TACOM

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

Ammunition for the Objective Crew Served Weapon (OCSW)

2000 NDIA Joint Services Small Arms Symposium, Exhibition and Firing Demonstration

August 29, 2000

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OCSW Ammo IPT Leader

OCSW ORIGINAL REQUIREMENTS

- **Primary round to be high explosive air-bursting munitions or kinetic energy rounds**

- **Settable fuze with a maximum burst range variation of +/- 2 meters. Must include PD backup**

- **Maximum effective range of at least 2,000 meters**

- **Capability against vehicles, vessels, light armor vehicles and slow, low flying aircraft**

- **A system weight of 38 pounds**

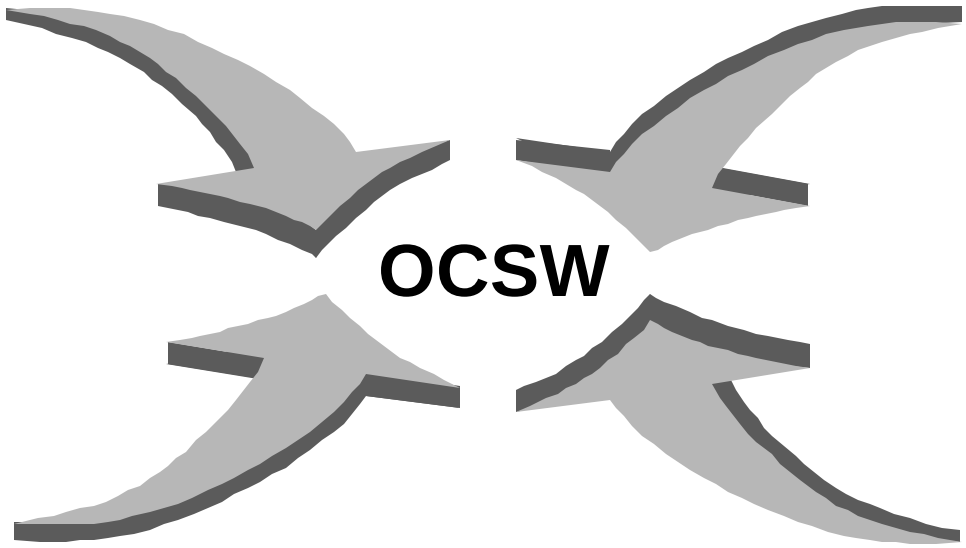
- **Recoil not to exceed that of the current caliber .50 M2 machinegun and/or the MK-19 grenade MG.**

- **Capability to penetrate lightly armored vehicles**

System Trades

System
- Size
- Weight
- Portability

Cost
- Weapon
- Fire Control
- Ammunition



Lethality
Effectiveness
Targets

Producibility
Technical maturity
Complexity

Caliber
- Ammo load
- Recoil
- Maximum range
- Armor penetration

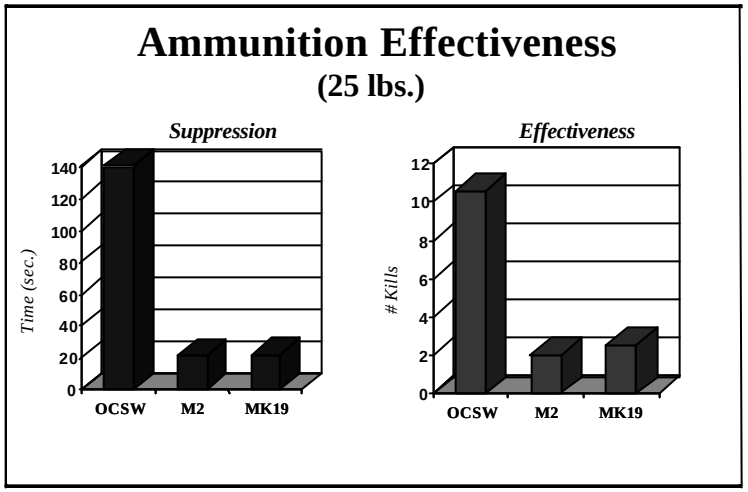
Error Budget Modeling

OCCASION-TO-OCCASION
Cross Wind
Wind Velocity
Wind Direction
Range Wind
Wind Velocity
Wind Direction
Air Density
Air Pressure
Air Temperature
Muzzle Vel. Error (Temp.)
Coriolis (earth rate)
Latitude
Firing Direction
Cant Angle
Cant Zeroing
Site Angle
Site Angle Zeroing
Jump - Vertical
Jump - Horizontal
Static Boresight
Gun Zeroing
Fire Control Solution

