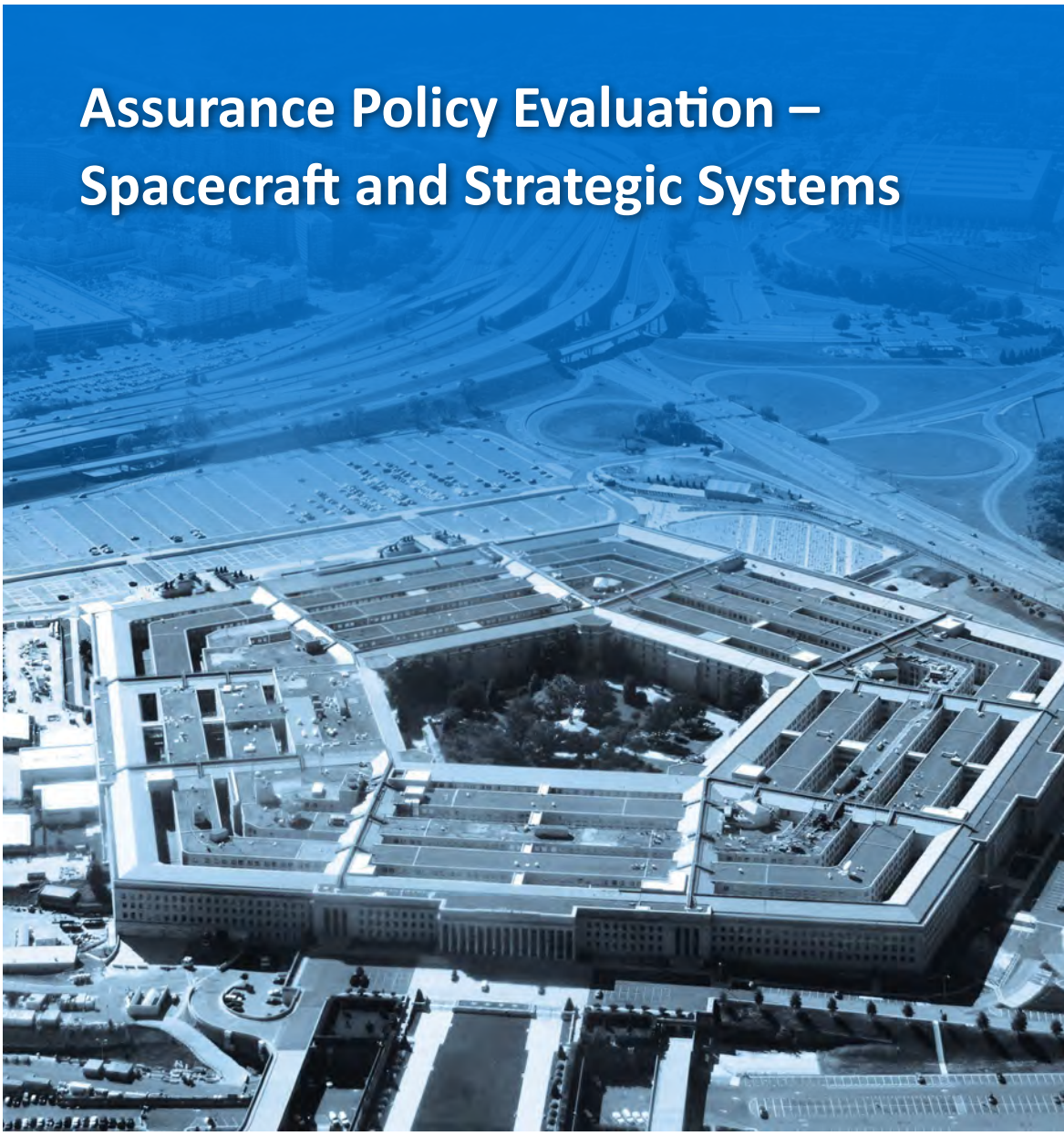
DODIG-2014-116

INSPECTOR GENERAL

U.S. Department of Defense

SEPTEMBER 17, 2014

Assurance Policy Evaluation – Spacecraft and Strategic Systems



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Results in Brief

Assurance Policy Evaluation – Spacecraft and Strategic Systems

September 17, 2014

Objective

Our objective was to evaluate the sufficiency of Department of Defense (DoD) mission assurance policies and procedures used in the acquisition of spacecraft and strategic systems.

Opportunity for Improvement

Our evaluation determined that there were no significant gaps or weaknesses in the DoD acquisition policies and procedures regarding mission assurance. The term "mission assurance" refers to the necessary systems engineering, design, quality, safety, reliability, maintainability, and availability requirements. Department of Defense Instruction (DoDI) 5000.02 "Operation of Defense Acquisition Systems" and the Defense Acquisition Guidebook generally support the mission assurance tenets through application of systems engineering practices. However, the Mission Assurance Guide TOR-2007(8546)-6018 provides more detailed guidance for systems engineering, quality assurance, and reliability; and it should be used by programs in their acquisition process.

We found three common program management practices across Missile Defense Agency (MDA), the Space and Missile Systems Center (SMC), and the Strategic Systems

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Opportunities (cont'd)

Program (SSP) that should be considered DoD standard practices. These three practices are 1) the development of specific policies and standards, which are applied on every program and contract, 2) verifying program requirements through in-depth quality assurance audits of the program and contractors; and 3) using independent organizations that report directly to the agency head to ensure mission success. These practices help ensure a specific level of mission success for their programs.

Recommendations

We recommend that the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)):

- Update the Defense Acquisition Guidebook, to recommend that Major Defense Acquisition Programs (MDAPs) review, tailor, and apply applicable mission assurance concepts and principles, such as those found in the Mission Assurance Guide TOR-2007(8546)-6018, when developing Systems Engineering Plans and contract requirements to promote a higher probability of mission success.

- Review the best practices of Missile Defense Agency, Air Force Space and Missile Systems Center, and Navy Strategic Systems Program identified within the report and incorporate them into the Defense Acquisition Guidebook. Present these practices at the next DASD(SE) bi-monthly systems engineering best practice meeting to ensure dissemination.

Results in Brief

Assurance Policy Evaluation – Spacecraft and Strategic Systems

Management Comments

The Director of Acquisition Resources and Analysis concurred with the recommendation. DASD(SE) will update the Defense Acquisition Guidebook Chapter 4 by 2015 to implement the DOD IG recommendations and will invite the MDA, SMC and SSP to present their best practices at a System Engineering Forum in 2015.

DoD IG Response

We concur with the response. We request to be informed when the Defense Acquisition Guidebook Chapter 4 is updated and when MDA, SMC and SSP are scheduled to present at the Systems Engineering Forum.

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
4800 MARK CENTER DRIVE
ALEXANDRIA, VIRGINIA 22350-1500

September 17, 2014

MEMORANDUM FOR PRINCIPAL DEPUTY ASSISTANT SECRETARY OF DEFENSE
FOR RESEARCH AND ENGINEERING

SUBJECT: Assurance Policy Evaluation — Spacecraft and Strategic Systems
(Report No. DoDIG-2014-116)

We are providing this report for information and use. The subject evaluation was performed to evaluate the sufficiency of the Department of Defense (DoD) mission assurance policies and procedure used in the acquisition of spacecraft and strategic systems. Mission assurance is the use of industry best practices in systems engineering, design, manufacturing, testing, quality assurance, risk management, reliability, maintainability, and availability requirements to support overall mission success.

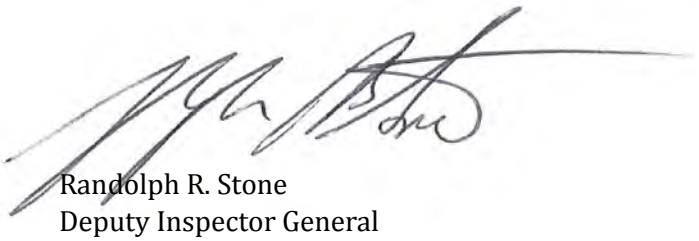
Our evaluation determined that there were no significant mission assurance gaps or weaknesses in the DoD acquisition policies and procedures. However, we determined that the Mission Assurance Guide TOR-2007(8546)-6018 provides more detailed guidance for system engineering, quality assurance, and reliability and should be used by programs in their acquisition process. Additionally, we found three common program management practices used by spacecraft and strategic systems programs that promote mission success. Those practices are: 1) The development of organizational mission assurance policies and standards, which are applied on every acquisition program and contract, 2) Verifying program requirements through in-depth quality management system audits of the program and contractors; and 3) The use of independent organizations reporting directly to the agency head to ensure mission success.

We recommend that the Defense Acquisition Guidebook be updated with the concepts and principles found in the Mission Assurance Guide TOR-2007(8546)-6018 so that Major Defense Acquisition Programs can incorporate best practices in their acquisition documents.

