop Grumman, at least, had made progress in addressing its shortfalls. Therefore, the disruption caused by finding a replacement was not warranted. The IRT team also recommends retaining Northrop Grumman. However, the award fee plan for the contract should be changed to focus on mission success.

The IRT also recommended that the government press forward with Raytheon to obtain the VIIRS instrument, although it could not determine how much longer it would take or how much it will ultimately cost. Replacement options should be limited to obtaining another unit of the existing Advanced Very High Resolution Radiometer (AVHRR) imager now in use should the VIIRS unit fail during its remaining test or integration processes.

The IRT notes that the program is still operating with insufficient funds to achieve the outcomes it is pursuing. Correcting this will be another outgrowth of the White House decision process, in that more funds will have to be found or something will have to be dropped. The IRT estimates that accomplishing the current program plan will require an additional $1 billion, which matches GAO's view (see section C, below).

B. What About EXCOM?

Previous hearings have examined the role and performance of the Executive Committee, which serves as the senior level of management for the NPOESS program. In the Committee's 2005 hearing, Mr. Gordon (then Ranking Member) had a sharp exchange with NOAA Administrator Conrad Lautenbacher about the flow of information to the EXCOM and the slow pace of EXCOM meetings even as the program was suffering severe budget problems. In a hearing before the Energy and Environment Subcommittee in 2007, GAO described the laborious process the EXCOM undertook to get concurrence on the set of documents needed to implement the management, technical and budgetary changes resulting from the Nunn-McCurdy recertification decisions in 2006. A year later, Mr. Powner testified that the updated Memorandum of Agreement and the new program baseline had still not been signed by all of the three principals.[4] The repeated inability to make even basic decisions led the Committee to ask GAO to focus attention on the EXCOM.

Mr. Powner will testify that, despite the efforts undertaken to repair the weaknesses in the EXCOM, "*. . . it has not effectively fulfilled its responsibilities and does not have the membership and leadership it needs to effectively or efficiently oversee and direct the NPOESS program.*" Part of the problem involved the fact that while the Secretary of the Air Force was serving as DOD's EXCOM representative, he had no authority to make commitments for DOD. The Under Secretary of Defense for Acquisition, Technology and Logistics had not delegated authority to make commitments for DOD when reaching procurement milestones. As GAO noted, however, the Under Secretary did not attend EXCOM meetings, which contributed to the inability to gain approval on the Memorandum of Agreement and the program baseline.

Thus the situation continues, and indeed has fueled growing friction between the program participants. GAO's report illuminates this where it states:

> *At the conclusion of our review, DOD officials reported that part of the problem in escalating risks is that, in violation of interagency agreements and inconsistent with DOD acquisition policy, two senior NOAA officials review and limit what the Program Executive Officer provides to the Executive Committee. NOAA officials and the Program Executive Officer strongly disagreed with this statement. NASA commented that NOAA's enhanced oversight provides a healthy set of checks and balances to the program.*

GAO also described in its draft report that the EXCOM fails to make clear decisions and does not regularly determine if progress is being made on the tasks it has ordered to be accomplished. GAO found no mechanism for tracking EXCOM decision milestones. Compounding this lack of oversight, the decisions that have been made often did little to actually resolve the problem. This is most clearly seen in the continuing inability to bring the primary sensor, the Visible Infrared Imaging Radiometer Suite (VIIRS), to completion. Despite continued pressure on prime contractor Northrop Grumman to achieve improved performance from Raytheon, the EXCOM has not been able to solve this major impediment to NPOESS progress.

Having been constituted by the EXCOM, Mr. Young's Independent Review Team proved diplomatic in its comments. Still, it raised concerns similar to those highlighted in GAO's report. As it concluded:

> *The EXCOM process is ineffective: The EXCOM is intended to be a decision body to provide streamlined direction to the PEO. The current DOD EXCOM representative has not been delegated the proper authority from the Defense Acquisition Executive (DAE), who is also the NPOESS Milestone Decision Authority (MDA), and decisions require an additional meeting and coordination to be finalized. Additionally, the IRT has observed that many of the topics that are discussed at the EXCOM delve too deeply into program details and many critical top level issues are left unresolved.*

GAO recommends that the Under Secretary for Acquisitions, Technology and Logistics be directed to attend EXCOM meetings. It further recommends that the EXCOM devise a realistic timeline for revising the program baseline, develop a plan to mitigate data gaps and pay closer attention to the outcome from its decisions.

Mr. Young argues that the EXCOM should play a different role if the NPOESS program becomes a NOAA–NASA responsibility. In that case, the EXCOM will provide DOD continuing insight into the NPOESS program. While DOD believes its

[4] On March 3, the EXCOM was notified that the accumulation of the most recent technical trouble with the VIIRS instrument required delays in the predicted launch dates for NPP and the NPOESS satellites. A new baseline was to be submitted by June 4.

needs are being met by the current generation of instruments, it is also the case that users often cannot recognize benefits from new technology until they are presented real, not theoretical, products to evaluate. That is very likely to be the case with NPOESS. Mr. Young believes that the EXCOM will then serve as the forum by which DOD participates in the continuing evolution of data requirements for future systems.

C. Cost Increases and Schedule Delays

The NPOESS program has changed significantly since its inception in 1994. A fundamental restructuring took place in 2005 and 2006 as a result of the breach of cost ceilings defined by the so-called Nunn-McCurdy provision of DOD procurement law. The recertified program, announced in June 2006, provided for the following:

- 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**.
- 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.

In the past seven years, Committee hearings on the NPOESS program have documented a continuing rise in the program's life cycle cost estimate and repeated delays in the expected launch dates for the satellites. Using Mr. Powner's statements at these hearings, the following table demonstrates the growing life cycle cost and schedule delays:

Date	Life-Cycle Cost Estimate (billions)	Number of NPOESS satellites	Launch date, NPOESS Preparatory Project (NPP) satellite	Launch date, final POES satellite (NOAA 19)	Availability date, first NPOESS satellite (NPOESS C1)	Launch date, first NPOESS satellite
[Program Initiation 1994]	$6.96	6				
[NGST contract award August 2002]	$6.5	6	May 2006	March 2008	March 2008	April 2009
July 15, 2003	$7.0	6	October 2006	March 2008	December 2009	November 2009
[Rebaselining 2004]	$8.1	6	October 2006	March 2008		November 2009
November 16, 2005	$9.7	6	April 2008	December 2007		September 2010
NUNN-McCURDY RECERTIFICATION (2005-2006)						
June 7, 2007	$12.5	4	January 2010	February 2009		January 2013
June 19, 2008	$13.5	4	January 2010			January 2013
June 17, 2009	$14.9	4	January 2011	February 2009		March 2014

The $14.9 billion estimate, according to Mr. Powner, includes some $1 billion in additional costs for the sensor problems, possible information security upgrades and estimates for the operational costs for the last two years of the program's life. Thus, the program has doubled in cost and yet will result in fewer satellites. It should also be of concern that, despite the effort to reduce or eliminate risk in the NPOESS program, cost increases on the order of $1 billion per year are continuing to occur.

During the 2005 Nun-McCurdy recertification, continuity of the existing data streams was the highest priority. As the Independent Review Team report notes,

> *While continuity of data is a critical priority for all users, it is at extreme risk: If all satellites are delivered on schedule, launched without incident, and meet their full design life, there will be no significant gap in capabilities. In keeping with historical trends, there is a high likelihood of early problems with the first few satellites. If NPOESS exhibits similar characteristics, there will be a minimum gap of several months. If there is a launch failure—a 41 percent chance of occurring over the remaining DMSP launches, NPP and NPOESS—there is a high likelihood of a gap measured in years . . ..*

NOAA's has assured data continuity by its policy of assuring spare satellites available for launch in case a satellite is lost at launch or fails prematurely. In the case of the geostationary program, NOAA provides a spare in orbit to reduce the time needed to respond to failure. This recently proved important when the current Geostationary Operational Environmental Satellite covering the eastern United States (GOES–12) suffered problems. NOAA was able to place the existing spare, GOES–13, into service until it could restore GOES–12 to duty.

This policy for backup satellites was also provided in the original NPOESS program. Yet by the time NOAA launched the last of its polar satellites, NOAA–19, on February 6,[5] the extreme risk identified by the IRT became concrete. NOAA is now dependent on NOAA–19 lasting at least for two years without incident, assuming that NPP achieves its planned launch in January 2011. NOAA has been fortunate in that it has not lost a satellite in a launch accident for some time. While it has been clear for some time that the NPP satellite would take on this "gap-filler" operational role, it also is designed for a four- to five-year lifetime. Should the first NPOESS satellite be lost,[6] NPP would be expected to carry on well into the next decade. The second NPOESS satellite is intended to operate in the morning orbit, which is of primary interest to DOD. The risk is somewhat lower there as DOD still has three of its DMSP satellites in reserve.

D. Program Status

The NPOESS program last month completed a Critical Design Review on the NPOESS system. Northrop Grumman's program manager commented afterwards that, "*The team demonstrated that the majority of the detailed design is complete and meets requirements. NPOESS is at a higher level of design maturity than typical at this milestone as a result of building sensors and ground elements for the NPOESS Preparatory Project . . ..*" The Government's System Program Director reported to the EXCOM on May 22 that the consensus favored going forward with the first NPOESS satellite, but with important qualifications:

- *NPOESS satellite integration and test schedule is high risk*
- *Four percent (16/458) of the non-KPP (Key Performance Parameter) attributes do not meet specification*
- *Compliance to baseline design depends on unapproved changes*
- *Government Furnished Equipment (GFE) sensor design insight and maturity is lacking*

Open items from the Review are expected to be resolved by August.

The Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which has been the critical pacing item for some time now, is now undergoing critical thermal-vacuum testing to determine if it can withstand the conditions it will face during operation. The Cross-Track Infrared Sounder (CrIS) is progressing through the steps needed to restore the instrument following failure of the frame during vibration testing. Screws in one element of the Ozone Mapping and Profiler Suite (OMPS) will be replaced to assure they were properly tightened. Funding from the NOAA's allocation in the American Recovery and Reinvestment Act has been used to assure that the Total Solar Irradiance Sensor (TSIS) and Earth Radiation Budget Sensor (ERBS) will be able to fly on NPP, thus avoiding gaps in critical climate data collections.

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[5] NOAA–19 was substantially rebuilt after it was dropped on the floor September 6, 2003 at the Lockheed Martin production facility. NOAA has regularly assured the Committee that all damage has been completely repaired.

[6] The change to operational status affects primarily the ground system, as NPP was originally intended to provide data only to NOAA and one of three military forecasting centers. The satellite will now serve all four centers.

The Integrated Program Office has also been contributing to efforts currently underway in the NPOESS agencies to assist the White House in responding to the recommendations from the two reports to be discussed at the Subcommittee's hearing.

Chairman MILLER. Good afternoon and welcome to today's hearing, *Continuing Independent Assessment of the National Polar-Orbiting Operational Environmental Satellite System*, NPOESS. Today, this subcommittee will receive two reports on the perennially unsettled NPOESS, the National Polar-Orbiting Operational Environmental Satellite System. The Science Committee, under the Chairmanship of former Chairman Boehlert and our current Chairman Gordon, have devoted years of oversight to this program, and despite our relentless pressure, our relentless oversight, to get this program under control, we meet again to learn what is going on, that the NPOESS satellites are facing another delay, another schedule slip, and that the total cost expected has grown an additional billion dollars.

The Committee's first hearing on this subject was in 2003, my first year in Congress. At that time, the first NPOESS satellite was projected for launch in 2009, this year. Here we are. Six years of effort have gained us one year of expected progress. Now we think that the first NPOESS satellite is likely to fly in 2014.

But if the math is correct and we continue to advance at the rate that we are advancing, the satellite will not really be ready for launch until 2039.

That is obviously not acceptable. The delays and cost overruns we will hear about today are not the most important news from the hearing. The most important news is what steps need to be taken to reorganize the management of this program in order to achieve a successful launch by 2014. We probably can't manage one this year at this point.

To help us understand what still needs to be done, two independent groups have given us the results of their recent works. The Government Accountability Office, GAO, their team represented by Mr. David Powner, has given the Committee invaluable help overseeing NOAA's satellite programs. We are also fortunate today to welcome Mr. Tom Young, who has found it hard to enjoy his retirement with all of the investigations of government space programs that we have asked him to lead in recent years. He will present the findings of an Independent Review Team that has just completed its review of the NPOESS program management. Both Mr. Powner and Mr. Young have recommendations for Congress and the Administration regarding how to restructure the management of this program to get it back on track.

And our third witness is NOAA Deputy Under Secretary Mary Glackin, who has recently taken on this thankless, difficult task of trying to shepherd NPOESS to a successful conclusion, by which I assume we mean actually launching one. Serving in her position since December of 2007 means that she should have some historical perspective on all of the questions facing NOAA and the Administration. Fundamentally, we hope she will help shed light on why the last Director of OSTP failed to make decisions on this project that are now left to the new Administration.

I think that Mr. Young, Mr. Powner and Ms. Glackin will all agree that NPOESS now needs key guidance that only the White House can deliver. As a project shared among three agencies, the Department of Defense, NASA and NOAA, NPOESS is cursed by too many cooks and no agreed-upon recipe for the proper mission

for the program. Only the White House can settle those differences and decide a path forward. The Subcommittee asked OSTP to send a representative today, but unfortunately a national security exercise has kept all senior OSTP staff occupied today. So instead of being here at the Rayburn Building, they are presumably at an undisclosed, secure location.

When it comes to NPOESS, it has been years since we had the luxury of time for making decisions. NOAA recently made its last polar satellite operational. Its predicted lifetime is five years. With every passing month, GAO reminds us that we get closer to the probability of a data interruption in weather data as well as the certain interruption in climate data. NOAA primarily pins its hopes to avoiding such a data gap by using the NPP satellite, which was never intended as an operational satellite, as a gap-filler. I would feel much more confident with that plan if the NPP launch schedule was not also slipping and if we actually knew whether its main instrument was going to work.

On March 12, speaking to State officials about the Recovery Act, President Obama said, "If we see money being misspent, we're going to put a stop to it." We have seen money misspent on NPOESS, but stopping NPOESS is not an option. NPOESS may be a mess—no real maybe about it—and it may have been mismanaged—not much maybe about that either—but the American public needs the data produced by NPOESS in order to have accurate weather forecasts, and the world needs the climate data that would be collected by NPOESS to continue to understand how our climate is changing. Cancellation of NPOESS is not an option, and failure is unacceptable. If we do not have NPOESS, we will need something like it, and we will need it soon.

We will spend our time today trying to deal with the program as it is, determine where we need to go and decide how we will get there from here.

I want to thank the witnesses for appearing today, and I now recognize my colleague from Georgia, the Ranking Member, Dr. Broun.

[The prepared statement of Chairman Miller follows:]

PREPARED STATEMENT OF CHAIRMAN BRAD MILLER

Good afternoon.

Today, the Subcommittee on Investigations and Oversight will receive two reports on the perennially unsettled National Polar-Orbiting Operational Environmental Satellite System (NPOESS). The Science Committee, under the leadership of former Chairman Boehlert and current Chairman Gordon, has devoted years of oversight to this program. Despite our relentless pressure to get this program under control, we meet again to learn that the NPOESS satellites are facing another schedule slip and that the total expected cost has grown an additional billion dollars.

The Committee's first hearing on this subject was in 2003, my first year in Congress. At that time, the first NPOESS satellite was projected for launch in 2009. Here we are in 2009, and six years of effort have gained us only one year of progress; now the first NPOESS satellite is slated to fly in 2014.

If my math is correct, at this rate we will not get an NPOESS satellite ready for launch until 2039.

That is obviously unacceptable. The delays and cost overruns we will hear about today are not the most important news from this hearing; the most important news is what steps need to be taken to reorganize the management of this program in order to guarantee a successful launch in 2014.

To help us understand what must be done, two independent groups will give us the results of their recent work. The Government Accountability Office (GAO) team

represented by Mr. David Powner has given the Committee invaluable help overseeing NOAA's satellite programs. We are also fortunate to welcome today Mr. Tom Young, who has found it hard to enjoy retirement with all of the investigations of Government space programs he has been asked to lead in recent years. He will present the findings of an Independent Review Team that has just completed its review of NPOESS program management. Both Mr. Powner and Mr. Young have recommendations for the Congress and the Administration regarding how to restructure the management of this program to get it back on track.

Our third witness, NOAA Deputy Under Secretary Mary Glackin, has recently taken on the difficult task of trying to shepherd NPOESS to a successful conclusion. Serving in her position since December of 2007 means she should have some historical perspective on all of the questions facing NOAA and the Administration. Fundamentally, we hope she will help shed light on why the last Director of OSTP failed to make decisions on this project that are now left to the new Administration.

I think that Mr. Young, Mr. Powner and Ms. Glackin will all agree that NPOESS now needs key guidance that only the White House can deliver. As a project shared among three agencies—the Department of Defense, NASA and NOAA—NPOESS is cursed by too many cooks and no agreed upon recipe for the proper mission for the program. Only the White House can settle these differences and carve a clear path forward. The Subcommittee asked OSTP to send a representative today, but unfortunately a national security exercise has kept all senior OSTP staff occupied today.

When it comes to NPOESS, it has been years since we had the luxury of time for making decisions. NOAA recently made its last polar satellite operational. Its predicted lifetime is five years. With every passing month, GAO reminds us that we get closer to the probability of a data interruption in weather data as well as the certain interruption in climate data. NOAA primarily pins its hopes to avoiding a data gap by using the NPP satellite—which was never intended as an operational satellite—as a gap-filler. I would feel more confident with that plan if the NPP launch schedule was not also slipping, and if we actually knew whether its primary instrument was going to work.

On March 12, speaking to State officials about the Recovery Act, President Obama said, "If we see money being misspent, we're going to put a stop to it." Unfortunately, we've seen money misspent on NPOESS, but stopping NPOESS is not an option. NPOESS may be a mess and it may have been mismanaged, but the American public needs the data produced by NPOESS in order to have accurate weather forecasts, and the world needs the climate data that would be collected by NPOESS to continue to understand how our climate is changing. Cancellation is not an option and failure is unacceptable. If we do not have NPOESS, we will need something very much like it. We will spend our time today trying to deal with the program as it is, determine where we need to go and decide how we will get there from here.

I want to thank the witnesses for appearing before the Subcommittee this afternoon and recognize my colleague from Georgia, Ranking Member Broun.

Mr. BROUN. Thank you, Mr. Chairman. I want to welcome our witnesses here today and thank them for participating in this important hearing.

This is the Committee's sixth hearing on the NPOESS program, spanning both Democratic as well as Republican controls of the Committee. This is, however, the first time that this committee, the Investigations and Oversight Subcommittee, has held a hearing, but we have been actively involved for some time now.

NPOESS was originally planned to create synergies and cost savings by combining the DMSP within the Department of Defense and the POES system at NOAA. But instead, the program has doubled in cost, shrunk from six to four satellites, degraded its sensor capabilities, and seen its schedule slip six years. If that wasn't bad enough, Mr. Young points out in his testimony that, and I quote him, "The current program has an extraordinarily low probability of success," even after numerous rebase linings and a significant Nunn-McCurdy recertification.

So how did we get here? After several years of cooperation it has become clear that the partner agencies had differing priorities and levels of commitment. This is certainly expected. There are unique

missions. But this divergence has ultimately created an untenable partnership. NOAA is pressured by the scientific community to continue operation of research satellites that feed cutting-edge data into weather and climate models, while DOD is content to operate legacy hardware. NOAA doesn't have any extra POES satellites to buff its transition, while DOD still has two DMSP satellites on the ground. This is NOAA's flagship mission, yet this barely amounts to a rounding error in the Pentagon's budget.

Another reason is simply that space acquisition isn't easy. This isn't an excuse, but it is worth noting that we aren't asking these agencies to build cardboard boxes. Sure, the government could do better with cost estimating, with procurement, and contract management. But in the end we are building one-of-a-kind, innovative hardware and launching it 17,500 miles per hour into the vacuum of space.

Because of this complexity, we have sought to limit our costs by putting numerous sensors on fewer spacecraft and launch vehicles, thereby restricting the opportunities for performance upgrades to generational timeframes. In doing so, we have created a program that is essentially too big to fail, a phrase we have all heard lately to describe another huge fiasco. By placing all of our eggs in one basket, we have developed an architecture where it seems failure is not an option. Further compounding the problem are issues of requirement creeps from climate sensors, schedule pressure because of data continuity concerns, and cost caps from external factors like Nunn-McCurdy.

It really isn't surprising that the program isn't run well when the managers can't fine tune fundamental program management parameters like cost, schedule and performance.

So where do we go from here? The GAO and the Independent Review Team have offered recommendations, and NOAA has proposed future management budget and data options. The IRT states that this program will ultimately require the White House to weigh in. We certainly have near-term decisions on the horizon as well as long-term plans to consider.

I look forward to exploring the implications of these options and proposed directions with the Chairman. NPOESS is a critical national asset that deserves not only this committee's attention but also that of all partner agencies, the White House, and the appropriators. Every American is impacted by this program, whether they know it or not. It is our responsibility to ensure that the farmers, fishermen, soldiers and sailors, Marines, and everyday commuters continue to receive weather and climate information, but we must not forget to be good stewards of taxpayers' money and to root out waste, inefficiency, and duplication wherever we can.

Thank you, Mr. Chairman. I yield back the balance of my time.

[The prepared statement of Mr. Broun follows:]

PREPARED STATEMENT OF REPRESENTATIVE PAUL C. BROUN

Thank you, Mr. Chairman. I want to welcome our witnesses here today and thank them for participating in this important hearing. This is the Committee's sixth hearing on the National Polar-Orbiting Operational Environmental Satellite System (NPOESS), spanning both Democratic and Republican control of the Committee. This is, however, the first time the Investigations and Oversight Subcommittee has held a hearing, but we have been actively involved for some time now.

NPOESS was originally planned to create synergies and cost-savings by combining the Defense Meteorological Satellite Program (DMSP) within the Department of Defense (DOD) and the Polar-Orbiting Environmental Satellite (POES) System at the National Oceanic and Atmospheric Administration (NOAA). Instead, the program has doubled in cost, shrunk from six to four satellites, degraded its sensor capabilities, and seen its schedule slip six years. If that wasn't bad enough, Mr. Young points out in his testimony that "the current program has an extraordinarily low probability of success"—even after numerous rebaselinings and a significant Nunn-McCurdy recertification.

So how did we get here? After several years of cooperation, it has become clear that the partner agencies have differing priorities and levels of commitment. This is certainly expected given their unique missions, but this divergence has ultimately created an untenable partnership. NOAA is pressured by the scientific community to continue operation of research satellites that feed cutting-edge data into weather and climate models, while DOD is content to operate legacy hardware. NOAA doesn't have any extra POES satellites to buffer its transition, while DOD still has two DMSP satellites on the ground. This is NOAA's flagship mission, yet this barely amounts to a rounding error in the Pentagon's budget.

Another reason is simply that space acquisition isn't easy. This isn't an excuse, but it is worth noting that we aren't asking these agencies to build cardboard boxes. Sure, the government could do better with cost-estimating, procurement, and contract management, but in the end we are building one-of-a-kind innovative hardware and launching it 17,500 miles per hour into the vacuum of space.

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So where do we go from here? The General Accountability Office (GAO) and the Independent Review Team (IRT) have offered recommendations, and NOAA has proposed future management, budget, and data options. The IRT states that this program will ultimately require the White House to weigh in. We clearly have near-term decisions on the horizon, as well as long-term plans to consider.

I look forward to exploring the implications of these options and proposed directions with the Chairman. NPOESS is a critical national asset that deserves not only this committee's attention, but also that of all the partner agencies, the White House, and the Appropriators.

Every American is impacted by this program whether they know it or not. It is our responsibility to ensure that the farmers, fisherman, war-fighters, and everyday commuters continue to receive weather and climate information. But we must not forget to be good stewards of taxpayers' money and root out waste, inefficiency and duplication where we can.

Thank you Mr. Chairman, I yield back my time.

Chairman MILLER. Thank you, Dr. Broun. I now ask unanimous consent that all additional opening statements submitted by Members be included in the record, and without objection, it is so ordered.

It is now my pleasure to introduce our witnesses at this time. Mr. David Powner is the Director of Information Technology Management Issues at the Government Accountability Office. Mr. Tom Young is the Chair of the NPOESS Independent Review Team, and Ms. Mary Glackin is the Deputy Under Secretary for Oceans and Atmosphere at the National Oceanic and Atmospheric Administration.

As our witnesses should know, you will each have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing. When you have completed your spo-

ken testimony, we will begin with questions. Each Member will have five minutes to question the panel.

It is the practice of the Subcommittee to receive testimony under oath. Do any of you have any objection to taking an oath? All the witnesses indicated that they did not. You also have the right to be represented by counsel. Do any of you have counsel here? All the witnesses indicated that they did not. If you will now please stand and raise your right hand? Do you swear to tell the truth and nothing but the truth? All the witnesses responded in the affirmative. So the witnesses have now taken the oath.

We will begin with Mr. David Powner. Mr. Powner, please begin.

STATEMENT OF MR. DAVID A. POWNER, DIRECTOR, INFORMATION TECHNOLOGY MANAGEMENT ISSUES, GOVERNMENT ACCOUNTABILITY OFFICE (GAO)

Mr. POWNER. Chairman Miller, Ranking Member Broun, and Members of the Subcommittee, we appreciate the opportunity to testify on our latest NPOESS report being released today. This afternoon I will discuss NPOESS's continued problems and our recommendations for improvement, both near- and long-term, so that our nation will have continued data and imagery essential for weather forecasting and climate monitoring.

Six years ago I first testified on NPOESS before Chairman Ehlers' Subcommittee when NPOESS was a $7 billion program and the launch of its first satellite was April 2009. Today the cost has increased $8 billion to at least $15 billion, and the first satellite launch has been delayed five years to March 2014.

I will briefly discuss these increasing costs, schedule delays, as well as potential gaps in critical satellite coverage and ineffective executive management.

The current cost of $14 billion and the various planned launch schedules are not achievable. Technical problems with two critical sensors, VIIRS and CrIS, continue to drive up costs and push launch schedules out. We expect the current $14 billion estimate to increase at least a billion dollars to cover sensor technical issues, new security requirements, and additional operations and maintenance costs.

We also need to keep in mind that the integration and testing of the sensors for the initial satellites has not yet occurred, and this could be an additional cost driver. The new cost estimates are scheduled to go to the EXCOM for approval by the end of the month, and we understand that at least five estimates are being considered.

Schedules for the demonstration satellite known as NPP, and the first two satellites have been delayed seven, fourteen, and five months, respectively. These delays endanger the continuity of weather and climate data. With the current launch schedule, should we run into any problems with the satellite launch failure or operational problems, we will have gaps in satellite coverage. My written testimony highlights these potential gaps in each of the three orbits. In fact, a single launch failure of one of the remaining DOD satellites known as DMSP or of NPP could result in a gap in satellite coverage of up to five years.

NOAA has been plagued by ineffective management over the years, and today our report highlights that NPOESS's executive committee has not been effective in fulfilling its responsibilities, which has contributed to NPOESS's problems. Specifically, the right folks don't attend the EXCOM meetings. Those that do don't effectively manage risks, nor do they make tough decisions when needed. For example, DOD's Under Secretary for Acquisition is DOD's official EXCOM member as agreed to in official memorandums of agreement. This official whose DOD's acquisition authority has never attended an EXCOM meeting and has delegated this role to the Under Secretary of the Air Force. Not having the acquisition authority attend these meetings has resulted in delays as the EXCOM decisions have later been overturned by the acquisition authority.

The bottom line here is that having the right officials attend could greatly streamline decision making. In addition, although the EXCOM holds quarterly meetings, they do not routinely track action items and issues to closure. Also, the tri-agency structure creates a situation of differing and competing priorities, and the EXCOM has not been effective in resolving these differences. In fact, the EXCOM is about to be presented with differing cost estimates by the end of the month where they will be asked to make a tough decision on the right program cost and scope, especially given the fact that NOAA and DOD will likely have differing costs and program performance that are acceptable.

Before discussing our recommendation, I would like to note a few areas of progress. The NPOESS program has delivered and integrated three of the five instruments for NPP. The ground station systems have been installed and tested at both locations, and the command and control system has passed acceptance testing. However, moving forward, we recommend that in the near-term the NPOESS program needs to have the right EXCOM members attend and participate in the EXCOM meetings, and this includes DOD's Under Secretary for Acquisition. Also, the EXCOM needs to effectively manage risks and make decisions, starting with approving new program costs and scheduled base lines.

The program also needs to develop mitigation plans to address potential gaps in satellite coverage, and it needs to seek White House guidance on a direction forward. These near-term recommendations are essential to keep the acquisition moving forward, to mitigate future cost increases, schedule delays, and gaps in satellite coverage.

Looking at this from a longer-term perspective, we need to acknowledge this tri-agency experiment has been an epic failure, and we need an exit strategy to go back to separate satellite acquisitions for the next series of polar orbiting satellites.

Mr. Chairman, this concludes my statement. Thank you for your leadership and oversight of this acquisition.

[The prepared statement of Mr. Powner follows:]

PREPARED STATEMENT OF DAVID A. POWNER

Polar-Orbiting Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to participate in today's hearing on the National Polar-orbiting Operational Environmental Satellite System (NPOESS). NPOESS is expected to be a state-of-the-art satellite system that will replace two existing satellite systems. It is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting (including severe weather events such as hurricanes) and global climate monitoring. Three agencies share responsibility for NPOESS: the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD)/United States Air Force, and the National Aeronautics and Space Administration (NASA). As requested, this statement summarizes our report being released today that (1) identifies the status and risks of key program components, (2) assesses the NPOESS Executive Committee's ability to fulfill its responsibilities, and (3) evaluates efforts to identify an alternative system integrator for later NPOESS satellites.[1]

In preparing this testimony, we relied on our work supporting the accompanying report. That report contains a detailed overview of our scope and methodology. All of our work for this report was performed in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide 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.

Background

Polar-orbiting satellites provide data and imagery that are used by weather forecasters, climatologists, and the military to map and monitor changes in weather, climate, the oceans, and the environment. Since the 1960s, the United States has operated two separate operational polar-orbiting meteorological satellite systems: the Polar-orbiting Operational Environmental Satellite (POES) series, which is managed by NOAA, and the Defense Meteorological Satellite Program (DMSP), which is managed by the Air Force. Currently, there is one operational POES satellite and two operational DMSP satellites that are positioned so that they can observe the Earth in early morning, mid-morning, and early afternoon polar orbits. In addition, the government is also relying on a European satellite, called Meteorological Operational, or MetOp, in the mid-morning orbit.

With the expectation that combining the POES and DMSP programs would reduce duplication and result in sizable cost savings, a May 1994 Presidential Decision Directive required NOAA and DOD to converge the two satellite programs into a single satellite program capable of satisfying both civilian and military requirements.[2] The converged program, NPOESS, is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting and global climate monitoring. To manage this program, DOD, NOAA, and NASA formed the tri-agency Integrated Program Office, located within NOAA. Within the program office, each agency has the lead on certain activities: NOAA has overall program management responsibility for the converged system and for satellite operations; the Air Force has the lead on the acquisition; and NASA has primary responsibility for facilitating the development and incorporation of new technologies into the converged system. NOAA and DOD share the cost of funding NPOESS, while NASA funds specific technology projects and studies. In addition, an Executive Committee—made up of the administrators of NOAA and NASA and the Under Secretary of Defense for Acquisition, Technology, and Logistics—is responsible for providing policy guidance, ensuring agency support and funding, and exercising over-

[1] GAO, *Polar-orbiting Environmental Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making,* GAO–09–564 (Washington, D.C.: June 17, 2009).

