

# GENERAL DYNAMICS

Ordnance and Tactical Systems



## 25mm Airburst Fuze Development NDIA Joint Armament Conference

21st Century Weapon Systems - Providing the Right Response™

**Event 2610**  
**Seattle, WA**  
**14-17 May 2012**



# Topics

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- 25mm Bushmaster Family
- US Army Contract History
- Airburst Cartridge
- Airburst Operation
- Fuze Communication
- Lethality and Capability
  - ↗ 8" Double Reinforced Concrete Wall Perforation
  - ↗ Warhead Lethality
  - ↗ Burst Point Accuracy
- Summary

# 25mm Bushmaster Family

## Original Bushmaster Family



**M910**

**TPDS-T**



**M791**

**APDS-T**



**M792**

**HEI-T/SD**



**M793**

**TP-T**

## AP Upgrade



**M919**

**APFSDS-T**

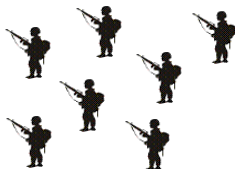
## HE Upgrade



**25mm**

**Airburst**

# Current Capability Gap: Modern target spectrum



Gap to fill with  
MPAB-T/SD



M792  
HEI-T/SD



M791  
APDS-T



AP gap filled  
with M919



Airburst



M919  
APFSDS-T

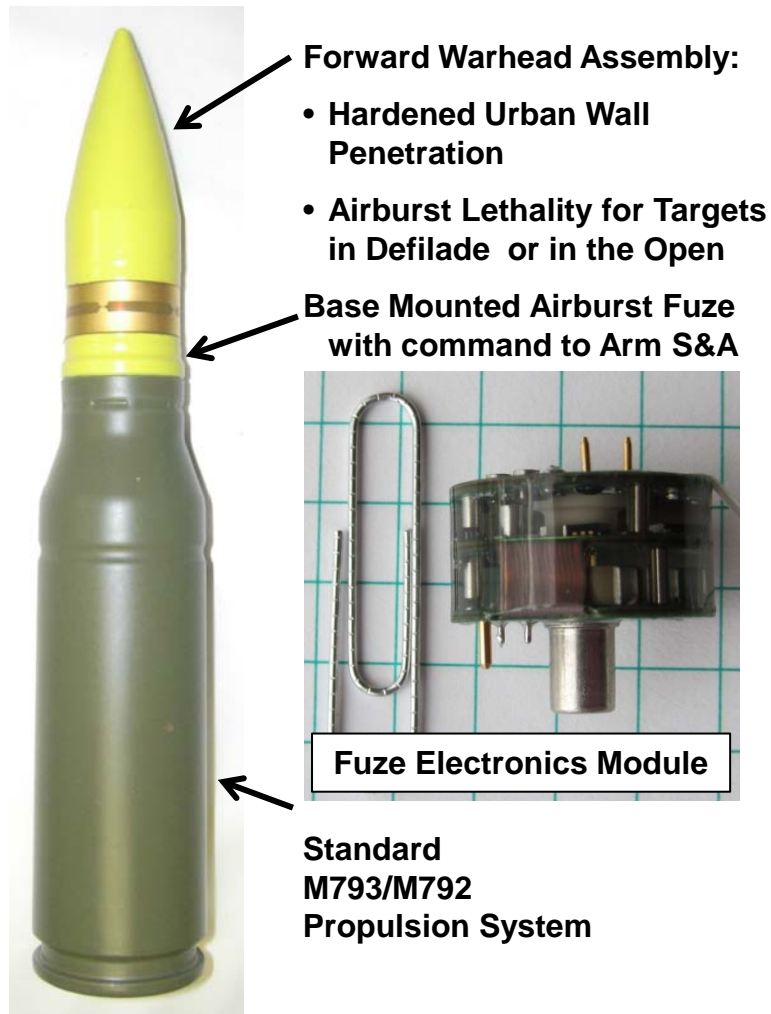
**Airburst fills capability gap against troops in  
trenches, barricades and buildings**

# Scalable Airburst Fuze US Army Contracts

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- **2007 Contract; July 2007 to August 2008**
  - Baseline fuze safety testing
  - Baseline M242 integration and testing
  - Develop selectable arming distance feature
- **2008 Contract; September 2008 to October 2009**
  - Army Fuze Safety Board reviews
  - Fuze safety testing
  - Develop selectable PD/PD delay feature
  - Long range M242 burst point accuracy testing
  - M230 weapon integration
  - Long range M230 burst point accuracy testing
- **2010 Contract; February 2010 to December 2011**
  - M242 fuze contact robustness
  - Additional fuze safety testing
  - Increase fuze reliability and accuracy
  - Limited warhead development for wall breaching capability

