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**HEARING TITLED
DYSFUNCTION IN MANAGEMENT OF
WEATHER AND CLIMATE SATELLITES**

**BEFORE THE
SUBCOMMITTEES ON ENVIRONMENT AND OVERSIGHT
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES**

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Good morning Chairmen Stewart and Broun, Ranking Members Bonamici and Maffei, and Members of the Committee. I am Mary Kicza, the Assistant Administrator of NOAA's National Environmental Satellite, Data, and Information Service (NESDIS). Thank you for the opportunity to join Mr. David Powner from the Government Accountability Office (GAO), and Mr. Marcus Watkins from the National Aeronautics and Space Administration (NASA) at today's hearing. While I will focus my remarks on NOAA's Joint Polar Satellite System (JPSS) and Geostationary Operational Environmental Satellite-R (GOES-R) Series Programs, I am ready to address questions on NOAA's entire satellite acquisition portfolio.

NOAA's mission to provide science, service, and stewardship to the Nation is fundamentally dependent on observations of our environment. These observations are the backbone of NOAA's predictive capabilities. NOAA must ensure operational weather, ocean, climate, and space weather data are available seven days a week, 24 hours a day, to address our Nation's critical needs for timely and accurate forecasts and warnings of solar storms and severe weather, such as hurricanes, flash floods, tsunamis, winter storms, and wildfires. Of the data actually assimilated into NOAA's National Weather Service (NWS) numerical weather prediction models that are used to produce the longer term weather forecasts three days and beyond, over 95 percent comes from satellites, of which over 80 percent are from polar-orbiting satellites. These polar-orbiting satellites include NOAA's Polar-orbiting Operational Environmental Satellite (POES), Suomi National Polar-orbiting Partnership (Suomi NPP) satellite, and NASA Earth Observing Satellites (EOS) in the afternoon orbit, and the European Metop satellites which fly in the mid-morning orbit. GOES satellites, along with Doppler Radar, assist operational weather forecasters with current and short-term forecasting abilities (i.e., weather that is occurring now up to three days in the future) and severe weather warning forecasts.

The American public and the commercial sector expect that they can continue to rely on receiving accurate, reliable, and timely weather information from NWS. The growing private weather sector, which delivers specialized weather information, is another consumer reliant on

receipt of these data. NOAA's satellites are an integral part of the observational infrastructure that supports these NWS and commercial sector forecasting capabilities.

My testimony today will focus on the progress that NOAA, with NASA as our acquisition agent, is achieving in developing the Nation's next generation geostationary and polar-orbiting satellite systems, the GOES-R Series and JPSS Programs. While these geostationary and polar-orbiting systems provide the backbone of data that drive the NWS numerical weather prediction models, NOAA augments its observational needs by leveraging data from research satellites (e.g., NASA EOS and Advanced Composition Explorer); by using data from Department of Defense satellites (e.g., Defense Meteorological Satellite Program); by purchasing data from the commercial sector (e.g., lightning data and space-based Synthetic Aperture Radar); by implementing international agreements to ingest data from partner organizations (e.g., Metop data, Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) data); and by jointly procuring satellite systems through domestic (e.g., Deep Space Climate Observatory (DSCOVR) refurbishment) and international partnerships (e.g., Jason-3 acquisition).

Over the past five years, NOAA has made strategic and deliberate steps to return to an over 40 year partnership with NASA for acquisition of NOAA's operational satellites. This renewed partnership leverages the acquisition and developmental expertise of NASA to provide systems engineering and procurement support on a fully reimbursable basis. This decision continues a partnership that has supported an unprecedented series of successful launches of NOAA's geostationary and polar-orbiting operational satellites and enables in-depth technical management and systems engineering oversight of NOAA's satellite acquisition portfolio.

I am pleased to report this partnership continues to enable us to stabilize management structures, staffing, requirements, and program oversight. This has led to the completion of key program milestones, and gives us confidence that we will meet the cost, schedule, and performance milestones that lie ahead.

