

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

Executive Summary

- During FY12, Command, Control, Battle Management, and Communications (C2BMC) participated in three ground tests, three flight tests, exercise Fast Eagle Increment 1, and the Israeli Arrow Weapon System (AWS) Block 4 System Verification Flight Test.
- C2BMC Spiral 6.4 (S6.4) software demonstrated simultaneous live control of two AN/TPY-2 radars operating in Forward-Based Mode (FBM) in Turkey and Israel in support of the European Phased Adaptive Approach (EPAA) Phase 1 deployment.
- C2BMC demonstrated interoperability with Aegis Ballistic Missile Defense (BMD), Patriot, Terminal High-Altitude Area Defense (THAAD), the Space-Based Infrared System/Defense Support Program (SBIRS/DSP), and the AWS.
- The Missile Defense Agency (MDA) included the Global Engagement Manager (GEM) in the deployment of C2BMC S6.4 to the Combatant Commands. GEM provides greater automation of sensor management functions and improved track processing and reporting.
- Even with the deployment of GEM, C2BMC still has battle management capabilities limited primarily to situational awareness, radar track forwarding, and control of AN/TPY-2 (FBM) radars until at least FY17 when the MDA tentatively plans to field S8.2.

System

- C2BMC is a Combatant Command's interface to the fully integrated Ballistic Missile Defense System (BMDS).
- More than 70 C2BMC workstations are fielded at U.S. Strategic, Northern, European, Pacific, and Central Commands (USSTRATCOM, USNORTHCOM, USEUCOM, USPACOM, and USCENTCOM); numerous Army Air and Missile Defense Commands; Air and Space Operations Centers; and other supporting warfighter organizations. 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 upper echelon deliberate planning at the Combatant Command and component level, permitting a federation of planners across the BMDS. BMDS elements (Aegis BMD, Ground-based Midcourse Defense [GMD], Patriot, and THAAD) use their own command, control, battle management systems and mission planning tools for stand alone engagements.
- C2BMC S6.4 provides command and control for multiple AN/TPY-2 (FBM) radars in the same area of responsibility.



- S6.4 includes the deployment of GEM, which includes updated sensor management, track processing, and reporting.
- 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 for THAAD and Patriot cueing and Aegis BMD engagement support.
 - C2BMC S8.2, although not fully defined by the MDA, is intended to improve and expand the initial S6.4 capabilities as the next step toward integrated sensor management. The MDA plans to field S8.2 not earlier than FY17.

Mission

U.S. Strategic, Northern, European, Central, and Pacific Commands currently use C2BMC to support ballistic missile defense engagements. Commanders use C2BMC specifically for:

- Deliberate and dynamic planning
- Situational awareness
- Track management
- AN/TPY-2 (FBM) sensor management and control
- Engagement monitoring
- Data exchange between C2BMC and BMDS elements
- Network management

Major Contractor

Lockheed Martin Information Systems and Global Solutions – Gaithersburg, Maryland

