TACOM

Lethality, Survivability, Mobility and Sustainment for America's Army

Advanced Light Armament for Combat Vehicles

NDIA Guns and Ammo Symposium

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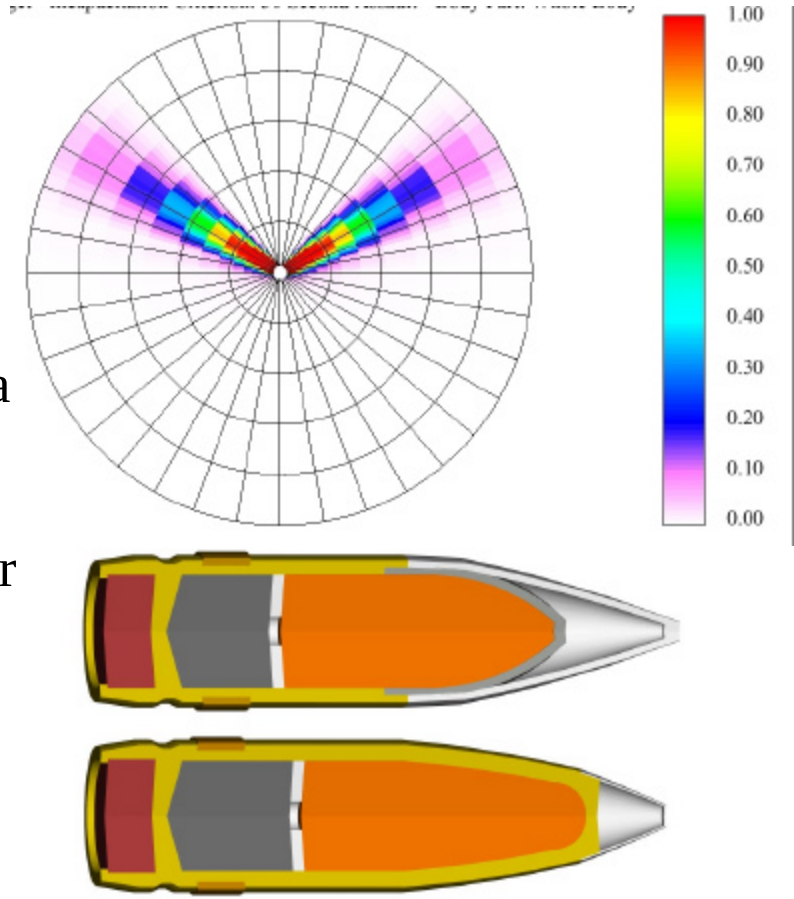
ALACV A/B Warhead

Baseline Design

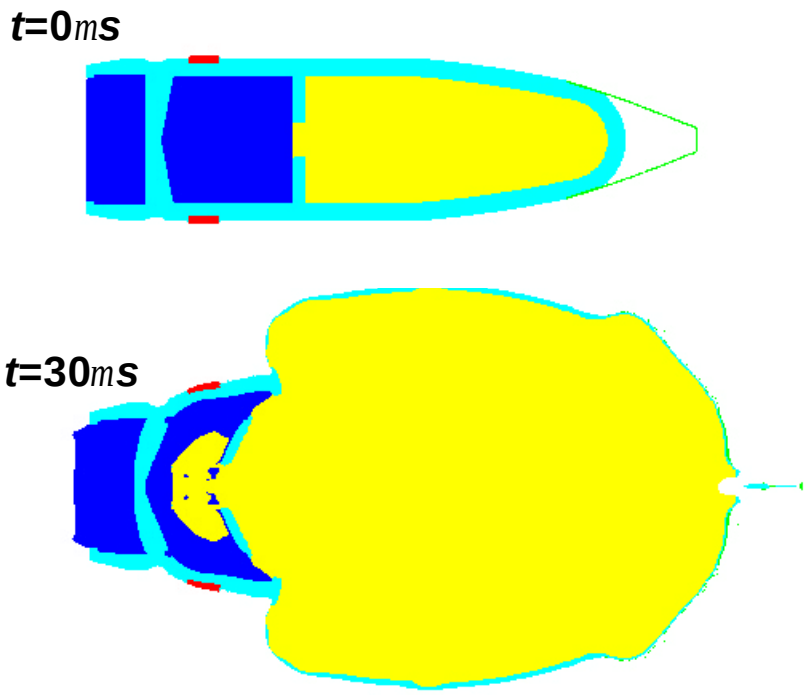
STO Objectives - Exit Criteria Air Bursting Munitions

- Develop and demonstrate air bursting capability in a 40mm cannon system
  - Exit Criteria:
    - Achieve a 400% increase in lethal area over a baseline 30mm HEI/PD (PGU-13B) round
    - Air Burst within ±5 meters of its set air burst point
    - Improve shape of lethal area over current "bat-winged" fragmentation plots

