

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

### Executive Summary

- Command, Control, Battle Management, and Communications (C2BMC) (Spiral 6.2) repeatedly demonstrated the ability to control a single AN/TPY-2 radar, receive and forward tracks, and receive and display weapon element status data from and interact with Ballistic Missile Defense System (BMDS) elements. C2BMC also demonstrated interoperability with the Arrow Weapon System in theater-level ground tests.
- In FY10, C2BMC participated in five ground tests and three flight tests. C2BMC continues to demonstrate the ability to provide situational awareness by receiving and displaying data from a variety of BMDS sensors and weapons.
- The Missile Defense Agency (MDA) continues to track and correct C2BMC software anomalies and improve data presentation.
- The next version of C2BMC (Spiral 6.4) is currently participating in ground and flight testing. Once fielded, it is intended to enable automated sensor management of multiple AN/TPY-2 (FBM) radars, implement basic battle management functions, and provide enhanced situational awareness.

### System

- Command, Control, Battle Management, and Communications (C2BMC) is a combatant command's interface to the fully integrated BMDS.
- Initial configuration includes C2BMC data terminals at the Missile Defense Integration and Operations Center (MDIOC), Schriever AFB, Colorado; Peterson AFB, Colorado; Cheyenne Mountain, Colorado; Fort Greely, Alaska; U.S. Strategic, Northern, European, Pacific and Central Commands; and the National Military Command System.
- The current C2BMC system provides situational awareness to combatant commands 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 Ground-based Missile Defense (GMD) elements use their own command, control, battle management systems and mission planning tools for stand-alone engagements.
- Currently, C2BMC Spiral 6.2 provides command and control for a single AN/TPY-2 (Forward Based Mode, or FBM) radar, with radars currently 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 boost phase precision cue, engagement assessment, and recommendations, as well as the implementation of the common X-band interface as the next step toward integrated sensor management.

### Mission

U.S. Strategic, U.S. Northern, U.S. European, U.S. Central and U.S. 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

### Major Contractor

Lockheed Martin Information Systems and Global Services – Gaithersburg, Maryland

## Activity

### Spiral 6.2 (S6.2)

- S6.2 is the operational version of C2BMC software.
- The MDA utilized the digital representation of C2BMC S6.2 in Performance Assessment-09 (PA-09) in November and December 2009 to assess C2BMC sensor tasking functionality.
- The MDA completed S6.2 fielding to the U.S. European Command (USEUCOM) in July 2010. The MDA also installed S6.2 hardware and software at the U.S. Central Command (USCENTCOM); this installation is currently undergoing integration and testing.
- C2BMC S6.2 participated in the Juniper Cobra 10 war game in October 2009.
- In October and December 2009, C2BMC S6.2 participated in Fast Contingency Analysis and Activation Team (CAAT) East-C (FCE-C) integrated hardware-in-the-loop and distributed ground tests. C2BMC provided situational awareness and communications to BMDS theater elements including the Arrow Weapon System. Successful cross-COCOM data exchange occurred between C2BMC at USEUCOM and two Aegis BMD ships (one USEUCOM ship and one USCENTCOM ship).
- C2BMC S6.2 participated in Flight Test Ground-based Interceptor-06 (FTG-06) in January 2010. During the test, C2BMC provided status of BMDS under test and situational awareness displays.

### Spiral 6.4 (S6.4)

- The next C2BMC software build, S6.4, is installed on the Parallel Staging Network at the Missile Defense Integration and Operations Center (MDIOC) at Schriever AFB, Colorado, and at the U.S. Pacific Command (USPACOM) for concurrent testing, training, and operations. The new C2BMC suite, Global Engagement Manager (GEM), is also available on the MDIOC and USPACOM Parallel Staging Network. The estimated fielding date for S6.4 is May 2011 at USPACOM, the U.S. Strategic Command (USSTRATCOM), and the U.S. Northern Command (USNORTHCOM), and is FY12 for USEUCOM. The ground test campaign GT-04, planned for FY11-FY13, will provide a system-level test for C2BMC S6.4.
- In February 2010, C2BMC S6.4 participated in Ground Test Other-04a (GTX-04a), an initial focused ground test of S6.4 in a hardware-in-the-loop test environment. C2BMC S6.4 GEM demonstrated control of multiple AN/TPY-2 (FBM) radars in a single area of responsibility and automated sensor and track management functions.
- During the GMD Booster Verification Test-01 (BVT-01) in June 2010, C2BMC S6.4 collected data for accreditation of C2BMC models and simulations and demonstrated command and control of an AN/TPY-2 (FBM) radar.
- C2BMC S6.4 participated in Flight Test Terminal High-Altitude Area Defense (THAAD)-14 (FTT-14)

in June 2010, but had difficulty providing situational awareness and status of BMDS elements participating in FTT-14. These will be discussed in the classified FY10 BMDS report to Congress.

- In August 2010, C2BMC S6.4 participated in Ground Test Integrated-04b (GTI-04b) in support of the S6.4 fielding decision. This exercise tested enhanced sensor management and track processing and reporting functions in S6.4, as well as enhanced situational awareness functionality of S6.4.

## Assessment

- C2BMC is a critical component of the BMDS. C2BMC interactions with theater and strategic elements continued to increase and improve in FY10 and now include connectivity with the Arrow Weapon System.
- C2BMC has limited battle management capabilities allowing combatant command controllers sitting at C2BMC consoles to direct an AN/TPY-2 (FBM) radar to execute focused search plans or respond to a precision cue.
- C2BMC continues to demonstrate interoperability with BMDS elements, but requires more extensive tests in order to support development of tactics, techniques, and procedures.
- Apart from already existing C2BMC roles in providing situational awareness and some planning capability, S6.4 (as installed on the Parallel Staging Network) introduces the GEM component at USPACOM with a backup at MDIOC. GEM allows for automated management of multiple AN/TPY-2 (FBM) sensors located in a single area of responsibility. It also provides greater automation of sensor management and improved track processing and reporting while requiring less operator involvement as compared to S6.2 software.
- In ground testing to date, S6.4 has demonstrated the ability to manage two AN/TPY-2 (FBM) radars, automated sensor and battle management functionality, and track processing enhancements. In ground and flight testing, S6.4 has partially demonstrated the ability to provide situational awareness and status of weapon elements under test.

## Recommendations

- Status of Previous Recommendations. The MDA addressed eight of the previous nine recommendations. The MDA continues to make progress on the one outstanding FY06 recommendation to include assessments of information assurance during BMDS-centric C2BMC testing.
- FY10 Recommendation.
  1. The MDA should conduct theater flight testing with S6.4 software with multiple threats and multiple weapon elements.