RDECOM

US Army Research, Development and Engineering Command

Presentation to NDIA Joint Armaments Conference

14-17 May 2012
Seattle, Washington

STAR
SCALABLE TECHNOLOGY for ADAPTIVE RESPONSE

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

STAR ATO
Scalable Technology for Adaptive Response
D.LE.2008.02

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US Army ARDEC RDAR-EIP
16 May 2012

Distribution A: Approved for public release.

Scalable Technology for Adaptive Response
STAR D.LE.2008.02

Purpose:

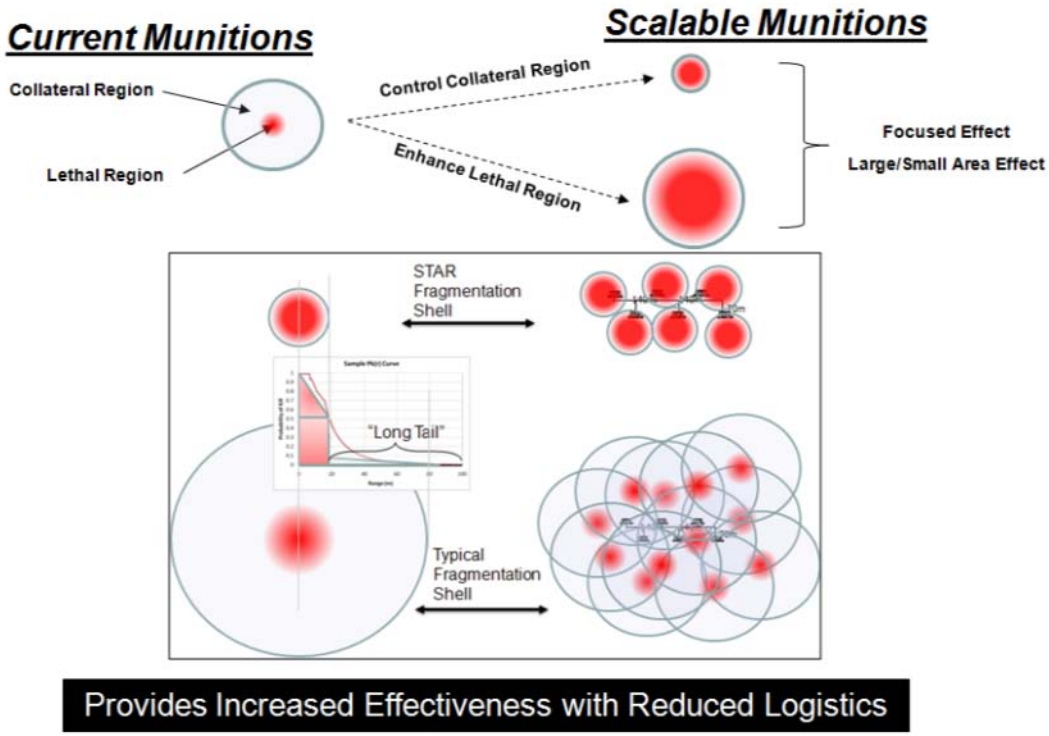
Provide capability for selectable, scalable & adaptive lethal effects against platforms and personnel while limiting collateral damage.

Approach:

Develop & integrate component technologies to Increase lethality and (simultaneously) control collateral damage.

Demonstrate technologies in fully integrated munitions of varied size and application.

