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STATEMENT

BY

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BEFORE THE

HOUSE ARMED SERVICES COMMITTEE

STRATEGIC FORCES SUBCOMMITTEE

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Chairman Cooper, Ranking Member Turner, and distinguished Members of the Committee, I appreciate this opportunity to discuss missile defense testing and my assessment of the Ballistic Missile Defense System (BMDS).

Test Activity

On March 25, 2019 I witnessed the Missile Defense Agency (MDA) conduct its most operationally realistic flight test of the Ground-based Midcourse Defense (GMD) system, which is designed to protect the U.S. Homeland from an intercontinental ballistic missile (ICBM) attack. During this test, the MDA launched a salvo of two interceptors against an ICBM-range target. Although we have just begun to analyze the wealth of data from this test, all indications are that the system worked as designed and intercepted the target. My office was deeply involved with the design of this test, reflecting the strong relationship that exists between my independent office and the MDA. I appreciate Congress' continued support of this relationship. In addition to this most recent flight test, during Fiscal/Calendar Year 2018 the MDA executed or participated in six intercept flight tests, three data collection flight tests, six non-MDA ballistic missile events, five ground tests, and nine operational cybersecurity assessments. The MDA also conducted numerous wargames and exercises designed to enhance Combatant Command readiness and to increase Service member confidence in the deployed elements of the BMDS.

Assessment of BMDS Capability

Threat ballistic missile systems are becoming more capable, flexible, mobile, survivable, reliable, and accurate, while also increasing in range. North Korea is developing weapons of mass destruction and the means to deliver them to the U.S. Homeland by intermediate-range and intercontinental ballistic missiles. Regional actors have close-, short-, medium-, and intermediate-range ballistic missiles that threaten U.S. forces, allies, and partners. Combatant Commanders combine the capabilities of available BMDS weapon systems with a sensor/command and control architecture to defend against ballistic missile threats.

The GMD system has demonstrated capability to defend the U.S. Homeland from a small number of intermediate-range and intercontinental ballistic missile threats with simple countermeasures when the BMDS employs its full architecture of sensors and command and control. The Regional/Theater BMDS has demonstrated capability to defend the U.S Indo-Pacific Command (USINDOPACOM), U.S. European Command (USEUCOM), and U.S. Central Command (USCENTCOM) areas of responsibility from short-range ballistic missile threats (less than 1,000 km range) and from small numbers of medium- and intermediate-range ballistic missile threats (1,000 to 4,000 km).

One instantiation of the Regional/Theater BMDS is the European Phased Adaptive Approach, or EPAA, designed to defend Europe from ballistic missile attack. EPAA includes an Aegis Ashore site in Romania, which became operational in 2015, and other

BMDS elements such as Command and Control, Battle Management, and Communications (C2BMC); forward-based radars; and Aegis Ballistic Missile Defense (BMD) ships. Aegis Ashore is a land-based version of Aegis BMD, with a surveillance and tracking radar and interceptor launch system to enable engagements against medium- and intermediate-range ballistic missiles with Standard Missile-3 (SM-3) interceptor missiles. The MDA plans to add a second Aegis Ashore site in Poland in 2020 following a period of significant construction delays. The MDA also plans to integrate the more capable SM-3 Block IIA missiles into Aegis Ashore, completing the third and final phase of the EPAA.

Both the land- and sea-based variants of Aegis BMD have demonstrated capability to defeat ballistic missiles in the midcourse phase of flight for many realistic operational scenarios.

In addition to Aegis BMD, the Regional/Theater BMDS includes the Terminal High-Altitude Area Defense (THAAD) and Patriot elements. THAAD has demonstrated capability to defeat short- to intermediate-range ballistic missiles. Patriot has demonstrated a capability to defeat many types of short- and medium-range tactical ballistic missiles. As the oldest and most mature missile defense program, Patriot has an extensive and robust test history, and a much larger inventory of interceptors than the other BMDS elements. Patriot is also the only element of the BMDS funded by the Army, not the MDA.

