

Ground-Based Midcourse Defense (GMD)

Executive Summary

- The Ground-based Midcourse Defense (GMD) weapon system has demonstrated capability to defend the U.S. Homeland from a small number of intermediate-range ballistic missile (IRBM) or intercontinental ballistic missile (ICBM) threats (greater than 3,000 km range) with simple countermeasures when the Homeland Defense Ballistic Missile Defense System (BMDS) employs its full architecture of sensors/command and control.
- GMD participated in one ground test, one developmental cybersecurity test, and three live fire tests.
- The Missile Defense Agency (MDA) fielded improved capability for both the Capability Enhancement-I (CE-I) and CE-II Exo-atmospheric Kill Vehicles (EKVs), and an upgrade to the GMD Launch Management System (LMS).
- The MDA released a Request for Proposal for the Next Generation Interceptor (NGI) and is currently assessing proposals received from multiple bidders.
- Ground-Based Interceptor (GBI) test assets are limited until the NGI program progresses to the point of manufacturing test articles, making annual flight tests of GMD infeasible. The MDA completed a test strategy, in consultation with DOT&E, to allocate GBI hardware to the operational inventory, operational spares, the Stockpile Reliability Program, and flight test.
- GMD modeling and simulation (M&S) continues to improve, but remains insufficient to support quantitative effectiveness and lethality assessments.

System

The GMD weapon system uses GBIs to defeat threat missiles during the midcourse segment of flight. Enabling the GBIs is a Ground System (GS) consisting of Ground Fire Control (GFC) nodes, an LMS, and In Flight Interceptor Communication System Data Terminals (IDT), all supported on the GMD Communications Network (GCN).

Activity

- The MDA conducted testing in accordance with the DOT&E-approved Integrated Master Test Plan as affected by the coronavirus (COVID-19) pandemic, which caused the MDA to delay several test events and some programmatic milestones; for example:
 - The FY20 GMD ground test was executed prior to the pandemic, the developmental cybersecurity test was delayed approximately 1 quarter, and the live fire tests were moved to the end of this fiscal year.
 - To date, the single FY21 GMD flight test has been delayed 3 quarters and the GMD ground tests have slipped 1-2 quarters each.
- In FY20, the MDA conducted one ground test, one developmental cybersecurity test, and three lethality tests in which GMD was the major participant:
 - From November to December 2019, the MDA conducted a ground test of legacy Homeland Defense upgrades in support of the fielding of CE-I and CE-II EKV upgrades.
 - The MDA conducted a GS 8 Cybersecurity Table Top Exercise in July 2020.
 - In October 2019, the MDA conducted the last three GBI subscale light-gas-gun tests in a series of seven to anchor the lethality model for an ICBM threat. The MDA executed the first four tests in the series in 4QFY19.



Mission

Commanders of U.S. Strategic Command and U.S. Northern Command employing U.S. Army Space and Missile Defense Command soldiers use the GMD system to defend the U.S. Homeland against IRBM and ICBM attacks.

Major Contractors

- GMD Integration: The Boeing Company – Huntsville, Alabama
- Boost Vehicle: Northrop Grumman Corporation – Chandler, Arizona
- Exo-atmospheric Kill Vehicle: Raytheon Technologies Corporation – Tucson, Arizona
- GFC, LMS, and GCN: Northrop Grumman Corporation – Huntsville, Alabama
- IDT: L3 Harris Technologies – Melbourne, Florida

FY20 BALLISTIC MISSILE DEFENSE SYSTEMS

- The MDA fielded:
 - GFC 7A.0.2 Phase II software with updates to Sea-Based X-band radar cueing and Target Object Map optimization, and CE-II 10.2 software with updates to salvo tracking, terminal aimpoint selection, threat databases, terminal artifact mitigation, and Target Object Map optimization in November 2019.
 - LMS software 7A.0.1.2 to support upgrades to the GBI Maintenance Manager in January 2020.
 - CE-I EKV software 23.2 providing the equivalent functionality already incorporated into CE-II EKV 10.2 to the legacy GBIs in July 2020.
- The GMD program continues to evolve:
 - The MDA approved a revised GMD Life Cycle Sustainment Plan in December 2019 to maintain a sustainment and repair capability for the fielded GMD weapon system and future capabilities.
 - The MDA released a Request for Proposal for the NGI in April 2020 and received multiple proposals from Industry in August 2020. The MDA is currently assessing these proposals.
 - In FY20, the MDA continued with construction and equipment manufacturing for Missile Field-4 at Fort Greely, Alaska, installed Launch Site Components for units 1-12, and completed Silo/Silo Interface Vault foundations 13-20.
- During FY20 testing, the MDA collected data supporting development and fielding of new capabilities associated with GMD Capability Increment 6B. Test data and resulting assessments are classified; see the DOT&E “FY20 Assessment of the BMDS,” to be published in February 2021.
- EKV lethality testing against emerging threats needs to continue in order to keep pace with threat evolution until the NGI is deployed, and to ensure the relevancy and accuracy of the M&S used in GBI lethality assessments.
- GBI test assets are limited until the NGI program progresses to the point of manufacturing test articles. In FY20, Congress provided \$485 Million to the GMD program to begin reliability upgrades to the CE-I fleet, execute risk reduction activities, and procure additional Configuration 2 boost vehicles. Even so, annual flight tests of GMD, as required by the FY17 National Defense Authorization Act as amended, remain infeasible due to operational requirements. The MDA completed a test strategy to balance allocating GBI hardware to the operational inventory, operational spares, the Stockpile Reliability Program, and flight test. DOT&E participated in the development of and approved the resulting test strategy.
- GMD M&S continues to improve, but remains insufficient to support quantitative effectiveness and lethality assessments. Ground and flight test threat M&S for GMD lags behind current operationally realistic threats with respect to countermeasures, debris, raid sizes, and electronic attack.

Assessment

- The GMD weapon system has demonstrated capability to defend the U.S. Homeland from a small number of IRBM or ICBM threats (greater than 3,000 km range) with simple countermeasures when the Homeland Defense BMDS employs its full architecture of sensors/command and control. This assessment is unchanged from last year’s annual report.

Recommendations

The MDA should:

1. Address GMD M&S deficiencies to enable credible assessment against operationally relevant threats.
2. Continue light-gas-gun testing against emerging threats to anchor the development of EKV lethality models.