Missile Defense Agency

**Missile Defense Agency Mission**

To develop and deploy a layered Ballistic Missile Defense System to defend the United States, its deployed forces, allies, and friends from ballistic missile attacks of all ranges and in all phases of flight.
• Continue focus on increasing system reliability to build warfighter confidence

• Increase engagement capability and capacity

• Address the Advanced Threat

BMDS Meets Today’s Threat but Requires Additional Capacity and Advanced Capability to Stay Ahead of the Evolving Threat
Today’s Ballistic Missile Defense System

C2BMC Command and Control, Battle Management and Communications

NMCC  USSTRATCOM  USNORTHCOM  USINDOPACOM  USEUCOM  USCENTCOM

BOOST / ASCENT Defense Segment

Aegis
Ballistic Missile Defense

SM-3
Standard Missile-3

MIDCOURSE Defense Segment

GBI
Ground-Based Interceptor

Aegis Ashore

TERMINAL Defense Segment

Aegis
Sea-Based Terminal

THAAD
Terminal High Altitude Area Defense

PAC-3
Patriot Advanced Capability-3

The System Of Elements

Sensors

Satellite Surveillance

Forward-Based Radar

Upgraded Early Warning Radar

AEGIS BMD SPY Radar

Sea-Based X-Band Radar

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Technology Transforming the Battlespace

- Increased rate of investment in military R&D from near-peers
- Easy proliferation of knowledge and technology has eroded U.S. historic advantages
  - Increasing systems capabilities
  - Advanced production capabilities
    - Driving lower costs
    - Decreasing the “time to market”
- Increasingly Competitive National Security Technical Environment
- Speed and cycle time become the discriminator
USD(R&E) Top 10 Modernization Priorities

- Missile Defense
- Hypersonics
- Directed Energy
- Fully Networked Command, Control, and Communication
- Space
- Cybersecurity – Offense and Defense
- Microelectronics
- Machine Learning (Artificial Intelligence)
- Quantum Science (Including Encryption and Computing)
- Autonomy
Transforming Missile Defense

Decrease Emphasis On:

- Fixed
- Right of Launch
- Centralized Location
- Prolonged Acquisition
- Costly

Increase Emphasis On:

- Agile
- Space
- Directed Energy
- Integrated Left & Right
- Autonomy
- Faster Refresh
- More Affordable

Invest in technology to revolutionize the BMDS and prove technology readiness through demonstrations.
MISSION: Seek out, develop, and deliver innovative technologies and capabilities across missile defense to outpace the threat.

BMDS Kill Chain
- Detect
- Track
- Discriminate
- Engage
- Assess

Technology Focus
- All Source Information Integration
- Sensor Technology (Active/Passive)
- Robust Communications
- Kinetic Weapons
- Directed Energy
- Advanced Technology M&S Testbed

Technology Investments
- MOKV
- Sensors
  - Ground
  - Airborne
  - Space
- Directed Energy – Power Scaling
- Hypersonic Glide Defense
- Advanced Research
- SBIR/STTR
- Right of Launch/Left of Launch

Architecture Development

Continue to mature advanced technologies and evolve Missile Defense capabilities through research, experiments, and demonstrations for insertion into the BMDS.
Multi-Object Kill Vehicle (MOKV)

- Concept: kill multiple lethal objects from a single interceptor
- Address evolving threats
- Improve cost effectiveness, manufacturability, supportability, and testability
- Demonstrate technical maturity through integrated hardware HWIL testing
- Force multiplier by increasing BMD interceptor capacity
Demonstrate Precision Tracking

- Two Reapers for stereo track
- Sensor with multiple cameras
- Unique airborne processor
- Forward chin mount to improve sensor field of view

- Extended Range Upgrades
  - Larger wings (more fuel and lift)
  - Ice protection (higher altitude)

- Incorporate tracking laser
  - Single platform operations
  - Increased precision and range

Demonstrate Acquisition & Tracking at Operational Ranges
The Nanosat Testbed Initiative uses small, low cost satellites to demonstrate MDS technology in a space environment.

