

GENERAL DYNAMICS

Ordnance and Tactical Systems

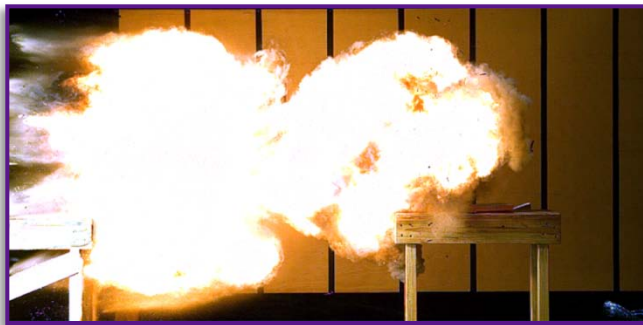
Reactive Material Neutralizer Technology

2012 NDIA Joint Armaments Conference

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Introduction

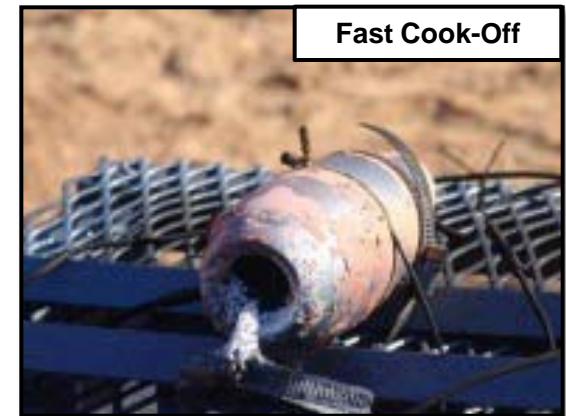
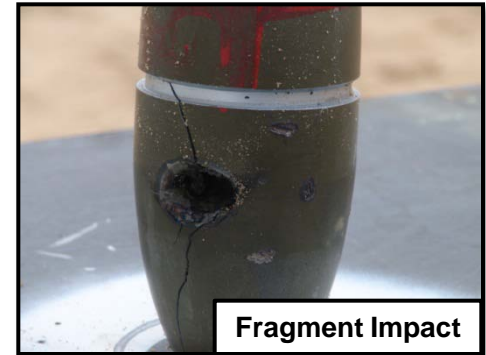
- GD-OTS Niceville Has Developed a Reactive Material (RM)-Based Neutralization Technology With Broad Application to High Explosives (HE) Neutralization
 - Neutralizers Contain Non-Detonable, High Flame Temperature RM Fill
 - No S&A Required, Unreacted Neutralizers Not Classified as Unexploded Ordnance (UXO) or Explosive Remnants of War (ERW)



Application

EOD/RSP's For IM Compliant HE Fills

- Increased IM Compliance of High Explosive Fills Increases The Difficulty of Explosive Ordnance Disposal and Render-Safe Procedures
 - Reduced Shock, Impact, Friction, and Sympathetic Reaction Sensitivity
 - Result: Existing Procedures Have Reduced Effectiveness
- All HE Fills Eventually Succumb to Thermal Threat
 - Thermal Decomposition, Leading to a Burn or Deflagration

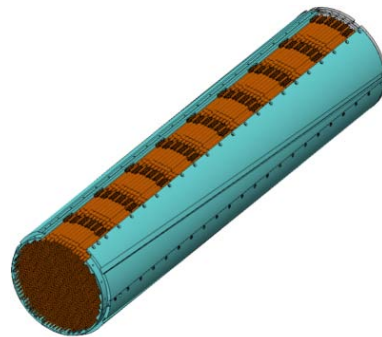
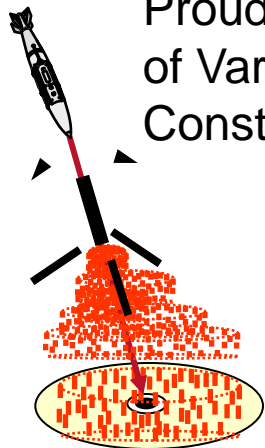


