



MISSILE DEFENSE AGENCY



FISCAL YEAR (FY) 2022 BUDGET ESTIMATES OVERVIEW



MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



MISSION

The Missile Defense Agency (MDA) mission is “to develop and deploy a layered Missile Defense System to defend the United States, its deployed forces, allies, and friends from missile attacks in all phases of flight.” MDA’s budget request for Fiscal Year (FY) 2022 is \$8.917 billion. MDA’s FY 2022 budget will continue the development, rigorous testing and fielding of reliable, increasingly capable, state-of-the-art defenses for the United States, our deployed forces, and the forces and territories of our allies and partners against current and projected missile threats. Building on the strategy to defend the Nation, the Agency’s foundations for missile defense are:

- 1) Operations and Readiness;
- 2) Production and Fielding;
- 3) Development and Technology.



MDA will continue to collaborate closely with Combatant Commanders and the Services to support current and future needs for missile defense capabilities. MDA and these key stakeholders leverage the existing all-domain MDS to develop integrated architectures and capabilities

to counter not only ballistic missiles but also hypersonic and cruise missile threats. This budget request maintains operational missile defense capacity and capabilities for existing homeland and regional defense forces and continues to increase interceptor inventory while improving maturation of defensive technologies, existing sensors, Command and Control, Battle Management and Communications (C2BMC) system, and kill vehicle capabilities to address evolving threats.

MDA’s President’s Budget submission aligns with longstanding U.S. missile defense policy, which encourages the development and deployment of homeland missile defenses to address ballistic missile threats from rogue states such as North Korea and Iran. The United States is not developing or deploying missile defense capabilities designed to counter nuclear intercontinental-range missile threats from near-peers Russia and China.

To address regional threats, U.S. missile defense policy promotes the development and deployment of missile defense capabilities against the full range of regional missile threats from any source, to include rogue states and near-peer adversaries. In response to increasing threats in the Indo-Pacific region, MDA is supporting efforts to improve the warfighter’s capability to defend Guam against regional cruise, ballistic, and hypersonic missiles. FY 2022 funding will support detailed engineering and analysis activities to develop and deploy an effective defensive architecture solution.

The Ground-Based Midcourse Defense (GMD) system, currently defends the U.S. against long-range ballistic missile threats from rogue states. Initially fielded in the early 2000s, the GMD system is undergoing a service life extension program and will be improved with



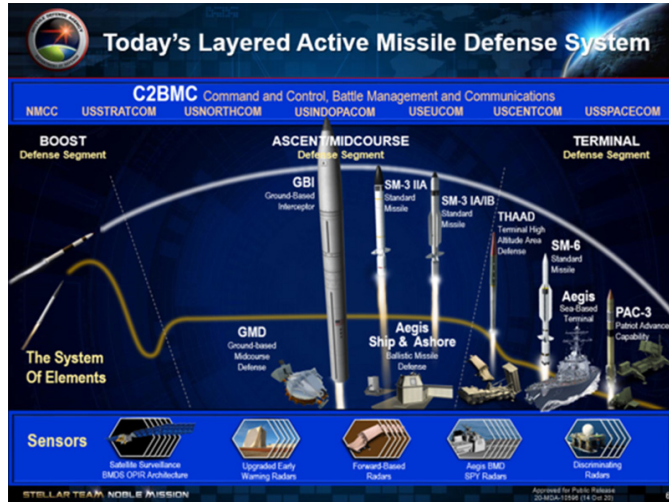
MISSILE DEFENSE AGENCY

FISCAL YEAR 2022

the addition of the Next Generation Interceptor (NGI) starting in 2028.

MDA continues to make significant progress in cybersecurity by incorporating system-level requirements into system specifications and then implementing rigorous evaluation-based testing and assessments. We established a Defensive Cyberspace Operations organization, augmenting the workforce with certified cyber teams to evaluate

the effectiveness of cyber capabilities and implement structures to enhance our cybersecurity posture. MDA is building cybersecurity into next-generation software processes by leveraging proven secure software development, security, and operations, and establishing continuous integration. We are also closely collaborating with our Defense Industrial Base partners to protect MDA and supplier information. MDA defends its networks against the advanced persistent cyber threat through its Cybersecurity Emergency Response Team. This team provides 24/7 network monitoring and defense of over 24 thousand network devices and continues to expand its breadth of coverage. MDA has continuously supported DoD cyberspace efforts by providing timely MDA situational awareness.



MISSILE THREAT

U.S. adversaries are developing more capable ballistic, hypersonic, and cruise missiles, systems with global reach, increased speed and maneuverability, greater accuracy, and improved countermeasures. North Korea is developing long-range ballistic missiles that threaten the United States and our allies in the Indo-Pacific region while also testing shorter-range maneuvering missiles. Iran continues to develop more sophisticated



North Korea Hwasong-15 ICBM

missiles with improved accuracy, range, and lethality. Iran is also fielding an array of increasingly accurate short- and medium-range ballistic missiles. Iran has demonstrated the ability to combine ballistic or cruise missiles with unmanned aerial vehicles in complex attacks.