The Deputy Assistant Secretary of Defense for System Engineering concurred with the findings and recommendation in this report. They stated the Deputy Assistant Secretary of Defense for System Engineering will update the Defense Acquisition Guidebook by 2015 and will include references to standards such as the systems engineering standard IEEE 15288.1, the technical reviews and audits standard IEEE 15288.2, and the configuration management standard

SAE EIA-649-1, once the standards are published. Also, the Deputy Assistant Secretary of Defense for System Engineering will invite the Missile Defense Agency, the Space and Missile Systems Center, and the Strategic Systems Program to present their best practices at a Systems Engineering Forum in 2015.

We appreciate the courtesies extended to the staff. Please direct questions to Captain Christopher Failla at (703) 604-8915 (DSN 664-8915), Christopher.Failla@dodig.mil. If you desire, we will provide a formal briefing on the results.



Randolph R. Stone
Deputy Inspector General
Policy and Oversight

cc:
Under Secretary of Defense for Acquisition, Technology and Logistics
Deputy Assistant Secretary of Defense, System Engineering
Director, Missile Defense Agency
Commander, Space and Naval Warfare System Command
Commander, Space and Missile Systems Center
Director, Navy Strategic Systems Program

Contents


INSPECTOR GENERAL
INTEGRITY
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Introduction

Objective

Our objective was to evaluate the sufficiency of Department of Defense (DoD) mission assurance policies and procedures used in the acquisition of spacecraft and strategic systems.

Background

The DoD space industry uses the term "mission assurance", which is defined by the Mission Assurance Guide TOR-2007(8546)-6018 (MAG),[1] used by several strategic space programs, as the "disciplined application of general systems engineering, quality, and management principles towards the goal of achieving mission success." DoD does not use the term "mission assurance" and focuses on an overall systems engineering approach. We initiated this evaluation to determine whether gaps exist in the overarching DoD policy related to systems engineering, manufacturing, testing, quality assurance, risk management, reliability, maintainability, and availability requirements leading to mission success.

Evaluation Methodology and Criteria

Methodology

The evaluation was limited to evaluating overarching DoD policy, and evaluating the approach taken by several agencies to ensure mission success with mission assurance principles. This evaluation was limited to DoD agencies that procure complex weapon systems that must survive the harsh environments of space, such as satellites and strategic missile systems. The selected agencies were:

- Missile Defense Agency (MDA), which is responsible for the development and operation of the DoD Ballistic Missile Defense System;
- Air Force Space and Missile Systems Center (SMC), which is responsible for space programs; and
- Navy Strategic Systems Program (SSP), which is responsible for the nuclear ballistic missile program.

[1] The Mission Assurance Guide TOR-2007(8546)-6081 was produced for U.S. Government by the Aerospace Corporation. The primary purpose of the MAG is to provide practical guidance to personnel of the Aerospace Corporation and, in general, National Security Space (NSS) program Office personnel, who are responsible for executing mission assurance functions that are key to achieving program and mission success.

We began our evaluation in March of 2013 by evaluating DoD documents including DoD Instruction (DoDI) 5000.02 "Operation of Defense Acquisition Systems", the Defense Acquisition Guidebook (DAG) May 15, 2013, and the Systems Engineering Plan (SEP) outline. The team used the 2008 version of DoDI 5000.02 for this evaluation. In November 2013 an interim version of DoDI 5000.02 was released, stating that the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), with support from the Department of Defense Chief Information Officer and the Director, of Operational Test and Evaluation were to revise DoDI 5000.02. Thus, we did not use the interim version as it was undergoing revision at the time of this evaluation. However, we did evaluate the interim document and provided comment through the formal DoD issuance process. We compared these documents to the MAG to determine if they contained the tenets of a mission assurance program described in the MAG. The SEP outline for space programs specifically calls out the MAG, and thus was used as our mission assurance criteria. We also met with Office of the Deputy Assistant Secretary of Defense for Systems Engineering (ODASD(SE)) personnel to evaluate their role in implementing DoD policy and how they use systems engineering to ensure mission assurance across DoD.

We then evaluated the selected agencies, focusing on the processes and procedures related to design, manufacturing, and quality assurance that support the implementation of the mission assurance. At each agency, we evaluated its documentation to include internal policies, procedures, and standards to understand and evaluate its approach to mission assurance. We conducted interviews with agency system engineers, mission assurance department directors, and system and quality engineers to determine how mission assurance practices were implemented. We then analyzed the documentation and information provided by engineering personnel to identify best practices. The detailed evaluation of each agency is in Appendix B along with supporting analysis, defining commonalities, and best practices.

DoD Policies Related to Mission Assurance

The team compared three acquisition documents; (1) DoDI 5000.02, the overarching acquisition document; (2) the DoD guidance for developing a SEP, which is a deliverable of DoDI 5000.02; and (3) the DAG, a supporting guidebook against the MAG to determine how mission assurance principles are incorporated into the acquisition process. The DoDI 5000.02 governs the DoD acquisition

process and establishes the framework for translating capability needs and technology into weapon system acquisition programs that meet statutory requirements. DoDI 5000.02 requires program managers develop a SEP, which outlines how the program will meet its engineering requirements. The SEP format states that programs operating under space system acquisition procedures describe how their mission assurance processes meet the best practices described in the MAG. DoDI 5000.02 also refers program managers to the DAG, which provides program managers best practices that can be applied throughout the acquisition process to help satisfy its requirements. The MAG is a collection of industry design, manufacturing, quality, and safety best practices whereas the DAG is a collection of acquisition life cycle best practices.

DoDI 5000.02 Operations of Defense Acquisition

DoDI 5000.02 is written by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), with support from the Department of Defense Chief Information Officer and the Director, of Operational Test and Evaluation to identify the program management functions and processes necessary to acquire any system or weapon system. It has gone through several iterations to reflect priorities and evolving acquisition policies. For example, early versions emphasized reviews, quality control, and design-to-cost. In 1996, the DoDI 5000.02 was revised to meet the 1994 Federal Acquisition Streamlining Act (FASA), which encouraged the simplification of Government procedures to procure items. The 1996 version separated mandatory policies and procedures from discretionary practices supporting the implementation of acquisition policy; these policies and procedures were placed in DoD Regulation 5000.2-R "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS)" and Defense Acquisition Deskbook respectively. The 1996 revision stated that by reducing mandatory guidance, program managers were free to exercise their own judgment while managing an acquisition program. The revised DoDI reduced the burden of mandatory procedures and specifications, encouraged prudent risk management, and allowed the integration of commercial products and best practices. This resulted in the acquisition process focusing on mission oriented program management and performance based contracting. In 2000, the DoDI 5000.02 canceled and replaced DoD 5000.2-R.

The DoDI 5000.02 (2008) lists applicable laws, policies, and reference documents related to the various phases of the acquisition process. Its purpose is to establish policy for the management of all acquisition programs and the

acquisition process itself. It does not provide technical program or system requirements. However, DoDI 5000.02 does include a systems engineering enclosure that describes the policies and procedures regarding the application of systems engineering to the acquisition process. The systems engineering section briefly outlines areas such as risk management, technical reviews, manufacturing and producibilty, and reliability and maintainability, which a program manager must discuss within the SEP.

Systems Engineering Plan Outline

DoDI 5000.02 requires program managers to develop a SEP showing how they will meet systems engineering requirements. The SEP is used to describe the programs overall technical approach to risk management, program processes, resources, organization, metrics, design considerations and the criteria for technical reviews. ODASD(SE) located within the Office of the Assistant Secretary of Defense for Research and Engineering is responsible for reviewing and approving all MDAPs and MAIS SEPs. On April 20, 2011, the Principal Deputy Under Secretary of Defense Acquisition Technology, and Logistics issued a memorandum, "Document Streamlining – Program Strategies and Systems Engineering Plan," directing programs to develop Systems Engineering Plans using the approved SEP outline to ensure proper documentation of required information. The SEP outline facilitates uniformity of program data submitted to DASD(SE) for evaluation and approval. It also ensures programs are submitting all required data to comply with section 139b title 10 United States Code (10 U.S.C. §139b) and DoDI 5000.02.

The SEP outline is composed of four sections: Introduction; Technical Requirements; Engineering Resources and Management; and Technical Activities and Products. The Technical Requirements section identifies the system architecture and required certification, such as airworthiness. The Engineering Resources Management section focuses on schedule, tasks, personnel roles and responsibilities, internal processes such as risk management, and the overall organizational structure of the program. The Technical Activities and Products section outlines the systems engineering activities of the program and how top-level performance requirements (how fast, how far, how big) are incorporated into the configuration. It also identifies the technical review entrance and exit requirements for all major reviews, such as milestone decisions, preliminary design reviews (PDR), and critical design reviews (CDR). In addition, the section requires the program managers to identify how affordability; corrosion; environmental, safety and occupational health (ESOH); Human System Integration (HSI); Item Unique Identification (IUID);

manufacturing, system architecture; program protection; and reliability and maintainability are identified and incorporated in the contract. However, if the program is space based the program manager would follow Table 4.6-1 Design Considerations footnote 3 in the SEP outline, for reliability and maintainability. The footnote states,

> "Programs operating under Space Systems Acquisition Procedures shall address Mission Assurance (MA) planning in the context of reliability and provide a description of MA activities undertaken to ensure that the system will operate properly once launched into orbit. Specifically, space programs will describe how the Mission Assurance process employed meets the best practices described in the Mission Assurance Guide (reference Aerospace Corporation TOR-2007(8547)-6018). This description should include program phase-dependent processes and planning for MA in the next phase of the program and the way program MA processes adhere to applicable policies and guidance. Also describe the launch and operations readiness process."