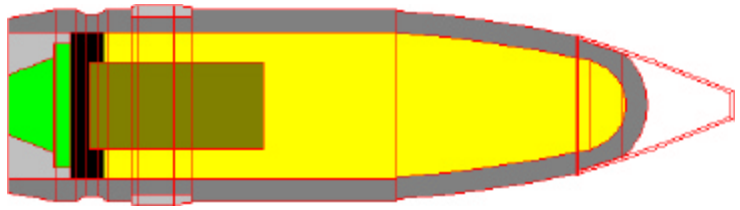
Generic 30mm



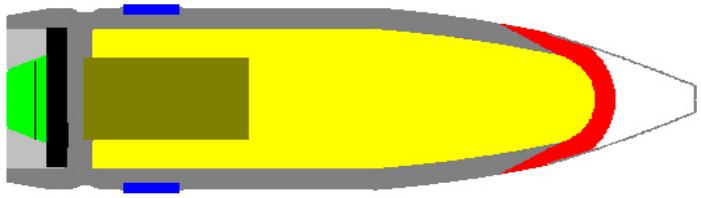
ALACV A/B Warheads



Downselected Baseline (Gen 1)



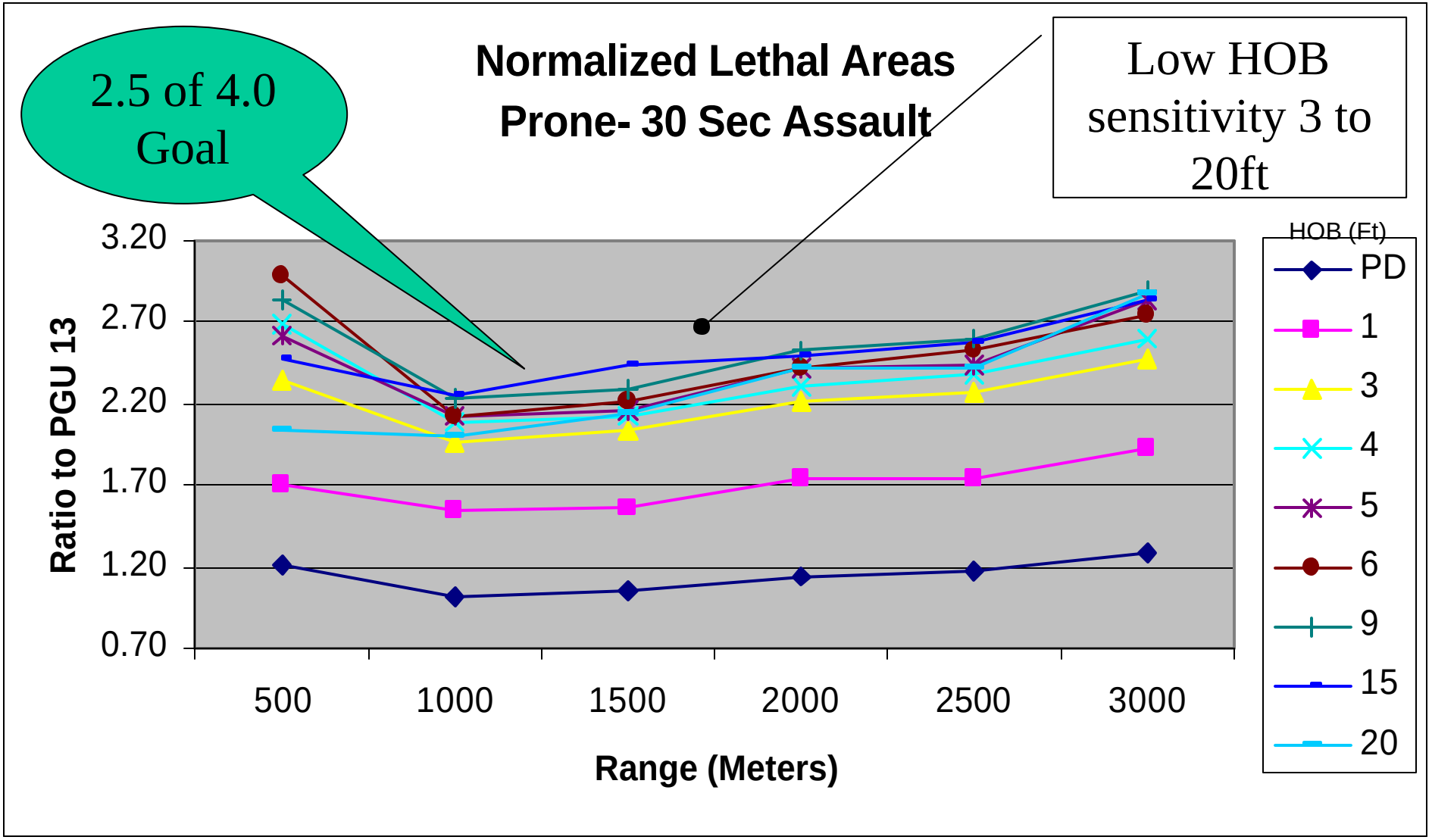
Gen 2 – Reduced Fuze Volume



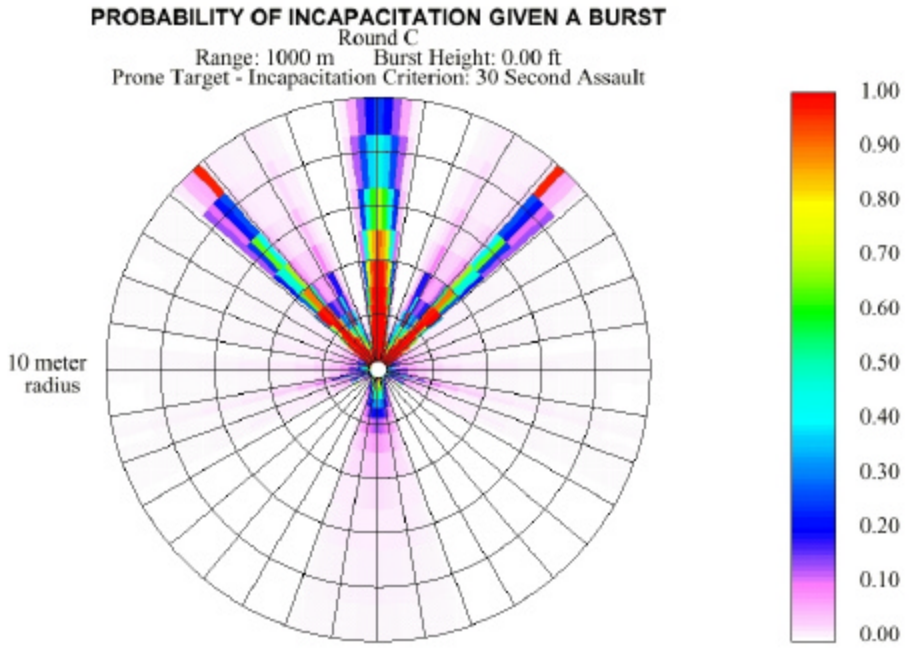
Gen 3 – Preformed Fragments

Provides forward Anti-Personnel and Anti-Materiel fragments (vehicle sensors, UAVs)

