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March 2, 2006



## Acquisition

### Systems Engineering Planning for the Ballistic Missile Defense System (D-2006-060)

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### Acronyms

ABL	Airborne Laser
BMD	Ballistic Missile Defense
BMDS	Ballistic Missile Defense System
CJCS	Chairman Joint Chiefs of Staff
JCS	Joint Chiefs of Staff
MDA	Missile Defense Agency
NR-KPP	Net-Ready, Key Performance Parameter
SEMP	Systems Engineering Management Plan
SSAA	System Security and Authorization Agreement
THAAD	Terminal High Altitude Area Defense

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INSPECTOR GENERAL  
DEPARTMENT OF DEFENSE  
400 ARMY NAVY DRIVE  
ARLINGTON, VIRGINIA 22202-4704

March 2, 2006

MEMORANDUM FOR DIRECTOR, MISSILE DEFENSE AGENCY

SUBJECT: Report on Systems Engineering Planning for the Ballistic Missile Defense System (Report No. D-2006-060)

We are providing this report for review and comment. We considered management comments on a draft of this report when preparing the final report.

DoD Directive 7650.3 requires that all recommendations be resolved promptly. The Missile Defense Agency comments were partially responsive. We request additional comments from the Director, Missile Defense Agency on Recommendations A.1., A.3., B.1.a., C.1., and C.2.; from the Element Manager, Aegis Ballistic Missile Defense on Recommendation B.2.; from the Element Manager, Terminal High Altitude Area Defense on Recommendation C.2.b.; and from the Element Manager, Airborne Laser on Recommendations D.1 and D.4. As a result of management comments, we redirected Recommendation B.1.b. to the Director, Missile Defense Agency, we revised Recommendation D.3., and we deleted Recommendations A.4., C.2.b., and C.2.c. Therefore, we request that the Director, Missile Defense Agency also provide comments on the redirected Recommendation B.1.b., and that the Element Manager, Airborne Laser provide comments on revised Recommendation D.3. Please provide responses by April 3, 2006.

If possible, please send management comments in electronic format (Adobe Acrobat file only) to [AudACM@dodig.mil](mailto:AudACM@dodig.mil). Copies of the management comments must contain the actual signature of the authorizing official. We cannot accept the / Signed / symbol in place of the actual signature. If you arrange to send classified comments electronically, they must be sent over the SECRET Internet Protocol Router Network (SIPRNET).

We appreciate the courtesies extended to the staff. Questions should be directed to Mr. Harold C. James at (703) 604-9088 (DSN 664-9088). See Appendix E for the report distribution. The team members are listed inside the back cover.

By direction of the Deputy Inspector General for Auditing:

Richard B. Jolliffe  
Assistant Inspector General  
Acquisition and Contract Management

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Department of Defense Office of Inspector General

Report No. D-2006-060

March 2, 2006

(Project No. D2005-D000AE-0134.000)

Systems Engineering Planning for the  
Ballistic Missile Defense System

Executive Summary

**Who Should Read This Report and Why?** DoD acquisition officials who are responsible for planning and implementing systems engineering for programs should be interested in this report because it discusses the critical planning needed to support systems engineering for the Ballistic Missile Defense System.

**Background.** On January 2, 2002, the Secretary of Defense expanded the Missile Defense Agency's (formerly the Ballistic Missile Defense Organization) responsibility and authority by directing the Missile Defense Agency to develop and field a single integrated ballistic missile defense system to protect the United States, its deployed forces, friends, and allies against ballistic missiles of all ranges in all phases of flight. Additionally, the Secretary of Defense emphasized the need to field Missile Defense Agency elements\* or key components of element capabilities as soon as practicable and to design incremental upgrades to integrate these components over time. The Missile Defense Agency budget for FY 2005 was \$8.8 billion in research, development, test, and evaluation funds.

**Results.** The Missile Defense Agency had not completed a systems engineering plan or planned fully for system sustainment. Therefore, the Missile Defense Agency is at risk of not successfully developing an integrated ballistic missile defense system (finding A). In addition, Missile Defense Agency Instruction 7600.01 did not comply with the requirements of DoD Instruction 7050.3. Therefore, the Missile Defense Agency needs to revise the Missile Defense Agency Instruction to comply with DoD guidance (finding E).

The Missile Defense Agency did not have adequate information to evaluate the planned systems engineering for the Aegis Ballistic Missile Defense Element. Until the Aegis Ballistic Missile Defense element manager obtains approval of the systems engineering management plan, implements information assurance requirements, and coordinates a net-ready, key performance parameter and an information support plan, the Missile Defense Agency cannot be assured the Aegis Ballistic Missile Defense information systems are secure and will be interoperable (finding B).

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\* When the Missile Defense Agency was created, the Secretary of Defense placed a number of individual Service acquisition programs that became components of the Ballistic Missile Defense System under Missile Defense Agency control. These formerly independent programs, which receive their funding directly from the Missile Defense Agency, became known as Missile Defense Agency elements. In February 2002, the Under Secretary of Defense for Acquisition, Technology, and Logistics designated the Ballistic Missile Defense System as one major DoD acquisition program.

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The Missile Defense Agency could not fully evaluate systems engineering for the Terminal High Altitude Area Defense Element. Until the necessary documentation is completed and approved, the Missile Defense Agency cannot be assured that the Terminal High Altitude Area Defense information systems are secure (finding C).

The Missile Defense Agency could not fully evaluate systems engineering for the Airborne Laser Element. Until the Airborne Laser element manager updates the single acquisition plan and the systems engineering plan, requires the contractor to comply with the software development plan, fully establishes earned value reporting, and implements security requirements for weapon systems, the element manager's ability to adequately oversee element development and system security will remain limited (finding D).

On a positive note, the Terminal High Altitude Area Defense element manager had aggressively developed a capabilities production document, with a net-ready, key performance parameter and an information support plan, 2 years ahead of the scheduled transition to the Army.

**Management Comments and Audit Response.** The Executive Director responded for the Director, Missile Defense Agency, and for the managers of the Aegis Ballistic Missile Defense, the Terminal High Altitude Area Defense, and the Airborne Laser elements. The Executive Director concurred that the Missile Defense Agency will establish a comprehensive systems engineering plan that will focus on achieving the technical objectives for the Ballistic Missile Defense System, updating logistic support planning to effectively sustain future missile defense capability, and revising agency policy so that auditors from the DoD Office of the Inspector General receive expeditious and unrestricted access to documents in future audits. The Executive Director also concurred with, or proposed actions that meet the intent of, the recommendations for providing improved planning for systems engineering and systems security for the Aegis Ballistic Missile Defense, the Terminal High Altitude Area Defense, and the Airborne Laser elements. The Executive Director nonconcurred with providing additional systems engineering guidance to element managers, planning for transitioning the Aegis Ballistic Missile Defense Element to the Navy, requiring Missile Defense Agency approval of the configuration management plan for the Terminal High Altitude Area Defense Element, for improving the software development plan, and for expanding earned value management reporting for the first Airborne Laser aircraft. As a result of the Executive Director's comments, we redirected Recommendation B.1.b. for transition planning on the Aegis Ballistic Missile Defense Element to the Director, Missile Defense Agency. Additionally, recognizing the work already completed on the first Airborne Laser aircraft, we revised our recommendations for software development and earned value management reporting to apply only to the second and subsequent Airborne Laser aircraft. Further, we deleted Recommendations A.4., C.2.b., and C.2.c. See the Findings section of the report for a discussion of management comments and the Management Comments section of the report for the complete text of the comments.

We request that the Director, Missile Defense Agency, and the element managers for Aegis Ballistic Missile Defense and the Airborne Laser comment on the final report by April 3, 2006.

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## Background

**National Missile Defense Policy.** On July 22, 1999, the President signed the National Missile Defense Act of 1999 (Public Law 106-38), which requires the United States to deploy an effective system capable of defending the United States against limited ballistic missile attacks. The President provided further direction in National Security Presidential Directive 23, "National Policy on Ballistic Missile Defense," December 16, 2002, requiring the Secretary of Defense to deploy an initial set of missile defense capabilities in 2004. Presidential Directive 23 also states that the Secretary of Defense is to develop and deploy a Ballistic Missile Defense System (BMDS) with the best technologies available.

**Missile Defense Agency.** On January 2, 2002, the Secretary of Defense expanded the Missile Defense Agency's (MDA) (formerly the Ballistic Missile Defense Organization) responsibility and authority by directing it to develop and field a single integrated BMDS to protect the United States, its deployed forces, friends, and allies against ballistic missiles of all ranges in all phases of flight. Additionally, the Secretary of Defense emphasized the need to field MDA elements<sup>1</sup> or key components of element capabilities as soon as practicable and to improve the BMDS with incremental block upgrades. MDA elements are Aegis Ballistic Missile Defense (BMD); Terminal High Altitude Area Defense (THAAD); Airborne Laser (ABL); Command and Control, Battle Management, and Communications; Ground-Based Midcourse Defense; Kinetic Energy Interceptor; Patriot Advanced Capability-3; BMDS Sensors; and Space Tracking and Surveillance System.

To accomplish the Secretary's directions, MDA implemented a capabilities-based acquisition strategy using a developmental test bed and a series of biennial developmental blocks. Each block permits MDA elements to insert newly developed component capabilities. The first biennial development block, Block 2004, occurred during 2004 and 2005. As of September 2005, MDA had defined developmental capabilities for biennial development out to Block 2014, which will occur during 2014 and 2015. Each block will build on the capabilities developed during previous blocks, and each successive block will provide increasing levels of capability to counter ballistic missiles of all ranges and complexity. The MDA budget for FY 2005 was \$8.8 billion in research, development, test, and evaluation funds.

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<sup>1</sup> When the Missile Defense Agency was created, the Secretary of Defense placed a number of individual Service acquisition programs that became components of the Ballistic Missile Defense System under Missile Defense Agency control. These formerly independent programs, which receive their funding (research, development, test and evaluation) directly from the Missile Defense Agency, became known as Missile Defense Agency elements. In February 2002, the Under Secretary of Defense for Acquisition, Technology, and Logistics designated the BMDS as one major DoD acquisition program.

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**Systems Engineering.** Systems engineering is the overarching process that an acquisition program team employs to transition a system from a stated capability need to an operationally effective and suitable system. Systems engineering:

- employs multiple disciplines to simultaneously design and develop system products and processes to satisfy the needs of the warfighter;
- applies certain processes adapted to each phase of the acquisition life cycle to foster balanced solutions; and
- provides the capabilities that the warfighters need, while remaining within design constraints and technology, budget, and schedule limitations.

Programs should apply systems engineering processes early in the concept definition phase, and then throughout the total life cycle. The goal of systems engineering is to provide the warfighter with a total system solution that will:

- withstand changing technical, production, and operating environments;
- adapt to the needs of the user; and
- balance design considerations, design constraints, and program budgets among multiple requirements.

The MDA was still developing systems engineering processes for the BMDS to provide an integrated and layered BMDS architecture and develop element requirements and schedules. Applying systems engineering is extremely difficult, particularly at MDA, because it is working with a number of programs that are in different and distinct stages of development, while attempting to field a test bed capability that can be used in the BMDS. Appendix B provides an overview of the MDA planned systems engineering process.

DoD acquisition managers must comply with many regulatory and guidance documents when they are planning and implementing systems engineering. Among the most significant documents are policy memorandums issued by the Under Secretary of Defense for Acquisition, Technology, and Logistics that reestablish the requirement for systems engineering. Specifically, these memorandums, which are planned for inclusion in updates to the DoD 5000 series, act as an acquisition manager's internal control by directing programs to document their use of systems engineering. Also, DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004, which supplemented the January 2002 Secretary of Defense direction, requires MDA acquisition managers to manage the BMDS consistent with the principles of DoD Directive 5000.1, "The Defense Acquisition System," May 12, 2003, and DoD Instruction 5000.2, "Operation of the Defense Acquisition System," May 12, 2003. Appendix C discusses regulatory and guidance documents and how they relate to the systems engineering process.



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## Objectives

The overall audit objective was to evaluate the MDA systems engineering planning needed to support the BMDS. Specifically, the audit determined whether the MDA was adequately planning systems engineering to develop field elements or key components of element capabilities into an effective and suitable BMDS. We also reviewed the managers' internal control program as it relates to the overall objective. See Appendix A for a discussion of the scope and methodology.

## Managers' Internal Control Program

DoD Directive 5010.38, "Management Control Program," August 26, 1996, and DoD Instruction 5010.40, "Management Control Program Procedures," August 28, 1996, require DoD organizations to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of the controls.

**Scope of the Review of the Management Control Element.** In accordance with DoD Directive 5000.1, acquisition managers are to use program cost, schedule, and performance parameters as control objectives to implement the requirements of DoD Directive 5010.38. Accordingly, we reviewed management controls that were directly related to systems engineering planning for the BMDS and the MDA elements.

**Adequacy of Management Controls.** We identified material management control weaknesses at MDA, as defined by DoD Instruction 5010.40, relating to systems engineering planning. MDA management controls for systems engineering planning were not adequate to manage BMDS and MDA elements according to the principles of the DoD 5000 series, including producing required documentation for systems engineering planning. The recommendations in findings A, B, C, and D, if implemented, will correct the identified weaknesses and result in compliance with DoD systems engineering principles. A copy of the final report will be provided to the senior official responsible for management controls at MDA.

**Adequacy of Management's Self-Evaluation.** MDA officials did not identify systems engineering as an assessable unit and therefore did not identify systems engineering as a management control weakness.