Our recurring challenge is being able to plan and execute our programs in the difficult budget environment we all face at this time. This requires the timely receipt of appropriated funds of the requested amounts, allowing these critical satellite systems to maintain their current development cadence, thereby ensuring the GOES-R Series and JPSS satellites are successfully launched and operating before the current legacy satellites cease to provide useful data. Without this, NOAA cannot guarantee that cost, schedule, and performance commitments can be met.

Over the past year, we were reviewed by David Powner's team, the Information Technology Team, at the GAO, the Department of Commerce Office of Inspector General (OIG), and independent review teams comprised of eminent aerospace experts. While the reviews looked at many specific areas of concern, all reviews urged us to remain focused on maintaining the continuity of our observational capability and being prepared to mitigate the impacts of a gap in coverage. The reviewers were mindful of the immediate and devastating impacts to the Nation that a gap in coverage would bring, starting with degraded forecast quality and skill, which could place lives and property at risk from severe weather events. We concur with the recommendations from these groups and are working to ensure the GOES-R Series and JPSS satellite development continues. The Committee has expressed concern that GAO added NOAA's satellite acquisition of the GOES-R Series and JPSS Programs to its Biennial High Risk

List due to the risk of gaps in weather observations. The steps that NOAA has been taking over the years to implement the OIG and GAO recommendations, and will take to implement these most current recommendations will address many of the root causes that the GAO High Risk report emphasized, specifically, the potentials for gaps in coverage and the impact on weather forecasts and on the customers and users of NOAA's satellite data. Additionally, the 2012 Independent Review Team (IRT) led by Thomas Young also provided invaluable recommendations that informed NOAA's FY 2014 Budget request and underscored the importance of refocusing the JPSS Program on a weather mission.

Progress on the GOES-R Series Program

The GOES-R Series Program is NOAA's next-generation geostationary environmental satellite constellation. Geostationary environmental satellites are our observational sentinels in space, providing constant watch for severe weather such as hurricanes, severe thunderstorms, flash floods, and wildland fires in the Western Hemisphere. With two geostationary satellites always in operation (GOES-East and GOES-West) and an on-orbit spare, we are able to track severe weather from the coast of Africa across to most of the Pacific basin. The GOES satellites complement *in situ* observational systems such as NOAA's Doppler Radar network, NOAA's Hurricane Hunters, and ocean buoys to provide NWS forecasters with near real-time data used to support operational weather forecasts.

GOES-R Series Program Content. The GOES-R Series Program content remains unchanged since the 2012 hearing, and progress is being made on the development of all the instruments which will provide continuity and needed enhancements of required weather and space weather data:

- Advanced Baseline Imager (ABI)
- Geostationary Lightning Mapper (GLM)
- Space Environmental In-Situ Suite (SEISS)
- Extreme Ultra Violet / X-Ray Irradiance Sensor (EXIS)
- Solar Ultra Violet Imager (SUVI)
- Magnetometer

GOES-R Series Program Progress. The GOES-R Series Program has made significant progress in its development, including:

- Delivery of the first GOES-R instrument, the Extreme Ultraviolet and X-ray Irradiance Sensor (EXIS) Flight Model 1 (FM1), which is ready to be integrated onto the GOES-R spacecraft.
- Completion of environmental testing of the Advanced Baseline Imager (ABI), the Solar Ultraviolet Imager (SUVI), and the Space Environment In-Situ Suite (SEISS). The ABI, SUVI, and SEISS will all be available for integration with the spacecraft by the end of 2013.
- Progress with the remaining GOES-R instruments, the Geostationary Lightning Mapper (GLM) and Magnetometer, which are on track for delivery in mid-2014.
- Significant progress on the development of the GOES-R spacecraft bus, which is on track to be available for instrument integration in 2014.

- Delivery of the first significant release of Core Ground System to the Government's Mission Operations Support Team located at the NOAA Satellite Operations Facility in Suitland, Maryland.
- Progress with the assembly and installation of GOES-R antenna structures at the Wallops Command and Data Acquisition Station in Wallops Island, Virginia and at the Remote Backup Unit (RBU) in Fairmont, West Virginia. These efforts are proceeding on schedule with four of six new antenna structures already complete.

