U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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Accessible Version

Congressional Committees

Defense Weather Satellites: Analysis of Alternatives Is Useful for Certain Capabilities, but Ineffective Coordination Limited Assessment of Two Critical Capabilities

The Department of Defense (DOD) uses data from military, U.S. civil government, and international partner satellite sensors to provide critical weather information and forecasts for military operations. As DOD's primary existing weather satellite system—the Defense Meteorological Satellite Program (DMSP)—ages and other satellites near their estimated end of life, DOD faces potential gaps in its space-based environmental monitoring (SBEM) capabilities which may affect stakeholders that use SBEM data, including the military services, the intelligence community, and U.S. civil agencies such as the National Oceanic and Atmospheric Administration (NOAA). After two unsuccessful attempts to develop follow-on programs from 1997 through fiscal year 2012, including the National Polar-orbiting Operational Satellite System (NPOESS), a tri-agency program between DOD, NOAA, and the National Aeronautics and Space Administration that was canceled in 2010 because of extensive cost overruns and schedule delays, DOD and other stakeholders who rely on SBEM data are now in a precarious position in which key capabilities require immediate and near-term solutions.[1] With potential capability gaps starting as early as this year, it is important for DOD to make decisions in a timely manner, but based on informed analysis that considers stakeholder input.

From February 2012 through September 2014, DOD conducted a requirements review and an analysis of alternatives (AOA) to identify and compare the operational effectiveness and life cycle costs of potential solutions for providing SBEM capabilities.[2] An AOA—a key analysis in DOD's acquisition process—is intended to inform a decision on the most cost effective solution for meeting validated capability requirements and identify a wide range of solutions with a reasonable likelihood of providing the needed capabilities. DOD conducted the SBEM AOA in two phases:

- Phase 1, which took place from October 2012 into March 2013, examined 12 potential capability gaps to determine the military utility—or operational benefit—and operational risk of each gap.

[1] In May 1994, a Presidential Decision Directive required DOD and the Department of Commerce through NOAA to converge their two separate weather satellite programs into a single program capable of satisfying both military and civilian requirements. Presidential Decision Directive NSTC-2, *Convergence of U.S. Polar-Orbiting Operational Environmental Satellite Systems* (May 5, 1994). The NPOESS program started in 1997; after it was cancelled in 2010 DOD was given responsibility for covering the early morning polar orbit and started a separate program, the Defense Weather Satellite System. The program was cancelled in fiscal year 2012 because of cost and timing considerations. NOAA has developed the Joint Polar Satellite System to meet its responsibility for coverage in the afternoon orbit.

[2] This period includes the development of study guidance and a study plan for the AOA, and the Joint Requirement Oversight Council's review of the AOA. The analysis took approximately 10 months to complete, from October 2012 into July 2013, followed by 3 months to prepare the final AOA report, issued in October 2013.

- Phase 2, which took place from March 2013 into July 2013, assessed potential solutions for meeting the gaps, focusing on 3 of the capabilities identified in Phase 1 as potentially requiring a space-based solution.

The Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act (NDAA) for Fiscal Year 2015 included a provision for us to review the SBEM AOA.[3] This report formally transmits the briefing we provided to congressional staff on October 20 and 21, 2015, as well as the final results of our work. See enclosure I: *Department of Defense (DOD) Weather Satellites: Briefing to Congressional Defense Committees*. The briefing addressed (1) The extent to which the SBEM AOA addressed input from stakeholders and assessed the range of alternatives for potential solutions and (2) the extent to which the AOA informed DOD's plans for providing SBEM capabilities.

In addition, Senate Report No. 114-49 to accompany S. 1376, a bill for the NDAA for Fiscal Year 2016, included a provision for us to evaluate whether launching the last DMSP satellite, DMSP-20, is the most cost-effective solution for covering an expected SBEM data gap over the Indian Ocean; however, in conducting this review, we found that there was limited cost information to make this determination. Moreover, during the course of our audit work, DOD moved to terminate DMSP-20 in December 2015 due to lack of funding for fiscal year 2016.[4] Nevertheless, because the launch of DMSP-20 is related to issues raised by the AOA, the enclosed briefing slides discuss potential impacts of not launching the satellite. Also, the relatively high costs of integrating, storing, and launching DMSP-20—estimated at over $400 million—have been important factors in weighing whether to launch the last satellite. Storage costs alone, including the costs of maintaining contractor support and a launch-readiness posture, have accounted for a significant portion of these costs—our related recent report found the costs of storing DMSP-20 to be $40 million annually.[5]

To determine the extent to which the SBEM AOA addressed the input of stakeholders and assessed the range of alternatives for potential solutions, we reviewed relevant DOD and GAO documents to develop an understanding of the requirements and guidance for conducting an AOA. We reviewed the AOA documents and interviewed DOD officials involved in conducting and reviewing the AOA to understand how it was developed. We also interviewed users and providers of DOD SBEM data (stakeholders), such as military service, intelligence community, and NOAA officials, to gain their perspectives on how stakeholder views were incorporated into the AOA. We also interviewed industry officials about ways to effectively assess options for providing SBEM capabilities. To determine the extent to which the AOA informed plans for providing SBEM capabilities, we reviewed documents and interviewed DOD officials about plans and decision making processes for providing future SBEM capabilities, including decisions about launching DMSP-20, the coverage it may provide, and related cost estimates, to the extent they were available. We also reviewed documents and interviewed NOAA officials about activities of the international SBEM community, including international partners, to understand those potential effects on DOD's plans.