Both THAAD and Patriot interceptors have demonstrated high reliability, but their ground-based components suffer from problems that reduce overall system reliability. Interoperability testing involving multiple BMDS elements has shown that the training provided for THAAD and Patriot crews does not prepare them well for a conflict involving Aegis BMD, THAAD and Patriot elements operating together. Planned system-level testing such as Flight Test, Operational-03 (FTO-03), distributed ground tests, and FTO-05, which is currently unfunded, will feature multiple elements operating together, provide their Soldier operators with realistic training, and provide an opportunity to refine Tactics, Techniques, and Procedures.

Test Adequacy and the Integrated Master Test Plan

The MDA continues to execute a rigorous test planning process, documented in the Integrated Master Test Plan (IMTP), which the MDA Director and I both approve. The MDA continues to emphasize operational realism when planning for and conducting both ground and flight testing, and involves my office with each update of the IMTP. Lieutenant General Greaves has welcomed DOT&E involvement and advice throughout his tenure at MDA, and it has been a pleasure to work with him.

U.S. Homeland Defense Testing: Flight testing of the GMD system is constrained by a number of factors, including range safety considerations and cost. The GMD test conducted in March, for example, cost more than $300 million. Hence, independently accredited models and simulations (M&S), anchored by flight test data, will be required

to assess the effectiveness of GMD across its full battlespace. Including the most recent flight test, the MDA plans to conduct a total of five GMD intercept flight tests from 2019 to 2025. These tests include objectives that address current data gaps, such as a multiple simultaneous threat engagement.

Regional/Theater Defense Testing: As with U.S. Homeland Defense, flight testing of regional/theater defense systems is constrained by range safety and cost considerations, which limits my ability to assess the effectiveness of these systems in realistic combat scenarios involving raids of multiple missiles, with multiple BMDS elements. The MDA and the Army have robust flight test programs for Aegis BMD, THAAD, and Patriot operating independently. Additional M&S capability, anchored by flight testing of Aegis BMD, THAAD, and Patriot systems operating together, will be needed to evaluate the effectiveness of these systems operating together under realistic combat conditions.

Key Challenges

Five key challenges limit the effectiveness of the BMDS, and my ability to assess BMDS capability:

1. Need for Accredited Modeling and Simulation (M&S) to Assess BMDS Effectiveness

Operationally realistic flight testing is limited by the availability of test assets, a limited test infrastructure, the lack of lethality testing against newer threat designs, long target development timelines, range safety complexity, and high test costs. BMDS

ground testing and M&S comprise the only feasible solutions to mitigate these flight test limitations. I believe the development of such M&S capability should be a priority for the MDA, and I think General Greaves agrees. For DOT&E to use M&S-generated data to quantitatively evaluate a system's operational effectiveness, the M&S must be independently accredited. To assess BMDS-level capability in a realistic combat environment, these models must present a common threat scene, include all interceptors from each BMDS element, and faithfully portray the complex debris fields generated by successful intercepts. These debris fields tax the performance of missile defense radars as they try to sort out legitimate targets from debris.

The MDA and BMDS Operational Test Agency (OTA) made substantial progress in the M&S area in 2018, increasing the value of the ground test events. The MDA and BMDS OTA have agreed upon an accreditation process and a plan to remove or minimize limitations, and the MDA continues to incrementally address them. As currently planned and resourced, this effort will take several more years to complete.

2. Susceptibility of the BMDS to Cyber-attack

Given the complexity and interdependence of the BMDS, cybersecurity and cyber resiliency are critical to the success of the BMDS mission. Under Lieutenant General Greaves' leadership, the MDA has prioritized cybersecurity, and the MDA continues to make progress characterizing the cybersecurity posture of fielded and soon-to-be fielded BMDS capabilities. The MDA began to implement more structured cybersecurity test

planning activities, and address some of the assessment shortfalls from previous years. Operationally realistic cybersecurity testing, conducted for the first time by the MDA in 2018, identified ways to improve THAAD, C2BMC, BMDS Overhead Persistent Infrared Architecture, and Army Navy/Transportable Radar Surveillance (AN/TPY-2) Forward-Based Mode network defense operations and capabilities in a cyber-contested environment.