# 25x137mm Airburst Cartridge



- Greater anti-personnel lethality over the M792
- Ability to reach troops in defilade/trenches
- 8" Double Reinforced Concrete (DRC) wall perforation
- Gunner selectable PD/PD delay
  - PD: Explode on a target
  - PD Delay: Penetrate and explode inside a target
- Gunner selectable arming via a command to arm Safe and Arm (S&A) device.
  - Default arming: Projectile arms at safe separation distance, 50-100m
  - Short arming: Projectile arms within 10-25m for short range engagements

# Airburst Cartridge Operation

## Step 1, Gunner Selects:

- 1. Airburst Mission:**  
Vehicle fire control determines range, computes time to burst, and programs fuze with PD as back up
- 2. Point Detonation Mission:**  
Normal engagement
- 3. Point Detonation Delay Mission:**  
Normal engagement, detonation delays 4-5ms after impact
- 4. Arming:**  
Default is safe separation range 50-100m with gunner option for "short" 10-25m arming if needed

## Step 2, Arming

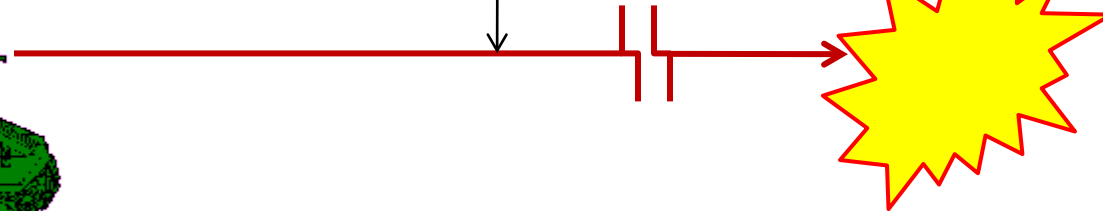
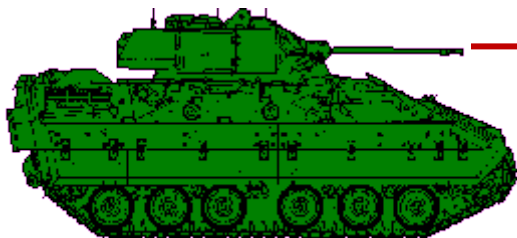
Fuze arms at preset flight time beyond the safe separation range or gunner selected "short" range

## Step 3, Terminal Effects

- Airburst on target
- Point Detonation
- Point Detonation Delay
- Self Destruct

### Target:

- Anti-personnel in open or defilade
- Light armor vehicle
- Hardened urban walls