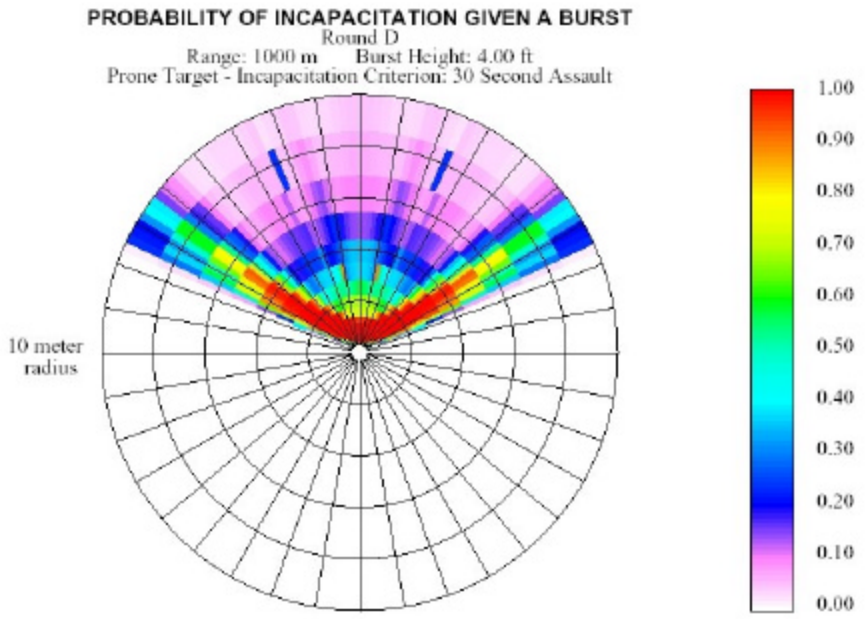
Baseline Design



AMSAA Results
30mm PGU 13 and ALACV Baseline



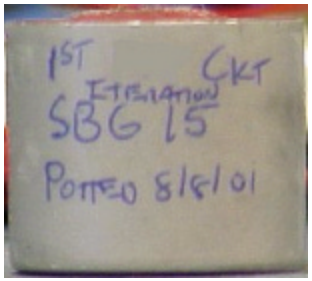
PGU-13



ALACV Baseline
With rear fuze

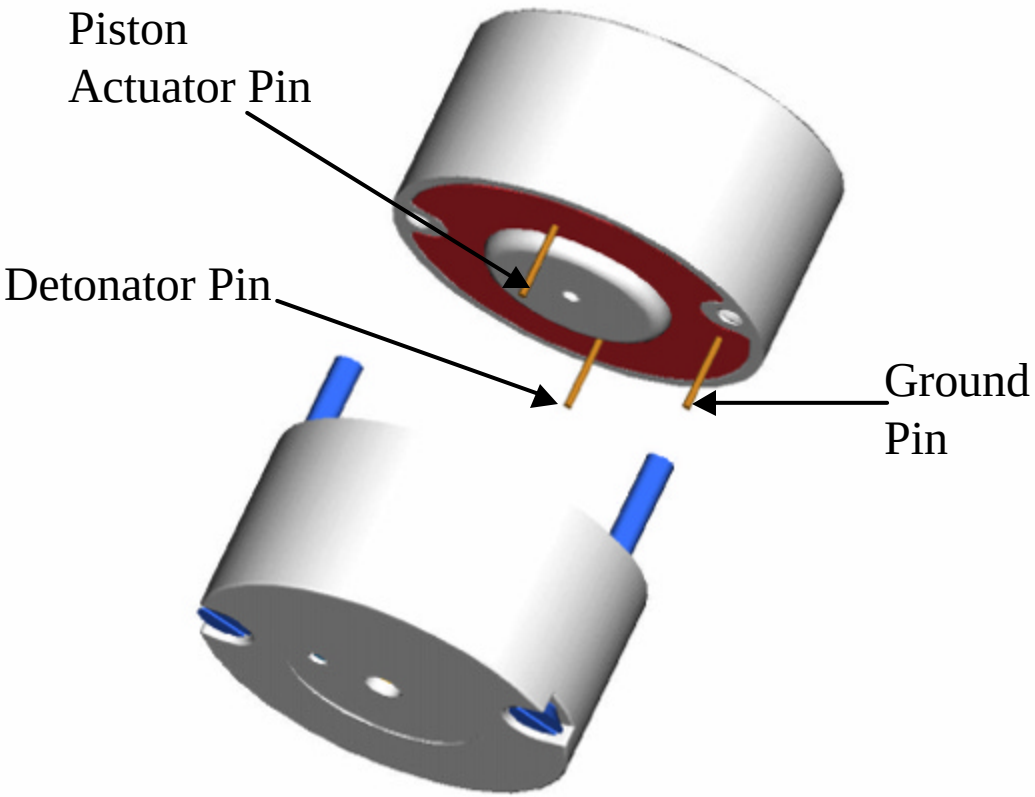
Demo Fuze Electronics

- First prototype units have been fabricated
  - Currently undergoing laboratory testing