China DF-17 HGV

Russia and China operate advanced ballistic and cruise missile forces, and they are developing and deploying advanced air- and surface-launched long-range cruise and hypersonic missile capabilities. Regional hypersonic missiles are being developed specifically to challenge U.S. missile defense capabilities. These threats are capable of holding deployed U.S. forces, allies,

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



and partners at risk. Hypersonic glide vehicles (HGVs) delivered by ballistic missile boosters will pose new challenges to our missile defenses. Moreover, U.S. adversaries and strategic competitors will increasingly use cyber capabilities to seek political, economic, and military advantage over the United States and its allies and partners, including intelligence gathering on and disruption of U.S. missile defense systems.

Major Program Element Highlights

The following discussion summarizes the highlights of major Program Elements (PE) aligned to five broad categories: 1) Detect and Control, 2) Engage, 3) Technology, 4) MDS Testing, and 5) International. First, the system detects the launch of the threat missile and tracks it maintaining birth to death custody of the threat. Based on this track, the Command and Control system, or C2BMC, tasks the appropriate weapon systems to engage the threat. The weapon systems develop fire control solutions so that our interceptors engage and negate the threat. MDA's C2BMC is the all-domain backbone that enables detect, control, engage sequence.

I. Detect and Control

Note: The following discussion does not necessarily examine all funding or activities included within each Program Element (PE).

MDA supports and upgrades C2BMC capability across 18 time zones with hardened networks supporting U.S. Northern Command (USNORTHCOM), U.S. Indo-Pacific Command (USINDOPACOM), U.S. European Command (USEUCOM), U.S. Central Command (USCENTCOM), U.S. Space Command (USSPACECOM) and Missile Defense Radars for missile defense and space domain awareness mission support. The budget request includes:

- **Command and Control, Battle Management and Communication (C2BMC) (PE 0603896C).**

MDA is requesting \$603.4 million in FY 2022 for C2BMC. C2BMC provides persistent acquisition, tracking, cueing, discrimination, and fire-control quality data to Aegis, GMD, THAAD, Patriot, Space C2 and coalition partners to support homeland and regional defense. MDA's C2BMC capabilities support Warfighter needs across the globe by providing the Combatant Commander with management and user nodes, the Ballistic Missile Defense (BMD) planner, situational awareness tools, and battle management capability. These tools support global missile defense situational awareness, coalition operations, weapons release authority for homeland defense, and to control and task a variety of MDS radars. C2BMC operators and maintainers deploy to some of the world's most threatening regions and continue to provide around-the-clock support to the local commanders.



NORAD - NORTHCOM Operations Center
Cheyenne Mountain in support of Homeland
Missile Defense

These tools support global missile defense situational awareness, coalition operations, weapons release authority for homeland defense, and to control and task a variety of MDS radars. C2BMC operators and maintainers deploy to some of the world's most threatening regions and continue to provide around-the-clock support to the local commanders.

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



GMD: Ground Based Missile Defense IBCS: Integrated Air & Missile Defense Battle Command System OPIR: Overhead Persistent Infrared SKA: Space-based Kill Assessment
HQR-H: Homeland Defense Radar - Hawaii LRDR: Long Range Discrimination Radar SBX: Sea-Based X-Band Radar UEW/R: Upgraded Early Warning Radar

- In FY 2022, MDA will sustain the C2BMC fielded capability (Spiral 8.2-3 initially and transition to Spiral 8.2-5) in USNORTHCOM, USINDOPACOM, USEUCOM, USCENTCOM, and USSPACECOM Areas of Responsibilities, which includes the following capability: Mobile Sensor Phase 1 and BMDS Overhead Persistent Infra-Red Architecture (BOA) 6.1 track data to the MDS; support for Space Domain Awareness with Hardened Army Navy/Transportable Radar Surveillance (AN/TPY-2) radars, and the Long Range Discrimination Radar (LRDR); Aegis Engage-on-Remote, which can provide a seven-fold increase in defended area coverage when compared to individual weapon system organic capability; provide Protected Anti-Scintillation Anti-Jam Net-Centric support for continued communications between sites and Combatant Commands (CCMD).
- MDA will field Spiral 8.2-5, which integrates LRDR and BOA 7.0 into the MDS for support of homeland defense. This spiral provides initial situational awareness and tracking capability for hypersonic threats; significantly expands Homeland Defense for NORTHCOM and Space Domain Awareness capabilities for the USSPACECOM with LRDR; integrates the U.S. Army's Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) into the MDS; integrates on-orbit Space-based Kill Assessment (SKA) sensors providing initial hit assessment capability for homeland defense; and develops initial MDS System Track for homeland defense.
- MDA continues to improve the MDS to keep pace with emerging threats worldwide by investing in the development, integration, and testing of advanced algorithms to improve track and discrimination capabilities and enhance the use of space-based sensor data, using the BOA.
- C2BMC will start capability development to support efforts to provide the Warfighter with the capability to employ layered missile defense architectures with auto-engagement coordination logic for multiple weapon systems (GMD, Aegis, and THAAD).

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



- Finally, MDA will continue to update its architecture to increase cybersecurity by assessing the risk of C2BMC architecture against possible attack. C2BMC capabilities will be involved in multi-agency cyber-focused tests and assessments planned in FY 2022 to identify and correct cyber vulnerabilities.