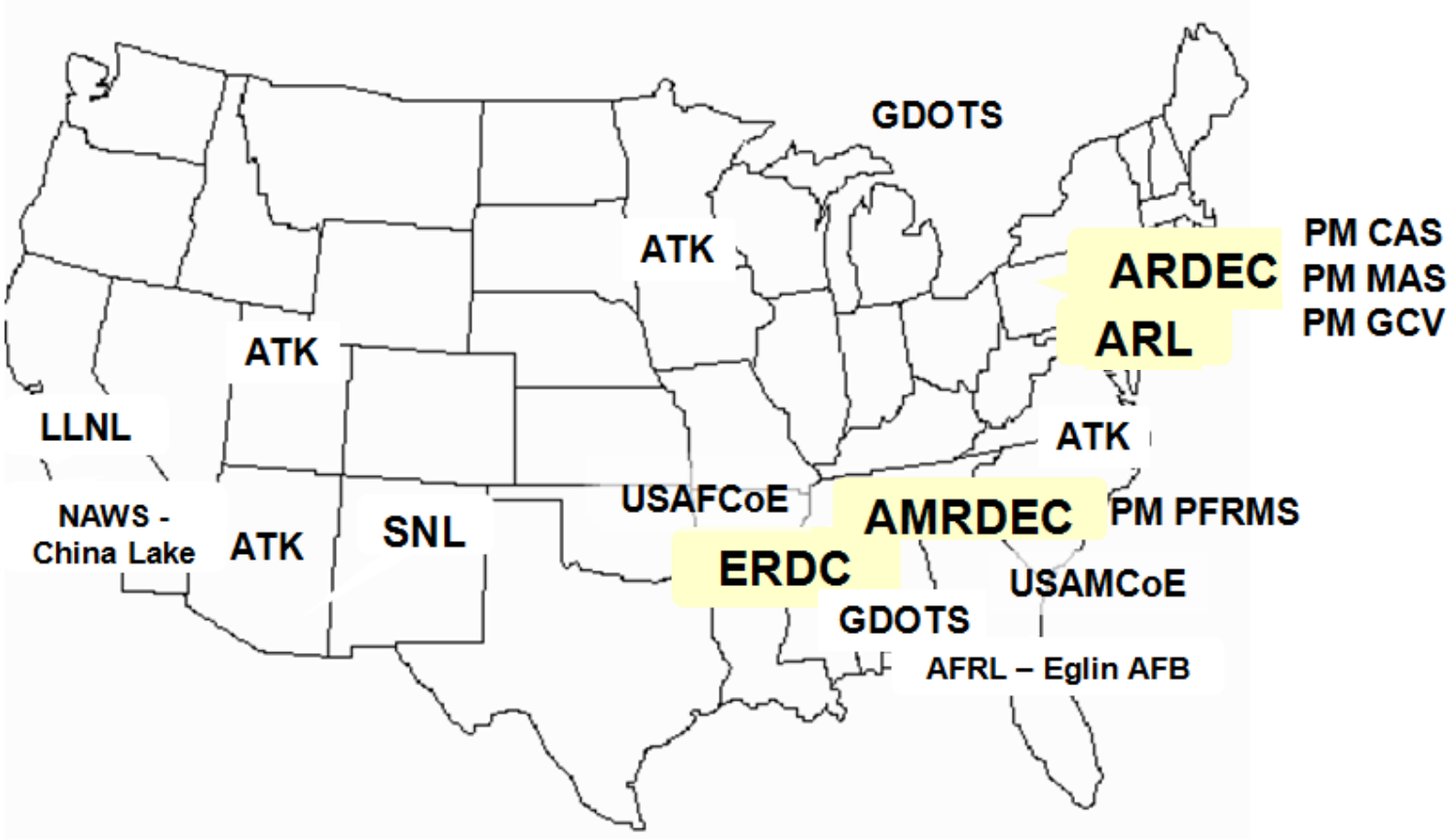
250mm GMLRS
105mm/155mm Cannon Artillery
30mm x 173mm Medium Cannon Caliber



Technology Transitions:

PEO AMMO (PM CAS, PM MAS) – Artillery and Medium Caliber
PEO M&S (PM PFRMS) – GMLRS Unitary Alternative Warhead
PEO GCS (PM GCV) – Medium Cannon Caliber