IED/Mine Defeat

- Desire for Low Collateral Damage Effects During Threat Defeat

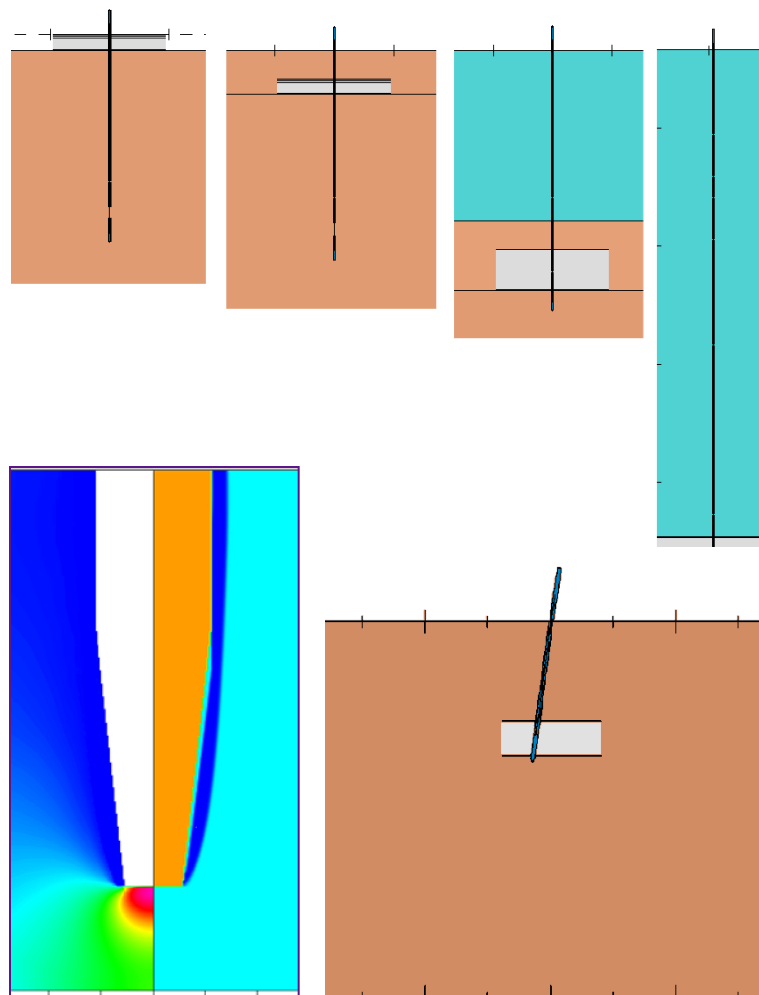
Neutralizer Development

- Reactive Neutralizer Technology Developed During US Navy Countermine System (CMS) Program
 - GD Contracted to Provide RM Neutralizer
 - Goal: Beachhead Clearance of Sea and Land-Based Mines
 - Broad Target Set: Underwater, Buried, Proud, Both Plastic and Steel Casings of Various Thicknesses and Construction



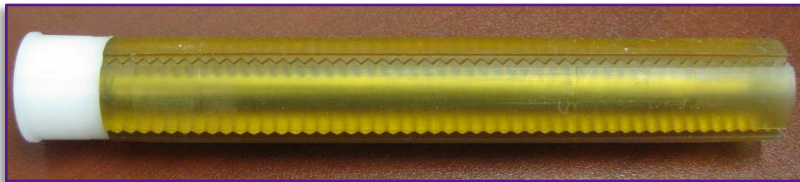
Penetration Analysis/Packaging Study

- Target Set Analysis
 - Layers, Thickness, Materials, Overburden
- OTI*Hull & PENCURV Used for Penetration Analysis
 - PENCURV – Rigid Body Penetration Code
 - OTI*HULL – FD Hydrocode
 - Optimization of Nose Shape/Design for Maximum Trajectory Stability and Minimum Velocity Loss
- Packaging Trade Study
 - Dart Diameter & Mass Yielding Greatest Loadout Within System Requirements