GOES-R Series Program Cost. The GOES-R Series Program Baseline Report, dated February 8, 2013, reported to Congress that the lifecycle cost (LCC) for the GOES-R Series Program is \$10.860 billion for four satellites. Maintaining the GOES-R Series Program at the LCC reflected in the Baseline Report is dependent on NOAA receiving appropriations as requested in the Administration's annual budget requests. Given sequestration and rescission impacts, the FY 2013 enacted appropriations bill did not provide the level of funding required for the GOES-R Series Program as outlined in the Baseline Report. The GOES-R Series Program is still refining the cost impact of the FY 2013 appropriations bill to the LCC.

GOES-R Series Schedule. The GOES-R Series Program recently completed an assessment of the impact on the schedule due to the \$54 million reduction from the sequestration and rescission included in the enacted FY 2013 appropriations. The effects from these budget reductions continue to be assessed. The GOES-R Series Program continues, however, to work aggressively in order to have GOES-R and GOES-S ready as early as possible. We are confident that we can meet these adjusted launch date commitments for GOES-R and GOES-S given timely receipt of requested funding amounts moving forward.

2013 GAO Review of the GOES-R Series Program

NOAA was provided an opportunity to review the draft GAO recommendations and NOAA concurs with the four GAO recommendations for the GOES-R Series Program reflected in that document. We will review the final report and the recommendations contained therein and will work to address them.

These recommendations include direction to:

- include information and methodology for calculating the amount of reserve funding for each of the four satellites in the program in regular briefings to NOAA senior executives;
- improve sequencing of all activities to ensure there are adequate resources for the activities, and conduct a schedule risk analysis on the core ground systems and spacecraft schedules;
- improve communications with internal and external satellite data users on changes in GOES-R requirements;
- revise the satellite and ground system contingency plans to provide more information on the potential impact of a satellite failure, identifying alternative solutions for preventing a delay in GOES-R launch as well as timelines for implementing those solutions, and coordinating with key external stakeholders on contingency strategies.

With sufficient appropriations, as noted above, we will minimize the possibility of a gap of coverage in the geostationary orbit.

2013 OIG Review of the GOES-R Series Program

The OIG completed its most recent review of the GOES-R Series Program in April 2013. NOAA has developed action plans which it is implementing in response to these findings and recommendations.

Recommend that the NOAA Deputy Under Secretary for Operations:

1. Develop a comprehensive set of tradeoff approaches to mitigate launch delays and communicate approaches to stakeholders and users.
2. Keep stakeholders and users informed of tradeoffs made to meet the launch date.
3. Direct NESDIS to report periodically on the adequacy of program systems engineering integration and NASA systems engineering support.

Recommend that the NOAA Assistant Administrator for NESDIS ensure that NASA:

4. Effectively validates contractors' proposals and subsequent plans, to verify that technical designs meet readiness requirements per NASA standards.
5. Modifies contract award-fee structures to reduce award fee percentages and clearly articulates how scores should be adjusted based on the magnitude of cost overruns.
6. Adjusts future award fees to be more commensurate with contractor performance.

Recommend that the NOAA Deputy Under Secretary for Operations:

7. Direct the development of a policy for managing undefinitized contract actions to definitize change orders in the shortest practicable time.

We believe that implementing these recommendations will improve our overall management of the GOES-R Series Program.

2012 IRT Review

While the IRT provided an overall review of NOAA's satellite portfolio, the team stated that the GOES-R model of governance is most consistent with the principles for success, and that its program requirements were well defined for its weather and space weather mission. There were other recommendations such as streamlining reporting and the decision making processes that have benefited the GOES-R Series Program. The IRT cautioned that the GOES-R gap required vigilance and management attention.

Progress on the JPSS Program

NOAA's Polar-orbiting Operational Environmental Satellite (POES) series provides full global coverage for a broad range of weather and environmental monitoring applications. Placed in the afternoon orbit, NOAA POES and NASA EOS satellites are crucial for NWS's three to seven day weather forecasts and environmental modeling efforts. The current POES satellite, NOAA-19, was launched in early 2009 with a design life lasting until the second quarter of FY 2013. While it continues to operate, it is beginning to demonstrate some sensor deterioration. The Suomi NPP satellite, which was launched in October 2011 with a design life lasting until the first quarter of FY 2017 and is now operated by NOAA as a part of the JPSS Program, is providing

operational data to the NWS weather forecast models. Both NOAA-19 and Suomi NPP are providing coverage for the afternoon orbit. The European Metop satellite constellation (Metop A and Metop B), which flies in the mid-morning orbit, is also robust and NOAA uses these data in its numerical weather prediction models.