The SEP demonstrates how systems engineering principles are being translated into the program's acquisition process, thus, the SEP is the criteria on which the technical aspects such as manufacturing, reliability and maintainability are judged. DASD(SE) must review and approve the SEP before the program proceeds. Finally, DASD(SE) uses the SEP during program reviews to ensure the programs are on track and engineering risks are being properly identified and mitigated.

Defense Acquisition Guidebook

The DAG, formerly the Defense Acquisition Deskbook, is designed to help a program manager meet the requirements outlined in DoDI 5000.02. The DAG is not a requirements document and should not be used as such. It contains non-mandatory expectations for satisfying the requirements of DoDI 5000.02. The DAG complements DoDI 5000.02 by providing discretionary best practices that can be tailored to program needs. The program managers use the DAG as a reference to support their decisions as well as help them understand the overall acquisition process.

The Defense Acquisition University provides the DAG to the acquisition community as an interactive website with 14 chapters that align to DoDI 5000.02 requirements. Each chapter lists potential ways the program manager can satisfy

process and requirements. The DAG does not contain a specific chapter or section dedicated to mission assurance; however, it mentions the principles throughout the document specifically within Chapter 4, "Systems Engineering." At the time of this report, the DAG was not updated to align with the current 2013 revision of DoDI 5000.02.

Mission Assurance Guide TOR-2007(8546)-6018

The MAG is an industry document, primarily used by the DoD space community that identifies the tenets of mission assurance. The MAG defines mission assurance as the disciplined application of proven scientific, engineering, quality, and program management principles towards the goal of achieving mission success, follows a general systems engineering framework, uses risk management, and independent assessment throughout the process. The Aerospace Corporation in concert with National Security Space (NSS) community and Government sponsors developed the MAG to:

- decrease the number of system integration anomalies and failures;
- prevent the weakening of systems engineering and mission assurance practices;
- reestablish high levels of mission success for the NSS activities; and
- re-invigorate and apply the principles and best practices of mission assurance in a formal and disciplined manner throughout the space acquisition process.

The MAG's primary purpose is to provide practical guidance for executing mission assurance functions that are key in achieving program and mission success.

The MAG describes the overarching mission assurance framework, processes, disciplines, tasks, best practices, standards, and procedures applicable to NSS programs to ensure mission success. The document first identifies the mission assurance guiding principles. It explains how to tailor the document to suit the program's needs and discusses mission assurance implementation and evaluation methods. Finally, the document describes in detail the tenets of mission assurance, which include program assurance, requirements developments, design assurance, manufacturing, integration, operations, reviews and audits, risk management, reliability, configuration, parts and material, quality, safety, software, and information assurance.

Opportunity for Improvement A

Mission Assurance Guide Provides Detailed Guidance

We determined there were no significant gaps or weaknesses in the DoD acquisition policies and procedures regarding mission assurance. DoDI 5000.02 and the DAG generally support the mission assurance tenets through application of systems engineering practices. However, the Mission Assurance Guide provides more detailed guidance for systems engineering, quality assurance, and reliability considerations supporting system acquisition.

DAG to MAG

The DAG is designed to improve a program manager's understanding of the acquisition process and the statutory and regulatory requirements associated with the process and guide them in meeting the requirements of DoDI 5000.02 using best practices. Conversely, the MAG provides details on how to ensure mission success from a product and engineering standpoint and contains activities specific to space systems. Therefore, when the DAG is compared to the MAG, there are differences in the level of detail required for space based design assurance; manufacturing assurance; integration, test, and evaluation; operations readiness assurance; reviews and audits; risk management; and reliability engineering.

The DAG discusses several mission assurance principles, in relation to the acquisition process, but does not offer the same depth of information as the MAG. The MAG is more specific in the areas of reviews and audits, quality, and reliability. Overall, the DAG focuses on acquisition programmatics such as cost and schedule, while the MAG focuses on the technical engineering aspects of the program.

The DAG addresses quality throughout the document as it relates to the acquisition process, it does not contain a dedicated section to address product quality assurance. However, the DAG does identify AS9100 "Quality Management Systems – Requirements for Aviation, Space and Defense Organizations" and ISO 9001:2008 "Quality Management Systems – Requirements" as quality requirements to be considered on any contract. In comparison, the MAG dedicates a chapter to quality assurance, which goes beyond stating quality requirements considerations. The MAG also defines quality assurance and clearly outlines the objectives and activities of both the contractor and program office for implementing a quality assurance program.

The DAG, Chapter 4, "Systems Engineering," discusses reliability in relation to the acquisition process, but not in detail. The DAG outlines considerations for the contract and statement of work, lists tools to calculate reliability and directs program managers to additional reliability resources. In comparison, the MAG dedicates a chapter to reliability. The MAG defines reliability, identifies the key practices, and describes the core reliability activities. The MAG also covers worst-case and parts stress analysis. The MAG also discusses critical and limited life item control, parts reliability analysis and environmental stress screening.

Recommendation, Management Comments, and Our Response

Recommendation A

We recommend DASD(SE) update the DAG to recommend that MDAPs review, tailor, and apply applicable mission assurance concepts and principles, such as those found in the MAG, when developing SEPs and contract requirements to promote a higher probability of mission success.

Principal Deputy for the Assistant Secretary of Defense for Research & Engineering Comments

The Director of Acquisition Resources and Analysis concurred with the recommendation. DASD(SE) will update DAG Chapter 4 to implement the DoD IG recommendations by 2015.

DoD IG Response

The DoD IG found the comments responsive, and requests to be notified when the DAG Chapter 4 is updated and released.

Opportunity for Improvement B

Common Program Management Practices

We found three common program management practices across MDA, SMC, and SSP that should be considered DoD standard practices. These three practices are 1) the development of specific policies and standards, which are applied on every program and contract, 2) verification of the program requirements through in-depth quality assurance audits of the program and contractors, and 3) the use of independent organizations reporting directly to the agency heads to ensure mission success. These practices help the program ensure they are maintaining a specific level of mission success for all their space programs.

Specific Policies and Standards

MDA, SMC, and SSP all developed their own specific policies and standards, which are required on each program to ensure quality and mission success. For example, MDA uses the MDA Assurance Provision (MAP) and Parts, Materials, and Processes Mission Assurance Plan (PMAP); SMC uses a list of 69 standards; and SSP uses the Technical Program Management Requirements for Strategic System Programs Acquisitions Document (T9001B), which identifies the contract requirements that help ensure the desired level of reliability and mission success. Each of these documents identifies the specific Government or industry standards that will become executable requirements for the contractor. These standards and policies cover areas such as systems engineering, including design and integration of systems, quality assurance and technical reviews and assessments. The application of uniform standards allows the program to maintain desired levels of mission success and provide a baseline to audit or evaluate the program to determine its overall probability of mission success.

Technical Assessments

MDA, SMC and SSP all conduct in-depth independent technical and quality assessments of their programs. Each component performs verification of its program requirements by conducting technical and quality assurance assessments of its contractors. For example, MDA has an audit program consisting of three types of audits that evaluate field activities, contractors, and suppliers; SMC employs technical reviews and audits throughout the program lifecycle as milestone decision points; and SSP has five main technical and quality reviews

that evaluate contractors, field activities and program offices. The assessments conducted by each of these components focus on the program's adherence to internal mission assurance policies and or the contractor's adherence to mission assurance, quality, and reliability standards as well as the contractor's own internal policies and procedures. These assessments include an in-depth assessment of the products, management, design, inspection, manufacturing and test processes. These assessment help the components identify potential program contractor or supplier practices that may impact mission success and verify contractual requirements are being met.

Independent Organizations

MDA, SMC and SSP all use an independent organization, reporting directly to leadership, to ensure mission success. For example, MDA's independent organization is Quality, Safety, and Mission Assurance (MDA/QS) which is responsible for the agency's mission assurance strategy; SMC's independent organization is the Engineering Directorate (SMC/EN) which is responsible for the independent assessment and analysis of programs; and SSP's independent organization is the Office of the Chief Engineer (SP201), under the Technical Division (SP20), which is responsible for ensuring that technical disciplines such as quality, reliability, maintainability and product assurance are included in program activities. These independent organizations have direct reporting lines to the agency's director. In each case, the independent organization must approve the tailoring of the baseline policies and requirements by the program office for inclusion on the contract. Additionally these organizations ensure compliance with the standards and policies through audits and direct engineering support to the program office. These organizations also participate in design reviews, material review boards, and tests providing independent risk assessments to the program manager and component heads.