  - 5 units will be subjected to 100,000 g's in ARDEC 2 in. airgun
    - Testing for stability of components when subjected to high g shock
    - 1 unit tested to 96,000g's – circuit functioned!

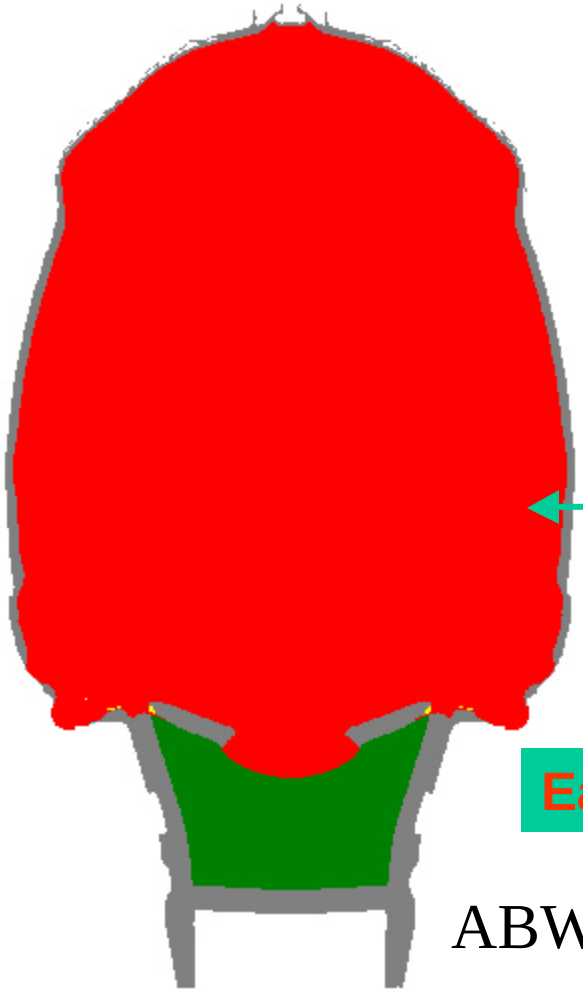


- Preliminary design for alternate timing circuit complete
  - Components being ordered
  - Will breadboard and lab test