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[3]Pub. L. No. 113-291 §1612(a)(3) (2014).

[4]The Explanatory Statement of the Consolidated Appropriations Act, 2016, Pub. L. No. 114-113 (2015) provided for a $89,351,000 reduction of the DMSP fiscal year 2016 budget request, and a rescission of $50,000,000 from the fiscal year 2015 procurement funds for DMSP. 161 Cong. Rec. H9693 at H9928 (Dec. 17, 2015).

[5]GAO, *Space Acquisitions: DOD Needs More Guidance on Decisions to Store Satellites*, GAO-15-97R (Washington, D.C.: Dec. 9, 2014).

We conducted this performance audit from May 2015 to March 2016 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.

In summary, DOD conducted a thorough assessment of some capabilities, but pressures to complete the AOA in time to inform budget planning and decision making for near-term needs imposed limitations on the analysis of the military utility of the two highest-priority capabilities in Phase 1 of the AOA. In addition, DOD did not effectively collaborate with NOAA—the agency that, on a case-by-case basis, represents DOD's interests in international partnerships regarding SBEM data. The lack of formal coordination and collaboration with NOAA, such as employing a mechanism that identified roles and responsibilities for the two agencies during the AOA, contributed to an incorrect assumption about the continued availability of critical data from European satellites. As a result, cloud characterization and theater weather imagery were not as thoroughly analyzed for potential solutions in Phase 2. Despite the limitations of the AOA, it offered analysis that was useful for informing plans for a space-based solution for three capabilities with near-term needs. In addition, the AOA determined that most of the remaining eight capabilities with military utility could be covered by other assets or addressed with modeling development.[6] However, the AOA is less useful as a decision making tool in support of plans for the two highest-priority capabilities, cloud characterization and theater weather imagery data, for which it did not fully evaluate potential solutions.

The SBEM AOA Was Thorough in Some Areas, but Limited Stakeholder Coordination Affected the Range of Alternatives Assessed

Ideally, DOD could have conducted an AOA for SBEM capabilities when it was pursuing new acquisitions in the aftermath of the NPOESS cancellation in 2010, in order to provide analysis with a long-term focus. Instead, DOD initiated an AOA in 2012 with the goal of having the results of the analysis in time to plan for the fiscal year 2015 budget. There is no standard time frame for conducting an AOA, and DOD officials have stated that AOAs are always limited in time and resources. However, in prior work, we have concluded that conducting AOAs under compressed time frames in order to meet a planned milestone decision or weapon system fielding date can short-change a comprehensive assessment of risks.[7] Further, we concluded such AOAs may be completed too late in the process to inform effective trade discussions before a program begins development. Despite time constraints, DOD generally conducted a thorough review of the military utility of capabilities in Phase 1, including assessing the effectiveness of DOD providing, or not providing, a space-based solution for each capability. However, pressures to complete the AOA in time to inform budget planning and decision making for near-term needs imposed limitations on the analysis of the two highest-priority capabilities—cloud characterization and theater weather imagery—during Phase 1 of the AOA. This, in turn, affected the extent to which these capabilities were analyzed further for solutions during Phase 2. For example, according to

[6]The AOA study team determined that 1 capability—auroral characterization—out of the 12 capabilities initially identified, was not being used operationally and so did not warrant further assessment, leaving 11 capabilities to consider for Phase 2.

[7]In a review of over 20 programs with AOAs, we found that 7 of the programs conducted AOAs that were limited because of compressed time frames or concurrency with other planning activities. GAO, *Defense Acquisitions: Many Analyses of Alternatives Have Not Provided a Robust Assessment of Weapon System Options*, GAO-09-665 (Washington, D.C.: Sept. 24, 2009).

officials, the risk assessment of these two capabilities used a limited weather data set because of the time required to generate and process data.

The AOA team effectively engaged with a broad range of DOD stakeholders, though concerns were raised about the methodology used to assess some gaps in both phases of the AOA. Further, ineffective coordination with NOAA—which generally is the signatory to international agreements on space-based weather monitoring data sharing and represents DOD's interests with international partners on a case-by-case basis—affected the range of capabilities that were fully assessed in Phase 2 of the AOA.[8] Specifically, limited engagement with NOAA contributed to an incorrect assumption about the continued availability of critical data from European satellites. The Air Force's AOA Handbook advises AOA leaders to identify appropriate stakeholders and how they will be involved in the study and review process, including vetting results of the final analysis.[9] However, DOD did not have a formal coordination and collaboration mechanism that specified roles and responsibilities for DOD and NOAA in conducting the AOA. NOAA was not involved in reviews of the AOA or regular discussions with AOA study leadership, according to NOAA officials, and did not provide formal input during the AOA study period. While DOD made some efforts to communicate with NOAA representatives about European coverage over the Indian Ocean—the particular region of concern—such as through a discussion with a senior technical advisor, these efforts did not result in DOD determining the full risks of assuming that European coverage would continue. Moreover, during the time of the AOA study, publicly available reports from an international coordination group indicated uncertainty about extended European coverage over the Indian Ocean.[10] Despite this information, and the study team's inability to quantify the risk of relying on international partners in the future, the final AOA report determined that the likelihood the gap would not be filled was low, based on historical trends. As a result, the Office of the Secretary of Defense, Cost Analysis and Program Evaluation, and the Undersecretary of Defense for Acquisition, Technology and Logistics determined that the AOA team did not need to fully assess space-based solutions for the two highest-priority capabilities because it assumed that support from civil and international partners would suffice.