BURST-TO-BURST
Initial Aiming
B-B Dispersion - Vertical
B-B Dispersion - Horizontal
T&E accuracy error (vertical)
T&E accuracy error (horizontial)
Visual Resolution
Dynamic Boresight
Muz. Vel. (lot-lot)

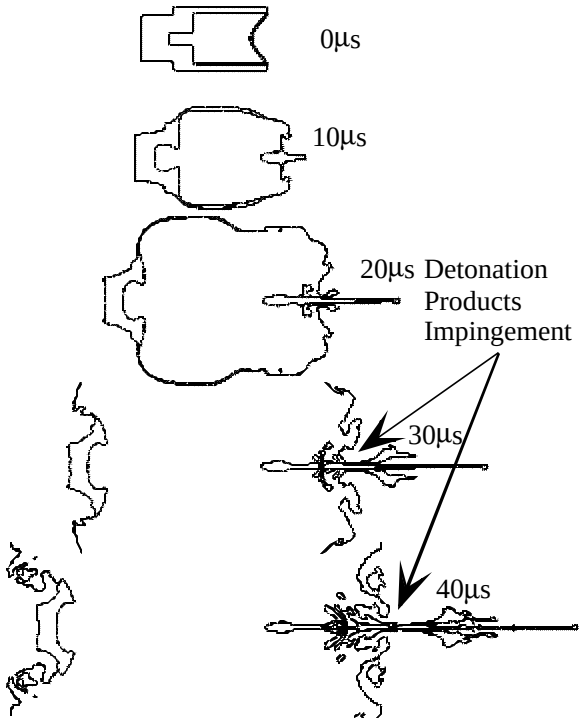
WITHIN BURST
Muzzle Velocity (within lot)
Muzzle Velocity Correction
W-B Incl. Mount Interactions - Vert.
W-B Incl. Mount Interactions - Horz.
Ammunition Dispersion - Vertical
Ammunition Dispersion - Horizontal
Drag Variability
Projectile Mass Variation
MV Correction Algorythm
Fuze Frequency Calibration
Fuze Timing

Lethality Models



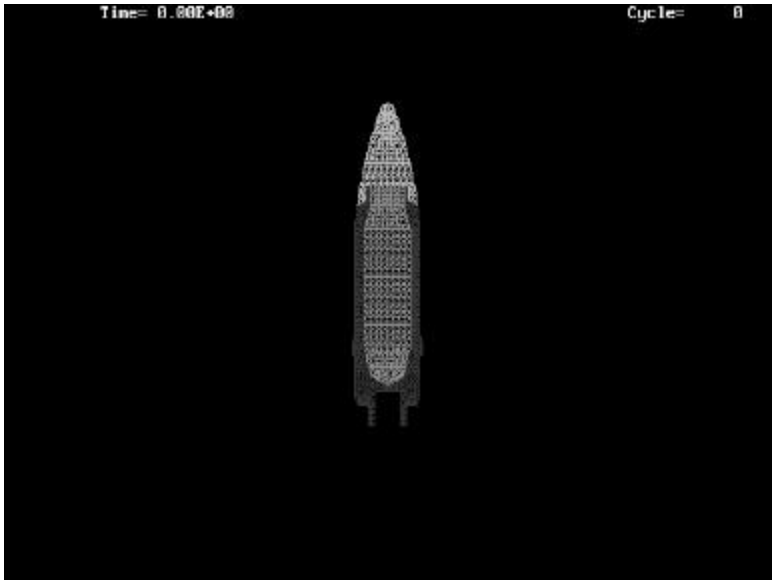
Committed to Excellence

Simulation and Modeling



Effectiveness
CASRED
FBAR
CASTFOREM
JCATS

Lethality
CTH
CALE
SHORTFRAG
DYNA 2D
ZEUS

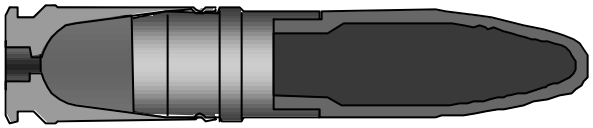


Design
ANSYS
ProEngineer
IDEAS

Ballistics
PRODAS

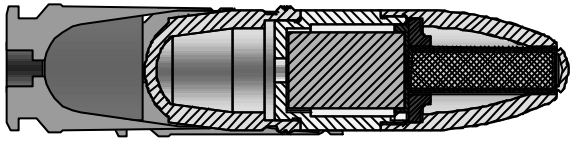
OCSW 25mm Ammunition Family

HE-AB Cartridge



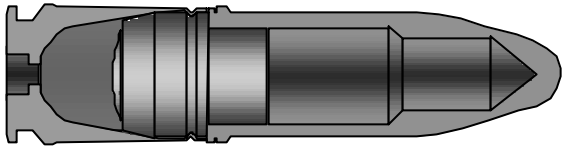
HE Air Burst Kills Open and Defilade Targets