- **Sea-Based X-band (SBX) Radar (PE 0603907C).**

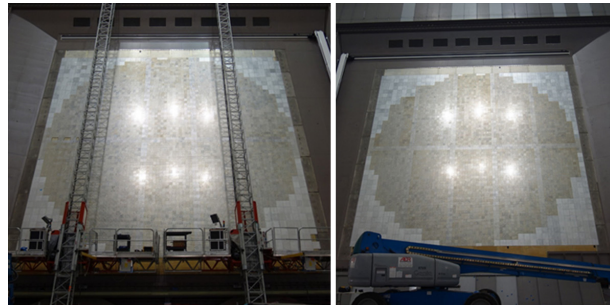
MDA is requesting \$147.2 million in FY 2022 for the SBX. SBX is an advanced sea-mobile radar that provides precision midcourse tracking and discrimination capabilities. The SBX participates in flight tests to demonstrate discrimination and debris mitigation improvements, as well as operations for homeland defense. The budget request includes funds to extend time at sea and conduct contingency operations for defense of the homeland. Specifically, SBX plans approximately 320 days at sea and 45 days for in-port maintenance in FY 2022, and average 300 days at sea annually from FY 2022-2026. The budget request also continues the x86 X-Band Radar (XBR) superdome replacement to address obsolete equipment and increase the XBR processing capabilities. The new processors and software will be fielded in FY 2022.



Sea-Based X-band Radar Undergoing Maintenance at Pearl Harbor, HI

- **Long Range Discrimination Radar (LRDR) (PE 0604873C).**

MDA is requesting \$133.3 million in FY 2022 for the LRDR, which will provide persistent long-range midcourse discrimination, precision tracking and hit assessment to support the GMD capability against long-range missile threats from the Pacific theater. LRDR's improved discrimination capability in the Pacific architecture increases the defensive capacity of the homeland defense interceptor inventory by enabling conservation of GBIs. LRDR includes threat discrimination improvements to enhance MDS effectiveness against the evolving threat. LRDR also supports other mission areas, including Space Domain Awareness. Initial fielding of the LRDR is planned for 2022 leading to Operational Acceptance by the Warfighter in FY 2023 timeframe. MDA's request includes funding for software Independent Verification and Validation, Modeling and Simulation (M&S) efforts, and development of software for tracking and discrimination improvements and refined space intelligence data.



Long Range Discrimination Radar Primary and Secondary Arrays

- **Radar Program Maintenance and Sustainment** supports both homeland and regional defense missions. MDA is requesting \$190.7 million in FY 2022 to sustain AN/TPY-2 radars, Cobra Dane, and Upgraded Early Warning Radars (UEWR).



Upgraded Early Warning Radar – Cape Cod, Massachusetts

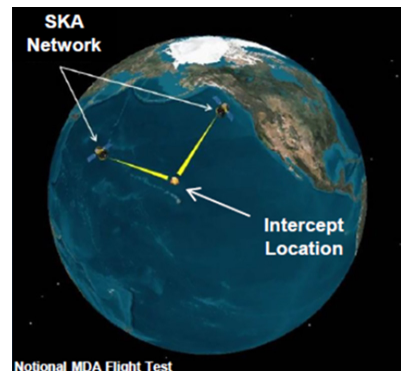
MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



The Services and CCMDs, with logistical support from MDA, operate AN/TPY-2 (Forward Based Mode) radars in Japan (two radars), Israel, Turkey, and USCENTCOM. MDA continues to support the AN/TPY-2 radar (Terminal Mode) as part of forward-deployed THAAD batteries in the USINDOPACOM area of responsibility.

- **Radar Procurement.** MDA is requesting \$2.7 million to procure an AN/TPY-2 Cooling Equipment Unit (CEU) modernization kit, which will bring the CEUs into a common, more reliable configuration over time.
- **Sensors (PE 0603884C).** MDA is requesting \$224.8 million in FY 2022 to provide software updates for the AN/TPY-2, COBRA DANE, SBX, and UEWR radars to counter evolving threats, and to develop future radar capabilities through system engineering, software development, and testing. MDA is investing in a robust sensor architecture that supports MDS weapons systems to provide highly accurate midcourse tracking, discrimination and battle damage assessment for homeland missile defense. The request includes funding for the development of advanced discrimination algorithms for the AN/TPY-2 and SBX radars to counter evolving threats. The improvements will develop and field integrated capabilities to improve the MDS ability to identify lethal and non-lethal objects.
- **Sensors Test (PE 0604879C).** MDA is requesting \$77.4 million in FY 2022 for Sensors testing. This includes planning, analysis and execution of MDS flight test events, including pre- and post-test efforts such as Digital and Hardware-in-the-Loop (HWIL) System Pre-Mission Tests and System Post-Flight Reconstruction. Sensor tests also provide planning, analysis and execution in accordance with the ground test Concept of Operations for MDS-level ground tests identified in the Integrated Master Test Plan (IMTP), as well as support to HWIL infrastructure.
- **Space Program (PE 1206895C).** MDA is requesting \$292.8 million in FY 2022 for Missile Defense Space Programs. This request funds the Spacebased Kill Assessment (SKA) project, which uses a network of fast-rate infrared sensors hosted on commercial satellites to deliver a hit and kill assessment capability for homeland defense. As MDA's pathfinder program to host military payloads on commercial satellites, SKA proved that commercial hosting can deploy assets on orbit quickly – around half the time of the average traditional space program, and at significant cost savings. SKA sensors on orbit today have participated successfully in a variety of MDA flight tests and engineering activities, to include the collection of data for hit assessment in Flight Test Ground-based Midcourse Defense-11 (FTG-11). In FY 2022, MDA will complete development of the operational hit assessment software code, continue developing kill assessment algorithms and threat models, and finalize integration of the SKA operational interface in order to add the SKA capability to the operational all-domain MDS. This request also funds the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) development. MDA is collaborating with the U.S. Space Force, under the leadership of the Chief of Space Operations, and the Space Development Agency to deploy HBTSS as an element within the larger Overhead Persistent Infrared Enterprise Architecture. During HBTSS Phase IIb acquisition, HBTSS will



MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



continue with prototype payload design informed by two Critical Design Reviews (CDRs). In FY2022, HBTSS will continue tracking algorithm maturation and commence flight infrared sensor payload assembly and integration. HBTSS will also acquire launch services through United States Space Force’s National Security Space Launch (NSSL) to support the planned launch date in FY 2023. Development and implementation of the HBTSS Ground System to support satellite operations and testing will continue as well in FY 2022 to meet the planned FY 2023 launch.



Hypersonic and Ballistic Tracking Space Sensor (HBTSS)

- **Space Tracking and Surveillance System (STSS) satellite operations and sustainment (PE 1206893C).** MDA is requesting \$15.2 million in FY 2022 to passivate the STSS satellites, bringing to conclusion an extremely successful program that demonstrated the necessity of an on-orbit detection and tracking capability for the MDS. Funds requested will provide for the safe passivation of the STSS demonstration satellites and close-out of the program through FY 2022.

II. Engage

MDA remains committed to developing, delivering, sustaining, and improving the nation’s missile defenses. The FY 2022 budget request continues to resource and improve U.S. homeland missile defenses designed to counter ballistic missile threats from rogue states. In addition, the FY 2022 budget request continues to resource and build integrated missile defenses that are interoperable with systems deployed by international partners to protect our deployed forces, allies and international



partners against ballistic, cruise, and hypersonic missile threats. GMD continues to serve as the backbone of our homeland missile defense. Initially fielded in the early 2000s, the GMD system is undergoing a life extension program and will be improved with the addition of the NGI starting in 2028. At the same time, MDA is assessing alternatives to augment GMD and provide additional homeland defense capability, including the potential of leveraging residual capability inherent in existing regional defense systems to defend against ICBM-range threats from rogue states. For regional defense of our deployed forces, allies, partners, and friends, the Aegis Sea-Based Weapon System, and THAAD continue to be key components. The budget request includes:

- **Ground-Based Midcourse Defense (GMD) (PE 0603882C).** MDA is requesting \$745.1 million in FY 2022 for GMD. The GMD element of the MDS provides CCMDs with a continuously available (24 hours a day, 7 days a week, 365 days a year) capability to defend the homeland against limited ICBM attacks during the midcourse phase of flight.

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



The GMD capability consists of GBI, GMD Fire Control system (GFC), GMD Communication Network (GCN), In-Flight Interceptor Communications System Data Terminals (IDTs) and ground Launch Support Systems (LSS). MDA plans to upgrade and replace ground system infrastructure and fire control/kill vehicle (KV) software to improve the reliability, capability, and cybersecurity resiliency of the GMD weapon system. MDA will continue developing, testing and fielding of a Ground System 8 software build that provides a selectable 2/3 stage capability for employment of GBIs, improves discrimination, integrates LRDR with GMD Fire Control, improves Cybersecurity posture, and supports GCN and IDT modernization. MDA will complete the acquisition of five boosters which will ensure the number of fielded GBIs does not decrease through the FYDP. MDA will continue development, testing and integration of the Fort Greely, Alaska Missile Field 4 and a new LSS with GMD Ground Systems to increase silo capacity and modernize Silo Interface Vault equipment in existing silos.

- **Improved Homeland Defense Interceptors (PE 0604874C).** MDA is requesting \$926.1 million in FY 2022 for the NGI. The NGI development allows trades between boost vehicle and payload, improves system survivability, and performance against projected threats from rogue states. MDA intends to leverage the valuable technical information developed under Redesigned Kill Vehicle (RKV) and Multi-Object Kill Vehicle (MOKV) to positively influence future designs. On March 24, 2021, the Department of Defense awarded



Missile Field 4 Silo Installation.

- two contracts in support of the Next Generation Interceptor (NGI) program. The request will fund initial requirements analysis, design, development, prototyping, integration and relevant environment testing to mature the booster, payload, sensor(s), and design-specific critical technologies and technology elements.
- **Ground-Based Midcourse Defense Test (PE 0604887C).** MDA is requesting \$61.4 million in FY 2022 for the GMD test program, which supports the Integrated Master Test Plan (IMTP). MDA is developing the capability for GMD to launch GBIs in a 2-stage mode in addition to the existing 3-stage mode. This approach will provide additional homeland defense performance by increasing battle-space capability through shorter engagement times. The 2-stage booster capability is scheduled to be flight tested in Ground-based Midcourse Defense Booster Vehicle Test-03 (GM BVT-03) in FY 2021. Although no flight tests will be executed for the NGI until the 2027 timeframe, continued ground testing and cyber testing is an essential requirement to support this critical MDS capability.
- **GMD Maintenance and Sustainment.** MDA is requesting \$156.6 million in FY 2022 for the Operation and Maintenance (O&M) of the GMD weapon system. In addition to operation, maintenance and sustainment of the GMD weapon system and operational and support facilities at Fort Greely, Alaska; Vandenberg AFB, California; Fort Drum, New York; Schriever AFB, Colorado; and Erickson Air Station, Alaska, this request includes Warfighter training, war-games, and exercises to maintain readiness.

