

## Ground-Based Midcourse Defense (GMD)

### Executive Summary

- Previous assessments that the Ground-based Midcourse Defense (GMD) system demonstrates a limited capability to defend the U.S. Homeland from small numbers of intermediate-range or intercontinental ballistic missile threats launched from North Korea or Iran remain unchanged.
- The Missile Defense Agency (MDA) did not conduct GMD flight testing in FY15. The GMD system did, however, participate in two BMDS hardware-in-the-loop ground tests where new mission functionality of the GMD Fire Control (GFC) software and interoperability between the GMD and Aegis Ballistic Missile Defense (BMD) combat systems was demonstrated.
- The Sea-Based X-band (SBX) radar acquired and tracked Minuteman III ballistic missiles during three Glory Trip (GT) missions.
- The MDA coordinated and received approval of the Re-designed Kill Vehicle Acquisition Plan and emplaced eight new Capability Enhancement-II (CE-II) Ground-Based Interceptors (GBIs) in the Flight Test, GBI-06b (FTG-06b) configuration.
- The U.S. Air Force became the lead Service for the Long-Range Discrimination Radar under development and selected Clear Air Force Station (AFS), Alaska, as its future location.

### System

GMD is a BMDS combat system that counters intermediate-range and intercontinental ballistic missile threats to the U.S. Homeland. The GMD consists of:

- GBIs at Fort Greely, Alaska, and Vandenberg AFB, California
- GMD ground system including GFC nodes at Schriever AFB, Colorado, and Fort Greely, Alaska; Command Launch Equipment at Vandenberg AFB, California, and Fort Greely, Alaska; and In-Flight Interceptor Communication System Data Terminals at Vandenberg AFB, California; Fort Greely, Alaska; and Eareckson Air Station, Alaska
- GMD secure data and voice communications system including long-haul communications using the Defense Satellite Communication System, commercial satellite communications, and fiber-optic cable (both terrestrial and submarine)
- COBRA DANE Upgraded Radar at Eareckson Air Station (Shemya Island), Alaska. COBRA DANE is a fixed site, fixed orientation, phased array L-band radar with one radar face that provides 120-degree azimuth field of view
- Upgraded Early Warning Radars (UEWRs) at Beale AFB, California; Royal Air Force Fylingdales, United Kingdom; and Thule Air Base, Greenland. These sensors are fixed site, fixed orientation, phased array ultra-high frequency radars.



**GMD**



**COBRA DANE**



**UEWRs**



**SBX**

The radars at Beale AFB and Thule Air Base have two radar faces that provide 240-degree azimuth field of view; the Fylingdales radar has three radar faces that provide a full 360-degree field of view. In 2012, the MDA and Air Force Space Command awarded a contract and exercised an option to upgrade the EWRs at Clear AFS, Alaska, and Cape Cod AFS, Massachusetts, respectively.

- SBX radar, a mobile phased array sensor operated by the MDA and located aboard a twin-hulled, semi-submersible, self-propelled, ocean-going platform
- External interfaces that connect to Aegis BMD; North American Aerospace Defense/U.S. Northern Command Command Center; Command and Control, Battle Management, and Communications system at Peterson AFB, Colorado; Space-Based Infrared System/Defense Support Program at Buckley AFB, Colorado; and AN/TPY 2 (Forward-Based Mode (FBM)) radars at Japan Air Self-Defense Force bases in Shariki and Kyoga-misaki, Japan

### Mission

Military operators from the U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (the Army service component to U.S. Strategic Command) will use the GMD system to defend the U.S. Homeland against intermediate-range and intercontinental ballistic missile attacks using the GBI to defeat threat missiles during the midcourse segment of flight.