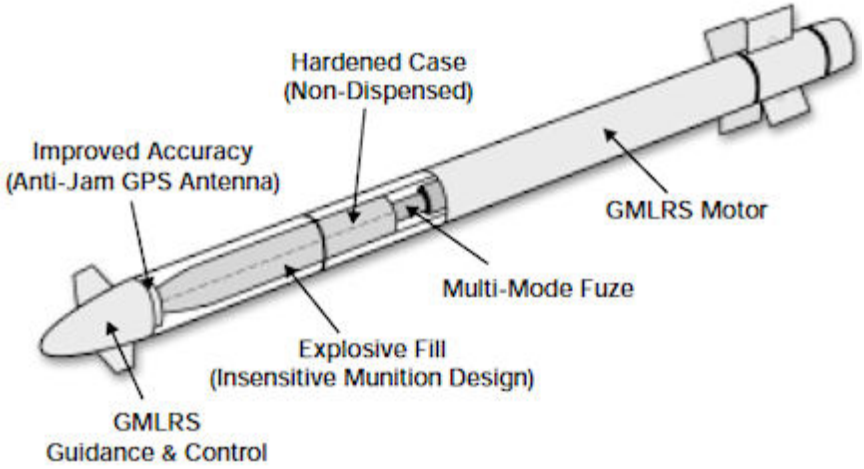
Integrated Product Team



Army Selectable Yield Unitary Warhead *(ASYU) - GMLRS*

- Unitary Warhead for GMLRS
- Scalable Multi-Mode Main Fill Explosive

  "Deflagrate-to-Detonate"



- Integrated Flight Demos @ WSMR – August 2012 (PM PFRMS)

Full Scale Arena Testing- ASYU (250mm)

Detonation

Mixed Mode

Deflagration

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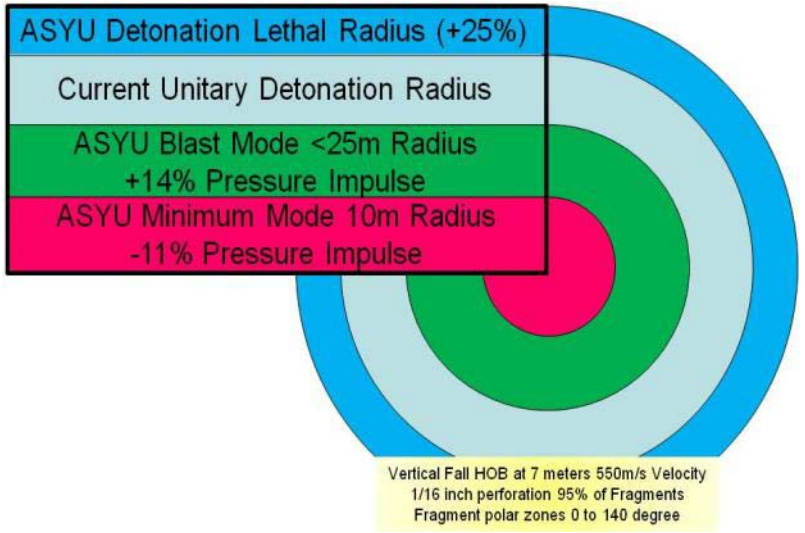
Sled Track Testing- ASYU (250mm)

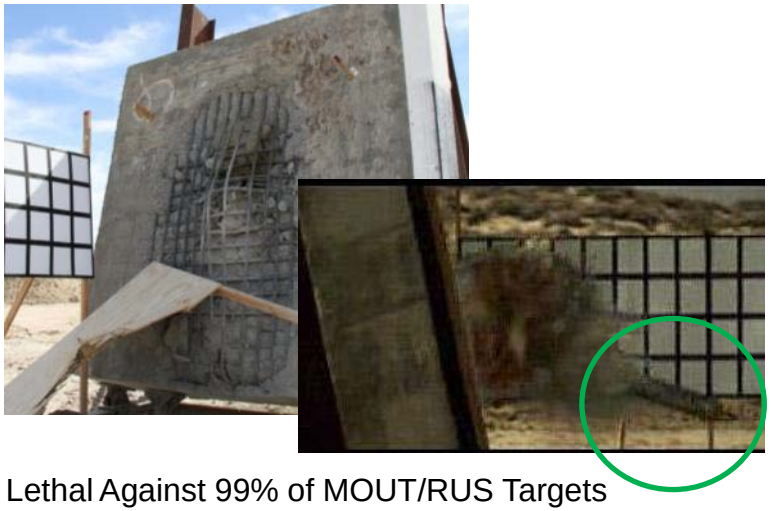
- Sled Track Test Target Defeat and Warhead Survivability
  - China Lake NAWC & Holloman AFB
- Sled Track Test Main Fill Explosive Survivability August 2012
- Integrated Flight Demos @ WSMR – August 2012 (PM PFRMS)

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Army Selectable Yield Unitary Warhead (ASYU)



- *Better Fragmentation Radius*
- *Beamspray Fragment Weight Doubled*
- *Perforation Capability Tripled*
- *More Explosive Payload Than Today*
- *Minimum (Urban) Mode Without UXO*



Lethal Against 99% of MOUT/RUS Targets

ASYU
Mode Selection With Better Than Today's Lethality
Don't Give Up Anything

Approved for public release; distribution unlimited.
Review completed by the AMRDEC Public Affairs Office
12 Mar 2011: FNS162.