JPSS Program Content. The JPSS Program, as described in the President's FY 2014 Budget request, consists of three satellites: Suomi NPP, JPSS-1 and JPSS-2, and the associated ground system.

The JPSS Program has been refocused to support a weather mission and will fly the following core instruments:

- Advanced Technology Microwave Sounder (ATMS)
- Cross-track Infrared Sounder (CrIS)
- Visible Infrared Imaging Radiometer Suite (VIIRS)
- Ozone Mapping and Profile Suite (OMPS)-Nadir

While JPSS-1 will fly the Clouds and the Earth's Radiant Energy System (CERES) instrument, responsibility for funding the development of the follow on instrument has been transferred to NASA. NASA will also assume responsibility for funding continuity of the second Total Solar and Spectral Irradiance Sensor (TSIS) and the OMPS-Limb instruments. The responsibility for providing spacecraft bus and rideshare for the first TSIS, Satellite-assisted Search and Rescue instrument (SARSAT), and the Advanced Data Collection System (A-DCS) has been transferred out of the JPSS portfolio to a new NOAA program entitled Polar Free Flyer.

JPSS Program Progress. Over the past year, the JPSS Program has achieved the following successes:

- Completed and passed the DOC Milestone 2/3 and Key Decision Point (KDP)-I reviews which documented the cost and schedule commitment for accomplishing the development and operation of JPSS.
- Submitted, as part of the President's FY 2014 Budget request, a JPSS Program focused on NOAA's weather mission, revising the total program LCC to \$11.3 billion.
- Completed reconciliation with a DOC Independent Cost Estimate, which validated the revised program cost.
- Completed JPSS-1 Mission KDP-C in July 2013, which baselined its cost, performance, and schedule to launch in early 2017.
- Transitioned Suomi NPP Ground Operations from NASA to NOAA in February 2013.
- Completed assembly of all JPSS-1 instruments and advanced them to instrument level test phase.

JPSS Program Cost. Since the 2012 hearing before this Committee, the Administration has reduced the scope and content of the JPSS program to more narrowly focus on the weather mission. This reduction was achieved by transferring responsibility for non-weather instruments to NASA and other programs within NOAA, trimming content, and improving efficiency. This has resulted in a reduction of the JPSS Program LCC from \$12.9 billion as reflected in the President's FY 2013 Budget request to the current LCC of \$11.3 billion. This new cost commitment was affirmed by the recent KDP-I approval. That figure consists of the prior year costs of \$2.5 billion legacy costs from the earlier NPOESS program and \$2.6 billion appropriated

from FY 2010 through FY 2013 to implement the transition and beginning of the JPSS program, and a commitment of \$6.2 billion from FY 2014 to FY 2025. The latter total is required to operate the Suomi NPP satellite, finish building the JPSS-1 satellite, build the JPSS-2 satellite, continue development of the ground system, and perform the activities required to launch JPSS-1 and JPSS-2 and operate and sustain all three satellite missions in the JPSS portfolio, i.e., Suomi NPP, JPSS-1, and JPSS-2.

JPSS Schedule. The launch schedule for the JPSS-1 satellite in the second quarter of FY 2017 remains unchanged since the 2012 hearing. We have recently completed additional analyses which indicate that we are in a much better position to meet this schedule based on the progress made on ground and flight development and based on full funding provided in the FY 2014 House and Senate Marks. With respect to the JPSS-2 launch readiness date, with the refocusing of the JPSS Program to weather mission, NOAA has rephased out-year funding to bring forward the JPSS-2 launch to the first quarter of FY 2022.

2013 GAO Review of the JPSS Program

NOAA was provided an opportunity to review the draft GAO recommendations and NOAA concurs with the five GAO recommendations for the JPSS Program reflected in that document. We will review the final report and the recommendations contained therein and will work to address them.

