Vice Admiral Jon A. Hill, USN
Director, Missile Defense Agency
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Good morning, Chairman Cooper, Ranking Member Lamborn, and distinguished Members of the subcommittee. The Missile Defense Agency (MDA) budget request of $9.628 billion for Fiscal Year (FY) 2023 enables the continued execution of the MDA mission to design, develop and deploy a layered Missile Defense System (MDS) to defend the United States and its deployed forces, allies, and friends from increasingly diverse missile threats. MDA's proposed investments for FY 2023 reflect missile defense guidance issued in the classified 2022 *Missile Defense Review*, which was provided to Congress on March 28, 2022, along with the 2022 *National Defense Strategy*, and are aligned with the February 1, 2022 "USD(R&E) Technology Vision for an Era of Competition."

Potential U.S. adversaries are developing more advanced ballistic, hypersonic, and cruise missile systems, increasingly making them more mobile, survivable, reliable, accurate, and capable of achieving longer ranges. Current and future missile threats pose the growing technical challenges of high velocity, heavy maneuver, large numbers, and the exploitation of combination attacks involving unmanned aerial vehicles. MDA continues to collaborate with Combatant Commanders and the Services to support current and future needs for missile defense capabilities. The Department periodically re-examines missile defense roles, responsibilities and authorities. For example, the Joint Staff is implementing its Integrated Air and Missile Defense (IAMD) Capability Portfolio Management Review (CPMR) to continuously review threats, identify capability

gaps, and make cost/risk tradeoff recommendations. I support this effort. I also consider the Warfighter Involvement Process, or WIP, currently led by U.S. Strategic Command and the Joint Functional Component Commander for Integrated Missile Defense, to be essential, as it is currently constituted, to the U.S. missile defense enterprise. I believe the **existing missile defense governance process**, including the WIP, is unique and necessary for the voices of the Combatant Commands and the Services to be heard. The current governance process, combined with MDA's capabilities-based approach and unique acquisition authorities, are essential in supporting the Warfighter given the rapidly evolving threat environment.

Delivering by, through and with the Services to meet Combatant Command Requirements

MDA is developing, delivering, sustaining, and improving affordable, proven, and leading-edge capabilities to counter increasingly advanced ballistic missiles and an expanding set of hypersonic and cruise missiles.

Space and Terrestrial Sensors

We can improve sensor tracking and discrimination capabilities by leveraging the global persistence and proximity of space sensors. The Spacebased Kill Assessment (SKA) network of infrared sensors hosted on commercial satellites is planned to deliver hit and kill assessment capabilities for homeland defense. On-orbit SKA sensors have already participated successfully in a variety of flight tests and engineering activities and provide situational awareness to U.S. Northern Command (USNORTHCOM) during regular exercises. We will complete SKA hit assessment integration using a Command and Control, Battle Management and Communications (C2BMC) operational interface

into the MDS in FY 2024 and continue developing a follow-on kill assessment as part of the post-intercept assessment capability.

MDA continues to collaborate with the U.S. Space Force (USSF), including the Space Development Agency, and industry to develop a Hypersonic and Ballistic Tracking Space Sensor (HBTSS) capability to detect and track boosting ballistic missiles and hypersonic glide vehicles. In FY 2023, we will complete development and implementation of ground systems to support satellite operations and testing and deliver two prototype satellites developed by two separate companies in support of a planned FY 2023 launch to conduct on-orbit demonstrations. I also would like to recognize the critical contributions made by the two Space Tracking and Surveillance System (STSS) satellites launched in September 2009. After lasting eight years past their design life, both space vehicles were decommissioned earlier this year. STSS satellites served as an important testbed for HBTSS risk reduction activities, which included demonstrations that we can close the MDS fire control loop from space.

MDA also continues to develop, deploy, and sustain a robust, cyber-secure and networked ground- and sea-based radar architecture. We completed Long Range Discrimination Radar (LRDR) construction and Initial Fielding in 2021 at Clear Space Force Station (SFS), Alaska. The LRDR is the most advanced ground-based radar in the world. In FY 2023, we will develop software for tracking and discrimination improvements, refining space intelligence data, and enhancing modeling and simulation. Following operational acceptance in FY 2023, LRDR will support the Ground-based Midcourse Defense (GMD) capability against Pacific theater long-range

missile threats with persistent long-range midcourse discrimination and precision tracking and hit assessment. LRDR also will support Space Domain Awareness (SDA).

