

## Command, Control, Battle Management, and Communications (C2BMC) System

### Executive Summary

- The Missile Defense Agency (MDA) implemented a new comprehensive approach to test design focused on data collection to verify, validate, and accredit models and simulations for system performance analysis. The MDA identified seven Command, Control, Battle Management, and Communications (C2BMC)-specific Critical Engagement Conditions (CECs) needed to accredit C2BMC models.
- C2BMC capabilities and interactions with other elements, particularly the Terminal High-Altitude Area Defense (THAAD) and the AN/TPY-2 (Forward-Based Mode (FBM)) radar in Shariki, Japan, expanded in FY09, adding a regional communications teleport at Ramstein AFB, Germany, and a control and communications interface for an AN/TPY-2 (FBM) radar in Israel.
- C2BMC repeatedly demonstrated the ability to control a single AN/TPY-2 (FBM) radar; to receive and forward tracks from other element radars such as the Aegis AN/SPY-1 and the AN/TPY-2 (Terminal Mode); and to interact with the Ground-based Midcourse Defense (GMD) element through the GMD Fire Control (GFC).
- The MDA continues to track and correct C2BMC software anomalies and improve data presentation.
- Although C2BMC is still primarily a Situational Awareness tool and a rudimentary planning tool, the MDA is starting to implement near real-time planning functions, battle management, and sensor network tools.

### System

- C2BMC is the warfighter's interface to the fully integrated Ballistic Missile Defense System (BMDS).
- Initial configuration includes C2BMC data terminals at the Missile Defense Integration and Operations Center (MDIOC), Schriever AFB, Colorado; Cheyenne Mountain, Colorado; Fort Greely, Alaska; U.S. Strategic, Northern, European, and Pacific Commands, and the National Military Command System.
- The current C2BMC system provides Situational Awareness to warfighters and the National Command Authority with information on missile events, BMDS status, and system coverage. C2BMC also provides above-element deliberative planning at the combatant command and component level, permitting a federation of planners across the BMDS. Aegis Ballistic Missile Defense (Aegis BMD) and GMD elements use their own command, control, battle management systems and mission planning tools for stand-alone engagements.
- Currently, the C2BMC provides command and control for two AN/TPY-2 (FBM) radars located at Shariki, Japan, and in Israel.



- C2BMC provides track forwarding of AN/TPY-2 (FBM) and AN/SPY-1 tracks to GMD. Additionally, it provides track forwarding of AN/TPY-2 (FBM) tracks to Aegis BMD for cueing.
- The next two significant upgrades will add new capabilities to the C2BMC:
  - Spiral 6.4: Initial implementation of the Global Engagement Manager is intended to manage multiple radars in the same area of responsibility.
  - Spiral 8.2: Although not fully defined by the MDA, the intent is to improve and expand the initial Spiral 6.4 capabilities with the addition of initial sensor-weapon system pairing and engagement direction, as well as the implementation of the common X-band interface as the next step toward integrated sensor management.

### Mission

U.S. Strategic, Northern, European, and Pacific Commands currently use the C2BMC to provide communications necessary to support ballistic missile defense engagements, as follows:

- Deliberate planning
- Collaborative dynamic planning
- Situational Awareness
- Consequence management
- Network management
- AN/TPY-2 (FBM) sensor management and control

### Prime Contractor

- Lockheed Martin Information Systems and Global Services, Gaithersburg, Maryland