# FY15 BALLISTIC MISSILE DEFENSE SYSTEMS

## Major Contractors

- GMD Prime: The Boeing Company, Network and Space Systems – Huntsville, Alabama
- Boost Vehicle: Orbital Sciences Corporation, Missile Defense Systems – Chandler, Arizona
- Exo-atmospheric Kill Vehicle: Raytheon Company, Missile Systems – Tucson, Arizona
- Fire Control and Communications: Northrop Grumman Corporation, Information Systems – Huntsville, Alabama
- COBRA DANE, UEWRs, and SBX: Raytheon Company, Integrated Defense Systems – Tewksbury, Massachusetts

## Activity

- The MDA conducted all testing in accordance with the DOT&E- approved Integrated Master Test Plan.
  - The MDA did not conduct GMD interceptor flight testing in FY15. The MDA prepared to conduct a non-intercept Ground-based Midcourse Controlled Test Vehicle Flight (GM CTV-02+) currently scheduled for January 2016. This test will verify the effectiveness of the GBI's new Alternate Divert Thruster and collect data for use in developing Mid-Term Discrimination Improvements for Homeland Defense.
  - The GMD system participated in two BMDS hardware-in-the-loop ground tests.
    - The MDA conducted Ground Test Distributed-04e (GTD-04e) Part 2 and Ground Test Integrated-06 (GTI-06) Part 3 in January and July 2015, respectively.
    - The MDA used hardware and software representations of the GMD system, the Space-Based Infrared System/ Defense Support Program, UEWRs, C2BMC, AN/TPY-2 (FBM) radar, Aegis BMD AN/SPY-1 radar in its long-range surveillance and track mode, and the SBX radar to investigate U.S. Northern Command strategic scenarios by stimulating the BMDS with intelligence-based intercontinental ballistic missile threats launched against the U.S. Homeland.
    - The COBRA DANE radar completed software build 2.7.1.1 Operations Trial Period Review Panel containing near-term discrimination improvements in March 2015 to support GTI-06 Part 3 in July 2015.
  - The SBX Radar exercised detection and tracking performance in three U.S. Air Force intercontinental ballistic missile GT missions: GT 214 and GT 215 in March 2015, and GT 216 in October 2015.
  - The MDA coordinated and received approval of the Re-designed Kill Vehicle Acquisition Plan and emplaced eight new CE-II GBIs in the FTG-06b configuration.
  - The U.S. Air Force became the lead Service for the Long-Range Discrimination Radar under development and selected Clear AFS, Alaska, as its future location.
- numbers of intermediate-range or intercontinental ballistic missile threats launched from North Korea or Iran remain unchanged.
- In GTD-04e Part 2, the MDA demonstrated interoperability between C2BMC and GFC Build 6B2.2. Further, GFC Build 6B2.2 processed data from the new AN/TPY-2 (FBM) radar in Kyoga-Misaki, Japan.
  - In GTI-06 Part 3, the MDA demonstrated interoperability between Aegis BMD 4.0.3, Aegis BL9.C1, Beale UEWR 9.0.4, and GFC 6B2.2 through strategic and theater scenarios and supported the deployment of operational assets within the BMDS architecture for U.S. Pacific Command and U.S. Northern Command.
  - In GT 214, GT 215, and GT 216, the SBX radar acquired and tracked the Minuteman III ballistic missile through the boost and midcourse phases of flight.
  - The selection of Clear AFS, Alaska, for the future location of the Long-Range Discrimination Radar necessitates examining if additional sensor capability, beyond the AN/TPY-2 (FBM) radars located in Japan, is needed to defend Hawaii.

## Recommendations

- Status of Previous Recommendations. The MDA has addressed most of the previous FY14 recommendations. However, the following remain outstanding:
  1. The MDA has not addressed the FY13 recommendation to retest the Capability Enhancement-I exo-atmospheric kill vehicle in order to accomplish the test objectives from the failed FTG-07 mission. The MDA plans to address this recommendation in 4QFY17 during FTG-11.
  2. The MDA has initiated, but not completed, the FY14 recommendation to extend the principles and recommendations contained in the Independent Expert Panel assessment report on the GBI fleet to all Homeland Defense components of the BMDS.
- FY15 Recommendation.
  1. The MDA should determine any additional sensor capability requirements for an effective Defense of Hawaii capability.

## Assessment

- Previous assessments that state the GMD demonstrates a limited capability to defend the U.S. Homeland from small