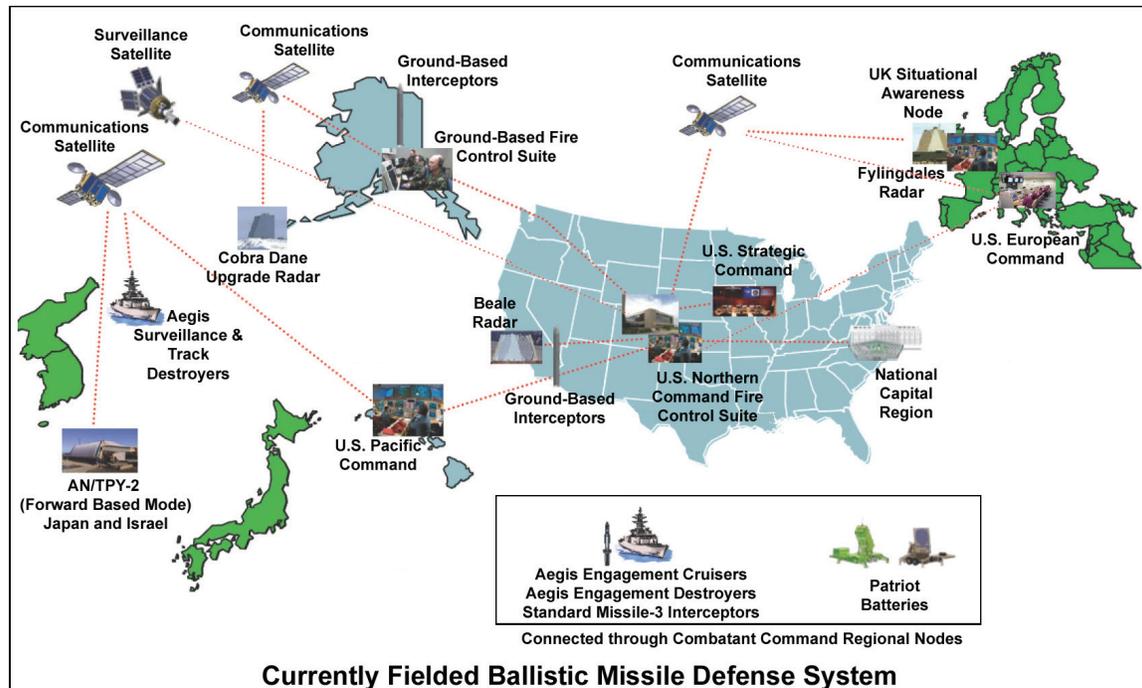


## Ballistic Missile Defense System (BMDS)



### Executive Summary

- The Missile Defense Agency (MDA) began execution of its revamped Integrated Master Test Plan (IMTP) to collect the data needed to accredit the models and simulations used for assessing performance and effectiveness of the Ballistic Missile Defense System (BMDS).
- The Ground-based Midcourse Defense (GMD) element conducted an unsuccessful intercept flight test and a successful two-stage interceptor boost vehicle flight test during FY10.
- Aegis Ballistic Missile Defense (Aegis BMD) intercepted one separating ballistic missile target in a Japanese Aegis BMD flight test. Hardware-in-the-loop ground testing demonstrated potential Aegis BMD capability to contribute to theater-level defense missions spanning a range of ballistic missile defense scenarios.
- The Terminal High Altitude Area Defense (THAAD) system successfully intercepted one unitary short-range target in the low endo-atmosphere. Another flight test event experienced a target failure and did not achieve its test objectives. In addition to delaying THAAD test objectives, the target failure also prompted the grounding of all air-launched targets within the MDA test program until contractor recertification in 3QFY11. THAAD completed a series of nine reduced-scale light-gas-gun tests to characterize the interceptor's lethality against missile payloads.
- Patriot conducted five flight tests against ballistic missile targets, all of which resulted in target intercepts. Patriot also conducted a Limited User Test (LUT) in FY10.
- Command, Control, Battle Management, and Communications (C2BMC) demonstrated the ability to control a single AN/TPY-2 (Forward Based Mode, or FBM) radar, receive and forward tracks, receive and display weapon element status data from several elements (Aegis BMD, THAAD, and Patriot), and interact with the GMD element through the GMD fire control.

### System

- The current BMDS architecture integrates ballistic missile defense capabilities against all ranges of threats.
- BMDS is a distributed system currently composed of four elements and five sensor systems.