- Directly applicable to MDS kill vehicles, space sensors, and space weapons
- Takes advantage of emerging small satellite technology, launch capacity, and automated operations for missile defense – many partnering opportunities available
- Demonstrations integrate with existing MDA space operations center and EO/IR testbed
Sub-Orbital Flight Experiments

• To demonstrate SBIR developed technologies in an operational environment

  - Raises TRL of Demonstration technologies to TRL=6
  - Impartial demonstration (Primes not in control)
  - Will provide verification of G6 Sim modeling
  - Can be used by small businesses as justification for insertion into programs of record
  - Provides risk mitigation activities for key components of MDA Architecture (DACS, Batteries, Sensors, IMUs)
  - Can be iterated on regular basis
  - Allows experimentation at a lower quality level than a Flight Test
• **Define weapon concepts and investments in key technology to enable a broad set of solutions including kinetic and non-kinetic means across left and right of launch**
  - Focus on development of weapon concepts through competitive development
  - Concepts and identified technology component risk reduction will formulate the trade space across cost, risk, and performance to inform the requirements development process

• **Develop technology to increase sensor capability**
  - Execute sensor technology demonstrations to inform the development strategy
  - Invest in larger focal plane arrays, clutter mitigation algorithms, low size, weight, and power, high speed processing
Advanced Technology Hypersonic Defense Mission

• Weapon Concept Definition:
  - Complete joint government and industry concept definition for the hypersonic intercept weapons. The weapons concepts will aid the Agency in establishing the requirements foundation for hypersonic defense.
  - Deliver contractor concept(s) for hypersonic interceptor weapon components for future technology risk reduction

• Hypersonic Threat Sensor Technology
  - Identify and demonstrate sensor components for future hypersonic applications
  - Test and demonstrate sensor components for future hypersonic applications
  - Conduct EO/IR sensor-to-tactical network experiments to lower latency of sensor data to user
  - Ground test data processing and algorithms for wide field of view threat scenes
MDA Advanced Research

• Pursue a broad range of high-risk technologies
  - Capitalize on the innovation and creativity of the Nation’s small businesses and universities
  - Develop and transform cutting edge technologies into actual applications for insertion into the BMDS

• Technology insertion into the BMDS is critical

• Advanced Research utilizes the following research vehicles:
  - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) program
    - 4th largest SBIR/STTR program in the Department of Defense
  - Rapid Innovation Funding
  - Broad Agency Announcements
    - Missile Defense Science & Technology Advanced Research
    - Advanced Technology Innovation

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Technology Interest Areas

- **Interceptor Technology**
  - Guidance, navigation, & control
  - Batteries & power systems
  - Advanced materials
    - High temperature
    - Light weight
  - Seeker technology
  - Rad-Hard technology
  - Deployment systems
  - Lightweight composites
  - Propulsion & control technologies
    - Improved specific impulse

- **C2BMC**
  - Advanced tracking & discrimination algorithms
  - Command & control algorithms
  - Low latency and secure communications
  - Battlespace management
  - Data fusion
  - Warfighter training
  - AI/ML

- **BMDS Testing**
  - Affordable targets
  - Scene generation
  - HWIL
  - Rapid analysis SW toolkits
  - Predictive analysis & modeling
  - Range safety

- **Sensors**
  - EO/IR and radar
    - T/R modules
    - FPAs
  - Signal & data processing algorithms
  - Rad-Hard technology
  - Telescopes & antennas
  - Windows & radomes

- **Modeling & Simulation**
  - Lethality
  - Battlespace environments
  - Engagement
  - Aerothermal environments
  - Technology investment evaluation
  - Test verification
1. What are you trying to do?
   - What problem are you trying to solve?

2. How does this get done at present? Who does it? What are the limitations of present approaches?

3. What is new about your approach? Why do you think you can be successful at this time?
   - Have you done a first-order analysis of your approach?

4. If you succeed, what difference will it make?

5. How long will it take? How much will it cost? What are your mid-term and final exams?
   - What does success look like and how will you demonstrate it?
   - What is your execution plan? How will you measure progress? What are your milestones/metrics? How will your results transition?
Solicitation Process

- SBIR / STTR program is a four step process
  - Phase I: feasibility and concept development ($100,000)
  - Phase II: technology and prototype development ($1,000,000)
    - Technology may receive one sequential Phase II
  - Phase II Enhancement: Prototype testing and technology demonstrations and validation ($500,000)
  - Phase III: Commercialization and Transition
**SBIR / STTR Phase I Overview**

### Proposals:
- **Three criteria;**
  - Technical merit, feasibility of the concept and approach
  - Qualifications of team
  - Commercialization/Transition potential and approach
- **Must identify all foreign nationals and level of involvement**
- **Limited to twenty pages**

### Contracts:
- **Topics typically Export Control restricted**
- **Unclassified**
- **Currently $100,000; 6 Months**
  - $50,000 options are awarded to Companies selected for Phase II award (Bridge Funding)
• All Phase I awardees under a particular solicitation are allowed to submit a proposal for Phase II award