The analysis in Phase 1 of the AOA informed the range potential solutions, or alternatives, to be assessed in Phase 2. Based on the Phase 1 results, DOD chose to fully assess alternatives for 3 capabilities with near-term needs. For the remaining 8 capabilities with military utility, DOD determined they either had limited space-based utility or would be sufficiently provided by climatology and/or ground-based or U.S. civil government and international partner capabilities, and therefore would undergo an abbreviated Phase 2 assessment. Within the scope of three capabilities to be fully assessed, the range of options DOD evaluated was broad and included alternatives beyond replacing the existing system with the same concept. In prior work, based on an assessment of over 20 programs that conducted AOAs, we found that programs that employed such a practice tended to result in better cost and schedule outcomes than programs that examined a limited range of options.[11] DOD assessed alternatives for the remaining eight

[8]For example, NOAA represents DOD interest on programs such as the Joint Polar System.

[9]Office of Aerospace Studies, Air Force Materiel Command OAS/A9, *Analysis of Alternatives (AOA) Handbook: A Practical Guide to Analyses of Alternatives* (Kirtland Air Force Base, N.Mex.: July 2010).

[10]Coordination Group for Meteorological Satellites, *Report of the 41st Meeting of the Coordination Group for Meteorological Satellites* (Tsukuba, Japan: July 8-12, 2013); *EUMETSAT's Plans for Indian Ocean Coverage Beyond 2013*, CGMS-41 EUM-WP-15 v1a (July 2, 2013); and *Report of the 40th Meeting of the Coordination Group for Meteorological Satellites* (Lugano, Switzerland: Nov. 5-8, 2012).

[11]GAO-09-665.

capabilities to a limited extent, but did not assess alternatives for providing cloud characterization and theater weather imagery—deemed the highest-priority capabilities—as fully as the three capabilities with near-term needs.

The AOA Informed Plans for Some Capabilities, but Is Less Useful as a Decision Making Tool for Two Critical Capabilities

DOD made an effort to plan for future capabilities with a more cost-effective approach in mind, including considering which capabilities DOD needed to provide and which could be provided by leveraging other sources of data. For the 3 capabilities with near-term needs, the AOA offered thorough analysis that was useful for informing related plans. Based on the analysis, DOD is developing plans for the Weather System Follow-on (WSF) to provide ocean surface vector wind and tropical cyclone intensity capabilities, though it may not be available in time to avoid short-term gaps. For example, the current and only system that fully meets DOD's needs for ocean surface vector wind data is expected to reach end of life as early as this year. However, the planned WSF technology demonstration, which DOD officials said will partially meet the requirements, is estimated to launch in 2017, and the WSF system intended to fully meet requirements is estimated to launch in 2022. For the third capability, energetic charged particles, DOD has developed a plan to collect data by hosting sensors on other satellites.

The AOA is less useful for informing plans for the two highest-priority capabilities for which it did not fully assess solutions— cloud characterization and theater weather imagery data, now facing near-term gaps over the Indian Ocean.[12] Outside of the AOA process, DOD is now examining short-term options for mitigating those gaps, which include:

- continuing to rely on DMSP coverage through the end of life for DMSP-19,[13] and
- obtaining data from European and Indian partners.[14]

Longer-term plans for providing these capabilities are undetermined, though DOD is exploring options, which include continued or increased reliance on data provided by international partners. Given NOAA's role in coordinating with and obtaining space-based environmental monitoring data from international partners, DOD and NOAA officials have indicated that formal collaboration is key to ensuring DOD's interests are represented in international partnerships. Since the conclusion of the AOA study period in the fall of 2013, DOD and NOAA have increased their communication by discussing ways to leverage international partners' satellite data and the possibility of establishing and employing formal coordination and collaboration arrangements. One potential vehicle for formalizing collaboration is the recently re-established Committee for Operational Environmental Satellites, led by NOAA's Office of the Federal Coordination for Meteorology. While the committee does not necessarily focus on international

[12]The Air Force has been directed by the Joint Requirements Oversight Council to include performance parameters and mitigation strategies, including solutions that do not require the development or purchase of new DOD items, for cloud characterization and theater weather imagery in the capability development document for the DOD solution. According to some officials, related efforts include the review and re-assessment of assumptions in the AOA.