TP-S Cartridge



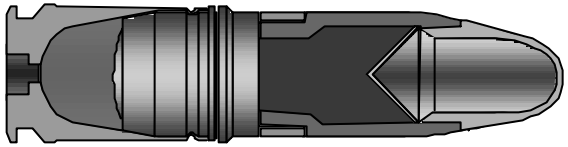
Target Practice Spotter Flash Bang Training Round

TP Cartridge



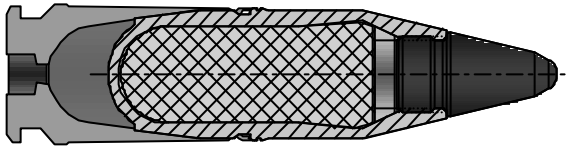
Target Practice Training Round

HE-AP Cartridge



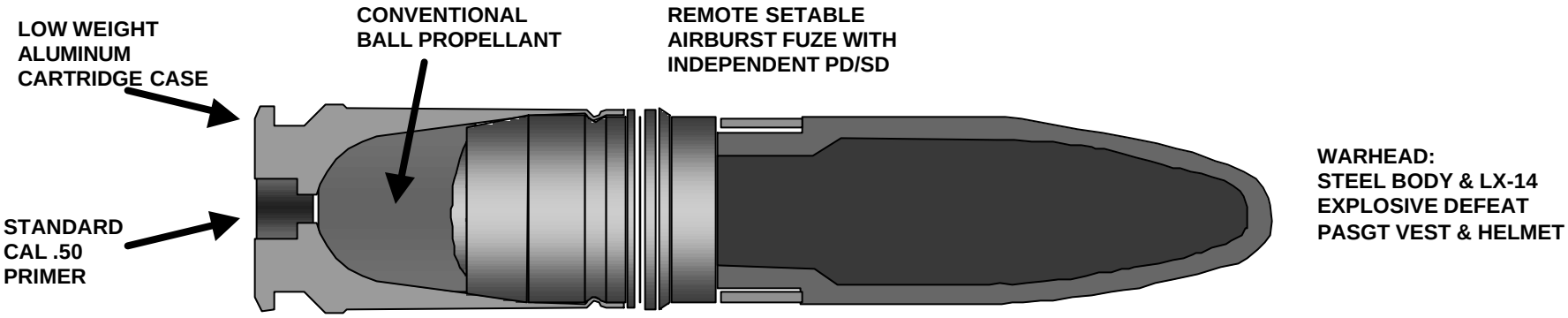
HE Armor Piercing Shaped Charge Round Defeats Light Armor

HE-PD Cartridge



HE Point Detonating Round Defeats Personnel and Material Targets

HE-AB Cartridge

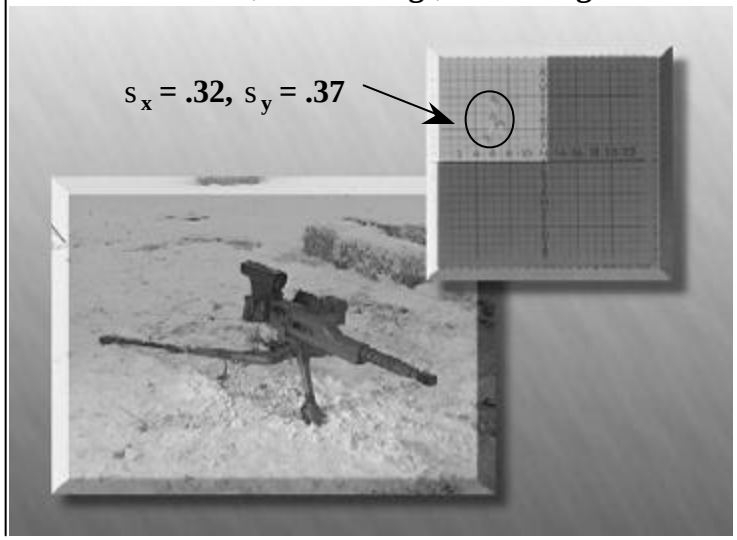


Features:

- Flat trajectory, lower time of flight and greater lethal area than MK19 40mm M430 HEDP.
- On board muzzle velocity correction minimizes burst point error.
- Battery not included …. or needed.
- Independent point detonate / self destruct switch (PD/SD).
- Independent back-up power generation and storage for PD/SD.
- Mechanical S&A provides positive safety control.