Recommendation, Management Comments, and Our Response

Recommendation B

We recommend DASD(SE) incorporate into the Defense Acquisition Guidebook the best practices of MDA, SMC and SSP that were identified and highlighted within the report. Present these practices at the next DASD(SE) bi-monthly systems engineering best practice meeting, to ensure dissemination of these best practices.

Principal Deputy for the Assistant Secretary of Defense for Research & Engineering Comments

The Director of Acquisition Resources and Analysis concurred with our recommendation stating the principles of DAG Chapter 4 are consistent with the DoD IG's recommendation. They also stated the DAG will be updated as new practices emerge and will include references to standards such as the systems engineering standard IEEE 15288.1, the technical reviews and audits standard IEEE 15288.2, and the configuration management standard SAE EIA-649-1 once the standards are published and adopted by the DoD. Also, DASD(SE) will invite MDA, SMC, and SSP to present their best practices at a Systems Engineering Forum in 2015.

DoD IG Response

The DoD IG found the comments responsive. We requests to be notified when the cited standards are released and when MDA, SMC and SSP are scheduled to present at the Systems Engineering Forum.

Appendix A

Scope and Methodology

We conducted this technical evaluation from March 2013 through June 2014 in accordance with the Council of the Inspectors General on Integrity and Efficiency, "Quality Standards for Inspection and Evaluation," January 2012. We planned and performed the evaluation to obtain sufficient and appropriate evidence to provide a reasonable basis for our observations and conclusions, based on our evaluation objectives

We evaluated DoD documents including DoD Instruction (DoDI) 5000.02 "Operation of Defense Acquisition Systems" December 8, 2008, the Defense Acquisition Guidebook (DAG) May 15, 2013, and the Systems Engineering Plan (SEP) outline. We then compared these documents to the MAG to determine if they contain the tenets of a mission assurance program as described by the MAG. We met with the personnel from the Office of the Deputy Assistant Secretary of Defense for Systems Engineering (ODASD(SE)) to evaluate their role in implementing DoD policy and how they use systems engineering to ensure mission assurance across DoD.

We then evaluated the Missile Defense Agency (MDA), Air Force Space and Missile Systems Center (SMC), and Navy Strategic Systems Program (SSP). At each agency, we evaluated its documentation to include internal policies, procedures, and standards to understand and evaluate its approach to mission assurance. We conducted interviews of agency directors and system and quality engineers to determine how mission assurance practices were implemented. We then analyzed the documentation and information provided by engineering personnel to identify best practices.

Use of Computer-Processed Data

We did not use computer-processed data to perform this audit.

Appendix B

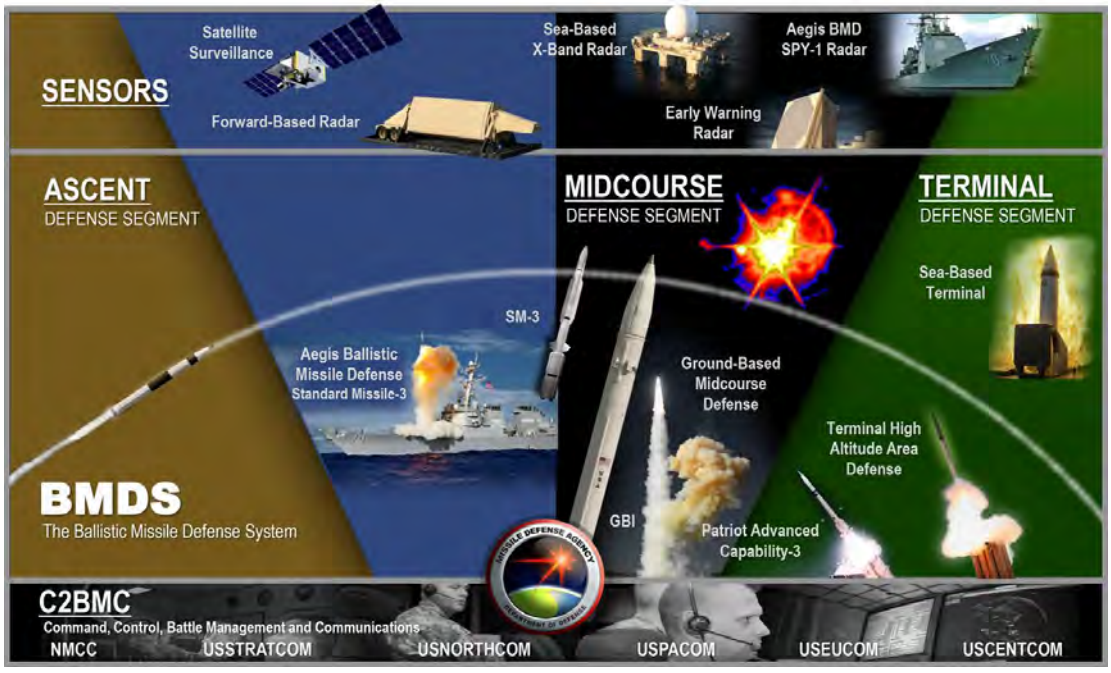
Service and Agency Reports

Missile Defense Agency

Background

The Missile Defense Agency, formerly known as The Strategic Defense Initiative Organization (SDIO), was established during the Reagan presidency in 1983 to develop non-nuclear missile defenses. In 1999 in accordance with Public Law 106-38, "The National Missile Defense Act," SDIO's mission was to develop and deploy an effective National Missile Defense System capable of defending the United States against limited ballistic missile attack. The mission was updated under President George W. Bush to develop an integrated, layered defense that would be capable of attacking warheads and missiles in all phases of their flight. This is what is known today as Ballistic Missile Defense System (BMDS). The BMDS is comprised of multiple interoperable subsystems with a mission to intercept ballistic missile threats in all phases of flight as seen in Figure B-1. MDA manages and develops the BMDS with an average budget of about 8 billion dollars based on fiscal data from FY 2011 through FY 2014. To date, MDA's test program has had 97 out of 111 successful flight tests across their multiple systems.

Figure B-1: Ballistic Missile Defense System



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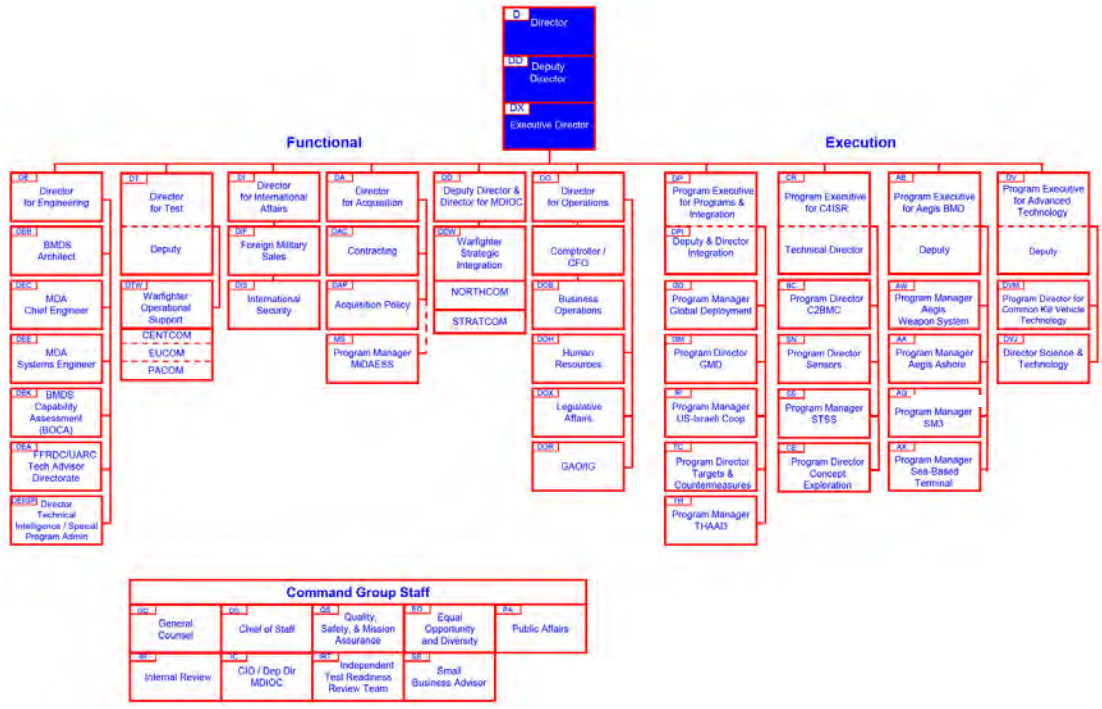
14-MDA-7121 (3 Jan 13)

ncr-114600/0022113

Source: Missile Defense Agency

The organizational structure of MDA includes functional managers, program managers, knowledge center managers, and two national teams (Figure B-2). The functional managers are comprised of deputies for operations, engineering, acquisition management, advanced technology, test/integration and fielding, and international affairs. Program Managers focus on executing each BMDS element.