## Activity

- In FY09, C2BMC supported the U.S. response to North Korean missile operations. The C2BMC met all operational mission objectives.
- The U.S. European Command (EUCOM) declared the command and control capability, communications systems, and interface to the AN/TPY-2 (FBM) radar to be operational in 1QFY09. The MDA and EUCOM assessed AN/TPY-2 and C2BMC performance during Fast Contingency Analysis and Activation Team exercises optimizing radar search fences and assessing focused search plans, demonstrating regional track management and forwarding of AN/TPY-2 track cues to Aegis BMD.
- During the process to revise the Integrated Master Test Plan (IMTP) and approach to test design, the MDA identified seven CECs, for which flight and ground testing will collect data to validate and accredit the C2BMC models and simulations. Six CECs relate to Spiral 6.4 and one CEC relates to Spiral 8.2.
- In FY09, C2BMC participated in three ground tests (integrated hardware-in-the-loop tests and distributed tests that used operational hardware and software) and four flight tests. C2BMC continues to demonstrate the ability to provide Situational Awareness by receiving and displaying data from a variety of sensors, as well as demonstrating AN/TPY-2 (FBM) track forwarding and radar management functions.
- Software Spiral 6.2 is operational at all Combatant Commands and Fort Greely, Alaska. The MDA is currently integrating and testing the base version of software Spiral 6.4 at the Missile Defense Integration and Operations Center (MDIOC) at Schriever AFB, Colorado. The MDA expects to field Spiral 6.4 by the end of FY10. Hardware upgrade installation in preparation for Spiral 6.4 fielding continues at the AN/TPY-2 (FBM) site in Shariki, Japan.
- During Flight Test GMD Interceptor (FTG)-05 in December 2008, C2BMC again demonstrated its role in connecting several BMDS elements: C2BMC cued AN/TPY-2 (FBM) to perform a focused search plan, received and forwarded AN/TPY-2 (FBM) tracks to the GFC and Aegis BMD, and received tracks from Aegis BMD.
- The MDA conducted the focused Ground Test Other (GTX)-03c in November and December 2008 and demonstrated a simulated Aegis BMD engagement using the AN/TPY-2 (FBM) target track forwarded by C2BMC.
- During Flight Test THAAD Interceptor (FTT)-10a in March 2009, C2BMC received tracks from and provided Situational Awareness to both Aegis BMD and THAAD.
- The Space-Based Infrared/Defense Support Program (SBIRS/DSP) provided launch data to C2BMC during the Ground Test Distributed (GTD)-03 in February and March 2009. C2BMC also demonstrated connectivity with GFC.
- GTX-03e, which took place in July 2009, tested C2BMC Situational Awareness functionality as well as interactions with

- SBIRS/DSP and GFC. C2BMC displayed track information from multiple sensors and successfully controlled the AN/TPY-2 (FBM) radar.
- In FY09, C2BMC participated in two wargames, Vigilant Shield 09 and Assured Response 09a, and trained operators for Juniper Cobra 10.

## Assessment

- Spiral 6.4 initial integration and test is under way. The MDA plans three implementations of this software spiral incorporating incremental increases in Spiral 6.4 capabilities. Spiral 6.4 introduces the Global Engagement Manager at U.S. Pacific Command. It will tie together two AN/TPY-2 (FBM) sensors allowing for automated sensor management, track downselect/forwarding, and operator track-level management. Generation of a single system track from multiple sensor source tracks is a critical BMDS level need. C2BMC is still developing the functionality to provide a single system track. The Ground Test campaign (GT)-04 will provide a system test for C2BMC Spiral 6.4.
- C2BMC is a critical component of the BMDS. C2BMC interactions with theater and strategic elements continued to increase and improve in FY09. It now includes connectivity with SBIRS/DSP, Aegis BMD, THAAD, and GFC, and connectivity with and control of two separately operated AN/TPY-2 (FBM) radars.
- All Combatant Command and National Command Authority C2BMC suites are now being manned and operated by warfighters. Logistical support is provided by each command's organic maintenance concept. Only the unique C2BMC software applications are still being maintained by the MDA, which continues to evolve C2BMC capability.
- C2BMC has limited battle management capabilities allowing warfighters at C2BMC consoles to direct the AN/TPY-2 (FBM) radar to execute focused search plans or respond to precision cues.
- Expanding C2BMC interoperability across the BMDS elements will necessitate more extensive testing to support development of tactics, techniques, and procedures.

## Recommendations

- Status of Previous Recommendations. The MDA addressed seven of the previous eight recommendations. The MDA continues to make progress on the one outstanding FY06 recommendation to include assessments of information assurance during BMDS-centric C2BMC testing.
- FY09 Recommendation.
  1. The MDA should revise the IMTP to incorporate testing of the C2BMC capabilities and linkages needed to implement the phased, adaptive approach to providing missile defense for Europe.