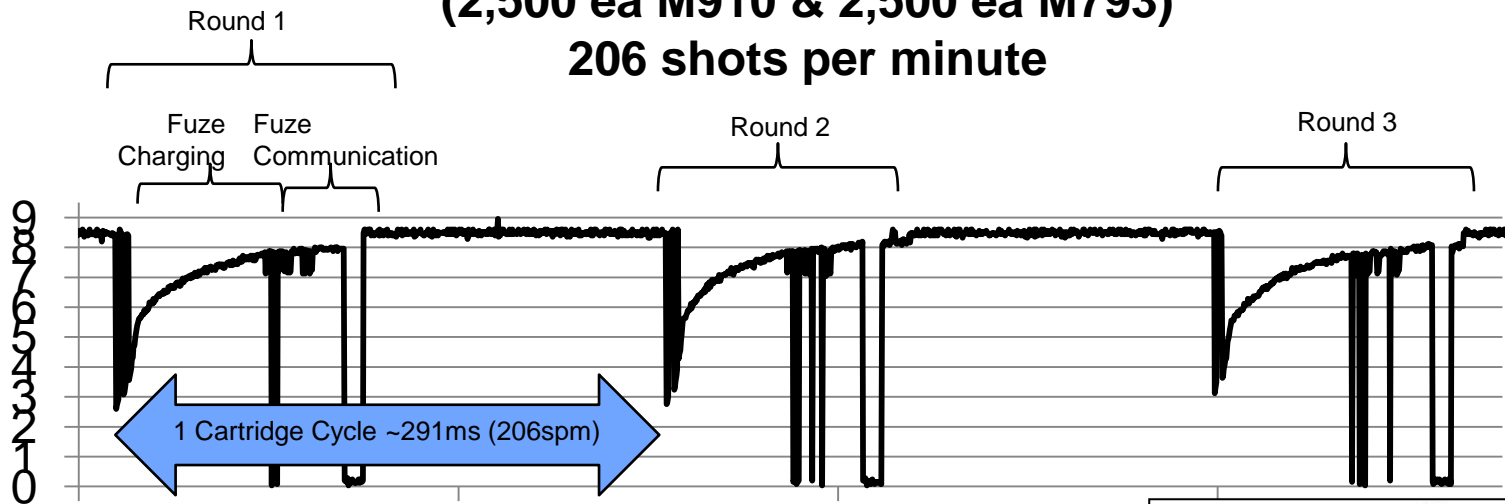
# Capability / Lethality / Accuracy



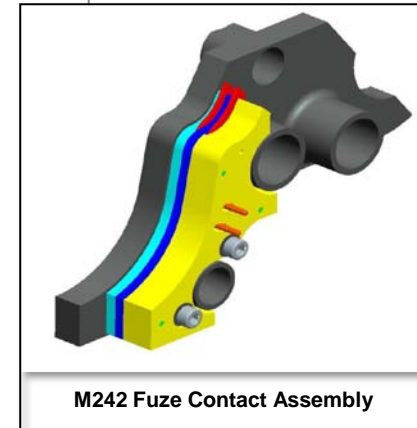
# Fuze Communication Robustness

## Valid Airburst Fuze Communication after 5000 Cartridge Cycles (2,500 ea M910 & 2,500 ea M793)

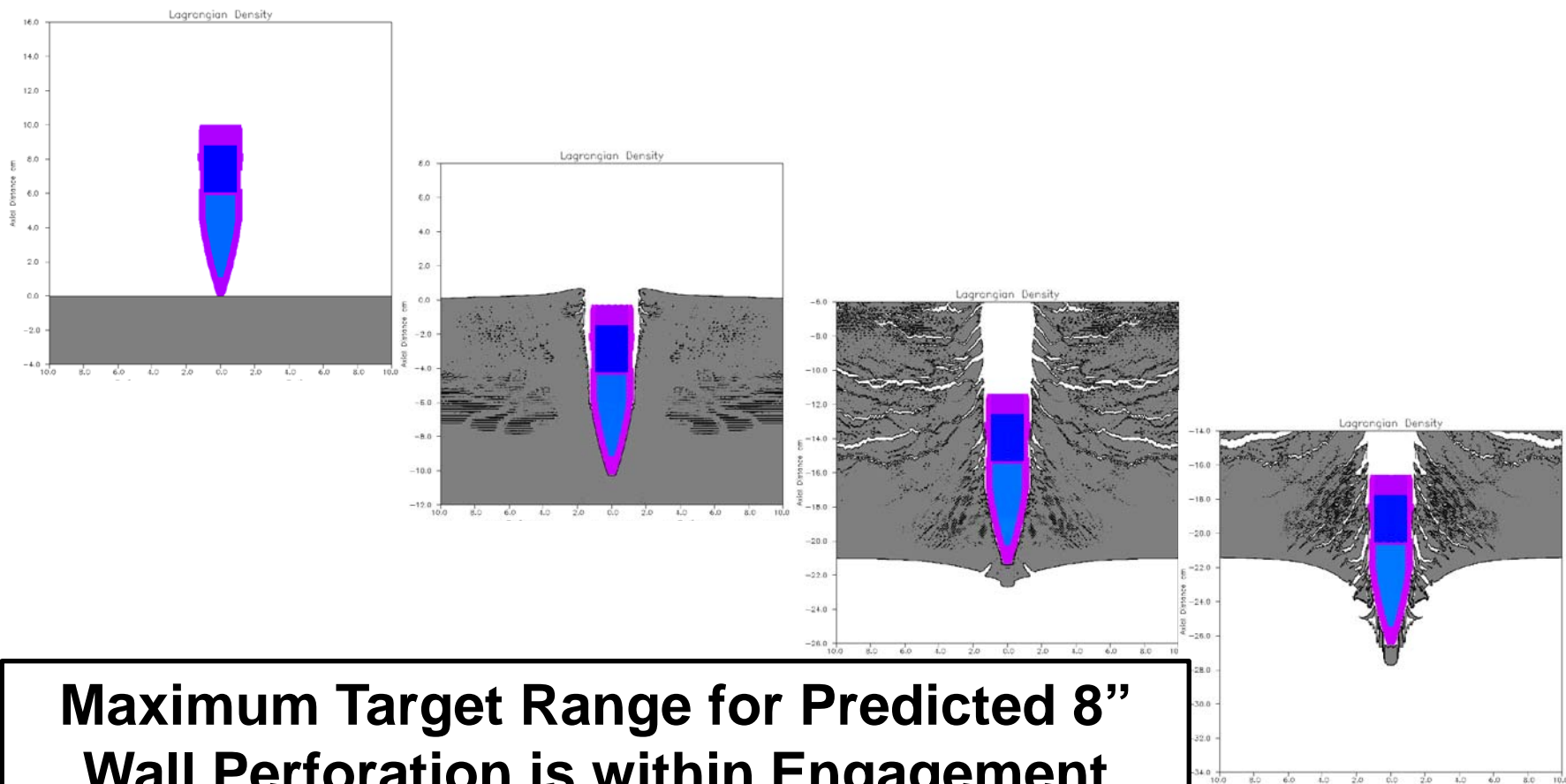
206 shots per minute



Fuze contact assembly bolts to the M242 weapon using existing holes in the feeder frame