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



Aegis capitalizes on and evolves the existing United States Navy Aegis Weapon System (AWS) and Standard Missile (SM) infrastructures. Aegis provides a forward-deployable, mobile capability to detect and track ballistic missiles of all ranges, and has the ability to destroy short-range ballistic missiles (SRBMs) and medium-range ballistic missiles



Aegis Ashore Missile Defense System - Romania (left) and Poland (right)

(MRBMs) in both the midcourse and terminal phases of flight and intermediate-range ballistic missiles (IRBMs) in the midcourse phase of flight. The FY 2022 budget request supports continued advancement of the Aegis Weapon System to counter growing and more complex threats, including improvements in system and missile reliability as well as increases in Aegis engagement capacity and lethality. MDA continues to support the European Phased Adaptive Approach (EPAA) as the U.S. contribution to the North Atlantic Treaty Organization’s (NATO) missile defense capability, providing coverage and protection of NATO’s European territory, populations, and forces against the increasing ballistic missile threat from outside the Euro-Atlantic region. Currently, there is an operational Aegis Ashore site located in Romania and another under construction in Poland. In FY 2022, MDA will begin efforts to improve missile defense capability for the defense of Guam.

- **Aegis (PE 0603892C).** MDA requests \$732.5 million in FY 2022 for Aegis Missile Defense. The program includes the design, development, and integration of the Aegis Weapon System with the SM-3 Interceptor (SM-3 Block IB and Block IIA). This includes continued software spiral development to pace and defeat more complex threats in more complex operational environments, and the transition of the Kinetic Warhead common hardware to support initial deployment. MDA is strongly committed to maintaining and enhancing the Aegis Weapon System capability, in alignment with Navy requirements, to improve performance against ballistic missiles threats. Utilizing improved radar discrimination, Aegis will increase capability against longer range and more sophisticated threats across three main weapon system product lines: BMD 5.1, BMD 4.2, and BMD 6.0. MDA continues to provide additional software capability development to upgrade Integrated Air and Missile Defense (IAMD) Baseline 9.C2 (BMD 5.1) in support of countering advanced threats and capabilities. MDA also continues software development for Aegis Baseline 5.4.1 (BMD 4.2) and the IAMD Baseline 10 (BMD 6.0). Both baselines bring enhanced weapon system functionality using more capable radars. BMD 4.2 is a joint effort with the U.S. Navy that refurbishes existing ship AN/SPY-1 radar arrays with the installation of antenna Low Noise Amplifiers (LNA) to provide increased radar sensitivity, discrimination improvements against an increased threat set.



USS JOHN FINN (DDG-113).



SM-3 Block IIA fired in FTM-44 – Aft Launcher.

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022

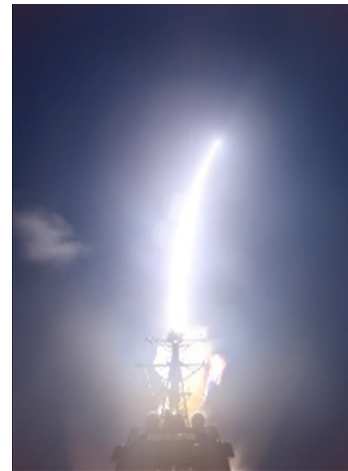


The BMD 6.0 computer upgrade will integrate MD capability with data provided by the Advanced Air and Missile Defense Radar (AMDR), also known as the AN/SPY-6, for enhanced engagement capability and increased raid capacity. Additionally, MDA continues upgrading the SM-3 Block IB hardware and software to leverage the capability of the SM-3 Block IIA. As part of the AEGIS request, MDA is requesting \$99 million in FY 2022, to provide greater depth of defense as part of a layered MDS.



- **Land Based SM-3 (0604880C).** MDA is requesting \$43.2 million in FY 2022 to modernize, develop, and test Aegis Ashore capability improvements at the Aegis Ashore Missile Defense Test Complex in Hawaii for implementation at operational sites. The funding also supports operations at the site in Romania and completion of construction at the site in Poland. In FY 2022 MDA will continue High-Altitude Electromagnetic Pulse Combat System hardening in Romania. Land Based SM-3 provides an Aegis Ashore exo-atmospheric defense against short to intermediate-range ballistic missile threats in the later stages of flight.

- **Aegis Testing (PE 0604878C).** MDA is requesting \$117.1 million in FY 2022 for the Aegis test program, which supports the IMTP. The Aegis Flight Test Program supports comprehensive testing of Aegis components and demonstrates their interoperability with the MDS. Using accredited Modeling and Simulation (M&S), the ground test program provides the evidence required to transition the capability to the Operational Capacity Baseline. In November, 2020 MDA successfully conducted flight test (FTM-44) to demonstrate an Aegis SM-3 Block IIA capability against an ICBM-class threat using an SM-3 Block IIA missile and the Aegis Weapon System. This test helped demonstrate the potential capability to augment our homeland defenses by “layering” different interceptor systems and leveraging engage-on-remote capabilities through the C2BMC network.