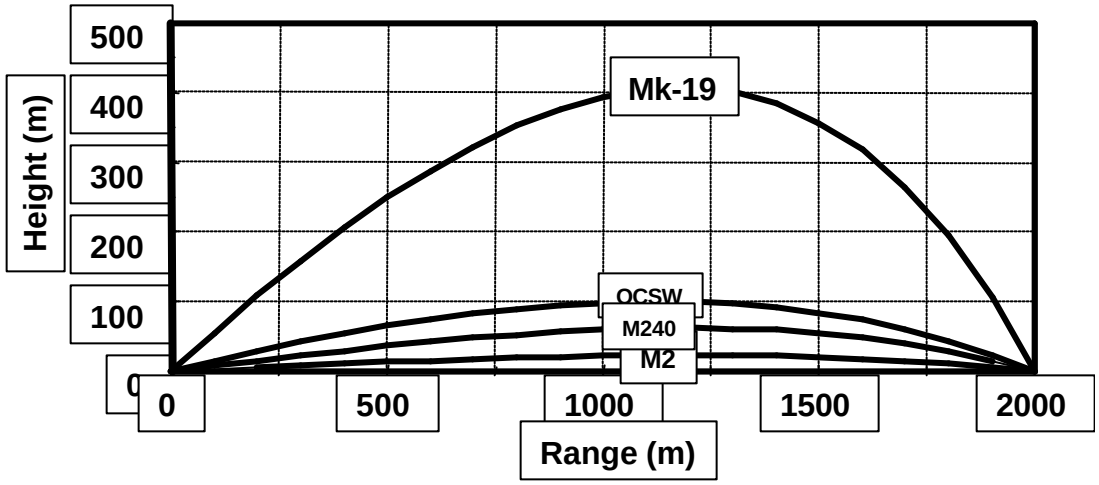
HE-AB Performance

Minimal Weapon Dispersion
s_{xave} = 0.5 mrad, s_{yave} = 0.5 mrad
5 round burst, no sandbags, 100m target

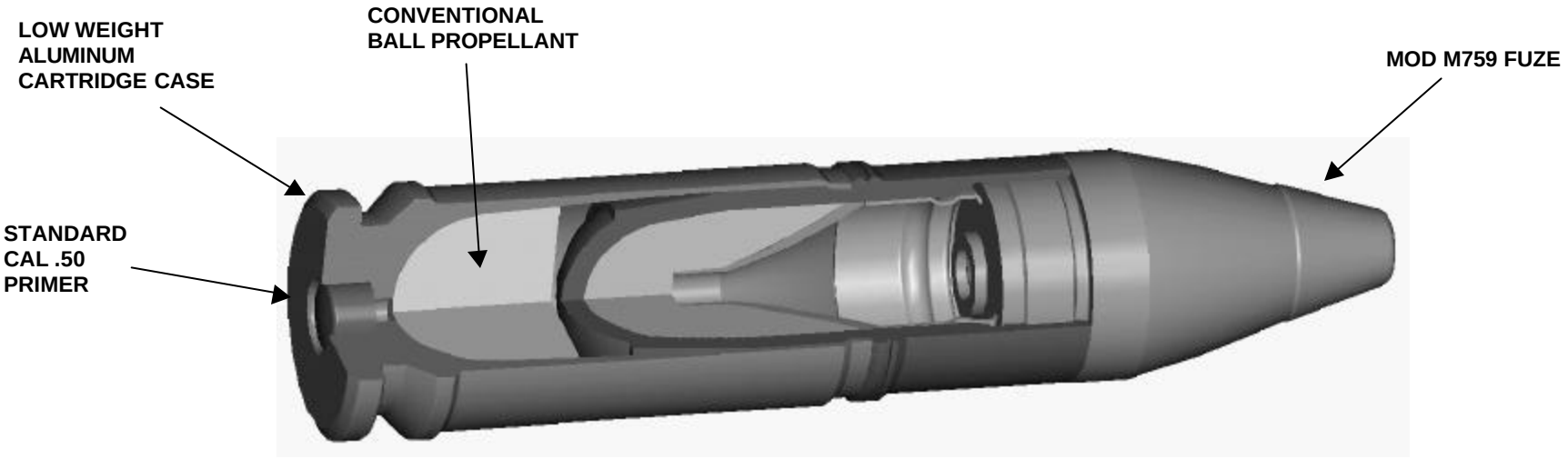


- Ammunition dispersion demonstrated at less than 0.2mils from a Mann barrel.
- Ammunition dispersion demonstrated at less than 0.4 mil from the OCSW weapon in full automatic fire.