105mm/155mm Cannon Artillery

Adaptive & Scalable Effects

Adaptive Effects Optimize Lethality

Scalable Lethality Controls Collateral Damage

Technologies Scale Up to Larger Calibers (i.e. 155mm) and Down to Smaller Calibers in Some Cases

Fuze & Power
- Advanced Proximity
- Guidance/Navigation Control
- Dual Output Electronic S&A Device
- EPIAFS Compatible Setter
- Thermal Battery

Unitary Warhead
- Selectable/Scalable Lethality
- Preformed/Adaptive Fragmentation
- Liners/Composites

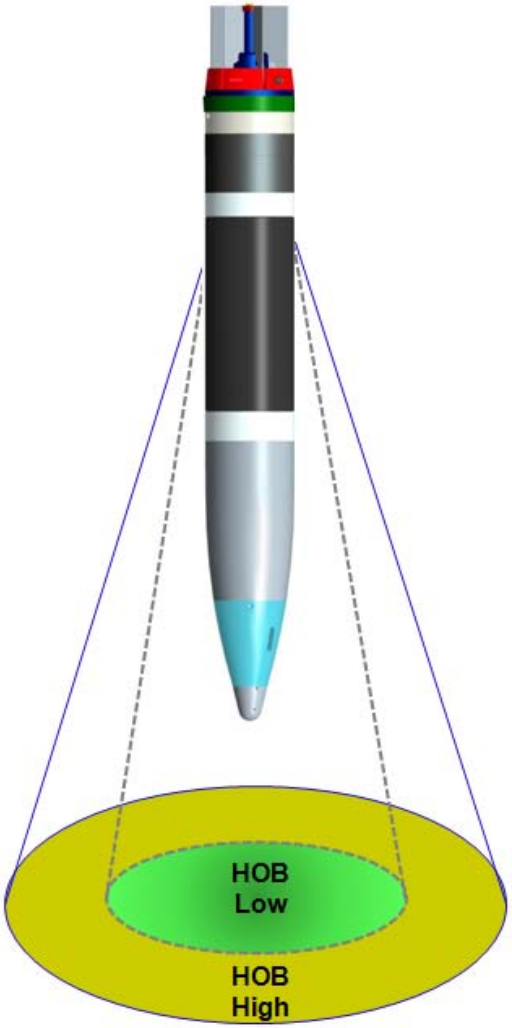
Advanced Energetics
- Combined Effects/Multi-mode IM HE
- Dual Purpose Energetics/Rocket Assist

Advanced Propulsion
- Coated Propellant
- Ballistic Efficiency/Flat Temp Profile
- Increase MV/Range
- Cooler Flame Temp
- Deterrent Migration/Shelf Life/Cost

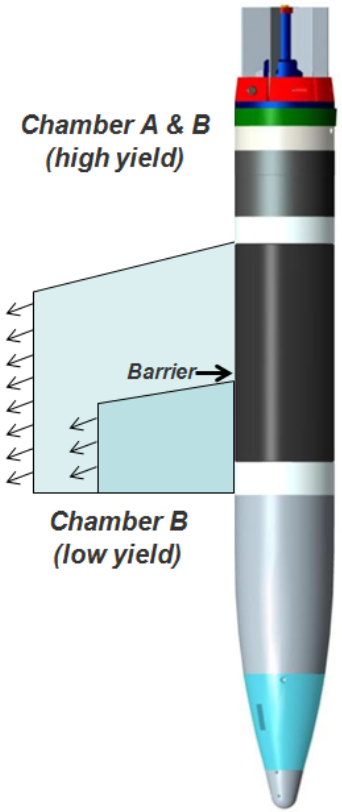
Demonstration Requirements
- Precision 105 CDD