[2] Presidential Decision Directive NSTC–2, May 5, 1994.

sight authority.[3] The Executive Committee manages the program through a Program Executive Officer who oversees the NPOESS program office.

Since the program's inception, NPOESS costs have grown to $13.95 billion, and launch schedules have been delayed by up to five years.[4] In addition, as a result of a 2006 restructuring of the program, the agencies reduced the program's functionality by removing two of six originally planned satellites and one of the orbits. The restructuring also decreased the number of instruments from 13 (10 sensors and three subsystems) to nine (seven sensors and two subsystems), with four of the sensors providing fewer capabilities. The restructuring also led agency executives to mitigate potential data gaps by deciding to use a planned demonstration satellite, called the NPOESS Preparatory Project (NPP) satellite, as an operational satellite providing climate and weather data. However, even after this restructuring, the program is still encountering technical issues, schedule delays, and the likelihood of further cost increases.

Progress Made, But Continued Instrument Problems Are Driving Costs Upward, Forcing Launch Delays, and Endangering Satellite Continuity

Over the past year, selected components of the NPOESS program have made progress. Specifically, three of the five instruments slated for NPP have been delivered and integrated on the spacecraft; the ground-based satellite data processing system has been installed and tested at both of the locations that are to receive NPP data; and the satellites' command, control, and communications system has passed acceptance testing. However, problems with two critical sensors continue to drive the program's cost and schedule. Specifically, challenges with a key sensor's (the Visible/infrared imager radiometer suite (VIIRS)) development, design, and workmanship have led to additional cost overruns and delayed the instrument's delivery to NPP. In addition, problems discovered during environmental testing on another key sensor (called the Cross-track infrared sounder (CrIS)) led the contractor to further delay its delivery to NPP and added further unanticipated costs to the program. To address these issues, the program office halted or delayed activities on other components (including the development of a sensor planned for the first NPOESS satellite, called C1) and redirected those funds to fixing VIIRS and CrIS. As a result, those other activities now face cost increases and schedule delays.

Program officials acknowledge that NPOESS will cost more than the $13.95 billion previously estimated, but they have not yet adopted a new cost estimate. Program officials estimated that program costs will grow by about $370 million due to recent technical issues experienced on the sensors and the costs associated with halting and then restarting work on other components of the program. In addition, the costs associated with adding new information security requirements to the program could reach $200 million.[5] This estimate also does not include approximately $410 million for operations and support costs for the last two years of the program's life cycle (2025 and 2026). Thus, we anticipate that the overall cost of the program could grow by about $1 billion from the current $13.95 billion estimate—especially given the fact that difficult integration and testing of the sensors on the NPP and C1 spacecrafts has not yet occurred.[6] Program officials reported that they plan to revise the program's cost estimate over the next few weeks and to submit it for executive-level approval by the end of June 2009.

As for the program's schedule, program officials estimate that the delivery of VIIRS to the NPP contractor will be delayed, resulting in a further delay in the launch of the NPP satellite to January 2011, a year later than the date estimated during the program restructuring—and seven months later than the June 2010 date that was established last year. In addition, program officials estimated that the first and second NPOESS satellites would be delayed by 14 and five months, respectively, because selected development activities were halted or slowed to address VIIRS and CrIS problems. The program's current plans are to launch C1 in March 2014 and the second NPOESS satellite, called C2, in May 2016. Program officials

[3] The Under Secretary of Defense for Acquisition, Technology, and Logistics delegated the responsibility for attending the meetings—but not the authority to make acquisition decisions—to the Under Secretary of the Air Force.

[4] Compared to original program plans, the demonstration satellite has been delayed by approximately four and a half years, while the first two NPOESS satellites have each been delayed by approximately five years.

[5] These estimates are subject to further refinement because the Executive Committee has not agreed on a cost estimating methodology and the agencies have not yet agreed to new information security requirements.

[6] This cost estimate includes launch vehicle costs of approximately $329 million, which are funded outside the program's baseline.

notified the Executive Committee and DOD's acquisition authority of the schedule delays, and under DOD acquisition rules, are required to submit a new schedule baseline by June 2009.

These launch delays have endangered our nation's ability to ensure the continuity of polar-orbiting satellite data. The final POES satellite, called NOAA–19, is in an afternoon orbit and is expected to have a five-year lifespan. Both NPP and C1 are planned to support the afternoon orbit. Should the NOAA–19 satellite fail before NPP is launched, calibrated, and operational, there would be a gap in satellite data in that orbit. Further, the delays in C1 mean that NPP will not be the research and risk reduction satellite it was originally intended to be. Instead, it will have to function as an operational satellite until C1 is in orbit and operational—and if C1 fails on launch or in early operations, NPP will be needed to function until C3 is available, currently planned for 2018. The delay in the C2 satellite launch affects the early morning orbit. There are three more DMSP satellites to be launched in the early and midmorning orbits, and DOD is revisiting the launch schedules for these satellites to try to extend them as long as possible. However, an independent review team, established to assess key program risks, recently reported that the constellation of satellites is extremely fragile and that a single launch failure of a DMSP, NPOESS, or the NPP satellite could result in a gap in satellite coverage from three to five years.

Although the program's approved cost and schedule baseline is not achievable and the polar satellite constellation is at risk, the Executive Committee has not yet made a decision on how to proceed with the program. Program officials plan to propose new cost and schedule baselines in June 2009 and have reported that they are addressing immediate funding constraints by deferring selected activities to later fiscal years in order to pay for VIIRS and CrIS problems; delaying the launches of NPP, C1, and C2; and assessing alternatives for mitigating the risk that VIIRS will continue to experience problems. Without an executive-level decision on how to proceed, the program is proceeding on a course that is deferring cost growth, delaying launches, and risking its underlying mission of providing operational weather continuity to the civil and military communities.

Executive Committee Has Not Effectively Fulfilled Its Responsibilities

While the NPOESS Executive Committee has made improvements over the last several years in response to prior recommendations, it has not effectively fulfilled its responsibilities and does not have the membership and leadership it needs to effectively or efficiently oversee and direct the NPOESS program. Specifically, the DOD Executive Committee member with acquisition authority does not attend Committee meetings—and sometimes contradicts the Committee's decisions, the Committee does not aggressively manage risks, and many of the Committee's decisions do not achieve desired outcomes. Independent reviewers, as well as program officials, explained that the tri-agency structure of the program makes it very difficult to effectively manage the program. Until these shortfalls are addressed, the Committee is unable to effectively oversee the NPOESS program—and important issues involving cost growth, schedule delays, and satellite continuity will likely remain unresolved.

Executive Committee Has Responded to Past Recommendations

We and others, including the Department of Commerce's Inspector General in a 2006 report, have reported that the Committee was not accomplishing its job effectively. However, since then, the Committee has met regularly on a quarterly basis and held interim teleconferences as needed. The Committee has also sought and reacted to advice from external advisors by, among other actions, authorizing a government program manager to reside on-site at the VIIRS contractor's facility to improve oversight of the sensor's development on a day-to-day basis. More recently, the Executive Committee sponsored a broad-based independent review of the NPOESS program and is beginning to respond to its recommendations.

Key Acquisition Executive Does Not Attend Executive Committee Meetings

As established by the 1995 and 2008 memorandums of agreement signed by all three agencies, the members of the NPOESS Executive Committee are (1) the Under Secretary of Commerce for Oceans and Atmosphere; (2) the Under Secretary of Defense for Acquisition, Technology, and Logistics; and (3) the NASA Administrator.[7] Because DOD has the lead responsibility for the NPOESS acquisition, the Under

[7] The 1995 agreement specified that the NASA member would be the Deputy Administrator. Responsibility was subsequently taken over by the Administrator of NASA.

Secretary of Defense for Acquisition, Technology, and Logistics was also designated as the milestone decision authority—the individual with the authority to approve a major acquisition program's progression in the acquisition process, as well as any changes to the cost, schedule, and functionality of the acquisition. The intent of the tri-agency memorandums was that acquisition decisions would be agreed to by the Executive Committee before a final acquisition decision is made by the milestone decision authority.[8]

However, DOD's acquisition authority has never attended an Executive Committee meeting. This individual delegated the responsibility for attending the meetings—but not the authority to make acquisition decisions—to the Under Secretary of the Air Force. Therefore, none of the individuals who attend the Executive Committee meetings for the three agencies have the authority to approve the acquisition program baseline or major changes to the baseline. As a result, agreements between Committee members have been overturned by the acquisition authority, leading to significant delays.

Committee Does Not Aggressively Manage Risks

To provide the oversight recommended by best practices,[9] including reviewing data and calling for corrective actions at the first sign of cost, schedule, and performance problems and ensuring that actions are executed and tracked to completion, the Executive Committee holds quarterly meetings during which the program's progress is reviewed using metrics that provide an early warning of cost, schedule, and technical risks. However, the Committee does not routinely document action items or track those items to closure. Some action items were not discussed in later meetings, and in cases where an item was discussed, it was not always clear what action was taken, whether it was effective, and whether the item was closed.

According to the Program Executive Officer, the closing of an action item is not always explicitly tracked because it typically involves gathering information that is presented during later Committee meetings. Nonetheless, by not rigorously documenting action items—including identifying the party responsible for the action, the desired outcome, and the time frame for completion—and then tracking the action items to closure, the Executive Committee is not able to ensure that its actions have achieved their intended results and to determine whether additional changes or modifications are still needed. This impedes the Committee's ability to effectively oversee the program, direct risk mitigation activities, and obtain feedback on the results of its actions.

Committee Decisions Do Not Achieve Desired Outcomes

Best practices call for oversight boards to take corrective actions at the first sign of cost, schedule, and performance slippages in order to mitigate risks and achieve successful outcomes.[10] The NPOESS Executive Committee generally took immediate action to mitigate the risks that were brought before them; however, a majority of these actions were not effective—that is, they did not fully resolve the underlying issues or result in a successful outcome. The Committee's actions on the sensor development risks accomplished interim successes by improving the government's oversight of a subcontractor's activities and guiding next steps in addressing technical issues—but even with Committee actions, the sensors' performance has continued to falter and affect the rest of the program. Independent reviewers reported that the tri-agency structure of the program complicated the resolution of sensor risks because any decision could be revisited by another agency. Program officials explained that interagency disagreements and differing priorities make it difficult to effectively resolve issues.

Program Has Assessed Alternatives, But Has Not Yet Identified a Viable Alternative for Acquiring the Last Two NPOESS Satellites

When NPOESS was restructured in June 2006, the program included two satellites (C1 and C2) and an option to have the prime contractor produce the next two satellites (C3 and C4). In approving the restructured program, DOD's decision authority noted that he reserved the right to use a different satellite integrator for the

[8] The 1995 and 2008 memorandums of agreement differ slightly in this regard. The first agreement stated that DOD's milestone decision authority will make acquisition decisions with concurrence of the other Executive Committee members, while the second agreement states that the DOD authority must consider Committee decisions. The second agreement takes precedence in the case of a conflict.

[9] GAO, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity,* GAO–04–394G (Washington, D.C.: March 2004).

[10] GAO–04–394G.

final two satellites, and that a decision on whether to exercise the option was to be made in June 2010. To prepare for this decision, DOD required a tri-agency assessment of alternative management strategies. This assessment was to examine the feasibility of an alternative satellite integrator, to estimate the cost and schedule implications of moving to an alternative integrator, and within one year, to provide a viable alternative to the NPOESS Executive Committee.

To address DOD's requirement, the NPOESS Program Executive Officer sponsored two successive alternative management studies; however, neither of the studies identified a viable alternative to the existing satellite integrator. The Program Executive Officer plans to conduct a final assessment of alternatives prior to the June 2010 decision on whether to exercise the option to have the current system integrator produce the next two NPOESS satellites. Program officials explained that the program's evolving costs, schedules, and risks could mean that an alternative that was not viable in the past would become viable. For example, if the prime contractor's performance no longer meets basic requirements, an alternative that was previously too costly to be considered viable might become so.

Implementation of Recommendations Could Improve Management and Oversight

In the report being released today, we are making recommendations to improve the timeliness and effectiveness of acquisition decision-making on the NPOESS program. Specifically, we recommend that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to attend and participate in NPOESS Executive Committee meetings. In addition, we are recommending that the Secretaries of Defense and Commerce and the Administrator of NASA direct the NPOESS Executive Committee to take the following five actions: (1) establish a realistic time frame for revising the program's cost and schedule baselines; (2) develop plans to mitigate the risk of gaps in satellite continuity; (3) track the Committee's action items from inception to closure; (4) improve the Committee's ability to achieve successful outcomes by identifying the desired outcome associated with each of the Committee actions, as well as time frames and responsible parties, when new action items are established; and (5) improve the Committee's efficiency by establishing time frames for escalating risks to the Committee for action so that they do not linger unresolved at the program executive level.

In written comments on a draft of our report, NASA and NOAA agreed with our findings and recommendations and identified plans to implement them. DOD concurred with one and partially concurred with our other recommendations. For example, regarding our recommendation to have the appropriate official attend Executive Committee meetings, the agency partially concurred and noted that the Under Secretary for Acquisition, Technology, and Logistics would evaluate the necessity of attending future Executive Committee meetings. DOD also reiterated that the Under Secretary of the Air Force was delegated authority to attend the meetings. While we acknowledge that the Under Secretary delegated responsibility for attending these meetings, it is an inefficient way to make decisions and achieve outcomes in this situation. In the past, agreements between Executive Committee members have been overturned by the Under Secretary, leading to significant delays in key decisions. The full text of the three agencies' comments and our evaluation of those comments are provided in the accompanying report.

In summary, continued problems in the development of critical NPOESS sensors have contributed to growing costs and schedule delays. Costs are now expected to grow by as much as $1 billion over the prior life cycle cost estimate of $13.95 billion, and problems in delivering key sensors have led to delays in launching NPP and the first two NPOESS satellites—by a year or more for NPP and the first NPOESS satellite. These launch delays have endangered our nation's ability to ensure the continuity of polar-orbiting satellite data. Specifically, if any planned satellites fail on launch or in orbit, there would be a gap in satellite data until the next NPOESS satellite is launched and operational—a gap that could last for three to five years. The NPOESS Executive Committee responsible for making cost and schedule decisions and addressing the many and continuing risks facing the program has not yet made important decisions on program costs, schedules, and risks—or identified when it will do so. In addition, the Committee has not been effective or efficient in carrying out its oversight responsibilities. Specifically, the individual with the authority to make acquisition decisions does not attend Committee meetings, the Committee does not aggressively manage risks, and many of the Committee's decisions do not achieve desired outcomes. Until the Committee's shortfalls are addressed, important decisions may not be effective and issues involving cost increases, schedule delays, and satellite continuity may remain unresolved.

Mr. Chairman and Members of the Subcommittee, this concludes our statement. We would be pleased to respond to any questions that you or other Members of the Subcommittee may have at this time.

Staff Acknowledgments

Other key contributors to this testimony include Colleen M. Phillips, Assistant Director; Kate Agatone; Neil Doherty; Kathleen S. Lovett; Lee McCracken; and China R. Williams.

BIOGRAPHY FOR DAVID A. POWNER

Experience

Twenty years' experience in information technology issues in both public and private sectors.

Education

Business Administration, University of Denver

Senior Executive Fellows Program, Harvard University, John F. Kennedy School of Government

Director, IT Management Issues, U.S. Government Accountability Office

Dave is currently responsible for a large segment of GAO's information technology (IT) work, including systems development, IT investment management, health IT, and cyber critical infrastructure protection reviews.

In the private sector, Dave has held several executive-level positions in the telecommunications industry, including overseeing IT and financial internal audits, and software development associated with digital subscriber lines (DSL).

At GAO, Dave has led teams reviewing major IT modernization efforts at Cheyenne Mountain Air Force Station, the National Weather Service, the Federal Aviation Administration, and the Internal Revenue Service. These reviews covered many information technology areas including software development maturity, information security, and enterprise architecture.

Chairman MILLER. Thank you, Mr. Powner. Mr. Young.

STATEMENT OF MR. A. THOMAS YOUNG, CHAIR, NPOESS INDEPENDENT REVIEW TEAM (IRT)

Mr. YOUNG. Chairman Miller, Ranking Member Broun, and Members of the Subcommittee, I am pleased to present a summary of the NPOESS Independent Review Team report.

We identified 10 findings and recommended corrective actions.

Finding one, the current NPOESS program has an extraordinarily low probability of success. Implementation of the following recommendations that I will discuss are necessary to address this finding.

Two, continuity of data, which each user organization identifies as the number one priority, is at significant risk. The program is hardware poor with little protection against a launch failure or early spacecraft failure. Data outages in a particular orbit can be measured in years with a failure. Corrective action is limited to moving the third and fourth spacecraft closer to the first and second spacecraft in their development schedules, launching on need rather than schedule and exploiting NPP data.

Three, NPOESS is being managed with cost as the most important parameter and not mission success. This program cost-focused culture needs to change to a mission success-focused culture, and the NPOESS contract award fee criteria needs a similar change in focus.

Four, NPOESS EXCOM is ineffective. Members must have decision authority. The focus of the EXCOM should be top-level issues and timely decisions.

Five, NPOESS program is not part of a space acquisition organization, which makes program implementation extremely difficult. NPOESS must be assigned to a space acquisition organization such as Space and Missiles Systems Center or NASA.

Six, fiscal year funding shortfalls are causing decisions to be made that are adding risk and increasing cost. Funding shortfalls must be corrected.

Seven, the highest probability of success is to maintain the current contractor team, Northrop Grumman and Raytheon, and the IRT recommends this action.

Eight, due to potential for coverage gaps, NPP has become a critical asset, and it is recommended that this be recognized and incorporated in program planning.

Nine, priorities of NOAA and DOD/Air Force are not aligned. DOD/Air Force stated that legacy performance is acceptable and that they are unwilling to provide additional funding to achieve above legacy capability. NOAA stated that current weather forecasting utilizes legacy and NASA R&D satellite data. Accepting legacy capabilities would be a significant step back. This difference in priorities must be resolved.

Ten, the current budget is inadequate with a shortfall in excess of $1 billion. Funding the program by fiscal year and through completion to 80 percent confidence, including a management reserve of approximately 25 percent, is required to have an executable program budgeted at the most likely cost.

The IRT recognizes that NPOESS is a national program with quality of life, economic, disaster planning, and national security implications. While the IRT believes the cited recommendations must be implemented, additional actions are necessary to have a successful NPOESS program.

The critical issue is the lack of alignment of DOD/Air Force and NOAA priorities. The IRT believes that the EXCOM will be unable to resolve this difference, and the White House will be required to define the NPOESS program that is in the national interest.

Following the NPOESS program decision, the responsibility for program implementation must be assigned to one organization—Air Force with SMC having implementation responsibility or NOAA with NASA having implementation responsibility. Either can do the job.

The IRT believes that the managing organization must have total acquisition responsibility, be allocated all currently planned and programmed budget and be responsible for funding the defined program at an 80 percent confidence level. The IRT recommends that responsibility for NPOESS be assigned to NOAA with NASA acting as NOAA's acquisition organization. This recommendation is based upon the recognition that NOAA has a broader responsibility for weather and climate requirements than any other organization and is a natural advocate for this program.

Under this construct NOAA/NASA will provide NPOESS data to DOD and Air Force and establish a process to meet future DOD and Air Force needs.

The EXCOM concept should continue to assure effective program implementation. Implementation of the IRT recommendations and

additional actions is urgently required. Risk and unnecessary cost are being realized at an unacceptable rate.

Thank you very much.

[The prepared statement of Mr. Young follows:]

PREPARED STATEMENT OF A. THOMAS YOUNG

Chairman Miller, Ranking Member Broun, and Members of the Subcommittee, I am Tom Young and I chair the NPOESS Independent Review Team (IRT) that was established by the NPOESS Executive Committee (EXCOM) to review the NPOESS program baseline and the management approach.

After numerous meetings, interviews with Air Force (AF), Department of Defense (DOD), National Aeronautics and Space Administration (NASA), and National Oceanic and Atmospheric Administration (NOAA) principals, visits to the primary contractors Northrop Grumman and Raytheon, and discussions with contractor Chief Executive Officers (CEOs), the IRT identified ten findings and recommended corrective actions.

1) The current NPOESS program has an extraordinary low probability of success. Implementation of the following recommendations is necessary to address this finding.
2) Continuity of data, which each user organization identifies as number one priority, is at significant risk. The program is hardware poor with little protection against a launch failure or early spacecraft failure. Data outages in a particular orbit can be measured in years with a failure. Corrective action is limited to moving C3 and C4 closer to C1 and C2, launching on need rather than schedule and exploiting NPOESS preparatory Project (NPP) data.
3) NPOESS is being managed with cost as the most important parameter and not mission success. This Program cost focused culture needs to change to a mission success focused culture and the NPOESS contract award fee criteria needs a similar change in focus.
4) NPOESS EXCOM is ineffective. Members must have decision authority. Focus of EXCOM should be top level issues and timely decisions.
5) NPOESS Program is not part of a space acquisition organization which makes program implementation extremely difficult. NPOESS must be assigned to a space acquisition organization such as Space and Missiles Systems Center (SMC) or NASA.
6) Fiscal year funding shortfalls are causing decisions to be made that are adding risk and increasing cost. Funding shortfalls must be corrected.
7) The highest probability of success is to maintain the current contractor team, Northrop Grumman and Raytheon and the IRT recommends this action.
8) Due to potential for coverage gaps, NPP has become a critical asset and it is recommended that this be recognized and incorporated in program planning.
9) Priorities of NOAA and DOD/AF are not aligned. DOD/AF stated that legacy performance is acceptable and that they are unwilling to provide additional funding to achieve above legacy capability. NOAA stated that current weather forecasting utilizes legacy and NASA Research and Development (R&D) satellite data. Accepting legacy capabilities would be a significant step back. This difference in priorities must be resolved.
10) The current budget is inadequate with a shortfall in excess of $1 billion. Funding the program by fiscal year and through completion to 80% cost confidence including a management reserve of approximately 25% is required to have an executable program budgeted at the most likely cost.

The IRT recognizes that NPOESS is a national program with quality of life, economic, disaster planning, and national security implications.

While the IRT believes the cited recommendations must be implemented, additional actions are necessary to have a successful NPOESS program.

The critical issue is the lack of alignment of DOD/AF and NOAA priorities. The IRT believes that the EXCOM will be unable to resolve this difference and the White House will be required to define the NPOESS program that is in the national interest.

Following the NPOESS program decision the responsibility for program implementation must be assigned to one organization, AF with SMC having implementation responsibility or NOAA with NASA having implementation responsibility. Either can do the job.

The IRT believes that the managing organization must have total acquisition responsibility, be allocated all currently planned and programmed budget and be responsible for funding the defined program at an 80 percent confidence level.

The IRT recommends that responsibility for NPOESS be assigned to NOAA with NASA acting as NOAA's acquisition organization. This recommendation is based upon recognition that NOAA has a broader responsibility for weather and climate requirements than any other organization and is a natural national advocate for this program.

Under this construct NOAA/NASA will provide NPOESS data to DOD/AF and establish a process to meet future DOD/AF needs.

The EXCOM concept should continue to assure effective program implementation.

Implementation of the IRT recommendations and additional actions is urgently required. Risk and unnecessary cost are being realized at an unacceptable rate.

BIOGRAPHY FOR A. THOMAS YOUNG

A. Thomas Young is the former Director of NASA's Goddard Space Flight Center and President and COO of Martin Marietta. He retired from Lockheed Martin in July, 1995. Mr. Young is involved in various advisory and review activities associated with the U.S. Space Program.

He is a Director of the Goodrich Corporation and Science Applications International Corporation. Mr. Young is an Honorary Fellow of the American Institute of Aeronautics and Astronautics, a Fellow of the American Astronautical Society, a Fellow of the royal Astronautical Society and a Fellow of the International Academy of Astronautics. He is a member of the National Academy of Engineering and the University of Virginia Raven Society.

Mr. Young began his career with NASA at the Langley Research Center in 1961. He was a member of the Lunar Orbiter Project Team and was Mission Director for Project Viking. He became Director of the Planetary Program at NASA Headquarters in 1976 and was appointed Deputy Director of the Ames Research Center in 1978. Mr. Young was Director of the Goddard Space Flight Center from 1979 to 1982. He joined the Martin Marietta Corporation in 1982 and was subsequently President of Baltimore Aerospace and the Electronics and Missiles Group. Mr. Young was President and COO of Martin Marietta from 1990 to 1995.

As a part of his advisory and review activities, Mr. Young chaired a group to assess the continued involvement of U.S. Astronauts with the MIR Space Station. He was Chairman of an Independent Assessment of Mission Success for Lockheed Martin. Following the Mars 1998 failures, he chaired the Mars Program Independent Assessment Team. Mr. Young was Chairman of the International Space Station Management and Cost Task Force. He has been Chairman of the Task Force on Acquisition of National Security Space Programs. He has chaired NASA's International Space Station Advisory Group and Space Flight Advisory Group. Mr. Young is a past member of the NASA Advisory Council. He chaired the National Academy of Engineering Committee on Technological Literacy. Mr. Young is currently a member of the National Academies Space Studies Board.

Mr. Young has received NASA's Distinguished Service Medal for his role in the Viking Project, the Outstanding Leadership Medal for contributions to the Voyager Project, Presidential Rank Awards of Meritorious Executive and Distinguished Executive, the Public Service Medal for his leadership of the Mars Program Independent Assessment Team, and the Distinguished Public Service Medal for his leadership of the International Space Station Management and Cost Task Force. Mr. Young received the National Reconnaissance Office Medal for leadership of the Task Force on the Acquisition of National Security Space Programs. He is the recipient of the AIAA Astronautics Award and the National Space Club Dr. Joseph V. Charyk Award. Mr. Young was selected as one of nine Outstanding Corporate Directors in 2005. He received the 2006 Bob Hope Distinguished Citizen Award from the NDIA.

Mr. Young earned a Bachelor of Aeronautical Engineering degree and a Bachelor of Mechanical Engineering degree in 1961 from the University of Virginia. In 1972, he received a Master's of Management degree from MIT which he attended as a Sloan Fellow. He also holds an honorary doctor of science degree from Salisbury State University.

Mr. Young and his wife, Page, reside in Onancock, Virginia. They have a daughter, Blair, and a son, Carter.

Chairman MILLER. Thank you, Mr. Young. Ms. Glackin.

STATEMENT OF MS. MARY M. GLACKIN, DEPUTY UNDER SECRETARY FOR OCEANS AND ATMOSPHERE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA), U.S. DEPARTMENT OF COMMERCE

Ms. GLACKIN. Chairman Miller, Dr. Broun, and distinguished Members and staff of the Committee, I appreciate the opportunity to testify about the steps NOAA has taken over the past year to address the ongoing challenges of this critical program.

While I am a 30-year career employee of NOAA, I have only served in my current position for the past 18 months. During this short tenure, I have spent a significant portion of my time learning about and overseeing the complex management of NOAA's satellite programs, especially NPOESS.

The challenges the program faces are substantial, and I am working closely with both Secretary Locke and NOAA Administrator Lubchenco to address the recommendations presented by both GAO and the Independent Review Team. Since NOAA's final satellite in its current series was launched earlier this spring, the agency is particularly focused on the threat further delays in this program may have on crucial weather and climate forecasts NOAA provides to the Nation.

NOAA is working with its partners, DOD and NASA, to move quickly to resolve remaining program issues, given their possible consequences. I would like to highlight two actions we have taken over the past year on the program and then address the recommendations that we have just heard from my two colleagues here.

One step that NOAA has taken is that we have advocated with our tri-agency partners last summer to install a government program manager at the subcontractor facility where the main imaging sensor, known as VIIRS, is being developed. By installing a government official in plant, an action typically taken by NASA for complex developments, it has enabled the program to better address the ongoing technical problems. The benefits are not only providing significant oversight of day-to-day testing and quality assurance processes, but allows the government to anticipate and react quickly to problems.

The second step, as highlighted by this hearing, is the tri-agency leadership of the EXCOM called for the high-level, independent review that Mr. Young just provided this committee. When the IRT findings were initially reported to the EXCOM, they made it very clear that the NPOESS program has little chance of success as it is currently structured. NOAA is taking the team's grim assessment of the program very seriously and is working with DOD and NASA to respond to the recommendations. Notably, we are actively working with the leadership of the White House Office of Science and Technology Policy to resolve the differences that exist among the agencies and implement actions to respond to the recommendations. We are approaching the responses to the findings and recommendations through three major areas which I will address: management of the program, satellite coverage and budgeting of the program.

For management, NOAA, DOD and NASA have been developing and considering four possible options. Option one is to maintain the existing tri-agency partnership with management improvements and additional budget reserve. Under this option, the tri-agency structure would remain in place, but the budget and schedule would be adjusted to allow the program to continue to address continued technical challenges.

Option two would establish NOAA as the national lead for delivering weather and climate data. Under this option, NOAA, with NASA as its acquisition agent, would have responsibility for delivering a system that provides weather and climate data required. DOD would continue to provide funds, and all agencies would still coordinate on the data needs for their user communities. The NPOESS program office would be transferred to NASA's Goddard Space Flight Facility Center in Maryland.

Option three would be similar, but with DOD as the national lead for delivering this. Under this option, the NPOESS program office would be transferred to the Air Force Space and Missile Center in Los Angeles.

Option four would result in a divergence of the NPOESS program into two separate agency programs: one DOD and one NOAA. Under this option each agency would be responsible for acquisition of satellites in its own priority orbit, similar to how NOAA and Air Force currently operate them.

The tri-agency partners are continuing to assess and outline possible implementation approaches for each of these options.

The second area is satellite coverage and continuity. In partnership with NASA and DOD, we have been considering ways to modify the constellation to address the risk of potential gaps. Possible adjustments here include modifying the undeveloped portions of the ground system and the one unbuilt sensor, reconsidering the structure of the primary spacecraft, and use of small satellites or commercial satellites to help make the program more successful.

Regarding budget, NOAA, DOD and NASA are working to address the budget challenges facing the program. Continued development problems have consumed the program's resources and forced the program to make difficult trade-offs. The program will likely require increased budget to meet the Nation's needs or have the program's scope reduced to better align with available budget. Cost estimating is underway at this time.

Regarding GAO recommendations, NOAA concurs with all of the recommendations and is implementing them.

In conclusion, I would just like to state that 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 provide critical information used in protecting life and property. Based on the steps NOAA has taken in partnership with NASA and DOD, the program is on an initial path to resolve some of its current challenges. However, it is clear additional work by the government is required to fully resolve these issues, and the program intends to continue to keep this committee apprised of its developments as we move forward. Thank you very much.