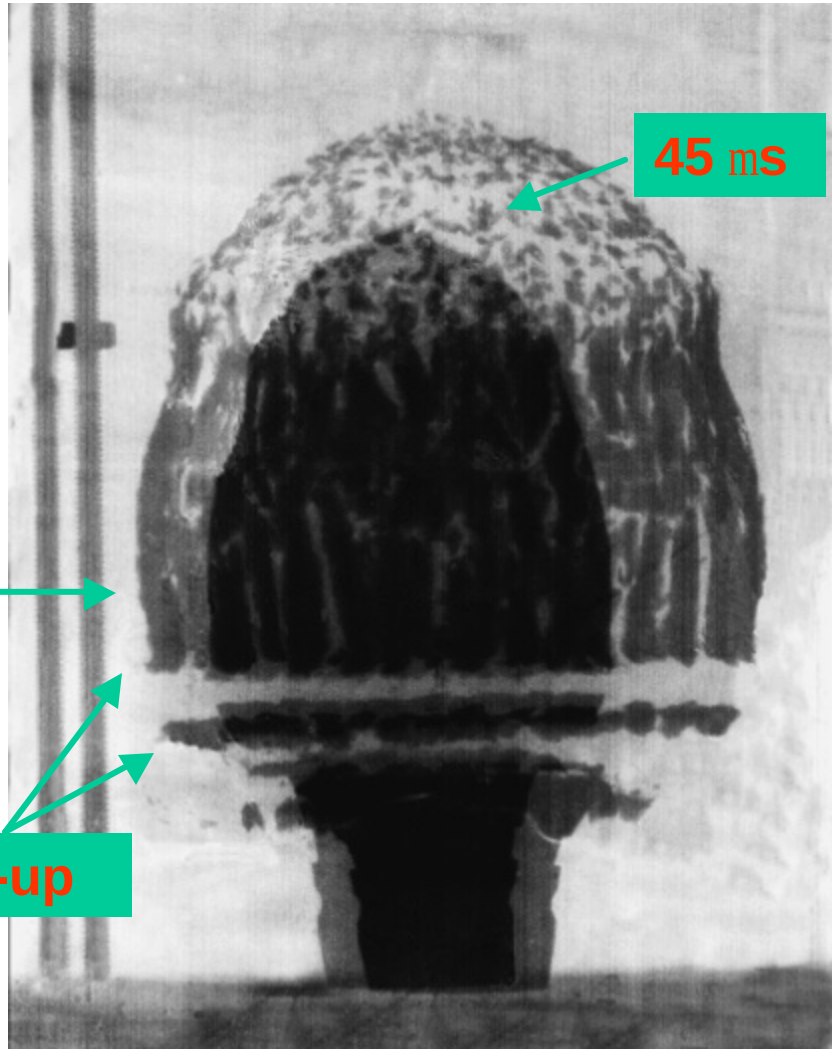
ALACV Demo Fuze Electronic and Mechanical Subassemblies