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## **A. Systems Engineering Planning for the Ballistic Missile Defense System**

MDA had not completed critical planning documents to support BMDS systems engineering. Specifically, the MDA had not completed a systems engineering plan and had not planned fully for system sustainment. These conditions occurred because MDA did not consistently follow the DoD policy that requires the Director, Missile Defense Agency to manage the BMDS consistent with the principles of acquisition policy in the DoD 5000 series. Another cause was that MDA was tasked with designing a single integrated system from a group of preexisting acquisition programs and fielding a missile defense capability quickly. As a result, the BMDS ability to develop and integrate the elements into a system that meets U.S. requirements is at risk.

### **Policies and Procedures**

Acquisition managers must follow a number of DoD policies and procedures relating to planning and executing systems engineering for the BMDS (see Appendix C). However, DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004, provides the Director, Missile Defense Agency with significant flexibility in managing BMDS elements until the elements transfer to the Services. Specifically, DoD Directive 5134.9 permits the Under Secretary of Defense for Acquisition, Technology, and Logistics, in collaboration with the Director, Missile Defense Agency, to determine the applicability of the DoD 5000 series in the development of the BMDS. Additionally, DoD Directive 5134.9 tasks the Director, Missile Defense Agency with maintaining a single development program for all work needed to design, develop, and test an integrated BMDS.

The MDA Systems Engineering and Integration Council assists the MDA Systems Engineering and Integration Directorate (the Systems Engineering Directorate) in managing systems engineering by providing a forum to engineer and integrate BMDS blocks. The Systems Engineering Integration Council also assists in planning and executing systems engineering and integration and overseeing element engineering.

### **Systems Engineering Planning for the BMDS**

MDA had not completed critical planning to support systems engineering for the BMDS. Specifically, MDA had not formulated a systems engineering plan or developed a complete integrated logistics support plan.

**Formulating a Systems Engineering Plan for the BMDS.** The Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, "Policy for Systems Engineering in DoD," February 20, 2004, requires program managers to

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develop a systems engineering plan for the milestone decision authority's approval that describes the program's overall technical approach and includes processes, resources, metrics, and applicable performance incentives required to achieve objectives. To follow the principles stated in the Under Secretary of Defense for Acquisition, Technology, and Logistics policy memorandum, the MDA should establish a systems engineering plan (or similar document) that provides a comprehensive description of the MDA technical approach and strategy to achieve its objectives. In March 2005, staff from the Systems Engineering Directorate stated that MDA had not prepared the systems engineering plan for the BMDS. Since then, the Systems Engineering Directorate took steps to address this difficult requirement and planned to complete a systems engineering plan for the BMDS that will include the systems engineering process that the Systems Engineering Directorate briefed to the elements in August 2005.

**Planning for System Sustainment.** DoD Instruction 5000.2 states that the effective sustainment of weapon systems begins with the design and development of reliable and maintainable systems through the continuous application of a strong systems engineering methodology. The Instruction also states that a weapon system requires a support program that meets operational support performance requirements and sustains the system in the most cost-effective manner.

The Director, Missile Defense Agency memorandum, "Missile Defense Agency Integrated Logistics Support Policy," August 4, 2003 (the MDA Support Policy), implements the principles of DoD Instruction 5000.2 on system sustainment by identifying logistics support actions that MDA managers must accomplish to fully sustain the BMDS. Under the MDA Support Policy, the Systems Engineering Directorate and the MDA Deputy for Force Structure Integration and Deployment (the Force Structure and Deployment Directorate) each has responsibilities for planning logistics support. The Systems Engineering Directorate is required to assess the engineering of BMDS elements including their producability, reliability, availability, and maintainability. The Force Structure and Deployment Directorate is required to:

- develop a plan for logistics supportability and guidance for all MDA staff offices and elements and review all elements' integrated support plans,
- integrate the elements' plans into a single logistics support annex within the MDA Block Activation Plan,
- develop an overarching concept for BMDS logistics support,
- identify ways to manage common logistics across elements, and
- propose methods for achieving economies and efficiencies of scale as warranted.

Additionally, the Systems Engineering Directorate and the Force Structure and Deployment Directorate jointly chair an integrated logistics support team to share data planning among the MDA elements throughout the logistics life cycle.

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MDA had not fully implemented management actions to support the integrated logistics outlined in the MDA Block Activation Plan and in the MDA Support Policy for sustaining the BMDS. For example, although the draft Block Activation Plan for Block 04 states that MDA would have a system-level, integrated logistics support plan approved by November 2003, the Force Structure and Deployment Directorate had not prepared an overall BMDS Integrated Logistics Support Plan. However, when MDA did outline a logistics support plan in Logistic Support Document 2005 (the Logistics Support Document), it provided only general information. For more detail, the Logistics Support Document referred to the individual element's integrated logistics support plans and states that each element is responsible for planning the following eight logistics-support-related areas: supply; equipment; packing, handling, storing, and transportation; facilities; computer resources; technical data; maintenance planning; and manpower and personnel.

Additionally, the Logistics Support Document states that the Force Structure and Deployment Directorate will transmit and distribute sustainment information between the user community and the elements, but it does not explain how the Force Structure and Deployment Directorate should perform this function. Further, although the integrated logistics support plans of the elements, including those for Aegis BMD, THAAD, and ABL, provide information on logistics support, they do not explain how the elements should work with MDA and other elements. If MDA is to develop and field an integrated BMDS, the Logistics Support Document and the elements' integrated logistics support plans should include provisions to allow the Force Structure and Deployment Directorate to better identify and manage logistics functions that are common to elements, so that they may achieve economies and efficiencies of scale as directed in the MDA Support Policy.

MDA was also drafting MDA Directive 5010.AA, "Ballistic Missile Defense Sustainment," to establish policies and procedures for developing a sustainable BMDS. The draft MDA Directive identifies the functions of the Integrated Logistics Support Team, which disseminates logistics information among the elements. It also lists sustainment-related events that elements should conduct during each phase of the development process to support future system sustainment. MDA planned to provide additional policy and guidance to clarify the content and schedule for sustainment-related events in the draft MDA Directive.

## **Factors Affecting Systems Engineering**

Because of the way in which the BMDS acquisition evolved, MDA was unable to complete critical planning to support systems engineering in compliance with the requirements in DoD Directive 5134.9 for managing the acquisition of the BMDS elements in a way that was consistent with the principles of DoD Directive 5000.1 and DoD Instruction 5000.2. Specifically, MDA had to plan and design an integrated system from a group of pre-existing acquisition programs (now the MDA elements), as well as meet the requirement of Presidential Directive 23 to field an initial BMDS capability in 2004. As a result, staff from the Systems

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Engineering Directorate stated that MDA had not prepared a systems engineering plan earlier for the BMDS because it was still developing a systems engineering process. Preparing the systems engineering plan was very difficult because MDA was not able to initially design the BMDS from the top down; instead, they first had to design a way to integrate the existing elements into the overall BMDS. After planning the initial BMDS capability, MDA developed systems engineering processes that involve both bottom-up and top-down processes. In the bottom-up process, MDA used the existing capabilities of the BMDS elements, along with maturing technologies, to lower system development risk and improve the timeliness for fielding the ballistic missile defense capability. In the top-down process, MDA used the capabilities defined in the Technical Objectives and Goals document to update capability development documents of the current, next, and future BMDS blocks.

The Systems Engineering Directorate staff recognized that they need to develop an MDA-level systems engineering plan. Additionally, because MDA was rushing to field an initial BMDS capability, it had not fully planned for system sustainment. Element managers may refer to their element system engineering plan as the systems engineering management plan (SEMP).

## Conclusion

Without improving systems engineering processes and documentation, MDA faces increased risk in successfully integrating the individual elements into a single system that will meet U.S. requirements for ballistic missile defense. An effective systems engineering process must provide key documents, including the systems engineering plan and an integrated logistics support plan. Systems engineering processes are necessary to transition the individual elements from a stated capability need to an operationally effective and suitable BMDS.

MDA staff stated in response to a discussion draft of this report that they were:

- developing a comprehensive systems engineering plan that describes approaches and strategies for achieving BMDS technical objectives,
- updating the Logistics Support Document;
- directing element managers to update elements' integrated logistics support plans; and

## Recommendations, Management Comments, and Audit Response

**Deleted Recommendation.** As a result of management comments, we deleted a section of finding A in the draft report that discussed guidance for the individual elements on systems engineering activities and deleted the corresponding Recommendation A.4. In his response, the Executive Director, MDA provided

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sufficient evidence to demonstrate that MDA had provided guidance to the individual elements on their systems engineering activities. Further details are discussed in Appendix D.

**We recommend that the Director, Missile Defense Agency:**

**1. Establish a comprehensive systems engineering plan that describes the Missile Defense Agency's approaches and strategy to achieve its technical objectives, in compliance with the DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004, requirement to manage the Ballistic Missile Defense System consistent with the principles of the DoD 5000 series.**

**Management Comments.** The Executive Director, responding for the Director, Missile Defense Agency, concurred, stating that MDA was coordinating a draft SEMP that would be distributed to the entire agency after it is approved.

**Audit Response.** In response to the final report, we request that the Director, Missile Defense Agency provide an estimated date for approving and distributing the draft SEMP.

**2. Update the Logistics Support Document 2005 to clarify how the Missile Defense Agency's Force Structure Integration and Deployment Directorate should coordinate with element offices to plan logistics sustainment for the Ballistic Missile Defense System.**

**Management Comments.** The Executive Director concurred, stating that MDA was updating the Logistics Support Document 2005 to create Logistics Support Document 2006. The Logistics Support Document 2006 will define coordination procedures for the MDA Force Structure and Deployment Directorate and the element offices to use in logistic sustainment planning for the BMDS. The Executive Director anticipated that the completion date for the Logistics Support Document 2006 would occur during the third quarter of FY 2006.

**3. Issue policy to Missile Defense Agency element managers to update elements' integrated logistics support plans with procedures for interacting with the Missile Defense Agency Force Structure Integration and Deployment Directorate and other element offices to more effectively plan for logistics support of missile defense.**

**Management Comments.** The Executive Director concurred, stating that the MDA Force Structure and Deployment Directorate was developing the BMDS Integrated Sustainment Support Plan that will link the procedures for interaction among the BMDS and element offices to more effectively plan integrated logistics support.

**Audit Response.** In response to the final report, we request that the Director, Missile Defense Agency provide an estimated date for the approval of the BMDS Integrated Sustainment Support Plan.

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## **B. Systems Engineering for the Aegis Ballistic Missile Defense Element**

Although the Aegis BMD element manager (the element manager) followed many of the systems engineering processes described in the Defense Acquisition Guidebook, she had not completed several systems engineering documents and processes that are important to transition the Aegis BMD Element (the element) capabilities for Block 04 to the Navy. Specifically, the element manager did not:

- obtain MDA approval for the element's draft SEMP;
- establish a plan to develop and implement information assurance requirements in the software development plan or implement the DoD Information Technology Security Certification and Accreditation Process (the Security Certification and Accreditation Process) for conducting information technology certification and accreditation; and
- establish a net-ready, key performance parameter (NR-KPP) in coordination with the Joint Staff and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) and an information support plan to transition Block 04 capabilities effectively onto 18 active duty Navy ships.

These conditions occurred because MDA did not provide explicit guidance for coordinating SEMP's with the elements and because the element manager believed that the element capability specification identified the necessary information assurance requirements. Additionally, the MDA did not give the element manager sufficient guidance on systems engineering activities needed to support the transitioning of element capabilities to operational use. As a result, MDA was not able to evaluate the adequacy of the planned systems engineering for the Aegis BMD Element. Further, MDA had no assurance that the information and information systems were secure and that the element capability would be fully interoperable with other DoD assets.

### **Aegis Ballistic Missile Defense Element**

In 1996, the Navy began developing a rapidly deployable and mobile ballistic missile defense capability as the Navy Theater Wide Program. In January 2002, the Navy Theater Wide Program became the Aegis BMD Element of the MDA. The Aegis BMD Element is based at sea and is tasked with destroying ballistic missiles in the mid-course phase. As part of the MDA Block 04, the Aegis BMD Element will provide the BMDS with increased capabilities through three planned incremental developments.

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The first increment, BMD 3.0E, was deployed in September 2004 and provided a long-range surveillance and tracking capability on an Aegis destroyer designated as part of the MDA test bed. Increment BMD 3.0E also provided surveillance and tracking for the Ground-Based Missile Defense Element. The second increment, BMD 3.0, which has been available since May 2005, added a missile engagement capability using the Navy Standard Missile-3 on the Aegis cruiser test bed. The third increment, BMD 3.6, will integrate an anti-air warfare, self-defense capability. According to the "Single Acquisition Management Plan," November 18, 2003 (the Single Acquisition Management Plan), the Navy plans to deploy Block 04 onto 18 operational Aegis ships. Aegis staff stated that Block 04 expects to be functional in August 2006. The Aegis BMD Element plans to provide logistical support for these ships until sometime in FY 08, after which the Navy will provide logistical support.

## **Implementing Systems Engineering Documentation and Processes**

The DoD and the Director, Missile Defense Agency issue policy and guidance for elements to use in planning systems-engineering-related actions, such as formulating and approving the SEMP, establishing information assurance and Security Certification and Accreditation Process requirements, and coordinating the transition of BMDS capabilities with the Joint Chiefs of Staff (JCS) and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments). However, the element manager had not completed several documents and processes that were important to transition Block 04 capabilities to the Navy. Specifically, the element manager did not submit the draft SEMP for MDA review and approval; establish information assurance provisions in the software development plan; and establish a System Security Authorization Agreement (SSAA), an NR-KPP, and an information support plan.