Water Penetration Test Video

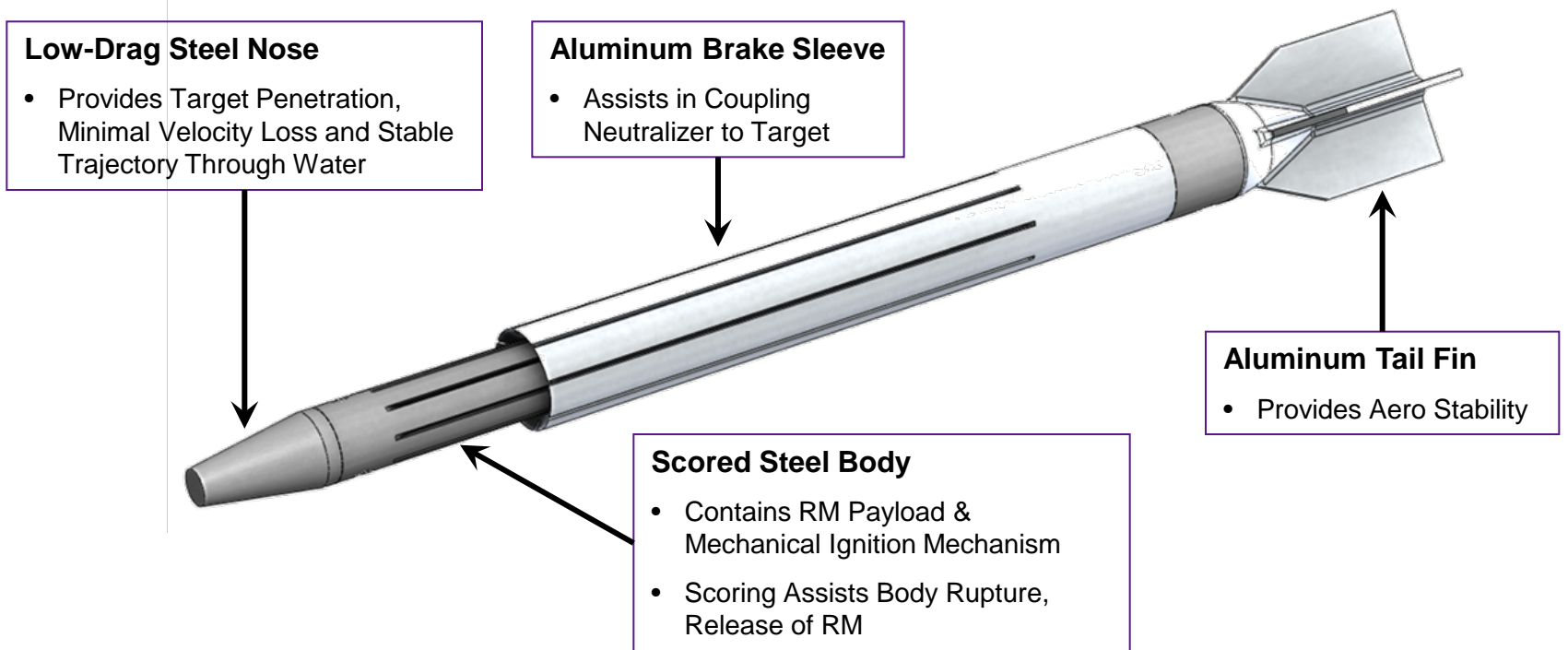
- 4'x4'x12' Long Tank Constructed For Ballistic Water Penetration Testing
 - Acrylic Front Panels to View Water Penetration/Trajectory
 - Inert Mass Mock Neutralizers Fired via Powder Gun & Sabot
 - Verification of Code-Driven Nose Solution



