Advanced Light Combat Vehicle Armament (ALACV) Air Bursting Munition

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Briefing Agenda

- Objectives
- Demonstration Vehicle Constraints
- Case Length Determinations/Mann Barrel Interface
- Body Sleeve
- Baseline Body Design Analysis
- Fuze
Objectives

- Develop a cartridge that will burst at a pre-determined location
- Show an increase in lethal area of 400% when compared to a 30 x 173 HEI projectile with a PD fuze
PROBABILITY OF INCAPACITATION GIVEN A BURST

Warhead: Generic 30mm
Range: 1000 m - Burst Height: 0.00 ft
Prone Target - Incapacitation Criterion: 30 Second Assault - Body Part: Whole Body
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Warhead Modeling

M789 (for fragmentation comparison)

- PBXN-5
- Frag data available for comparison

Tank-automotive & Armaments COMmand
M789 fragmentation comparison

Retaining Ring? (not included in model)

Excellent Agreement!
M789 fragmentation comparison

Shaped Charge Jet (momentum average velocity in modeling)

Excellent Agreement!
M789 fragmentation comparison
Preliminary Baseline
Base Fuzed

- $t=11.2\%$ (0.0885 in)
- $t=22.5\%$ (0.1770 in)
- $t=33.7\%$ (0.2655 in)
Steel shell thickness $t$, in

Mass weighted number of fragments $N/M$ (m > 3 grains)

Preliminary Baseline
Base Fuzed
Static Configuration (ie: like arena test)

- $t=22.5\%$ (0.1770 in), abw01
- $t=15.0\%$ (0.1180 in), abw02
- $t=26.2\%$ (0.2065 in), abw03
- $t=18.7\%$ (0.1475 in), abw04
- $t=30.0\%$ (0.2360 in), abw05
- $t=33.7\%$ (0.2655 in), abw07
- $t=11.2\%$ (0.0885 in), abw06
ALACV A/B Warhead

Downselected Baselines

Rear Fuze Configuration
(concept 12, abw01)

Nose Fuse Configuration
(concept 9a, abw13)
Rear Fuze Configuration, concept 12, abw01
Nose Fuze Configuration, concept 9a, abw13

Rear Fuze looks better
Rear Fuze Configuration, concept 12, abw01
Nose Fuze Configuration, concept 9a, abw13
Fragmentation Testing

- Test Set-up
- Original Warhead
- X-ray Result
- Collected Frag
- High Speed Photography

- Velocity Distribution
- Mass Distribution
- Required Design Information
- Less expensive/time than Arena
- Final Prototype Arena Testing
Base Initiated Steel Baseline
Finite Element G-load analysis
Finite Element G-load analysis

Warhead Survives Full Load

Van Mises stress plot (psi)
The body maximum stress is approx. 105,000 psi.

The model assumes a continuous boundary between the top and bottom body. If the top/bottom body are threaded together, the stress level would be much higher.

Ignore stress at these areas

40mm base bullet
• In-house Design of a Modular Timed Fuze
  – Maximum Use of Off-The-Shelf Components
  – Pre-set Time Input
  – Single Shot Test Firing Only

• CRADA with Industry
  – Define Interfaces between Electronics/S&A
  – Partner to Demo Advanced Designs & Multiple Mission Modes
ALACV Baseline Projectile

S&A

Electronics