5-Inch Shotgun Projectile (KE-ET)

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Shotgun Projectile Overview

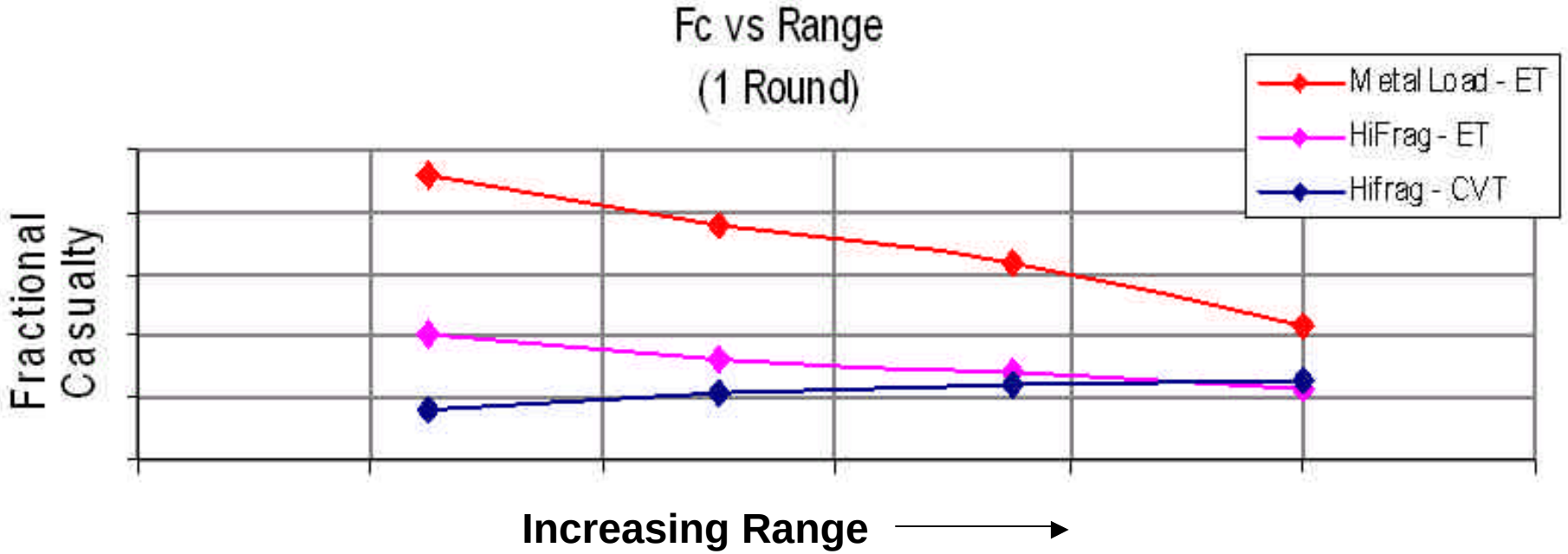
- Overview
- Why We Started This Program
- Design
- Modeling & Simulation
- Testing
- Conclusions

Shotgun Projectile Overview

- Program initiated Fall ’02 as a demonstration in support of ADM Ulrich’s Hip-Pocket Task Force
- Designed to combat threat of small high-speed craft
- Qualification testing is underway
- Shipboard test in June ‘03