RM Fill Material Selection

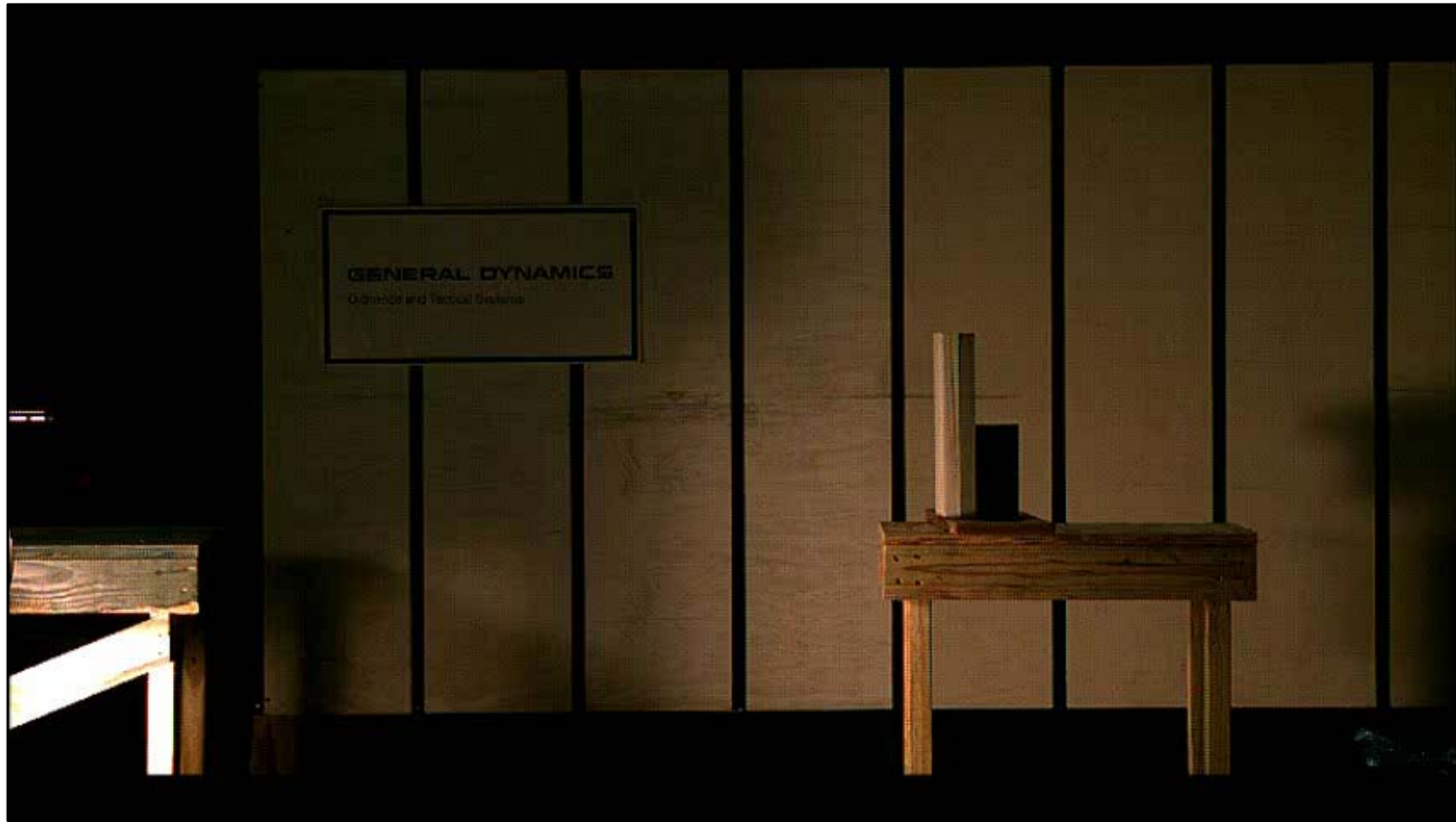
- Selected Group of Candidate Materials From Supplier Base
- Initial Studies Conducted:
 - Initiation Mechanisms/Sensitivity
 - Temperature Effects
 - Output/Effects on Flake TNT
 - Test Results Suggested Dual Material Solution:
 - One Material Easily Initiated, But Limited Effect on HE – Igniter
 - Second Material Harder to Initiate, But Greatest Effect on HE – Sustainer
 - Very High Flame Temperature: ~ 4500 °F