Time of flight to 2000 meters half that of the MK19.



HE-AP Cartridge

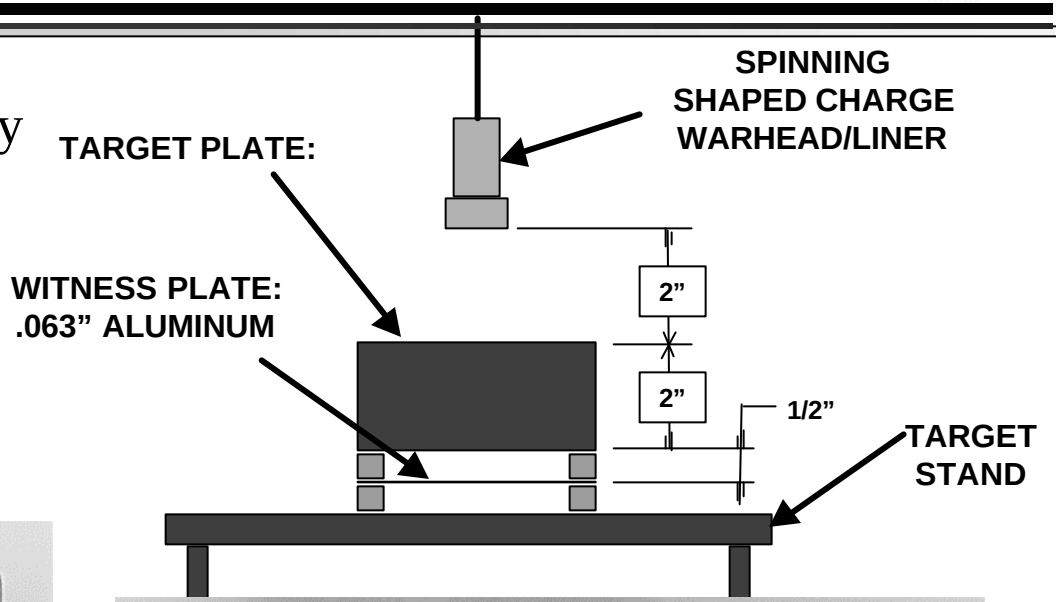


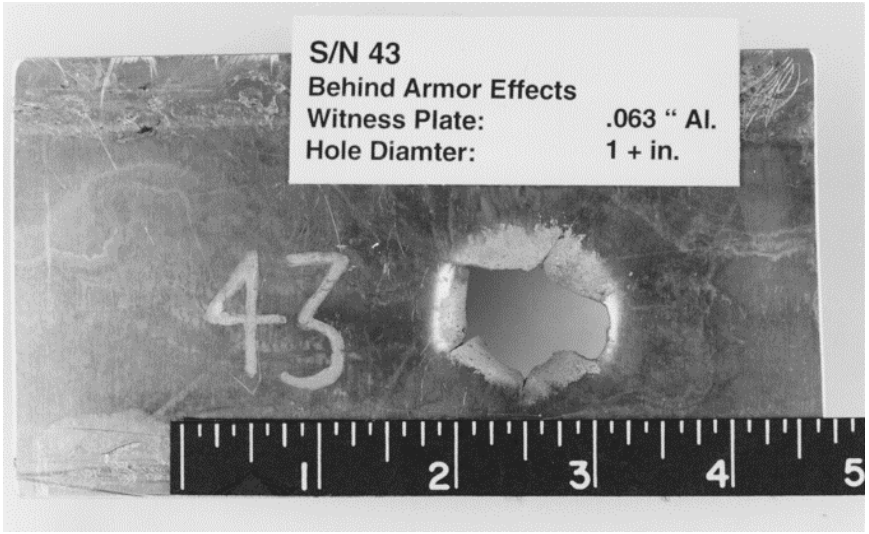
Features:

- Two inch armor penetration demonstrated in static spin tests.
- Collaborative effort with Primex, Dyna East, and TACOM-ARDEC .
- Non-fluted liner is relatively spin-insensitive .
- Current HE-AP cartridge uses a modified M759 PD fuze.
- Currently being flight tested at Primex, Marion, IL.