[13]In addition, DOD is still responsible for providing weather monitoring coverage in the early morning polar orbit. With the termination of DMSP-20, that coverage is currently estimated to last until 2020 and DOD has less time to determine how it will continue to meet that need.

[14]In July 2015, DOD also inquired with NOAA about the possibility of using one of NOAA's geostationary weather satellites to preserve coverage over the Indian Ocean. NOAA responded that, while technically feasible, potential limitations would need to be addressed, including ensuring the availability of a satellite as a spare.

partner issues, DOD officials have stated that it is one way DOD can connect with NOAA's international affairs officials. Our body of work on interagency collaboration has shown that establishing formal collaborative mechanisms and documenting agreements can help provide clarity about roles and responsibilities and support accountability.[15]

Conclusions

DOD's effort to analyze options in the SBEM AOA, including consideration of ways to leverage other sources of data, is a positive step toward a more cost-effective approach to providing SBEM capabilities, and for some of these capabilities, the SBEM AOA is useful for decision making. However, understanding the limitations of the SBEM AOA is important for informing sound decision making. As a result of the AOA's limitations, as well as cancellations of prior efforts to develop a follow-on system to DMSP, DOD is in a position in which it has to quickly initiate efforts to assess potential solutions for other near-term capability gaps that were not fully assessed in the AOA. Because decisions about whether to provide DOD solutions for SBEM capabilities are dependent on the availability of data from U.S. civil government and international partner satellites, sufficient and reliable information to determine the level of risk DOD is willing to take is crucial. Formalizing coordination and collaboration to identify roles and responsibilities in planning for SBEM capabilities could offer DOD and NOAA the opportunity to help ensure effective communication about the availability and reliability of data from U.S. civil government and international partner satellites and better inform decision making in the future.

Recommendation for Executive Action

To help ensure DOD is sufficiently informed about the availability and reliability of data from U.S. civil government and international partner satellites as it plans for future SBEM capabilities that rely on such satellites, we recommend that the Secretary of Defense ensure the leads of future SBEM planning efforts establish formal mechanisms for coordination and collaboration with NOAA that specify roles and responsibilities and ensure accountability for both agencies.

Agency Comments and Our Evaluation

DOD and NOAA, through the Department of Commerce, provided us written comments on a draft of this report. These comments are reprinted in enclosures II and III. DOD and NOAA also provided technical comments that have been incorporated where appropriate.

In its written comments, DOD disagreed with statements in our draft report that detailed alternatives were only developed for three capabilities—ocean surface vector wind, tropical cyclone intensity, and energetic charged particles. Specifically, DOD stated that the AOA developed alternatives capable of meeting all 12 capability gaps and examined the military utility assessed with the operational risk of all 12 gaps. We acknowledge that the alternatives included all capabilities assessed in the SBEM AOA that were determined to have military utility. However, the level of analysis applied to alternatives for the three capabilities with nearest-term needs was more detailed and thorough than the analysis of alternatives for the remaining capabilities, including the two highest-priority capabilities: cloud characterization and theater weather imagery. The AOA report itself acknowledged the focus of analysis on these three capabilities. DOD analyzed a total of 10 alternatives—1 representing the baseline option in

[15]GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, GAO-12-1022 (Washington, D.C.: Sept. 27, 2012); and *Interagency Collaboration: Implications of a Common Alignment of World Regions among Select Federal Agencies*, GAO-11-776R (Washington, D.C.: July 11, 2011).

which DOD would rely only on non-DOD assets to provide all capabilities; 7 primarily focused on various ways to provide ocean surface vector wind, tropical cyclone intensity, and energetic charged particles; and 2 that sought to address all capabilities either by leveraging alternative data sources as a more cost-effective approach to mitigating gaps, or by providing a DOD solution that would meet all minimum performance requirements.[16] While decision makers could have decided, on their own accord, to isolate the potential solutions for cloud characterization and theater weather imagery from the latter two alternatives, the range of options explored for those two capabilities were minimal as compared with the range of options for the three capabilities that were fully assessed. Specifically, in each of the two alternatives that included cloud characterization and theater weather imagery, one option was assessed for providing those capabilities. By comparison, seven alternatives were focused on various ways to provide ocean surface vector wind, tropical cyclone intensity, and energetic charged particles. The AOA laid out a valuable rationale for focusing on the capabilities that DOD really needed to provide instead of moving forward with DOD providing all capabilities on its own. Accordingly, we revised statements as appropriate so as not to imply that all 12 capabilities were not assessed early on in the analysis or that all 12 warranted a DOD solution. However, it is clear DOD missed an opportunity to more fully assess options for cloud characterization and theater weather imagery. As a result, DOD is now re-assessing ways to meet the near-term needs of its two highest-priority SBEM capabilities.