The Sea Based X-band (SBX) radar supports homeland defense operations, MDS testing and data collection, and it provides SDA and precision midcourse tracking and discrimination capabilities. The SBX will continue at-sea deployment into FY 2023 while conducting selected radar and vessel maintenance, software and hardware upgrades, and testing. Fabrication of the SBX replacement radome continues on schedule for installation in FY 2025.

MDA continues to support the USSF in sustaining and updating the Upgraded Early Warning Radars (UEWRs) at Clear SFS, Alaska; Cape Cod SFS, Massachusetts; Royal Air Force Fylingdales, United Kingdom; Thule Air Base, Greenland; and Beale AFB, California. UEWRs support missile defense of the Homeland and detection of ballistic missile attacks and conduct general space surveillance and satellite tracking.

MDA is providing affordable software upgrades to Aegis Integrated Air and Missile Defense (IAMD) destroyers equipped with the SPY-1 radar to support the USSF SDA mission. The Aegis SDA capability is fully compatible with deployed U.S. Navy operations and has appropriate safeguards to ensure full Aegis IAMD warfighting capability is available. In April and September 2021, we worked in partnership with the USSF, Navy, and industry to demonstrate the first-ever SDA capability from operational Navy destroyers, where the USSF tasked Aegis Baseline 9 Destroyers via C2BMC to detect, track, and report resident space objects. In FY 2023, we will continue to develop, test, and deliver this upgrade to the Navy. Twenty-nine Aegis ships are scheduled to be upgraded with this capability by FY 2024.

MDA also is working with the U.S. Navy to refurbish existing shipboard SPY-1 radar arrays to provide increased radar sensitivity and discrimination improvements. We also plan to integrate missile defense capability with delivery of the Navy's Air and Missile Defense Radar, the SPY-6, for enhanced engagement capability and increased raid capacity.

MDA is upgrading, sustaining, and supporting operation of 12 AN/TPY-2 radars, including five Forward Based Mode radars in Japan, Israel, Turkey, and U.S. Central Command. We have seven Terminal Mode radars in CONUS locations or forward-deployed with U.S. Army Terminal High Altitude Area Defense (THAAD) batteries in U.S. Indo-Pacific Command. AN/TPY-2 radar 13 production is on schedule with planned delivery as a Terminal Mode radar in second quarter FY 2025 for service with THAAD Battery 8. MDA continues supporting two THAAD Foreign Military Sales (FMS) cases that include seven AN/TPY-2 radars in production for the Kingdom of Saudi Arabia (KSA) along with two operational radars in the United Arab Emirates (UAE).

Command and Control, Battle Management and Communications

C2BMC integrates the MDS and provides Combatant Commanders with global, persistent, space-based infrared, land-, and sea-sensor acquisition, tracking, cueing, discrimination, and fire-control quality data to support U.S. and coalition-partner missile defense and SDA operations. C2BMC interfaces with Service, NATO, and international systems and provides decision makers a common operating missile defense picture. C2BMC also operates an advanced prototype processing node that tracks and reports hypersonic threats in response to U.S. Indo-Pacific Command operational need.

Funding in FY 2023 sustains the C2BMC planner, situational awareness, battle management capabilities, global missile defense network, and SDA in Combatant Command user nodes. The most recent C2BMC upgrade integrates LRDR and the updated BMDS Overhead Persistent Infrared Architecture into the MDS, providing situational awareness and tracking capability for hypersonic threats. This spiral significantly expands SDA capabilities for U.S. Space Command with LRDR, provides additional SDA coverage using the Aegis SPY-1 radar, and integrates on-orbit SKA sensors into the MDS. It also integrates the U.S. Army's IAMD Battle Command System into the MDS.

Homeland Defense

The GMD system protects the U.S. Homeland from rogue state ballistic missile attacks, and we are focused on delivering new capabilities to address the limited but increasingly advanced North Korean Intercontinental Ballistic Missile (ICBM) threat. In September 2021, we demonstrated the capability to select a 2-stage or 3-stage burn of a Ground Based Interceptor (GBI) booster, which enables an earlier release of the kill vehicle to greatly expand the engagement area and time to counter the inbound threat. In FY 2023, we will execute an intercept flight test demonstrating this capability and the latest incremental improvements of the entire kill chain to defeat an advanced threat-representative ICBM target equipped with countermeasures.

MDA continues to upgrade the ground system infrastructure, communications network, fire control system, and missile fields to improve the reliability, capability, and cybersecurity resiliency of the GMD weapon system and support acceptance of the Next Generation Interceptor (NGI). The entire GMD weapon system is currently

undergoing a Service Life Extension Program to improve GBI reliability and availability. With these ongoing efforts, we anticipate the existing GBI fleet will be extended beyond 2030.