• Phase II proposals:
  - Accepted only during announced open period
  - Announcement on web page with email notification to current Phase I awardees
  - Two-year award for further concept development to prototype stage
  - Submitted for an amount not to exceed $1,000,000
• Phase II Enhancement and 2\textsuperscript{nd} Phase II proposals:
  - Technology must progress and innovate beyond the work you accomplished in your initial Phase II
  - Must address why continued investment from the Government is needed
  - Show a transition path for the technology beyond the SBIR/STTR Program.
  - Up to $500,000 award for Enhancements and up to $1,000,000 award for 2\textsuperscript{nd} Phase II
• Non-SBIR funded R&D or production of contracts for products developed under Phase I & Phase II activities
• Several means to pursue Phase III funding
  - Phase III Contract with the Government
  - Sub to a Prime Contractor
  - Rapid Innovation Fund (RIF)
• Benefits of SBIR developed technology
  - Eligible for sole-source non-competitive contract
  - Help meet program small business goals
  - Source to generate cost savings to achieve life cycle cost goals
  - Extends SBIR data rights for five years from end of last SBIR award
• Develop a diverse portfolio of cash flow for your technology
  - SBIR technology often takes years to commercialize
• Lay the framework for transition of SBIR technology early
  - Program Office Requirements List
  - Prime Contractors have limited flexibility after contract negotiation
• Look for opportunities outside of the Program/Agency that your SBIR/STTR technology was developed
  - Phase I award qualifies your technology with any SBIR Program
## Solicitation Schedule

### Milestones

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**Milestones**

- **BAA**
- **Phase I Award**
- **Phase II RFP**
- **Phase II Award**

### Table

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**Concept**

- **Topic Write Up**
- **Topic Approval**

**Phase I**

- **Pre-Release**
- **BAA**
- **Evaluation**
- **Acquisition**
- **Base POP**
- **Option**

**Phase II**

- **RFP**
- **Evaluation**
- **Acquisition**
- **Base POP**

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• A competitive research and development contracting approach in the form of a general agency announcement:
  - Identifies areas of research interest
  - Evaluates proposals based on peer or scientific reviews against individual merits rather than against each other

• Meets full and open competition requirements of "The Competition in Contracting Act of 1984"

• The following slides give more information regarding specific BAA programs
• Technical Objectives
  - Fund relevant, advanced research and development at domestic universities and academic institutions
  - Build portfolio of revolutionary technology to support and enhance BMDS
  - Develop holistic partnerships
  - Educate future scientists and engineers

• Open continuously for proposals from universities
  - Broad Agency Announcement (http://www.fbo.gov)
  - Research topics revised annually
  - MDA is seeking strategic alliances with universities
  - One year base period with two one year options
    ▪ Base period up to $200,000
    ▪ Option years $200,000 (each)
• Technical Objectives

- Fund relevant cutting edge technology from industry, small business and universities
- Build portfolio of revolutionary technology to support and enhance BMDS

• Advanced Technology Innovation Broad Agency Announcement

- Open continuously to university and commercial vendors
- Contract value not limited
Rapid Innovation Fund (RIF) Program

- Established under FY11 Defense Authorization Act (Section 1073)
  - A competitive, merit-based program
  - Accelerate fielding of innovative technologies into military systems
  - Typically, all MDA RIF projects are a SBIR Phase II follow-on
  - Prioritization is given to small business

- Key Requirements:
  - Satisfy an operational or national security need
  - Accelerate or enhance military capability
  - Reduce
    - Technical risk
    - Cost: Development, acquisition, sustainment, or lifecycle
  - Improve timeliness and quality of test and evaluation outcome
  - Provide approach for use by an acquisition program
  - Typical award length 24 months
  - Award values up to $3,000,000
Recent SBIR / RIF / BAA Sponsored Research Accomplishments

- Inaugurated a nanosat testbed program to demonstrate notional Kill Vehicle communication architecture
- Executed structural test series to validate SBIR developed lightweight unitary nosecone
- Near Net Shape Manufacturing Non-Eroding, Thin Walled, Tungsten
- Completed radiation testing on hardened mirrors
- Developed high-speed test instrumentation

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For More Information

www.mda.mil

- Missile Defense News, Images, Videos, Fact Sheets
- BMDS Overview, BMD Basics
- DoD SBIR/STTR website: https://sbir.defensebusiness.org
- SBA SBIR/STTR website: https://www.sbir.gov

To Contact MDA

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Questions