Figure B-2. MDA Organizational Chart



Source: Missile Defense Agency

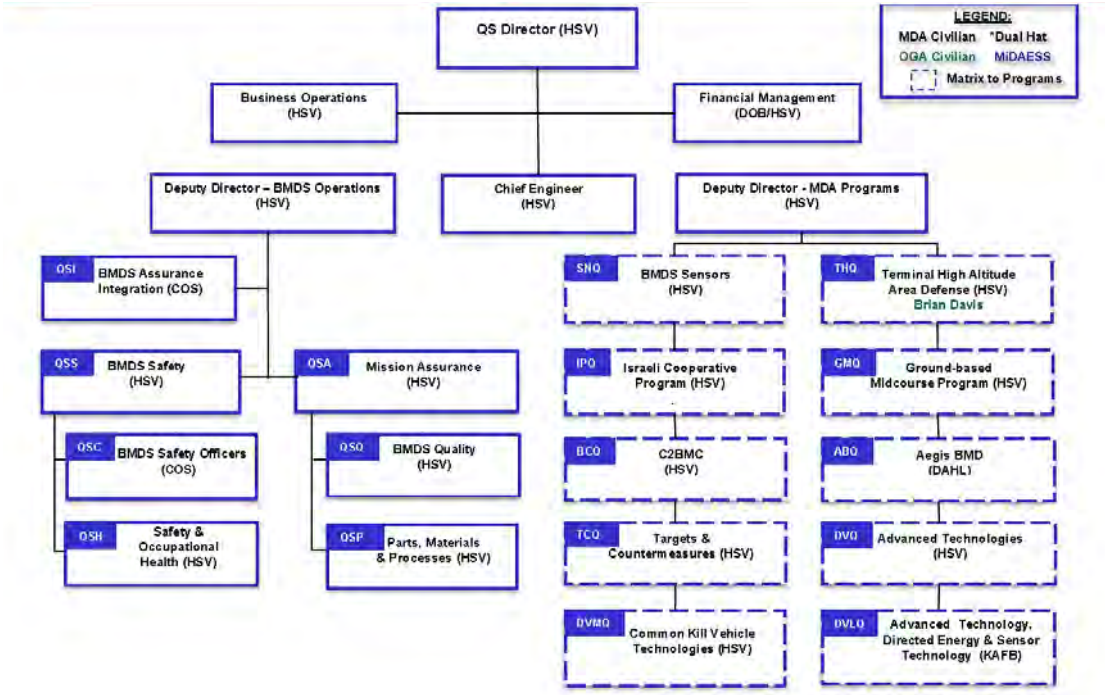
Mission Assurance Approach

MDA's organizational structure designates a Quality, Safety, and Mission Assurance directorate (QS), which is responsible for carrying out the agency's mission assurance strategy (Figure B-2). QS is a standalone organization and reports directly to the MDA Director on matters relating to Quality, Safety, and Mission Assurance (QSMA). According to the QS Concept of Operations, "QS functions as an independent, unfettered and unrestricted, non-advocate technical organization for MDA with a specific focus on mission success and personnel safety."[2]

[2] QS-SOP-01, "Quality, Safety, and Mission Assurance Directorate Concept of Operations, May 9, 2013, Page 4

QS executes this function through seven groups, which are BMDS Assurance Integration (QSI), BMDS Safety (QSS), BMDS Safety Officers (QSC), Safety and Occupational Health (QSH), Mission Assurance (QSA), BMDS Quality (QSQ), and Parts, Materials, and Processes (QSP) as seen in the QS organizational chart (Figure B-3). Although there is a specific mission assurance group within QS, all of the groups perform some mission assurance activities outlined in the MAG and MDA Assurance Provissions (MAP).

Figure B-3. Quality, Safety, and Mission Assurance (QS) Directorate



Source: Missile Defense Agency

The main functional groups that support mission assurance are QSQ, QSA, QSP, QSI and QS program support personnel.

QSQ ensures that the quality assurance requirements are enforced and incorporated into MDA contracts by incentivizing suppliers to provide quality products. QSQ also maintains the supplier road maps (SRM), which documents each program's supplier down to the fourth tier. In addition, they support MDA test programs by reviewing and providing input to test event certification plans, certification data plans, and verifies test configurations.

QSA ensures that the mission assurance requirements in the MAP are enforced. They do this through participation in design reviews, design certification reviews, manufacturing readiness assessments, manufacturing process analysis, pedigree reviews, and flight and ground tests participation. They also work with program personnel to help prepare and identify program risks and mitigation plans.

QSP ensures use of authentic, quality, and reliable parts and materials. QSP maintains and enforces the MDA Parts, Materials, and Processes Mission Assurance Plan (PMAP), which defines Parts, Materials, and Processes (PMP) requirements for all new or modified safety and mission critical products and systems developed for MDA. In addition, they maintain and enforce the MDA policy on purchasing electronic parts to address counterfeiting. Lastly, QSP is leading a team to develop an MDA corrosion prevention program.

QSI consists of personnel, known as MDA Assurance Representatives (MARs), who are permanently located at MDA contractor facilities that produce/integrate MDA critical assets. MARs are also located at Vandenberg Air Force Base and Ft. Greely Alaska launch sites. QSI currently has 26 MARs that are stationed at 20 locations across the U.S. overseeing the day-to-day operations. In addition to covering their primary facilities, MARs also evaluate other suppliers within the MDA supply chain. Their boots-on-the-ground presence allows for continuous process improvement, implementation of industry best practices, technical oversight of the supply chain, and formalized facility assessments. Facility assessments cover electrical, electronic, electromechanical (EEE) parts, software, design and workmanship, work instructions, manufacturing and tooling, cleanrooms, electrostatic discharge, foreign object debris , safety, training, and operator certification, critical lifts and moves, Material Review Boards, configuration management processes and metrology MARs produce reports highlighting hardware/software risks and facility areas for improvement. QSI personnel work with local Defense Contract Management Agency representatives to create surveillance requirements and ensure quality products are produced by the supplier per contract requirements. Lastly, QSI personnel lead and participate in formal quality and mission assurance audits throughout the supply chain.

There are 167 QS personnel embedded in MDA program offices to ensure that QSMA requirements are met. They work as program personnel to ensure requirements are included in contracts awarded to MDA suppliers and that award fee criteria incorporate QSMA provisions. In terms of program execution, QS program personnel are responsible for contract requirements reviews, design reviews, ground and flight tests, manufacturing readiness review, first article inspections, hardware acceptance reviews, pedigree reviews, and failure review boards/failure investigations.

Observation 1

MDA has two main documents, which identify the standards, requirements, and engineering principles that are applied to each program, acquisition, and contract. This ensures that MDA programs and contracts execute to the same baseline mission assurance standards and meet a minimum level of quality.

The two main documents, the MAP and the PMAP, are supported by additional internal standards, policies, and processes. Flow down of mission assurance standards, requirements, and principles are ensured through contract incentives.

MDA Assurance Provisions (MAP)

QS developed the MAP, which establishes quality, safety, and mission assurance processes and disciplines required throughout the acquisition process for each program contract. They developed the MAP by taking standards and requirements applicable to the mission of the agency from industry best practice such as ANSI/EIA-632-1998 Process for Engineering a System and IEEE Standard 1012-1998 Software Verification and Validation. MAP also aligns with the MAG in several areas including technical and mission assurance reviews. Furthermore, it provides MDA with methods to measure, verify, and validate mission success through the collection of metrics, risk assessment, technical evaluations, and independent assessments and reviews.

MDA deputates are responsible for developing BMDS subsystems such as Terminal High Altitude Air Defense and Ground-Based Midcourse Defense are required to develop a Mission Assurance Implementation Plan (MAIP) to describe how the MAP is implemented on their programs. MDA contracts incorporate QSMA requirements to promote flow down of requirements and best practices from prime contractors down to the lower-tier subcontractors. For example, the Ground Based Missile Defense Development and Sustainment Contract include

criteria and metrics for non-conformances, unverified failures, quality escapes, sibling risks, repeat nonconformance, first pass yield, and cost of rework, repair, scrap or use as is.

Parts, Materials and Processes Mission Assurance Plan (PMAP)
QS established the PMAP, which identifies requirements for selection, approval, and overall management of PMP used in MDA products and systems. This plan documents a coordinated approach needed to maintain the highest quality, reliability, and availability of MDA products and systems by using part review boards at the program and agency level. The PMAP is implemented in all MDA mission and safety-critical hardware contracts. The PMAP requires suppliers to purchase parts from authorized sources, or perform appropriate testing of parts from unauthorized sources to mitigate the potential risks that counterfeit parts may infiltrate the BMDS.