NGI development and fielding will improve the interceptor fleet, with deliveries starting as early as 2028. The Department awarded two NGI contracts in March 2021, and our competing Industry prime contractors are advancing through the design development process with full technical rigor to deliver this new capability as soon as possible. Both designs feature multiple kill vehicle payloads to reduce the number of interceptors required to defeat a single ballistic missile threat to our Nation. Our FY 2023 request will continue to mature critical technologies for the NGI booster, payload, and sensors.

Regional Defense

Globally deployed ship-based and land-based Aegis BMD capabilities are critical to the Nation's integrated defense of our deployed forces, allies, and partners against short- to intermediate-range missile threats. In FY 2023, we will continue to meet the quickly advancing threat through improvements to the Aegis BMD capability, including procuring and delivering Standard Missile (SM)-3 Block IB and Block IIA missiles, improving Sea-Based Terminal (SBT) defense, advancing weapon system and missile reliability, and enhancing Aegis BMD engagement capacity and lethality. We will continue developing Aegis BMD weapon system software to enhance functionality and leverage more-capable radars, artificial intelligence, and national technical means.

MDA continues to support protection of NATO's European territory and forces against the ballistic missile threat from the Middle East. Aegis Ashore in Romania is

operational, and we plan to complete construction on Aegis Ashore Poland in 2023. Both sites are designed to launch the SM-3 Block IB and Block IIA. This past year, installation of select combat system equipment occurred in parallel with construction activity, and U.S Navy sailors moved into the residential building at Naval Support Facility Redzikowo.

We are planning to conduct in FY 2022 an Aegis Weapon System flight test experiment (FEM-01), which will be an exo-atmospheric engagement to demonstrate an Aegis ship firing an SM-3 Block IIA against a Medium-Range Ballistic Missile (MRBM) target. We also plan to execute an Aegis intercept flight test campaign with Japan (JFTM-07) in which we will demonstrate the newest BMD engagement capability of the Japan (J7) Aegis BMD configuration with SM-3 Block IIA against an MRBM. We will also demonstrate Aegis ship-to-ship engage-on-remote in a simulated engagement, an IAMD capability using SM-2 surface-to-air defense missiles, and an organic engagement of an SRBM with SM-3 Block IB Threat Upgrade interceptor.

The THAAD weapon system is globally transportable and ground-based and is highly effective against short-, medium- and intermediate-range missile threats inside and outside the atmosphere in the terminal phase of flight. MDA currently supports forward-deployment of two batteries stationed in the U.S. Indo-Pacific Command area of responsibility and continues to cooperate with UAE and KSA in support of operational FMS THAAD batteries. The UAE THAAD weapon system successfully intercepted ballistic missiles launched at the UAE in January 2022, marking the first operational use of the U.S.-built system. In FY 2023 we will continue THAAD development and interceptor procurement, obsolescence mitigation efforts, production and training

support, the THAAD Stockpile Reliability Program, and modifications to meet growing cybersecurity threats.

MDA is providing a more robust IAMD capability, one that integrates THAAD, Army Patriot, and at-sea Aegis ships into a seamless network. THAAD/Missile Segment Enhancement (MSE) integration improves the area defended by a THAAD battery without the requirement of a dedicated Patriot battery and increases engagement opportunities while conserving THAAD interceptors. In February 2022, THAAD demonstrated control of MSE interceptors in a simulated SRBM non-intercept flight test (TH CTV-01a). TH CTV-01a verified that the latest THAAD software could allow the THAAD weapon system to compute an MSE firing solution, communicate with an M903 Launcher, and control an MSE interceptor in flight. In THAAD Flight Test (FTT)-21, a combined developmental and operational test conducted in March 2022, we used the latest THAAD software to fire two MSE interceptors to engage the SRBM target. In FY 2023, we plan to conduct the first THAAD demonstration of concurrent control of THAAD and MSE interceptors against multiple MRBM targets.

In FY 2022, MDA will begin engineering and planning a survivable and operationally effective IAMD architecture to defend Guam from ballistic, hypersonic, and cruise missile threats. Defense of Guam IAMD architecture would leverage proven missile defense capabilities, allow for expansion of emerging capabilities, and provide a single command and control structure. Our FY 2023 funding request allows continued development, to include engineering and planning activities, environmental impacts studies, procurement on long lead items, and integration between Army and Navy

assets. All early design and integration activities will support a range of architecture options, pending upcoming Departmental decisions.