The recommendations include direction to:

- track the extent to which groups of satellite data users are using Suomi NPP and JPSS products and obtain feedback on these products;
- establish a complete JPSS Program integrated master schedule that includes a logically linked sequence of activities;
- address the shortfalls in the ground system and spacecraft component schedules outlined in the report;
- update the joint cost and schedule confidence level for JPSS-1, if warranted and justified after completing the integrated master schedule and addressing shortfalls in component schedules; and
- establish a comprehensive contingency plan for potential satellite data gaps in the polar orbit that is consistent with the contingency planning best practices identified in this report. The plan should include, for example, specific contingency actions with defined roles and responsibilities, timelines, and triggers; analysis of the impact of lost data from the morning orbits, and identification of opportunities to accelerate the calibration and validation phases of JPSS-1.

Refocusing the JPSS Program to a weather mission and moving content to other programs has improved our confidence on meeting the second quarter FY 2017 launch readiness date for the JPSS-1 satellite, thereby minimizing the possibility of gaps in data coverage noted in the GAO's "High Risk" report. While there is still a risk of a gap in coverage, recent analyses and assessments have increased our confidence that we will launch JPSS-1 in the second quarter of FY 2017. This, coupled with a rigorous management regime for the Suomi NPP satellite to preserve operating life, gives us confidence that if the satellite continues to perform as expected,

we will significantly reduce risk of a gap of coverage in the afternoon orbit. However, sufficient funding is required to ensure that we maintain the current acquisition schedule.

2013 OIG Review of the JPSS Program

The OIG has not yet completed its 2013 review. The JPSS Program continues to provide full and open access to the employees and records to the OIG as they carry out their review. We remain ready to review their findings and recommendations.

2012 IRT Review

The IRT findings and recommendations were organized in five areas of concern:

1. Oversight and Decision Process
2. Governance
3. JPSS Gap
4. Programs, and
5. Budget

Significant changes have been implemented at the Department of Commerce, NOAA, and NASA in response to the IRT recommendations. Most notably, the JPSS program, as reflected in the President's FY 2014 Budget request, was modified to focus on NOAA's weather mission, with the JPSS-2 schedule for launch accelerated. Oversight, decision processes and governance have been both streamlined and clarified. The DOC, NOAA, and NASA teams are currently in the process of reviewing with the IRT our responses to their recommendations.

Looking to the Future

As we look to the future, NOAA is aware that the challenges we face require examining and reaffirming the core activities that the Government must provide and excel at, while looking at possible roles that partnership with the commercial sector and international community can provide. For example, this Committee has issued a challenge to NOAA to extend tornado warning lead times to one hour. As we work to address the fundamental warning paradigm shift this challenge would entail, we will require input from the entire NOAA enterprise. As a major data provider for weather forecasting, NESDIS is working with NWS and NOAA's Office of Oceanic and Atmospheric Research to assess the best means of approaching this challenge from scientific, technological, and human behavioral dimensions.

A first and crucial step towards meeting this challenge is to minimize any potential for gaps in coverage between the handoff from the current capabilities that NOAA's satellite constellation provide to the next generation GOES-R and JPSS Programs. In addition, NOAA remains focused on retaining our current forecasting skill and making incremental improvements towards providing as much advance warning as we can to protect lives and safeguard property from severe weather events.

The importance of NOAA's relationship with the aerospace industry is another integral aspect in meeting such challenges. Most of the instruments, all of the spacecraft buses, and much of the ground systems and data processing capabilities that will support the GOES-R Series and JPSS

Programs are being developed by the aerospace industry under contract to either NASA or NOAA. Moreover, NOAA is considering commercial rideshare opportunities for the first TSIS instrument, satellite assisted search and rescue (SARSAT) and the Advanced Data Collection System (A-DCS) instruments.