DOD also disagreed with statements in our draft report that time constraints imposed limitations on the analysis and its ability to inform decisions about whether to provide DOD solutions. DOD stated that the Senior Advisory Group that guided the AOA proceeded methodically and moved forward to new stages in the study only after achieving unanimous agreement that the preceding stages had been completed. In addition, DOD stated that the Study Advisory Group granted additional time when the Navy raised concerns about one requirement's minimum acceptable value. We recognize that AOAs are generally limited by time and resource constraints, and that DOD was faced with both constraints in conducting the SBEM AOA. Our statements regarding time constraints are to acknowledge this reality and to make transparent the fact that time limitations had an effect on the extent to which the AOA team could conduct some pieces of the analysis, such as exploring the utility of certain capabilities in additional planning scenarios and vignettes. While it is not possible to determine the potential outcomes such additional analysis may have generated, it is important to reiterate that in prior work we have concluded that AOAs conducted under compressed time frames have been limited, and may not have enough time to assess a broad range of alternatives and their risks.[17] As such, we believe limitations related to time constraints should be acknowledged. However, to avoid implying that time constraints were the root cause of all the issues we raise in our findings, we revised our report title and made other edits as appropriate, including noting that the Navy was provided additional time to conduct analysis.

In addition, DOD disagreed with statements in our draft report regarding modeling limitations. Specifically, DOD stated that the AOA used meteorological models that are currently used with the DOD Weather Centrals and by civil meteorological partners.[18] We do not contend that the AOA

[16]Ocean surface vector wind, tropical cyclone intensity, and energetic charged particles were assessed under one principal alternative with six excursions, for a total of seven alternatives.

[17]GAO-09-665.

[18]The DOD Weather Centrals include the 557th Weather Wing (formerly the Air Force Weather Agency), the Fleet Numerical Meteorology and Oceanography Center, the Naval Oceanographic Office, and NOAA's National Environmental, Satellite, Data, and Information Service. The centrals ingest and exploit weather data from satellites on a daily basis.

did not use current meteorological models; rather, and in keeping with the AOA findings, we acknowledge that some forecast models were determined to be insufficient to demonstrate the advantages of using space-based measurements to close gaps that were determined to have military utility. Multiple officials we interviewed confirmed this finding and stated that further development of models could help better leverage data sources going forward. However, we recognize that some capabilities, such as snow depth and soil moisture, have inherent limitations in being measured from space, and that the time required to develop sufficient models is difficult to predict. We believe that one of the positive outcomes of the AOA was to identify more cost-effective steps DOD could take to mitigate potential capability gaps, such as developing algorithms to more effectively process existing data. Accordingly, we revised our report so as not to suggest that a longer period for the AOA study could have enabled the necessary modeling development.

DOD also disagreed with statements in our draft report that the AOA did not fully capture the risk that coverage by international partner satellite systems, such as Europe's Meteosat, might not continue. DOD stated that the AOA was fully informed of the status of future plans of all civil and international partner systems, and that the AOA team had standing members from NOAA to ensure the team's analyses were informed by current data on those systems. We continue to uphold our finding that DOD did not effectively coordinate with NOAA officials to help ensure the department had sufficient information about plans for Meteosat and to adequately assess the related risk. While several NOAA officials were assigned to one of the AOA working groups, according to one NOAA participant, the interaction entailed receiving emails rather than participating in meetings or regular dialogue throughout the AOA. Regarding the status of and plans for international partner systems in particular, NOAA officials said they provided copies of their memorandums of agreement with international partners to DOD, but DOD did not make further attempts to discuss the issue with NOAA's international affairs office, which regularly interacts with international partners. DOD did consult with a knowledgeable representative serving as a senior technical advisor to NOAA at the time and discussed potential future coverage over the Indian Ocean, among other issues. However, the results of this discussion were presented to the AOA team as it was approaching Phase 2 of the study, at which point the assumption about continued support from international partners had already been established and used for the analysis, and the team was moving forward with assessing alternatives primarily focused on other capabilities.[19] Further, the representative said he told DOD that although the European agency had supported coverage over the Indian Ocean region in the past, there was no obligation to provide that coverage again in the future. During the AOA study period, publicly available reports confirmed this status, indicating uncertainty about extended Meteosat coverage of the region and stating that the European agency had not committed to providing coverage in the long term.[20] While the AOA study guidance directed the study team to conduct a comprehensive assessment of existing and planned future international partner

[19]The final AOA report states, as the first driving assumption for the study, that, "Baseline civil/international SBEM satellites will provide capabilities, as designed, for the duration of their projected lifetimes and this data will be available during the planning period. This assumption also implies that Europe, Japan, and the United States will have follow-on systems that match current capabilities, with the exception that there will be no follow-on to DMSP after the end of life of DMSP-20." It further states, "This means there will always be geostationary coverage" of several regions, including the Indian Ocean, "by U.S. and European satellites."

[20]These reports were published by the Coordination Group for Meteorological Satellites, which has a range of international member organizations, including NOAA and the European agency responsible for the Meteosat system, EUMETSAT. Coordination Group for Meteorological Satellites, *Report of the 41st Meeting of the Coordination Group for Meteorological Satellites*; *EUMETSAT's Plans for Indian Ocean Coverage Beyond 2013*; and *Report of the 40th Meeting of the Coordination Group for Meteorological Satellites.*

capabilities and the likelihood of their availability, the AOA team ultimately did not assess future plans and, as directed by the Study Advisory Group, did not attempt to quantify the risk. Despite this limitation and the information available at the time, the AOA team deemed the likelihood of the Indian Ocean gap not being filled as low, based on historical trends.