Similar to the MAP, all MDA programs are required to develop a program-level PMP plan, which identifies the level of PMAP compliance that their contractors are required to meet. PMP activities within each program are coordinated with their respective PMP Control Board (PMPCB). There is an agency level PMP board that handles system-level PMP activities and issues. QS staffs a PMP Advisory Group (PMAG), which is a part of the PMPB and supports each Program PMPCB as required.

Observation 2

MDA employs and incorporates several types of independent mission assurance and quality reviews throughout the product lifecycle. These reviews help ensure that mission assurance policies, standards, and contract requirements are being implemented.

The MDA Director delegated authority to QS to institute an audit program to validate if hardware and software products are acceptable. The program validates products against engineering design requirements, compares qualification and acceptance test methods against MDA and industry standards, validates end-item flight readiness, and examines supplier QSMA practices and procedures. The MDA Audit Program consists of Mission Assurance Audits, Mission Focused Audits, and Facility Checklist Assessments. Procedures for each of these assessments are documented in the MDA QSMA Audit Program Standard Operating Procedure.

QS functional and program personnel conduct audits and assessments at MDA supplier facilities. These audits are internally scheduled in advance but are considered "no-knock" audits to the supplier or contractor. According to QS, "no-knock" audits provide an opportunity for accurate assessments and insight into a supplier's actual operating environment. Once onsite, the audit team evaluates the supplier's adherence to existing contract requirements, internal procedures, and MDA and/or industry best practices. These audits and assessments also determine the effectiveness of the QSMA strategies and processes of MDA suppliers.

MDA's audit program has uncovered several significant findings. For example, an MDA contractor purchased EEE parts for a rocket motor controller from an unauthorized supplier, increasing the risk that counterfeit parts were used. The purchased EEE parts were not subjected to standard authenticity testing at time of purchase. As a result of this finding, the contractor took corrective actions to prevent further occurrences of counterfeit parts.

Conclusion

MDA accomplishes its mission assurance strategy by designating QS as an independent technical organization with a focus on quality and mission success. QS performs technical assessments, provides recommendations for risk mitigation and acceptance, and provides mission readiness statements at critical readiness reviews, and facilitates supplier development to improve site/supplier mission safety and reliability. These processes and tools such as the MAP, PMAP, and its audit program supports MDA's goal of ensuring mission success.

Air Force – Space and Missile System Center

Background

The Space and Missile Systems Center (SMC), located at Los Angeles Air Force Base in El Segundo, CA, is a subordinate unit of the Air Force Space Command at Peterson Air Force Base, CO. It is the center of excellence for acquisition of military space systems. SMC conducts research, development, procurement, deployment and sustainment of various space systems. It supports this mission with an average budget of $8.66 billion as calculated from FY2009 through FY2013.

SMC equips U.S. and allied forces with satellites, command and control systems, and launch systems in support of global military operations. SMC programs focus on space force enhancements including communications, navigation, tracking satellites, space support to include launch systems, satellite control networks, and force application. SMC develops, acquires, fields and sustains systems in four major mission areas. These areas are:

- Space superiority, which includes programs such as Space Based Surveillance constellations of satellites and the Space Fence;
- Space support, which includes launch systems, range support, and satellite networks;
- Space force enhancement, which includes programs such as Military Satellite Communications Systems, Global Positioning Systems, Space Based Infrared Systems, and nuclear detection; and
- Force application, which supports conventional missiles and prompt global strike.

SMC Mission Assurance Approach

SMC approach to mission assurance is through the development and use of technical specifications and standards as an element of acquisition practices and the use of independent assessments and technical reviews of programs. SMC developed its approach to mission assurance after a string of launch failures, which were attributed to relaxed requirements because of acquisition reform, which occurred in the late 1980s and early 1990s. SMC implemented several initiatives to improve the probability of mission success through their back-to-basics approach implemented in the 2000s. The approach focused first on launch process revitalization then expanded into a larger systems engineering revitalization campaign across the organization. This back-to-basics approach focused on processes and procedures to bring back key specifications and standards. This involved industry partnerships and collaboration with other civil agencies to share lessons learned and best practices across the space community. These processes included using the MAG and space flight worthiness criteria, which provided a standard to assess safety, suitability, reliability, quality, and effectiveness. They use an Independent Readiness Review Team (IRRT), which conducts independent assessments of the program. The IRRT reviews artifacts such as pedigree data and

test results to independently identify risk using mission focus areas and expert judgment. It also provides risk assessment and recommendation at key readiness milestones such as space and launch vehicle ship readiness, and launch readiness. This back-to-basics approach brought back many of the principles of mission, product and quality assurance lost during acquisition reform allowing SMC to improve its overall mission success. Overall, the SMC mission assurance process ensures safety, suitability, reliability, quality, and effectiveness of the program and system.

Observation 1

SMC uses an independent engineering directorate within its organizational structure to ensure mission assurance is incorporated into programs early in the acquisition lifecycle while continuously providing systems engineering support to SMC programs throughout the lifecycle. This independence from the program offices ensures that quality and mission assurance practices are not inadvertently compromised in the pursuit of cost and schedule efficiencies.

The SMC Chief Engineer is responsible for ensuring center-wide application, implementation and adherence to all policies and best practices. The Chief Engineer does this through the SMC Engineering Directorate (SMC/EN). SMC/EN provides independent assessment and analysis of programs in support of the Program Executive Office (PEO) for Space. It also provides technical assistance to program offices through their engineering Cadre team program. The Cadre team consists of Government and contractor subject matter experts (SME) in the systems engineering directorate that provide daily technical assistance to program offices. The team interacts directly with the engineers and program managers to provide technical advisory services in addition to provide independent assessments to programs. Its ultimate goal is to prevent the reduction of mission, quality, and product assurance by the program manager in the pursuit of cost and schedule. Similarly, the Engineering Directorate team conducts independent reviews on the program, and provides recommendation to the program, manager and to the PEO for Space. The team reviews and approves contract requirements, acceptance of all decision and launch readiness reviews, and assesses program offices to ensure readiness to enter operational testing.

Observation 2

SMC uses a set of 69 standards and policies to attain and ensure mission success, which every SMC program manager must consider and apply to their programs. These baseline standards and policies includes at a minimum mission assurance, quality and safety principles and processes; and assurance disciplines providing the program manager a stable starting point to ensure mission success. Additionally, they provide a baseline for analysis and assessments of the program and the contractor's technical performance.

Of the 69 standards, two standards that stand are SMC-S-001, "Systems Engineering Requirements and Products," and SMC-S-019, "Program and Subcontractor Management." They help the program manager ensure that the proper engineering and assurance standards and processes are included on the program and in contracts. SMC-S-001, defines the Government's requirement for a disciplined systems engineering approach to systems engineering. It specifies the government's requirements for executable contractor systems engineering efforts and can be used as a guide by the tasking activity to assist in systems engineering planning and management. While SMC-S-019 establishes the requirements for the program and subcontractor management program to ensure that all process, roles, responsibilities, and resources affecting the control of the program are defined.

SMC/EN highly recommends that mission assurance standards, policies and principles be placed in the initial request for a proposal and awarded contract. Any deviation from standards, policies and principles must be formally approved by SMC/EN and must meet the intent of the standards. This ensures that mission assurance best practices are applied to weapon systems acquisition throughout the lifecycle of the program. The MAG principles are then flowed down to the subcontractors and suppliers through the prime contract. SMC/EN ensures the contractor is meeting the proper standards and policies through technical reviews and audits such as the System Requirement Review, System Functional Review, Preliminary and Critical Design Reviews, Functional and Physical Configuration Audits, and independent readiness reviews. They also have in-plant representatives where necessary to ensure adherence standards and requirements. Similarly, SMC contracts ensure proper systems engineering rigor and disciplines are reflected in the acquisition strategy, request for proposal, and contract.

Conclusion

SMC mission assurance process assesses and ensures safety, suitability, reliability, quality, and effectiveness of the program and system. SMC does this through SMC/EN, which provides independent engineering support to the chief engineer and program managers through the issuance of baseline standards, policies and requirements, and technical assessments and program reviews. SMC mission assurance approach ensures the proper standards, polices, and requirements are on contract at the start of the program and throughout the lifecycle. Furthermore, they institute several technical reviews and audits within their processes to ensure systems have met requirements before proceeding to the next phase or milestone.