SM-3 Block IIA Launch - FTM-44.

- **Defense of Guam (PE 0604102C).** MDA requests \$78.3 million to assess systems to support Defense of Guam. Funds support detailed threat and requirements analysis, systems engineering, trade studies, specifications updates and risk management in support of INDOPACOM stated needs. The Department is in the process of finalizing the details for this IAMD system. Architectures under consideration include some common elements.
- **Aegis Procurement.** MDA requests a total of \$755.1 million in FY 2022 for Aegis procurement. This includes \$647.4 million for procuring Aegis SM-3 missiles. MDA will procure 40 Aegis SM-3 Block IB missiles and 8 Aegis SM-3 Block IIA missiles in FY 2022.



MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



The request continues a five-year Multiyear Procurement for Aegis SM-3 Block IB missiles ending in FY 2023. The procurement budget also requests \$81.8 million for Aegis Weapon Systems consisting of Aegis shipset equipment, software, and installation materials. The budget requests \$25.9 million for installation of the combat system and combat structure adaptation at the Aegis Ashore site in Poland. Each missile variant can be used on Aegis ships and at the Aegis Ashore sites in Romania and Poland.

- **Defense of Guam Procurement.** MDA requests \$40 million procurement for long lead items in FY 2022. MDA plans to begin procuring materials that are common to the architectures under consideration including components for fire control, radar technology, and common display processing equipment.
- **Aegis Maintenance and Sustainment.** MDA is requesting \$68.3 million in FY 2022 in O&M funding. The Aegis program will perform missile recertification, repair efforts, and Ordnance Assessment/Surveillance. This funding also supports sustainment of MD Computer Programs, Ship Equipment, and Aegis Ashore Poland, as well as Fleet integration support.

Also key to missile defense capability is the Terminal High Altitude Area Defense (THAAD) weapon system. THAAD is a globally-transportable, ground-based missile defense system that is highly effective against short-, medium-, and limited intermediate-range ballistic missile threats inside and outside the atmosphere in the terminal phase of flight. THAAD provides unique, cost-effective, and rapidly deployable capability to the Combatant Commanders. MDA currently supports forward-deployment of two batteries stationed in the USINDOPACOM area of responsibility. Specific to THAAD, MDA's request includes:

- **Terminal Defense (PE 0603881C).** MDA is requesting \$277.9 million for THAAD development efforts in FY 2022. MDA will continue the development and integration of multiple, independent THAAD software builds to address the evolving threat, improve the Warfighter's defense planning, and improve the capability to engage SRBM, MRBM, and limited IRBM threats. These development efforts will enhance THAAD's capability against global operational threats. As part of the Terminal Defense request, MDA is requesting \$64.6 million in FY 2022 to execute Rapid Acquisition efforts to develop and demonstrate THAAD interceptor and weapon system performance enhancements and capabilities needed to meet evolving threat requirements, including potential defensive capability against longer range threats. MDA will continue the development and demonstration of interceptor improvements to enhance THAAD capabilities against evolving threats. This effort will leverage the existing missile design improvement activities and develop software and hardware enhancements that will demonstrate THAAD capabilities.



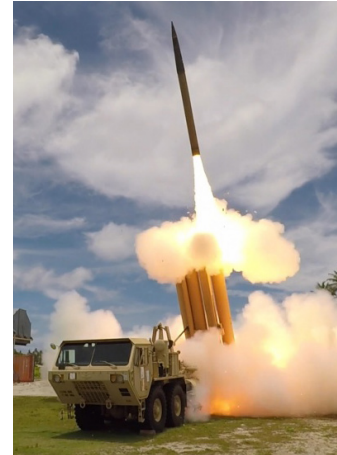
THAAD Battery emplacement at Zurf Site, White Sands, NM.

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



- **Terminal Defense Testing (PE 0604876C).** MDA requests \$32.7 million for Terminal Defense Testing in FY 2022, which supports the IMTP. This includes flight and ground testing, test operations and infrastructure, wargames, and exercises.
- **THAAD Procurement.** MDA is requesting \$251.5 million for THAAD procurement in FY 2022 for 18 THAAD Interceptors, interceptor obsolescence mitigation, training support, Stockpile Reliability testing, and THAAD Battery Ground Component modifications to meet growing cyber threats.
- **THAAD Operations and Maintenance.** MDA is requesting \$86.8 million for O&M in FY 2022 to support the maintenance and upkeep of all MDS-unique items of the fielded U.S. THAAD batteries and for all THAAD training devices. In FY 2022, MDA will provide support to seven THAAD batteries, including the two forward-based batteries stationed in the USINDOPACOM area of responsibility, and is prepared to support the U.S. Army in any future deployments around the world.