[The prepared statement of Ms. Glackin follows:]

PREPARED STATEMENT OF MARY M. GLACKIN

Introduction

Mr. Chairman and Members of the Subcommittee, I am Mary Glackin, the Deputy Under Secretary for Oceans and Atmosphere of the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce (DOC). I appreciate the opportunity to testify about the steps NOAA has taken over the past year to address the ongoing challenges with the National Polar-orbiting Operational Environmental Satellite System (NPOESS).

NPOESS—A National Asset for Weather and Climate Data

NPOESS is a tri-agency collaboration involving the NOAA, the National Aeronautics and Space Administration (NASA), and the Department of Defense (DOD). The NPOESS program is designed to deliver four operational satellites that will provide global weather and climate coverage from 2014 to 2026, along with the NPOESS Preparatory Project (NPP), which was originally intended as a risk reduction satellite for the program's advanced sensor technology, and is now scheduled to launch in 2011.

The NPOESS program, a pivotal national satellite constellation designed to meet the Nation's weather forecasting and some key climate monitoring needs, is at risk. Should delivery of the NPOESS satellites be delayed or a catastrophic failure occur on launch or in orbit, NOAA's forecasting ability would be severely degraded because current forecast models rely heavily on NOAA and NASA's polar orbiting satellites that will be coming to the end of their useful lives.

- While NOAA's weather forecasting ability can sustain gaps of less than six months by relying on older satellites, a larger gap in satellite coverage would be unacceptable for weather forecasting since NOAA would be unable to produce useful 4 and 5 day hurricane track forecasts. Overall, weather model forecast performance would degrade by approximately 10 percent, a regression back to the quality that existed in the late 1990s.
- A gap in satellite coverage of any length would most likely interrupt critical climate measurements that are needed for the Nation to determine the cause, magnitude and direction of future climate change.

NOAA's final satellite in its Polar Operational Environmental Satellite (POES) series, NOAA–19, was launched in February 2009 and declared operational earlier this month. NOAA also operates the Air Force's Defense Meteorological Satellite Program (DMSP) satellites, a program that continues to have two satellites awaiting launch. Given that NOAA does not have any further polar satellites remaining to be launched, the agency is particularly focused on the threat further delays in the NPOESS program and the threat launch or early-on-orbit failures may have on the crucial weather and climate forecasts NOAA provides to the Nation.

The NPOESS program has the potential to provide crucial information to our continued monitoring of the climate both nationally and globally. Both Secretary of Commerce Locke and NOAA Administrator Lubchenco have indicated their commitment to fix this program to better ensure the future of the Nation's weather forecasting and climate monitoring capability.

Steps Taken to Reduce Risk in NPOESS Program

Since NOAA last testified about the NPOESS program last June, the agency has taken a series of steps to address the continued technical and management challenges in the program. The following section provides a summary of these steps in chronological order.

Working in partnership with DOD and NASA, NOAA has begun to address the challenges facing the program. Given the recent completion of crucial independent reviews, NOAA is seeking to move quickly to resolve remaining program issues.

A. Government Program Manager Installed at Contractor Facility

To address ongoing technical problems in the development of the Visible/Infrared Imager/Radiometer Suite (VIIRS), the main imaging sensor for the system, the NPOESS Executive Committee (EXCOM) agreed in August 2008 to have a government program manager with the expertise to oversee its development. Working in partnership with the existing prime contractor team from Northrop Grumman, as well as the subcontractor team from Raytheon, the senior NASA engineer and manager was installed on site at the Raytheon plant in El Segundo, California.

Since the government program manager's start at the facility, she has assessed the development of the VIIRS sensor being developed for NPP as well as those to

be built for NPOESS C1 and later NPOESS spacecraft. She is leading the continued testing of the VIIRS instrument with a team of government experts, providing significant oversight on day-to-day testing and quality assurance processes.

B. Tri-Agency Joint Assessment Team Established by NPOESS Executive Committee

As a result of the continued VIIRS development difficulties in 2008, the EXCOM chartered the Tri-Agency Joint Assessment Team (TJAT) last fall to address the impacts to schedule and cost that these ongoing development problems were causing. Consisting of senior officials from NOAA, NASA, DOD, and Air Force, the TJAT determined the following:

- The best solution to maintain overall program data continuity is to use NPP data operationally.
  - NOAA has accelerated the development of additional environmental data products so NPP is able to produce all of the products that NPOESS C1 was expected to produce (additional 35 data products).
- The program should proceed to plan to procure an Advanced Very High Resolution Radiometer (AVHRR), the main imaging sensor on NOAA's POES satellites, as an option if the program is unable to deliver VIIRS.
  - The AVHRR does not meet the full set of VIIRS operational requirements. There is also no funding available currently to implement this option.
  - The VIIRS sensor is currently undergoing thermal vacuum testing that will continue through August. If the sensor successfully proceeds through this testing, the option to procure an AVHRR will not be required.
  - The EXCOM directed the NPOESS Integrated Program Office (IPO) to complete the necessary procurement planning in the event VIIRS thermal vacuum testing problems require the program to proceed to procure an AVHRR.

C. Alternative Management Studies

The June 2006 Acquisition Decision Memorandum directed NPOESS to ". . . develop the option for a viable competing management structure . . ." to provide the EXCOM with a possible alternative to be exercised when the decision is made in FY 2010 on whether to continue with the same contractor team for the production of NPOESS satellites C3 and C4. The Alternative Management Study (AMS) was commissioned by the NPOESS Program Executive Officer (PEO) to assess management structure options.

An AMS was conducted in 2008 and made recommendations to improve program and sensor development oversight, fill key government positions, and implement contingency planning. It did not identify a viable alternative to the existing satellite integrator, or prime contractor, on the program. Their program oversight recommendations were addressed by creating an NPOESS Program Executive Officer-Program Management Council (PEO PMC), a monthly conference of tri-agency officials to support decision-making on the data requirements, acquisition, operations, and resourcing of the NPOESS program. Likewise, VIIRS oversight recommendations were addressed by deploying a government program manager and government support team to work on-site at the Raytheon subcontractor facility to provide additional oversight on VIIRS sensor testing and development.

D. Independent Review Team

At the request of the tri-agency leadership of the EXCOM, a high-level Independent Review Team (IRT) composed of senior independent aerospace and science experts from industry, academia, and government, concluded a comprehensive review of the program this spring. Chaired by Tom Young, the recently released IRT report provides valuable findings and recommendations regarding the current state of the program.

When the IRT findings were initially reported to the EXCOM, the IRT was clear that the NPOESS program "cannot be successfully executed within the constraints of cost, schedule, performance, and with the current management construct."

NOAA is taking the team's grim assessment of the program very seriously and is working with DOD and NASA to respond to the recommendations and make the changes necessary to improve the management and technical oversight of the program. Since Tom Young is expected to testify in his role as IRT Chairman at this

hearing, this testimony will not summarize each of the team's findings and recommendations.

NOAA, in partnership with DOD and NASA, is approaching the response to the IRT findings and recommendations through three major areas:

- the management of the program,
- the satellite coverage and data continuity challenges in the program, and
- the budgeting of the program.

The IRT noted they believe some NPOESS issues "can only be resolved at the White House level," given the interactions they had with government officials that indicate the agencies have differences in how they propose to address key challenges in the program. The Office of Science and Technology Policy has begun to engage the tri-agency leadership to resolve the differences and implement actions to respond to the IRT's recommendations.

Management: NOAA, DOD, and NASA are working to address the management challenges in the program through a consideration of all of the IRT's recommendations, but particularly the following four (out of nine):

- Focus on mission success (not on cost);
- Fix the Executive Committee/oversight structure;
- Assign the development management responsibility of NPOESS to a space acquisition enter; and
- Resolve and establish clear program priorities.

NOAA, DOD and NASA have been developing and considering management alternatives to reformulate the NPOESS tri-agency relationship in response to IRT recommendations. The options being considered include:

a. Maintain the existing tri-agency partnership with management improvements and additional budget reserve.
   - Under this option, the current tri-agency program structure would remain in place, but the budget and schedule would be adjusted to allow the program to address continued technical challenges.
   - Under this option, the NPOESS program office could be transferred to NASA's Goddard Space Flight Center in Greenbelt, Maryland or Air Force's Space and Missile Systems Center in Los Angeles, California, to enable it to use the resources of one of these renowned space acquisition centers.

b. Establish NOAA–NASA as national lead for delivering a satellite system that provides weather and climate data.
   - Under this option, NOAA, in coordination with NASA as its acquisition lead, would have responsibility for delivering a system that fulfills the NPOESS requirements.
   - NOAA and NASA would be responsible for designing and implementing an improved system to reduce risk of weather and climate data gaps.
   - DOD would continue to provide funds at a to-be-determined level, and all agencies would still coordinate on the data requirements for each agency's user communities.
   - The NPOESS program office would be transferred to NASA's Goddard Space Flight Center in Greenbelt, Maryland, to enable it to use the resources of this renowned space acquisition center.

c. Establish DOD as national lead for delivering a satellite system that provides weather and climate data.
   - Similar to the previous option, DOD would have responsibility for delivering a system that fulfills the NPOESS requirements.
   - The DOD would be responsible for designing and implementing a system to reduce risk of weather and climate data gaps.
   - NOAA would continue to provide funds, and all agencies would still coordinate on the data requirements for each agency's user communities.
   - The NPOESS program office would be transferred to Air Force's Space and Missile Systems Center in Los Angeles, California, to enable it to use the resources of this renowned space acquisition center.

d. Divergence of the NPOESS program into two separate agency programs (one DOD, one NOAA)

- Under this option, each agency would be responsible for acquisition of assets supporting its mission in its own priority orbits, similar to how the NOAA POES and Air Force DMSP programs currently operate.
- Data sharing between the agencies would continue as it does today.
- Existing partnerships for satellite operations, data distribution, and launch service would be continued.
- While dependent on when such a structural change would occur, this option would require NOAA, DOD, and NASA to negotiate which agencies would receive the assets that have already been developed by the NPOESS program.
- New competitive procurements for individual NOAA and DOD systems may be required shortly after such a divergence decision is made, potentially in FY 2010 or FY 2011 if decision is made in the near-term.

The NPOESS tri-agency partners are continuing to assess and develop cost estimates for these options.

Satellite Coverage and Data Continuity:

NOAA, DOD, and NASA are working to address the challenges of satellite coverage and data continuity in the program through consideration of all of the IRT's recommendations, but particularly the following four (out of nine):

- Proactively manage and mitigate the potential gap in continuity of coverage,
- Continue and strengthen the relationship with Northrop Grumman and Raytheon;
- Use NPOESS Preparatory Project data operationally; and
- Resolve and establish clear program priorities.

NOAA, NASA, and DOD have been considering ways to modify and adjust the current planned NPOESS constellation of satellites to better mitigate potential gaps in coverage as well as better address each NPOESS agency's need for environmental data. The agencies are examining initially the following areas to adjust the constellation to help make the program more successful:

- Alternatives for the currently undeveloped portions of the ground system;
- Alternative sources for the currently undeveloped Microwave Imager/Sounder (MIS) sensor;
- Alternatives for the structure of the primary spacecraft; and
- Use of a series of small satellites and inclusion of sensors on commercial spacecraft, both of which may improve the tri-agency's ability to recover from launch or on-orbit failures.

Some of these options would require modifications to contracts and additional resources. Some of the options may reduce the capability of the NPOESS system.

Budget:

NOAA, DOD, and NASA are working to address the budget challenges facing this program through consideration of all of the IRT's recommendations, but particularly the following three (out of nine):

- Proactively manage and mitigate the potential gap in continuity of coverage;
- Increase near-term funding; and
- Fund the program by fiscal year and through the duration of the program at an 80 percent cost confidence level, including a management reserve of 25 percent.

Continuing development problems have consumed the program's resources and forced the program to make difficult trades to preserve schedule and remain within available annual funding. Unfortunately, these trades have added substantial risk to the program. In the near-term, the program will likely require increased budget to meet the Nation's needs, or have to reduce program scope to better align the program with its available budget.

In response to this concern, NOAA allocated $26 million of *American Recovery and Reinvestment Act* funding for NPOESS, including funding above its matching re-

quirement with DOD. This additional funding will allow NOAA to perform critical NPOESS development activities and address risk mitigation within the program.

Based on the four above major steps the NPOESS program leadership has taken recently, the program is on an initial path to resolve some of its current challenges. Additional work by the government is required to resolve the issues and the program intends to continue to keep the Committee apprised of these developments.

Government Accountability Office Recommendations for Executive Action

The Government Accountability Office (GAO) has provided regular reviews of the NPOESS program and NOAA appreciates the perspective GAO professionals have provided. NOAA has met with GAO and provided information and feedback on its most recent report.

GAO made six recommendations that it anticipates will improve the effectiveness and efficiency of the EXCOM. The first recommendation was directed solely to DOD and the remaining five recommendations are directed to DOC/NOAA, DOD, and NASA.

Recommendation 1: *To improve the timeliness and effectiveness of acquisition decision making on the NPOESS program, we recommend that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to attend and participate in NPOESS Executive Committee meetings.*

NOAA Response: NOAA defers to the DOD on this recommendation but has no objection to EXCOM participation by the Under Secretary of Defense for Acquisition, Technology and Logistics.

Recommendation 2: *Establish a realistic timeframe for revising the program's cost and schedule baselines.*

NOAA Response: NOAA concurs with this recommendation. The NPOESS Integrated Program Office is developing an updated program office estimate for a revised acquisition program baseline as required by DOD acquisition regulation. However, a revised program cost and schedule estimate will be established later this year following a robust independent cost analysis of recommended programmatic and acquisition alternatives that better reflect a budget with appropriate contingency funding to reduce risk. The revised program cost and schedule estimates will be ready for initial EXCOM review in late summer 2009.

Recommendation 3: *Develop plans to mitigate the risk of gaps in satellite continuity.*

NOAA Response: NOAA concurs with this recommendation. The NPP sensors are capable of producing data that meet or exceed the data provided by NOAA–19 (NOAA's current operational satellite). Accordingly, to mitigate the potential gap in polar environmental satellite data coverage in the afternoon orbit between NOAA–19 and NPOESS C1, NOAA plans to make operational use of the data from the NPP spacecraft and increase the number of products NOAA had planned to generate from the NPP system as a risk reduction mission to minimize impacts to NOAA's National Weather Service and other users.

Specifically, NOAA will accelerate development of 54 polar legacy products. Previously, 19 legacy products were expected from NPP, with an increase to 54 products in the NPOESS C1 era. NOAA will enhance its NPP data processing ground system with sufficient infrastructure to support the additional 35 products and 24x7 operations and support.

In the mid-morning orbit, NOAA will continue through the next decade to process and deliver environmental products to its customers from the U.S. and European instruments on board the European Organization for the Exploitation of Meteorological Satellites MetOp series of satellites.

NOAA is assessing the use of additional international and interagency assets as well as potential development of spare satellites and instruments. The cost and schedule details associated with these contingency options are currently under review. Any alternative decisions will also take into account the results of the VIIRS sensor testing currently underway.

Recommendation 4: *Track the Committee's action items from inception to closure.*

NOAA Response: NOAA concurs with this recommendation. NOAA will task the NPOESS Program Executive Officer (PEO) to ensure that Executive Committee (EXCOM) action items are clearly and completely defined, assigned to responsible parties for completion within a specific timeframe, and tracked to completion, including reporting the results to the EXCOM. NOAA will monitor EXCOM action

items through the NOAA Program Management Council, which I chair, and take corrective actions needed to ensure action item coordination and closure.

Recommendation 5: *Improve the Committee's ability to achieve successful outcomes by identifying the desired outcome associated with each of the Committee actions, as well as timeframes and responsible parties, when new action items are established.*

NOAA Response: NOAA concurs with this recommendation. NOAA will task the PEO to ensure EXCOM action items and desired outcomes are clearly and completely defined, assigned to responsible parties for completion within a specific timeframe, and tracked to completion, including reporting the results to the EXCOM. NOAA will monitor EXCOM action items through the NOAA Program Management Council, which I chair, and take corrective actions needed to ensure successful outcomes.

Recommendation 6: *Improve the Committee's efficiency by establishing timeframes for escalating risks to the committee for action so that they do not linger unresolved at the program executive level.*

NOAA Response: NOAA concurs with this recommendation. The PEO will ensure that risks, resolution plans and schedules are established and tracked at the PEO–PMC, the PEO's monthly management council. NOAA will work with NASA and DOD to ensure the PEO establishes clear criteria and timeframes for elevating risks to the EXCOM for action. NOAA will monitor PEO action items and issue resolution through the NOAA Program Management Council and the tri-agency NPOESS Oversight Council (NOC) to take corrective actions needed to ensure timeliness in addressing escalating risks.

The NOC, established in the spring of 2009, is the tri-agency council that reviews the NPOESS program on a more recurrent basis than the senior-level EXCOM. The NOC, which reports to the EXCOM, is co-chaired by the Deputy Under Secretary for Oceans and Atmosphere, the Deputy Under Secretary of the Air Force, and the Deputy Administrator of NASA. These members are responsible for representing their agencies and providing a reasonable representation of their EXCOM position to ensure that issues and actions are responded to in a timely manner.

Conclusion

In conclusion, NOAA appreciates the Committee's continued interest in the success of the agency'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. NOAA is acting quickly to support the important decisions that are likely required to modify the program to more effectively achieve its objectives in line with the recommendations of key independent reviewers. DOC and NOAA remain committed to pursuing a program that will provide continuity of data for the Nation's weather and climate prediction needs. I would be happy to answer any questions you may have.

BIOGRAPHY FOR MARY M. GLACKIN

Mary M. Glackin has been the Deputy Under Secretary for Oceans and Atmosphere since December 2, 2007. In this role she is responsible for the day-to-day management of NOAA's domestic and international operations.

Glackin has more than 15 years of senior executive level experience working in numerous NOAA line offices. She served as the acting Assistant Administrator for Weather Services and Director, National Weather Service from June 12, 2007, through September 15, 2007. Before that, she was the Assistant Administrator for the National Oceanic and Atmospheric Administration's (NOAA) Office of Program Planning and Integration. From 1999 until 2002, she served as the Deputy Assistant Administrator for the National Environmental Satellite, Data, and Information Service of NOAA. From 1993 to 1999, she worked as the Program Manager for the Advanced Weather Interactive Processing System (AWIPS) with the National Weather Service (NWS), NOAA. Prior to this, Ms. Glackin was both a meteorologist and computer specialist in various positions within NOAA where she was responsible for introducing improvements into NWS operations by capitalizing on new technology systems and scientific models.

She is the recipient of the Presidential Rank Award (2001), Charles Brooks Award for Outstanding Services to the American Meteorological Society, the NOAA Bronze Medal (2001), the Federal 100 Information Technology Manager Award (1999), the

NOAA Administrator's Award (1993), and the Department of Commerce Silver Medal Award (1991). She is a Fellow of the American Meteorological Society and a member of the National Weather Association and the American Geophysical Union.

Ms. Glackin has a B.S. degree from the University of Maryland.

DISCUSSION

Chairman MILLER. It sounds like there will be six more oversight hearings on the NPOESS satellite system.

ENSURING INTERAGENCY COOPERATION

I now recognize myself for five minutes of questioning. Mr. Powner, your report, as well as Mr. Young's testimony, attributed much of the failure to the inability of the three agencies, NOAA, DOD, NASA, the tri-agency executive committee, or EXCOM, to function properly for the different agencies simply to play well with others. Your recommendation that in the future they should develop their own satellites because they just couldn't get along seemed like an extraordinary step when there appear to be some significant savings or something that should be available if they all need satellites flying to cooperate.

We have got new players on the scene. We have got Dr. Lubchenco at NOAA, Dr. Carter at DOD, Mr. Scolese if I have pronounced it correctly, at NASA in the EXCOM positions. Do you have access to their report cards from elementary school? Do you know how well they play with others? Do you think there is any chance that EXCOM can be made to work as intended with different people in the seats?

Mr. POWNER. I think clearly in the short-term the delivery of the four satellites as well as the demonstration satellite with NPOESS, we need to keep the current structure or go to something similar to what Mr. Young is suggesting with one agency lead. You know, we are about ready to deliver on the demonstration satellite hopefully and then also with the first satellite, C1. The recommendation long-term to split it, I think if you look historically, this was intended to save money. It hasn't saved money. We still haven't resolved the differing agency missions. I think after these four satellites are delivered, we ought to consider going back to separate satellite acquisitions. In the interim, our recommendations are geared toward getting the EXCOM on board. They still have a management role here to deliver the satellites that are currently on the table.

Chairman MILLER. Mr. Young, do you agree? Is there something that is just in the system of having these three agencies try to work together? Is it a personality issue? Is there any possibility now that we have got different people sitting in the seats at the EXCOM meetings that we will have better results, it will be less dysfunctional?

Mr. YOUNG. I don't think it is a personality issue. I think it really boils down to a couple of factors. One is the priorities of the partners are different, and it is hard to have an integrated management team when the various partners have different priorities. But I will come back and say, you know, as I mentioned in my testimony, I think even in the revised program that IRT suggested,

EXCOM has a role. But it is almost kind of fundamental that the three parties be the people who have decision-making authority, you know. As was pointed out in the GAO report, the DOD representative is not the individual decision-making authority. So fundamentally this is an organization that meets some weeks. Afterwards there is some meeting which I am not totally familiar with where the decision-making authority, the individual who has milestone and acquisition authority, makes decisions.

So I think there are ways to make it more efficient, but it is hard to overcome the factor that the three organizations have in our view different priorities. And by the way, I want to come back and say it doesn't mean any of the priorities are wrong. I mean, it is just that they are different.

THE ROLE OF OSTP

Chairman MILLER. Mr. Young, your testimony embraced the idea that the White House should—ultimately they are all three executive branch agencies. Perhaps OSTP should come in and decide between the priorities. That seems like kind of a big task for a small office. But am I correct? Is that what you think needs to happen? OSTP needs to come in and decide, adjudicate the disputes?

Mr. YOUNG. Yes, and let me add to that just a little bit. It again is our observation or judgment that the EXCOM cannot come to resolution on the issue for the reasons we have talked about. So then as you said, it really has to go to another level. When we really got looking at this, that was kind of beyond where we had expected to go, to tell you the truth. But when we started looking at this particular program, it becomes very odd—this is a national program for all the reasons that you folks identified. It is not a program that should be subject to compromise. It is a program that should be decided on what is in the best interest of the country. And the right place for that to be done is the White House. So in our view, the Office of the President has to designate a decision-maker, underline decision-maker, not a committee chairman, not a coordinator, but a decision-maker. And that decision maker has to listen to all of the inputs and decide one, what is affordable, and two, what is in the best interest of the country. I think it can be done. We didn't identify who that should be. It certainly could be the Director of the Office of Science and Technology and Policy. It could be Director of the NSC, but I think it is probably in those two organizations that you would find the right expertise to provide this leadership.

But again, if you will excuse me, I want to underline, we don't need another Committee Chairman and we don't need another Coordinator. We need someone who is going to listen to all the facts and decide what is in the best interest of the country.

Chairman MILLER. My time is now expired. Both cloakrooms have now told us that there will likely be votes shortly. We will try to go and make a decision about whether we will come back or not depending on how far we have gone. I think all the Members should know that if they remain Members of this committee, they will have many opportunities to ask questions at NPOESS oversight hearings.

Dr. Broun for five minutes.

SELECTING A MANAGEMENT STRATEGY

Mr. BROUN. Thank you, Mr. Chairman. Secretary Glackin, NOAA has recommended four different paths toward the resolution as we go forward in the NPOESS management. Do you all have a preference of one over the other? Would you make that clear to us, please?

Ms. GLACKIN. Yes, I will. I will speak from a NOAA perspective here. NOAA believes that we have the broadest mission requirements for this, for both weather and climate, and we also recognize that this is a critically important program to us. It is really germane to our mission, and NOAA would be prepared to take leadership in this program, I think as we move forward with it. There are quite a few—I would hasten to say there are quite a few issues associated with things that have to be worked out, and we are really in the midst of doing that. But Secretary Locke has been actively engaged in this program and is committed to finding the right solution for the Nation. And if it is going to be right for the Nation, then I think he would be prepared.

Mr. BROUN. Okay. Would you rank those four options for us in terms of effectiveness, difficulty in implementing each option, and the likelihood of it being implemented?

Ms. GLACKIN. All of the options have, I think, pros and cons to them that are still being evaluated at this point. I think the status quo does represent some significant challenges for us as Mr. Young has highlighted for us today. Options two and three, I think, have a significant pro to them in that there would be a very clear point for authority, accountability and responsibility for a program there. To go to option two would obviously be a transition to get there. Option three would be easier.

In option four which I described as a divergence, I will take another minute to say that there really is still a lot of commonality in that site. We have a ground system today, and the Committee may not be aware but NOAA actually operates DOD's operational satellites for them today. So NOAA has a very strong role in operations of these satellites.

Mr. BROUN. Mr. Young, would you please comment on those four options and any other option that you see of the four, as well as rank them in order of effectiveness and implementation?

Mr. YOUNG. Let me give just a little bit of background. You are probably familiar, but our particular group, we had a fairly broad representation. It was nine of us, but if there was any waiting, it was in the direction of people who had national security space experience. I really highlight that because it was a group that I think was genuinely looking for what is in the best interest of the country, not what is the best organizational solution.

We debated a fair amount on that subject, and our conclusion is a little bit as Ms. Glackin said, that NOAA is really the organization that the country looks to to provide weather and climate leadership, and when you're assigning responsibility for something, I think you want to assign it to that organization where it is their number one priority, not their number seven priority. And in that regard, it is number one priority to NOAA. It was very obvious to us that NOAA was the organization.

NOAA is not a space acquisition organization, so they need NASA to be a partner with them in order to be able to implement it.

Mr. BROUN. So you basically agree with——

Mr. YOUNG. I do.

Mr. BROUN.—Secretary Glackin. Mr. Powner, would you comment, please?

Mr. POWNER. Well, I think in the near-term we have the existing structure to deal with. So that needs to go forward over the next several months. Hopefully we will have a quick decision if we go with the one agency. I agree that NOAA would be that agency, because this is not a priority at DOD.

The fourth option is clearly a longer-term approach after this constellation of NPOESS satellites would be launched.

Mr. BROUN. Okay, Mr. Chairman. For the sake of time, I am going to yield back.

Chairman MILLER. Thank you for that very generous decision.

What I would propose is that each of the remaining Members—we have been called for votes. You heard the bells or the horns—that each of the Members ask one round of questions if they can keep it below five minutes, maybe more like three-ish. We can complete this sixth hearing on NPOESS and save our questions for the seventh or eighth hearing.

Ms. Dahlkemper for five or less.

PROGRAM COST

Ms. DAHLKEMPER. Thank you, Mr. Chairman. I will try to be brief. Mr. Powner, it seems that every time that you have come before this committee, you are reporting cost increases in this program. Yet the entire Nunn-McCurdy process was supposed to stabilize the program.

Why haven't we converged on a stable cost estimate for the program before this, and can you give me a firm number now?

Mr. POWNER. Well, I think if you look at the history of this program, the current overrun is primarily due to the technical problems that the program has faced with the VIIRS sensor. I think there were unforeseen technical problems. You can argue that maybe those technical problems could have—we should have anticipated those. So in the past, we can go back to—there has been mismanagement across the board on this. We are faulting EXCOM right now. Historically, you can go back. There was a prime contractor not overseeing subs, there were problems with program offices. So there has been mismanagement throughout, not a single organization that we can point to say, that is the one organization. It has been from contractors through program offices, through PEOs through EXCOM. Everyone is at fault.

I think if you look going forward, the estimate right now of $3.9 billion, it is going to at least grow another billion but likely more because there also will be integration issues which typically occur on both NPP and that first satellite. So I would expect at a minimum it will be $1 billion but likely more. So that will place this in the $15 billion life cycle cost range.

Ms. DAHLKEMPER. So I am sorry, what was the total?

Mr. POWNER. $15 billion.

Ms. DAHLKEMPER. And can you say that that is a stable number?

Mr. POWNER. No, it will be higher than that.

Ms. DAHLKEMPER. So there is still no firm number?

Mr. POWNER. And I think the program would agree with that, too. That is why they want to have these detailed cost estimates that they are going to work on. There are five estimates that are currently in the works right now. We haven't seen those. Those have not been disclosed to us. It is going to at least be fifteen.

Ms. DAHLKEMPER. Mr. Young and Ms. Glackin, would you please comment on my question?

Mr. YOUNG. I really can't add to the cost numbers. In our report, the thing that we were really trying—we said greater than a billion dollars. What we were really trying to do is make sure that everybody understood this wasn't a fixer-up problem. I mean, it was a problem of a significant magnitude. I don't know what the upper cap, you know, is on that particular number. But it is in excess of a billion dollars.

Ms. DAHLKEMPER. Ms. Glackin.

Ms. GLACKIN. I agree with that.

Ms. DAHLKEMPER. Well, it certainly would be nice to have a stable number. I am new to Congress, so I haven't been here for all these other hearings, and I guess I will be here for quite a few after this.

Mr. BROUN. You hope you are.

Ms. DAHLKEMPER. What is that?

Mr. BROUN. You hope you are.

Ms. DAHLKEMPER. Yeah, I hope I am. But I mean, I hope I am not. I hope that we can put this problem behind us, you know, just as a concerned citizen who came into Congress. These are the kind of things that, you know, just make people back home shake their heads and wonder what we are doing down here.

Mr. YOUNG. I probably should, if I could add to that, I agree. My personal belief is, it is not necessary to have a seventh hearing.

Ms. DAHLKEMPER. We should be able to do this if we get a decision maker in?

Mr. YOUNG. The right leadership and the right corrective actions can prevent a seventh hearing.

Ms. DAHLKEMPER. Thank you very much. I will yield back.

Chairman MILLER. The record should note that most of these hearings do predate Ms. Dahlkemper's service in Congress.

Mr. Bilbray for five minutes or such lesser time as he may consume.

COORDINATING AGENCIES AND TECHNOLOGIES

Mr. BILBRAY. Yes, Mr. Chairman, just as an editorial note, it is nice to hear about a problem that is only a billion.

Chairman MILLER. No, it is more than that.

Mr. BILBRAY. That was with a B, not with a T, right? Okay. Are we talking the biggest problem is incompatibility of hardware between the three different choices? Is that a debate over the hardware itself?

Mr. YOUNG. I don't think so. I think it really—if I could kind again hit the point I was trying to make in my testimony. The DOD/Air Force states that they are satisfied with legacy, meaning

current weather satellite data. They are satisfied with that capability.

Mr. BILBRAY. Who is?

Mr. YOUNG. The DOD and the Air Force.

Mr. BILBRAY. Okay.

Mr. YOUNG. And they are not willing to provide funding to provide capability beyond that. Now, it has been kind of directed that the two organizations fund 50–50. Now, NOAA and Ms. Glackin can say this much better than I, but NOAA states that today they use all their weather satellites, including theirs and DOD's. But they also use some very special capability from NASA R&D satellites that are operating well beyond their designed lifetime. And it is the combination of those data that gives us the quality of weather forecasting we have today. To go to legacy capability only would be a significant step back in the country's ability to do weather forecasting. That difference in opinion is big, and when we would sit in the meetings with the two organizations, good people on both sides, but you could just sense the edge that that created because each was trying to be supportive of their respective organization's priorities, not surprising. Given that large difference, and it is large, difference in priorities makes any kind of an integrated implementation for this program—I guess I could say difficult but I probably should use even a stronger statement than that.