**Approving the Draft SEMP.** The "MDA Assurance Provisions," January 9, 2004, requires elements to submit a SEMP to MDA for approval. Instead, the element manager coordinated the SEMP for approval within the element staff. Although the element manager did not comply with requirements of the MDA Assurance Provisions for forwarding the SEMP to MDA for approval, the MDA Assurance Provisions did not provide explicit guidance to the elements regarding who within the MDA would review and approve the SEMP. Specifically, the MDA Assurance Provisions did not state which MDA office should receive the SEMP or define the coordination process that supported the approval. According to the mission statement, the Systems Engineering Directorate has responsibility for planning and executing systems engineering, as well as overseeing element engineering; therefore, the MDA Assurance Provisions should have identified the Systems Engineering Directorate as the office responsible for reviewing and approving the SEMP.

**Establishing Requirements for Information Assurance and Security Certification and Accreditation.** DoD Directives and Instructions require Defense agencies to include information on how to develop and implement



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information assurance requirements in the software development plan and how to implement the Security Certification and Accreditation Process for information technology certification and accreditation.

The element manager did not include the information on developing and implementing information assurance requirements in the software development plan as required by DoD Directive 8500.1, "Information Assurance," October 24, 2002, and DoD Instruction 8580.1, "Information Assurance in the Defense Acquisition System," July, 9, 2004, or implementing the Security Certification and Accreditation Process for conducting information technology certification and accreditation process in accordance with DoD Instruction 5200.40, "DoD Information Technology Security Certification and Accreditation Process," December 20, 1997.

The element manager did not include a plan to develop and implement information assurance requirements in the software development plan because she believed that the information assurance requirements were identified in the element capability specification of the development contract. However, the element capability specification references information assurance requirements, but it does not include information on how to develop and implement them. The Technical Directorate staff acknowledged that the software development plan lacked the information assurance provisions and they developed an information assurance section for the next updated version of the software development plan.

The element manager did not implement the Security Certification and Accreditation Process because she did not comply with the requirements in DoD Instruction 5200.40. The information assurance manager recognized that the element was not certified and accredited and began to complete the requirements for the Security Certification and Accreditation Process phase 1, which includes developing and completing the SSAA by December 2005. The phase 1 SSAA documents that the program manager, the designated approval authority, and the certification authority agreed on the method to implement security requirements. The SSAA also describes system mission and security and data access policies.

**Coordinating with the JCS and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) to Support Transition.** DoD Directive 5134.9 requires that the Director, Missile Defense Agency work closely with the warfighter and the JCS to develop and integrate requirements into control systems. Additionally, the Secretary of Defense memorandum, "Missile Defense Program Direction," January 2, 2002 (the Secretary of Defense Memorandum), requires the elements to enter the formal acquisition process at Milestone C, Production and Deployment, as described in DoD Instruction 5000.2, when they transition to the Services. Upon transition, the elements must satisfy the requirements of DoD Directives and Instructions to work together with JCS to establish an NR-KPP and an information support plan. To establish an NR-KPP, the Military Departments must assess information needs, information timeliness, information assurance, and net-ready attributes required to exchange technical information and determine the effectiveness of the exchange from the originator to the final recipient. The Military Departments use the information support plan to manage, evaluate, and report on implementing interoperability requirements.

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The element manager did not coordinate with the JCS and the Deputy Chief of Staff for Naval Operations (Resources, Warfare Requirements, and Assessments), as required, to establish an NR-KPP and develop an information support plan. Initially, the Secretary of Defense Memorandum exempted MDA from the requirements of the Chairman Joint Chiefs of Staff (CJCS) Instruction 3170 series and the associated regulations that it references, including DoD Directive 4630.5, "Interoperability and Supportability of Information Technology and National Security Systems," May 5, 2004; DoD Instruction 4830.8, "Procedures for Interoperability and Supportability of Information Technology and National Security Systems," June 30, 2004; and the CJCS Instruction 6212.01 series before fielding element capabilities. However, the Secretary of Defense Memorandum also requires BMDS elements that are transitioning to the Services to enter the acquisition process at Milestone C: Production and Deployment. Therefore, when the Aegis BMD Element moves beyond the test bed ship and transitions the Block 04 capability to 18 Navy ships, the Secretary of Defense Memorandum will no longer exempt the element from the CJCS and DoD requirements. Specifically, when fielding the Aegis BMD Element capability to the Navy, the element manager will be subject to the requirements of Milestone C, which include establishing an NR-KPP and an information support plan. Additionally, MDA and the element manager did not follow DoD Directive 5134.9, which requires that the MDA coordinate with the JCS on integrating command and control capabilities to enable the JCS to advise the BMDS on supportability features.

The element manager did not prepare an NR-KPP and an information support plan because the MDA did not provide clear guidance on the documentation and processes needed to complete and to meet the requirements of DoD policies for transitioning capabilities to operational use. Specifically, the Director, Missile Defense Agency did not provide the elements with an alternative acquisition process to replace the process defined in DoD Instruction 5000.2 and the guidance in the Defense Acquisition Guidebook.

## Conclusion

The MDA was not fully informed to evaluate the adequacy of the planned systems engineering for the element. Also, MDA had no assurance that the element information and information systems were secure and would be interoperable with other DoD assets when transitioned.

To effectively evaluate the adequacy of the planned systems engineering, the element manager needs to coordinate the SEMP for approval with the appropriate MDA organizations. After MDA approves the SEMP, the document will provide a baseline for further systems engineering planning requirements for the element.

The element manager needs to implement information assurance requirements to ensure the availability, integrity, authenticity, confidentiality, and nonrepudiation of the element's information and information systems. Not developing and implementing information assurance requirements in the software development plan for the element puts the system, and those connected to it, at risk of being

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compromised. The element manager also needs to prepare and obtain approval of an SSAA to enter phase 2 of the Security Certification and Accreditation Process.

To ensure that the element is interoperable with other DoD assets, the element manager needs to coordinate with the JCS and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) to fully define and obtain certification for an NR-KPP, as required by CJCS Instruction 6212.01C. The NR-KPP will provide the measurable, testable, and calculable characteristics and performance metrics required for the timely, accurate, and complete exchange and use of information. MDA staff response to a discussion draft of this report stated that they recognized that an NR-KPP and an information support plan were required to support transitioning the Aegis BMD capability to the Navy, and that they would work towards their development.

By coordinating an interoperability NR-KPP with the JCS, the element manager will be developing and submitting an information support plan, as required, to document information technology and national security system needs, dependencies, and interface requirements, and providing assurance that the element will be interoperable within the BMDS and with other Navy ships.

## **Recommendations, Management Comments, and Audit Response**

**Redirected and Revised Recommendations.** As a result of management comments, we redirected draft Recommendation B.2.d. to the Director, Missile Defense Agency to recognize that MDA, as the operator of the BMDS, should coordinate with JCS and renumbered it as Recommendation B.1.b.

**1. We recommend that the Director, Missile Defense Agency:**

**a. Revise the "Missile Defense Agency Assurance Provisions," January 9, 2004, to designate the appropriate Missile Defense Agency organization to be responsible for coordinating and approving systems engineering management plans for the Missile Defense Agency elements.**

**Management Comments.** The Executive Director, responding for the Director, Missile Defense Agency, concurred, stating that the MDA Safety, Quality, and Mission Assurance Directorate will update the MDA Assurance Provisions to designate the appropriate MDA organization responsible for coordinating and approving element SEMP.

**Audit Response.** In response to the final report, we request that the Director, Missile Defense Agency provide an estimated completion date for updating the MDA Assurance Provisions for the coordination and approval of element SEMP.

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**b. Coordinate with Joint Chiefs of Staff Director for Command, Control, Communications, and Computer Systems Directorate and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) to establish a net-ready, key performance parameter and an information support plan to comply with requirements of the Secretary of Defense Memorandum, "Missile Defense Program Direction," January 2, 2002, for transitioning the Aegis Ballistic Missile Defense Element.**

**Management Comments.** The Executive Director nonconcurred, stating that MDA, as the operator of the BMDS, should coordinate with JCS. He stated that coordination with the JCS should occur at the MDA, rather than at the element level, because DoD Directive 5134.9 requires the MDA Director to work closely with the warfighter community and JCS to develop and integrate BMDS command and control architecture. The Executive Director also stated that MDA does not use an NR-KPP, but the Aegis BMD element manager was coordinating with the Navy in the development of its command and control architecture. Further, in his general comments on the draft report, he stated that providing the Navy with some capabilities for Block 04 does not constitute transitioning production to the Navy and therefore does not activate Milestone C requirements to establish an information support plan with an NR-KPP. Specifically, the 2002 Secretary of Defense Memorandum states that the MDA elements will enter the formal DoD acquisition cycle at Milestone C, concurrent with transferring procurement responsibility to a Service.

**Audit Response.** We recognize that MDA should coordinate with JCS and redirected the recommendation. Although we also recognize that MDA does not use a NR-KPP, we disagree that the Aegis BMD Block 04 is not currently transitioning to the Navy. The Executive Director's comment is based on the Navy's not procuring the Aegis BMD Block 04 capability and, therefore, according to the requirements of the 2002 Secretary of Defense Memorandum, is not activating acquisition Milestone C requirements. Milestone C requirements include developing an NR-KPP and information support plan. In fact, MDA and the Navy are planning to move beyond Milestone C and into the operations and support phase of the acquisition process for the Block 04 capability. Specifically, the Aegis BMD Single Acquisition Management Plan, November 18, 2003, states that the Navy plans to deploy the Aegis BMD capability onto 18 operational Aegis ships. Additionally, MDA and the Navy plan for the Navy to begin providing operations and support for the Block 04 capability on these ships sometime in FY 2008. DoD Instruction 5000.2 defines Milestone C as authorizing entry into low-rate initial production for major acquisition systems. The DoD Instruction defines low-rate initial production as completing manufacturing development to produce the minimum quantity necessary to provide for successful completion of operational testing, establish an initial production base, and permit an orderly increase in the production rate leading to full-rate production. By fielding and maintaining the Aegis BMD capability on 18 operational Navy ships, MDA met the intent of the DoD Instruction 5000.2 definition of low-rate initial production and the attainment of an initial operational capability when the Navy begins providing operations and support for the Block 04 capability in FY 2008.

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A draft MDA memorandum recognizes that MDA and the Navy need to start planning for the transition of the Aegis BMD Block 04 capability, which, if implemented, would meet the intent of the recommendation. Specifically, the draft MDA memorandum, "Transition of Aegis BMD Block 04 System" (the Transition Memorandum), states that the transition of Aegis BMD Block 04 to the Navy will consist of transitioning operations and support responsibilities. The draft Transition Memorandum further states that the transition will occur when the Aegis BMD is installed on all 18 planned Navy ships and successfully completes planned test events that support the transfer of operational and support responsibilities to the Navy. MDA projects that the transition of Aegis BMD Block 04 operations and support to the Navy will occur during FY 2008. To support the operational and support transition, the draft Transition Memorandum states that MDA will provide a number of documents, including the information support plan. CJCS Instruction 6212.01C requires that the information support plan include a NR-KPP. Therefore, we request that the Director, Missile Defense Agency reconsider his position on the draft recommendation and respond to the redirected recommendation in the final report.

**2. We recommend that the element manager for the Aegis Ballistic Missile Defense Element:**

**a. Coordinate with the Joint Chiefs of Staff Director and obtain approval of the draft Aegis Ballistic Missile Defense Systems Engineering Management Plan from the Missile Defense Agency.**

**Management Comments.** The Executive Director, responding for the Aegis BMD element manager, concurred, stating that the Aegis BMD SEMP should be coordinated with the BMDS System Engineer to integrate the element systems engineering process into the BMDS. The Executive Director further stated that MDA keeps informed of the element systems engineering status through various reviews.

**Audit Response.** In response to the final report, we request that the Aegis BMD element manager provide an estimated completion date for coordinating and obtaining approval of the Aegis BMD SEMP.

**b. Develop and include information assurance requirements in the Software Development Plan that meet the requirements of DoD Directive 8500.1, "Information Assurance," October 24, 2004, to include information assurance requirements in the design and acquisition of all information systems.**

**Management Comments.** The Executive Director concurred, stating that the Aegis BMD element manager will address information assurance requirements in the software development plan as well as in the element capability specification for Block 06. The Executive Director further stated that the Aegis BMD element manager, the MDA System Engineering Directorate, and the prime contractor will work on delineating information assurance requirements.

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**Audit Response.** In response to the final report, we request that the Aegis BMD element manager provide an estimated completion date for including information assurance requirements in the Block 06 software development plan.

**c. Complete the DoD Information Technology Security Certification and Accreditation Process, including producing a System Security Authorization Agreement for the element to become certified and accredited in accordance with DoD Instruction 5200.40, "DoD Information Technology Security Certification and Accreditation Process," December 20, 1997.**

**Management Comments.** The Executive Director concurred, stating that the Aegis BMD SSAA is in final coordination. He commented that the Aegis BMD information assurance requirements are managed consistent with the DoD 8500 series of directives, and that element SSAAs will be combined into a single BMDS SSAA. The Executive Director stated that the DoD 8500 series of directives and instructions was an improvement over the DoD 5200 series of directives and instructions because the new series provided specific information assurance controls for Mission Assurance Category I systems that MDA uses for compliance tracking and risk management. He stated that MDA uses a tailored Security Certification and Accreditation Process that is based on requirements in DoD Manual 8580.1-M, "DoD Information Technology Security Certification and Accreditation Process Application Manual," July 31, 2000.

**Audit Response.** In response to the final report, we request that the Aegis BMD element manager provide estimated dates for completing the SSAA and the Security Certification and Accreditation Process.