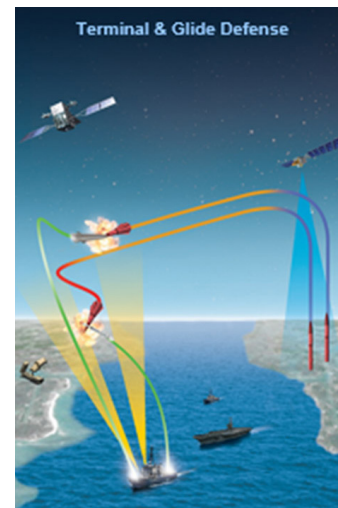
MRBM THAAD Remote Launcher Capability (FTT-23).

III. Technology

MDA is investing in advanced technology today to prepare for tomorrow's threats by improving system performance and effectiveness. This budget request will continue development of technology improvements for the current MDS, along with breakthrough technologies for integration into future missile defense architectures. These efforts include, advanced discrimination techniques, and hypersonic defense technology.

- **Hypersonic Defense (PE 0604181C).** MDA requests \$247.9 million for FY 2022 for Hypersonic Defense. MDA is developing a layered defensive architecture to address regional hypersonic threats from any source and leveraging sensors for early warning, identification, and tracking of regional and strategic hypersonic threats. The funding supports:

- 1) the development of disruptive technologies for future hypersonic defense architectures; 2) the investment in engineering enablers for systems engineering activities to analyze, develop requirements and leverage engineering expertise at multiple Federally Funded Research and Development Centers (FFRDCs) and University Affiliated Research Center (UARC) for analyzing, testing, and recommending solutions for hypersonic defense; 3) leveraging and upgrading C2BMC systems to support hypersonic defense, and; 4) accelerate the development



CubeSat Networked Communication Experiment CNCE Block 2 Nanosatellite space vehicles.

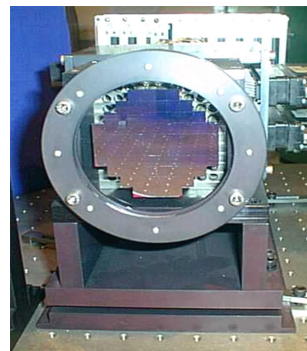
MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



of an operational demonstration of a glide phase defense capability against regional hypersonic threats using the Aegis Weapon System.

- **Cruise Missile Defense Homeland Architecture and Demonstration (PE 0603890C, Budget Project MD21).** MDA is requesting \$13.9 million to begin the development of the system architecture for cruise missile defense of the homeland. In response to USNORTHCOM's requirements for cruise missile defense of the homeland, MDA will develop the systems architecture and conduct a demonstration of cruise missile defense capabilities using the Joint Tactical Integrated Fire Control (JTIFC) capability. The effort includes developing systems engineering requirements, software modifications, models and simulations, and integration of joint sensors and shooters into a fire control network for the demonstration of cruise missile defense capability.
- **Advanced Research Program (PE 0603180C).** MDA is requesting \$21.5 million in FY 2022, to conduct innovative, state of the art, and disruptive research and development with small and large businesses, universities, national laboratories, and allied nations to create and enable future missile defense capabilities aligned to the MDA Science and Technology Strategy. Key investments include proving out technologies in a relevant environment through high temperature material and seeker window characterization, as well as, nano-satellite and sounding rocket experiments and developing component technologies to support Missile Defense programs. In accordance with identified Agency requirements and Warfighter needs, the program assesses and demonstrates the utility of emerging component technologies, then facilitates transition of the technologies to the MDS. The program also manages the selection process and administers the Missile Defense Small Business Innovation Research (SBIR) program.
- **Advanced Concepts & Performance Assessment (PE 0603176C).** MDA is requesting \$15.8 million in FY 2022 to centralize advanced technology concept modeling, simulation, and performance analysis. Advanced Concepts & Performance Assessments focus on the exploration of novel and emerging capabilities that may have the potential to enhance missile defense. The request will fund independent government assessments of industry sensor, directed energy, and weapon system technology concepts and mature related tracking, discrimination, and sensor fusion algorithms. Assessment activities include development of Hypersonic Defense, Artificial Intelligence and Machine Learning Initiatives, and Left-through-Right Integration key technology areas. The innovative structured concept definition and assessment methodology enables MDA to validate focus areas, verify contractor technology solutions, and evaluate promising concepts for



Large Format Fine Steering Mirror (left), and Prototype Deformable Mirror (right).

MISSILE DEFENSE AGENCY

FISCAL YEAR 2022

use in future missile defense architectures. This program element supports the monitoring and tracking of cybersecurity mitigations, as well as the exploration of cyber effects on emerging technology.

MDA plans and executes a fully integrated test program that synchronizes the system under test with the Warfighters trained to operate the system under varying wartime conditions against current and emerging threats.

IV. Missile Defense Testing

- MDS Testing (PE 0603914C).** MDA is requesting \$362.9 million in FY 2022. In collaboration with stakeholders, the IMTP identifies and incorporates all testing requirements into a comprehensive, highly integrated, cost-effective series of flight tests, ground tests, cybersecurity tests, exercises, and wargames. IMTP Stakeholders, who are also signatories, include: Director, Operational Test & Evaluation (DOT&E); Director, Developmental Test, Evaluation and Assessments (DTE&A); Commander, Joint Functional Component Command for Integrated Missile Defense (JFCC IMD) representing Combatant Commands; Commander, Army Test and Evaluation Command (ATEC); Commander, Air Force Operational Test and Evaluation Center (AFOTEC); Commander, Operational Test and Evaluation Force (COMOPTEVFOR); and Commander, Joint Interoperability Test Command (JITC). For flight testing, the Agency incorporates the nine operational realism criteria defined by the Ballistic MDS Response to National Defense Authorization Act (NDAA) Section 234, for Fiscal Year 2005, Increasing Operational Realism. For system-level ground testing, all tests culminate in operational testing with Warfighters on console and independent operational assessments by the BMDS Operational Test Agency Team. This ensures that MDS capabilities are credibly demonstrated and validated prior to delivery to the Warfighter.