In concurring with our recommendation, DOD stated that the recommendation is consistent with current working-level engagements between DOD and NOAA, and that it will invite senior NOAA representatives to participate in future SBEM planning efforts and maintain frequent contact with NOAA during SBEM acquisition efforts to ensure DOD is informed of the plans and operational status of international partner systems. This is a positive step. However, we believe DOD should formalize its coordination and collaboration in future efforts, whether through committees that have been established or re-established since the AOA study was completed, such as the Committee for Operational Environmental Satellites, or other means, to include clearly defined roles and responsibilities for the two agencies.

In its written comments, NOAA stated that our draft report "captures the key issues relating to the usefulness of the AOA including calling into question the understanding of risk that was accepted," and that our draft report "noted that NOAA leadership was not involved in the reviews of the AOA or any regular advisory group meetings."

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, and the Director of NOAA. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

Should you or your staff have any questions concerning this report, contact me at (202) 512-4841 or at chaplainc@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are Rich Horiuchi, Assistant Director; Jay Tallon, Assistant Director; Maricela Cherveny; Erin Cohen; Brenna Guarneros; Krista Mantsch; Marie Ahearn, Emily Bond, and Roxanna Sun.

Cristina T. Chaplain
Director, Acquisition and Sourcing Management

Enclosures - 3

List of Committees

The Honorable John McCain
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Mac Thornberry
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Thad Cochran
Chairman
The Honorable Richard Durbin
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Rodney Frelinghuysen
Chairman
The Honorable Pete Visclosky
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Enclosure II: Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3600 DEFENSE PENTAGON
WASHINGTON, DC 20301-3600

ACQUISITION

FEB 09 2016

Ms. Cristina Chaplain
Director, Acquisition and Sourcing Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Ms. Chaplain:

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report, GAO-16-252R, "DEFENSE WEATHER SATELLITES: Usefulness of Analysis of Alternatives is Limited Due to Time Constraints and Ineffective Coordination," dated January 6, 2016 (Code 121280). Detailed comments on the report and its recommendations are enclosed.

Sincerely,

Darlene Costello

Darlene Costello
Acting Assistant Secretary of
Defense for Acquisition

Enclosure:
As stated

GAO Draft Report
GAO-16-252R (GAO CODE 121280)

"DEFENSE WEATHER SATELLITES: USEFULNESS OF ANALYSIS OF ALTERNATIVES IS LIMITED DUE TO TIME CONSTRAINTS AND INEFFECTIVE COORDINATION"

DEPARTMENT OF DEFENSE RESPONSE TO THE REPORT AND COMMENTS ON THE GAO RECOMMENDATION

DOD COMMENTS ON THE REPORT: The Department of Defense does **NOT CONCUR** with the characterization that the Space Based Environmental Monitoring (SBEM) Analysis of Alternatives (AoA) is of limited usefulness due to time constraints imposed or that is was ineffectively coordinated. The Department does not concur with the assertions summarized below and made in the draft GAO report:

a) Statements asserting that detailed alternatives were developed for only Gaps 3, 8, and 11. The SBEM AoA developed alternatives capable of meeting all 12 capability gaps and examined the military utility and assessed the operational risk of all 12 gaps.
b) Statements asserting that time constraints were imposed that prevented analysis sufficient to inform materiel and non-material decisions. The Senior Advisory Group (SAG) that guided the SBEM AoA proceeded methodically, moving forward to new stages of the AoA study only after achieving unanimous agreement that the preceding stages had been completed. Even with this generous allowance of time, the SAG granted additional time when the Navy raised concerns about one requirement's minimum acceptable value.
c) Statements asserting that meteorological models were incomplete. The SBEM AoA used meteorological models that are currently used with the DoD Weather Centrals and by civil meteorological partners.
d) Statements asserting that the SBEM AoA did not understand the risks to international partner SBEM systems, particularly the European Meteorological Satellite 7. The SBEM AoA was fully informed of the status and future plans of all civil and international partner systems. Furthermore, the SBEM AoA team had standing members from the National Oceanic and Atmospheric Administration (NOAA) to ensure their analyses were informed by current data on these systems.

(A more detailed and specific explanation of the disparities between the GAO Draft Report and the SBEM AoA Report will be provided separately.)

GAO RECOMMENDATION FOR EXECUTIVE ACTION: To ensure DoD is sufficiently informed about the availability and reliability of data from U.S. civil government and international partner satellites as it plans for future SBEM capabilities that rely on such satellites, we recommend that the Secretary of Defense ensure that leads of future SBEM planning efforts establish formal mechanisms of collaboration with the National Oceanic and Atmospheric Administration that specify roles and responsibilities and assure accountability for both agencies.