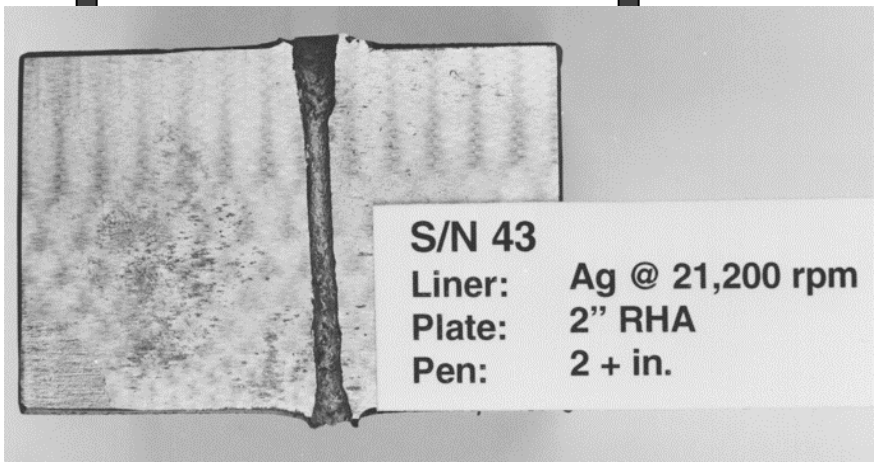
HE-AP Warhead Performance

- Wide Angle, Shallow Cone, Shaped Charge Liner Consistently Penetrates 2.0 inch RHA with Sizable Hole in Witness Plate
- 15 gram LX-14 Explosive
- 2.0 inch Standoff
- 21,000 - 28,000 RPM Spin





Behind Armor Witness Plate

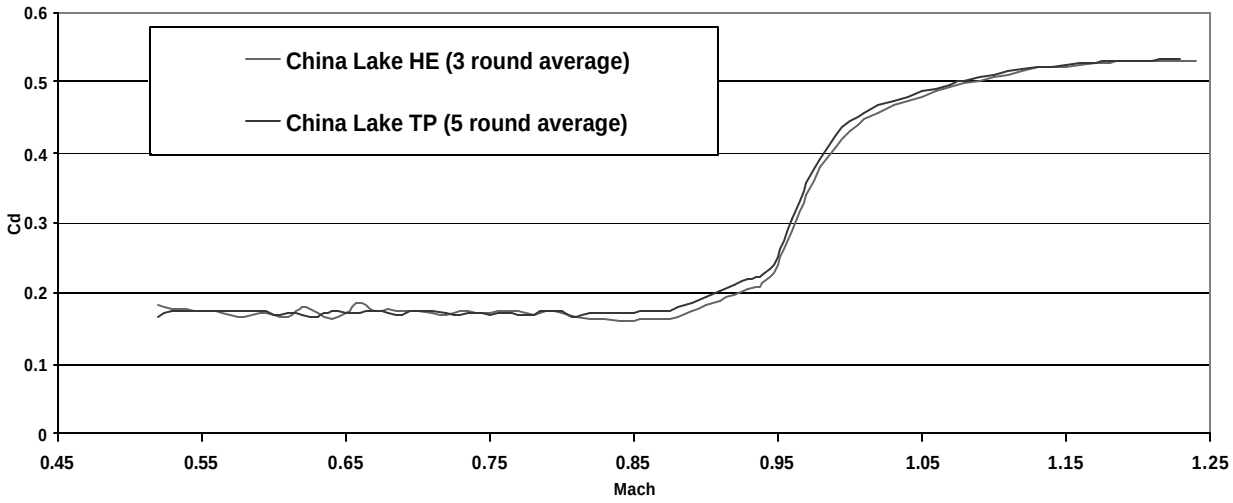


Target Plate

TP Cartridge

- Ballistic Match to HE Cartridge
- Two-Piece Projectile:
  - Aluminum Base
  - Steel Forebody with Integral Rotating Band
- Aluminum Cartridge Case
- Ball Powder Propellant & Standard Cal .50 Primer

Comparison of HEAB and TP Drag Measurements



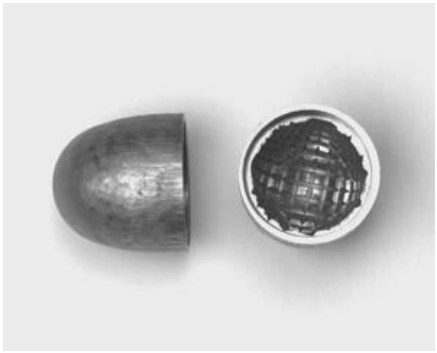
ITEM	WT (GM)
PROJECTILE	131.65
PRIMED CASE	28.41
PROPELLANT	7.00
TOTAL	167.06 (0.3683 LB)