The IMTP supports MDA's programming strategy and test priorities. This test program captures:

- New GMD Test Program and plans for testing of the NGI.
- GMD demonstrating the use of SBX Data for additional advanced Target Object Mapping techniques, upgraded In-Flight Interceptor Communications System (IFICS) In-Flight Data Terminal, GMD Enhanced Modem (GEM) with Exo-atmospheric Kill Vehicle (EKV) using 2-/3- stage selectable, in 3-stage mode.
- Flight tests for SM-3 Block IIA production cut-in and the Aegis Weapon System C2BMC using Space Domain Awareness capability.
- Increased flight test integration and interoperability testing with Allies.
- Updates on planning for cybersecurity testing through the FYDP.
- Refinements on test planning for system-level ground testing.
- Investment in the development of the Modified Ballistic Re-entry Vehicles (MBRV) Front End for future testing.

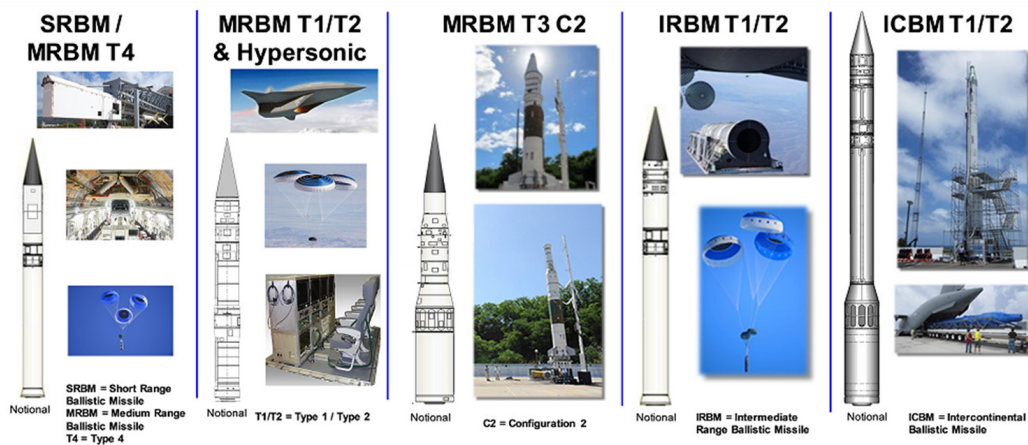
MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



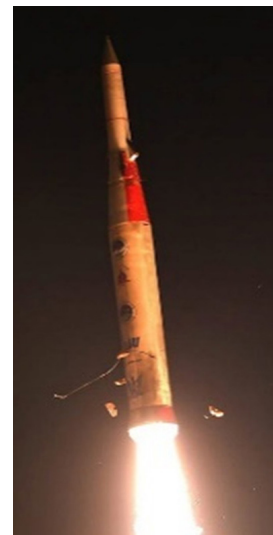
MDA also allocates funding for hypersonic partner flight tests in FY 2022 to be identified, requirements defined, and assets de-conflicted.

- **MDS Targets (PE 0603915C).** MDA is requesting \$553.3 million in FY 2022 to develop, produce, and launch an economical and reliable inventory of targets based on engineering assessments of threat intelligence data. This funding enables the test, verification, and validation of the performance of the MDS against threats in support of the IMTP, and includes funding for the continued development of Advanced Targets, and development and production of more reliable and capable MRBM Target motors with enhanced maneuverability and range.



V. International

- **Israeli Programs.** MDA is requesting \$500 million for Israeli programs in FY 2022. This funding level remains consistent with the Memorandum of Understanding between the United States and Israel that spans FY2019 – FY2028. This budget continues MDA's longstanding support of U.S.-Israeli Cooperative Programs, to include the co-development and co-production of the David's Sling Weapon System and the Arrow Weapon System. The Department continues to support co-production efforts for the Iron Dome Defensive System program to provide critical defense against short-range rockets and missiles, mortars, and artillery shells, and new capabilities against Unmanned Aerial Vehicles. In FY 2022, the MDA budget will also support several flight tests across the Israeli portfolio. These continued joint efforts provide Israel with a three-tiered defense to defend itself from ballistic missiles, rockets, and cruise missiles and ensures Israel maintains its qualitative military edge against its adversaries.



MISSILE DEFENSE AGENCY

FISCAL YEAR 2022



SUMMARY

MDA requests \$8.917 billion in FY 2022 for missile defense development efforts to build Warfighter confidence by focusing on readiness and sustainment, increasing capability and capacity of fielded homeland and regional defense systems, and increasing the speed of delivery of advanced technology to counter the advanced missile threat.