DOD RESPONSE TO THE RECOMMENDATION: CONCUR. The recommendation is consistent with current working-level engagements between the DoD and the NOAA. The DoD will invite senior NOAA representatives to participate in guiding future SBEM planning efforts and will maintain frequent contact with NOAA during the conduct of SBEM acquisition efforts to ensure the DoD is informed of the plans and operational status of international partner SBEM systems.

Text of Enclosure II: Comments from the Department of Defense

Page 1

Ms. Cristina Chaplain

Director, Acquisition and Sourcing Management U.S. Government Accountability Office

441 G Street, N.W. Washington, DC 20548

Dear Ms. Chaplain:

This is the Department of Defense (DoD) response to the Government Accountability

Office (GAO) Draft Report, GA0-16-252R , "DEFENSE WEATHER SATELLITES: Usefulness of Analysis of Alternatives is Limited Due to Time Constraints and Ineffective Coordination," dated January 6, 2016 (Code 121280). Detailed comments on the report and its recommendation s are enclosed.

Sincerely,

Darlene Costello

Acting Assistant Secretary of Defense for Acquisition

Enclosure: As stated

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GAO Draft Report

GA0-16-252R (GAO CODE 121280)

"DEFENSE WEATHER SATELLITES: USEFULNESS OF ANALYSIS OF ALTERNATIVES IS LIMITED DUE TO TIME CONSTRAINTS AND INEFFECTIVE COORDINATION"

DEPARTMENT OF DEFENSE RESPONSE TO THE REPORT AND COMMENTS ON THE GAO RECOMMENDATION

DOD COMMENTS ON THE REPORT:

The Department of Defense does NOT CONCUR with the characterization that the Space Based Environmental Monitoring (SBEM) Analysis of Alternatives (AoA) is of limited usefulness due to time constraints imposed or that is was ineffectively coordinated. The Department does not concur with the assertions summarized below and made in the draft GAO report:

1. Statements asserting that detailed alternatives were developed for only Gaps 3, 8, and 11. The SBEM AoA developed alternatives capable of meeting all 12 capability gaps and examined the military utility and assessed the operational risk of all 12 gaps.
2. Statements asserting that time constraints were imposed that prevented analysis sufficient to inform materiel and non-material decisions. The Senior Advisory Group (SAG) that guided the SBEM AoA proceeded methodically, moving forward to new stages of the AoA study only after achieving unanimous agreement that the preceding stages had been

completed. Even with this generous allowance of time, the SAG granted additional time when the Navy raised concerns about one requirement's minimum acceptable value.

3. Statements asserting that meteorological models were incomplete. The SBEM AoA used meteorological models that are currently used with the DoD Weather Centrals and by civil meteorological partners.
4. Statements asserting that the SBEM AoA did not understand the risks to international partner SBEM systems, particularly the European Meteorological Satellite 7. The SBEM AoA was fully informed of the status and future plans of all civil and international partner systems. Furthermore, the SBEM AoA team had standing members from the National Oceanic and Atmospheric Administration (NOAA) to ensure their analyses were informed by current data on these systems.

(A more detailed and specific explanation of the disparities between the GAO Draft Report and the SBEM AoA Report will be provided separately.)

GAO RECOMMENDATION FOR EXECUTIVE ACTION:

To ensure DoD is sufficiently informed about the availability and reliability of data from U.S. civil government and international partner satellites as it plans for future SBEM capabilities that rely on such satellites, we recommend that the Secretary of Defense ensure that leads of future SBEM planning efforts establish formal mechanisms of collaboration with the National Oceanic and Atmospheric Administration that specify roles and responsibilities and assure accountability for both agencies.

Page 3

DOD RESPONSE TO THE RECOMMENDATION: CONCUR.

The recommendation is consistent with current working-level engagements between the DoD and the NOAA. The DoD will invite senior NOAA representatives to participate in guiding future SBEM planning efforts and will maintain frequent contact with NOAA during the conduct of SBEM acquisition efforts to ensure the DoD is informed of the plans and operational status of international partner SBEM systems.

Enclosure III: Comments from the Department of Commerce

THE DEPUTY SECRETARY OF COMMERCE
Washington, D.C. 20230

February 4, 2016

Ms. Cristina T. Chaplain
Director, Acquisition and Sourcing Management
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Chaplain:

Thank you for the opportunity to review and comment on the Government Accountability Office (GAO) draft report titled *Defense Weather Satellites: Usefulness of Analysis of Alternatives Is Limited Due to Time Constraints and Ineffective Coordination* (GAO-16-252R). Enclosed are the National Oceanic and Atmospheric Administration's programmatic comments on the draft report.

If you have any questions, please contact me or Steve Haro, Assistant Secretary for Legislative and Intergovernmental Affairs, at (202) 482-3663.

Sincerely,

Bruce H. Andrews

Enclosure

Department of Commerce
National Oceanic and Atmospheric Administration's
Response to the GAO Draft Report Titled
Defense Weather Satellites: Usefulness of Analysis of Alternatives Is Limited Due to Time Constraints and Ineffective Coordination
(GAO-16-252R, January 2016)

General Comments

The National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to respond to the Government Accountability Office (GAO) draft report. The report on the Defense Weather Satellites Analysis of Alternatives (AOA) captures the key issues relating to the usefulness of the AOA including calling into question the understanding of risk that was accepted. Further, the draft report noted that NOAA leadership was not involved in the reviews of the AOA or any regular advisory group meetings.