Four Concepts Developed & Demonstrated

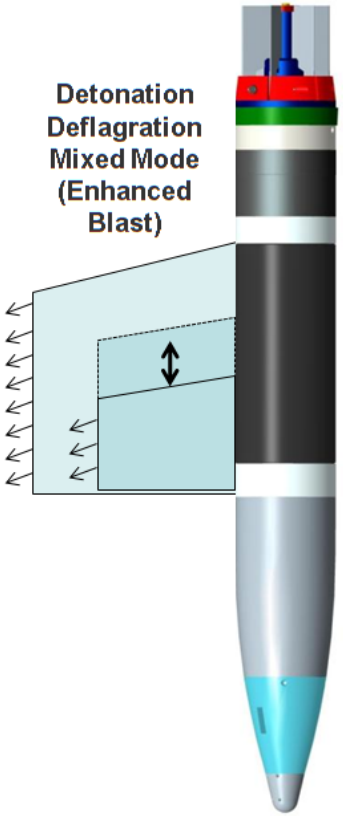
Composite
Pre-Formed Fragment



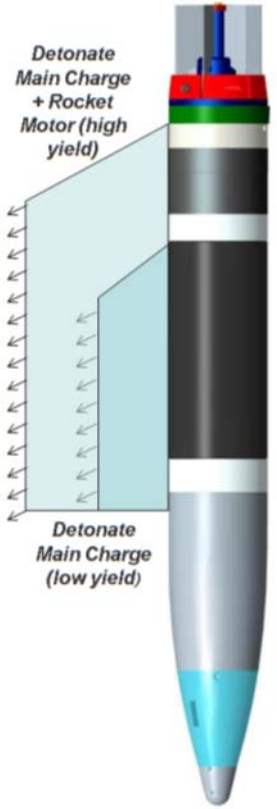
Compartmentalized



Deflagrate-to-Detonate



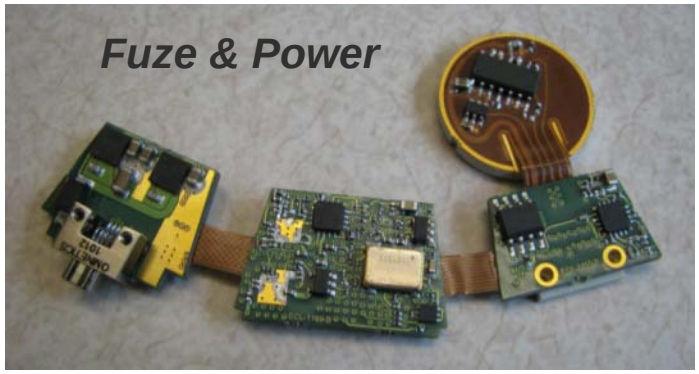
Dual Purpose
Energetic



105mm/155mm Cannon Artillery

Controlled Fragmentation Liners & Sleeves

Selectable Mechanisms



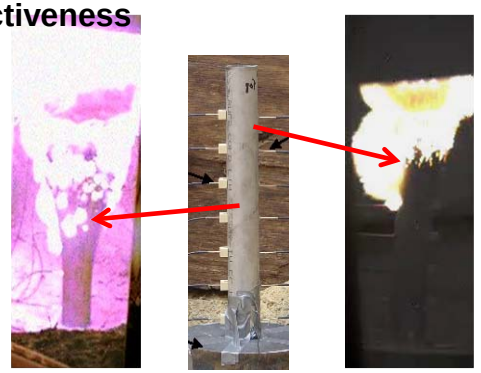
Concurrent Efforts for Integrated Systems

•Modeling & Simulation
•Virtual Integration
•Fragmentation Arena Tests
•Warhead Lethality/Collateral Damage Analysis/Effectiveness
•IM
• Interior Ballistics
• Structural Survivability
• Aeroballistics
•Integration
•Demonstration

Propulsion

Design Variable	Requirement	Achieved
Muzzle Velocity	500 m/s	525+ m/s
Max Operating Pressure	<53000 psi	36000 psi

Explosives



Velocity = 5.4 km/s Velocity = 1.7 km/s

Gun Tests

- Strength of Design
- Charge Establishment
- Ballistic Flight Tests
- Live Initiator Flight Tests
- Live Demonstrations

* Fired from Facility Mount with M20 105mm Tube (M119 Howitzer Tube)

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30mm x 173mm Medium Cannon Caliber

Improved Lethality & Effectiveness in Complex environments against targets in the open and behind cover & urban structures/walls.

