



## OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE SYSTEMS ENGINEERING

### System of Systems Engineering Collaborators Information Exchange (SoSECIE)

Tuesday, September 11, 2012  
11:00 a.m. to Noon EDT

#### Complexity Management: A Perspective on Large, Joint, System Capabilities and Requirements Management in the Missile Defense Agency (MDA)

Mr. Robert Braunger and Mr. Warren Anderson, Missile Defense Agency  
Ms. Kelly Sacco, CSC

#### Abstract

This presentation will provide perspectives on the technical management of the large, complex Ballistic Missile Defense System (BMDS), focusing on capabilities, requirements, and baseline management. First, we will describe the nature of the BMDS program and the capabilities, requirements, and baseline technical management challenges this presents. Second, we will provide insights into the systems engineering process used to take desired combatant capabilities and needs and translate these into BMDS-level requirements. Third, we will overview the approach for requirements and baseline management. We will conclude with lessons learned.

The Missile Defense Agency (MDA) is a Department of Defense (DoD) agency chartered in 2002 to develop, test, and field an integrated BMDS to protect the United States, our forward deployed forces, and our friends and allies from hostile ballistic missile attack. The BMDS is an integrated, “layered” architecture, providing Warfighter capabilities and fulfilling specific combatant needs to defend against any hostile missile. The BMDS is a complex system of Elements and supporting efforts. The Systems Engineering Guide for Systems of Systems, Version 1.0, refers to the BMDS as an “integrated, global ballistic missile defense enterprise of interconnected sensors, battle managers, C2 systems and weapons.” In the taxonomy of the DoD SoS Guide, the BMDS is built and managed to fulfill the above specific purposes as in a Directed SoS. However, some of the BMDS Elements retain independent purposes unique to the Service that operates that Element as in an Acknowledged SoS. As one would expect, this complexity presents challenges that must be overcome to successfully field capability to the Warfighter, particularly in managing capabilities and both integrated and unique requirements.

BMDS-level requirement and capability management is a critical task for MDA. The core directive from DoD directs MDA to provide capability in blocks, inserting new technologies as they become available, and control development through system-level management to enable capability trades among elements and decision-making in response to events. MDA has been empowered by DoD to develop new processes for capability-based acquisition of this critical and technically complex system.

The BMDS capabilities-based requirements processes and “system engineering vee” will be briefly compared to the DoD SoS Guide’s systems engineering vee, focusing on activities supporting capability and requirements development of the BMDS. An illustrative example set of capabilities for a current C2BMC build in support of the BMDS PAA Phase I/“Initial Integrated Defense” will be discussed, with sample capability relationships and flows to BMDS documents. The MDA manages its acquisition and BMDS programs through the use of six baselines. The six baselines are schedule, technical (TBL), test, operational capacity, contracts, and resource. A primary working group is associated with each baseline as well as sub-working groups. These working groups may be viewed as BMDS-level IPTs, with responsibility for baseline management and review. The baseline working groups are very similar to standard DoD IPTs in that they do contain subject matter experts from different Elements and across all

---

For more information: <http://www.acq.osd.mil/se/outreach/sosecollab.html>



## OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE SYSTEMS ENGINEERING

the Functional Managers within MDA. Each baseline working group supports the Integrated Synchronization Group (ISG). The ISG supports the baseline control process by providing integrated and coordinated analysis of BMDS baseline change requests, acquisitions, and other changes requested by senior MDA staff. A Functional Manager (FM) is responsible for each baseline, and each FM delegates a Baseline Champion and support staff to support the ISG. From an ISG meeting, a change request may need to be elevated to the MDA Program Change Board (PCB), which serves as the decision authority for establishing and changing the BMDS and component baselines and is chaired by the MDA Director. With the approval of each change request, a decision memorandum is signed and dated and is distributed by the ISG to the MDA community. Following formal decision, the Baseline Champion, to include the TBL, updates its current configuration with a new version, reflecting the ISG or PCB decision made. Although each day is demanding in a complex effort such as the BMDS, the systems engineering and baseline management processes enable effective complexity management. By developing capabilities-based, acquisition processes, MDA successfully fields critical capabilities to the Warfighter. We continue to improve Complexity Management and strive to apply our lessons learned to evolve the BMDS.

### **Biography**

Mr. Braunger is Deputy Director for Interfaces and Requirements Allocation, Director for Engineering, Missile Defense Agency (MDA). He oversees requirements allocation and traceability, chairs the engineering board managing MDA's SoS-level interfaces, and leads SoS-level requirements design teams. Mr. Braunger has over 20 years experience as a former Army officer and engineer / physicist for NASA, the Department of Energy, Air Force, and MDA. He is a doctoral student in Systems Engineering at the University of Alabama in Huntsville, with a research focus of SoS Requirements. He has a Bachelor in Aerospace Engineering from Princeton, Master of Science in Physics and Master of Arts in Teaching (Physics) from the University of Iowa, and Master of Engineering (Aerospace) from the University of Florida. He has been nominated for the 2010 MDA Rising Star Award.

Mr. Anderson serves in MDA as the Chief, BMDS Integration Management. He oversees resolution of BMDS interoperability issues supporting the BMDS Chief Engineer. He previously served in the US Air Force, retiring in 2009 as a Colonel. Mr. Anderson received a Master of Science in National Resource Strategy from the National Defense University as well as Master of Science in Industrial Management, Bachelor of Aerospace Engineering, and Bachelor of Science in Chemistry from the Georgia Institute of Technology. He received the OSD Certificate of Recognition for Excellence in Systems Engineering in 2007.

Ms. Sacco is a defense contractor with CSC, supporting the MDA Director for Engineering. She is a Systems Engineer, serving as the Ballistic Missile Defense System Technical Baseline (TBL) Champion managing configuration control of the TBL. Ms Sacco has over 12 years with MDA as well as the Space and Missile Defense Center, Program Executive Office for Missiles and Space, Aviation and Missile Research Development and Engineering Center, and Air Force JASSM Program Office. She received a Bachelor of Science in Engineering in Industrial and Systems Engineering in December 2000. She was on the 2010 MDA Contractor Honor Roll and nominee for MDA Contractor of the Year.