On the international front, NOAA continues to support and strengthen international partnerships that help us to maintain continuity of geostationary and polar-orbiting satellite observational capability. To that end, I offer the following important updates:

- NOAA signed a new agreement with its European operational satellite counterpart, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) that provides a broad policy framework for all of its wide-ranging cooperative activities. Building on a 30-year relationship, this agreement commits both to continued cooperation in the areas of geostationary backup support, joint ocean altimetry satellite development and operation (Jason series), and our JPSS, whereby NOAA and EUMETSAT each operate a polar-orbiting satellite in one of the two key orbits required for weather forecasting (NOAA will operate JPSS in the "afternoon" orbit).
- NOAA is working with the Japan Aerospace Exploration Agency (JAXA) to receive and process data from its first Global Change Observation Mission-Water (GCOM-W1) satellite, which carries the Advanced Microwave Scanning Radiometer (AMSR-2) instrument. These data help NOAA conduct assessments of precipitation, water vapor amounts, wind velocity above the ocean, sea surface temperature, water levels on land areas, and snow depths.
- Partnerships with the Canadian and French Space Agencies have been reaffirmed, with these agencies providing the satellite-assisted search and rescue (SARSAT) and the Advanced Data Collection System (A-DCS) instruments planned for launch by the NOAA Polar Free Flyer Program.
- NOAA has reaffirmed partnerships with our European and Japanese space partners for back-up support in the event of a catastrophic loss of NOAA GOES or POES/Suomi NPP satellites.

With funds provided by the Public Law 113-2, "*Disaster Relief Appropriations Act of 2013*," NOAA is implementing a number of strategic actions designed to make its weather forecasting enterprise more robust in the face of the possibility of a gap in polar-orbiting weather data. These activities seek to make better use of existing data, take advantage of new data sources planned in the future, improve operational high performance computing capacity, and improve the assimilation of data into weather prediction models, including hurricane models. The goal is to minimize the impact of a gap in coverage should it become a reality. While none of these activities, individually or collectively, can totally replace a lack of JPSS data, they represent the positive actions NOAA can take to mitigate the loss of these data. Should a data gap not occur, these investments will nonetheless improve NOAA's ability to use existing data, thus improving weather forecasts. These actions are being taken in addition to the steps NOAA is taking to ensure that JPSS and GOES-R Series satellite development continue as planned.

Meeting the customers' needs remains the most important part of this acquisition process. As the GOES-R Series Program enters the phase where the first satellite will be launched, it has ramped up outreach and interaction with the NWS and external weather forecasting communities to

inform these current users of the advances that GOES-R data will provide and how it will assist weather forecasters.

NOAA is using the Suomi NPP data to demonstrate the significant enhancements that these data are providing compared to the POES data currently being provided by NOAA-19 and NASA EOS satellites. This overlap of coverage allows users to characterize the utility of Suomi NPP data with the assurance of having the NOAA-19 and NASA EOS data on-hand to meet their immediate mission requirements.

We are cognizant that each day is a day closer to the eventual retirement of the current legacy satellites: the GOES-N Series, NOAA-19 and the NASA research satellites. This reality underscores the urgency that we must maintain the current development schedule to ensure that the first JPSS satellite is launched no later than the second quarter of FY 2017.

We rely on your continued support to ensure that these critical programs are fully funded in FY 2014 and beyond.

Conclusion

I will conclude by reaffirming that the NOAA-NASA partnership is strong and is supporting the good progress that the GOES-R Series and JPSS Programs are making. Stability of funding in FY 2014 and beyond is critical for meeting developmental milestones that will allow these programs to meet their launch dates. NOAA shares the concern of the Congress that gaps in coverage would significantly impact our ability to provide the weather coverage that the American public and commerce rely on. NOAA and the Department of Commerce thank the GAO for the very important contributions they are making to these programs. Mr. Powner and his team's recommendations offer us the opportunity for continuous improvement as we move forward to maintain the continuity of the operational environmental satellites that are so crucial to protecting American lives and property. Further, we express our appreciation to the members of the IRT and the OIG staff who have also provided significant and valuable review and recommendations. We accept their recommendations and will be responsive to them.

Finally, I wish to say that NOAA values the long-standing interest by the Committee and its staff regarding NOAA's satellite program. We understand the difficult fiscal environment that we find ourselves in and appreciate the Congressional support to ensure that these critical national programs are supported to the maximum extent possible. I am happy to answer any questions you may have.