Projectile Body

Hardened 4340 steel with modified chemistry to enhance toughness

PAX50 Explosive

Siliconized, RDX-based "Combined Effects Explosive" (CEX)

Tailored Progressivity Propellant

•Nitrochemie ECL (Extruded Composite Low-Vulnerability) Propellant
•Coated Propellants

Base Fuze

•Three-Mode Fuze
Point Det'n (PD)
Point Det'n w/Delay (PDD)
Air Burst (AB)
•MEMS S&A
•Compact Electronics
•Magnetic & Piezoelectric Setback Generators

Tungsten Nosecone

Pre-formed tungsten pellets fragments in tungsten alloy matrix

Ceramic Windscreen

Near net-shaped ceramic

➢ **MK44 Chain Gun**

30mm x 173mm Medium Cannon Caliber

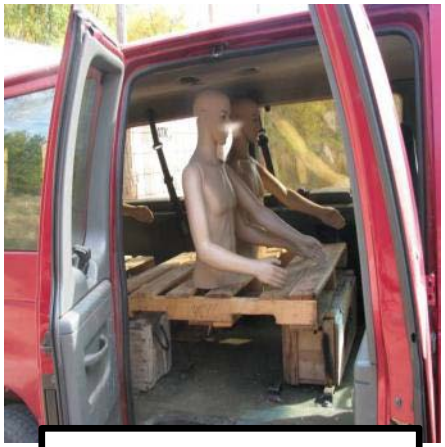
DEMONSTRATIONS:

1. Air Burst
2. PD against double reinforced concrete (DRC) wall
3. PDD against Adobe
4. PDD against Framed Wall Construction
5. PDD & AB against a Commercial Passenger Vehicle

DRC

Adobe

Framed Wall Construction



Passenger Van

30mm x 173mm
Medium Cannon Caliber

30mm x 173mm
Medium Cannon Caliber

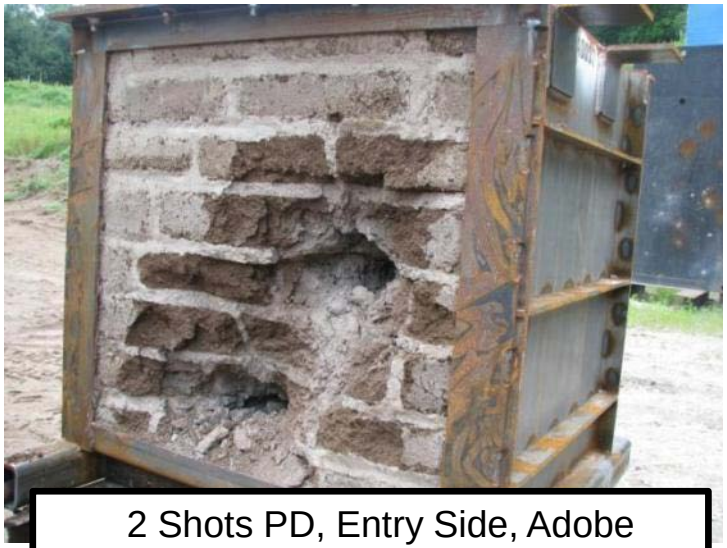
1 Shot PD, Entry Side, DRC

1 Shot PD, Exit Side, DRC

30mm x 173mm Medium Cannon Caliber

1st Shot PD, Exit Side, Concrete Block Wall

2nd Shot PD, Entry Side, Concrete Block Wall



2 Shots PD, Entry Side, Adobe

1 Shot PD, Entry Side, Hole in Adobe

30mm x 173mm
Medium Cannon Caliber

STAR 30mm
Point Detonation with Delay (PDD)
Adobe
27 July 2011

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30mm x 173mm
Medium Cannon Caliber

STAR 30mm
Point Detonation with Delay (PDD)
Framed Wall Construction
5 October 2011