PROJ. C.G. = 44.69 MM FROM NOSE

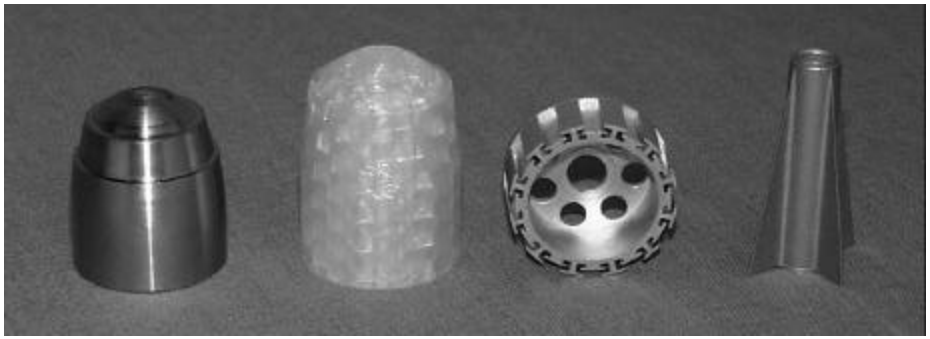
Manufacturing Technology (MANTECH)

HF-1 Naturally fragmenting Steel

Warheads



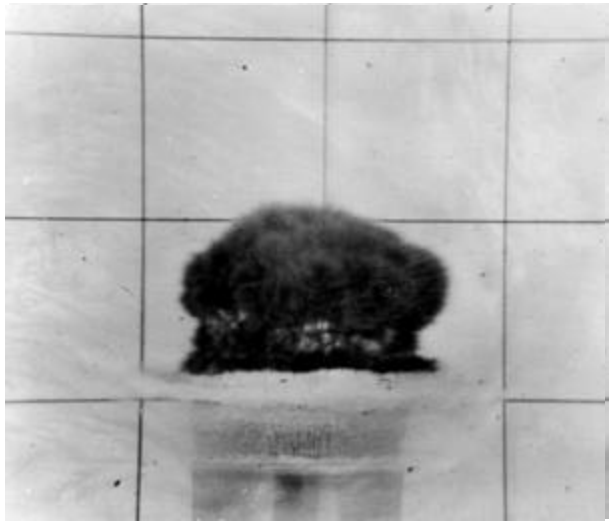
Tungsten



Powder metal injection molding

Investment cast

MANTECH WARHEADS



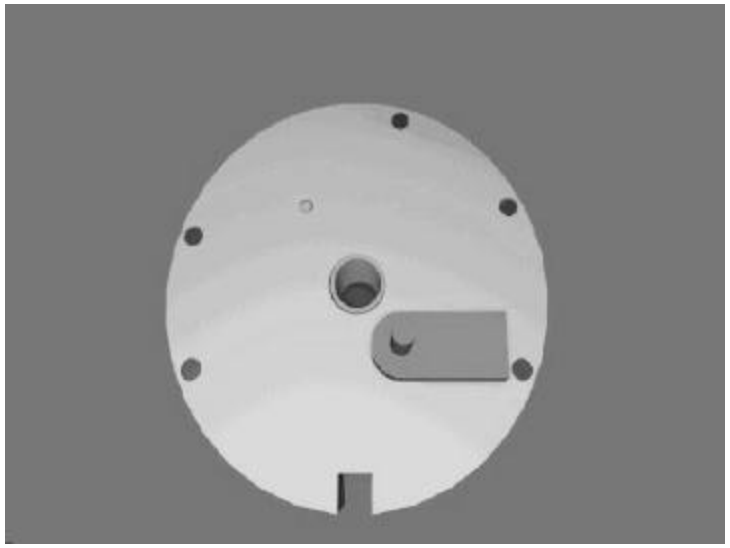
OCSW warhead design and production processes are being investigated under the MANTECH program to maximize lethality and cost effectiveness.