Mr. BILBRAY. Well, let me say, for instance, if somebody has been in government for over 30 years, I mean, any bureaucracy that is satisfied obviously doesn't know what it doesn't know. I mean, I think that seriously we need to talk about that. And this whole in-fighting kind of reminds me of trying to get 18 police agencies to agree on one communication system——

Mr. YOUNG. That would be right.

Mr. BILBRAY.—and everybody has got their angle to it. And I understand the in-fighting here.

My biggest concern is people thinking they don't have a vested interest in the other guy's agenda. I don't think that there are very many people in business who thought the military doing Internet was going to be a big deal to them, and frankly, I think there is a whole lot of technology exchange. I don't think any of us know in the long run the benefits that may happen through cooperation.

And so, Mr. Chairman, I just think that we have got to approach this not just over the issues of what is the forecasting that the three agencies want to look at or data they want to acquire or the program they want. But the fact of understanding that there are things out there that if we are going to get a benefit and get problems in that we don't know about and to approach that.

I mean, how many people in business really saw the *Eisenhower Act*, which originally was designed for the military. That really was a boon for interstate commerce. So I just hope that we approach this with the attitude that there is a lot more at stake than just, you know, forecasting the weather we know now, and it just boggles my mind to think that maybe the institutions that think they have enough data really aren't aware of just how broad horizons are. I guess it goes back to the old thing at the turn of the century when they said we might as well shut down the patents office be-

cause everything that has ever been invented has already been invented.

So I yield back, Mr. Chairman.

THE KEYS TO AVOIDING FUTURE PROBLEMS

Chairman MILLER. Thank you, Mr. Bilbray. Mr. Davis has made our life slightly easier by going to vote and forgoing his round of questions. Without making this another round of questions, we do have just a minute or two more. Mr. Young said he did not think we needed a seventh hearing, or an eighth or a ninth or a tenth hearing, that there were things that we could do to avoid that necessity, that need. Could each of you give one sentence that you think is the most important thing to be done to avoid the need for a seventh, eighth, ninth hearing and further delays and further cost overruns and further everything that has gone wrong. Mr. Powner.

Mr. POWNER. There is an EXCOM meeting June 26. We need a firm decision on program direction which includes scope and cost; and if we don't have that decision, I think we do need a hearing.

Chairman MILLER. Does someone need to call the Secretary of Defense and suggest someone show up? Mr. Young.

Mr. YOUNG. The White House needs to establish the program is in the best interest of the country, and then we need to budget for it at the most probable cost which is an 80/20 confidence with a sufficient amount of contingency.

Chairman MILLER. Ms. Glackin.

Ms. GLACKIN. I think that we need to make adjustments to the program with respect to management, to have the management oversight be more effective, and we need to develop realistic cost and schedules for this program that we can live within.

CLOSING

Chairman MILLER. All right. Any valedictory comments from Dr. Broun?

Mr. BROUN. I just want to thank Mr. Powner and Mr. Young for their hard work on this. Hopefully we won't need another hearing, hopefully we will get good management in place and we can start flying birds and get the data that Ms. Glackin and her agency needs and that this will be a soft problem, and I just want to thank you all very much. I have tremendous respect for Mr. Young. I knew him years ago when I was the physician for the Martin Marietta plant in Americus, Georgia. And so I have known him for a number of years, and I just have tremendous confidence in what he recommends. And I thank both of you gentlemen, and I thank you Madam Secretary for coming. Thank you.

Mr. YOUNG. Thank you very much.

Chairman MILLER. All right. Now we need to sprint to the Floor, but thank you again. We will bring this hearing to a close. I thank all the witnesses for testifying. Under the rules, the record will remain open for two weeks for additional statements from the Members and for answers to any follow-up questions the Committee may have for the witnesses. The witnesses are excused. The hearing is now adjourned.

[Whereupon, at 2:54 p.m., the Subcommittee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

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ANSWERS TO POST-HEARING QUESTIONS

Responses by David A. Powner, Director, Information Technology Management Issues, Government Accountability Office (GAO)

Questions submitted by Representative Paul C. Broun

Q1. There are many different cost estimates for the NPOESS program.

Q1a. What do you know about them?

A1a. Currently, there are at least five different cost estimates for the NPOESS program. One estimate is the program's current official cost estimate of $13.95 billion, which is recognized as no longer being achievable. Agency officials have provided us an overview of the other four estimates, but not the estimates themselves since they were still being determined at the time of our review. All of them are based on a delayed schedule.[1] The estimates, as explained by agency officials, are:

- Program officials' cost estimate at the 50 percent confidence level.[2]
- The Office of the Secretary of Defense's Cost Analysis Improvement Group's independent cost assessment at the 50 percent confidence level.
- Program officials' cost estimate at the 80 percent confidence level.
- Program officials' estimate that includes the cost of acquiring the third and fourth NPOESS satellites as early as possible (as recommended by a recent Independent Review Team report).

Q1b. Which [cost estimate] do you think the program should use moving forward?

A1b. The recent Independent Review Team (IRT) report recommends funding the NPOESS program at the 80 percent confidence level and including a management reserve for the program of approximately 25 percent. We agree that, at this stage of the program, the cost estimate should be at the 80 percent confidence level. Using an estimate with a higher confidence level and management reserve should help the program plan for and handle unanticipated issues as it moves from the development phase to the production phase.

Q2. One of the findings of the IRT was that the Integrated Program Office (IPO) does not have sufficient space acquisition expertise, and they cited the Goddard Space Flight Center at NASA and the Air Force Space and Missile Systems Center as good examples.

Q2a. Why can't the current IPO leverage the expertise of these institutions without actually being co-located?

A2a. The program office currently leverages the expertise of these institutions without being co-located. However, key agency officials reported that co-location could provide a supportive infrastructure, facilitate cooperation, and allow active oversight by the selected center's management.

Q2b. Does the IPO consult with these organizations already?

A2b. Officials from both Goddard Space Flight Center and Air Force Space and Missile Systems Center are members of, and participate in, the Program Executive Officer's Program Management Council. In addition, many of the program's and the program executive office's employees are originally from either NASA or the Air Force, and both the program and the program executive office work with NASA and the Air Force to get specific expertise as needed.

Q2c. Is there an overhead cost associated with NASA running NOAA programs?

A2c. There is an overhead cost associated with NASA running NOAA programs. For example, on the Geostationary Operational Environmental Satellites–R series (GOES–R) program, NOAA reimburses NASA for its program office support such as facilities management and information technology support services, which is calculated by NASA via a general management overhead cost rate.

Q3. The NPOESS Preparatory Project (NPP) mission was meant to mitigate program risk and test sensors and ground systems prior to the full stand-up of

[1] This schedule delays the launches of the NPOESS prototype—called the NPOESS Preparatory Project (NPP)—and the first and the second NPOESS satellites by seven, fourteen, and five months, respectively.

[2] A 50 percent level of confidence indicates that a program has a 50 percent chance that the program will be delivered at the identified cost.

NPOESS. I understand that we don't have many options now because of concerns about data gaps, but what are the implications of "operationalizing" NPP?

A3. There are several implications of using NPP data operationally. First, the four central data processing centers (one managed by NOAA, one by the Air Force, and two by the Navy) will need to ensure that the infrastructure they had planned to build to handle NPOESS data are in place and that the scientific algorithms are ready to accept NPP data. Because neither Navy facility will have an NPOESS Integrated Data Processing System until the first NPOESS satellite is operational, they may also need to make additional accommodations to use NPP data effectively. Second, there are fewer operational ground stations supporting NPP than will support NPOESS, which means that data will take longer to get to the centers and, therefore, may be less useful. Third, the NPP satellite was only designed to a five-year mission life, unlike the seven-year mission life of the NPOESS satellites. Thus, if there are further delays in the launch of C1, NPP may not bridge the gap in satellite data.

Q4. NOAA is responsible for program management and operation, while acquisition authority belongs to DOD.

Q4a. How has this affected the program?

A4a. As outlined in a tri-agency memorandum of understanding, NOAA, DOD, and NASA each have different responsibilities for the NPOESS program and all are represented on a tri-agency Executive Committee. However, we recently reported that it is difficult for the NPOESS Executive Committee to navigate the three agencies' competing requirements and priorities.[3] We also reported that the Executive Committee has not been effective in fulfilling its responsibilities because the official with the authority to make acquisition decisions did not attend committee meetings, corrective actions were not identified in terms of desired outcomes, actions were not tracked to closure, and selected risks were not escalated in a timely manner.

Q4b. Is this relationship unique in the Federal Government?

A4b. The 2008 NPOESS Alternative Management Study team found that the NPOESS tri-agency management approach has no prior model on which to rely. Other similar programs, including NOAA's GOES program and Air Force programs, use management approaches that have been in place for decades. The team noted that the success of these other programs appears to be attributable, in part, to the maturity of the government management approach.

Q5. Given all of the technical issues experienced on the Visual/infrared Imager Radiometer Suite (VIIRS) instrument, is it time to pursue an alternative instrument?

A5. While the VIIRS instrument has had many serious technical issues, the recent Independent Review Team recommended that the program stay with the current sensor and contractor teams through the third VIIRS sensor (for NPOESS C2). However, if problems on VIIRS persist during its current thermal vacuum testing, the program plans to pursue an alternative to ensure that launch schedules do not slip any further. The Executive Committee has directed NASA to start the documentation that will be needed to procure an Advanced Very High Resolution Radiometer (AVHRR) for C1 at the beginning of the next fiscal year (October 1, 2009)—should VIIRS performance during thermal vacuum testing dictate such a need. Agency officials have noted that a decision would need to be made by that time in order to avoid further schedule delays.

Q5a. Is using an AVHRR the only option [for C1]?

A5a. The agencies' options depend on their goals, such as whether schedule or cost is more important than system performance. Specifically, an AVHRR is cheaper and easier to build than VIIRS, and is NOAA's current operational imaging sensor. However, it offers a major step back from NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) sensor, which NOAA and NASA both consider their "legacy" sensor—and both agencies use MODIS data operationally.

As of March 2009, over 80 percent of the parts for the second VIIRS instrument (currently planned for C1) were in house at the contractor, with plans in place to acquire the rest. Further, an independent review team chaired by officials from NASA's Jet Propulsion Laboratory recently reviewed the contractor's ability to build

[3] GAO, *Polar-orbiting Environmental Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making,* GAO–09–564 (Washington, D.C.: June 17, 2009).

the second and third VIIRS instruments. The team recommended staying with the current VIIRS contractor for C1 and C2.

Q5b. When would the [Executive Committee] need to make this decision by?

A5b. The Executive Committee has directed NASA to start the procurement paperwork for an AVHRR for C1 at the beginning of the next fiscal year (October 1, 2009)—should VIIRS performance during its on-going thermal vacuum testing dictate such a need. A decision would need to be made by that time in order to avoid further schedule delays to the C1 launch.

Q5c. What are the cost and performance implications of making this decision?

A5c. Although building an additional AVHRR appears to be the least costly of the options for replacing VIRRS on C1—should that be required—the AVHRR sensor would be a significant step back in terms of performance currently available through NASA's MODIS sensor. Further, AVHRR would not meet the key performance parameters required for the NPOESS program.

Q5d. Are there any international implications to this option since we owe an AVHRR to the Europeans for their MetOp satellite?

A5d. The current direction of the Executive Committee is to plan for the purchase of an AVHRR for C1 (in the afternoon orbit)—not for NPP—beginning October 1, 2009, if needed. In that event, the program plans to acquire a new AVHRR for C1—not the AVHRR intended for MetOp. However, there are agreements in place between the European Organization for the Exploitation of Meteorological Satellites (Eumetsat) and NOAA regarding the exchange of NPOESS data. These should be examined before deciding how to proceed regarding an AVHRR.

In responding to these questions, we relied on information from our recent review of the NPOESS program.[4] The work supporting the report was conducted from October 2008 to June 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide 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. Additional details on our objectives, scope, and methodology are provided in our report.[5]

[4] GAO–09–772T and GAO–09–564.
[5] GAO–09–564.

ANSWERS TO POST-HEARING QUESTIONS

Responses by A. Thomas Young, Chair, NPOESS Independent Review Team (IRT)

Questions submitted by Representative Paul C. Broun

Q1. Your review found critical flaws in the way the three agencies interact.

Q1a. If you were advising the Office of Science and Technology Policy on how to proceed, what would you suggest?

A1a. Establish a sound program. A program that responds to all requirements and corrective actions needs to be established for NPOESS. This program should provide the capabilities necessary to meet Level 1 requirements and include all of the IRT recommendations regarding management structure and data continuity. The resultant funding and schedule for this program should be adjusted to support an 80/20 cost confidence in each fiscal year and for the total program. The affordability of the resultant program and the associated funding should be assessed.

If the resultant program and level of funding are judged to be unaffordable, then the scope of the program should be adjusted such that the reduced program scope can be accommodated within the level of the available funding at an 80/20 cost confidence level in each fiscal year and for the total program. The acceptability of this reduced-scope program should be assessed.

The IRT believes that, in addition to defining the NPOESS program that meets national interests, responsibility for the program's execution must be assigned to one organization (USAF or NOAA). Should the selected NPOESS program option have requirements consistent with current Level 1 requirements, the logical choice would be the organization needing the improved capabilities above legacy, i.e., NOAA. If the decision is to constrain the program to be consistent with legacy performance and the associated budget, either NOAH or the USAF could be assigned the responsibility.

The organization assigned management responsibility must have total acquisition authority including control and responsibility for all supporting resources and functions such as people, budget, and contracting. Additionally, that organization should be allocated all currently planned and programmed NPOESS budget and then be responsible for funding the NPOESS program at an 80–20 cost confidence level.

At the March 4, 2009 EXCOM briefing of the IRT findings and recommendations regarding NPOESS, the EXCOM requested that the IRT evaluate the organizational alternatives for the acquisition of NPOESS. The conclusion of this evaluation is that either organization has the capability to execute the NPOESS program. However, the IRT recommends that responsibility for NPOESS execution be assigned to NOAA with NASA acting as NOAA's acquisition organization. This recommendation is based on the following two factors: 1) NOAA has the broader responsibility for weather and climate than any other organization; and 2) this national responsibility of NOAA aligns well with the national character of the NPOESS program and makes NOAA the natural national advocate for the NPOESS program.

Under this construct, NPOESS execution is assigned to NOAA with NASA as NOAA's acquisition organization, NOAA/NASA will provide all polar data from the NPOESS program to all users. Additionally, NOAA/NASA, working with DOD, must establish a process that will ensure that future DOD needs will be satisfied. The current EXCOM concept should continue as an interagency forum to assure effective program implementation.

Q2. How much more do you think this program will cost if it is budgeted to 80/20?

A2. The program is currently funded at less than the 50/50 level which is an insufficient level of funding. At this level of funding the program lacks sufficient management reserve which leads to the program using risk as its management reserve. The most probable cost is at the 80/20 level including reserves. To fund at the most probable cost, the IRT estimated that the NPOESS budget has a shortfall in excess of $113 through program completion. Funding the program (by Fiscal Year and through Estimate to Complete) to 80/20 cost confidence would provide a management reserve of approximately 25 percent.

Q2a. Does this include your recommendation to mitigate the risk of continuity gaps?

A2a. No, it does not. The IRT review of the baseline program highlighted a concern regarding operational continuity associated with how the baseline program was structured. Both heritage programs, the DOD's Defense Meteorological Satellite Program (DMSP) and the NOAA Polar-orbiting Operational Environmental Satellite

(POES) were planned and constructed with spares on the ground to implement a "launch on need" philosophy. Even early NPOESS planning carried this same launch philosophy to preclude long gaps in coverage. The current NPOESS program plan does not have that same level of assuredness regarding operational continuity. Furthermore, the IRT was unable to find Level 1 requirements for operational continuity or constellation availability.

If all satellites are delivered on schedule, launched without incident, and meet their full design life, there will be no significant gap in capabilities. In keeping with historical trends, there is a high likelihood of early problems with the first few satellites. They occur across the manufacturing, integration and test, and on-orbit performance phases. If NPOESS exhibits these characteristics, there will be a minimum gap of several months. If there is a launch failure—a 41 percent chance of occurring over the remaining DMSP launches, NPP and NPOESS there is a high likelihood of a gap measured in years (note: 41 percent based on the Success Probability used in the Aerospace GAP analysis). If there is a launch failure or an early spacecraft failure on NPP, C1 or C2, there will be a capability gap of three to five years. The NPOESS Preparatory Project (NPP)—once a key risk reduction activity for NPOESS—is now a critical asset to help mitigate these potential gaps in operational coverage.

The IRT recommended that steps be taken to proactively manage and mitigate the potential gap in continuity coverage. The EXCOM must clarify the program priorities and determine if continuity of coverage is a priority. If it is a priority, it should be clearly captured as a Level 1 requirement. Spare satellites should also be programmed for launch/early-orbit failure. Ideally, the spacecraft should be available and tested to a common point for either orbit, with payloads available for either orbit configuration. Move production and launch dates of C3 and C4 closer to C1 and C2. To bolster this fragile constellation, an integrated management approach is needed for the remaining DMSP, POES, METOP and NPOESS, including NPP. Modify the launch philosophy of all polar-orbiting environmental assets to launch on need (or launch on failure). Use the NPOESS Preparatory Project (NPP) data, originally intended for risk reduction, as an option to mitigate potential data gaps. This will help but will not compensate for lack of spares in case of launch or early spacecraft failures.

Information regarding the cost impacts of implementing these actions was not available when the IRT conducted its review.

Q2b. If the cost is budgeted to an 80/20, what should the program office cut in order to keep the program from undergoing another Nunn-McCurdy review?

A2b. If the program is budgeted to a cost confidence level of 80/20 this will provide approximately 25 percent management reserve. If this is done and the other IRT recommendations (e.g., placing priority on and incentivizing mission success) are implemented, the program has a very good chance of not undergoing another Nunn-McCurdy review.

Q3. One of the findings of your team was that the Integrated Program Office (IPO) does not have sufficient space acquisition expertise, and you cited the Goddard Space Flight Center at NASA and the Air Force Space and Missile Systems Center as good examples.

Q3a. Why can't the current IPO leverage the expertise of these institutions without actually being co-located?

A3a. Co-location is a secondary implementation issue. The key to the proper implementation of this IRT recommendation is the nature of the association of the program with the space acquisition center and the center to the agency/department responsible for the execution of the program. The arrangement should be one that holds,the center responsible for the successful acquisition of the program and the program responsible to the center for the same. However, while co-location is not essential, it certainly can make the benefits of a space acquisition center for the successful execution of the program easier to achieve. Not only can the program more effectively draw on the knowledgeable resources of the center but the status reporting from the program to the center and the management oversight of the program by seasoned senior space acquisition personnel can be more comprehensive, timely, and effective.

Q3b. Does the IPO consult with these organizations already?

A3b. Consultation or communications does not meet the requirement. Effective support and oversight of the program by a space acquisition center requires the center

to have responsibility for the success of the program and be able to employ its support and oversight expertise, resources, and processes to that end.

Q3c. Is there an overhead cost associated with NASA running NOAA programs?

A3c. Certainly. NASA, as the space system acquisition organization for NOAA, would bring the expertise and experience that NOAA does not have that is required for successful execution of these space system programs. NASA would be responsible to NOAA for the successful achievement of the space system acquisition objectives. To accomplish this, NASA would provide implementation as well as support and oversight resources for the programs.

Q4. You recommended keeping the current contractor team because they represent the highest probability of success at this point.

Q4a. How can the Federal Government continue with the current contractors without creating a "moral hazard" by seeming to allow poor performance?

A4a. Contractors should be held accountable for poor performance for which they are responsible. With respect to NPOESS, it could be argued that the incentive structure that placed priority on cost over mission success, the lack of sufficient funding which lead to the adoption of risk to resolve issues, the lack of space acquisition expertise, and the lack of effective oversight and decision-making have been principal causes for the poor results so far. Again from a mission success perspective, the continued use of the contractor team that is familiar with the program and the issues is more likely to achieve successful execution, assuming the other issues are resolved, than spending the time and money to change contractor teams and then bring the new team up to the level of knowledge the incumbent team already possesses.

Q5. Your team believes NPOESS will ultimately end up costing at least another $1 billion.

Q5a. Is this additional cost simply a result of budgeting to 80/20?

A5a. Yes, this is the result of funding the current program to the 80/20 cost confidence level.

Q5b. Where is this additional cost coming from?

A5b. The program is currently funded at less than the 50/50 level which is an insufficient level of funding. At this level of funding the program lacks sufficient management reserve which leads to the program using risk as its management reserve. The most probable cost is at the 80/20 level including reserves. Funding the program (by Fiscal Year and through Estimate to Complete) to 80/20 cost confidence would provide a management reserve of approximately 25 percent.

Q6. The NPOESS Preparatory Project (NPP) mission was meant to mitigate program risk and test sensors and ground systems prior to the full stand-up of NPOESS.

Q6a. I understand that we don't have many options now because of concerns about data-gaps, but what are the implications of "operationalizing" NPP?

A6a. Rather than utilizing NPP and its data in a one-time or short-term proof-of-concept or risk reduction approach, NPP data would be used over the duration of the mission to address selected operational polar data requirements. This might require additional processing and dissemination capabilities for the NPP data.

Q7. NOAA is responsible for program management and operations, while acquisition authority belongs to DOD.

Q7a. How has this affected the program?

A7a. A multi-agency organization is typically more complex and less efficient than an organization contained within one agency. NPOESS, a tri-agency program, is no different than many multi-agency organizations, and not surprisingly has a few built-in challenges:

1. The NPOESS budget is funded 50 percent by the DOD and 50 percent by the DOC. This split funding requires significantly increased effort and overhead in coordination. As an example, to receive funding, the NPOESS budget is reviewed by six Congressional committees. Once received, NPOESS must also use two financial systems to execute the budget.
2. Requirements are also managed through another multi-agency construct called the Senior Users Advisory Group (SUAG).

3. By the Memorandum of Agreement (Dec. 2008), the acquisition reporting runs from the NPOESS PEO to the EXCOM, of which the DOD EXCOM representative is also the Milestone Decision Authority (MDA).

The EXCOM is intended to be a decision body to provide streamlined direction to the PEO. As currently run, however, the EXCOM is not a decision-making body, and major program decisions can only be finalized (sometimes weeks) after the EXCOM. The current DOD EXCOM representative has not been delegated the proper authority from the Defense Acquisition Executive (who is also the NPOESS Milestone Decision Authority) and decisions require an additional meeting and coordination to be finalized. Additionally, the IRT has observed that many of the topics that are discussed at the EXCOM delve too deeply into program details and many critical top level issues are left unresolved.

For an EXCOM process to be effective, the EXCOM members must be the decision makers or have the appropriate authorities delegated to them. When they meet, the EXCOM should focus on strategic issues and decisions-such as on program priorities, risk to data continuity, or the inadequate budget - not on tactical day-to-day program development status.

Q7b. Is this relationship unique in the Federal Government?

A7b. Not aware of any other tri-agency arrangements similar to NPOESS. However, having one agency do acquisition for another is common. In the space systems arena, the National Reconnaissance Office has been acquiring space systems that were part of larger NSA and NGA systems and programs for decades.

Q8. Given all of the technical issues experienced on the VIIRS instrument, is it time to pursue an alternative instrument?

a. Is using the AVHRR the only option?

b. When would the EXCOM need to make this decision by?

c. What are the cost and performance implications of making this decision?

d. Are there any international implications to this option since we owe an AVHRR to the Europeans for the MetOp satellite?

A8. With a VIIRS Engineering Design Unit (EDU) already through environmental testing, the recent successful completion of vibration testing for VIIRS F1, and the planned completion of VIIRS F1 thermal vacuum testing scheduled for the summer of 2009, there is growing confidence that a VIIRS F1 can be delivered. With the maturity and progress already invested in VIIRS, it is unlikely that a "new" instrument start would be any more cost effective or bring the schedule in any closer. Another new instrument start will only siphon more money away from an already budget-strapped program.

In addition, there are no apparent, viable, near-term alternatives for VIIRS. The one remaining legacy sensor—the last Advanced Very High Resolution Radiometer (AVHRR)—is slated for EUMETSAT via an international agreement and will be used for METOP that supports the mid-morning orbit. Re-opening the production lines for legacy sensors such as the Operational Linescan System (OLS) and the AVHRR would not save much, if any, money, nor would they be delivered any earlier or at lower risk. These legacy sensors would also constitute a significant step back in performance compared to VIIRS. In fact, while perhaps an OLS-like performance would be suitable for some DOD requirements, the AVHRR does not meet the requirements for NOAA and NASA. Other options, such as starting an alternative VIIRS concept will also contain significant cost and schedule impacts.

However, while not optimal, the IPO should continue to protect AVHRR as an option until VIIRS completes Thermal Vacuum testing. Since there are only minimal costs to develop and submit the paperwork to potentially acquire an AVHRR (e.g., a Justification for Other than Full and Open Competition and/or a Justification and Approval), the IRT recommends the continuation of this no/low-cost effort until the VIIRS thermal vacuum data is available in the summer of 2009. If the data is favorable, this AVHRR option can be stopped.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mary M. Glackin, Deputy Under Secretary for Oceans and Atmosphere, National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce

Questions submitted by Representative Paul C. Broun

Q1. We understand that there are several alternative cost estimates under consideration.

Q1a. What are they?

A1a. The National Polar-orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office (IPO) submitted a notification letter to the Defense Acquisition Executive indicating that the schedule of the current Acquisition Program Baseline (APB) was unachievable. As part of that notification process, the IPO is required by Department of Defense (DOD) acquisition regulations to submit a revised APB with an updated schedule and cost estimate. Prior to submitting the revised APB for DOD approval, the NPOESS Executive Committee (EXCOM) requires an independent assessment of the schedule and cost estimate.

There will be only one schedule and cost estimate submitted for consideration; however, it will be subjected to two different independent reviews. One review is being conducted by the Office of the Secretary of Defense Cost Analysis Improvement Group (CAIG), using DOD methodology. The other review is being conducted by NASA and NOAA, consistent with past assessment practices for collaborative satellite procurements. Both of the independent assessments are proceeding and a revised program cost and schedule estimate will be ready for review by the EXCOM in fall 2009.

Q1b. Why is it taking so long to figure out what this program will cost to complete?

A1b. The NPOESS Program has many variables that make cost estimating challenging. It is somewhat premature to determine whether the technical difficulties with the two primary instrument development programs—the Visible/Infrared Imager/Radiometer Suite (VIIRS) and Cross-track Infrared Sounder (CrIS)—have been overcome and whether the positive impact of "lessons learned" in the development of the NPOESS Preparatory Project can be incorporated into the next instruments to be developed for the first and second NPOESS satellites (C1 and C2, respectively). The EXCOM has directed a special detailed assessment called a "deep dive" in order to develop shared agreement on the magnitude of the program's challenges.

Once the technical challenges are fully identified, a revised program schedule must be developed before the revised program cost estimates are completed. As the agencies analyze schedule and cost, they must reconcile the differences in their standards and approaches, adding to the time required to complete an accurate cost estimate.

DOD and NOAA have fundamentally different approaches to cost estimating, which are difficult to reconcile. The White House Task Force led by the Office of Science and Technology Policy (OSTP) has a working group focused on determining the best cost methodology for this program.

Q1c. Is it true that going with the most conservative estimate, using 80 percent confidence level, you would trigger another Nunn-McCurdy breach?

A1c. NOAA's current estimate for an 80 percent cost confidence NPOESS profile for FY 2012 and beyond would result in a cost growth of 15.6 percent above the 2006 Nunn-McCurdy certified program budget. A 15.6 percent cost growth would require a notification to Congress, but not a complete re-certification similar to the one performed in 2006. A recertification is required if cost growth exceeds 25 percent.

Q2. In your opinion, why has the Executive Committee (EXCOM) failed to effectively oversee the NPOESS Program?

A2. The answer is multifaceted. First, tri-agency management of any program is inherently difficult. Second, the EXCOM should be utilized for strategic direction related to the high-level needs and requirements of the program and establishment of key budget baselines, not for tactical day-to-day program oversight. The current structure requires these very high level managers to provide both, which results in both functions being weakened. It is also essential for the EXCOM to have critical strategic issues presented at an appropriate level by program staff to facilitate decision-making. Finally, NOAA, DOD, and NASA agree with and have taken action on

the Government Accountability Office (GAO) finding that the EXCOM lacks the membership and leadership needed to effectively and efficiently oversee and direct the program. For the past three months, the DOD committee member with acquisition authority has been attending Executive Committee meetings. NOAA also agrees with GAO that the EXCOM failed to track action items to closure and that many of the EXCOM decisions did not achieve desired outcomes. The White House Task Force that is examining the NPOESS program is considering these types of issues, with the goal of ensuring the most effective possible management structure as we move forward.

Q3. Because of the continued delays to the NPOESS Program, we have reached the point where weather and climate data continuity could be at risk if NPP or NPOESS fail on launch or orbit. What is NOAA prepared to do to ensure weather and climate data continuity?

A3. NOAA's Polar-orbiting Operational Environmental Satellites (POES), both the operational on-orbit and recently launched satellites, are performing well and there is no immediate risk to data continuity for NOAA's weather and climate missions. NOAA is concerned about the fragility of the constellation and the risk to data continuity once the last operational NOAA POES and NASA Earth Observing Satellites (EOS) missions reach the end of their expected life time by 2013.

For the afternoon orbit, which is most at-risk, NOAA plans to maximize use of existing NOAA POES satellite assets, use NPP data operationally, leverage data from other NASA and DOD environmental satellites, and forge partnerships with international space agencies to acquire data needed to support NOAA's operational weather and climate missions.

In the mid-morning orbit, NOAA will continue processing and delivering environmental products for its customers from the U.S. and European instruments on board the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) MetOp series of satellites through the next decade.

Q4. How does NOAA plan to ensure that all three agencies individual priorities are weighed and needs are met?

A4. The NPOESS Executive Committee (EXCOM) was structured to be the key decision-maker on the strategic direction of the program. Though both the Government Accountability Office (GAO) and NPOESS Independent Review Team (IRT) have noted the EXCOM has not been focused enough on strategic issues, NOAA, together with DOD and NASA, and more broadly, the White House Task Force, are working to ensure the program gets restructured in a way that ensures the requirements of each agency's mission will be met.

Coordinating with the EXCOM development and sustainment of the program's key data needs and priorities is the NPOESS Tri-agency Joint Agency Requirements Council, along with its subordinate Senior User Advisory Group and Joint Agency Requirements Group. These tri-agency entities are responsible for developing and sustaining the Integrated Operational Requirements Document (IORD), which details the data and information priorities for the program. NOAA is engaged in these working groups to ensure that all NPOESS requirements are accounted for and traceable to each agency and its customers. The White House Task Force led by OSTP is examining NPOESS in its requirements working group.

Q5. The CERES instrument which measures Earth's radiance budget is being put back on NPP and NPOESS.

Q5a. Does this instrument need a water vapor sensor on orbit to help calibrate it?