ALACV Baseline Flash Radiography

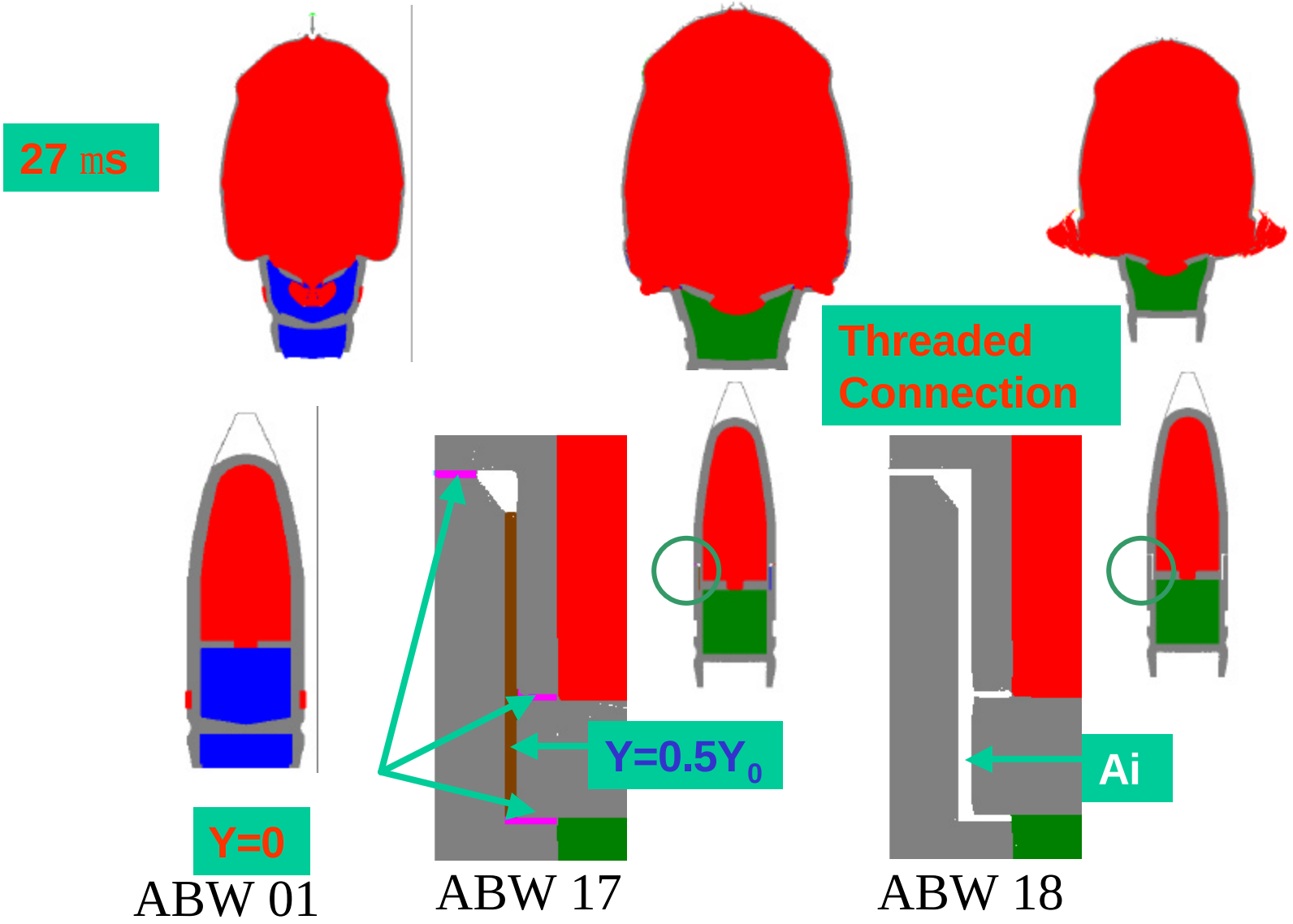


27 ms



ABW 17

ALACV Baseline Modeling

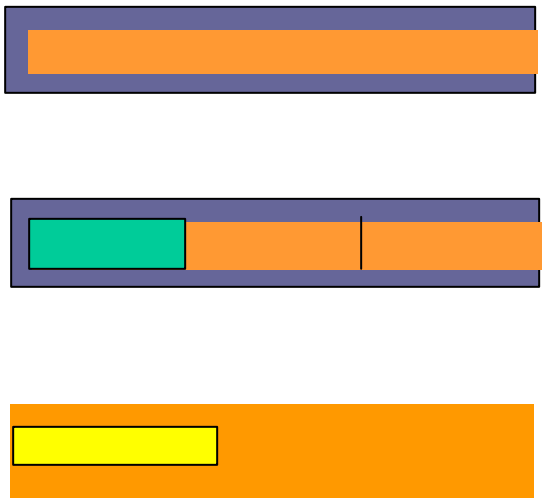


Air Bursting Munitions Technologies

Technology	Notes	Available FY04?
Warhead Technology	**Primary Goal of STO.**	
Launch Vehicle	Considers LW40 Configuration, other technologies directly applicable to more developed calibers.	
Fuze Technology	Working with industry partners to increase level of capability	
Weapon Integration	Working with industry partners to explore setting schemes	
Platform Integration	Need customer support / platform.	
Training Capability	Have concepts to address need	