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## C. Systems Engineering for the Terminal High Altitude Area Defense Element

The THAAD element manager followed many of the system engineering processes prescribed in the Defense Acquisition Guidebook. Of special note, the THAAD element manager aggressively developed the capabilities production document with the NR-KPP for Block 06 and the information support plan 2 years before the scheduled transition of the THAAD to the Army. However, the element manager did not complete a systems engineering process that is important to system planning and development. Specifically, the element manager did not complete phase I of the Security Certification and Accreditation Process in a timely manner. Additionally, MDA policy was unclear concerning the required level of approval for the THAAD configuration management plan. These conditions occurred because the element manager had not allocated funding to comply with established policies for information assurance and system security. Moreover, MDA did not give the element managers sufficient guidance on procedures for approving configuration management plan to MDA for approval. As a result, the MDA had no assurance that the THAAD information and information systems were secure and was not able to fully evaluate the adequacy of the planned engineering for the element.

### Terminal High Altitude Area Defense Element

The THAAD system development started in 1992 with the award of the contract for the Program Definition and Risk Reduction phase of the acquisition process, which includes activities now performed in the early part of the technology development phase as defined in DoD Instruction 5000.2. These activities include early operational assessments as necessary to reduce technology, manufacturing, and support risks before the next decision point. The THAAD Element is a ground-based missile defense system that is being developed to protect forward-deployed military forces, population centers, and civilian assets from short- and medium-range ballistic missile attacks.

THAAD consists of six principal components: missile round, launcher, command and control/battle management and communications, radar, peculiar support equipment, and non-embedded training devices. The THAAD missile provides a non-nuclear, hit-to-kill, missile intercept capability for engaging and destroying theater ballistic missiles in and above the earth's atmosphere.

The THAAD development is divided into blocks (Block 2004, Block 2006, and Block 2008). The development of each block incrementally increases the element's capability. The THAAD Block 04 provides a THAAD Element capable of defense against short- and medium-range ballistic missiles and provides homeland defense against different threats. Block 06 builds on THAAD Block 04, expanding the capabilities of the THAAD Element against increasingly complex targets with a tactical missile configuration. Block 08 includes two

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development aspects. First, flight-testing will determine the capability of the THAAD Element against the full spectrum of short- and medium-range adversarial capabilities. Second, THAAD capability growth will enhance survivability and deployment of the weapon system.

## **Systems Engineering Documentation and Processes**

As discussed in finding B, the elements follow CJCS and MDA policy and guidance for planning and executing systems-engineering-related actions in support of transitioning capabilities to the Services. Although the element manager had developed documents defining capabilities and information support requirements for transition to the Army, he had not completed phase 1 of the Security Certification and Accreditation Process in a timely manner. Additionally, MDA policy was unclear concerning the required level of approval for the THAAD configuration management plan.

**Defining Capabilities and Information Support Requirements.** As discussed in finding B, DoD policy requires that the elements enter the formal acquisition process at Milestone C, Production and Deployment, when they transition to the Services. Upon transition, the elements must satisfy the requirements of the DoD Directives and Instructions that require Military Departments and DoD agencies to coordinate with the JCS to establish a capability production document with an NR-KPP and an information support plan.

**Capability Production Documents.** The element manager, in partnership with the Army Air Defense Artillery School, developed the capabilities document to formally state the required capabilities.

**Information Support Plan.** The element manager developed the THAAD Element Information Support Plan to provide the Army, the JCS, and the Office of the Secretary of Defense planners with a description of the THAAD Element and information technology needs, objectives, and interface requirements.

**Completing Phase 1 Security Certification and Accreditation Requirements.** As discussed in finding B, DoD Instruction 5200.40 defines the process for conducting information technology certification and accreditation. The DoD Instruction requires that phase I, Definition, of the Security Certification and Accreditation Process is completed before beginning system development. Phase 1 consists of documenting the system mission, environment, and architecture to identify security requirements and levels of effort necessary to achieve security certification and accreditation.

Although the THAAD program began in 1992, the element manager had only a draft SSAA that was not completed or certified by either the designated approving authority (MDA) or the certifying authority (Deputy for Security, Intelligence, and Special Programs). Although the draft SSAA addressed Security Certification and Accreditation Process areas, such as System Capabilities, System Criticality, and Life Cycle of the System, it was not complete because the



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element manager did not allocate funds to implement Security Certification and Accreditation Process requirements.

**Configuration Management Plan.** The MDA Assurance Provisions established information assurance requirements for developing and maintaining a configuration management plan. The plan should describe how configuration management is accomplished and how consistency among product definition, product configuration, and configuration management records is achieved and maintained throughout applicable phases of the product's life. Although the element manager had developed and maintained a configuration management plan, "THAAD Development Program Configuration Management Plan," January 27, 2003, which addressed essential configuration management areas, the MDA Assurance Provisions were unclear concerning the appropriate level of approval for the plan. Specifically, the MDA Assurance Provisions require that the cognizant MDA 2-letter manager approve the element configuration management plans. MDA has 2-letter managers at both the MDA and the element levels. Based on the element-specific nature of the configuration management plan, the MDA Assurance Provisions should specify that the element manager is the final approval authority for element configuration management plans.

## **Conclusion**

MDA was unable to fully evaluate the adequacy of the planned system engineering for the THAAD Element. The lack of a certified SSAA and approved Security Certification and Accreditation Process exposes the system to unnecessary risk and delays in defining system security requirements. Also, an approved SSAA is necessary to show that the Director, Missile Defense Agency and the element manager have agreed on critical schedule, budget, security, functionality, and performance objectives. Further, the absence of clear policy for approval of the element configuration management plan weakens MDA element oversight, coordination, integration, and control.

## **Recommendations, Management Comments, and Audit Response**

**Deleted Recommendations.** As a result of management comments and additional review, we deleted draft Recommendations C.2.b. and C.2.c. which, respectively, recommended that the THAAD element manager coordinate and obtain MDA approval of the draft configuration management plan and revise the software development plan for THAAD to include verification of contractor processes, procedures, staffing, and training relating to software development. We deleted Recommendation C.2.b. because we agreed with the Executive Director's comments on Recommendation C.1. that the THAAD element manager was the appropriate final approval authority for the configuration management plan. On Recommendation C.2.c., we agreed with the Executive Director that the sections in the software development plan on software quality assurance,

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corrective actions, and process training planning, when combined with the provisions of the THAAD contract DASG60-00-C-0072, which require the contractor to report software metrics, did adequately address the THAAD element manager's responsibilities for verifying contractor processes, procedures, staffing, and training relating to software development.

**1. We recommend that the Director, Missile Defense Agency revise the "Missile Defense Agency Assurance Provisions," January 9, 2004, to designate the appropriate organization within the Missile Defense Agency to coordinate and approve configuration management plans for the Missile Defense Agency elements.**

**Management Comment.** The Executive Director, responding for the Director, Missile Defense Agency nonconcurrent, stating that the MDA Assurance Provisions require that the element's configuration management plan be approved by the cognizant MDA 2-letter manager. The Executive Director stated that the THAAD element manager was the cognizant 2-letter manager, and that the element manager's approval met MDA requirements.

**Audit Response.** The Executive Director's comments were not responsive. While we agree that the THAAD element manager is the appropriate authority to approve the configuration management plan, the Director, Missile Defense Agency needs to revise the "Missile Defense Agency Assurance Provisions," January 9, 2004, to clearly define that approval authority. MDA 2-letter managers exist at MDA and at the elements. If the element manager is the appropriate 2-letter manager for approving element configuration management plans, the Missile Defense Agency's Assurance Provisions should clearly define this responsibility. We request that the Director, Missile Defense Agency reconsider his position and provide comments in response to the final report.

**2. We recommend that the element manager for the Terminal High Altitude Area Defense Element complete phase 1 of the Defense Information Technology Security Certification and Accreditation Process to include an approved System Security and Authorization Agreement.**

**Management Comments.** The Executive Director concurred, stating that, in November 2005, the THAAD element manager submitted a draft SSAA to the MDA designated approving authority and certification authority for coordination. The element SSAA for THAAD will be approved before the end of FY 2006.

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## D. Systems Engineering for the Airborne Laser Element

Although the ABL element manager (the element manager) followed many of the systems engineering processes described in the Defense Acquisition Guidebook, he did not complete several documents and processes that are important to system planning and development. Specifically, the element manager did not:

- update the 1996 Single Acquisition Management Plan and the 1997 SEMP to reflect the changes that had occurred in the ABL Element's (the element) overall technical approach, systems engineering processes, and tasks since the element became part of MDA in January 2002;
- establish a requirement for the contractor to follow the software development plan in the current development contract;
- use earned value management to report on the cost and schedule status for software development in four of the five ABL subsystems; and
- include the security requirements for weapons systems in the SSAA.

These conditions occurred because the element manager did not comply with established MDA guidance for preparing and coordinating SEMP's and did not promptly react to changes in the program, consistent with the principles of the DoD 5000 series. Further, MDA provided less oversight and direction because the program was not scheduled to deliver the BMDS capability as part of BMDS Blocks 04 or 06. As a result, without an updated single acquisition management plan and SEMP, the ABL element manager and the Director, Missile Defense Agency did not have an agreed-upon acquisition strategy to support the element's progression through the acquisition process and to fully evaluate the adequacy of the planned system engineering. Further, by not requiring the prime contractor to adhere to the software development plan, to establish earned value management reporting for the software in all five subsystems, and to implement weapon system security requirements, the element manager was limited in his ability to adequately oversee element development and system security.

### Airborne Laser Element

The Air Force began developing the ABL in 1992 as a separate acquisition program. In January 2002, the ABL Program became an element of the MDA and the BMDS. Within the BMDS, the primary mission of the ABL Element is to kill

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or disable ballistic missiles using a laser connected to an aircraft. The element's secondary missions include locating ballistic missile launch sites, providing early warnings of ballistic missile launches, providing cueing information to other BMDS elements that may need to engage launched ballistic missiles, and predicting missile impact points. The element consists of five major subsystems: the beam control/fire control, battle management, the laser, the Boeing 747-400F aircraft, and ground support equipment. All subsystems include mission-critical software and hardware.

The existing ABL contract for aircraft 1, F29601-97-C-0001, includes activities performed in the early part of the Technology Development phase as defined in DoD Instruction 5000.2. Activities in the Technology Development phase include early operational assessments, as necessary, to reduce technology, manufacturing, and support risks before the next decision point. ABL Program staff stated that a contract for the next acquisition phase for a second and later aircraft will be signed after the planned missile shoot down using the ABL technology, which will occur in 2008.

The MDA Decision Memorandum No. 01, "Planning Direction for BMDS Test Bed Capability," February 18, 2005, classified the ABL Element at Level 3 of development maturity. The MDA defines Level 3 as future blocks whose activities are generally associated with integration concepts including component development and demonstration. To complete Level 3 activities, the element manager must demonstrate that the lasers can shoot down a ballistic missile. ABL staff indicated that the ABL Element could deliver capability as part of BMDS Block 08 or Block 10, depending on MDA priorities and when test results demonstrate that the ABL can destroy or disable a ballistic missile.

## **Systems Engineering Documents and Process**

Although the element manager did follow many of the traditional systems engineering processes described in the Defense Acquisition Guidebook, he did not complete documents and processes that are important to system planning and development. Specifically, the element manager did not update the single acquisition management plan and the SEMP, establish a requirement for the contractor to follow the software development plan, establish earned value management reporting on software development for all five subsystems, and cite security requirements for weapon systems in the SSAA.

**Updating Planning Documents.** The element manager did not update the 1996 single acquisition management plan and 1997 SEMP to recognize the changes that had occurred in the overall technical approach, systems engineering processes, and tasks since the element became part of MDA. The element's most significant change was moving from a single, stand-alone system to being part of an overall integrated system that must communicate with the other MDA elements within the BMDS, such as the Aegis BMD, the THAAD, and the Patriot-3. Another significant change was that the element, as part of MDA, was required to start following acquisition procedures that meet the principles of the DoD 5000 series of directives.

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**Single Acquisition Management Plan.** DoD Instruction 5000.2 requires program managers to prepare and obtain approval of an acquisition strategy at program initiation and to update their acquisition strategy at subsequent major decisions, program reviews, and whenever a change occurs in the program's approved acquisition strategy. The element manager, under Air Force management, issued the single acquisition management plan on November 26, 1996, to support the Milestone I (now Milestone A) decision to initiate the program. The single acquisition management plan states that it is a comprehensive, integrated plan that describes the overall acquisition strategy and management processes for executing definition and risk reduction. It includes planning for the ABL engineering and manufacturing development and production phases of the acquisition process.

The element manager, however, did not update the original single acquisition management plan as required even though significant changes occurred over the 8 years since issuance of the 1996 Single Acquisition Management Plan. One of the significant changes was the MDA plan to use an evolutionary approach for developing and deploying the various BMDS elements, which meant that the element manager needed to include a specific set of parameters, with thresholds and objectives, for each evolutionary increment. The ABL Single Acquisition Management Plan did not describe and define how the element would use an evolutionary acquisition strategy.

**System Engineering Management Plan.** The Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, "Implementing Systems Engineering Plans in DoD - Interim Guidance," March 30, 2004, states that program managers should establish the systems engineering plan early in the program's life cycle to guide all technical aspects of an acquisition program. Further, the systems engineering plan is intended to be a living document that supports program management by defining and describing the systems engineering responsibilities of the Government and the contractor. The systems engineering plan should include specific parameters that describe a program's overall technical approach, including systems engineering processes, resources, key technical tasks, activities, and events, and measure its success. Further, the Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, "Policy for Systems Engineering in DoD," February 20, 2004, requires the systems engineering plan, or the SEMP for MDA, to be integrated with the acquisition strategy. To comply with this principle, the SEMP should be updated when significant changes occur in the acquisition strategy. The element manager had not updated the SEMP since 1997, before the ABL became an MDA element.