A5a. No. CERES does not need a water vapor sensor on-orbit for calibration purposes. The CERES instrument is calibrated using water vapor data from an existing meteorological model which uses data from multiple sources (sounders, microwave radiances, etc.). Use of this model eliminates the need to use an additional satellite instrument for calibration.

Q5b. MODIS has a water vapor sensor, but VIIRS does not. Are we adding an instrument back to NPP and NPOESS that perhaps may not work correctly when the MODIS mission ends?

A5b. No. Water vapor data is being provided by an existing meteorological model which uses data from multiple sources (sounders, microwave radiances, etc.) to meet mission requirements, so it is not a requirement for VIIRS.

Q5c. Is this truly an issue, what is NOAA doing to mitigate this risk?

A5c. This is not an issue for NOAA with the use of the existing meteorological model.

Q6. One of the findings of your team was that the Integrated Program Office (IPO) does not have sufficient space acquisition expertise, and you cited the Goddard Space Flight Center at NASA and the Air Force Space and Missile Systems Center as good examples.

Q6a. Why can't the current IPO leverage the expertise of these institutions without actually being co-located?

A6a. It may be possible to better leverage the expertise of the space acquisition centers without being co-located. A White House Task Force led by the Office of Science and Technology Policy (OSTP), with the participation of NOAA, NASA, and DOD, is examining ways to strengthen program management, including strengthening the program's access to the expertise at the space acquisition centers.

The IPO currently takes advantage of selected technical resources from NASA Goddard Space Flight Center (GSFC) and the Air Force Space and Missile Systems Center (SMC). However, having greater access to the expertise and personnel at a space acquisition center like GSFC or SMC could improve day-to-day management and oversight by providing a more complete infrastructure of technical and program staff, policies and procedures, and checks and balances at all levels of management. For example, a space acquisition center has access to an extensive infrastructure of engineering and mission assurance experts who can be available on demand to support timely mission support. In addition to timely technical support, this infrastructure provides expert oversight of technical and management activities to ensure that staff is trained and providing the highest level of performance.

Acquisition centers have a system of independent reviews they perform on all programs throughout the course of their acquisition that ensure they are remaining on track technically. Subjecting NPOESS to such a system could be optimal for the program given its ongoing technical challenges, especially on sensors, which have not been noticed early enough in many cases by the program's current prime contractor and tri-agency management structure. Such a set of customary independent reviews would provide higher-level management, especially the EXCOM, an ongoing stream of management information allowing them to focus on the results and actions required, rather than needing to plan and repeatedly call for future independent tests.

Q6b. Does the IPO consult with these organizations already?

A6b. The IPO consults with these agencies today as referenced in response 6a above.

Q6c. Is there an overhead cost associated with NASA running NOAA programs?

A6c. If the decision is made by the Executive Office of the President that NASA would be the acquisition authority for the program, NASA would not run the NPOESS program, but could act as NOAA's or DOD's acquisition agent. There would be associated overhead costs for NASA support as there currently is for DOD acquisition support. NASA's overhead costs associated with individual programs are clearly identified and tracked in the cost accounts for the program. This practice is called "full cost accounting" and it provides transparency for all costs associated with a program.

Q7. The NPOESS Preparatory Project (NPP) mission was meant to mitigate program risk and test sensors and ground systems prior to the full stand-up of NPOESS.

Q7a. I understand that we don't have many options now because of concerns about data-gaps, but what are the implications of "operationalizing" NPP?

A7a. In order to use the NPOESS Preparatory Project (NPP) data operationally, NOAA needs to accelerate the installation of an NPOESS Data Exploitation ground system, which includes critical hardware improvements that will allow the NPP data to be used for operational weather forecasting and climate monitoring. No NPP spacecraft design changes are required to implement this.

The benefit of operationalizing NPP will be an expansion in the number of operational environmental products (from 19 to 54) since the instruments on NPP are capable of producing data that meet or exceed the data provided by NOAA–19, our current operational afternoon polar-orbiting satellite. The availability of these products will provide additional data that will benefit NOAA's weather forecasts and warnings as well as its climate assessments.

Q8. NOAA is responsible for program management and operation, while acquisition authority belongs to DOD.

Q8a. How has this affected the program?

A8a. The tri-agency management structure adds complexity to an already complex space system acquisition. Since guidance and direction to the program must be coordinated between senior leaders within each agency, program management is inherently more cumbersome and protracted in comparison to major programs being managed within a single agency.

The White House Task Force led by OSTP is looking at ways to improve the program management.

Q8b. Is this relationship unique in the federal government?

A8b. NOAA and NASA have a history of collaboration in the development of satellite systems since the 1960s. While tri-agency programs are not unique, NOAA is not aware of a tri-agency management structure involving a program as large or as complex as NPOESS.

Q9. Given all of the technical issues experienced on the VIIRS instrument, is it time to pursue an alternative instrument?

A9. VIIRS has satisfactorily progressed through ambient, electromagnetic interference vibration testing. VIIRS has completed the thermal vacuum testing process, though continued analysis of the results is ongoing. Given that substantial risks also exist if a new option must be developed in place of VIIRS, both the tri-agency technical team and independent reviews recommended staying the course with VIIRS.

The EXCOM did, however, direct the IPO to develop a plan to procure an additional Advanced Very High Resolution Radiometer (AVHRR) instrument as a contingency option should VIIRS experience additional problems that would drive cost and schedule to even more unacceptable levels. Given that the instrument has progressed through thermal vacuum testing, it is less likely an AVHRR will need to be procured.

Q9a. Is using an AVHRR the only option?

A9a. :After studying several options, a tri-agency technical team concluded that planning for an additional AVHRR in case it was needed was the best option. Given the status of current testing on VIIRS, it is less likely an AVHRR will need to be procured.

Q9b. When would the EXCOM need to make this decision by?

A9b. A decision to procure an additional AVHRR instrument will be made in fall 2009 following the completion of VIIRS thermal vacuum testing and analysis of its results.

Q9c. What are the cost and performance implications of making this decision?

A9c. The cost of procuring a single AVHRR instrument compatible with the NPOESS C1 spacecraft is estimated to be $60 million. However, AVHRR performance falls short of VIIRS capabilities in important areas including cloud detection, aerosol monitoring, as well as land, ice and snow products that are routinely used in numerical weather prediction models. With only AVHRR, rather than a more advanced imaging sensor, weather models could not be improved as rapidly as planned to enhance environmental predictions.

Q9d. Are there any international implications to this option since we owe an AVHRR to the Europeans for the MetOp satellite?

A9d. No. The procurement plan for an additional AVHRR instrument allows for NOAA to meet its delivery commitments to EUMETSAT.

Appendix 2:

Additional Material for the Record

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United States Government Accountability Office

GAO

Report to Congressional Requesters

June 2009

POLAR-ORBITING ENVIRONMENTAL SATELLITES

With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making

GAO

Accountability * Integrity * Reliability

GAO-09-564

GAO
Accountability*Integrity*Reliability
Highlights

Highlights of GAO-09-564, a report to congressional requesters

June 2009

POLAR-ORBITING ENVIRONMENTAL SATELLITES

With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making

Why GAO Did This Study

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a tri-agency acquisition—managed by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA)—that has experienced escalating costs, schedule delays, and technical difficulties. As the often-delayed launch of its demonstration satellite draws closer, these problems continue.

GAO was asked to (1) identify the status and risks of key program components, (2) assess the NPOESS Executive Committee's ability to fulfill its responsibilities, and (3) evaluate efforts to identify an alternative system integrator for later NPOESS satellites. To do so, GAO analyzed program and contractor data, attended program reviews, and interviewed agency officials.

What GAO Recommends

GAO is making recommendations to the Secretaries of Commerce and Defense and to the Administrator of NASA to improve the effectiveness and efficiency of the Executive Committee. In commenting on a draft of this report, NASA and Commerce officials concurred with the recommendations; DOD concurred with one and partially concurred with the other recommendations.

View GAO-09-564 or key components. For more information, contact David A. Powner at (202) 512-9286 or pownerd@gao.gov.

What GAO Found

While selected components of the NPOESS program have made progress over the past year, the program is once again over budget and behind schedule. In terms of progress, three of the five instruments slated for a demonstration satellite (called the NPOESS Preparatory Project—NPP) have been delivered and integrated on the spacecraft; the ground-based satellite data processing system has been installed and tested at both of the locations that are to receive NPP data; and the satellites' command, control, and communications system has passed acceptance testing. However, the program's approved cost and schedule baseline are not achievable, and problems with two critical sensors continue to drive the program's cost and schedule. Costs could grow by $1 billion over the current $13.95 billion estimate, and the schedules for NPP and the first two NPOESS satellites are expected to be delayed by 7, 14, and 5 months, respectively. These delays increase the risk of a gap in satellite continuity. An independent review team established to assess key program risks recently reported that the constellation of satellites is extremely fragile, and that there could be a 3 to 5 year gap in satellite coverage if NPP, NPOESS, or other DOD satellites fail on launch.

The NPOESS Executive Committee responsible for overseeing the program has made improvements over the last several years, but still has not effectively fulfilled its responsibilities. Responding to past concerns expressed by GAO and the Department of Commerce's Inspector General, the Committee now meets on a regular basis, and has sought and reacted to advice from external advisors to mitigate specific risks. However, the Committee lacks the membership and leadership needed to effectively and efficiently oversee and direct the program. Specifically, the DOD Committee member with acquisition authority does not attend Executive Committee meetings—and sometimes contradicts the Committee's decisions, the Committee does not track its action items to closure, and many of the Committee's decisions do not achieve desired outcomes. Program officials and external independent reviewers explained that it is extremely difficult for the Committee to navigate three agencies' competing requirements and priorities. Until these shortfalls are addressed, the Committee will remain ineffective.

The NPOESS program has conducted two successive studies of alternatives to using the existing system integrator for the last two NPOESS satellites, but neither identified a viable alternative to the current contractor. Both studies assessed a variety of alternatives, including re-competing the entire prime contract, obtaining an independent system integrator while having the existing prime contractor continue to develop space and ground components, and having the government take over responsibility for the system's integration. The first study identified strengths and weaknesses and the second study identified high-level costs and benefits. Neither study identified an alternative that is viable. Program officials plan to conduct a final study prior to the June 2010 decision on whether to proceed with the existing prime contractor.

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Abbreviations

CrIS	Cross-track Infrared Sounder
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
EDR	Environmental Data Record
MetOp	Meteorological Operational (satellite)
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NPP	NPOESS Preparatory Project
POES	Polar-orbiting Operational Environmental Satellites
VIIRS	Visible/infrared imager radiometer suite

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GAO

Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

June 17, 2009

Congressional Requesters

The planned National Polar-orbiting Operational Environmental Satellite System (NPOESS) program is expected to be a state-of-the-art, environment-monitoring satellite system that will replace two existing polar-orbiting environmental satellite systems. Polar-orbiting satellites provide data and imagery that are used by weather forecasters, climatologists, and the military to map and monitor changes in weather, climate, the oceans, and the environment. The NPOESS program is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting (including severe weather events such as hurricanes) and global climate monitoring through the year 2026.

Three agencies share responsibility for the NPOESS acquisition: the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), the Department of Defense (DOD)/United States Air Force, and the National Aeronautics and Space Administration (NASA). These agencies established a tri-agency office to manage the NPOESS program. The program is overseen by an Executive Committee made up of senior executives from each of the agencies. Since its inception, NPOESS costs have doubled, launch schedules have been repeatedly delayed, and significant functionality was cut from the program. Even after a major restructuring, the program is still encountering technical issues, schedule delays, and the likelihood of further cost increases. More importantly, delays in launching the satellites have put the program's mission at risk.

This report responds to your request that we (1) identify the status and risks of key program components, (2) assess the NPOESS Executive Committee's ability to fulfill its responsibilities, and (3) evaluate efforts to identify an alternative system integrator for later NPOESS satellites. To identify the status and risks to the program, we reviewed program documentation including status briefings, monthly program management documents, and contractor-provided earned value data. We compared the contractor's earned value management data to cost and schedule estimates and evaluated reasons for variances in the contractor's performance. To assess the NPOESS Executive Committee's ability to fulfill its responsibilities, we reviewed Executive Committee documentation, including meeting minutes. We compared the Committee's actions to its documented responsibilities, as well as to best practices in

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investment management and oversight.[1] To evaluate the efforts to develop an alternative system integrator for NPOESS, we compared the requirement for a study of alternatives to the results of two successive studies. We also interviewed relevant agency officials from NOAA, NASA, and DOD. In addition, this report builds on work we have done on environmental satellites over the last several years.[2]

We conducted our work at the NPOESS Integrated Program Office headquarters and at NOAA, NASA, and DOD facilities in the Washington, D.C., metropolitan area. In addition, we conducted work at contractors' facilities in the Los Angeles, California, area because of the importance of these sites to development of the sensors for the program and to the satellites' integration. We conducted this performance audit from October 2008 to June 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide 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. Additional details on our objectives, scope, and methodology are provided in appendix I.

[1]GAO, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity*, GAO-04-394G (Washington, D.C.: March 2004).

[2]GAO, *Environmental Satellites: Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity*, GAO-08-899T (Washington, D.C.: June 19, 2008); *Environmental Satellites: Polar-orbiting Satellite Acquisition Faces Delays; Decisions Needed on Whether and How to Ensure Climate Data Continuity*, GAO-08-518 (Washington, D.C.: May 16, 2008); *Environmental Satellite Acquisitions: Progress and Challenges*; GAO-07-1099T (Washington, D.C.: July 11, 2007); *Polar-orbiting Operational Environmental Satellites: Restructuring Is Under Way, but Challenges and Risks Remain*, GAO-07-910T (Washington, D.C.: June 7, 2007); *Polar-orbiting Operatimal Environmental Satellites: Restructuring Is Under Way, but Technical Challenges and Risks Remain*, GAO-07-498 (Washington, D.C.: Apr. 27, 2007); *Polar-orbiting Operational Environmental Satellites: Cost Increases Trigger Review and Place Program's Direction on Hold*, GAO-06-573T (Washington, D.C.: Mar. 30, 2006); *Polar-orbiting Operational Environmental Satellites: Technical Problems, Cost Increases, and Schedule Delays Trigger Need for Difficult Trade-off Decisions*, GAO-06-249T (Washington, D.C.: Nov. 16, 2005); *Polar-orbiting Environmental Satellites: Information on Program Cost and Schedule Changes*, GAO-04-1054 (Washington, D.C.: Sept. 30, 2004); *Polar-orbiting Environmental Satellites: Project Risks Could Affect Weather Data Needed by Civilian and Military Users*, GAO-03-987T (Washington, D.C.: July 15, 2003); and *Polar-orbiting Environmental Satellites: Status, Plans, and Future Data Management Challenges*, GAO-02-684T (Washington, D.C.: July 24, 2002).

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Background

Since the 1960s, the United States has operated two separate operational polar-orbiting meteorological satellite systems: the Polar-orbiting Operational Environmental Satellite (POES) series, which is managed by NOAA, and the Defense Meteorological Satellite Program (DMSP), which is managed by the Air Force. These satellites obtain environmental data that are processed to provide graphical weather images and specialized weather products. These satellite data are also the predominant input to numerical weather prediction models, which are a primary tool for forecasting weather 3 or more days in advance—including forecasting the path and intensity of hurricanes. The weather products and models are used to predict the potential impact of severe weather so that communities and emergency managers can help prevent and mitigate its effects. Polar satellites also provide data used to monitor environmental phenomena, such as ozone depletion and drought conditions, as well as data sets that are used by researchers for a variety of studies such as climate monitoring.

Unlike geostationary satellites, which maintain a fixed position relative to the earth, polar-orbiting satellites constantly circle the earth in an almost north-south orbit, providing global coverage of conditions that affect the weather and climate. Each satellite makes about 14 orbits a day. As the earth rotates beneath it, each satellite views the entire earth's surface twice a day. Currently, there is one operational POES satellite and two operational DMSP satellites that are positioned so that they can observe the earth in early morning, midmorning, and early afternoon polar orbits. In addition, the government is also relying on a European satellite, called the Meteorological Operational (MetOp) satellite, in the midmorning orbit.[8] Together, they ensure that, for any region of the earth, the data provided to users are generally no more than 6 hours old. Figure 1 illustrates the current operational polar satellite configuration. Besides the four operational satellites, six older satellites are in orbit that still collect some data and are available to provide limited backup to the operational satellites should they degrade or fail. The last POES satellite was launched in February 2009 and declared operational in early June 2009. The Air Force plans to continue to launch its three remaining DMSP satellites every few years, with the final launch planned for 2014.

[8]The European MetOp program is a series of three polar-orbiting satellites dedicated to operational meteorology. MetOp satellites are planned to be launched sequentially over 14 years. The first of these satellites was launched in 2006 and is currently operational.

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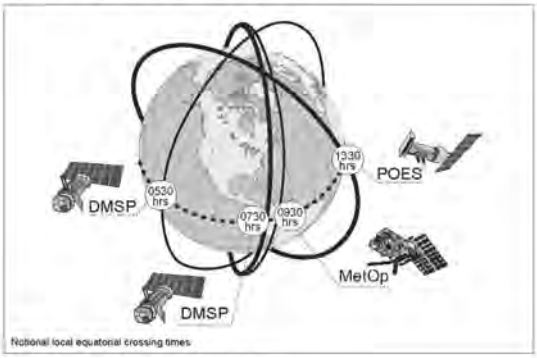
Figure 1: Configuration of Operational Polar Satellites



Source: GAO analysis of NPOESS program office Sector Report (JCSA).

Polar Satellite Data and Products

Polar satellites gather a broad range of data that are transformed into a variety of products. Satellite sensors observe different bands of radiation wavelengths, called channels, which are used for remotely determining information about the earth's atmosphere, land surface, oceans, and the space environment. When first received, satellite data are considered raw data. To make them usable, the processing centers format the data so that they are time-sequenced and include earth location and calibration information. After formatting, these data are called raw data records. The centers further process these raw data records into channel-specific data sets, called sensor data records and temperature data records. These data records are then used to derive weather and climate products called environmental data records (EDR). EDRs include a wide range of atmospheric products detailing cloud coverage, temperature, humidity, and ozone distribution; land surface products showing snow cover, vegetation, and land use; ocean products depicting sea surface temperatures, sea ice, and wave height; and characterizations of the space environment. Combinations of these data records (raw, sensor, temperature, and environmental data records) are also used to derive more sophisticated products, including outputs from numerical weather

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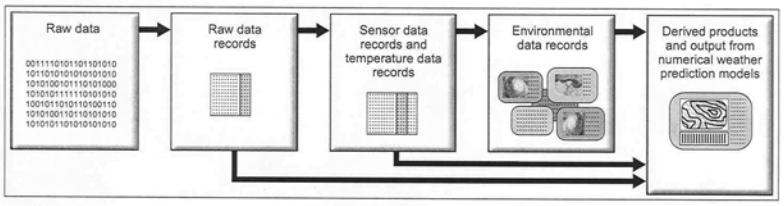
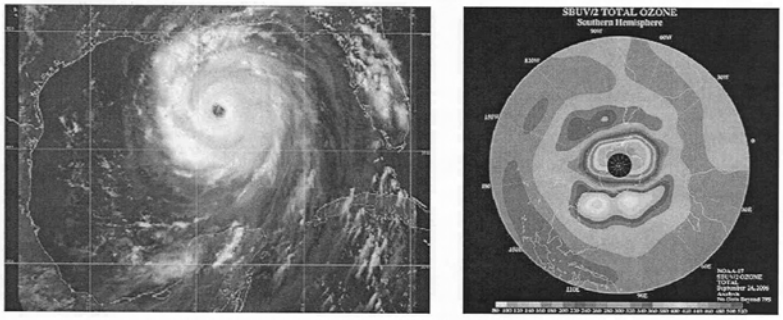
models and assessments of climate trends. Figure 2 is a simplified depiction of the various stages of satellite data processing, and figure 3 depicts examples of two different weather products.

Figure 2: Stages of Satellite Data Processing



Source: GAO analysis of NOAA information.

Figure 3: Examples of Weather Products



Source: NOAA's National Environmental Satellite Data and Information Service.

Note: The figure on the left is a POES Image of Hurricane Katrina in 2005, and the figure on the right is an analysis of ozone concentration produced from POES satellite data.

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NPOESS Overview

With the expectation that combining the POES and DMSP programs would reduce duplication and result in sizable cost savings, a May 1994 Presidential Decision Directive required NOAA and DOD to converge the two satellite programs into a single satellite program capable of satisfying both civilian and military requirements.[4] The converged program, NPOESS, is considered critical to the United States' ability to maintain the continuity of data required for weather forecasting and global climate monitoring. To manage this program, DOD, NOAA, and NASA formed the tri-agency Integrated Program Office.

Within the program office, each agency has the lead on certain activities: NOAA has overall program management responsibility for the converged system and for satellite operations; the Air Force has the lead on the acquisition; and NASA has primary responsibility for facilitating the development and incorporation of new technologies into the converged system. NOAA and DOD share the cost of funding NPOESS, while NASA funds specific technology projects and studies. In addition, an Executive Committee—made up of the administrators of NOAA and NASA and the Under Secretary of Defense for Acquisition, Technology, and Logistics—is responsible for providing policy guidance, ensuring agency support and funding, and exercising oversight authority.[5] Figure 4 depicts the organizations that make up the NPOESS program and lists their responsibilities.

[4]Presidential Decision Directive NSTC-2, May 5, 1994.

[5]The Under Secretary of Defense for Acquisition, Technology, and Logistics delegated the responsibility for attending the meetings—but not the authority to make acquisition decisions—to the Under Secretary of the Air Force.

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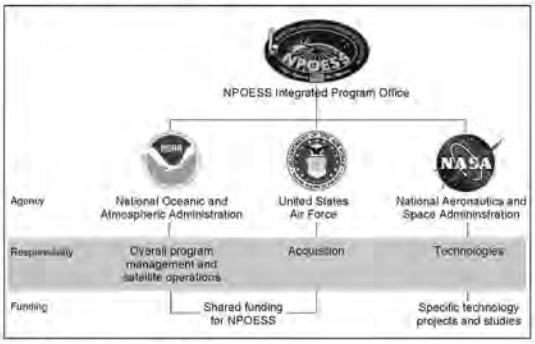
Figure 4: NPOESS Program Roles and Responsibilities



Source: GAO analysis of NPOESS program office data

Acquisition Strategy

NPOESS is a major system acquisition that was originally estimated to cost about $6.5 billion over the 24-year life of the program from its inception in 1995 through 2018. The program is to provide satellite development, satellite launch and operation, and ground-based satellite data processing. These deliverables are grouped into four main categories: (1) the space segment, which includes the satellites and sensors; (2) the integrated data processing segment, which is the system for transforming raw data into EDRs and is to be located at the four processing centers; (3) the command, control, and communications segment, which includes the equipment and services needed to support satellite operations; and (4) the launch segment, which includes the launch vehicle services.

When the NPOESS engineering, manufacturing, and development contract was awarded in August 2002, the cost estimate was adjusted to $7 billion. Acquisition plans called for the procurement and launch of six satellites over the life of the program, as well as the integration of 13 instruments—consisting of 10 environmental sensors and 3 subsystems. Together, the sensors were to receive and transmit data on atmospheric, cloud cover, environmental, climatic, oceanographic, and solar-geophysical observations. The subsystems were to support nonenvironmental search

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and rescue efforts, sensor survivability, and environmental data collection activities. The program office considered four of the sensors to be critical because they provide data for key weather products; these sensors are in bold in table 1, which describes each of the expected NPOESS instruments.

Table 1: Expected NPOESS Instruments as of August 31, 2004 (critical sensors are in bold)

Instrument	Description
Advanced technology microwave sounder	Measures microwave energy released and scattered by the atmosphere and is to be used with infrared sounding data from the cross-track infrared sounder to produce daily global atmospheric temperature, humidity, and pressure profiles.
Aerosol polarimetry sensor	Retrieves specific measurements of clouds and aerosols (liquid droplets or solid particles suspended in the atmosphere, such as sea spray, smog, and smoke).
Conical-scanned microwave imager/sounder	Collects microwave images and data needed to measure rain rate, ocean surface wind speed and direction, amount of water in the clouds, and soil moisture, as well as temperature and humidity at different atmospheric levels.
Cross-track infrared sounder (CrIS)	Collects measurements of the earth's radiation to determine the vertical distribution of temperature, moisture, and pressure in the atmosphere.
Data collection system	Collects environmental data from platforms around the world and delivers them to users worldwide.
Earth radiation budget sensor	Measures solar short-wave radiation and long-wave radiation released by the earth back into space on a worldwide scale to enhance long-term climate studies.
Ozone mapper/profiler suite	Collects data needed to measure the amount and distribution of ozone in the earth's atmosphere. Consists of two components (limb and nadir) which can be provided separately.
Radar altimeter	Measures variances in sea surface height/topography and ocean surface roughness, which are used to determine sea surface height, significant wave height, and ocean surface wind speed and to provide critical inputs to ocean forecasting and climate prediction models.
Search and rescue satellite aided tracking system	Detects and locates aviators, mariners, and land-based users in distress.
Space environmental sensor suite	Collects data to identify, reduce, and predict the effects of space weather on technological systems, including satellites and radio links.
Survivability sensor	Monitors for attacks on the satellite and notifies other instruments in case of an attack.
Total solar irradiance sensor	Monitors and captures total and spectral solar irradiance data.
Visible/infrared imager radiometer suite (VIIRS)	Collects images and radiometric data used to provide information on the earth's clouds, atmosphere, ocean, and land surfaces.

Source: GAO analysis of NPOESS program office data.

In addition, a demonstration satellite, called the NPOESS Preparatory Project (NPP), was planned to be launched several years before the first NPOESS satellite in order to reduce the risk associated with launching new sensor technologies and to ensure continuity of climate data with NASA's Earth Observing System satellites. NPP was to host three of the four critical NPOESS sensors, as well as one other sensor and to provide

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the program office and the processing centers an early opportunity to work with the sensors, ground control, and data processing systems.[6] When the NPOESS development contract was awarded, the schedule for launching the satellites was driven by a requirement that the NPOESS satellites be available to back up the final POES and DMSP satellites should anything go wrong during the planned launches of these satellites.[7] Early program milestones included (1) launching NPP by May 2006, (2) having the first NPOESS satellite available to back up the final POES satellite launch then planned for March 2008, and (3) having the second NPOESS satellite available to back up the final DMSP satellite launch then planned for October 2009. If the NPOESS satellites were not needed to back up the final predecessor satellites, their anticipated launch dates would have been April 2009 and June 2011, respectively.

Cost Increases, Schedule Delays, and Technical Problems Led to a Decision to Restructure the NPOESS Program

Over several years, we reported that NPOESS had experienced continued cost increases, schedule delays, and serious technical problems.[8] By November 2005, we estimated that the cost of the program had grown from $7 billion to over $10 billion. In addition, the program was experiencing major technical problems with the VIIRS sensor and expected to delay the launch date of the first satellite by almost 2 years. These issues ultimately required difficult decisions to be made about the program's direction and capabilities.

The Nunn-McCurdy law requires DOD to take specific actions when a major defense acquisition program growth exceeds certain cost thresholds.[9] Key provisions of the law require the Secretary of Defense to notify Congress when a major defense acquisition is expected to overrun its current baseline by 15 percent or more and to certify the program to Congress when it is expected to overrun its current baseline by 25 percent

[6]The four sensors are the Visible/infrared imager radiometer suite, the Cross-track infrared sounder, the Advanced technology microwave sounder, and the Ozone mapper/profiler suite. NPP will now also host the Clouds' and earth's radiant energy system sensor.

[7]In general, satellite experts anticipate that roughly 1 out of every 10 satellites will fail either during launch or during early operations after launch.

[8]GAO-06-573T, GAO-06-249T, GAO-04-1054, GAO-03-987T, and GAO-02-684T.

[9]10 U.S.C. § 2433 is commonly referred to as Nunn-McCurdy.

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or more.[10] In November 2005, NPOESS exceeded the 25 percent threshold, and DOD was required to certify the program. Certifying a program entails providing a determination that (1) the program is essential to national security, (2) there are no alternatives to the program that will provide equal or greater military capability at less cost, (3) the new estimates of the program's cost are reasonable, and (4) the management structure for the program is adequate to manage and control costs. DOD established tri-agency teams—made up of DOD, NOAA, and NASA experts—to work on each of the four elements of the certification process.

In June 2006, DOD (with the agreement of both of its partner agencies) certified a restructured NPOESS program, estimated to cost $12.5 billion through 2026—an increase of $4 billion more than the prior life cycle cost estimate.[11] This restructuring decision delayed the launch of NPP and the first 2 satellites by roughly 3 to 5 years—a deviation from NOAA's requirement to have NPOESS satellites available to back up the final POES and DMSP satellites should anything go wrong during those launches. The restructured program also reduced the number of satellites to be produced by relying on European satellites for the midmorning orbit and planning to use NPOESS satellites in the early morning and afternoon orbits. In addition, in order to reduce program complexity, the Nunn-McCurdy certification decision decreased the number of NPOESS sensors from 13 to 9 and reduced the functionality of 4 sensors.

In addition, a new executive position—called the Program Executive Officer—was established to oversee the NPOESS program office and to report directly to the Executive Committee. The Program Executive Officer obtains weekly and monthly reports on the program's cost, schedule, performance, and risks from the System Program Director, and in turn, provides monthly and quarterly updates to the Executive Committee. Table 2 summarizes the major program changes made by the Nunn-McCurdy certification decision, and figure 5 denotes the

[10]10 U.S.C. § 2433 has recently been amended by Pub. L. No. 109-163, § 802 (Jan. 6, 2006) and Pub. L. No. 109-364, § 213 (a) (Oct. 17, 2006). The law now also includes cost growth thresholds from the program's original baseline.

[11]DOD estimated that the acquisition portion of the certified program would cost $11.5 billion. The acquisition portion includes satellite development, production, and launch, but not operations and support costs after launch. When combined with an estimated $1 billion for operations and support after launch, this brings the program life cycle cost to $12.5 billion.

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configuration of the planned polar-operational satellite program in the future.

Table 2: Major Changes to the NPOESS Program by the Nunn-McCurdy Certification Decision

Key area	Program before the Nunn-McCurdy decision	Program after the Nunn-McCurdy decision (as of June 2006)
Life cycle range	1995—2020	1995—2026
Estimated life cycle cost	$8.4 billion	$12.5 billion
Launch schedule	NPP by October 2008	NPP by January 2010
	First NPOESS (C1) by November 2009	C1 by January 2013
	Second NPOESS (C2) by June 2011	C2 by January 2016
Management structure	System Program Director reports to a tri-agency steering committee and the tri-agency Executive Committee	System Program Director is responsible for day-to-day program management and reports to the Program Executive Officer
	Independent program reviews noted insufficient system engineering and cost analysis staff	Program Executive Officer oversees program and reports to the tri-agency Executive Committee
Number of satellites	6 (in addition to NPP)	4 (in addition to NPP)
Number of orbits	3 (early morning, midmorning, and afternoon)	2 (early morning and afternoon; will rely on European satellites for midmorning orbit data)
Number and complement of instruments	13 instruments (10 sensors and 3 subsystems)	9 instruments (7 sensors and 2 subsystems); 4 of the sensors are to provide fewer capabilities
Number of EDRs	55	39 (6 are to be degraded products)

Source: GAO, analysis of NPOESS program office data

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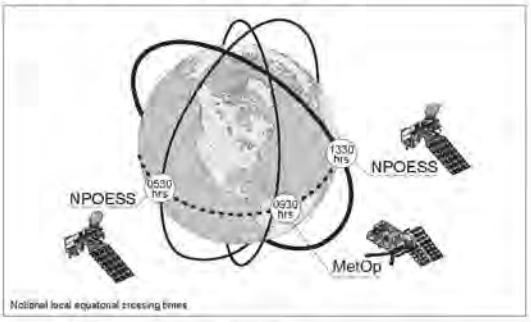
Figure 5: Nunn-McCurdy Certified Satellite Constellation



While the Nunn-McCurdy certification decision decreased the number of NPOESS sensors and reduced the functionality of others, it allowed for the reintegration of the canceled sensors if other parties choose to fund them. Table 3 describes the changes to NPOESS instruments.