DTO Objectives - Exit Criteria Advanced KE

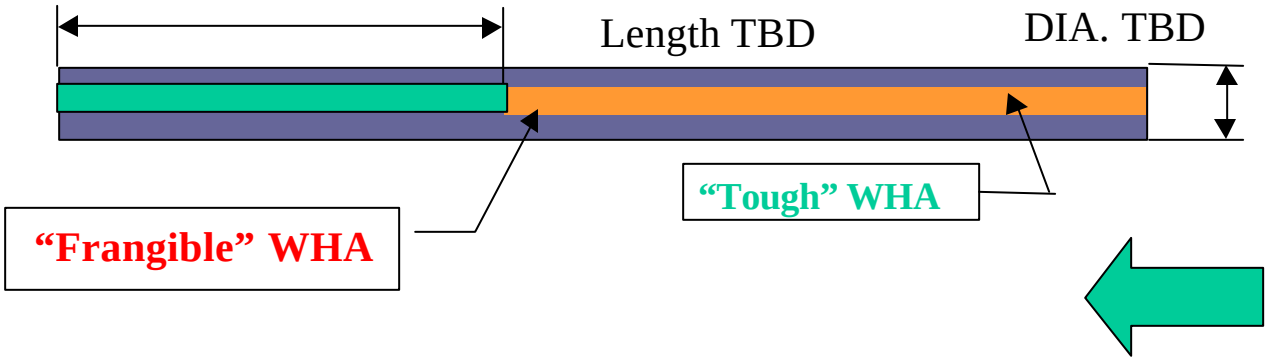
- Develop and demonstrate advanced KE penetrators using tungsten or other alternative materials
  - Exit Criteria:
    - Achieve a 30% increase in behind armor effects (BAE) over a baseline 40mm APFSDS penetrator.
    - Relate a 30% increase in the combined (BAE) to an increase in Probability of Kill (P_k) of 10% over the baseline.



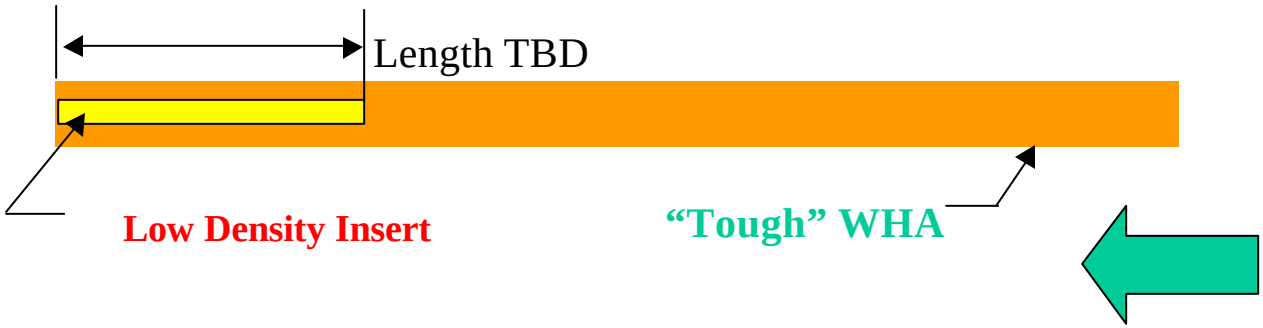
Novel Penetrators

KE Designs Tested

NOVEL Jacketed Rod w/ Frangible Tail Insert



NOVEL approach with Lateral Effects

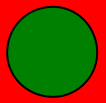


Emerging Results:

- **Results show this design may be ineffective in medium caliber**
- **Very expensive to produce**
- **Inconsistent results, potentially related to assembly problems.**

- **Results indicate that this design has the best chance of meeting DTO requirements.**
- **Simpler and less costly to produce, with more apparent benefit.**

Advanced KE Technologies

Technology	Notes	Available FY04?
Penetrator Technology	Primary Goal of STO.	
Launch Vehicle	Considers LW40 Configuration, other technologies directly applicable to more developed calibers.	
Weapon Integration	Mann Barrel Demo sufficient to demo weapon integration alone	
Platform Integration	Integration of KE technologies has minimal platform integration concerns	
Training Capability	KE Training concepts and methods are well developed	

Affordability

- Air Bursting Munitions:
  - Leveraging OICW/OCSW production for components, projectiles will cost about 2 times the current cost of an HEI-T round, but use only ¼ the number of rounds,
    - 100 of today's rounds costing $4500 will be as effective as 25 future rounds costing $1875
- Advanced KE:
  - An advanced KE penetrator will be more complex to machine and produce than a standard penetrator, adding about 10% to the production costs of advanced rounds, but use only ¾ of the number of rounds
    - 100 of today's APFSDS-T rounds costing $16500 will be as effective as 75 future rounds costing $13575