We believe some background context on the Department of Defense (DOD) responsibilities for the early morning orbit should be included in the report and provide suggested language below.

Text of Enclosure III: Comments from the Department of Commerce

Page 1

February 4, 2016

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Director, Acquisition and Sourcing Management

U.S. Government Accountability Office 441 G Street, NW

Washington, DC 20548 Dear Ms. Chaplain:

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Enclosure

Page 2

Department of Commerce

National Oceanic and Atmospheric Administration's Response to the GAO Draft Report Titled

Defense Weather Satellites: Usefulness of Analysis of Alternatives Is Limited Due to Time Constraints and Ineffective Coordination

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General Comments

The National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to respond to the Government Accountability Office (GAO) draft report. The report on the Defense Weather Satellites Analysis of Alternatives (AOA) captures the key issues relating to the usefulness of the AOA including calling into question the understanding of risk that was accepted. Further, the draft report noted that NOAA leadership was not involved in the reviews of the AOA or any regular advisory group meetings.

We believe some background context on the Department of Defense (DOD) responsibilities for the early morning orbit should be included in the report and provide suggested language below.

Recommended Changes for Factual Technical Information

Pages 3, 4, and 22, for example: In various parts of the draft report, it states that NOAA is "the agency that represents DOD interests in international partnerships regarding SBEM data." Recommend rewording: "the agency, on a case by case basis, represents DOD interests such as for the Joint Polar System, in international partnerships regarding SBEM data."

Page 3 and in the recommendation: The report mentions the lack of, or need for, "collaboration" between DOD and NOAA, such as on page 3, "DOD did not have a formal collaboration mechanism for the AOA that identifies roles and responsibilities for DOD and NOAA," and the recommendation states " ....establish formal mechanisms of collaboration with NOAA that specify role and responsibilities ...." Recommend the insertion of the word "coordination" prior to collaboration in the recommendation, to read, " ...SBEM planning efforts establish formal mechanisms for coordination and collaboration with NOAA that specify roles and responsibilities and assure accountability for both agencies."

Page 4, first paragraph, insert after second full sentence:

We recommend including additional background text to explain that DOD and NOAA flew all three orbits until merged by Presidential Decision Directive into the NPOESS program in 1994. "In 2010, after the program ran into technical, cost, and schedule difficulties, responsibility of the early morning orbit was placed on DOD; the mid-morning orbit would be filled through a European Organisation for the Exploitation of Meteorological Satellites

(EUMETSA T) partnership, and NOAA would be responsible for the afternoon orbit via the JPSS program. Therefore, the AOA should address more than just how DOD will meet its requirements, but should also address how it plans to meet the requirements for providing satellite coverage in the early morning orbit."

Page 3

Page 6, third sentence in the paragraph prior to "Conclusions ":

We request changing the sentence "Since the conclusion of the AOA ... " by ending the sentence after the text "establishing formal collaboration arrangements." We request adding a new sentence that states "In August 2013, the Oceanographer of the Navy requested the Office of the Federal Coordinator for Meteorology (OFCM) help improve interagency coordination of the operational environmental satellite issues. By the end of20I3, OFCM had secured approval of the Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR) to establish the Committee for Operational Environmental Satellites (COES) which includes Air Force and Navy representation."

Page 7, Recommendations for Executive Action, line 3:

Change text following Secretary of Defense, " ... ensure the leads of future SBEM planning efforts engage established interagency coordination services provided through the Federal Committee for MeteorologicalServices and Supporting Research (FCMSSR), Interdepartmental Committee for MeteorologicalServices and Supporting Research (ICMSSR), and/or Committee for Operational Environmental Satellites (COES), which are administered by the Office of the Federal Coordinator for Meteorology (OFCM)."

Briefing slide page 10, Bullet 1, sub-bullet 1:

Add: "These satellites provide global high-resolution observations ideal for tactical weather support and long range numerical weather prediction."

Briefing slide page 10, Bullet 1, sub-bullet 2:

Add the following text to the end of the bullet: " ... and providing real-time monitoring of rapidly developing weather conditions."

Briefing slide page 13, Bullet 1, sub-bullet 2:

Reword as: "Defense Weather Satellite Systems - DOD response to White House direction to continue to provide weather observations from the 'morning' orbit following NPOESS cancellation ... "

Briefing slide page 23, Bullet 2:

Reword the first sentence to say "Without employing established mechanisms for formal coordination ... "

Briefing slide page 41, second bullet:

Delete the text after the text "such as a memorandum" and add "In August 2013, the Oceanographer of the Navy requested the Office of the Federal Coordinator for Meteorology (OFCM) help improve interagency coordination of the operational environmental satellite issues. By the end of2013, OFCM had secured approval of the Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR) to establish the Committee for Operational Environmental Satellites (COES). The COES Terms of Reference establish the formal relationships between the agencies and should be leveraged."

Editorial Comments

None.

(GAO Job Code: 121280)