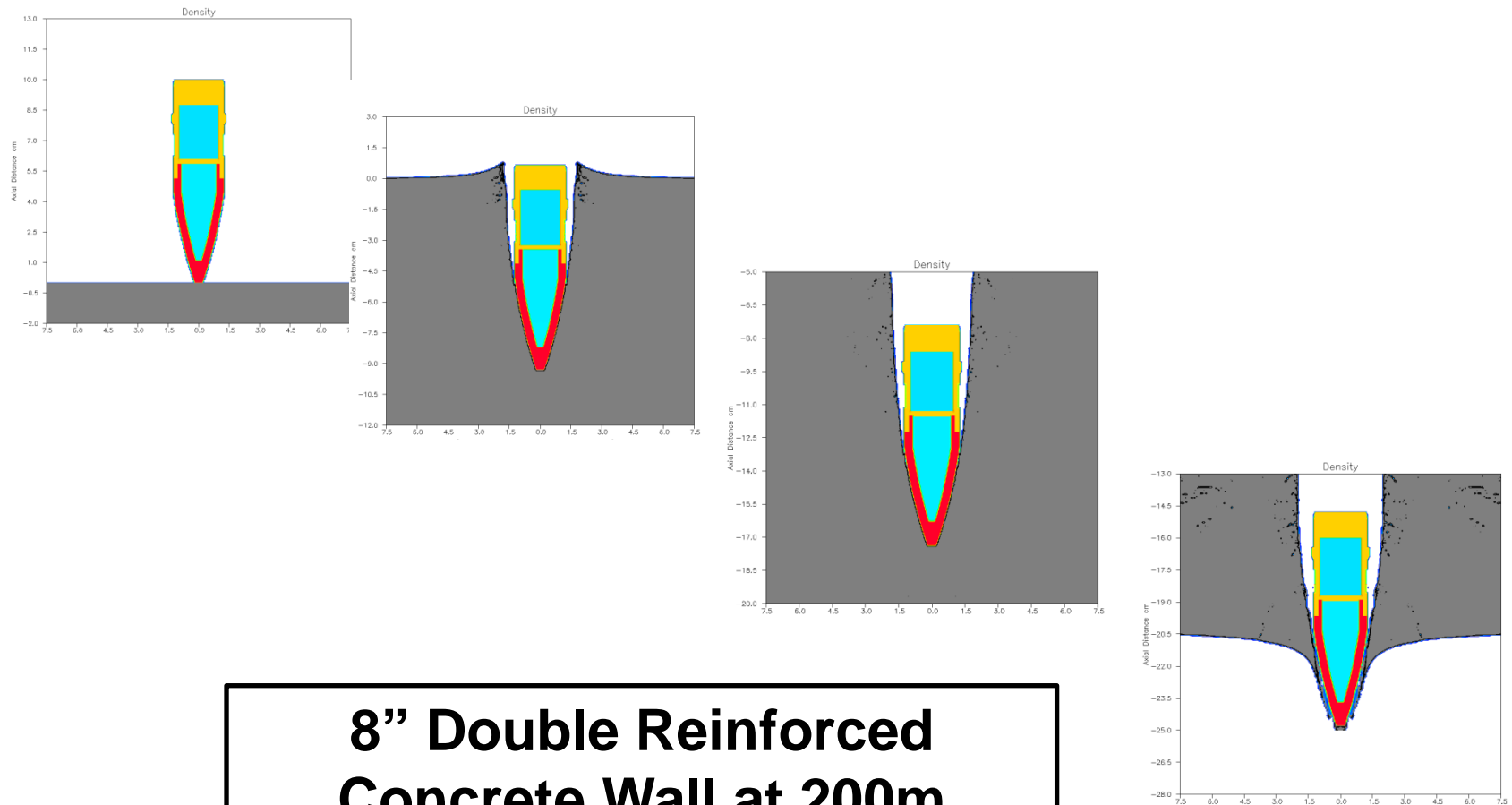


# Models and Simulation – Wall Defeat



**Maximum Target Range for Predicted 8”  
Wall Perforation is within Engagement  
Range**

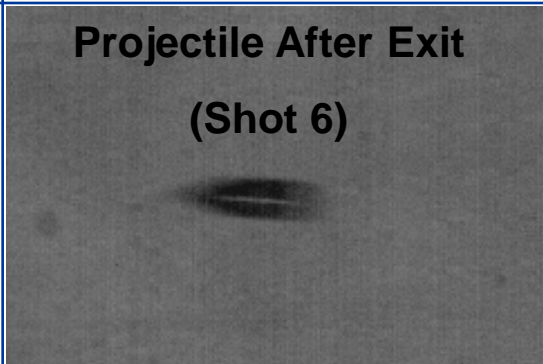
# Models and Simulation – Wall Defeat



**8" Double Reinforced  
Concrete Wall at 200m**

