STELLAR TEAM   NOBLE MISSION

MDA University Outreach
MDA Corporate Lethality Program

By: Dr. Rick Yaw
Chief, Survivability and Lethality
Missile Defense Agency DE/SE
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BLUF

(U) MDA Corporate Lethality Program (CLP) is searching for innovative technologies and methods to improve our ability to model and assess the lethality of our systems

Areas of Focus:

1. (U) Performance Goal: Innovative hydro- and hydro-structural code methodologies to predict intercept effectiveness

- (U) Modeling and Simulation cost effective approach – must anchor codes to physical test data
- (U) Minimize cost of performing benchmarking testing (e.g., via Light Gas Gun or Sled Tests)
- (U) Provide timely, accurate lethality data to MDS programs

2. (U) Technical Challenge: Innovative methodologies for testing and M&S code benchmarking for any intercept technology

- (U) Kinetic intercept, Directed Energy, etc.
- (U) Understanding of hypervelocity performance on lethality

3. (U) Technical Challenge across OSD: Techniques for effective and cost-efficient testing and M&S applied to

- (U) Equations of State
- (U) Constitutive Models
- (U) Ballistics Testing
- (U) Failure & Fragmentation Models
- (U) System Level Testing and Fragility Models

Corporate Lethality Program Overview

- **KV Lethality**
  - Benchmark kinetic interceptor interaction with a threat and predict resulting damage
  - Post-intercept debris and related signatures require the same M&S tools and anchoring
- **Hypersonic Missile Defense Lethality**
  - Kinetic Energy (KE) and Non-KE (Directed Energy, other) intercept lethality
  - M&S development and validation
  - Live fire testing (e.g., Light Gas Gun, other) to benchmark M&S
  - Testing of TPS, structural materials, control systems, and responses to insult
- **US/UK Collaboration**
  - Testing conducted in UK - leverages unique test capabilities
  - Hydrocode Benchmarking for Post-Intercept Debris (PID) Modeling
  - M&S development and validation
- **Legacy Lethality Database (LLD)**
  - Compiles data from every major MDA LFT&E test series - all test venues and systems
  - Ground tests (arena, sled, light gas gun), Flight tests
  - Robust search interface; access to all available historical ballistic missile intercept data

Technology Challenge Examples

(U) Data Collections on a Surrogate Warhead

- — (U) Design of test to approximate kinetic intercept physics
- — (U) Recover and Characterize debris – mass, size, damage
- — (U) Velocity data for thousands of debris pieces – legitimate statistics
- — (U) Ability to identify specific pieces and their dynamics at early times
- — (U) 3D scanning of debris - allow for more robust comparison to hydrocode predictions

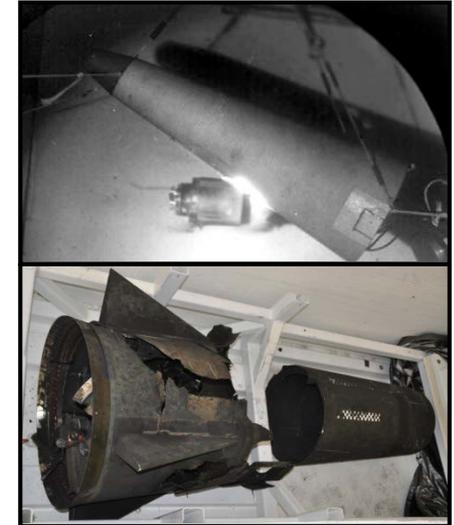**(U) Develop Dataset for Robust Model Benchmarking**

- — (U) Self-consistent radar/optical debris velocities and tracks
- — (U) Correlated stereo tracks and make screen data
- — (U) Correlated debris recovery with optical track data

(U) Investigating the lethality of non-KE weapon systems against hypersonic threats

Flight Tests

Light Gas Gun Tests

Sled Tests

Arena Tests

- **Initiative 1: Research Topics on Metals**
  - **Methodologies for Cost-Effective Measurement of Dynamic Material Properties or Characterization of Materials under Dynamic Loads**
  - **Innovative Methodologies for Manufacturing of Lethality Test Articles**

- **Initiative 2: Research Topics on Composite / High Temperature Materials**
  - **Methodologies for Cost-Effective Measurement of Dynamic Material Properties for Carbon-Carbon Composites**
  - **Uncertainty Quantification for Modeling and Testing of Carbon-Carbon Materials**
  - **High Temperature Fracture Mechanics**

- **MDA needs innovative concepts and technology to increase the effectiveness and cost-efficiency of live-fire testing and M&S for assessing the effectiveness of Missile Defense intercepts**

- **The lethality testing needs include technologies and methods for test design, data collection, data correlation and analysis, and model benchmarking**

- **The requirements extend across all MDA intercept systems and technologies**