Activity

- The MDA conducted testing during FY12 in accordance with the DOT&E-approved Integrated Master Test Plan.
- The USEUCOM C2BMC upgrade to S6.4 was completed at the end of 2011 as part of the EPAA Phase 1 deployment. The USCENTCOM C2BMC upgrade to S6.4 will complete with the MDA publication of a Technical Capability Declaration in 4QFY12. Apart from already existing C2BMC roles in providing situational awareness, sensor management for acquisition, basic track forwarding, and some planning capability, S6.4 introduced the GEM suite at USPACOM (with a backup at Missile Defense Integration and Operations Center), USEUCOM, and USCENTCOM. C2BMC participated in the Flight Test THAAD-12 (FTT-12) IOT&E in October 2011, demonstrating interoperability with THAAD over Tactical Datalink 16. C2BMC provided situational awareness and status of the BMDS under test.
- The MDA conducted Ground Test Integrated-04d (GTI-04d) Part 2 in October 2011. The USEUCOM warfighters used C2BMC to control two AN/TPY-2 (FBM) radars. C2BMC also provided situational awareness and demonstrated interoperability with Aegis BMD, Patriot, Israeli AWS, and SBIRS/DSP.
- The MDA completed GTI-04 (Israel) in November 2011. C2BMC controlled one AN/TPY-2 (FBM) radar and demonstrated interoperability with Aegis BMD, Patriot, THAAD, SBIRS/DSP, and the Israeli AWS.
- In December 2011, C2BMC participated in Ground Test Distributed-04d (GTD-04d) Part 2. An AN/TPY-2 (FBM) radar was represented in the test architecture and controlled by C2BMC. Aegis BMD and SBIRS/DSP also participated.
- In December 2011, the MDA conducted GTD-04d Part 3 in support of the EPAA Phase 1 assessment. The USEUCOM sensor managers used C2BMC to command and control two AN/TPY-2 (FBM) radars for the first time in a distributed ground test. C2BMC demonstrated interoperability with Aegis BMD and SBIRS/DSP.
- In April 2012, the MDA conducted a developmental ground test, Ground Test Focused-04e (GTX-04e), and collected data for several C2BMC critical factors (referred to as Critical Engagement Conditions). C2BMC demonstrated interoperability with the full BMDS architecture, provided situational awareness, and controlled AN/TPY-2 (FBM) radars in USPACOM and USEUCOM areas of responsibility (one and two radars, respectively).
- C2BMC participated in the Fast Eagle Increment 1 hardware-in-the-loop test in June 2012 and distributed test in August 2012. It demonstrated the ability to provide situational awareness and command and control of one AN/TPY-2 (FBM) radar, and interoperability with other USCENTCOM BMD assets.
- In October 2012, C2BMC managed a deployed AN/TPY-2 (FBM) radar from which it forwarded acquisition cues to Aegis BMD and THAAD during the MDA's combined developmental/operational Flight Test Integrated – 01 (FTI-01).

Assessment

- GEM allows for automated management of multiple AN/TPY-2 (FBM) sensors located in one area of responsibility. It also provides greater automation of sensor management functions and improved track processing and reporting while requiring less operator involvement as compared to S6.2 software.
- C2BMC has limited battle management capabilities allowing Combatant Command sensor managers to direct AN/TPY-2 (FBM) radars to execute focused search plans or respond to a precision cue. S6.4 demonstrated command and control of a single AN/TPY-2 (FBM) radar in ground and flight tests. S6.4 demonstrated command and control of two AN/TPY-2 (FBM) radars in both a hardware-in-a-loop and distributed test environment, but not in a flight test using deployed assets.
- During the GTX-04e event, in which the MDA tested S6.4 interactions with strategic elements, C2BMC S6.4 demonstrated interoperability with strategic BMDS elements and the ability to provide situational awareness.
- The MDA tested C2BMC S6.4 interactions with theater elements throughout the GT-04 and Fast Eagle Increment 1 ground test campaigns in FY11 and FY12. In addition to providing situational awareness, C2BMC S6.4 demonstrated interoperability with theater BMDS elements and command and control of one and two AN/TPY-2 (FBM) radars contributing to the defensive capability for the southeastern European, Israeli, and Middle Eastern theaters.
- During the GT-04 and Fast Eagle Increment 1 campaigns, the MDA identified S6.4 interoperability and command and control deficiencies that affected track processing, situational awareness, and battle management. The MDA is currently testing solutions to these deficiencies. Some interoperability issues are outside of the C2BMC program's authority to resolve, and will require MDA and Service action.
- C2BMC appeared to successfully manage and forward cues from the deployed AN/TPY-2 (FBM) supporting FTI-01. Analysis is ongoing. DOT&E will report results in the 2012 BMDS report to Congress, scheduled for publication in February 2013.

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.
- FY12 Recommendation.
 1. The MDA should continue to address the C2BMC interoperability and command and control deficiencies uncovered during the GT-04 campaign. Resolution of these deficiencies should be demonstrated through ground and/or flight testing.