Additionally, the element manager did not discuss technical baselines or entrance criteria for technical reviews in the SEMP, as required in the Under Secretary of Defense for Acquisition, Technology, and Logistics memorandums on "Policy Addendum for Systems Engineering, October 22, 2004 and "Implementing Systems Engineering Plans in DoD - Interim Guidance," March 30, 2004. Instead, the SEMP indicated that the technical reviews were performed according to a schedule rather than being based on satisfying specific entrance criteria.

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**Implementing the Software Development Plan Requirements.** The ABL contractor developed a software development plan, "ABL Software Development Plan," November 26, 2003, and coordinated it with the element manager. However, the element manager did not require the contractor to comply with it in executing contract F29601-97-C-0001. The software development plan established and defined the best practices and processes necessary to complete all phases of the ABL software development. Specifically, the plan covered planning, production, and testing of software for the operational flight and mission, and the simulation and engineering that could be used by the contractor in developing the ABL software. The element office staff agreed that being able to enforce compliance with portions of the software development plan in the contract terms would enhance their ability to manage software development. The software development plan should be followed for the next and any subsequent ABL contracts.

**Establishing Earned Value Management Reporting for Software Development.** The National Defense Industrial Association Program Management Systems Committee ANSI/EIA-748-A, "Standard for Earned Value Management Systems Intent Guide," January 2005, intended for Government and contractor use in implementing earned value management, states that the work breakdown structure for earned value management reporting should extend to the level necessary for management action and control and be based on the complexity of the work. The element office staff indicated that software development was complex and difficult for all five ABL subsystems, but the element manager and the contractor established software development as a top-level, work breakdown structure, with earned value management reporting for only one of the five subsystems—the Battle Management. Accordingly, the element office did not receive earned value management cost and schedule reporting for the beam control/fire control, the high energy laser, the aircraft subsystems, and the ground support subsystem.

Tracking and reporting earned value is the key to understanding the status of the project because earned value measures the actual cost and time to perform work against the budgeted cost and time. Further, earned value allows acquisition managers to estimate the cost for completing planned work. The first step in implementing earned value management is defining the work breakdown structure. Element office staff agreed that revising the work breakdown structure for separate cost and schedule reporting on the software development for the other three subsystems would add value in understanding their potential software problems.

**Applying Requirements for Weapon System Security.** The element manager applied system security requirements in the SSAA for the National Industrial Security Program Operating Manual for contractor facilities, rather than applying weapon systems security requirements. The element office staff stated that weapon systems security requirements did not apply to the first ABL aircraft because it was only used for development and testing. However, the staff agreed that it would be more appropriate for the SSAA to reference weapon system security requirements for the second ABL aircraft, because that aircraft will have operational as well as developmental use.

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## Factors Affecting Systems Engineering

The element manager did not satisfy the requirements of DoD Directive 5134.9 for managing according to the principles of the DoD 5000 series of directives and the Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, March 30, 2004, which requires the element manager to update the single acquisition management plan, and the SEMP when significant changes occur in the program acquisition strategy. Additionally, the element manager did not comply with MDA guidance for coordinating and obtaining MDA approval of SEMPs. Specifically, the MDA Assurance Provisions require program managers to document the design, engineering, and technical management processes for all phases of a SEMP life cycle and submit it to MDA for approval.

Further, the element received less direct and explicit direction from the MDA because it was at Capability Level 3 maturity and therefore was not scheduled to deliver BMDS capability as part of Blocks 04 or 06. Specifically, unlike the elements classified at Capability Level 2: Next Block, MDA did not identify detailed requirements from the test bed system specification for the ABL Element. Element office staff stated that it would be helpful if MDA provided them with more specific guidance on the systems engineering activities that the element should be performing as it progresses towards achieving Level 2 classification.

## Conclusion

The Director, Missile Defense Agency was not able to fully evaluate the adequacy of the system engineering for the ABL Element and could not be certain that all technical changes in the element were known and approved. Specifically, an updated single acquisition management plan was necessary to show that the Director, Missile Defense Agency and the element manager had agreed to an acquisition strategy to bring the element to Level 2: Next Block and to transition the ABL to the Air Force. Additionally, an updated SEMP would have provided the element manager with a plan describing the element's overall technical approach to achieve its objectives. Further, the element manager could increase his oversight and control of the ABL development and increase system security by requiring the prime contractor to comply with the software development plan, to establish earned value management reporting for the software for the five element subsystems, and to implement security requirements for weapon systems.

MDA staff stated in response to a discussion draft that they would issue more detailed engineering guidance to the element manager, beginning in 2006 or 2007, and would establish specific ABL Element requirements to support the element's expected Block 2010 maturation. The MDA staff stated that the ABL transition to the Air Force depended on a successful demonstration in the BMDS test bed and on the MDA Director's decision to effect the transition. Further, the ABL element staff stated that, while they had not updated the SEMP since 1997, they had updated the systems engineering documents cited in the SEMP that provide program guidance. Specifically, they had updated the Integrated Task and

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Management Plan, a contractor document that tracks key technical tasks and events, and ABL program instructions that document systems engineering processes, technical performance measures, source selection, and corrective and preventive action procedures. We believe that those plans and actions, combined with implementing our recommendations, will significantly enhance the effectiveness of systems engineering for the ABL Element.

## Recommendations

**Revised Recommendation.** As a result of management comments, we revised Recommendation D.3. to pertain to the planned second and later ABL aircraft rather than the first ABL aircraft. We made this revision based on management assertions that because the contractor had already completed the majority of work on the first aircraft, it was not cost-effective to implement the recommendation on this aircraft. We further revised the recommendation to recognize that the aircraft subsystem of ABL did not require new software.

We recommend that the Airborne Laser element manager:

1. Update the 1996 Single Acquisition Management Plan to:

a. Adhere to the principles in DoD Instruction 5000.2, "Operation of the Defense Acquisition System," May 12, 2003, to update the changes that occurred in the element's technical approach, systems engineering processes, and tasks since it became part of the Missile Defense Agency in January 2002.

b. Define the evolutionary acquisition strategy and include parameters, with thresholds and objectives, for each evolutionary increment planned for the Airborne Laser Element, in compliance with DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004.

**Management Comments.** The Executive Director, responding for the ABL element manager, concurred, stating that the ABL element manager will update the single acquisition management plan to include the evolutionary acquisition strategy plan.

**Audit Response.** In response to the final report, we request that the ABL element manager provide an estimated date for updating and obtaining final approval of the single acquisition management plan.

2. Update the 1997 Systems Engineering Management Plan to comply with the principles of the Under Secretary of Defense for Acquisition, Technology, and Logistics memorandums' requirement to update as changes occurred in the program's overall technical approach, including processes, resources, metrics, and applicable performance incentives, and to establish entrance criteria for all planned technical reviews.



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**Management Comments.** The Executive Director concurred, stating that the SEMP had been updated and that the most recent version was dated September 22, 2005.

**3. For the planned contracts for the second and subsequent ABL aircrafts:**

**a. Require the contractor to implement the Airborne Laser Software Development Plan.**

**Management Comments:** The Executive Director nonconcurred, stating that it would be cost prohibitive and of limited benefit for the ABL program to put the ABL Software Development Plan on the existing contract for the first ABL aircraft because most subsystem software was already complete and supported integration and test activities.

**Audit Response:** We recognize that there are costs as well as benefits that are associated with implementing the ABL Software Development Plan, and we acknowledge the Executive Director's statement that the majority of the work was complete on the contract for the first ABL aircraft. Therefore, we revised the recommendation to require the contractor to implement the ABL Software Development Plan in the planned contracts for the second and later aircraft. In response to the final report, we request that the ABL element manager comment on the revised recommendation.

**b. Require the contractor to use earned value management reporting for software development on the following subsystems of the Airborne Laser: beam control/fire control, the high energy laser, and ground support equipment.**

**Management Comments:** The Executive Director nonconcurred, stating that the ABL Element had adequate earned value management reporting. Specifically, he stated that software earned value reporting was already occurring on the beam control/fire control unit and on the ground support equipment. The Executive Director stated that the laser software was embedded within each subsystem and that the aircraft did not require new software. He further stated that although the ABL element manager agrees that software earned value reporting is a good practice, it would be cost prohibitive to invoke a lower level earned value reporting at this time.

**Audit Response:** The Executive Director's comments were not responsive. The contractor's Cost Performance Report Work Breakdown Structure for February 25, 2005, through March 31, 2005, provided separate earned value reporting for the Battle Management, Command, Control, Communications, Computers and Intelligence segment only. Although the narrative section discussed software issues relating to the other ABL subsystems, it did not provide specific earned value percentages for the other ABL subsystems. Recognizing that the contractor had completed the first ABL aircraft and that the aircraft subsystem did not require new software, we revised the recommendation to require the ABL element manager to task the contractor to use earned value management reporting for software development on the beam control/fire control, the high energy laser, and ground support equipment on the planned contracts for

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the second and later aircraft. In response to the final report, we request that the ABL element manager reconsider his response to the draft report recommendation and comment on the revised recommendation in the final report.

**4. Update the System Security Authorization Agreement to include weapon system security requirements for the second and later ABL aircraft.**

**Management Comments:** The Executive Director nonconcurred stating that the current SSAA for the ABL Weapon System applies only to the first ABL aircraft. However, the Executive Director stated that when the ABL element manager develops contracts for the second and later ABL aircraft, he will include system security requirements in the contracts and in a new SSAA.

**Audit Response:** The Executive Director's comments met the intent of the revised recommendation. In response to the final report, we request that the ABL element manager provide an estimated date for completing the updated SSAA for the second and later ABL aircraft.

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## **E. Auditor Access to Documents at the Missile Defense Agency**

MDA did not provide the audit staff with expeditious access to requested documents because MDA policy conflicted with DoD policy. The delay in receiving documents resulted in a delay of audit evaluations, wasted staff-hours for the auditors and the MDA staff, and suspension of another audit. Also, because of the unexplained delays, Government Accountability Office Government Auditing Standards, June 2003, required the auditors to perform additional audit work to verify the accuracy of the documents received.

### **Policy For Releasing Documents to Auditors**

DoD Instruction 7050.3, "Access to Records and Information by the Inspector General, Department of Defense," April 24, 2000, provides DoD policy and assigns responsibilities for expediting access to DoD records that members of the DoD Office of Inspector General require to perform their official duties.

MDA Instruction 7600.01, "External Audits and Requests," March 17, 2003, establishes the MDA policies and procedures for working with the Government Accountability Office, DoD Office of Inspector General, and other external audit agencies during audits, surveys, reviews, inspections, and other investigatory activities.

### **Release of Documents at Missile Defense Agency**

DoD Instruction 7050.3 requires that staff of the DoD Office of Inspector General have expeditious and unrestricted access to, and, when required, copies of all records, reports, investigations, audits, documents, papers, recommendations, or other material. To enable expeditious and unrestricted access, the Instruction further requires that Heads of DoD Components establish procedures to immediately grant any DoD Office of Inspector General request for information or records relating to matters under an authorized audit. MDA did not provide copies of documents in an expeditious manner during auditor visits to the MDA Systems Engineering and Integration office, the Aegis BMD Element office, the ABL Element office, and the Targets Program office, even when documents were readily available. Specifically, from June through September 2004, the auditors working on Project No. 2004AE-0154, "Audit of the Capabilities Development Process and Management of Target Acquisitions at MDA," received only 2 percent (2 of 94) of the requested documents within 5 business days. For Project No. 2005AE-0134, "Audit of Systems Engineering Planning for the BMDS," auditors received 20 percent (49 of 245) of requested documents within 5 business days. Although document access improved for the second audit, it still did not meet the requirements of expeditious access as required by DoD Instruction 7050.3.

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Additionally, the auditors were unable to remove documents that the MDA or element staffs had specifically copied or burned onto a CD for them. Instead, the auditors were required, because of MDA Instruction 7600.01, to first coordinate the release of documents through MDA, after which they encountered delays while they waited for the requested documents.

Following discussions between MDA and the DoD Office of Inspector General, MDA recognized that MDA Instruction 7600.01 was not in accordance with DoD policy. Accordingly, MDA issued a memorandum on September 2, 2005, to clarify that the MDA policy is to expeditiously provide materials and information to auditors. Although other parts of the memorandum still allow MDA up to 10 working days to provide auditors with documents and do not differentiate between the DoD Office of Inspector General and the Government Accountability Office, MDA has been providing documents to auditors without delay.

## **DoD and Missile Defense Agency Policy**

The unacceptable delays in receiving requested documents occurred because MDA policy conflicts with DoD policy on expeditious and unrestricted auditor access to documents. Specifically, MDA Instruction 7600.01 states that MDA may have up to 10 working days to provide auditors with copies of requested documents and that auditors must coordinate document requests through MDA and its General Counsel. That extensive coordination process led to unreasonable delays in receiving documents, in direct violation of the document access requirements and Component Heads' responsibility to establish procedures that grant immediate access to documents in DoD Instruction 7050.3.

Additionally, the MDA Instruction incorrectly classified the DoD Office of Inspector General as an external audit agency. The DoD Office of Inspector General reports directly to the Secretary of Defense, making the Office of Inspector General an internal audit agency. Therefore, the auditors should not have been subjected to the restrictions that MDA Instruction 7600.01 places on external audit organizations.

## **Effects of Document Access**

The delay in receiving documents resulted in delays in audit evaluations, wasted staff-hours for the auditors and the MDA staff, and suspension of another audit. Additionally, Government Accountability Office Government Auditing Standards, June 2003, required the auditors to perform additional audit work to verify the accuracy of the documents received because of the unexplained delay.

**Audit Evaluations.** The delays in receiving documents delayed the auditors' work to complete their evaluations. For example, MDA personnel used briefing charts in meetings; evaluations of those briefing charts were delayed as the auditors waited for the charts to complete the MDA coordination process.