Table 3: Changes to NPOESS Instruments, as of June 2006

Instrument	Status of instrument after Nunn-McCurdy decision
Advanced technology microwave sounder	Sensor unchanged; to be included on NPP and on afternoon satellites
Aerosol polarimetry sensor	Sensor was canceled[1]
Conical-scanned microwave imager/sounder	Sensor was canceled; program office to procure a less complex microwave imager/sounder for inclusion beginning on the second NPOESS satellite
Cross-track infrared sounder	Sensor unchanged; to be included on NPP and on afternoon satellites
Data collection system	No change; subsystem is to be included on all four NPOESS satellites
Earth radiation budget sensor	Sensor was canceled; is to be replaced by a legacy sensor on C1 only[2]
Ozone mapper/profiler suite	One part of the sensor (limb) was canceled; remaining part is to be included on NPP and on all four NPOESS satellites[3]
Radar altimeter	Sensor was canceled
Search and rescue satellite aided tracking system	Sensor unchanged; subsystem is to be included on all four NPOESS satellites
Space environmental sensor suite	Sensor was canceled; is to be replaced by a less capable, less expensive legacy sensor[4]

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Instrument	Status of instrument after Nunn-McCurdy decision
Survivability sensor	Subsystem was canceled[a]
Total solar irradiance sensor	Sensor was canceled[a]
Visible/infrared imager radiometer suite	Sensor unchanged; sensor is to be included on NPP and on all four NPOESS satellites

Source: GAO analysis of NPOESS program office data.

[a]While direct program funding for these sensors was eliminated, these sensors could be reintegrated should other parties choose to fund them. The Nunn-McCurdy decision notes that the spacecraft is to include space for these sensors and funds to integrate them.

The changes in NPOESS sensors affected the number and quality of the resulting weather and environmental products, called EDRs. In selecting sensors for the restructured program during the Nunn-McCurdy process, decision makers placed the highest priority on continuing current operational weather capabilities and a lower priority on obtaining selected environmental and climate measuring capabilities. As a result, the revised NPOESS system has significantly less capability for providing global climate measures than was originally planned. Specifically, the number of EDRs was decreased from 55 to 39, of which 6 are of a reduced quality. The 39 EDRs that remain include cloud base height, land surface temperature, precipitation type and rate, and sea surface winds. The 16 EDRs that were removed include cloud particle size and distribution, sea surface height, net solar radiation at the top of the atmosphere, and products to depict the electric fields in the space environment. The six EDRs that are of a reduced quality include ozone profile, soil moisture, and multiple products depicting energy in the space environment.

Selected Climate Sensors Have Been Added Back to the Program

After the 2006 Nunn-McCurdy decision, the NPOESS Executive Committee decided to add selected sensors back to individual satellites in order to address concerns from the climate community about the loss of key climate data. In January 2008, the Committee approved plans to include a replacement for the Earth radiation budget sensor (called the Clouds' and the earth's radiant energy system sensor) on the NPP satellite. In addition, in May 2008, the Committee approved plans to include a Total solar irradiance sensor on the C1 satellite. Table 4 shows which instruments are currently planned for NPP and the four satellites of the NPOESS program, called C1, C2, C3, and C4. Program officials acknowledged that these configurations could change if other parties decide to develop the sensors that were canceled.

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Table 4: Configuration of Instruments Planned for NPP and NPOESS Satellites, as of May 2008

Instrument	NPP	NPOESS C1 (PM)	NPOESS C2 (AM)	NPOESS C3 (PM)	NPOESS C4 (AM)
Advanced technology microwave sounder	X	X	O	X	O
Microwave imager/sounder (replacing the canceled Conical-scanned microwave imager/sounder)	—	—	X	X	X
Cross-track infrared sounder	X	X	O	X	O
Data collection system	—	X	X	X	X
Clouds' and the earth's radiant energy system sensor (replacing selected capabilities of the Earth radiation budget sensor)	X	X	—	—	—
Ozone mapper/profiler suite (nadir)	X	X	—	X	—
Ozone mapper/profiler suite (limb)	X	O	—	O	—
Search and rescue satellite aided tracking system	—	X	X	X	X
Space environment monitor (replacing selected capabilities of the space environmental sensor suite)	—	X	—	X	—
Total solar irradiance sensor	—	X	O	—	O
Visible/infrared imager radiometer suite	X	X	X	X	X

Key:
X = Sensor is currently planned for this satellite
O = Canceled but could be restored to this satellite
— = Not applicable—sensor was never planned for this satellite

Source: GAO analysis of NPOESS program officials.

NPOESS Experienced Schedule Delays and Cost Growth after It Was Restructured

After the program was restructured, NPOESS continued to experience schedule delays and cost growth. In June 2008, we reported that poor workmanship and testing delays caused an additional 8-month slip to the expected delivery date of the Visible/infrared imager radiometer suite (VIIRS) sensor.[G] This late delivery caused a corresponding delay in the expected launch date of the NPP demonstration satellite, moving it to June 2010. In addition, we reported that the program life cycle costs, estimated at $12.5 billion, were expected to rise by approximately $1 billion because of problems experienced in the development of the VIIRS and Cross-track infrared sounder (CrIS) sensors, the need to revise outdated operations and support cost estimates, and the need to modify information security requirements on ground systems. Program officials subsequently modified their life cycle cost estimate to $13.95 billion, which included about

[G]GAO-08-896T.

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$1.15 billion for revised pre- and post-launch operations and support costs and about $300 million to address development issues. The revised cost estimate did not include funds to modify information security requirements.

Prior Reports Recommended Steps to Mitigate Program Risks

In recent years, we have made a series of recommendations to mitigate risks on the NPOESS program. In April 2007, we reported that the program lacked a process and plan for identifying and filling key staffing shortages and that DOD's plans to reassign the Program Executive Officer would unnecessarily increase risks to an already risky program.[13] We also reported that while the program office had made progress in restructuring NPOESS after the June 2006 Nunn-McCurdy certification decision, important tasks leading up to finalizing contract changes remained to be completed. Specifically, the program had made progress in drafting key acquisition documents, including the system engineering plan, the test and evaluation master plan, and the memorandum of agreement between the agencies. However, executive approval of those documents was about 6 months late at that time—due in part to the complexity of navigating three agencies' approval processes. To address these issues, we recommended that NPOESS program officials develop and implement a written process for identifying and addressing human capital needs and establish a plan to immediately fill needed positions; that DOD delay the reassignment of the Program Executive Officer until all sensors were delivered to NPP; and that the appropriate agency executives finalize key acquisition documents by the end of April 2007.

Following up on these recommendations, in May 2008, we reported that program officials had documented the program's staffing process and made progress in filling selected budgeting and system engineering vacancies.[14] DOD, however, reassigned the Program Executive Officer in July 2007 and replaced this person with a new Program Executive Officer. We also reported that executive approval of key acquisition documents was more than a year late at that time and reiterated our prior recommendation that the agencies immediately complete these activities. The last of these acquisition documents was approved in December 2008.

[13]GAO-07-498.

[14]GAO-08-518.

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Progress Made, but Continued Instrument Problems Are Driving Costs Upward, Forcing Launch Delays, and Endangering Satellite Continuity

Over the past year, selected components of the NPOESS program—including the ground segment and selected sensors—have made progress. However, the program's approved cost and schedule baseline is not achievable, and problems with two critical sensors continue to drive the program's cost and schedule. Costs are expected to grow by about $1 billion from the current $13.95 billion cost estimate, and the schedules for NPP and the first two NPOESS satellites are expected to be delayed by 7, 14, and 5 months, respectively. These delays endanger the continuity of weather and climate satellite data because there will not be a satellite available as backup should a satellite fail on launch or in orbit. Program officials reported that they are assessing alternatives for mitigating risks, and that they plan to propose a new cost and schedule baseline by June 2009.

Program Made Progress on Selected Components

With over $4 billion expended on the program through the end of fiscal year 2008, the program is well under way. Over the past year, selected components of the NPOESS program have made progress. Specifically, three of the five instruments slated for NPP have been delivered and integrated on the spacecraft; the ground-based satellite data processing system has been installed and tested at both of the locations that are to receive NPP data; and the satellites' command, control, and communications system has passed acceptance testing. Details on the status of key components are provided in table 5.

Table 5: Status and Risk Level of Key Space and Ground Components, as of April 2009

Component	Program-identified risk level	Status
Advanced technology microwave sounder	Low	For NPP: The instrument was integrated on the spacecraft in December 2006 and is awaiting delivery of the other sensors in order to complete integration testing. For C1: The instrument is currently being built by the prime contractor. Although the effort is low risk, the effort is taking more time than originally expected.
Clouds' and the earth's radiant energy system	Low	For NPP: The instrument was integrated on the spacecraft in November 2008. For C1: The instrument is on track and expected to go through systems requirements review in April 2009.
Cross-track infrared sounder (CrIS)	High	For NPP: The instrument has experienced several issues during testing and final review, including a faulty calibration target and overstressed semiconductors. Repairing these issues delayed the instrument's delivery to the NPP integration contractor. That date is now set for July 2009.
	Medium	For C1: A new calibration target will be needed for the second flight unit. A simplified design has been chosen that is based on existing technology. In addition, because the program needs to delay activities on the second flight unit in 2009, delivery of the unit could be delayed by a full year.

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Component	Program-identified risk level	Status
Microwave imager/sounder	Low	For C2: The NPOESS Executive Committee recently directed the program to review the sensor's requirements in order to mitigate growing program costs. Because the sensor is not yet in development, the executive committee noted that this is an appropriate time to consider developing a less complex sensor. The program director stated that he expects the sensor to undergo a requirements review by the end of May 2009.
Ozone mapper/profiler suite	Medium	For NPP: The instrument was recently integrated on the spacecraft. However, the program office raised concerns that screws had been overtorqued and is reviewing the assembly of the instrument.
	Low	For C1: In order to fund problems on VIIRS, work was halted on the second flight unit—which will lead to a delayed delivery of approximately 1 year.
Total solar irradiance sensor	Low	For C1: Due to a lack of available funds prior to April 2009, the program office is reassessing the schedule for the first flight unit of this instrument. The preliminary design review is currently scheduled for April 2009.
Visible/infrared imager radiometer suite (VIIRS)	High	For NPP: The sensor has completed electromagnetic compatibility and vibration testing, and it began thermal vacuum testing in early May 2009. However, continued slow test execution and problems during environmental testing have led to further delays in delivering it to the NPP integration contractor. While the contractor's current plan shows delivery in September 2009, the government estimates a delivery by December 2009. For C1: More than 80 percent of the parts for the second VIIRS sensor have already been acquired.
Spacecraft	Low	For NPP: The spacecraft has been completed and three of five instruments have been integrated on it.
	Medium	For C1: The spacecraft recently completed a critical design audit; however, it is also on the "critical path" for C1, which means that any delays in the spacecraft could delay the launch date.
Command, Control, and Communications	Low	The command, control, and communications segment is being developed in a series of builds. For NPP: Build 1.4 has been completed. For C1: Build 2.1 is under development.
Integrated Data Processing System	Low	For NPP: Hardware has been deployed to two central data processing centers (NOAA's National Satellite Operations Facility in Suitland, Maryland and the Air Force Weather Agency) and testing has begun. Development continues on the next system software build.
Ground stations for receiving satellite data	Low	NOAA is working with domestic and foreign authorities to obtain approval to operate ground stations to receive satellite data. To date, the program office has reached agreement with 7 of 15 ground station sites. According to agency officials, only 3 ground stations will be operational by the launch of the first NPOESS satellite and the full complement of ground stations will be operational by the launch of the second NPOESS satellite.

Source: GAO analysis of NPOESS program office data.

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Technical Challenges Cause Cost Increases, Delay Schedule, and Risk Data Continuity; Key Decisions on Program's Next Steps Are Pending

While the program has made progress, problems with two critical sensors continue to drive the program's cost and schedule. Specifically, ongoing challenges with VIIRS development, design, and workmanship have led to additional cost overruns and delayed the instrument's delivery to NPP. In addition, problems discovered during environmental testing on CrIS led the contractor to further delay its delivery to NPP and added further unanticipated costs to the program. To address these issues, the program office halted or delayed activities on other components (including the development of a sensor planned for the C1 satellite) and redirected those funds to fixing VIIRS and CrIS. As a result, those other activities now face cost increases and schedule delays.

Program officials acknowledge that NPOESS will cost more than the $13.95 billion previously estimated, but they have not yet adopted a new cost estimate. Program officials estimated that program costs will grow by about $370 million due to recent technical issues experienced on the sensors and the costs associated with halting and then restarting work on other components of the program. In addition, the costs associated with adding new information security requirements to the program could reach $200 million.[15] This estimate also does not include approximately $410 million for operations and support costs for the last two years of the program's life cycle (2025 and 2026). Thus, we anticipate that the overall cost of the program could grow by about $1 billion from the current $13.95 billion estimate—especially given the fact that difficult integration and testing of the sensors on the NPP and C1 spacecrafts has not yet occurred.[16] Program officials reported that they plan to revise the program's cost estimate over the next few weeks and to submit it for executive-level approval in June 2009.

As for the program's schedule, program officials estimate that the delivery of VIIRS to the NPP contractor will be delayed, resulting in a further delay in the launch of the NPP satellite to January 2011, a year later than the date estimated during the program restructuring—and seven months later than the June 2010 date that was established last year. In addition, program officials estimated that the first and second NPOESS satellites

[15]These estimates are subject to further refinement because the Executive Committee has not agreed on a cost estimating methodology and the agencies have not yet agreed to new information security requirements.

[16]This cost estimate includes launch vehicle costs of approximately $329 million, which are funded outside the program's baseline.

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would be delayed by 14 and 5 months, respectively, because selected development activities were halted or slowed to address VIIRS and CrIS problems. The program's current plans are to launch C1 in March 2014 and C2 in May 2016. Program officials notified the Executive Committee and DOD's acquisition authority of the schedule delays, and under DOD acquisition rules, are required to submit a new schedule baseline by June 2009. See table 6 for changes in key program milestones over time.

Table 6: Changes in Key Program Milestones over Time

Milestones	As of the August 2002 contract award	As of the June 2006 certification decision	Current program estimates (as of April 2009)	Change from 2006 certification decision
Final POES launch[a]	March 2008	February 2009	February 2009 (actual)	Not applicable
NPP launch	May 2006	January 2010[b]	January 2011	1-year delay
First NPOESS satellite planned for launch	April 2009	January 2013	March 2014	14-month delay
Final DMSP launch[c]	October 2009	April 2012	May 2014	25-month delay
Second NPOESS satellite planned for launch	June 2011	January 2016	May 2016	5-month delay[d]

Source: GAO analysis of DOD, NOAA, and NPOESS program office data.

[a]POES and DMSP are not part of the NPOESS program. Their launch dates are provided to indicate the increased risk of satellite data gaps between when these systems launch and when the NPOESS satellites launch.

[b]In February 2008, the launch date for NPP was delayed to June 2010.

[c]DMSP program staff noted that the DMSP launches were delayed due to the health of existing satellites and to mitigate the impact of NPOESS delays. The final DMSP could be delayed to as late as 2018, if required.

[d]This 5-month delay extends from the first day of January 2016 to the last day of May 2016.

These launch delays have endangered our nation's ability to ensure the continuity of polar-orbiting satellite data. The final POES satellite, called NOAA-19, is in an afternoon orbit and is expected to have a 5-year lifespan. Both NPP and C1 are planned to support the afternoon orbit. Should the NOAA-19 satellite fail before NPP is launched, calibrated, and operational, there would be a gap in satellite data in that orbit. Further, the delays in C1 mean that NPP will not be the research and risk reduction satellite it was originally intended to be. Instead, it will have to function as an operational satellite until C1 is in orbit and operational—and if C1 fails on launch or in early operations, NPP will be needed to function until C3 is available, currently planned for 2018. The delay in the C2 satellite launch affects the early morning orbit. There are three more DMSP satellites to be launched in the early and midmorning orbits. DOD is revisiting the launch schedules for these satellites to try to extend them as long as possible. An independent review team, established to assess key program risks,

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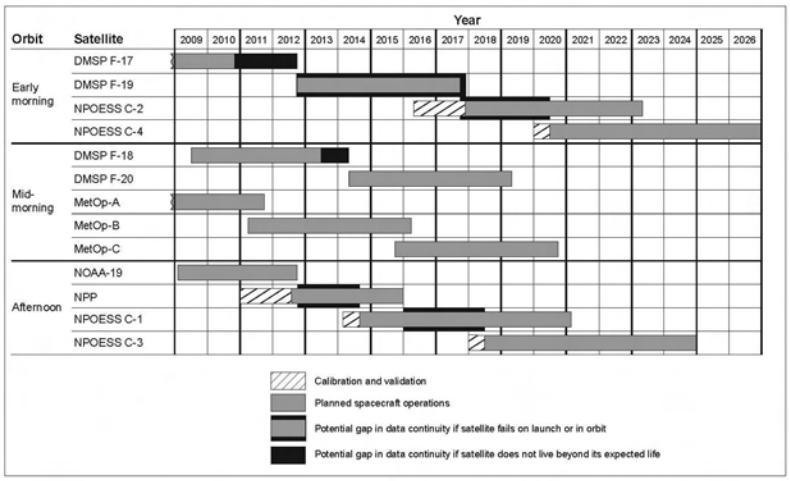
recently reported that the constellation of satellites is extremely fragile and that a single launch failure of DMSP or of the NPP satellite could result in a gap in satellite coverage from 3 to 5 years. Figure 6 shows the current and planned satellites and highlights gaps where the constellation is at risk.

Figure 6: Potential Gaps in the Continuity of Current and Planned Polar Satellites



Sources: GAO analysis of DOD, NOAA, and NPOESS program office data.

Although the program's approved cost and schedule baseline is not achievable and the polar satellite constellation is at risk, the Executive Committee has not yet made a decision on how to proceed with the program. Specifically, the Committee has not approved a new program schedule and a realistic cost estimate or determined whether it will mitigate or accept the risk of a potential gap in satellite continuity. Program officials plan to propose new cost and schedule baselines in June 2009. However, the Executive Committee does not have an estimate for

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when it will make critical decisions on cost, schedule, and risk mitigation. Program officials reported that they are addressing immediate funding constraints by deferring selected activities to later fiscal years in order to pay for VIIRS and CrIS problems, delaying the launches of NPP, C1, and C2, and assessing alternatives for mitigating the risk that VIIRS will continue to experience problems—including the possibility of purchasing a legacy imaging sensor to replace VIIRS on C1. Without an executive-level decision to do so, the program is proceeding on a course that is deferring cost growth, delaying launches, and risking its underlying mission of providing operational weather continuity to the civil and military communities.

Executive Committee Has Not Effectively Fulfilled Its Responsibilities

While the NPOESS Executive Committee has made improvements over the last several years in response to prior recommendations, it has not effectively fulfilled its responsibilities and does not have the membership and leadership it needs to effectively or efficiently oversee and direct the NPOESS program. Specifically, the DOD Executive Committee member with acquisition authority does not attend committee meetings—and sometimes contradicts the Committee's decisions, the Committee does not aggressively manage risks, and many of the Committee's decisions do not achieve desired outcomes. Independent reviewers, as well as program officials, explained that the tri-agency structure of the program makes it very difficult to effectively manage the program. Until these shortfalls are addressed, the Committee is unable to effectively oversee the NPOESS program—and important issues involving cost growth, schedule delays, and satellite continuity will likely remain unresolved.

Executive Committee Has Responded to Past Recommendations

In November 2005, we reported that the Executive Committee did not meet on a regular basis and that most of its meetings did not result in major decisions, but instead triggered further analysis and review.[17] In addition, in May 2006, the Department of Commerce's Inspector General reported that the Committee did not effectively challenge the program's optimistic assessments and recommended that it provide more vigilant oversight. Since then, the Committee has met regularly on a quarterly basis and held interim teleconferences as needed.

[17]GAO-06-249T.

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The Committee has also sought and reacted to advice from external advisors by, among other actions, authorizing a government program manager to reside onsite at the VIIRS contractor's facility to improve oversight of the sensor's development on a day-to-day basis. More recently, the Executive Committee sponsored a broad-based independent review of the NPOESS program and is beginning to respond to its recommendations. The independent review team's findings and recommendations are provided in appendix II.

Key Acquisition Executive Does Not Attend Executive Committee Meetings

As established by the 1995 and 2008 memorandums of agreement signed by all three agencies, the members of the NPOESS Executive Committee are (1) the Under Secretary of Commerce for Oceans and Atmosphere; (2) the Under Secretary of Defense for Acquisition, Technology, and Logistics; and (3) the NASA Administrator.[16] Because DOD has the lead responsibility for the NPOESS acquisition, the Under Secretary of Defense for Acquisition, Technology, and Logistics, was also designated as the milestone decision authority—the individual with the authority to approve a major acquisition program's progression in the acquisition process, as well as any changes to the cost, schedule, and functionality of the acquisition.[17] The intent of the tri-agency memorandums was that acquisition decisions would be agreed to by the Executive Committee before a final acquisition decision is made by the milestone decision authority.[18]

However, DOD's acquisition authority has never attended an Executive Committee meeting. This individual delegated the responsibility for attending the meetings—but not the authority to make acquisition decisions—to the Under Secretary of the Air Force. Therefore, none of the individuals who attend the Executive Committee meetings for the three

[16]The 1995 agreement specified that the NASA member would be the Deputy Administrator. Responsibility was subsequently taken over by the Administrator of NASA.

[17]According to DOD, the milestone decision authority is the designated individual who has overall responsibility for an investment. This person has the authority to approve a major acquisition program's progression in the acquisition process and is responsible for reporting cost, schedule, and performance results.

[18]The 1995 and 2008 memorandums of agreement differ slightly in this regard. The first agreement stated that DOD's milestone decision authority will make acquisition decisions with concurrence of the other Executive Committee members while the second agreement states that the DOD authority must consider committee decisions. The second agreement takes precedence in the case of a conflict.

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agencies have the authority to approve the acquisition program baseline or major changes to the baseline. As a result, agreements between committee members have been overturned by the acquisition authority, leading to significant delays. For example, the details of the program's acquisition program baseline were agreed to by members of the Executive Committee, but were overruled by the office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. This required several months of extensive renegotiation. In addition, after the Executive Committee members agreed to a revised tri-agency memorandum of agreement and it was signed by the Secretary of Commerce and the Administrator of NASA, the Under Secretary of Acquisition, Technology, and Logistics refused to approve the document, and it took over a year to finalize it. Crucially, this year-long disagreement focused on whether the Under Secretary should consult with or coordinate with members of the Executive Committee on matters related to NPOESS. In August 2008, the Under Secretary of Commerce for Oceans and Atmosphere wrote to the Under Secretary of Defense for Acquisition, Technology, and Logistics, expressing concern that DOD did not recognize the management role of the tri-agency NPOESS Executive Committee or its responsibility, authority, and accountability to make decisions that represent the respective agency positions.

At the conclusion of our review, DOD agency officials stated that the absence of the Under Secretary of Defense for Acquisition, Technology, and Logistics at Executive Committee meetings is not the root cause of the Executive Committee's problems, but acknowledged that this individual's presence at the meetings could be helpful in streamlining the flow of information and the decision-making process.

Committee Does Not Aggressively Manage Risks

Best practices note that oversight of large investments is a critical part of the investment life cycle and call for oversight boards to take corrective actions at the first sign of cost, schedule, and performance problems. They also call for oversight boards to ensure that corrective actions and related efforts are executed by the project management team and tracked until the desired outcomes occur.[21] To provide this oversight, the Executive Committee holds quarterly meetings during which the program's progress is reviewed using metrics that provide an early warning of cost, schedule, and technical risks.

[21]GAO-04-394G.

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Although the Executive Committee meets quarterly to review program progress and risks, and the results of those meetings are recorded in meeting minutes, the Committee does not routinely document action items or track those items to closure. Specifically, in the four meetings held between March 2007 and January 2008, the Committee explicitly documented 12 action items, but did not explicitly document action items in the three meetings from May to December 2008. Instead, 5 actions were implied in the text of the meeting minutes and at least 1 action item to proceed with a modified schedule for VIIRS was not recorded at all. Further, the Executive Committee did not routinely track the closure of its action items. Some action items were not discussed in later meetings and in cases where an item was discussed, it was not always clear what action was taken, whether it was effective, and whether the item was closed. Specifically, of the 18 action items we identified between March 2007 and December 2008, 7 were clearly closed and 11 were not.[22] For example, in May 2008, the Executive Committee asked DOD's Cost Analysis Improvement Group and the program office to reconcile their cost estimates, but it is not clear from the meetings that took place after this one whether this action was taken and what the result was. Also in May 2008, the Committee directed the prime contractor and others to investigate the root causes of technical issues; again, it is not clear whether this was completed or what the results were.

According to the Program Executive Officer, the closing of an action item is not always explicitly tracked because it typically involves gathering information that is presented during later Committee meetings. Nonetheless, by not rigorously documenting action items—including identifying the party responsible for the action, the desired outcome, and the time frame for completion—and then tracking the action items to closure, the Executive Committee is not able to ensure that its actions have achieved their intended results and to determine whether additional changes or modifications are still needed. This impedes the Committee's ability to effectively oversee the program, direct risk mitigation activities, and obtain feedback on the results of its actions.

[22]The program subsequently reported that 12 of the 18 action items have been closed and that 6 are in progress.

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Committee Decisions Do Not Achieve Desired Outcomes

Best practices in investment management call for oversight of large investments throughout their life cycles.[21] Government guidance calls for oversight boards to take corrective actions at the first sign of cost, schedule, and performance slippages in order to mitigate risks and achieve successful outcomes. The NPOESS Executive Committee generally took immediate action to mitigate the risks that were brought before them; however, a majority of these actions were not effective—that is, they did not fully resolve the underlying issues or result in a successful outcome. Specifically, of 22 significant risks forwarded to the Executive Committee between January and December 2008, the Committee took some action to mitigate 17 of the risks and decided to monitor the other 5 risks. Committee actions included approving modifications to the VIIRS schedule and directing the program to modify key acquisition documents to resolve disagreements, to establish an onsite government manager at a subcontractor's facility, and to develop a plan for the way forward for the program once it was determined that the program could not execute its baseline on time within its budget.

However, the Committee's actions either did not result in successful outcomes or were inefficient in achieving successful outcomes. Of the 22 risks presented to the Executive Committee, 18 involved cost, schedule, and technical issues on the VIIRS and CrIS sensors, and 4 involved barriers to gaining approval of key acquisition documents. The Committee's actions on the sensor development risks accomplished interim successes by improving the government's oversight of a subcontractor's activities and guiding next steps in addressing technical issues—but even with committee actions, the sensors' performance has continued to falter and affect the rest of the program. Independent reviewers reported that the tri-agency structure of the program complicated the resolution of sensor risks because any decision could be revisited by another agency. In addition, while the government's onsite program manager is responsible for managing deliverables of a critical sensor, this individual reported that the plurality of customers with different expectations and priorities made it difficult to move the sensor development effort forward.

As for the 4 risks involving barriers to gaining approval of key acquisition documents, by the end of 2008, all of the acquisition documents had been completed. However, the path to achieving this successful outcome was inefficient. For example, it took over 2 years and countless iterations by

[21] GAO-04-394G.

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multiple levels of management in three different agencies to complete the tri-agency memorandum of agreement. The leader of an independent review team charged with reviewing key program risks recently reported that the Executive Committee is "at best… inefficient." Program officials explained that interagency disagreements and differing priorities make it difficult to effectively resolve issues. In addition, two independent advisors noted that the tri-agency aspect of the program makes it difficult to make decisions that balance the needs of all three agencies.

The Committee's inability to make effective and efficient decisions is further complicated when difficult risks are not escalated in a timely manner. While most risks are raised to the Committee within months of the time they surface at the program level, selected interagency issues lingered before being brought before the Executive Committee. Specifically, an interagency disagreement regarding the appropriate level of security requirements was discussed and studied for 2 years before the Committee was notified—and the Committee still has not been asked to make a decision on this issue.

At the conclusion of our review, DOD officials reported that part of the problem in escalating risks is that, in violation of interagency agreements and inconsistent with DOD acquisition policy, two senior NOAA officials review and limit what the Program Executive Officer provides to the Executive Committee.[26] NOAA officials and the Program Executive Officer strongly disagreed with this statement. NASA officials commented that NOAA's enhanced oversight provides a healthy set of checks and balances to the program.

[26]DOD directive 5000.55 section E2.1.43 states that a Program Executive Officer only reports to and receives guidance and direction from the DOD component acquisition executive. Also, the 2008 tri-agency memorandum of agreement reiterates that the Program Executive Officer reports directly to and takes direction from the Executive Committee.

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Program Has Assessed Alternatives, but Has Not Yet Identified a Viable Alternative for Acquiring the Last Two NPOESS Satellites

When NPOESS was restructured in June 2006, the program included two satellites (C1 and C2) and an option to have the prime contractor produce the next two satellites (C3 and C4). In approving the restructured program, DOD's decision authority noted that he reserved the right to use a different satellite integrator for the final two satellites, and that a decision on whether to exercise the option was to be made in June 2010. To prepare for this decision, DOD required a tri-agency assessment of alternative management strategies. This assessment was to examine the feasibility of an alternative satellite integrator, to estimate the cost and schedule implications of moving to an alternative integrator, and within one year, to provide a viable alternative to the NPOESS Executive Committee.

To address DOD's requirement, the NPOESS Program Executive Officer sponsored two successive alternative management studies; however, neither of the studies identified a viable alternative to the existing satellite integrator. The first study, conducted in 2007, identified three alternatives to the existing satellite integrator, including (1) re-competing the entire prime contract, (2) obtaining an independent system integrator while having the existing prime contractor continue to develop space and ground components, and (3) having the government take over responsibility for the system integration. The study identified the relative strengths and weaknesses of the alternatives and recommended that the program remain with the existing prime contractor for C3 and C4 because doing otherwise would increase cost and schedule risks. It did not quantify these costs or risks. The second alternative management study, conducted in 2008, identified the same alternatives to the current system integrator and assessed their relative cost, schedule, and performance risks to the program. The study determined that the alternatives to the system integrator were not viable options because of their potential costs, and because the prime contractor's performance had been meeting requirements. This study also recommended staying with the prime contractor for C3 and C4. Both of these studies also assessed other aspects of program management—including the government's executive and program management and the contractors' management—and made recommendations to improve them.