# Wall Defeat Test Results

Projectile After Exit  
(Shot 6)



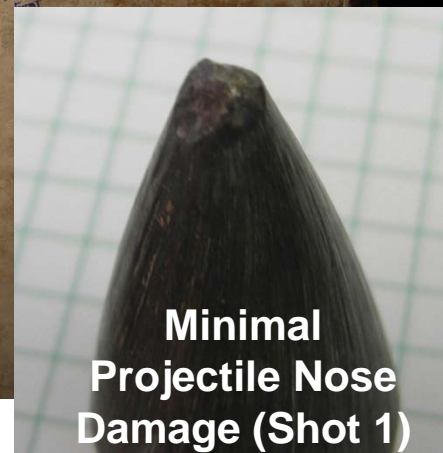
**Front of 8" DRC Wall**  
**All Projectiles Perforated Wall**  
**Additional Wall Testing Planned**



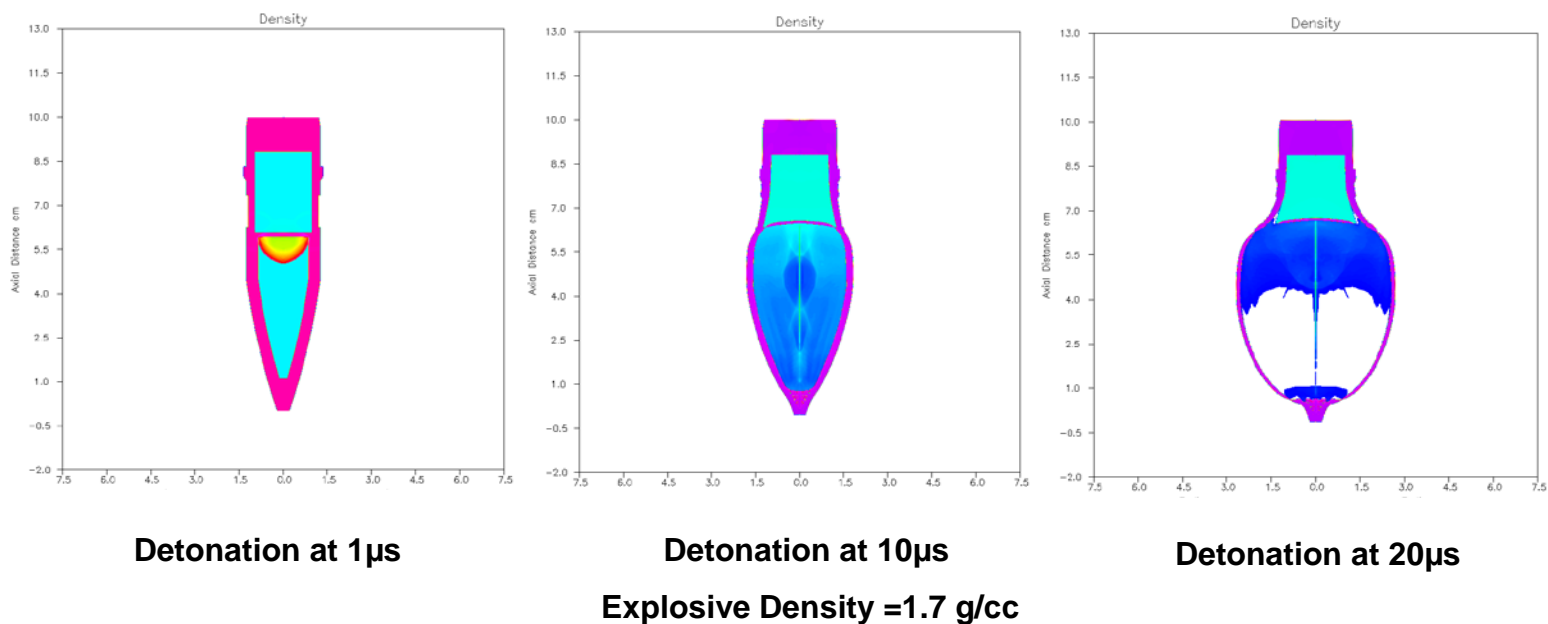
Typical Exit Hole  
(Shot 4)