RM Neutralizer Design



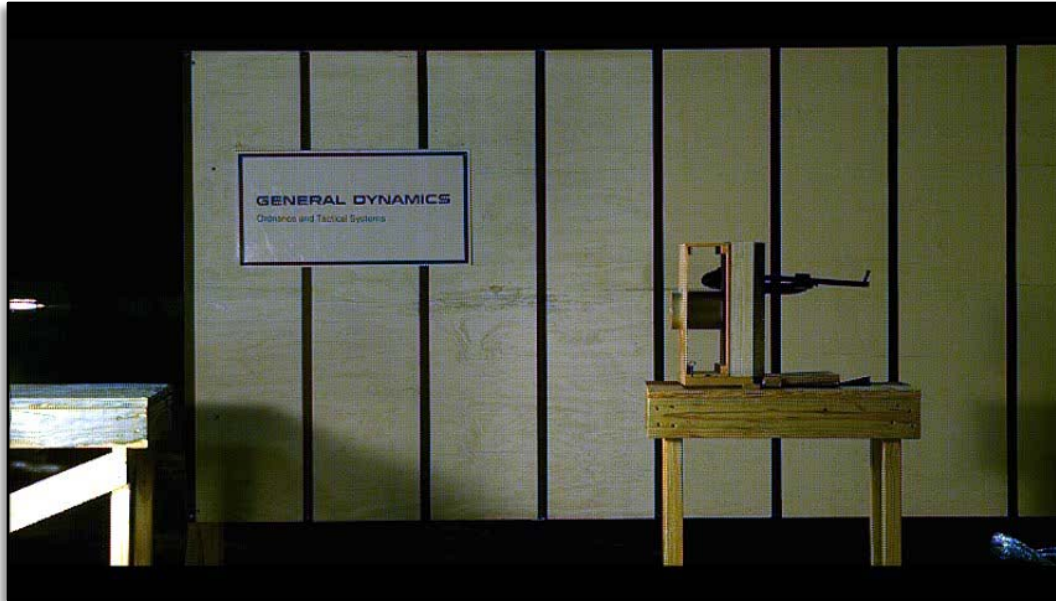
- Neutralizer Can Be Tailored to Defeat A Range of Targets and Engagements
 - Multiple Materials, Thicknesses, Emplacements, etc.
- Form Factor Can Easily be Adjusted for Integration Into Existing EOD Tools
 - PAN Disrupter, .50-Cal De-Armer, etc.

Example RM Neutralizer Reaction



- Neutralizer Fired Against Steel Plate
 - Demonstrates Size of RM Reaction

RM Fill Coupling With HE



- Live Neutralizer vs. Live Target
 - 2lb TNT, Cast From Flake
- Aluminum Tube Casing
- Steel Plate Backstop

Summary

- New Target Defeat Mechanism Identified For Use in EOD/RSP Operations
 - ↗ Estimate of TRL 6 Maturity
 - ↗ Non-Detonable Fill, No S&A Required
 - ↗ Compliant With Cluster Munition Directive
 - Unreacted Neutralizers Not Classified as UXO
- Thermal Output Defeat of Conventional & Reduced-Sensitivity HE's
 - ↗ Conventional: Proven During CMS Program
 - ↗ Reduced Sensitivity: Unproven, But Results Look Promising
- Technology Can Be Tailored To A Range of Targets and Deployment Systems
- Possible Application as Area Effect Weapon vs. Fuel Farm Target

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QUESTIONS

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