Navy – Strategic Systems Programs

Background

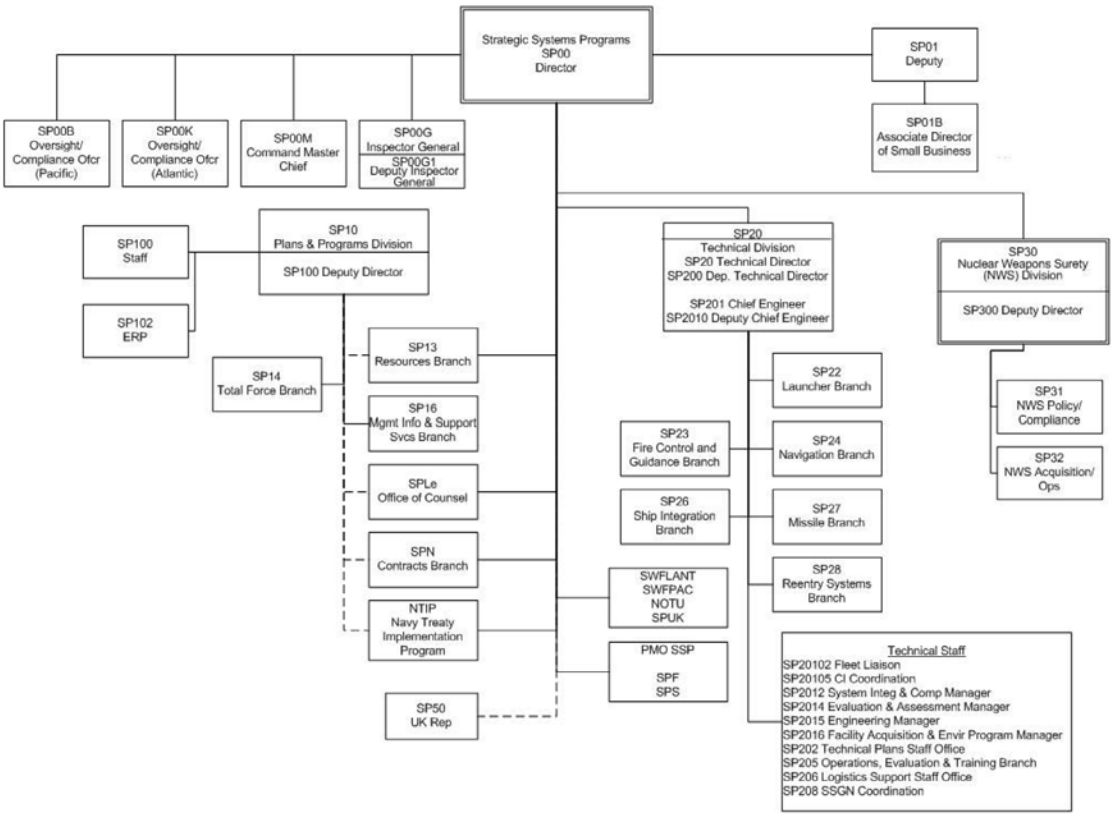
The Strategic Systems Program (SSP) is responsible for the Trident strategic weapon system. SSP has a 50-year history of providing credible sea-based deterrent missile systems and numerous successful flight tests. It is the Department of the Navy organization that directs the end-to-end effort of the Navy's nuclear deterrent Strategic Weapon System to include system acquisition, training, equipment sustainment, and facilities; and fulfill the terms of the U.S. and UK Polaris Sales Agreement. SSP is responsible for every aspect of the Strategic Weapons System (SWS) from concept, design and development, production, deployment, protection, and operational support; through system retirement and disposal. They have an average budget of $2.57 billion as calculated from FY2009 through FY2013.

SSP is a vertical hierarchy organization with clear lines of responsibility, authority, and accountability and is aligned to the SWS subsystems. The organizational chart in Figure B-4 shows the overarching SSP structure. The SSP Director has overall accountability and three division level direct report offices. These division level direct reports are:

- Nuclear Weapons Safety and Security Division (SP30), responsible for coordinating policies associated with the safety and security of nuclear weapons;

- Technical Division (SP20), accountable for the technical aspects of the weapon system including design, production, maintenance and operations; and
- Plans and Programs Division (SP10), which provides supporting program planning functions and manages resources and support services.

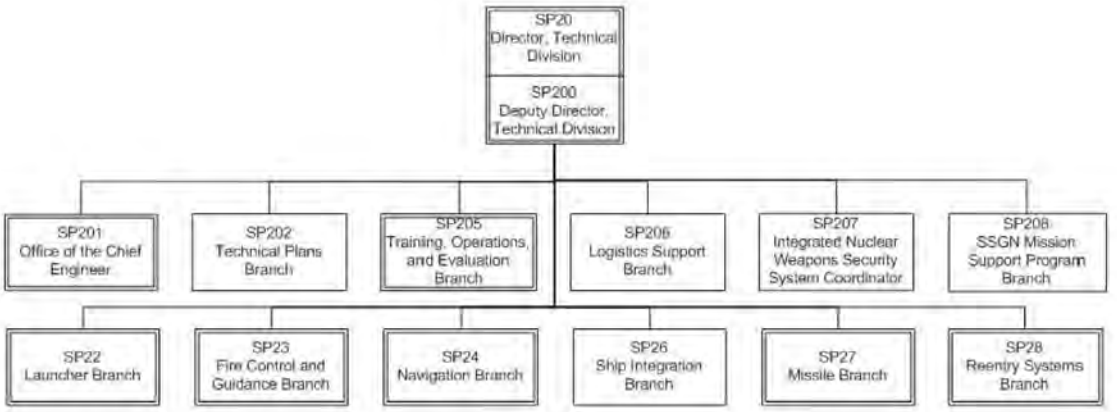
Figure B-4. SSP Organizational Structure



Source: Strategic Systems Programs

The Technical Division is responsible for mission assurance and is organized into branches aligned with SWS subsystems (Figure B-5).

Figure B-5. Technical Division (SP20) Organization Chart



Source: Strategic Systems Programs

The Technical Division sets policies, flows down requirements, guides technical management, and provides oversight to ensure product assurance, quality assurance, and SSP success. The Chief Engineer and his staff ensure technical disciplines, such as quality, reliability, maintainability, and product assurance are included within program management activities conducted at headquarters, field activities, contractor locations and other support activities. They also support and ensure technical communication is occurring between the branches and divisions of SSP. SSP executes the principles of mission assurance through its technical management and oversight processes by using proven engineering principles, risk management techniques, and independent assessments throughout the programs lifecycle.

Observation 1

SSP has three main documents that identify the standards, requirements, and engineering principles that are applied to each acquisition, contract, and program. This ensures each acquisition, contract, and program starts with the same baseline standards and meets a minimum level of quality and product assurance criteria. The three main documents are as follows.

- Technical Objectives Guide (TOG), which is the top-level specification. It guides development; identifies systems engineering requirements; and specifies performance, reliability and maintainability requirements for operations, sustainment, and overall test methodology.

- Strategic Systems Program Organization Manual (SORM), which sets the organizational structures, relationships, and functions of the SSP. The SORM identifies key offices for technical direction, policies, requirement flow down, technical and program oversight, manufacturing, testing, and independent assessment.
- Technical Program Management Requirements for Strategic Systems Programs Acquisitions Document (T9001B), which is the baseline contract document for quality and product assurance and specifies the management actions and technical disciplines to be invoked on SSP contracts.

These three documents are supported by additional internal standards and policies to facilitate implementation, process flow, and overall best practices. SSP identified 43 documents that address technical management, oversight, assessment, reporting, issue resolution, configuration control, interface management, and testing. The technical branches are responsible for executing their programs in accordance with these documents and are assessed against them by the SSP Chief Engineer and his staff. Finally, these documents guide and help the SSP chief engineer ensure mission success of SSP programs through product and quality assurance and risk management principles.

The T9001B lays out application of proven scientific, engineering, quality, and program management principles towards the goal of achieving mission success. It covers all phases of life cycle support, beginning with development and extending through production, operational support and eventual disposal. T9001B is a compendium of quality, product, safety, and guidelines that program managers use to define specific contract CDRLs. It calls out specific design, reliability, availability, and maintainability requirements, the test program approach, configuration management program, supplier management process, and production standards to be included on the contract. Program managers can tailor T9001B based on specific components, lifecycle phase, and contract type. The SSP Chief Engineer Office (in particular the Engineering Manager Section) is required to review and concur with the tailoring. This ensures a disciplined approach and application of proven scientific, engineering, and quality principles to ensure mission success.

The SSP SORM specifies the functions of the SSP organization and the processes and products for which the organization is responsible. The organizational functions, in particular, those of the SSP Technical Division, require the application of proven scientific, engineering, quality, and program management principles. Three examples are the assigned functions of the Engineering Manager Section, Evaluations and Assessments Section, and Missile Branch. The Engineering Manager Section develops policy and program guidance for Technical Program Management (TPM), Product Assurance, and Quality systems for the SWS during all phases of the SWS life cycle at contractor facilities, Government shore facilities, and in the operational Naval Fleet. The Evaluation and Assessment Section provides SSP technical program management, evaluations, audits, and management reviews. The Missile Branch executes planning, budgeting, directing, and technical management of programs to research, design, develop, test, qualify, and install the missile system, and related support equipment.

In summary, the three main documents guide SSP system acquisition and program execution. These internal policies, procedures, and standards are applied to system acquisition to specify system and technical requirements that drive quality and product assurance. The documents direct responsibility, management, and technical performance of the SSP organization to guide technical program management and engineering.