We are investing in defensive capabilities to counter regional hypersonic missile threats by upgrading sensors and C2BMC for early warning, identification, and tracking of regional and strategic hypersonic threats from space (e.g., HBTSS). We also are leveraging existing systems where possible (including proven engage-on-remote and launch-on-remote capabilities) and pursuing a Glide Phase Intercept (GPI) demonstration. We are working closely with the Navy to develop, field, and upgrade the SBT capability to counter regional maneuvering and hypersonic threats in the terminal phase of flight. The SBT program already provides an initial terminal defensive capability to counter hypersonic threats, and additional improvements are scheduled for 2024. Today, the SM-6 missile is the only weapon in the country's arsenal capable of engaging highly-maneuverable hypersonic threats. In FY 2023, Aegis SBT will demonstrate a simulated engagement against a hypersonic target (FTX-40) and in FY 2024 will demonstrate a salvo engagement firing two SM-6 Block IA Upgraded guided missiles against a Hypersonic Glide Vehicle target (FTM-43). Complementing this terminal capability, in FY 2023, MDA will continue to develop and plan a GPI demonstration and leverage the Aegis Weapon System to provide the U.S. Warfighter increasingly capable regional defensive capabilities.

We will continue to work with North American Aerospace Defense Command (NORAD) and USNORTHCOM to develop system architecture for cruise missile defense (CMD) of the Homeland. I agree with the NORAD/USNORTHCOM Commander that modern threats require improved all-domain awareness, updated

capabilities, and policies and strategies that reflect the current strategic environment and the advanced capabilities of our competitors. We have been able to make good progress on enhanced indications and warning and will continue to develop the systems architecture and conduct a demonstration of CMD capabilities using the Joint Tactical Integrated Fire Control (JTIFC) capability. JTIFC enhances integrated fire control capabilities across the Services by connecting existing sensors, command and control systems, and weapons at the tactical level through real-time sensor networks. I also share the NORAD/USNORTHCOM Commander's desire to have an Over-The-Horizon radar fielded as soon as possible to support All Domain Awareness and agree with his assessment that the air and cruise missile threat to the Homeland is a top priority.

We are continuing our cooperative missile defense relationship with Israel to help our partner develop systems to strengthen its missile defenses and increase interoperability with U.S. forces. Our two nations continue to cooperate on engineering, development, co-production, testing, and fielding of the Arrow Weapon System, the David's Sling Weapon System, and co-production for the Iron Dome Defense System. I would like to highlight our cooperative demonstration of interoperability in the successful flight test of the Arrow Weapon System and Arrow-3 interceptor conducted on January 18, 2022. In FY 2023, MDA will continue co-development, testing, and co-production with Israel.

Developing Technology for Future Competition

With mission focus on warfighting outcomes, MDA is investing in innovative and disruptive technologies to provide leap-ahead capabilities to address the emergence of new and more advanced threats. We must continue to sustain, modernize, and expand

missile defenses by pursuing rapid, yet measured, development of advanced missile defense concepts and technologies for homeland and regional defense. We will continue to develop mission-aligned disruptive technologies, solutions, and transition opportunities for future ballistic and hypersonic defense architectures, investing in the technology development necessary for the next increment of capability, including externally and internally-cooled seeker window technology, axial upper stage throttling and maneuvering capability, robust and resilient materials for hypersonic flight, secured mesh communications, and novel guidance and control capability.

MDA continually assesses emerging and disruptive technology for potential applications to missile defense utilization that are producible, reliable, and cost-effective. We are pursuing efforts in directed energy, artificial intelligence, machine learning, nanosat technology, Left-through-Right of Launch Integration, cybersecurity, and quantum science. Keys to this assessment have been our insight into the missile defense industrial base and our development of testbeds that allow us to exercise and demonstrate capabilities and test new concepts, algorithms, simulations, and software. We are also expanding technology opportunities through cooperative, collaborative engagements with our DoD partners, laboratories, allies, industry, and universities.

Conclusion

Chairman Cooper, Ranking Member Lamborn, Members of the Subcommittee, we will continue to increase the readiness, resiliency, cybersecurity as well as the capability and capacity of fielded homeland and regional missile defense systems while investing in mission-focused advanced technology. We are committed to attracting and building a strong, talented future workforce to meet the mission challenges of tomorrow.

I would like to recognize and thank the men and women who serve in our Armed Forces at home and abroad and who operate the integrated Missile Defense System with the support of our dedicated civilian and contractor workforce. I appreciate your continued support for MDA and the missile defense mission, and I look forward to answering the committee's questions. Thank you.