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**Staff-hours.** The DoD Office of Inspector General spent unnecessary staff-hours waiting for MDA to comply with procedures in MDA Instruction 7600.1 for releasing documents. To obtain the documentation, the auditors:

- maintained a database of the documents that they requested,
- waited to receive MDA updates on the release status of documents requested, and
- requested information regularly on the status of their various document requests through phone calls and e-mails.

More delays occurred because the MDA internal audit personnel who coordinated the release of requested documents had to track down documents' owners within MDA and wait for the MDA and General Counsel to clear the release of documents. These delays reduced the amount of internal audit work the auditors could perform for MDA. Thus, the requirements of MDA Instruction 7600.01 decreased productivity for MDA and DoD Office of Inspector General personnel.

**Audit Suspension.** The delays in receiving documents resulted in the suspension of another audit. Specifically, Project No. D2005-D000AL-0152, "Information Security Operational Controls at the Missile Defense Agency," was suspended for 24 days, beginning June 3, 2005, and reopening June 27, 2005, because MDA was slow in releasing documents.

**Additional Audit Work.** Government Accountability Office Government Auditing Standards, June 2003, state that unexplained delays in providing information might indicate a heightened risk of fraud; therefore the auditors had to perform additional audit work to verify the accuracy of the documents they received. Very few documents were received in an expeditious manner and it was unclear why MDA needed to review documents before releasing them to the auditors. The auditors had to reconfirm problems previously noted during onsite reviews of documents when MDA later released the documents. We did not identify any discrepancies in the documents with what we previously noted during our onsite reviews.

## **Conclusion**

MDA Instruction 7600.01 did not comply with the requirements of DoD Instruction 7050.3. Specifically, the coordination process and the associated delays in releasing documents did not conform with DoD policy for expeditious and unrestricted auditor access to documents, and the auditors had to complete additional audit work to verify the accuracy of the documents to comply with Generally Accepted Government Auditing Standards.

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## **Recommendation, Management Comments, and Audit Response**

We recommend that the Director, Missile Defense Agency revise Missile Defense Agency Instruction 7600.01, "External Audits and Requests," March 17, 2003, to require that auditors from the DoD Office of the Inspector General, as an internal audit agency, receive expeditious and unrestricted access to all documentation in accordance with DoD Instruction 7050.3, "Access to Records and Information by the Inspector General, Department of Defense," April 24, 2000.

**Management Comments.** The Executive Director, responding for the Director, Missile Defense Agency, concurred, stating that MDA Business Management has substantially modified MDA Instruction 7600.01 to streamline the release of the majority of documents within 5 days of a request. He further stated that MDA Instruction 7600.01 will be coordinated within MDA, with planned approval by January 2006.

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## Appendix A. Scope and Methodology

We evaluated whether the MDA was adequately planning systems engineering to develop and field missile defense elements, or key components, into an effective and suitable BMDS. The review focused on the MDA and three elements of the BMDS: Aegis BMD, ABL, and THAAD. We chose those three elements because they were in three different stages of development with plans to transition to three different Services. Specifically, the ABL was in early development (Technology Level 3) and was to transition to the Air Force, the THAAD was in mid-development (Technology Level 2: Next Block) and was to transition to the Army, and the Aegis BMD was partially transitioned to the Navy.

To determine whether MDA was adequately planning systems engineering, we examined systems engineering documents dating from November 1996 through October 2005. We obtained those documents from and conducted interviews with personnel from MDA, Arlington, Virginia; the Aegis BMD Element office, Arlington, Virginia; the ABL Element office, Albuquerque, New Mexico; and the THAAD Element office, Huntsville, Alabama.

Our determination of whether MDA had adequate planning for systems engineering also included evaluating MDA compliance with the principles or the exact provisions of the following policy and guidance: DoD Directive 5000.1, "The Defense Acquisition System," May 12, 2003; DoD Instruction 5000.2, "Operation of the Defense Acquisition System," May 12, 2003; DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004; Defense Acquisition Guidebook, October 17, 2004; DoD Directive 8500.1, "Information Assurance," October 24, 2002; DoD Instruction 8580.1, "Information Assurance in the Defense Acquisition System," July 9, 2004; DoD Instruction 5200.40, "DoD Information Technology Security Certification and Accreditation Process," December 20, 1997; DoD Directive 4630.5, "Interoperability and Supportability of Information Technology and National Security Systems," May 5, 2004; DoD Instruction 4630.8, "Procedures for Interoperability and Supportability of Information Technology and National Security System," June 30, 2004; CJCS Instruction 3170.01E, "Joint Capabilities Integration and Development System," May 11, 2005; and CJCS Instruction 6212.01C, "Interoperability and Supportability of Information Technology and National Security Systems," November 20, 2003.

We performed this audit from March 2005 through October 2005 in accordance with generally accepted government auditing standards. The scope was limited because of the restrictions that MDA placed on the release of documentation. Not receiving documents in an expeditious manner resulted in the delay of audit evaluations, wasted staff-hours for the auditors and the MDA staff, and performance of additional work to confirm that MDA did not alter documentation. This scope limitation is further detailed in finding E.

**Use of Computer-Processed Data.** We did not use computer-processed data to perform this audit.

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**Use of Technical Assistance.** Two electrical engineers and one software engineer from the Technical Assessment Division of the Audit Follow-up and Technical Support Directorate, DoD Office of Inspector General assisted in the audit. The electrical engineers assisted the audit team by analyzing systems engineering documents and participating in interviews. The software engineer assisted the audit team by analyzing software documents and participating in interviews.

**Government Accountability Office High-Risk Area.** The Government Accountability Office has identified several high-risk areas in DoD. This report provides coverage of the DoD weapons systems high-risk area.

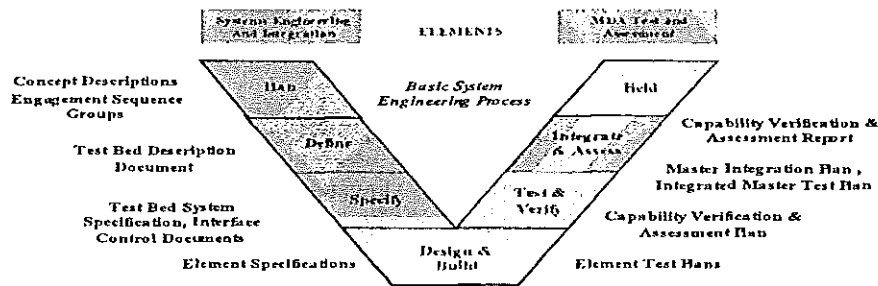
## **Prior Coverage**

No prior coverage has been conducted on systems engineering planning at MDA during the last 5 years.

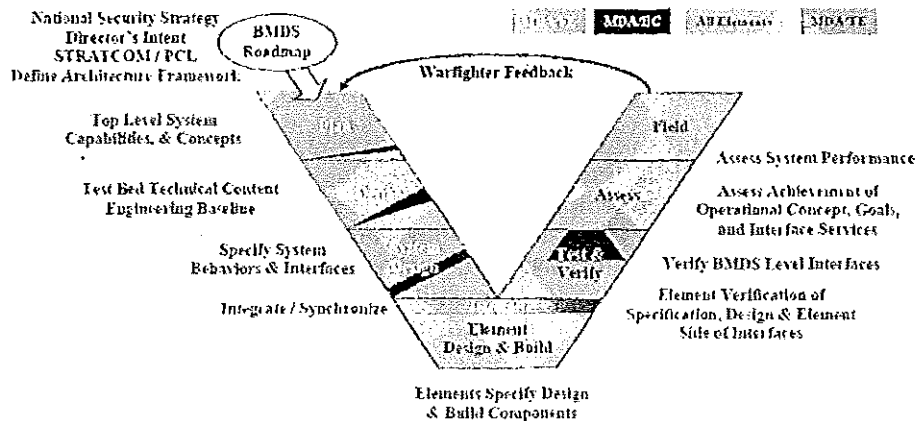


# Appendix B. Missile Defense Agency Systems Engineering Process

## The MDA Systems Engineering Process, March 17, 2005



## The MDA Systems Engineering Process, September 12, 2005



- MDA/BC – Missile Defense Agency Battle Management/Command and Control
- MDA/SE – Missile Defense Agency Systems Engineering and Integration Directorate
- MDA/TE – Missile Defense Agency Test and Assessment
- STRATCOM/PCL – U.S. Strategic Command Prioritized Capabilities Listing

Staff in the Systems Engineering Directorate included a BMDs Roadmap, an architecture framework, and element participation in every stage of the systems engineering process.

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## Appendix C. Systems Engineering Policy and Guidance

The following provide policy and guidance for DoD acquisition managers to follow when implementing systems engineering, information assurance, and interoperability requirements within acquisition programs.

### Systems Engineering

**DoD Directive 5000.1, "The Defense Acquisition System," May 12, 2003.** The Directive requires acquisition programs to be managed through a systems engineering approach that optimizes total system performance and minimizes total ownership costs. DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004, states that the Director, Missile Defense Agency must manage according to the principles of DoD Directive 5000.1.

**DoD Instruction 5000.2, "Operation of the Defense Acquisition System," May 12, 2003.** The Instruction states that effective sustainment of a weapon system begins with designing and developing reliable and maintainable systems and applying a strong systems engineering methodology. To further clarify systems engineering policy, the Under Secretary of Defense for Acquisition, Technology, and Logistics issued a series of three policy memorandums that are planned for inclusion in the next update to the Instruction. The three policy memorandums are discussed below.

**Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, "Policy for Systems Engineering in DoD," February 20, 2004.** The memorandum provides policy on systems engineering for acquisition programs. The memorandum requires program managers to develop a systems engineering plan for the milestone decision authority to approve that describes the program's overall technical approach on processes, resources, metrics, and applicable performance incentives.

**Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, "Implementing Systems Engineering Plans in DoD - Interim Guidance," March 30, 2004.** The memorandum reaffirms the policy in the February 20, 2004, memorandum and identifies areas that the systems engineering plan will cover, including the systems engineering process, the technical baseline approach, use and criteria of technical reviews, and integrated product teams. The memorandum requires acquisition managers to submit the systems engineering plan to the Director, Defense Systems for evaluation 30 days before a milestone review.

**Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum, "Policy Addendum for Systems Engineering," October 22, 2004.** The memorandum requires the Program Executive Officer or a chief systems engineer to be responsible for the review and oversee the

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implementation of the systems engineering plan. It also states that technical reviews must be event driven and be conducted when the system meets the review entrance criteria documented in the systems engineering plan. Additionally, the memorandum endorses the systems engineering best practices in the Defense Acquisition Guidebook.

**DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004.** The Directive states that the Under Secretary of Defense for Acquisition, Technology, and Logistics will provide policy direction and overall management oversight to MDA. The Directive states that the Director, Missile Defense Agency must manage by the principles of DoD Directive 5000.1 and DoD Instruction 5000.2 during incremental and spiral development. The Directive also requires MDA to obtain warfighter advice on desired operational features, approaches to system fielding, and system integration.

**Defense Acquisition Guidebook, October 17, 2004.** The Guidebook is designed to provide best practices to the acquisition workforce. The Guidebook states that systems engineering should provide the capabilities that the warfighters need within design constraints and technology, budget, and schedule limitations. Further, the Guidebook provides a detailed description of the systems engineering activities required at each acquisition phase.

## **Information Assurance**

**DoD Directive 8500.1, "Information Assurance," October 24, 2002.** The Directive requires Defense agencies to identify and include information assurance requirements in the design, acquisition, installation, operation, upgrade, or replacement of all information systems. Accordingly, the software development plan should define how to develop and implement the information assurance requirements that are defined in the requirements documents.

**DoD Instruction 8580.1, "Information Assurance in the Defense Acquisition System," July 9, 2004.** The Instruction requires Defense agencies to implement information assurance throughout the entire life cycle of a weapon system.

**DoD Instruction 5200.40, "DoD Information Technology Security Certification and Accreditation Process," December 20, 1997.** The Instruction requires that Defense agencies protect information technology by implementing the system Security Certification and Accreditation Process. Specifically, the Security Certification and Accreditation Process requires program managers to complete an SSAA to document the conditions required for a system to become certified and accredited. The Instruction prescribes procedures for certifying and accrediting information technology, automated information systems, networks, and DoD sites. Specifically, the Instruction establishes a standard process to certify and accredit information technology systems that will maintain the security of the defense information infrastructure. A critical element of the DoD Information Technology Security Certification and Accreditation Process is the SSAA between the system program manager, designated approving authority, certification authority, and user representative.

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## Interoperability

**DoD Directive 4630.5, "Interoperability and Supportability of Information Technology and National Security Systems," May 5, 2004.** The Directive requires DoD Components to establish and use the NR-KPP to assess the attributes required for the technical exchange of information and the effectiveness of that exchange. The Directive also requires an information support plan to manage and evaluate interoperability and supportability needs.

**DoD Instruction 4630.8, "Procedures for Interoperability and Supportability of Information Technology and National Security Systems," June 30, 2004.** The Instruction requires CJCS to coordinate with DoD Components to provide advice, guidance, direction, and assistance on interoperability and supportability. The Instruction also requires that the information support plan include an NR-KPP and document the program's interoperability, information, and support requirements.

**CJCS Instruction 3170.01E, "Joint Capabilities Integration and Development System," May 11, 2005.** The Instruction requires the JCS Director for Command, Control, Communications, and Computers Systems (J6) to serve as the lead for validating the NR-KPP and resolving any issues associated with it. The Instruction also requires DoD Components to establish performance thresholds and objectives for all NR-KPPs.

