MDA University Outreach
MDA Corporate Lethality Program

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

• 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
Summary

- 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.