Minimal  
Projectile Nose  
Damage (Shot 1)



# Models and Simulation – Lethality



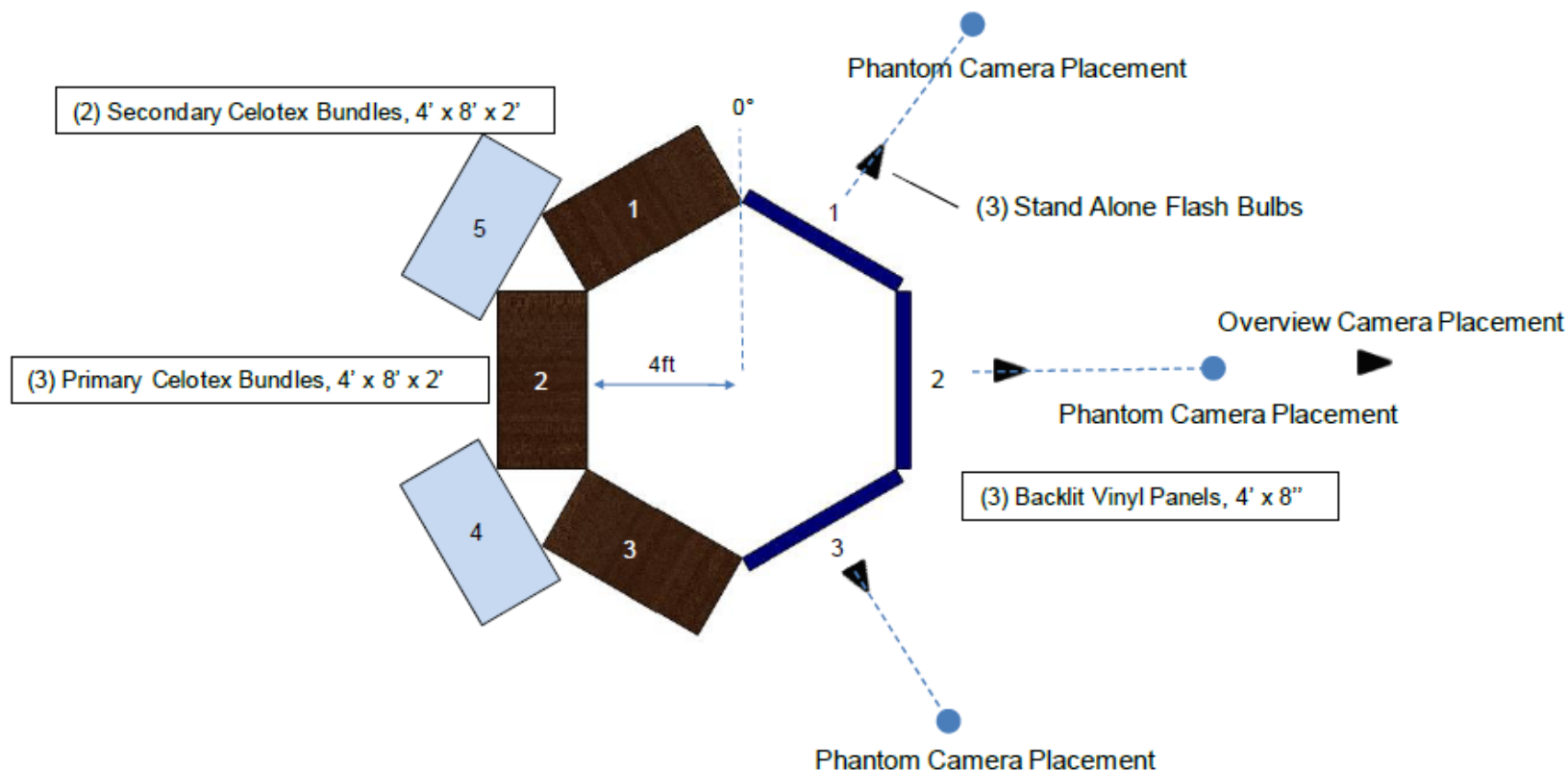
**HULL Prediction yields greater lethality over the M792 HEI.  
Greater lethality over the M792 verified with arena test.**