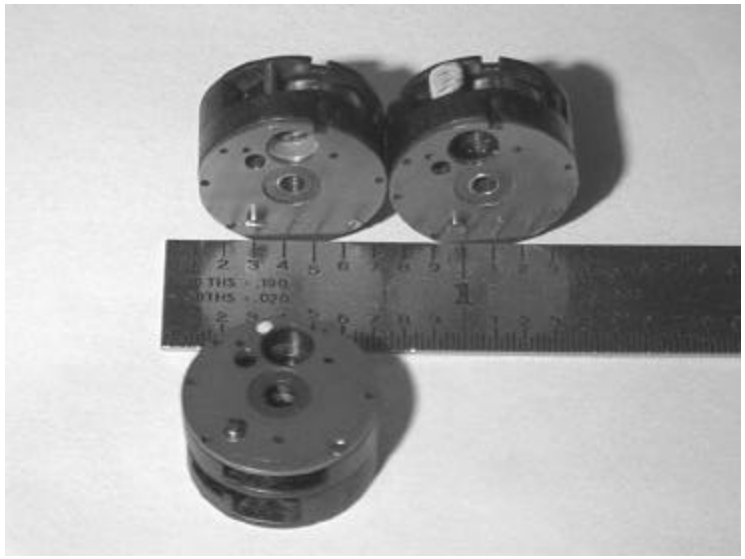
Results to date:
A cold forged naturally fragmenting OCSW warhead has been demonstrated with 75% of warhead weight resulting in lethal, effective fragments.

Fuze Safe and Arm (S&A)

Features:

- Dayron produced tried and true miniaturized verge escapement S&A.
- Mechanical S&A for assured safety.
- Produced by the millions in larger calibers.
- Near frictionless gear train requires no lubrication.





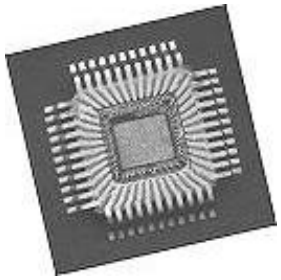
Fuze Electronics

Miniature Air Burst Electronic Fuzing

- **No batteries**
- **On-board power good for 2000+ Meters**
- **Communication and air-burst function at 220 Shots per Minute**
- **On-board muzzle velocity correction electronics**
- **Survival at High Acceleration (100,000 G's)**
- **Independent Point Detonation & Self Destruct Function**
- **Independent back-up power supply**

Manufacturing Technology (MANTECH)

Fuzing



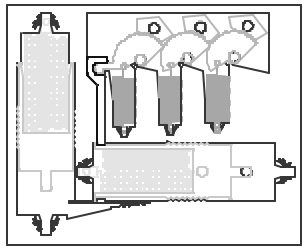
ASIC

Application Specific Integrated Circuits (ASICs)

ASICs will dramatically reduce the cost and size of fuze electronics while improving reliability and robustness

Micro Electro Mechanical Systems (MEMS)

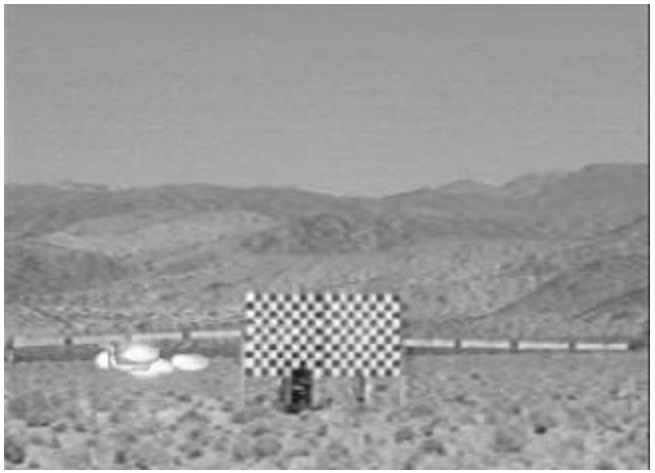
MEMS will integrate with micro and Nano electronics to provide today's complicated electromechanical S&As on a single chip.



MEMs Safe & Arm

Objective Crew Served Weapon
Ammunition Summary

- **Modeling and simulation continuously and successfully employed throughout the program.**
- **Critical Ammunition and Fuzing Technologies Demonstrated:**
  - ✓ **Automatic air-bursting ammunition at 220 shots per minute**
  - ✓ **On-board muzzle velocity correction**
  - ✓ **40mm armor penetration in a 25mm package**
  - ✓ **Fuze electronics good for 100,000 g's**
- **Producibility and MANTECH efforts will increase lethality and reliability while reducing unit costs.**
- **The OCSW ammunition effort is on track to meet or exceed all technical goals.**



OCSW will provide……

Revolutionary Lethality for the 21st Century Warfighter