Observation 2

Evaluation and reviews are conducted on SSP prime contractors, major subcontractors, and SSP Government Field Activities and Program Management Offices. SSP employs and incorporates several types of independent technical and quality reviews, and evaluations into their processes. These reviews help ensure that policies, standards, and contract requirements are being implemented, which results in a higher probability of mission success.

There are five primary independent technical and quality reviews and evaluations that ensure program success: Technical Program Management Evaluation (TPME), Management Review (MR), Facility Technical Proficiency Evaluation (FTPE), Demonstration and Shakedown Operation (DASO), and Strategic Systems Program Alteration (SPALT) Program. The teams that execute TPMEs, MRs, FTPEs, and DASOs are independent of the unit under review or evaluation. The SPALT program initiates with a pre-proposal for change or alteration to a SWS or AWS, which if approved by the responsible SSP field office is submitted as a proposal for review and evaluation by Naval activities and approval by the SSP Technical Director.

TPMEs assess contract compliance and are typically performed every 3 years. The TPME evaluates the onsite Program Management Office and associated contractor performance to ensure it is meeting contract requirements by reviewing the technical specifications and manufacturing processes against the statement of work and the tailored T9001B. An external group, called the Evaluation and Assessment Team, made up of product assurance subject matter experts from NSWC Corona performs the TPMEs. TPMEs take a week to complete. The Chief Engineer then uses the information from the TPME to identify underlying issues of the non-compliance with requirements and subsequent root cause analysis and corrective action determination are conducted for each issue.

MRs are scheduled every 3 years to evaluate the Government's performance and implementation of programmatic and technical functions responsibilities. The MR ensures effective onsite monitoring and technical management of contractors by the respective SSP Program Management Offices. Management reviews are conducted on Flight and Shipboard Systems Program Management Offices (PMOs). The SSP Evaluation and Assessment Section chairs the evaluations with support from NSWC, Corona and SSP Technical Branch(es).

The FTPE, performed every 3 years, is an objective evaluation of facility performance to assure proper accomplishment of the SSP mission. SSP Headquarters, with support from SSP PMOs, NSWC Corona, other SSP field activities, and contractors conduct FTPEs every 3 years of Strategic Weapons Facility Atlantic, Strategic Weapons Facility Pacific, and the Naval Ordnance Test Unit. The FTPE evaluates both the Government and contractor components to properly assess operational performance and systems, the potential for performance problems, requirements adequacy and validity, and the need for continuous improvement in requirements, systems, and procedures.

DASOs provide assurance that ships are ready to carry out their primary mission. The purpose of DASO is to certify weapon system, crew, documentation, and logistical support for strategic deployment after new construction or overhaul. The DASO demonstrates successful firing of a Trident II D5 Missile and validates from end-to-end that the SWS meets all deterrent mission performance requirements. The SSP Operations, Evaluation, and Training Branch is the lead for planning, coordination, technical direction, analysis, execution, and conduct of the DASO Program.

SSP uses the SPALT Program for configuration control and configuration status accounting for SWS and Attack Weapon System (AWS) Hardware Configuration Items and Computer Software Configuration Items. The SPALT program lays out SSP's process for proposal, evaluation, approval, implementation, and configuration management of changes to hardware configuration items and Computer Software Configuration Items that are part of the SWS and AWS. The SPALT program ensures that changes to the SWS are needed and provide a positive advantage to the overall system program considering total impact on cost, personnel, safety, and system effectiveness. The SPALT Program provides the policies, controls, and procedures for configuration control and status accounting of SWS and AWS hardware and software items.

Although internal policies, procedures, and standards specify system, quality, and product assurance requirements, SSP uses independent assessments, reviews, and evaluations to ensure compliance to requirements. The independent assessments, reviews, and evaluations are applied to contractors and the SSP organization. Independent assessments, reviews, and evaluations ensure that contractors meet contract requirements; SSP facilities accomplish their assigned mission; SSP PMOs provide effective oversight of contractors; ships are prepared to execute their missions; and SSP executes configuration management of changes and alterations to the SWS and AWS.

Conclusion

SSP executes the principles of mission assurance as an integral part of technical program management. Its internal process, procedures, and policies ensure adherence to technical management and systems engineering practices. The execution of independent assessments and certifications ensure compliance and readiness are key factors SSP's success. Internal policy, procedures, and standards direct quality assurance, product assurance, and mission success throughout the system, while operational exercises provide certification that ships are mission ready.

Management Comments

Principal Deputy for the Assistant Secretary of Defense for Research & Engineering

ASSISTANT SECRETARY OF DEFENSE
3030 DEFENSE PENTAGON
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RESEARCH AND ENGINEERING

SEP 2 2014

MEMORANDUM FOR DEPUTY INSPECTOR GENERAL POLICY AND OVERSIGHT

THROUGH: DIRECTOR, ACQUISITION RESOURCES AND ANALYSIS 9/3/14

SUBJECT: Response to DoDIG Draft Report on Assurance Policy Evaluation – Spacecraft and Strategic Systems (Project No. D2013-DT0TAD-0002)

As requested, I am providing responses to the general content and recommendations contained in the subject report.

Recommendation A:

We recommend DASD(SE) update the Defense Acquisition Guidebook (DAG) to recommend that Major Defense Acquisition Programs review, tailor, and apply applicable mission assurance concepts and principles, such as those found in the Mission Assurance Guide, when developing Systems Engineering Plans and contract requirements to promote a higher probability of mission success.

Response:

Concur. DASD(SE) will update the DAG Chapter 4 to implement the DoDIG recommendations. The updated DAG will be released in 2015 along with other revisions to support the updated Department of Defense Instruction 5000.02.

Recommendation B:

We recommend DASD(SE) review the best practices of Missile Defense Agency (MDA), Space and Missile Systems Center (SMC) and Strategic Systems Program (SSP) identified within the report and incorporate them into the DAG. Present these practices at the next DASD(SE) bi-monthly systems engineering best practice meeting, to ensure dissemination of these best practices.

Response:

Concur. The principles of the DAG Chapter 4 are consistent with the DoDIG recommendation and DASD(SE) will continue to update the DAG as new practices emerge. For example, the DAG will be updated to include reference to standards such as systems engineering standard IEEE 15288.1, the technical reviews and audits standard IEEE 15288.2, and the configuration management standard SAE EIA-649-1 once these standards are published and adopted by the

Principal Deputy for the Assistant Secretary of Defense for Research & Engineering (cont'd)

DoD. Also, DASD(SE) will invite MDA, SMC, and SSP to present their best practices at a Systems Engineering Forum in 2015.

Please contact Mr. Dean Ridgely, 571-256-4929, dean.a.ridgely.civ@mail.mil if additional information is required.

Alan R. Shaffer
Principal Deputy

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Acronyms and Abbreviations

AWS	Attack Weapon System
BMDS	Ballistic Missile Defense System
CDR	Critical Design Reviews
DAG	Defense Acquisition Guidebook
DASD(SE)	Deputy Assistant Secretary of Defense for Systems Engineering
DASO	Demonstration and Shakedown Operation
EEE	Electrical, Electronic, Electromechanical
ESOH	Safety and Occupational Health
FASA	Federal Acquisition Streamlining Act
FTPE	Facility Technical Proficiency Evaluation
HSI	Human Systems Integration
IUID	Item Unique Identification
IRRT	Independent Readiness Review Team
MAG	Mission Assurance Guide TOR-2007(8546)-6018
MAIP	Mission Assurance Implementation Plan
MAIS	Major Automated Information System
MAP	MDA Assurance Provissions
MDA	Missile Defense Agency
MDAPs	Major Defense Acquisition Programs
MDA/QS	Quality, Safety, and Mission Assurance
MARs	MDA Assurance Representatives
MR	Management Review
ODASD(SE)	Office of the Deputy Assistant Secretary of Defense for Systems Engineering
PDR	Preliminary Design Reviews
PEO	Program Executive Office
PMAG	PMP Advisory Group
PMAP	MDA Parts, Materials, and Processes Mission Assurance Plan
PMO	Program Management Offices
PMP	Parts, Materials, and Processes
QSA	Mission Assurance
QSH	Safety and Occupational Health
QSI	Assurance Integration
QSP	Parts, Materials, and Processes

Acronyms and Abbreviations (cont'd)

QSQ	BMDS Quality
QSS	BMDS Safety
SDIO	Strategic Defense Initiative Organization
SEP	Systems Engineering Plan
SMC	Space and Missile Systems Center
SSP	Strategic Systems Program
SME	Subject Matter Experts
SMC/EN	Space and Missile Systems Center/Engineering Directorate
SORM	Strategic Systems Program Organization Manual
SPALT	Strategic Systems Program Alteration
SRM	Supplier Road Maps
SWS	Strategic Weapons System
T9001B	Technical Program Management Requirements for Strategic Systems Programs Acquisitions Document
TOG	Technical Objectives Guide
TPM	Technical Program Management
TPME	Technical Program Management Evaluation
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics


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