# Lethality – Arena Test



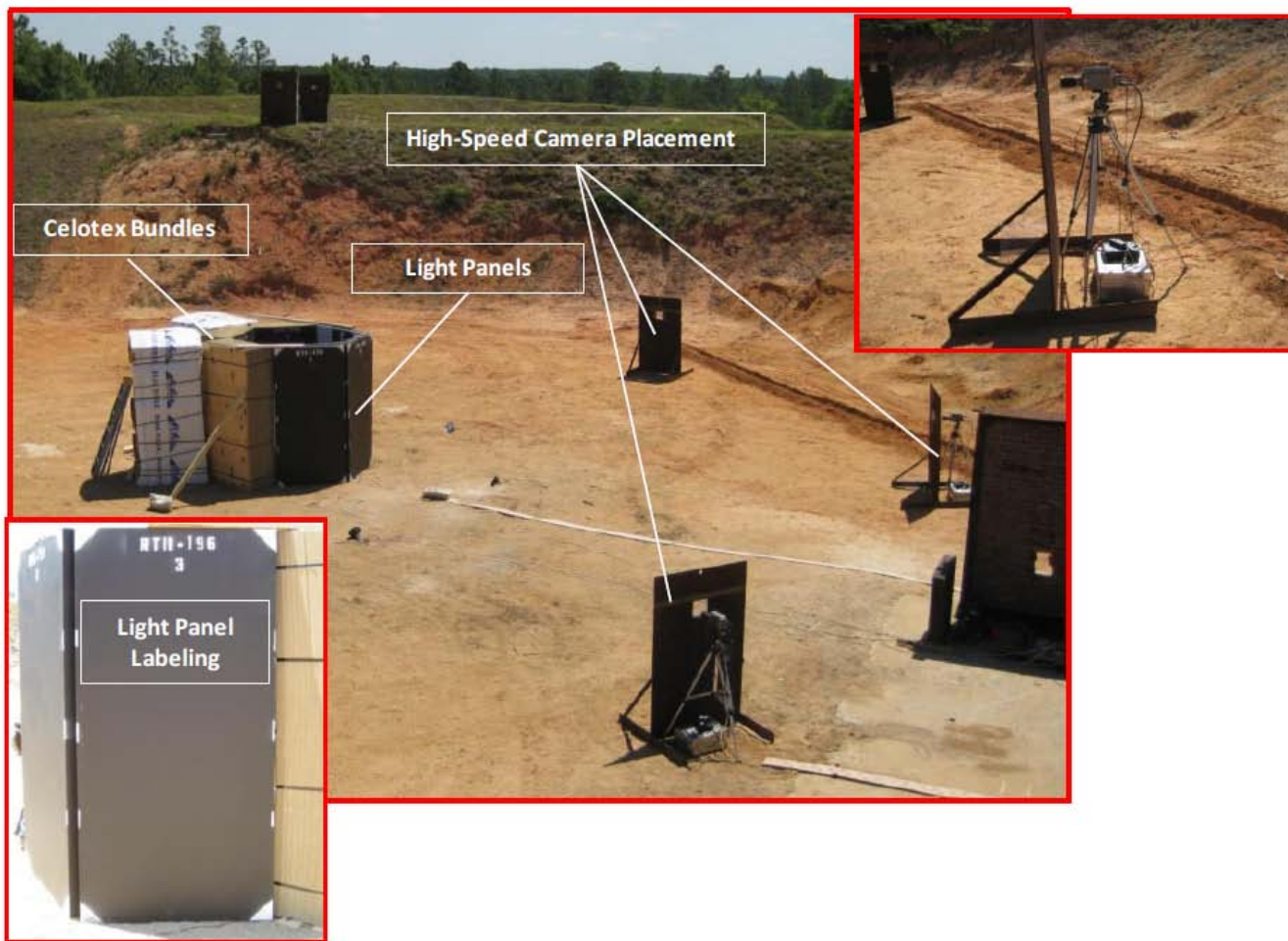


# Lethality – Arena Test

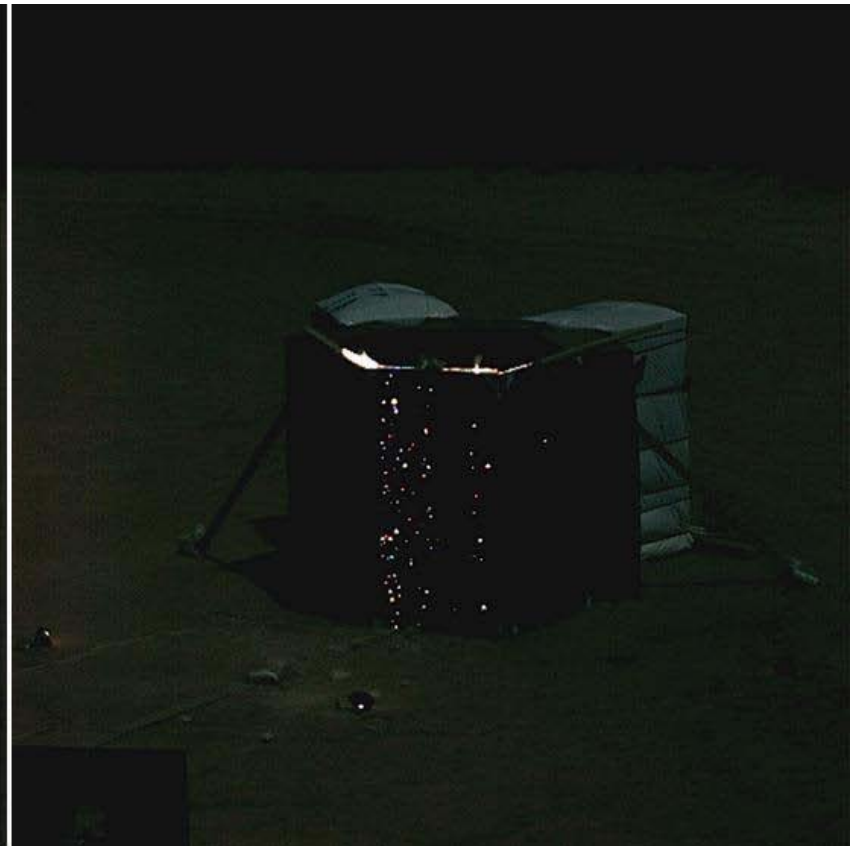




# Lethality – Arena Test



# Lethality – Arena Test



# Lethality – Arena Test



Typical warhead fragments



Typical body fragments

Typical body base and warhead closure plate fragments



# Accuracy

Airburst accuracy testing conducted at contract end to evaluate improvements with the addition of:

- Muzzle Velocity Correction (MVC)
- Increased fuze calibration time during fuze communication

Results: Airburst improvements in both average and standard deviation observed at super-sonic ranges



**600m Projectile  
Catch Box**



**Test Barrel with radar, high speed video,  
and flash detector**



**Standard M242  
Muzzle Brake (left)**

**MVC Brake (right)**



# Accuracy

Target Range Across Temperatures	Average Airburst Result
600m at +63°C, +21°C, and -46°C	598m
1500m at +63°C, +21°C, and -46°C	1501m
2500m at +63°C, +21°C, and -46°C	2480m



# Accuracy



600m  
Target  
Area



Airburst  
Signature  
at 600m



# Summary – 25mm Airburst



- More lethality against troops in the open plus the ability to reach targets in defilade, trenches, and behind sandbags
- Single shot 8” double reinforced concrete wall perforation
- Gunner selectable PD/PD delay for detonation on or within a target
- Gunner selectable arming range for safe separation or “short” range arming for close range engagements

Airburst solution offers increase lethality and capability over traditional HE ammunition in a single cartridge



# Questions