Under General Greaves' leadership, the MDA, in coordination with DOT&E and the U.S. Northern Command, plans to initiate persistent cyber operations – which emulate actual cyber threats in a safe and controlled manner on currently fielded MDA systems and networks. DOT&E's Cybersecurity Assessment Program has demonstrated that persistent cyber operations are the most effective way to rapidly find and fix mission-critical cybersecurity vulnerabilities in operational systems across the Department.

Over the last year, the MDA continued efforts to draft a BMDS Cybersecurity and Resiliency Strategy in response to a DOT&E recommendation. This strategy is intended to define a general concept and roadmap for implementing cybersecurity and resilience across the BMDS, but it has not yet resulted in a standard approach being applied across the elements for software assurance and developmental and operational cybersecurity testing. Going forward, the MDA should tailor this concept to each element, providing specific information on how developmental cybersecurity testing will be executed to inform the design cycle, government acceptance, and operational testing.

3. Reliability and Sustainment

The BMDS is a complex system using advanced technology with resultant reliability and sustainment challenges. From 2010 to 2014, the MDA had three consecutive GMD intercept flight test failures. These failures were caused by poor reliability of the existing GMD kill vehicles – the parts of the interceptors designed to impact and destroy the target warheads. These failures led to the initiation of the MDA's Redesigned Kill Vehicle (RKV) program, whose primary purpose is to improve GMD system reliability. The MDA recently discovered a significant problem with the RKV design during ground testing, and General Greaves wisely instituted a program pause. He does not plan to proceed with further development or testing until the MDA thoroughly investigates and mitigates the problem, and verifies the resultant fix through testing. General Greaves is not allowing GMD program history to repeat itself with respect to the RKV program, and I strongly support his course of action.

When ready, the MDA plans to conduct an interceptor-only flight test of the RKV followed by an intercept flight test against an intermediate-range ballistic missile target. The MDA anticipates deploying the RKV beginning in 2023 following a successful intercept test.

Aegis BMD has also experienced numerous problems during flight and ground testing since the start of Initial Operational Test and Evaluation flight testing of the SM-3 Block IB missile in 2013. High-fidelity ground testing could have discovered some of

the SM-3 flight test failure mechanisms prior to flight. In accordance with DOT&E's recommendation, the MDA is working to develop a robust failure reporting system and more robust ground tests of all missile components, sections, and all-up rounds using the same configuration as flown in flight tests (i.e., "test as you fly"). In addition to assisting with problem discovery, such high-fidelity ground testing will provide essential data for estimating missile reliability.

As I mentioned previously, both Patriot and THAAD programs have experienced reliability problems with their ground systems. The Army and the MDA should address these problems to ensure these systems can maintain a high state of readiness in combat.

4. Interoperability and the Maturation of BMDS Coordination

The BMDS can make more effective use of its limited inventory of interceptors if the BMDS elements coordinate with each other to assign each threat missile in a raid to an appropriate BMDS element. This de-conflicts and optimizes the use of interceptors to defeat raids of incoming threat missiles.

The BMDS is currently not capable of automatic de-confliction and training does not fully prepare system operators to conduct such de-confliction manually. Operators have reported a lack of multi-element training and documentation during all four previous BMDS system-level flight tests.

Additional system-level flight and ground tests are needed to demonstrate and improve element interoperability and to give warfighters the opportunity to refine their

Tactics, Techniques, and Procedures. In particular, the Army and the MDA need to continue to work together to integrate the Army's Patriot test program with the MDA's THAAD and Aegis BMD test programs.

5. Discrimination of Threat Reentry Vehicles

Identifying the threat reentry vehicle from all the other objects in a sensor's field of view remains a challenging technical problem. The MDA has a dedicated engineering project to improve discrimination, but significant challenges remain. I encourage the MDA to continue this project, to develop the M&S needed to accurately assess BMDS performance against the wide variety of possible countermeasures an adversary might employ, and to conduct flight testing involving countermeasures to anchor the M&S and demonstrate BMDS discrimination capabilities.

In closing, I want to note how much I appreciate General Greaves' contributions to the Missile Defense Agency, how well he has worked with me and my staff, and how much I will miss working with him when he retires, as he plans to do soon.

Thank you for your attention and I look forward to answering the Committee's questions.