The Program Executive Officer plans to conduct a final assessment of alternatives prior to the June 2010 decision on whether to exercise the option to have the current system integrator produce the next two NPOESS satellites. Program officials explained that the program's evolving costs, schedules, and risks could mean that an alternative that was not viable in the past would become viable. For example, if the prime contractor's performance no longer meets basic requirements, an

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alternative that was previously too costly to be considered viable might become so.

Conclusions

Continued problems in the development of critical NPOESS sensors have contributed to growing costs and schedule delays. Costs are now expected to grow by as much as $1 billion over the prior life cycle cost estimate of $13.95 billion, and problems in delivering key sensors have led to delays in launching NPP and the first two NPOESS satellites—by a year or more for NPP and the first NPOESS satellite. These launch delays have endangered our nation's ability to ensure the continuity of polar-orbiting satellite data. Specifically, if any planned satellites fail on launch or in orbit, there would be a gap in satellite data until the next NPOESS satellite is launched and operational—a gap that could last for 3 to 5 years.

The NPOESS Executive Committee responsible for making cost and schedule decisions and addressing the many and continuing risks facing the program has not yet made important decisions on program costs, schedules, and risks—or identified when it will do so. In addition, the Committee has not been effective or efficient in carrying out its oversight responsibilities. Specifically, the individual with the authority to make acquisition decisions does not attend committee meetings; corrective actions are not identified in terms of desired outcomes, resources, and time frames for completion; these actions are not tracked to closure; and selected risks are not escalated in a timely manner. Until the Committee's shortfalls are addressed, important decisions may not be effective and issues involving cost increases, schedule delays, and satellite continuity may remain unresolved.

Recommendations for Executive Action

To improve the timeliness and effectiveness of acquisition decision-making on the NPOESS program, we recommend that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to attend and participate in NPOESS Executive Committee meetings.

We also recommend that the Secretaries of Defense and Commerce and the Administrator of NASA direct the NPOESS Executive Committee to take the following five actions:

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- establish a realistic time frame for revising the program's cost and schedule baselines;
- develop plans to mitigate the risk of gaps in satellite continuity;
- track the Committee's action items from inception to closure;
- improve the Committee's ability to achieve successful outcomes by identifying the desired outcome associated with each of the Committee's actions, as well as time frames and responsible parties, when new action items are established; and
- improve the Committee's efficiency by establishing time frames for escalating risks to the Committee for action so that they do not linger unresolved at the program executive level.

Agency Comments and Our Evaluation

We received written comments on a draft of this report from the Secretary of Commerce (see app. III), the Deputy Assistant Secretary of Defense (see app. IV), and the Associate Deputy Administrator of NASA (see app. V). In their comments, NASA and NOAA agreed with our findings and recommendations and identified plans to implement them. For example, NASA noted that it would work closely with DOD and NOAA to ensure that a realistic time frame was established for cost and schedule baselines and to develop plans to mitigate program risks. NOAA noted that it planned to mitigate risk, in part by accelerating the development of environmental products—and planned to use more data from NPP than it had originally planned. Regarding our recommendations to track Executive Committee actions and ensure successful outcomes by identifying the desired outcome associated with each action as well as time frames and responsible parties, both NASA and NOAA noted that they would work with the Program Executive Officer to ensure that these actions happen in a timely and effective manner. Finally, regarding our recommendation to improve the Executive Committee's efficiency by establishing time frames for escalating risks to the Committee, both NASA and NOAA noted that they would work with the Program Executive Officer to ensure that this was done. NOAA also provided technical comments on the report, which we incorporated as appropriate.

In its written comments, DOD concurred with one and partially concurred with our other recommendations. Regarding our recommendation to have the appropriate official attend Executive Committee meetings, the agency partially concurred and noted that the Under Secretary of Acquisition,

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Technology, and Logistics would evaluate the necessity of attending future Executive Committee meetings. DOD also reiterated that the Under Secretary of the Air Force was delegated the authority to attend the meetings. While we acknowledge that the Under Secretary delegated responsibility for attending these meetings, it is an inefficient way to make decisions and achieve outcomes. In the past, agreements between Executive Committee members have been overturned by the Under Secretary, leading to significant delays in key decisions.

In addition, DOD partially concurred with our recommendations that the Executive Committee establish a realistic time frame for revising the program's cost and schedule baselines, and develop plans to mitigate the risk of data gaps. For both recommendations, DOD noted that the program office should develop the plans, which would then be reviewed by the Executive Committee. We agree that the program is responsible for revising the cost and schedule baselines and developing risk mitigation plans, and that the Executive Committee is responsible for approving these plans. However, our recommendations focused on implementing these activities. Until the Committee establishes a time frame for making decisions on the program's cost and schedule baseline and endorses risk mitigation plans, there is a continued risk that the program will encounter further delays or gaps in satellite data continuity.

DOD concurred with our recommendation that the Executive Committee track action items and noted that it will recommend that the Program Executive Officer establish a Web-based tracking system so that all agencies can review the action items and their status.

Regarding our recommendation to identify the desired outcomes, responsible parties, and time frames associated with the Committee's corrective actions, DOD partially concurred and noted that the tri-agency memorandum of agreement empowers the System Program Director and Program Executive Officer to achieve successful outcomes. While we agree that the memorandum establishes these executives' responsibilities, it is the responsibility of the Executive Committee to define expectations associated with their directed actions—including desired outcomes, who is accountable, and time frames for completion. In past Executive Committee meetings, these expectations have not been defined.

DOD partially concurred with our recommendation to establish time frames for escalating risks to the Executive Committee, and noted that the Program Executive Officer should be able to do so. However, DOD expressed concern that interference by the other agencies had weakened

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the Program Executive Officer's ability to perform as intended. We acknowledge that there is a disagreement among the three agencies on the appropriate level of oversight of the program; however, we believe that one of the roles of the Executive Committee members should be to ensure that risks are escalated in a timely manner. Until time frames are established, risks may continue to linger unresolved at the program level.

We are sending copies of this report to interested congressional committees, the Secretary of Commerce, the Secretary of Defense, the Administrator of NASA, the Director of the Office of Management and Budget, and other interested parties. In addition, this report will be available on the GAO Web site at http://www.gao.gov.

If you have any questions about this report, please contact me at (202) 512-9286 or at pownerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in Appendix VI.

David A. Powner

David A. Powner
Director, Information Technology Management Issues

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List of Congressional Requesters

The Honorable Brian Baird
Chairman
The Honorable Bob Inglis
Ranking Member
Subcommittee on Energy and Environment
Committee on Science and Technology
House of Representatives

The Honorable Brad Miller
Chairman
The Honorable Paul Broun, Jr.
Ranking Member
Subcommittee on Investigations and Oversight
Committee on Science and Technology
House of Representatives

The Honorable F. James Sensenbrenner, Jr.
House of Representatives

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Appendix I: Objectives, Scope, and Methodology

Our objectives were to (1) identify the status and risks of key National Polar-orbiting Operational Environmental Satellite System (NPOESS) program components, (2) assess the NPOESS Executive Committee's ability to fulfill its responsibilities, and (3) evaluate efforts to identify an alternative system integrator for later NPOESS satellites.

To evaluate the status and risks of key program components, we reviewed briefings and monthly program management reports. We analyzed earned value management data to assess the contractors' performance against cost and schedule estimates and evaluated reasons for variances in the contractors' performance. We obtained adequate assurance that these agency-provided data had been tested and were sufficient for our assessment purposes. We reviewed cost reports and program risk management documents and interviewed program officials to determine program and program segment risks that could negatively affect the program's ability to maintain the current schedule and cost estimates. We also interviewed agency officials from the Department of Defense (DOD), National Aeronautics and Space Administration (NASA), and National Oceanic and Atmospheric Administration (NOAA) and the NPOESS program office to determine the status and risks of the key program segments. We interviewed senior-level officials representing the prime contractor and the subcontractor responsible for developing a critical sensor. We also observed senior-level management review meetings to obtain information on the status of the NPOESS program.

To assess the NPOESS Executive Committee's ability to fulfill its responsibilities, we reviewed the presidential directive that established NPOESS and the 1995 and 2008 memorandums of agreement signed by all three agencies to determine the responsibilities and membership of the Executive Committee. We analyzed Executive Committee meeting minutes to determine the attendees of the meetings, the action items that were identified, and whether those action items were tracked to closure. We reviewed monthly briefings from the Program Executive Officer's Program Management Council to identify the key risks and issues facing the program. We then compared these risks and issues to the matters brought to the Executive Committee's attention in monthly letters and meeting minutes to determine whether those risks were escalated. In addition, we analyzed the Executive Committee's response to the identified risks and issues to determine whether and how the Committee responded. Finally, we interviewed senior officials in the NPOESS program office and program executive office.

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To evaluate efforts to identify an alternative system integrator for later NPOESS satellites, we reviewed the Acquisition Decision Memorandum that identified the need for a study of alternatives. We reviewed briefings from two alternative management studies and analyzed the alternatives presented in those briefings. We reviewed program plans and status for addressing the recommendations of those studies. We interviewed the chair of the 2008 alternative management study and senior officials from the NPOESS program office regarding steps taken to close the studies' recommendations. We also interviewed the Program Executive Officer to understand the next steps to be taken by the program.

We primarily performed our work at the NPOESS Integrated Program Office and at DOD, NASA, and NOAA offices in the Washington, D.C., metropolitan area. In addition, we conducted work at the Los Angeles, California, facilities of the prime contractor, the subcontractor responsible for a critical sensor, and the Defense Contract Management Agency groups overseeing those contractors. We conducted this performance audit from October 2008 to June 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide 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.

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Appendix II: Summary of the Fall 2008 Independent Review Team's Findings and Recommendations

To address programwide risks and challenges, the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Executive Committee sponsored an independent review of the program in Fall 2008. In March 2009, the independent review team reported on its findings to the Executive Committee.[1] Its findings were that

- the program has a low probability of success in its current configuration;
- the program, as configured after the Nunn-McCurdy certification, places continuity of data at high risk because of the inability to recover from a launch or spacecraft failure;
- cost has become the most important parameter, over mission success;
- the Executive Committee is at best inefficient;
- the program office suffers from a lack of space acquisition infrastructure typically found at space acquisition centers;
- the program is making questionable decisions because of the pressure put on it by near-term budget needs;
- the highest probability of success is with the current contractor team for both NPOESS and the Visible/infrared imager radiometer suite;
- the NPOESS Preparatory Project (NPP) satellite is an operational asset;
- the priorities of the Air Force and the National Oceanic and Atmospheric Administration are not aligned; and
- the current budget is inadequate.

To address these findings, the independent review team recommended that the Committee

- address the continuity issues by defining the "right" program to meet the country's weather and climate needs;
- determine how to co-locate the program office at an acquisition center;

[1]The independent review team has provided briefings on its findings and recommendations, but as of the first week of June 2009, had not yet released its final report.

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- determine an appropriate budget for the program;
- accelerate the schedule of the third and fourth NPOESS satellites;
- use NPP data operationally;
- assess whether to launch NPP on schedule or on an anticipated need date for the data;
- change the culture to put mission need first;
- stop looking at options for VIIRS and NPOESS; and
- either fund the program at an 80 percent confidence level or reduce the content of the program so that it can be funded at an 80 percent confidence instead of a 50 percent confidence level.[2]

[2]A 50 percent level of confidence indicates that a program has a 50 percent chance that the program will be delivered at the identified cost.

Appendix III: Comments from the Department of Commerce

UNITED STATES DEPARTMENT OF COMMERCE
The Secretary of Commerce
Washington, D.C. 20230

June 1, 2009

Mr. David A. Powner
Director
Information Technology
Management Issues
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Powner:

Thank you for the opportunity to review and comment on the Government Accountability Office's draft report entitled *Polar-orbiting Environmental Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making* (GAO-09-564). On behalf of the Department of Commerce, I have enclosed the National Oceanic and Atmospheric Administration's programmatic comments to the draft report.

Sincerely,

Gary Locke

Enclosure

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Department of Commerce
National Oceanic and Atmospheric Administration
Comments on the Draft GAO Report Entitled
"Polar-orbiting Environmental Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision-Making"
(GAO-09-564, June 2009)

General Comments

The Department of Commerce (DOC) and the National Oceanic and Atmospheric Administration (NOAA) appreciate the opportunity to review this report on the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. The Government Accountability Office (GAO) makes six recommendations that it anticipates will improve the effectiveness and efficiency of the tri-agency Executive Committee (EXCOM). The first recommendation is directed to the Secretary of Defense, while the remaining five recommendations are directed to DOC as well as to the Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA). Overall, the report was fair and balanced in assessing the status and risks of key program components. DOC is committed to successfully executing the NPOESS program.

NOAA Response to GAO Recommendations

The draft GAO report states, "We are also recommending that the Secretaries of Defense and Commerce and the Administrator of NASA direct the NPOESS Executive Committee to take the following five actions:"

Recommendation 2: "Establish a realistic timeframe for revising the program's cost and schedule baselines."

NOAA Response: NOAA concurs with this recommendation. The NPOESS Integrated Program Office is developing an updated program office estimate for a revised acquisition program baseline as required by DoD acquisition regulation. However, a revised program cost and schedule estimate will be established later this year following a robust independent cost analysis of recommended programmatic and acquisition alternatives that better reflect a budget with appropriate contingency funding to reduce risk. The revised program cost and schedule estimates will be ready for initial EXCOM review in late summer 2009. The updated acquisition program baseline review process should subsequently be completed in fall 2009.

Recommendation 3: "Develop plans to mitigate the risk of gaps in satellite continuity."

NOAA Response: NOAA concurs with this recommendation. The NPOESS Preparatory Project (NPP) sensors are capable of producing data that meet or exceed the data provided by NOAA-19, our current operational satellite. Accordingly, to mitigate the potential gap in polar environmental satellite data coverage in the afternoon orbit between NOAA-19 and

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NPOESS C1, NOAA plans to make operational use of the data from the NPP spacecraft and increase the number of products NOAA had planned to generate from the NPP system as a risk-reduction mission to minimize impacts to NOAA's National Weather Service and other users.

Specifically, NOAA will accelerate development of 54 polar legacy products. Previously, 19 legacy products were expected from NPP, with an increase to 54 products in the NPOESS C1 era. NOAA will enhance its NPP data processing ground system with sufficient infrastructure to support the additional 35 products and 24/7 operations and support.

In the mid-morning orbit, NOAA will continue through the next decade to process and deliver environmental products to its customers from the U.S. and European instruments on board the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) MetOp series of satellites.

NOAA will assess the use of additional international and interagency assets as well as potential development of spare satellites and instruments. The cost and schedule details associated with these contingency options are currently under review. Any alternative decision will ultimately be made consistent with results of the Visible/Infrared Imager/Radiometer Suite (VIIRS) instrument testing that is currently underway.

Recommendation 4: "Track the Committee's action items from inception to closure."

NOAA Response: NOAA concurs with this recommendation. NOAA will task the NPOESS Program Executive Officer (PEO) to ensure that Executive Committee (EXCOM) action items are clearly and completely defined; assigned to responsible parties for completion within a specific timeframe; and tracked to completion, including reporting the results to the EXCOM. NOAA will monitor EXCOM action items through the NOAA Program Management Council and take corrective actions needed to ensure action item coordination and closure.

Recommendation 5: "Improve the Committee's ability to achieve successful outcomes by identifying the desired outcome associated with each of the Committee actions, as well as timeframes and responsible parties, when new action items are established."

NOAA Response: NOAA concurs with this recommendation. NOAA will task the PEO to ensure EXCOM action items and desired outcomes are clearly and completely defined; assigned to responsible parties for completion within a specific timeframe; and tracked to completion, including reporting the results to the EXCOM. NOAA will monitor EXCOM action items through the NOAA Program Management Council and take corrective actions needed to ensure successful outcomes.

Recommendation 6: "Improve the Committee's efficiency by establishing timeframes for escalating risks to the Committee for action so that they do not linger unresolved at the program executive level."

NOAA Response: NOAA concurs with this recommendation. The PEO will ensure that resolution plans and schedules are established and tracked at the PEO's monthly management

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council. NOAA will work with NASA and DoD to ensure that the PEO establishes clear criteria and timeframes for elevating risks to the EXCOM for action. NOAA will monitor PEO action items and issue resolution through the NOAA Program Management Council and the tri-agency NPOESS Oversight Council (NOC) to take corrective actions needed to ensure timeliness in addressing escalating risks.

Note: The NOC, established in the spring of 2009, is the tri-agency council that reviews the NPOESS program on a more recurrent basis than the senior-level EXCOM. The NOC, which reports to the EXCOM, is co-chaired by NOAA's Deputy Under Secretary of Commerce for Oceans and Atmosphere, the Deputy Under Secretary of the Air Force, and the Deputy Administrator of NASA. These members are responsible for representing their agencies and providing a reasonable representation of their EXCOM position to ensure that issues and actions are responded to in a timely manner.

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Appendix IV: Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

MAY 28 2009

NETWORKS AND INFORMATION INTEGRATION

Mr. David A. Powner
Director, Information Technology and Management Issues
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Powner,

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) draft report, GAO-09-564, "POLAR-ORBITING ENVIRONMENTAL SATELLITES: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making" dated May 1, 2009 (GAO Code 310890). The DoD acknowledges receipt of the DRAFT report.

Sincerely,

Dr. Ronald C. Jost
Deputy Assistant Secretary of Defense
(C3, Space and Spectrum)

Enclosure(s):
As stated

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GAO DRAFT REPORT DATED MAY 1, 2009
GAO-09-564 (GAO CODE 310890)

"POLAR-ORBITING ENVIRONMENTAL SATELLITES: WITH COSTS INCREASING AND DATA CONTINUITY AT RISK, IMPROVEMENTS NEEDED IN TRI-AGENCY DECISION MAKING"

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology and Logistics to attend and participate in National Polar-orbiting Operational Environmental Satellite System (NPOESS) Executive Committee meetings. (p. 32/GAO Draft Report)

DOD RESPONSE: Partially concur. The recently confirmed Under Secretary of Defense for Acquisition, Technology and Logistics (USD AT&L) as the Milestone Decision Authority for NPOESS, will evaluate the necessity to attend and participate in all future Executive Committee (EXCOM) meetings. The Memorandum of Agreement (MOA) between the Department of Commerce, Department of Defense, and National Aeronautics and Space Administration clearly defines the responsibilities of the EXCOM, Integrated Program Office (IPO), Program Executive Officer (PEO), and System Program Director (SPD). The Under Secretary of the Air Force attends EXCOM meetings on behalf of USD AT&L as delegated on 03 June 2002. The SecAF is the DoD lead for acquisition execution review, funding and manpower, as well as the lead service for operational weather products for the DoD.

RECOMMENDATION 2: The GAO recommends that the Secretary of Defense direct the NPOESS Executive Committee to establish a realistic timeframe for revising the program's cost and schedule baselines. (p. 32/GAO Draft Report)

DOD RESPONSE: Partially concur. Per the Memorandum of Agreement (18 Dec 2008), *"The Under Secretary of Commerce for Oceans and Atmosphere, the Under Secretary of Defense for Acquisition, Technology, and Logistics, and the NASA Administrator will form the NPOESS EXCOM. Each EXCOM member will be accountable to the EXCOM for his/her agency's support of the NPOESS program."* The DoD EXCOM member will continue to monitor and review the NPOESS program cost and schedule updates to the baseline from the PEO quarterly.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense direct the NPOESS Executive Committee to develop plans to mitigate the risk of gaps in satellite continuity. (p. 32/GAO Draft Report)

Attachment:
Page 1 of 2

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DOD RESPONSE: Partially concur. The EXCOM should direct the program office to establish plans to mitigate the risk gaps in satellite continuity as indicated in this report. The EXCOM can review the program's risk mitigation plan and modify as necessary.

RECOMMENDATION 4: The GAO recommends that the Secretary of Defense direct the NPOESS Executive Committee to track the Committee's action items from inception to closure. (p. 33/GAO Draft Report)

DOD RESPONSE: Concur. To accomplish this, the DoD recommends the PEO establish a web-based tracking system such that all agencies can review action items from inception to closure.

RECOMMENDATION 5: The GAO recommends that the Secretary of Defense direct the NPOESS Executive Committee to improve the Committee's ability to achieve successful outcomes by identifying the desired outcome associated with each of the Committee actions, as well as timeframes and responsible parties, when new action items are established. (p. 33/GAO Draft Report)

DOD RESPONSE: Partially concur. The DoD believes the MOA establishes responsibilities that empower responsible individuals (e.g. PEO, SPD) to achieve successful outcomes. The MOA states, "*The SPD will direct and manage the NPOESS IPO with immediate oversight of the PEO. The SPD is ultimately responsible to the EXCOM for the conduct of the NPOESS program and will be granted the decision authority deemed necessary to execute the program. The SPD will also coordinate decisions on NPOESS matters that affect DOC, NASA, and DoD with the PEO to ensure resolution and coordination of all major decisions.*" Furthermore, the EXCOM will "*exercise oversight authority over the program through the PEO*". The DoD EXCOM member will support Committee actions and will be responsive to the PEO's recommendations.

RECOMMENDATION 6: The GAO recommends that the Secretary of Defense direct the NPOESS Executive Committee to improve the committee's efficiency by establishing timeframes for escalating risks to the Committee for action so that they do not linger unresolved at the program executive level. (p. 33/GAO Draft Report)

DOD RESPONSE: Partially concur. The DoD agrees that issues that are unresolved at the program execution level should be brought to the EXCOM and efficiently acted upon. As a DoD led acquisition, the PEO structure is in place to manage program risks. As such, the PEO has the responsibility to follow the traditional DoD streamlined acquisition supervision channels between the PEO and MDA. The object of this streamlined channel is to improve ability of MDA-PEO chain to pass clear unfiltered information up/subsequent acquisition guidance down. Impact of additional entities in PEO-MDA chain, contrary to approved MOA Amendment, has apparently weakened PEO oversight (as highlighted in the Alternative Management Structure Study of 2008).

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Page 2 of 2

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Appendix V: Comments from the National Aeronautics and Space Administration

National Aeronautics and Space Administration
Office of the Administrator
Washington, DC 20546-0001

May 29, 2009

Mr. David A. Powner
Director
Information Technology Management Issues
United States Government Accountability Office
Washington, DC 20548

Dear Mr. Powner:

NASA appreciates the opportunity to comment on your draft report entitled, "Polar-orbiting Environmental Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making." (GAO-09-564).

In the draft report, GAO makes a total of six recommendations intended to improve the timeliness and effectiveness of acquisition decision-making on the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program. Below is NASA's response to the five recommendations which were addressed directly to the Agency:

Recommendations 2 and 3: (1) Establish a realistic timeframe for revising the program's cost and schedule baselines; and (2) develop plans to mitigate the risk of gaps in satellite continuity.

Response: Concur. We have been working closely with the National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense (DoD) to develop a viable course of action to address both of these concerns. The NPOESS program continues to struggle with the impacts of persistent delays caused by the late deliveries of key instruments. As you know, this has significantly impacted the launch readiness date for our NPOESS Preparatory Project (NPP) Mission, causing near-term concerns about data continuity with the on-orbit Aqua Satellite. NASA has been actively supporting the tri-agency assessment efforts that are studying the possible options for a path forward for NPOESS and will continue to do so.

Recommendation 4: Track the Committee's action items from inception to closure.

Response: Concur. We agree with your recommendation that the Executive Committee (EXCOM) maintain a status of action items established during the quarterly EXCOM meetings and track these items from inception to closure. We will work with the Program Executive Officer for Environmental Satellites (PEO) to ensure that the necessary controls and processes are established.

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Recommendation 5: Improve the Committee's ability to achieve successful outcomes by identifying the desired outcome associated with each of the Committee actions, as well as timeframes and responsible parties, when new action items are established.

Response: Concur. We agree with your recommendation to establish desired outcomes, timeframes, and responsible parties for the actions taken during the EXCOM meetings. Again, we will work with the PEO to ensure that the actions are fully documented and recorded in the minutes to the EXCOM meetings.

Recommendation 6: Improve the Committee's efficiency by establishing timeframes for escalating risks to the Committee for action so that they do not linger unresolved at the program executive level.

Response: Concur. We agree with your concerns and recommendation regarding unresolved program risks and the escalation of risks to the EXCOM. Although many risks can be adequately managed at the PEO or Systems Program Director (SPD) level, there are some risks that would benefit from escalation to the EXCOM level for tri-agency adjudication. We will work with the PEO to ensure that those risks are escalated to the EXCOM level when necessary.

NASA will continue to work with NOAA and the DoD toward the success of the NPP and NPOESS programs. If you have any questions or require additional information, please contact Andrew Carson at (202) 358-1702.

Thank you again for the opportunity to review this draft report, and we are looking forward to your final report to Congress.

Sincerely,

Charles H. Scales
Associate Deputy Administrator

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Appendix VI: GAO Contact and Staff Acknowledgments

GAO Contact	David A. Powner, (202) 512-9286 or pownerd@gao.gov
Staff Acknowledgments	In addition to the contact named above, Colleen M. Phillips, Assistant Director; Kate Agatone; Carol Cha; Neil Doherty; Kaelin P. Kuhn; Kathleen S. Lovett; and Lee McCracken made key contributions to this report.

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Congressional Relations	Ralph Dawn, Managing Director, dawnr@gao.gov, (202) 512-4400 U.S. Government Accountability Office, 441 G Street NW, Room 7125 Washington, DC 20548
Public Affairs	Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548

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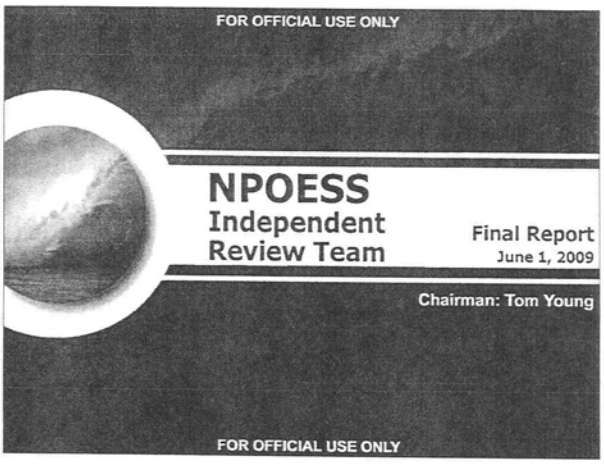

This briefing contains the assessment of the National Polar-Orbiting Environmental Satellite System (NPOESS) program by the Independent Review Team (IRT). It captures the *significant* findings and recommendations resulting from the review of the baseline NPOESS Program. It is important to note that the findings and recommendations in this briefing are in response to the NPOESS Program definition and content presented to the IRT, and primarily cover the NPOESS Management Approach and Baseline Assessment (Tasks 1 and 2). It reflects the integrated perspectives of the IRT developed over time across all review tasks.

1

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Acknowledgements

- **The following organizations provided numerous briefings, detailed discussions and extensive background material to this IRT:**
  - **NPOESS Program Executive Office (PEO)**
  - **NPOESS Integrated Program Office (IPO)**
  - **NOAA/National Environmental Satellite, Data, and Information Service (NESDIS)**
  - **NASA/Goddard Space Flight Center (GSFC)**
  - **DoD/USAF**
  - **Northrop Grumman**
  - **Raytheon**
- **This IRT is grateful for their timely support and quality effort necessary for this assessment**

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The IRT would like to thank the many individuals and organizations that supported this effort with numerous briefings, detailed discussions, and extensive background material. Some of these include:

- NPOESS Program Executive Office (PEO)
- NPOESS Integrated Program Office (IPO)
- NOAA/National Environmental Satellite, Data, and Information Service (NESDIS)
- NASA/Goddard Space Flight Center (GSFC)
- DoD/USAF
- Northrop Grumman
- Raytheon

This IRT is grateful for their timely and forthright support necessary for this assessment.

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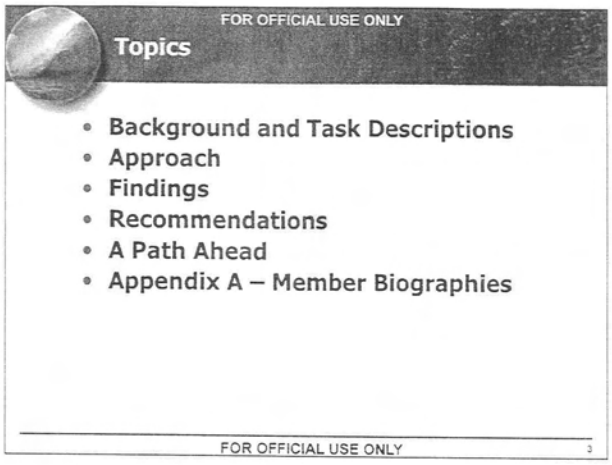

This slide depicts the overall content and structure of the report.

After the Acknowledgements and this overview slide, the briefing will cover some background information on the IRT – the tasks assigned, the approach and the timeline.

The Findings and Recommendations sections capture the key observations and overall recommendations from the IRT. It is organized in a similar flow as discussed and presented at the EXCOM on March 4, 2009. It is followed with some additional conclusions developed since the EXCOM meeting in the section titled "A Path Ahead".

Appendix A describes the make up of the IRT and contains the IRT member biographies.

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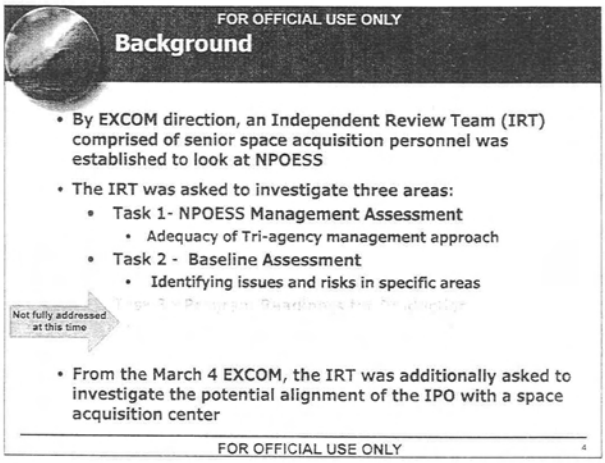

Comprised of senior executive space acquisition experts, this Independent Review Team (IRT) was tasked by the EXCOM to assess the National Polar-orbiting Operational Environmental Satellite System (NPOESS), the next generation of polar-orbiting weather and environmental monitoring satellite system.

Tasks for this major review included an evaluation of high-level NPOESS program elements, including (1) the organization, effectiveness, and efficiency of the Tri-Agency management approach and (2) the technical feasibility, adequacy, and risk of the program baseline. A third task, the program readiness for production, was not fully addressed at this time.

From the March 4 EXCOM, the IRT was additionally asked to investigate the potential alignment of the IPO with a space acquisition center. The results of these deliberations are captured in the section "A Path Ahead".

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Approach (1/2)

- Sept - Oct: IRT members identified, read-ahead materials provided
- October 15, 2008: First Meeting
  - Introductory/Overview Presentations with discussions on objectives and on topics covering broad areas of Tasking
- November 12, 13 2008: Second Meeting
  - Interviews and discussions with tri-agency senior officials and key IPO personnel
  - Detailed presentations on management and baseline status, including AMS
- January 12, 13 2009: Third Meeting
  - Visit, interview, presentations and discussions with the prime contractor NGST and the VIIRS contractor RSAS

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The IRT held a series of meetings beginning in October 2008 and ran through March 2009.