**CJCS Instruction 6212.01C, "Interoperability and Supportability of Information Technology and National Security Systems," November 20, 2003.** The Instruction requires DoD Components to coordinate with the JCS Director J6 to obtain certification of NR-KPPs and information support plans for fielded capabilities. The Instruction also details a methodology to develop the NR-KPP and provides a checklist for J6 certification of information support plans.

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## Appendix D. Audit Response to the Missile Defense Agency Comments

The detailed responses on the comments from the Executive Director, MDA, follow. The complete text of those comments is in the Management Comments section of this report.

### Management Comments on General Content and Audit Response

The Executive Director's comments focused on general content in the Background and finding A.

**Background.** The Executive Director stated that the report should include the following ideas in the background.

- the January 2, 2002, Secretary of Defense memorandum greatly expanded MDA responsibility and authority.
- DoD Directive 5134.9 supplements the Secretary of Defense memorandum. Specifically, DoD Directive 5134.9 permits the Under Secretary of Defense for Acquisition, Technology, and Logistics in collaboration with the Director, Missile Defense Agency to periodically determine the applicability of DoD Directive 5000.1 and DoD Instruction 5000.2.
- DoD Directive 5134.9 provides the Director, Missile Defense Agency with significant flexibility in managing the elements until they transfer to the Services.
- DoD Directive 5134.9 allows the BMDS to be managed consistent with the principles of the DoD 5000 series.
- the February 2002 Under Secretary of Defense for Acquisition, Technology, and Logistics memorandum designated the BMDS as one major DoD acquisition program.

**Audit Response.** We revised the report by including the above information in either Background section of the report or in finding A under "Systems Engineering Planning for the BMDS," which is the background information for the finding.

**Finding A—Systems Engineering Plan.** The Executive Director stated that our assertion that the MDA Assurance Provisions documented support for a systems

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engineering plan is inaccurate. The MDA Safety, Quality, and Mission Assurance Directorate developed the MDA Assurance Provisions to assure safety, risk mitigation, and quality.

**Audit Response.** We removed this reference from the report.

**Finding A—Systems Engineering Guidance.** The Executive Director disagreed with the conclusion that MDA had not provided clear guidance to the elements on the systems engineering activities that were appropriate to their stage of development. He stated that the MDA Systems Engineering Directorate had provided significant and thorough guidance to the elements throughout the system development cycle through meetings and numerous documents. Documents coordinated included:

- the testbed description document, which describes the concepts to be developed,
- the testbed system specification, which allocates system requirements and interfaces to the BMDS elements, and
- the technical objectives and goals, which guided initial BMDS development by providing the elements a path for program development and metrics to measure progress.

**Audit Response.** We recognize that MDA did provide significant guidance to MDA elements on systems engineering activities. As a result, we deleted the finding A section of the draft version and the corresponding recommendation that addressed an overall lack of MDA guidance to BMDS elements. While the draft report overstated the overall need for MDA guidance to the BMDS elements, findings B, C, and D address the need for specific types of MDA guidance to the BMDS elements, including guidance for coordinating and approving SEMP, submitting configuration management plans for approval, and providing oversight and guidance to elements that are not yet part of a specific developmental block.

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## **Appendix E. Report Distribution**

### **Office of the Secretary of Defense**

Under Secretary of Defense for Acquisition, Technology, and Logistics  
  Director, Acquisition Resources and Analysis  
Under Secretary of Defense (Comptroller)/Chief Financial Officer  
  Deputy Chief Financial Officer  
  Deputy Comptroller (Element/Budget)  
Assistant Secretary of Defense for Homeland Defense  
Assistant Secretary of Defense for Networks and Information Integration  
  Deputy Assistant Secretary of Defense for Space Program  
Director, Program Analysis and Evaluation

### **Department of the Army**

Auditor General, Department of the Army

### **Department of the Navy**

Assistant Secretary of the Navy (Manpower and Reserve Affairs)  
Naval Inspector General  
Auditor General, Department of the Navy

### **Department of the Air Force**

Assistant Secretary of the Air Force (Financial Management and Comptroller)  
Auditor General, Department of the Air Force

### **Combatant Commands**

Commander, U.S. Northern Command  
Commander, U.S. Strategic Command

### **Other Defense Organizations**

Director, Missile Defense Agency  
  Deputy, Systems Engineering and Integration Directorate  
  Element Director, Aegis Ballistic Missile Defense  
  Element Director, Airborne Laser  
  Element Director, Terminal High Altitude Area Defense

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## **Non-Defense Federal Organization**

Office of Management and Budget

## **Congressional Committees and Subcommittees, Chairman and Ranking Minority Member**

Senate Committee on Appropriations  
Senate Subcommittee on Defense, Committee on Appropriations  
Senate Committee on Armed Services  
Senate Committee on Homeland Security and Governmental Affairs  
House Committee on Appropriations  
House Subcommittee on Defense, Committee on Appropriations  
House Committee on Armed Services  
House Committee on Government Reform



# Missile Defense Agency Comments



DM

DEPARTMENT OF DEFENSE  
MISSILE DEFENSE AGENCY  
7100 DEFENSE PENTAGON  
WASHINGTON, DC 20301-7100

JAN 03 2006

MEMORANDUM FOR DEPUTY INSPECTOR GENERAL FOR AUDITING,  
PROGRAM DIRECTOR, ACQUISITION AND  
TECHNOLOGY, OFFICE OF THE INSPECTOR  
GENERAL, DEPARTMENT OF DEFENSE

SUBJECT: Response to Draft Report on System Engineering Planning for the Ballistic  
Missile Defense System (Project No. D2005 - D000AE-0134)

We appreciate the efforts made by your staff to work with the Missile Defense Agency in ensuring that the report is factually accurate. However, we have some major concerns with the draft report as currently written. Attachment 1 responds to the subject report's findings and recommendations. Attachment 2 provides additional comments on the discussion sections of the draft.

My point of contact for this submission is Mr. Robert Weyant, Director, Internal Review at (703) 553-5627.

A handwritten signature in cursive script that reads "Terry R. Little".

TERRY R. LITTLE  
Executive Director

Attachments:  
As stated

**Missile Defense Agency Response to Draft Report on System Engineering Planning for the Ballistic Missile Defense System (Project No. D2005 – D000AE-0134)**

The Missile Defense Agency (MDA) continues to aggressively and successfully develop an integrated ballistic missile defense system (BMDS). The MDA Director has established numerous boards and venues to actively track progress of the integration (Configuration Control Board, System Element Review, Operational Configuration Management Board, Test Configuration Control Board, Program and Organizational Review, System Engineering Integration Council and the Executive Management Council, to name a few). Progress of system integration is constantly monitored and evaluated to provide the best approach toward a completely integrated BMDS. Additionally, MDA uses a Technical Objective and Goals (TOG) document to guide development and systems engineering of the BMDS. This document contains the technical objectives and goals (aka key performance parameters) that provide the systems engineering team with a solid and proven method of risk management and analysis. Further, MDA has prepared a draft comprehensive, overall system engineering plan which will be disseminated to the entire MDA upon its approval.

**General Content:**

Describing the January 2, 2002, Secretary of Defense (SECDEF) memorandum without indicating that this memorandum significantly expanded MDA's responsibility and authority minimizes the Presidential emphasis on the BMDS effort at this time across multiple BMDS component developments. Supplementing (and not replacing) the January 2002 memorandum is Department of Defense Directive (DoDD) 5134.9, "Missile Defense Agency," dated October 9, 2001, which provides significant guidance to all the Services and the Department. In that Directive, the Under Secretary of Defense for Acquisition, Technology, and Logistics (AT&L) in concert with the Director, MDA, periodically determines the applicability of DoDD 5000.1 and Department of Defense Instruction (DoDI) 5000.2. The Director is offered significant flexibility in managing BMDS elements and components until the Services enter transferred elements into the Formal Department of Defense (DoD) acquisition process. In accordance with DoDD 5134.9, MDA will manage the BMDS "consistent with" the principles of the DoD 5000 series. These ideas are significant and should be mentioned in the background.

It is important to recognize that the BMDS is one Major Defense Acquisition Program (MDAP) (see AT&L memorandum of February 2002, page 2, para c). The Aegis BMD element, for example, is not an MDAP, nor is the Aegis BMD element transitioning to the Navy, although some capabilities will be provided from Block 04. Further, providing those capabilities does not amount to transitioning production or procurement responsibilities to the Navy and so does not trigger Milestone C requirements (see, for example, the SECDEF Memo of January 2002, page 3, para f; the

**ATTACHMENT 1**

AT&L memorandum of February 2002, page 2, para b(6); and DoDD 5134.9, para 6.3.1). The discussion in Findings, Section B, Systems Engineering for the AEGIS Element takes a contrary view, with which we strongly disagree.

Findings, Section A of the report concludes, in part, that "...MDA had not provided clear guidance to MDA elements on the systems engineering activities that were appropriate to their stage of development," (page 4, third bullet). That conclusion does not recognize that MDA System Engineering and Integration (MDA/SE) provides significant and thorough guidance to the elements and components throughout the full system development cycle, i.e. from planning and concept development through fielding. MDA is not subject to the traditional requirements generating process of the 3170 series of documents. Beginning in 2001 and culminating in mid 2002, MDA developed and published a TOG document to guide the initial BMDS development. This document provided the elements a path for program development and metrics to measure progress.

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The MDA uses the TOG instead of the Key Performance Parameters (KPP) construct, which is a vestige of the 3170 series closeouts. In addition, over the course of the last four years, MDA/SE developed a significant body of documentation to be used as guidance for the elements in the form of System Capability Specifications, Adversary Capability Documents, Adversary Data Packages, Test Bed Description Documents (TBDD) and Block-specific Test Bed System Specifications (TBSS). These top-level specifications were developed and coordinated with BMDS elements through an interactive and collaborative process to identify alternative concepts to enhance the BMDS. During that process, Concept Description (CD) and Engagement Sequence Group (ESG) documents are drafted and coordinated with the elements/components via tabletop discussions. The collaborative process continues in the development of the analysis that evaluates these concepts against the criteria contained in the TOG.

The results of this process are coordinated via another set of tabletop discussions with the elements/components. Then, all of the concepts are reviewed at a Technical Review Board (TRB - last one held May 2005) with senior MDA leadership, including all of the elements/components. The TRB's recommendation on the concepts to be developed is documented in the TBDD which is approved at the BMDS Configuration Control Board (CCB), chaired by the Director, MDA. After CCB approval, the TBDD is distributed via a Director's memorandum that directs the elements/components to execute the program described in the TBDD. A similar process is used in the development of the TBSS, which describes system requirements and interfaces and allocates them to the elements and components of the BMDS. This interactive and collaborative process with elements/components is used for development of all system engineering documentation. Appropriate analysis and risk management support all phases of the system engineering process and a well established technical review process and configuration management board system controls the system engineering process.

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Further, the assertion that, "MDA documented its support for systems engineering planning in the MDA Assurance Provisions, February 24, 2004, which require that all elements develop a systems engineering plan for MDA coordination and approval," is inaccurate (report, page 7). The MDA Assurance Provisions (MAP) is a document created by the MDA Safety, Quality, and Mission Assurance Directorate (MDA/QS). It refers to the need for system engineering processes to assure safety, risk mitigation, and quality, but it does not define those processes. Moreover, the MAP is not a compliance document. MDA/SE developed an initial BMDS System Engineering Process to reflect a capability-based, spiral acquisition methodology. The process was implemented for the BMDS Block 04. In collaboration with the BMDS elements, that process was modified for BMDS Block 06. It was briefed to the organization and, when approved, will be issued to the BMDS elements and components as the BMDS System Engineering Plan.

Attachment 2 to this response provides some specific corrections, clarifications, and updates. The following is the response to the specific recommendations.

**Recommendations:**

**A. Systems Engineering Planning for the Ballistic Missile Defense System**

**DoDIG Recommendation A1:** We recommend that the Director, Missile Defense Agency: Establish a comprehensive overall systems engineering plan that describes the Missile Defense Agency's approaches and strategy to achieve its technical objectives, in compliance with the DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004, requirement to manage the Ballistic Missile Defense System consistent with the principles of the policies in the DoD 5000 series.

**MDA Response: Concur.** The draft plan is currently in agency coordination and when approved, will be sent to the entire agency as a follow-up to agency approval of the system engineering process in August, 2005, and consistent with the current process being executed agency-wide.

**DoDIG Recommendation A2:** We recommend that the Director, Missile Defense Agency: Update the Logistics Support Document 2005 to clarify how the Missile Defense Agency Block Transition and Sustainment Office should coordinate with element offices to plan logistics sustainment for the Ballistic Missile Defense System.

**MDA Response: Concur.** The Logistics Support Document 2005 is being updated to a Logistics Support Document 2006 that includes coordination between MDA Force Structure Integration and Deployment Directorate (MDA/TR) and the elements on planning logistic sustainment for the BMDS. Anticipate completion of the 2006 Logistics Support Document NLT 3Q FY06. Additionally, the "Missile Defense Agency

Block Transition and Sustainment Office" listed above should be changed to read "Missile Defense Agency Force Structure Integration and Deployment Directorate."

**DoDIG Recommendation A3:** We recommend that the Director, Missile Defense Agency: Issue policy to Missile Defense Agency element managers to update elements' integrated logistics support plans with procedures for interacting with the Missile Defense Agency Block Transition and Sustainment Office and other element offices to more effectively plan for logistics support of missile defense.

**MDA Response: Concur.** MDA/TR is currently working on generating a BMDS Integrated Sustainment Support Plan that will tie together the BMDS level and the element levels to more effectively plan for integrated support across all portions of missile defense. Additionally, the "Missile Defense Agency Block Transition and Sustainment Office" listed above should be changed to read "Missile Defense Agency Force Structure Integration and Deployment Directorate."