### Elements

- Aegis BMD
- C2BMC
- GMD
- Patriot

### Sensors

- Aegis BMD AN/SPY-1 Radar
- Cobra Dane Radar
- Upgraded Early Warning Radars (UEWRs) – Beale AFB, California and Fylingdales, England
- AN/TPY-2 (FBM) radar (formerly Forward-Based X-band Transportable radar, or FBX-T)
- Space-Based Infrared System/Defense Support Program (SBIRS/DSP)

# BALLISTIC MISSILE DEFENSE SYSTEMS

- BMDS is employed as part of the nation's integrated strategic response plans.
- Projected near-term additions to the BMDS include the Sea-based X-Band (SBX) Radar, an additional UEWR in Thule Air Base, Greenland, and the THAAD system.
- Advanced technology BMDS capabilities may include the following:
  - Airborne Laser Test Bed (ALTB)
  - Precision Tracking Space System (PTSS)
  - Airborne Infrared (ABIR) Sensors

## Mission

- The U.S. Strategic Command is responsible for synchronizing and integrating ballistic missile defenses employing U.S. Northern Command, U.S. Pacific Command, U.S. Central Command, and U.S. European Command assets, as well as the BMDS to defend U.S. territory, deployed forces, friends, and

allies against ballistic missile threats of all ranges, in all phases of flight. Initial capability permits defending U.S. territory against simple ballistic missile threats and defending deployed forces, friends, and allies from theater-level ballistic missile threats.

- U.S. Strategic Command, U.S. Northern Command, U.S. European Command, U.S. Central Command, and U.S. Pacific Command will maintain situational awareness across the full mission engagement space using the C2BMC system.
- The Army employs Patriot to provide theater defense for deployed forces against short- and medium-range threats. The MDA has transferred Patriot to the Army; it is reported as an Army program.

## Major Contractor

The Boeing Company, Integrated Defense Systems, Missile Defense Systems – Huntsville, Alabama

## Activity

- The MDA began execution of its newly revised IMTP that uses a critical factors analysis (also referred to as Critical Engagement Conditions, or CECs) and other important data needs (also referred to as Empirical Measurement Events, or EMEs) to drive test design, planning, and execution.

## GMD

- GMD executed the Flight Test Ground-based Interceptor-06 (FTG-06) event in January 2010. The SBX radar participated as the sole midcourse sensor. This test resulted in a failed target intercept. FTG-06 was the first flight test and intercept attempt by an interceptor equipped with the new Capability Enhancement II (CE II) Exo-atmospheric Kill Vehicle (EKV).
- GMD executed the Booster Vehicle Test-01 event in June 2010, successfully testing two-stage first-generation avionics and executing EKV data gathering maneuvers.
- The MDA executed the system-level event, Ground Test Integrated-04b (GTI-04b), in August 2010 using to be fielded element software and component representations.

## Aegis BMD

- In FY10, the Aegis BMD program continued the test and evaluation of the Aegis BMD 3.6.1 software load with the Standard Missile-3 (SM-3) Block IA interceptors.
- The Aegis BMD program conducted two intercept tests: Japanese Flight Test Mission-3 (JFTM-3) in FY10 and JFTM-4 in early FY11. It also participated in several BMDS system flight and ground tests including:
  - Juniper Cobra 10 war game
  - Fast Contingency Analysis and Activation Team (CAAT) East-C (FCE-C)
  - Flight Test Other-06 (FTX-06) Events 1 through 4
  - Ground Test Other (GTX)-04a
  - GTI-04b

## THAAD

- The MDA conducted Flight Test THAAD-11 (FTT-11) in December 2009. The air-launched target deployed from the C-17 aircraft, but failed to ignite.
- The MDA conducted FTT-14, a successful low endo-atmospheric intercept of a unitary short-range target, in June 2010.
- The Army Operational Test Agency conducted a Force Development Experiment and LUT supporting an FY11 materiel release decision.
- THAAD completed its series of nine reduced-scale light-gas-gun tests, participated in GTX-04a, GTI-04b, and FTX-06.
- THAAD radar participated in FTG-06 and JFTM-3. THAAD also participated in the Juniper Cobra 10 war game and FCE-C.

## Patriot

- The Army conducted the Post-Deployment Build-6.5 LUT at White Sands Missile Range (WSMR), New Mexico, from November 2009 to July 2010. Patriot conducted four flight tests against ballistic missile targets:
  - Flight Test ATM-48 in October 2009, which resulted in a target intercept
  - Production Configuration Flight Test PC-08 in December 2009, which resulted in a target intercept
  - Flight Test 7-2A (second attempt) in February 2010, which resulted in a target intercept
  - Flight Test P6.5-2 in March 2010, a dual target engagement which resulted in intercept of both targets.