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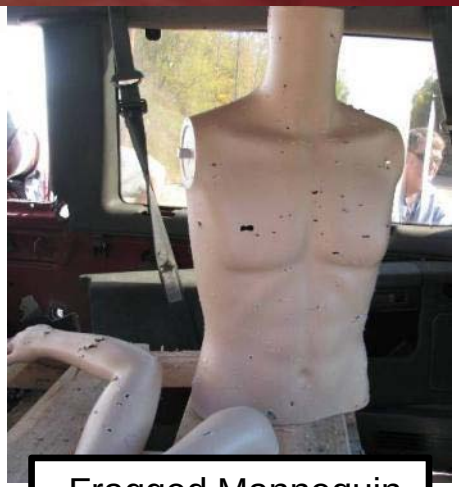
30mm x 173mm Medium Cannon Caliber

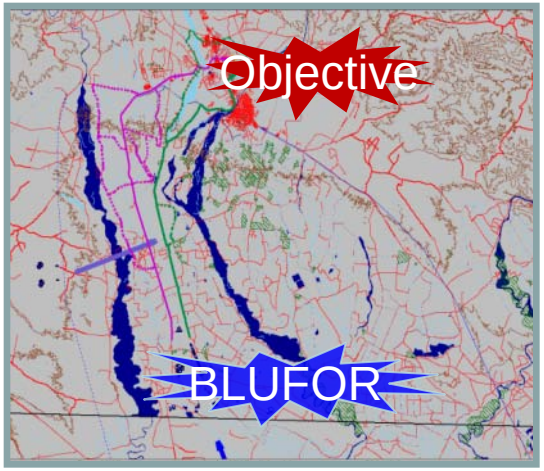
PDD –Blast and Fragment Effects

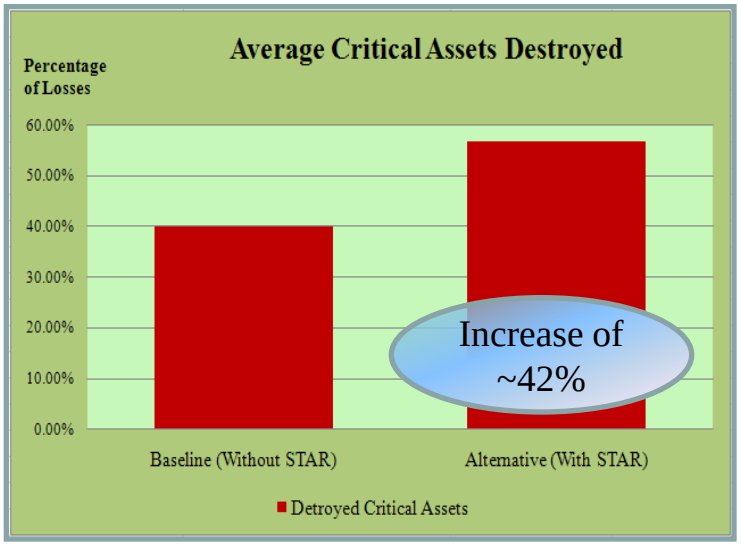


Fragged Mannequin

Fragment Pattern on Van Roof

Modeling & Simulation to Optimize Effectiveness in the Urban Environment





- ***Force Level Effectiveness Analysis***
- ***RDECOM Modeling Architecture for Technology, Research, and Experimentation (MATREX)***
- ***Application to CAMEX***

85% Fewer Individual Combatant Losses
17% Fewer Aircraft Losses
6% Fewer Ground Platform Losses

154% More OPFOR Individual Combatant Losses
34% More OPFOR Ground Platform Losses
30% More OPFOR Air Defense Losses

—Scalable Lethality Enabled Engagement of Targets in Collateral Damage Sensitive Sites

—Attacks on otherwise protected targets forced relocation of critical OPFOR assets and prevented OPFOR from returning fire

—Destruction of OPFOR Air Defense Systems Enabled BLUFOR Aircraft to Participate in Battle and Identify & Engage Targets

Scalable Lethality Benefits the Entire Force

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Conclusion

- ***Scalable Effects Technologies Demonstrated in Integrated Munition Systems for Medium Cannon Caliber, Cannon Artillery and Rocket Artillery to Improve Warfighter Effectiveness***

- ***Collaborative Effort included ARDEC, AMRDEC, ARL & ERDC (Army), NAWS-CL (Navy) & AFRL-EAFB (Air Force) and many Industry participants***

- ***Technologies, Government and Industry are Ready for EMD***

Contact Information

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