**DoDIG Recommendation A4:** We recommend that the Director, Missile Defense Agency: Provide guidance to Missile Defense Agency element managers on systems engineering planning and activities that are appropriate to the development stage of their elements, in compliance with the DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004, requirement for the Director, Missile Defense Agency to direct, manage, and control the resources of the Missile Defense Agency.

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**MDA Response: Nonconcur.** Consistent with the General Content comments noted above, MDA provides guidance to element managers via a collaborative process and documents this in CDs/ESGs and the TBDD consistent with the stage of their development. The TBSS and Interface Control Documents (ICDs) codify these requirements and provide additional direction to the element managers consistent with the principles of DoDD 5000.1 and DoDI 5000.2

#### B. Systems Engineering for the AEGIS Element

**DoDIG Recommendation B1:** We recommend that the Director, Missile Defense Agency: Revise the "Missile Defense Agency Assurance Provisions," February 24, 2004, to designate the appropriate Missile Defense Agency organization to be responsible for coordinating and approving systems engineering management plans for the Missile Defense Agency elements.

Renumbered  
as  
Recommendation B.1.a.

**MDA Response: Concur.** MDA/QS will update the MAP to designate the appropriate MDA organizations for the coordination and approval of SEMP and Configuration Management Plans.

**DoDIG Recommendation B2a:** We recommend that the element manager for the AEGIS Ballistic Missile Defense Element: Coordinate and obtain approval of the draft AEGIS Systems Engineering Management Plan from the Missile Defense Agency.

**MDA Response: Concur.** Element System Engineering Plans should be coordinated with the BMDS System Engineer to ensure that their system engineering process supports the BMDS System Engineering Process. While MDA does not want to impose a 'one-size-fits-all' system engineering process given the diversity of the types of elements/components that are part of the BMDS, it does want to ensure that there is a sound system engineering process that supports the element/component integration into the BMDS. Numerous National Team reviews, MDA System Element Reviews, progress reviews, and design reviews performed by both MDA and Aegis BMD personnel keep MDA informed of Aegis BMD systems engineering status.

**DoDIG Recommendation B2b:** We recommend that the element manager for the AEGIS Ballistic Missile Defense Element: Develop and include information assurance requirements in the Software Development Plan that meet the requirements of DoD Directive 8500.1, "Information Assurance," October 24, 2004, to include information assurance requirements in the design and acquisition of all information systems.

**MDA Response: Concur.** Aegis BMD currently has a Tactical Interim Authority to Operate for Block 04 approved by the MDA Chief Information Officer (MDA/IO). The Block 04 System Security Authorization Agreement (SSAA) is being staffed within Aegis BMD for submittal to MDA/IO. Aegis BMD has incorporated Information Assurance (IA) requirements into the Block 06 Element Capability Specification that was presented to MDA/SE and the Deputy Director, Technology & Engineering at the Aegis BMD Block 06 System Requirements Review, and is working with MDA/SE along with the prime contractors on further delineation of those requirements. Additionally, the Block 06 System Engineering Management Plan (SEMP) will further address the IA requirements as well as the Software Development Plan (SDP) for implementation into the Block 06 program.

**DoDIG Recommendation B2c:** We recommend that the element manager for the AEGIS Ballistic Missile Defense Element: Complete the DoD Information Technology Security Certification and Accreditation Process, including producing a System Security Authorization Agreement for the element to become certified and accredited in accordance with DoD Instruction 5200.40, "DoD Information Technology Security Certification and Accreditation Process," December 20, 1997.

**MDA Response: Concur but with comments.** Since the BMDS is a system of elements and components with platform information technology (IT) interconnections, MDA manages the IA requirements of the BMDS and its subordinate elements consistent with the DoD 8500 series. Platform IT refers to computer resources, both hardware and

software, that are physically a part of, dedicated to, or essential to the mission performance of special purpose systems such as weapons... (para. E2.1.17.4, DoDI 8500.2 February 6, 2003). Further, MDA uses a tailored DoD Information Technology Security Certification and Accreditation Process (DITSCAP) process based on DoD 8510.1-M July 31, 2000, to certify and accredit types, sites, and element SSAs that roll up into a single unified system-level SSA for the BMDS. The Aegis BMD SSA is in final coordination. The 8500 series is an improvement over the 5200 series since the newer series has specific IA controls for Mission Assurance Category I systems that MDA uses for compliance tracking and risk management.

**DoDIG Recommendation B2d:** We recommend that the element manager for the AEGIS Ballistic Missile Defense Element: Coordinate with the Joint Chiefs of Staff Director for Command, Control, Communications, and Computer Systems and the Deputy Chief of Naval Operations (Resources, Warfare Requirements, and Assessments) to establish a net-ready, key performance parameter and an information support plan to comply with the requirements of the Secretary of Defense memorandum, "Missile Defense Program Direction," January 2, 2002, for transitioning the AEGIS Ballistic Missile Defense Element.

**MDA Response: Nonconcur.** MDA, not the elements, coordinates with Joint Chiefs of Staff (JCS) as the operator of the BMDS. Interaction with the JCS should come from higher than the element level. This is supported by DoDD 5134.9, which calls for the MDA Director to "Work closely with the warfighter community (including the Combatant Commanders and the Chairman of the Joint Chiefs of Staff) to develop the joint command and control architecture for the BMDS and to integrate it into the applicable command and control architectures for air and missile defense." Even so, Aegis BMD is working closely with the Navy (which, in turn, coordinates with the JCS) in the development of its command and control architecture and is fully compliant with Military Standard 6016 and 3016 for LINK-16. In addition, MDA does not use KPPs, as noted in the General Content comments.

### C. Systems Engineering for the Terminal High Altitude Area Defense Element

**DoDIG Recommendation C1:** We recommend that the Director, Missile Defense Agency: Revise the "Missile Defense Agency Assurance Provisions," February 24, 2004, to designate the appropriate organization within the Missile Defense Agency to coordinate and approve configuration management plans for the Missile Defense Agency elements.

**MDA Response: Nonconcur.** Paragraph 3.10.1.2 of the MDA MAP, dated January 9, 2004, states, "The CM (Configuration Management) Plan shall be submitted to the cognizant MDA 2-letter organization for approval..." The cognizant MDA 2-letter in this

Redirected  
and  
Renumbered  
as B.1.b.

instance is the Project Manager, Terminal High Altitude Area Defense (THAAD), MDA/TH. The THAAD Project Manager's approval meets the MDA guidance.

**DoDIG Recommendation C2a:** We recommend that the element manager for the Terminal High Altitude Area Defense Element: Complete phase 1 of the Defense Information Technology Security Certification and Accreditation Process to include an approved System Security and Authorization Agreement.

**MDA Response: Concur but with comments.** MDA manages the IA requirements of the BMDS and its subordinate elements consistent with the DoD 8500 series since the BMDS is a system of elements and components with platform IT interconnections. Platform IT refers to computer resources, both hardware and software, that are physically a part of, dedicated to, or essential to the mission performance of special purpose systems such as weapons... (para E2.1.17.4, DoDI 8500.2 February 6, 2003). Further, MDA uses a tailored DITSCAP process based on DoD 8510.1-M July 31, 2000 to certify and accredit types, sites, and element SSAAs that roll up into a single unified system-level SSAA for the BMDS. The THAAD element manager submitted a draft SSAA to the MDA Designated Approving Authority (DAA) and Certification Authority (CA) for coordination in November 2005 that will lead to an approved element SSAA for THAAD before the end of FY06. The 8500 series is an improvement over the 5200 series since the newer series has specific IA controls for MAC I systems that MDA uses for compliance tracking and risk management.

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**DoDIG Recommendation C2b:** We recommend that the element manager for the Terminal High Altitude Area Defense Element: Coordinate and obtain approval of the draft configuration management plan from the Missile Defense Agency.

**MDA Response: Completed.** The THAAD Project Manager approved the THAAD Development Program Configuration Management Plan, effective January 27, 2003. Paragraph 3.10.1.2 of the MDA MAP states "The CM Plan shall be submitted to the cognizant MDA two-letter organization for approval..." The cognizant MDA two-letter in this instance is the Project Manager, THAAD, MDA/TH. The THAAD Project Manager's approval meets the MDA guidance.

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**DoDIG Recommendation C2c:** We recommend that the element manager for the Terminal High Altitude Area Defense Element: Revise the software development plan to include:

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(1) Plans for assessing the verification methodology that the contractor uses to measure whether the processes, standards, and procedures being used to develop software are adequate.



(2) Verification methodology for determining whether the software development was adequately staffed and the staff fully trained.

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**MDA Response: Nonconcur.** On November 3, 2005, MDA/QS concurred with THAAD's contracted approach for updating and executing all applicable provisions of the THAAD MAIP including the SDP approach for implementing MDA Assurance Provisions.

#### **D. Systems Engineering for the Airborne Laser Element**

**DoDIG Recommendation D1:** We recommend that the Airborne Laser element manager: Update the 1996 Single Acquisition Management Plan to: a. Adhere to the principles in DoD Instruction 5000.2, "Operation of the Defense Acquisition System," May 12, 2003, to update the changes that occurred in the element's technical approach, systems engineering processes, and tasks since it became part of the Missile Defense Agency in January 2002. b. Define the evolutionary acquisition strategy and include parameters, with thresholds and objectives, for each evolutionary increment planned for the Airborne Laser Element, in compliance with DoD Directive 5134.9, "Missile Defense Agency," October 9, 2004.

**MDA Response: Concur:** The Airborne Laser (ABL) program will update the Single Acquisition Management Plan (SAMP) based on the DoDIG recommendation. ABL has developed their evolutionary acquisition strategy plan which was briefed to the DoDIG. ABL will include the plan in the SAMP update.

**DoDIG Recommendation D2:** We recommend that the Airborne Laser element manager: Update the 1997 Systems Engineering Management Plan to comply with the principles of the Under Secretary of Defense for Acquisition, Technology, and Logistics memorandums' requirement to update as changes occurred in the program's overall technical approach, including processes, resources, metrics, and applicable performance incentives, and to establish entrance criteria for all planned technical reviews.

**MDA Response: Concur & Completed.** While at the time of the review the ABL program had not updated the SEMP since 1997, ABL had updated the systems engineering documents pointed to in the SEMP that are used to guide the program. The SEMP has since been updated and the most current version is dated September 22, 2005.

Revised

**DoDIG Recommendation D3a:** We recommend that the Airborne Laser element manager modify Contract F29601-97-C-0001 to: Require the contractor to implement the Airborne Laser Software Development Plan.

Revised

**MDA Response: Nonconcur:** It would be cost prohibitive and of limited benefit for the ABL program to put the Airborne Laser SDP on the current contract. Most subsystem software is complete and supporting integration and test activities.

**DoDIG Recommendation D3b:** We recommend that the Airborne Laser element manager modify Contract F29601-97-C-0001 to: Require the contractor to use earned value management reporting for software development on the following subsystems of the Airborne Laser: beam control/fire control, the high energy laser, aircraft, and ground support equipment.

**MDA Response: Nonconcur:** On the ABL program, software earned value (EV) reporting is done in Battle Management, Command, Control, Communications, Computers and Intelligence and Beam Control/Fire Control. Laser software is embedded within each subsystem. The aircraft does not have any new software being developed and Ground Support software EV is reported. The ABL Element manager agrees that software EV reporting, which ABL has, is a good practice. The program office position is that adequate software EV is in place on the program. Invoking a lower-level of EV software reporting via contractual changes would be cost prohibitive at this point in the program -- most subsystem software is complete and supporting integration and test activities.

**DoDIG Recommendation D4:** We recommend that the Airborne Laser element manager: Update the System Security Authorization Agreement to include weapon system security requirements for the second and subsequent ABL aircraft.

**MDA Response: Nonconcur.** The current SSAA for the ABL Weapon System applies only to aircraft #1. When contracts are started to develop aircraft #2, weapon system security requirements will be included in those contracts. The new SSAA developed for the new aircraft will also include those requirements. It will be a separate and distinct document from the current SSAA. There is no need at this time to change the current SSAA.

**E. Auditor Access to Documents at the Missile Defense Agency**

**DoDIG Recommendation E:** We recommend that the Director, Missile Defense Agency revise Missile Defense Agency Instruction 7600.01, "External Audits and Requests," March 17, 2003, to require that auditors from the DoD Office of the Inspector General, as an internal audit agency, receive expeditious and unrestricted access to all documentation in accordance with DoD Instruction 7050.3, "Access to Records and Information by the Inspector General, Department of Defense," April 24, 2000.

**MDA Response: Concur.** MDA Business Management (MDA/DM) has substantially modified Instruction 7600.01 to address the DoDIG concerns relating to providing

expeditious access to requested documents, not only for the DoDIG, but also the General Accountability Office and other audit agencies external to MDA. The new Instruction streamlines the process for releasing information and further clarifies roles and responsibilities, which will result in the release of the majority of documents within five days of the auditor's request. The MDA General Counsel has coordinated on the new Instruction, and according to MDA policy, will be coordinated with all MDA 2-letter organizations for their comments and any proposed changes. MDA/DM estimates that the Director, MDA, will approve the Instruction in January 2006.

## **Team Members**

The Department of Defense Office of the Deputy Inspector General for Auditing, Acquisition and Contract Management prepared this report. Personnel of the Department of Defense Office of Inspector General who contributed to the report are listed below.

Mary L. Ugone  
Richard Jolliffe  
John E. Meling  
Harold C. James  
Chris O. Parrish  
Brad M. Heller  
Kenneth M. Pomietto  
Steven P. Mazur  
Jaime Bobbio  
Peter Johnson  
Bill Chang  
Jacqueline Pugh

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