## C2BMC

- The MDA completed C2BMC software spiral 6.2 (S6.2) fielding to the U.S. European Command and installed S6.2 hardware and software at the U.S. Central Command.

# BALLISTIC MISSILE DEFENSE SYSTEMS

- C2BMC S6.2 participated in the Juniper Cobra 10 war game, FCE-C, and FTG-06.
- C2BMC S6.4 participated in GTX-04a, FTT-14, and GTI-04b.

## Assessment

- The inherent BMDS defensive capability against theater threats increased during the last fiscal year. DOT&E anticipates continued increases in this capability over time.
- The designated military combatants actively participated in all system-level BMDS testing, as well as nearly all element-level testing. They perform operational roles at individual element levels through major combatant command levels using operational tactics, techniques, and procedures.
- Test planning for assessment of Phase I of the Phased Adaptive Approach for the Defense of Europe is on schedule consistent with achieving operational capability by the end of CY11.
- The elements that comprise the present and future BMDS are at different levels of testing and maturity.
- During THAAD flight test FTT-11, the MDA experienced a failure of the C-17 air-launched target system. The failure investigation revealed significant training and quality control problems. The MDA Director decertified the sole contractor providing air-launched target capability. The MDA plans a recertification flight test in 3QFY11.

## GMD

- To date, GMD has demonstrated a limited capability against a simple threat. The FTG-06 failure to intercept delayed demonstration of the new CE II EKV-based interceptors and delayed progress in the execution of the revised IMTP by precluding obtaining specific critical engagement condition data. Ground testing continued to support increasing GMD interoperability with the BMDS sensors and elements.
- GMD capability assessments are complicated by:
  - Extant differences between fielded and flight-tested interceptor configurations.
  - Flight tests failures during the past year.
  - Interceptor design changes precipitated by parts obsolescence and previous ground and flight test failures.

## Aegis BMD

- Aegis BMD flight testing continued to demonstrate the capability to engage separating ballistic missile targets in the midcourse phase with SM-3 Block IA interceptors.
- Intercept tests have demonstrated the efficacy of the SM-3 Block IA interceptor for some midcourse engagement missions.

## THAAD

- THAAD continued progress, demonstrating much of the functionality necessary for challenging low endo-atmospheric intercepts in FTT-14.

- The FTT-11 target failure and a tight schedule forced the Army to conduct the LUT before the Sim-Over-Live-Driver could be fully accredited, which could result in an incomplete capability assessment supporting the materiel release decision and/or the need for additional testing. In addition to delaying THAAD test objectives, the target failure also prompted the grounding of all air-launched targets within the MDA test program.
- THAAD completed the planned lethality test program for FY10 and provided lethality information against several types of threat payloads, but some lethality data voids and knowledge gaps remain to be resolved.

## Patriot

- With the FY10 deployment and LUT of the Post-Deployment Build 6.5 software, Patriot continued to provide mature and moderately well-understood capabilities against much of its theater-level missile threat set. This assessment is based also on the number and complexity of prior test and evaluation events in which Patriot participated (both flight and ground testing) as well as combat operations during Operation Iraqi Freedom.
- Understanding of Patriot performance against anti-radiation missiles and air-to-surface missiles is limited because Patriot interceptor lethality data do not yet exist for these threats.
- Understanding of Patriot performance against cruise missiles, fixed-wing aircraft, and unmanned aerial vehicles is limited because the Lower Tier Product Office has not performed the simulation runs necessary to characterize Patriot interceptor lethality against these threats.
- The Army Test and Evaluation Command will conduct a LUT for Post-Deployment Build-7 capability beginning in late FY11.
- The full report on Patriot can be found in the Army section of this Annual Report.

## C2BMC

- C2BMC continues to demonstrate interoperability with all BMDS elements.
- Ground testing demonstrated the ability to control two AN/TPY-2 (FBM) radars, to execute limited automated sensor and battle management functionality, and to track processing enhancements of C2BMC S6.4.

## Recommendations

- Status of Previous Recommendations. Although the MDA has made progress on previous recommendations, the two FY08 recommendations regarding the BMDS lethality program and BMDS computer network defense, as well as the FY09 recommendation regarding IMTP execution, are still valid.
- FY10 recommendations. None.

# BALLISTIC MISSILE DEFENSE SYSTEMS