The initial session, on October 15, 2009 discussed the tasks, objectives, and organization of the IRT and provided the IRT an introductory overview of NPOESS and the Integrated Program Office (IPO).

The second meeting, held in November 2008, consisted of interviews and discussions with tri-agency senior officials and key IPO personnel including:

- Dan Stockton (NPOESS PEO), Ed Phillips (NPOESS SPD), Mike Haas (Aerospace), Pam Sullivan (RSAS Factory GPOC)

- MGen Neil MacCasland, BGen Mashiko from the USAF

- Chris Scolese from NASA

- Mary Glackin, Abby Harper, and Gary Davis from NOAA; and

- MGen (ret) Mitch Mitchell (AMS lead). The Alternative Management Study was conducted by an independent team spanning 3 years and over 2 phases. The second phase, led by MGen Mitchell, looked at the internal NPOESS management and contractor structures.

The third set of meetings were held in January 2009 at the contractor facilities in El Segundo, CA. Interviews were held with contractor senior executives, including Ron Sugar (CEO, Northrop Grumman) and Bill Swanson (CEO, Raytheon).

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Approach (2/2)

- **February 12, 2009: Fourth Meeting**
  - **February 12: Received TJAT Brief; team discussions on findings, recommendations**
  - **February 18 : Brief at NOAA PMC**
- **March 3,4, 2009: Pre-EXCOM mtg; Brief to EXCOM**
- **April 29, 2009: Fifth Meeting**
  - **Received and discussed initial Quick Look results of Alignment Study from RADM (ret) Vic See. Reviewed draft results**
- **May 15, 2009: Coordination Draft Report distributed to IRT**
- **June 1, 2009: Report submitted**

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At the fourth meeting held in February 2009, the IRT received the Tri-agency Joint Assessment Team (TJAT) brief, and held detailed discussions with Mary Kicza (NOAA), Josh Hartman (DoD), Mike Freilich (NASA), as well as with Dan Stockton and Gary Davis. Additional contractor discussions were held, and the IRT spent a working session developing findings and recommendations.

Numerous action items were generated from these meetings, and answers were quickly supplied to the IRT, reviewed and dispositioned.

On March 3, 2009, the IRT held a pre-brief meeting to discuss findings and recommendations prior to the EXCOM held on March 4, 2009. At the EXCOM, Mr. Tom Young presented the IRT findings and recommendations, summarizing them into ten key observations and two potential program responses. One of the recommendations from the IRT was to investigate aligning the IPO with a space acquisition center. During the closed Executive Session following the open EXCOM meeting, the principals assigned an action, documented in revised EXCOM minutes published on April 1, 2009, for the IRT to develop pro's and con's for two alignment alternatives: The Air Force Space and Missile Systems Center or the NASA Goddard Space Flight Center.

Following receipt of the minutes, the IRT tasked Vic See to look at the advantages and disadvantages of aligning the IPO with either NASA's Goddard Space Flight Center or the USAF's Space and Missile Systems Center. He presented a status and an assessment of his research at the April 29th meeting.

On May 15, 2009 the Coordination Draft Report was distributed to IRT.

On June 1, 2009, this report was submitted.

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Summary

NPOESS is a national priority - it is a critical enabler for national security, weather forecasting, emergency response, and climate research. NPOESS is vitally important, and in the IRT's opinion, it cannot be successfully executed with the current management construct and within the current funding and scheduling constraints.

The tri-agency team must work more closely and effectively together, garner White House support, and aggressively address these findings. If the status quo continues, there is an extremely low probability of success.

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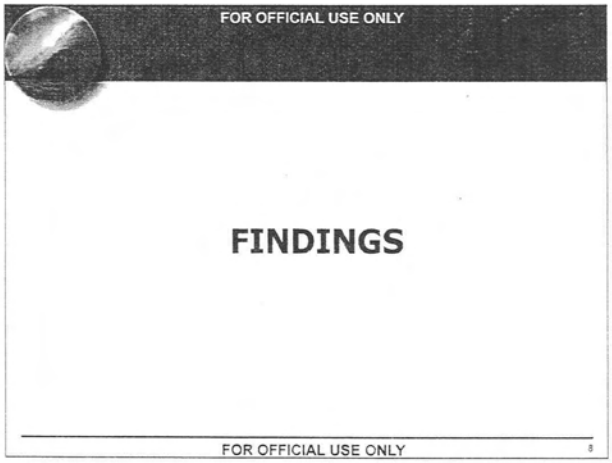

This section presents the Findings of the IRT. These Findings are organized similar to the discussion and presentation flow held at the EXCOM on March 4, 2009.

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Findings

Highlighted below are key findings and observations of the IRT, followed by recommendations to address these shortfalls and enhance program success

1. **The current NPOESS program has an extraordinarily low probability of success**
2. **Continuity of data – a critical priority from the user community – is at significant risk of realizing gaps in coverage that may be measured in years**
3. **NPOESS is being managed with cost as the most important parameter and not Mission Success**
   - **Award Fee incentivizes cost performance with insufficient focus on high risk, critical tasks, and on mission assurance/success**

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1. The current NPOESS program has extraordinarily low probability of success: It is the IRT's assessment that the current program cannot be successfully executed within the constraints of cost, schedule, performance, and with the current management construct. Many of the following findings and observations will support this principle finding, and identify more specific areas to address to enhance program success.

2. While continuity of data is a critical priority for all users, it is at extreme risk: If all satellites are delivered on schedule, launched without incident, and meet their full design life, there will be no significant gap in capabilities. In keeping with historical trends, there is a high likelihood of early problems with the first few satellites. If NPOESS exhibits similar characteristics, there will be a minimum gap of several months. If there is a launch failure – a 41% chance of occurring over the remaining DMSP launches, NPP and NPOESS – there is a high likelihood of a gap measured in years (note: 41% based on the Success Probability used in the Aerospace GAP analysis). The NPOESS Preparatory Project (NPP) – once a key risk reduction activity for NPOESS – is now a critical asset to help mitigate these potential gaps in operational coverage. (see also #8)

3. NPOESS is being managed with cost as the most important parameter: One observation of this cost priority is reflected in the award fee structure and its emphasis on cost control. Successful space acquisition requires mission success to be the top priority not cost as the overarching factor. It is the IRT's belief that best way to control cost is to manage quality and focus on mission success. In turn, this quality focus will have the lowest cost in the long run.

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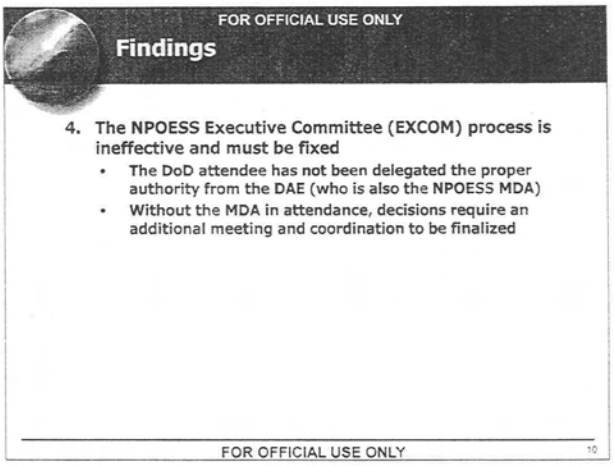

4. The EXCOM process is ineffective: The EXCOM is intended to be a decision body to provide streamlined direction to the PEO. The current DoD EXCOM representative has not been delegated the proper authority from the Defense Acquisition Executive (DAE), who is also the NPOESS Milestone Decision Authority (MDA), and decisions require an additional meeting and coordination to be finalized. Additionally, the IRT has observed that many of the topics that are discussed at the EXCOM delve too deeply into program details and many critical top level issues are left unresolved.

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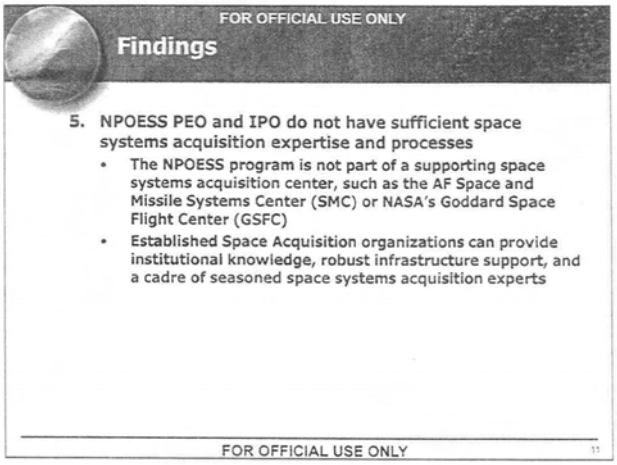

5. The PEO and IPO do not have sufficient space systems acquisition expertise and processes: The NPOESS program is not part of a supporting space systems acquisition center, such as the AF Space and Missile Systems Center (SMC) or the NASA Goddard Space Flight Center (GSFC). These types of established space acquisition organizations can provide institutional knowledge, robust infrastructure support, and a cadre of seasoned space systems acquisition experts. A program such as NPOESS has a questionable probability of success without the support capabilities of an acquisition center.

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Findings

6. **Funding shortfalls are causing the IPO to make short-sighted decisions to cover VIIRS cost growth and stay within allocated budget at a significant increase to out-year costs and program risks**
   - **One example: Contractor was directed to delay part buys for C2 and beyond to save < $10M near term. In doing so, the program lost the opportunity for bulk buying and sparing while increasing the risk of obsolescence and redesign**
7. **Highest probability of success is to retain the current contractor team, Northrop Grumman Space Technology (NGST) and Raytheon Space and Airborne Systems (RSAS)**

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6. Funding shortfalls are causing the IPO to make short-sighted decisions to cover VIIRS cost growth and stay within allocated budget at a significant increase to out-year costs and program risks: While the IPO has no choice but to make these decisions, risk is being deliberately built into the program to stay within allocated budget. Two examples: 1) After the System CDR in April 2009, contractors will immediately begin lay-offs to the spacecraft team to save near-term dollars. Not only will reconstituting the team be difficult, but the spacecraft development will now be on the critical path for the NPOESS C1 launch; 2) VIIRS parts purchases are now spread out, losing block buy purchase savings, losing the flexibility of spares, and increasing the risk of parts non-availability and obsolescence with potential requalification costs.

7. The highest probability of success is with the current contractor team: Northrop Grumman Space Technology as the prime and Raytheon Space and Airborne Systems as the subcontractor for the Visible/Infrared Imager Radiometer Suite (VIIRS). A new team will cost at least as much, take at least as long, will further dilute limited near term funds, and will not provide any benefits to the probability of success. Although the best chance to achieve a VIIRS-like capability is with RSAS, it is unclear though, on what schedule and at what cost.

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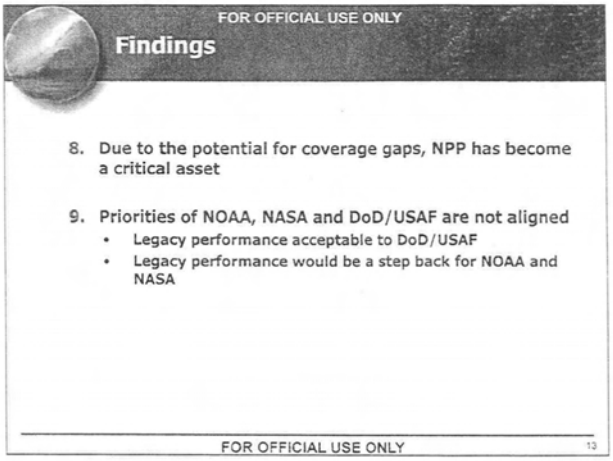

8. NPP has become a critical asset: As noted in Finding #2, with data continuity at significant risk, the NPOESS Preparatory Project has become a critical asset. While its value has diminished as a pathfinder and risk reducer for the NPOESS program, NPP can provide needed gap mitigation for this fragile and hardware poor constellation.

9. The priorities of NOAA, NASA and DoD/USAF are not aligned: The DoD has stated that while the program should continue to pursue the current NPOESS requirements, the DoD is willing to accept legacy performance (DMSP and POES) to maintain continuity, cost and schedule goals and is not willing to provide additional funding to pursue requirements beyond legacy. NOAA states that legacy performance would be a step back in today's performance because of their current operational use of NASA research satellites that are well beyond their design life. The NOAA requirements are reflected in the current Level 1 requirements, but because they are more than legacy, the requirements are characterized as objective vice threshold values. NASA has requirements similar to NOAA for climate data records. These differences are straining interagency relationships and are impacting how people do their jobs, even down to the lowest levels of the IPO. The IRT believes that this program will not survive if this particular problem is not addressed immediately.

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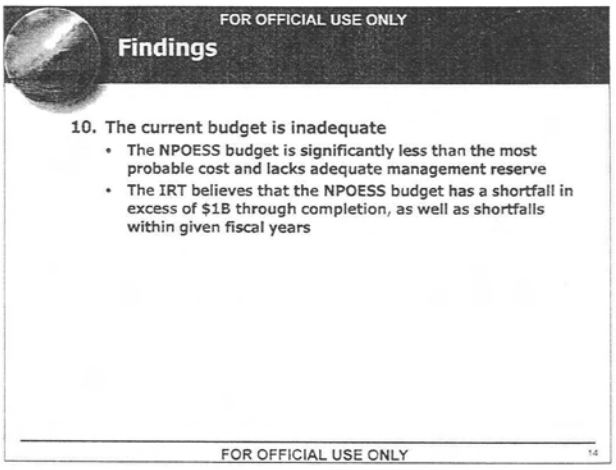

10. The current budget is inadequate: Budgeting to a 50-50 cost estimate leads to insufficient funding. It lacks sufficient management reserve, and as noted in Finding #6, this leads to programs using risk as its management reserve. The current budget is not at the 50/50 level. The most probable cost is at the 80/20 level including reserves. To fund at the most probable cost, the IRT estimates that the NPOESS budget has a shortfall in excess of $1B through program completion.

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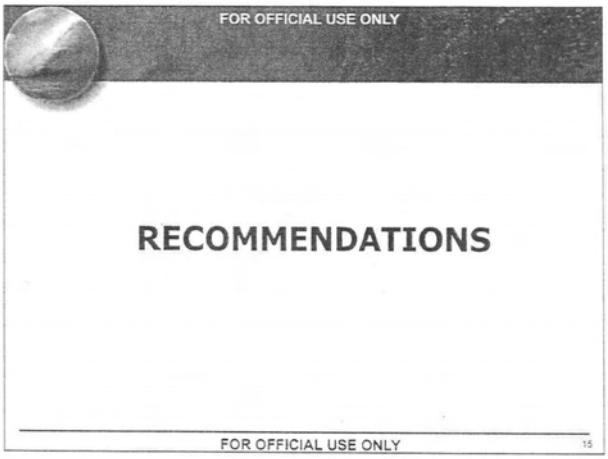

This section presents the Recommendations of the IRT. The Recommendations are organized to track against the Findings, and the flow is similar to the discussion and presentation held at the EXCOM on March 4, 2009.

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Recommendations

Recommendations:

1. To improve the probability of success for the NPOESS program, the following recommendations are provided to address the key findings
2. Proactively manage and mitigate the potential gap in continuity of coverage
   - Establish formal operational availability requirements
   - Move launch of C3 and C4 closer to C1 and C2
   - Exploit NPP data operationally
   - Institute Launch on Need philosophy for all remaining satellite vehicles (DMSP, METOP, and NPP)
3. Focus on Mission Success (not on cost) – Restructure Award Fee Plan

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1. The current NPOESS program has extraordinarily low probability of success:

Recommendation: To improve the probability of success for the NPOESS program, the following recommendations are provided to address the key findings. These recommendations attempt to protect operational data continuity, fix the management structure, strengthen infrastructure support, and increase budget or decrease program scope. These recommendations are provided in more detail below.

2. Continuity of data is at extreme risk:

Recommendation: Proactively manage and mitigate the potential gap in continuity of coverage. Treat all remaining and future polar-orbiting environmental assets as part of an integrated architecture. Establish formal operational availability requirements. Move production and launch dates of C3 and C4 closer to C1 and C2. Modify launch philosophy of all polar-orbiting environmental satellites to launch on need (or launch on failure). Use the NPOESS Preparatory Project (NPP) data, originally intended for risk reduction, as an option to mitigate potential data gaps. This will help but will not compensate for lack of spares in case of launch or early spacecraft failures.

3. NPOESS is being managed with cost as the most important parameter:

Recommendation: Change the culture throughout the program and focus on mission success. Change the award fee structure.

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Recommendations

Recommendations (continued):

4. Fix the EXCOM/oversight structure
   - Ensure the EXCOM members are the decision makers or have the appropriate authorities delegated to them
   - Focus the EXCOM topics on strategic issues and decisions
   - Follow streamlined process described in MOA, or modify the MOA to an acceptable management structure
5. Assign the development management responsibility of NPOESS to a space acquisition center
6. Increase near term funding

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4. The EXCOM process is ineffective:

Recommendation: Fix the management/oversight structure. For an EXCOM process to be effective, the EXCOM members must be the decision makers or have the appropriate authorities delegated to them. The EXCOM topics must also be focused on strategic issues and decisions, and not on tactical program issues. Follow the streamlined process described in the Memorandum of Agreement (Dec 2008), or modify the MOA to reflect an acceptable management structure.

5. The Program Office lacks space acquisition institutional support:

Recommendation: Assign NPOESS within a space acquisition center. Additional thoughts and considerations in aligning the IPO with a space systems acquisition center are provided in following sections of this report.

6. Due to inadequate funds, the IPO is forced to make short-sighted decisions to stay within budget at a significant increase to out-year costs and risks:

Recommendation: Increase near term funding. Fund to 80% confidence levels.

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Recommendations

Recommendations (continued):

7. **Continue and strengthen relationship with NGST and RSAS**
   - **Stop studying alternative VIIRS options, except to continue to protect the option to have AVHRR as a back up until VIIRS testing is complete**
8. **Use NPP data operationally**
9. **Resolve and establish clear program priorities**
10. **Fund the program by FY and through ETC to 80% cost confidence, including a management reserve of approximately 25%**

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7. The highest probability of success is with the current contractor team:

   Recommendation: Given the risk to continuity of operational polar environmental data, the least risk to a gap is to continue the development of the original NPOESS scope with Northrop Grumman and Raytheon. Stop studying VIIRS options. In addition to increased costs, the IPO efforts are fragmented by studying options instead of executing the program. Instead, only protect the option to have AVHRR as a back up until VIIRS thermal vacuum testing is complete.

8. NPP has become a critical asset:

   Recommendation: Use NPP operationally. The employment of NPP should be managed as a part of an integrated approach to the polar-orbiting environmental satellite architecture. (see Recommendation #2)

9. The priorities of NOAA, NASA and USAF are not aligned:

   Recommendation: This issue can only be resolved at the White House level. The White House should appoint a senior official or officials to establish the future course for NPOESS.

10. The current budget is inadequate:

    Recommendation: Fund the program (by Fiscal Year and through Estimate to Complete) to an 80-20 cost confidence including a management reserve of approximately 25%.

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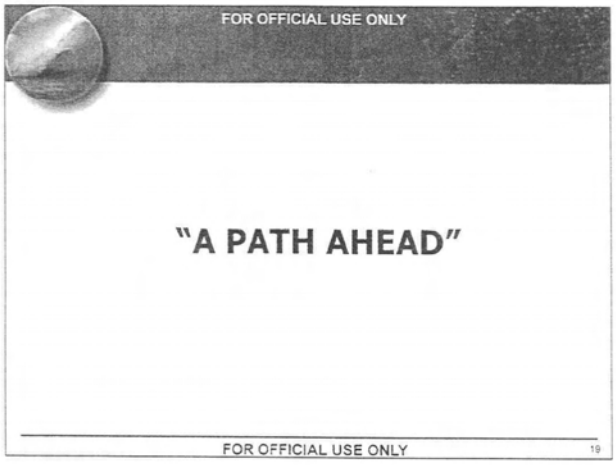

This section focuses upon "A Path Ahead" to establish the NPOESS program that is in the best interest of the country and a management approach that maximizes the probability of program success.

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A Path Ahead (1/6)

The IRT recommends the following priority actions:

- Establish a program by matching cost and schedule to accomplish Level 1 requirements and implementing the IRT recommendations on management structure and ensuring data continuity
  - Assess the affordability of the resulting program
- If the program is unaffordable, then adjust the scope to fit within the affordable profile with the resulting cost at the 80/20 level
  - Assess the acceptability of the program

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A program that responds to all requirements and corrective actions needs to be established for NPOESS. This program should provide the capabilities necessary to meet Level 1 requirements and include all of the IRT recommendations regarding management structure and data continuity. The resultant funding and schedule for this program should be adjusted to support an 80-20 cost confidence in each fiscal year and for the total program. The affordability of the resultant program and the associated funding should be assessed.

If the resultant program and level of funding are judged to be unaffordable then the scope of the program should be adjusted such that the reduced program scope can be accommodated within the level of the available funding at an 80-20 cost confidence level in each fiscal year and for the total program. The acceptability of this reduced scope program should be assessed.

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A Path Ahead (2/6)

- The IRT believes that the program which accomplishes all requirements will be judged by the DoD/USAF to be unaffordable
- The IRT believes that the program which fits with the current budget profile at an 80/20 level will be judged by NOAA and NASA to have inadequate performance
- The IRT believes that the EXCOM will be unable to resolve this difference
- This will require the White House to define the NPOESS program that is in the national interest

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Based upon the DoD/USAF stated priorities for NPOESS, its willingness to accept legacy capabilities and the associated cost, the IRT believes the DoD/USAF will be unwilling to budget an NPOESS program compliant with the level 1 requirements and the IRT recommendations to an 80-20 cost confidence level.

On the other hand, NOAA and NASA are unlikely to support a reduced program that will fit available funding based on an 80-20 cost confidence since the likely reductions in capabilities would represent a step back from the level of capabilities they are using today to meet forecasting and climate requirements.

The IRT believes that the EXCOM will be unable to resolve this difference. This leaves the White House as the only viable forum for the resolution and definition of the NPOESS program that best fits the national interests.

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A Path Ahead (3/6)

- The IRT offers the following considerations for the White House decision process:
  - The White House must decide the NPOESS program that is in the best interest of the country
  - The IRT believes that following this decision, the responsibility for program implementation must be assigned to one organization (USAF or NOAA)
  - The choice as to "which organization?" can be a function as to the selected program option
    - If the selected program meets the requirements of NOAA, NOAA should be assigned program implementation responsibility
    - If on the other hand, the selected program is constrained by current budget, either organization can be assigned implementation responsibility

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The IRT believes that, in addition to defining the NPOESS program that meets national interests, responsibility for the program's execution must be assigned to one organization (USAF or NOAA).

Should the selected NPOESS program option have requirements consistent with current Level 1 requirements, the logical choice would be the organization needing the improved capabilities above legacy, i.e., NOAA. If the decision is to constrain the program to be consistent with legacy performance and the associated budget, either NOAA or the USAF could be assigned the responsibility.

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A Path Ahead (4/6)

- The IRT believes that the managing organization should:
  - Have total acquisition responsibility and all resources including people, budget, and contracts,
  - Be allocated all currently planned and programmed NPOESS budget
  - Be responsible for funding the resulting program at 80/20

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The organization assigned management responsibility must have total acquisition responsibility including control and responsibility for all supporting resources and functions such as people, budget, and contracting.

Additionally, that organization should be allocated all currently planned and programmed NPOESS budget and then be responsible for funding the NPOESS program at an 80-20 cost confidence level.

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A Path Ahead (5/6)

- At the request of the EXCOM, the IRT evaluated the organizational options for the acquisition of NPOESS
- The conclusion of this evaluation is that either organization has the capability to implement NPOESS
- However, for this particular program the IRT recommendation is that the responsibility be assigned to NOAA with NASA as its acquisition organization
- This recommendation is based on the following factors:
  - NOAA has a broader responsibility for weather and climate requirements than any other organization
  - As such NOAA is a natural national advocate for this program

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At the March 4, 2009 EXCOM briefing of the IRT findings and recommendations regarding NPOESS, the EXCOM requested that the IRT evaluate the organizational alternatives for the acquisition of NPOESS. The conclusion of this evaluation is that either organization has the capability to execute the NPOESS program.

The IRT recommends that responsibility for NPOESS execution be assigned to NOAA with NASA acting as NOAA's acquisition organization. This recommendation is based on the following two factors: 1) NOAA has the broader responsibility for weather and climate than any other organization; and 2) This national responsibility of NOAA aligns well with the national character of the NPOESS program and makes NOAA the natural national advocate for the NPOESS program.

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A Path Ahead (6/6)

- Under this construct:
  - NOAA/NASA will provide all polar environmental data from the currently planned NPOESS system for all users
  - NOAA/NASA, in conjunction with DoD, must establish a process that also ensures future DoD needs will be satisfied
  - The EXCOM concept should continue to provide an interagency forum to assure effective program implementation

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Under this construct, NPOESS execution is assigned to NOAA with NASA as NOAA's acquisition organization, NOAA/NASA will provide all polar data from the NPOESS program to all users. Additionally, NOAA/NASA, working with DoD, must establish a process that will ensure that future DoD needs will be satisfied.

The current EXCOM concept should continue as an interagency forum to assure effective program implementation and address high level strategic and policy issues associated with NPOESS implementation.

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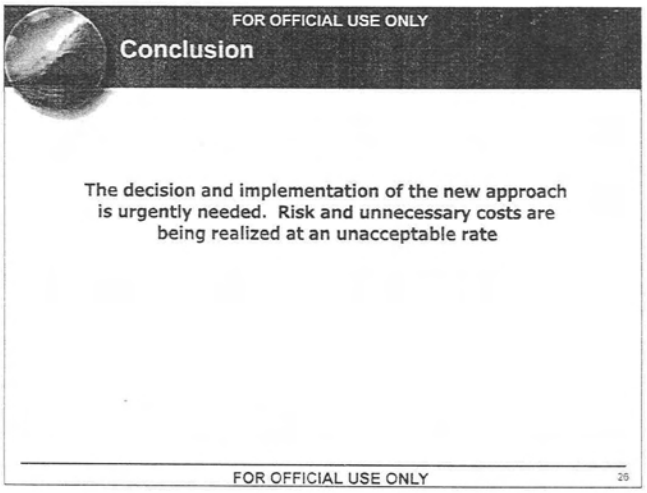
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Conclusion
The decision and implementation of the new approach is urgently needed. Risk and unnecessary costs are being realized at an unacceptable rate
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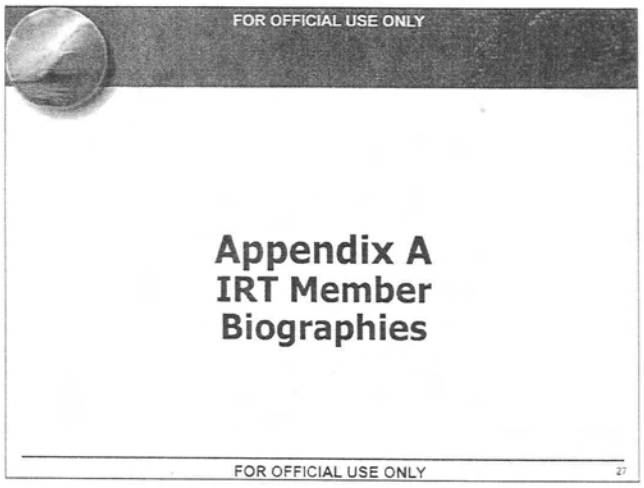
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Appendix A
IRT Member
Biographies
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IRT Members & Support

• **A Thomas Young**	IRT Chair
• **Dr. William F Ballhaus**	Member
• **RADM (ret) Thomas C Betterton**	Member
• **Maj Gen (ret) Donald G Hard**	Member
• **Jimmie D Hill**	Member
• **Col (ret) James Mannen**	Member
• **Dr. Berrien Moore III**	Member
• **Gen (ret) Thomas S Moorman**	Member
• **Joseph H Rothenberg**	Member

Support Staff:

Curt Munechika	Executive Secretary	Ernest Daddio	Executive Support
Dennis Berry	Executive Support	Mark Mulholland	Government IRT Lead
Barbara Golf	Executive Support	Capt Susan Lewis	IPO Liaison
Stephen Zini	IRT Coordinator	Mike Kimberling	Technical Advisor
RADM (ret) Vic See	Technical Advisor		

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This Independent Review Team (IRT) is composed of DoD General Officers, Director-level NASA personnel, NRO, Industry, and space, weather, and climate professionals. A brief biography on each member is provided in Appendix A.

Additionally, the Program Executive Officer for Environmental Satellites invited each of the NPOESS participating agencies to send an official observer to each of the IRT meetings. The designated official observers were:

- NOAA: Abigail Harper, NOAA NESDIS Deputy Assistant Administrator for Systems;

- Air Force: Major Riley Pyles, SAF/USAE, Program Element Monitor

- NASA: Andrew Carson, HASA HQ Earth Science Division, Science Mission Directorate

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IRT Members

1. **A. Thomas Young -- IRT Chairperson**: Former President and Chief Operating Officer, Martin-Marietta Corporation; former director, Goddard Space Flight Center; chair of numerous national-level space acquisition independent review panels; chair of NOAA GOES-R IRT; member, National Academy of Engineering

2. **Dr. William Ballhaus**: Retired President and CEO, Aerospace Corporation; Retired Corporate VP, Engineering & Technology, Lockheed Martin Corporation; and former Director, NASA Ames Research Center; Member, National Academy of Engineering

3. **Thomas Betterton, Rear Admiral, USN (Retired)**: former Director, NRO Program C; visiting professor and Space Technology Chair, Naval Postgraduate School; GOES-R IRT member

4. **Donald Hard, Major General, USAF (Retired)**: former deputy director, Secretary of the Air Force Office of Special Projects; former director of space acquisition, Secretary of the Air Force (SAF/AQS); GOES-R IRT member

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IRT Members

5. **Jimmie D. Hill**: Former Principal Deputy Assistant Secretary of the Air Force (Space) and Deputy Director, National Reconnaissance Office (NRO); Goddard Memorial Trophy recipient; GOES-R IRT member

6. **James Mannen, Colonel, USAF (Retired)**: Former (first) System Program Director, NPOESS; former program director, NRO classified programs; GOES-R IRT member

7. **Dr. Berrien Moore III**: Executive Director, Climate Central, Inc. Princeton, NJ; Chair, Committee on Earth Studies, Space Studies Board, National Research Council, The National Academies; former Director, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire

8. **Thomas Moorman, General, USAF (Retired)**: former Vice Chief of Staff, USAF; former Commander, Air Force Space Command; former Director, NRO Staff; former partner Booz Allen Hamilton; participant in numerous national-level space acquisition independent review panels

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IRT Members

9. **Joseph Rothenberg**: former Director, Goddard Space Flight Center and Associate Administrator for Space Flight, NASA HQ positions; Chief Customer Service Officer, President and Board member, Universal Space Network; GOES-R IRT member

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