



NDIA
MDA SBIR Industry Day
7 August 2008

C2BMC

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Agenda



- **Research Area Scope & Objectives**
- **List of Technology Areas & Topics**
- **Topic Overview**
- **Questions**



C2BMC Scope & Objectives



The C2BMC research area funds hardware and software related innovations that enhance system performance through the integration of BMDS assets. Technology areas and their research topics include:

- **Communications**
 - **Topic: End-to-End BMDS Interceptor / Ground Terminal Communication Links**
- **Automated Battle Management / Planning Aids**
 - **Topic: Global Missile Defense Battle Management**
- **System Discrimination & Discrimination Fusion**
 - **Topic: Discrimination**
- **Integrated Sensor Mgmt./Systems Registration**
 - **Topic: Sensor Registration**



Communications



End-to-End BMDS Interceptor / Gnd. Terminal Com. Links

Objective

MDA is seeking innovative approaches to improving the current hardening levels of communications systems for current and future Interceptor/Kill Vehicle systems. All future MDA interceptor communication systems must employ effective means to mitigate potential link performance degradation associated with wartime environments.

- Develop innovative design/development/test concepts to enhance the reliability of communications between the Ballistic Missile Defense System (BMDS) Fire Control and Interceptor/Kill Vehicles under severe wartime conditions.

Key Points

- Focus on increasing probability of message delivery in the presence of both adversarial electronic counter-measures (ECM) and signal fading caused by ionospheric scintillation arising from high altitude nuclear explosions.
- Provide analysis of proposed communications solutions within the framework of the MDA layered architecture, and develop prototype hardware that will demonstrate the utility of the proposed solution.
- Specific issues that the successful bidder should consider include:
 - Representation and modeling of fading channels and threat ECM techniques
 - Link Attributes (i.e., data rate, bandwidth, range, latency, error rates)
 - Channel waveform design
 - Communication system performance prediction methods
 - Receiver mitigation techniques for signal fading and Jam and Intelligence gathering resistance

Development Plan

Phase I

Propose and analyze candidate end-to-end communications solutions for providing robust connectivity to missiles and/or kill vehicles within the evolving MDA architecture, including strengths and weaknesses of different proposed solutions.

Phase II

Perform a detailed design of the system based upon Phase I work. Identify specific hardware components and demonstrate the capability for hardness, reliability and performance.



Automated Battle Management / Planning Aids

Global Missile Defense Battle Management



Objective

Battle Management solutions must be developed in coordination with multiple dispersed and disparate weapon platforms that are networked together, but still retain control and responsibility for their own individual fire-control systems and endgames.

- Develop innovative, robust, real-time battle management algorithms and software to support layered missile defense across the theater, regional, and global levels.

Key Points

- Assume at least two defensive layers capable of coordination / no coordination between the in-range weapons in the two layers, and capable of coordination / no coordination between the in-range weapons in each layer.
- The solution must involve the optimization of defender or two-sided resources, which may be surviving value, remaining inventory, etc.
- The methodology should be applicable both to centralized and distributed operation.

Development Plan

Phase I

Develop the mathematical basis for and provide a demonstration of advanced allocation methods that will enable robust engagement planning for various weapon systems with different capabilities.

Phase II

Develop/update the technology based on Phase I to provide a demonstration of the technology in a realistic environment using realistic data, to include realistic processing speeds in complex scenarios and alternate courses of action based on weapon platform coordination



System Discrimination & Discrimination Fusion



Discrimination

Objective

BMDS performance is dependent upon data from dispersed and disparate radars and other types of sensors. As such, the Discrimination topic seeks to successfully employ these sensors to increase the accuracy in identifying lethal objects from non-lethal objects in an environment with many closely spaced objects and countermeasures moving at high velocities.

- Develop advanced, innovative techniques through the use of algorithms, software, and/or hardware, in the exploration of models, system-level versus sensor level approaches, dealing with ambiguity, and integration with existing track correlation mechanisms.

Key Points (Note: These bullets describe an approach. Alternative approaches giving the same results are acceptable.)

- Innovative approaches should sufficiently account for: uncertainty in both threat evolution and sensor feature measurements, spatial and temporal registration of radars, data throughput within and between sensor platforms, processing speed and capacity, data latency and gap handling, target feature exploitation, and sensor calibration, countermeasure identification and negation.
- Given the uncertainties in the first bullet, and a list of characteristics, develop a model to estimate the volume resulting from the variability of these characteristics.
- Given a lethal hypothesis and (if necessary) a set of measurements, relate this volume to uncertainty about the measurements to lethality assessment.

Development Plan

Phase I

Develop and conduct proof-of-principle demonstrations showing that the approach merits further investigation.

Phase II

Based upon Phase I results, update and develop technology to demonstrate in a realistic environment using data from multiple sensors (as applicable) sources. Demonstrate the ability of the technology to work in a real-time, high clutter environment.



Integrated Sensor Mgmt./Systems Registration

Sensor Registration



Objective

The BMDS employs multiple sensors (optical and radar) in the detection, tracking, and identification of ballistic missiles and their constituent pieces. The available range of spatially separated EO/IR and radar sensors, each with its own temporally and geometrically constrained view of the battle space, will have increasing demands placed upon them as the need for collection of target discrimination information expands to cope with countermeasures.

- Develop advanced, innovative, robust, real-time techniques (algorithms and software) for the real-time monitoring of sensor registration.

Key Points

- Sensor registration techniques / algorithms should clearly identify performance improvement for the fused data.
- Sensor management techniques may be based on dynamic programming or approximations thereto, stochastic programming or otherwise.
- Proposed schemes must consider the following system features: simultaneous observation from different platforms; priorities for sensor tasking must reflect the need to provide fire control solutions for weapon systems appropriate to each layer in the BMDS architecture; fidelity of track and discrimination information required will vary with time.

Development Plan

Phase I

Develop a mathematical basis for the proposed approach, augmented as appropriate by coding or analysis sufficient to demonstrate it's computational and performance abilities.

Phase II

Develop / update the technology based on Phase I and provide a demonstration of the technology in a realistic simulation environment, to include using realistic scenarios. Develop an Operational Concept of how the developed solution will be employed by the Warfighter and the elements.



Points of Contact



Government POC: Joey Wang, MDA/BC

Technical POC: Stan Harmon, MDA/BC

Communications

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Automated Battle Management / Planning Aids

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System Discrimination & Discrimination Fusion

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Integrated Sensor Mgmt./Systems Registration

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Questions

- Questions after today need to be submitted through the SBIR/STTR Interactive Topic Information System (SITIS) <http://www.dodsbir.net/sitis>
- For reasons of competitive fairness, direct communication between proposers and topic authors is not allowed starting September 13, when DoD begins accepting proposals for this solicitation.
- However, proposers may still submit written questions about solicitation topics in which the questioner and respondent remain anonymous and all questions and answers are posted electronically for general viewing until the solicitation closes.
- All proposers are advised to monitor SITIS (08.3 Q&A) during the solicitation period for questions and answers, and other significant information, relevant to the SBIR 08.3 topic under which they are proposing.