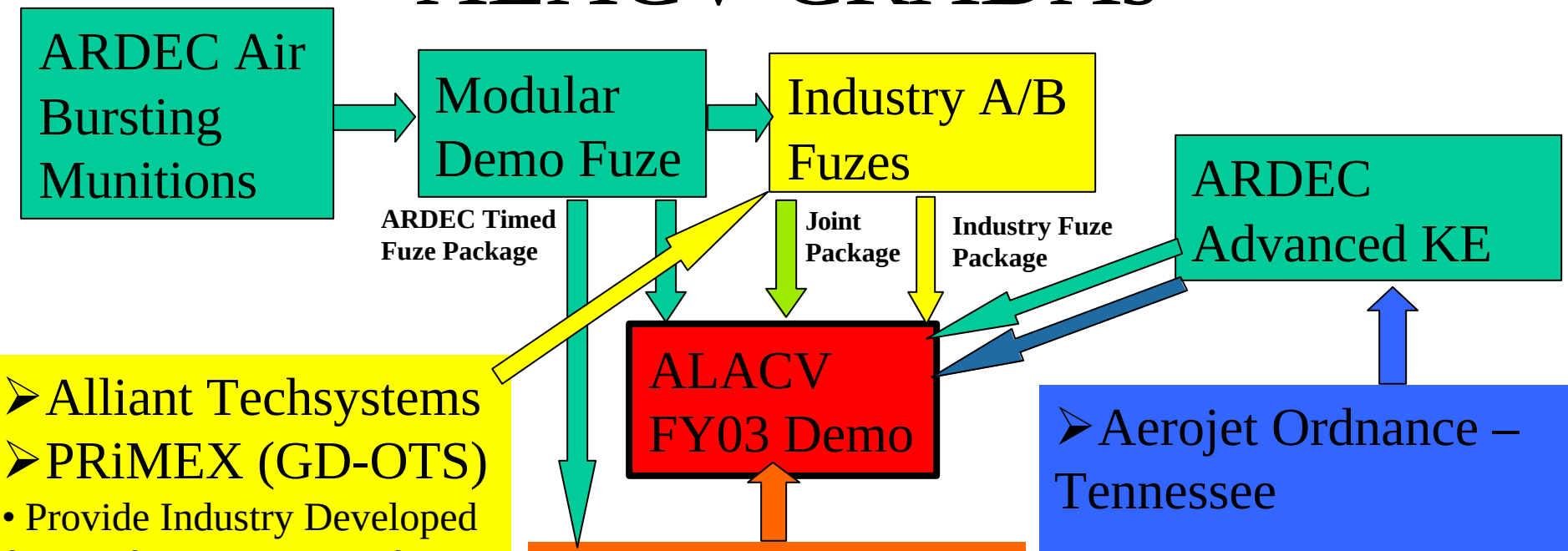
FY03 Demo

Demo	Details	Demo Type
Full Warhead Solution	Demo 400% increase in lethal area in arena test	Laboratory / TECOM site
Integrated Warhead	Demo pre-set fuzed ALACV warheads from Mann Barrels (may not be full 400% configuration)	Mann Barrel Demo • **ARDEC Fuze** • **GD – OTS Fuze** • **ATK Fuze** • **CTAI Warhead with ARDEC fuze** • **ARL Fuze in inert warhead**
Launch System	Demo LW40 from Mann Barrel and Auto Cannon	Firing Demo, both A/B and KE configurations
Scalability to other calibers	Modeling and Simulation	Paper study, with backup laboratory firing data
Advanced KE Penetrators	ARL/SLAD firing and analysis of most optimal KE configuration	Laboratory gun test with witness packs
Integrated KE cartridges	Demo in LW40 using “Final –1” iteration design or baseline	Firing Demo from Mann Barrel & Auto Cannon

Major Technical Accomplishments

- Air Bursting Warhead development has demonstrated 250% improvement over baseline.
  - Modeling matches fragmentation test data within 5%.
- Developed innovative algorithm for sensor fusion with ARL for accurate control of air burst point without use of muzzle velocity correction.
- Baseline Novel KE demonstrated to defeat target of interest without loss of defeat range. (No tradeoff to achieve DTO goals anticipated.)
- Established 5 cooperative R&D agreements with industry:
  - Air Bursting Fuzes: Alliant TechSystems and GD-OTS
  - KE Penetrator Materials: Aerojet Ordinance
  - Case Telescoped Technology: CTA International

ALACV CRADAs



- Alliant Techsystems
- PRiMEX (GD-OTS)

• Provide Industry Developed fuze or fuze electronics for inclusion in our modular Demo

• Get Test Data, range time, IPT membership, engineering support

Industry Fuze Technology

- CTAI/RONA

• Provide CT-2000 gun system, CT ammo components, current CT expertise

• Get ARDEC Demo Fuzes in CT configuration, range time, IPT membership

Cased Telescoped Technology

- Aerojet Ordnance – Tennessee

• Provide Advanced KE materials and penetrator concepts

• Get Test data, range time, IPT membership, engineering support.

Industry Materials Technology