Shotgun Projectile
Why We Started This Program

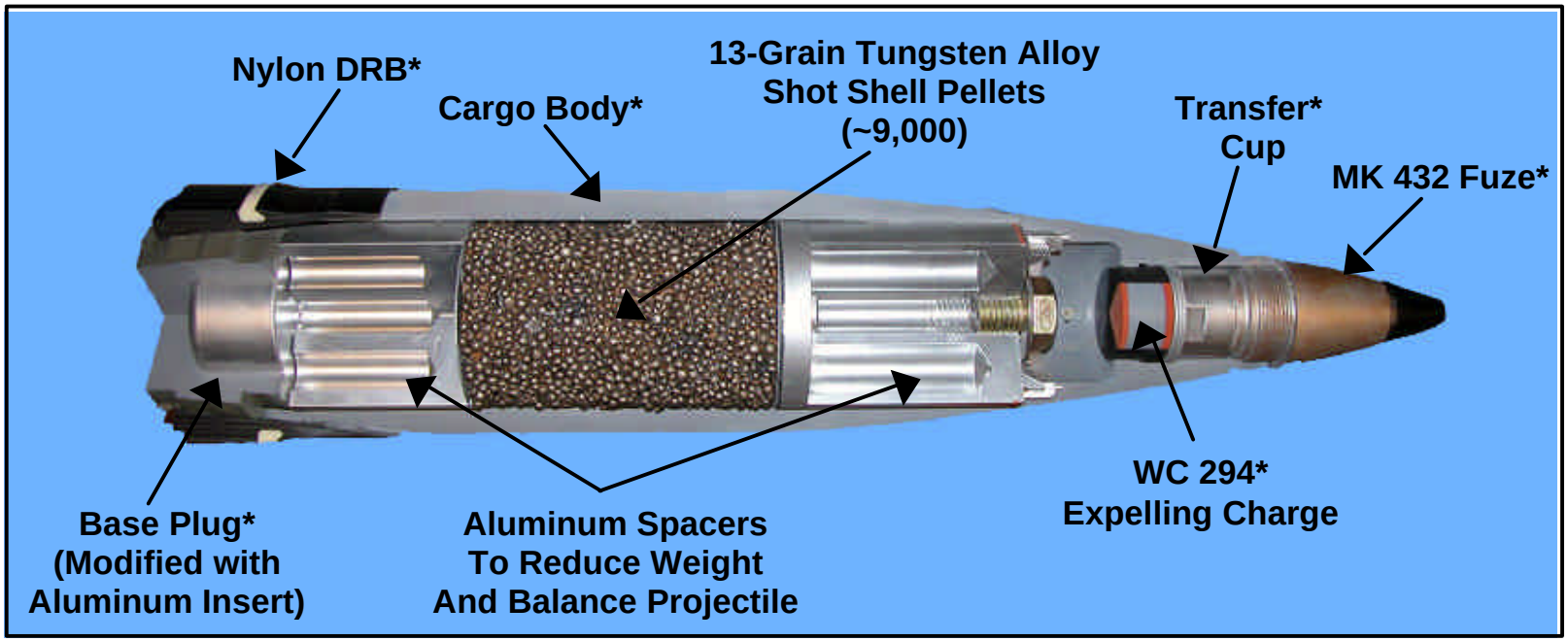
Engagement of Personnel Target



- Includes all GWS errors for stationary targets
- Does not include moving target prediction error

Shotgun Projectile Design

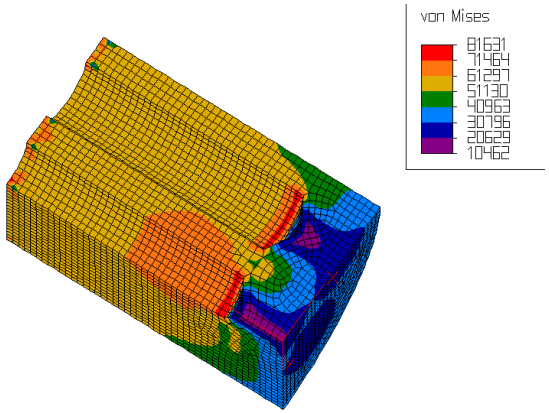
Leveraged Off 5-Inch HE-ICM (Cargo) Projectile Program

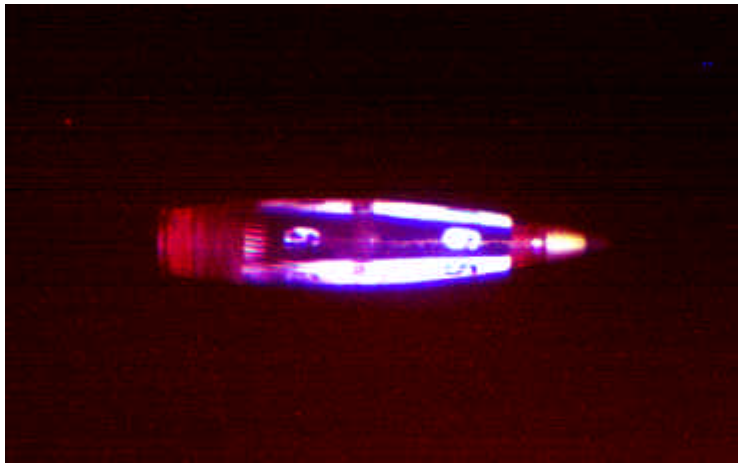


*** Existing parts from FY98 Procurement**

Shotgun Projectile Design

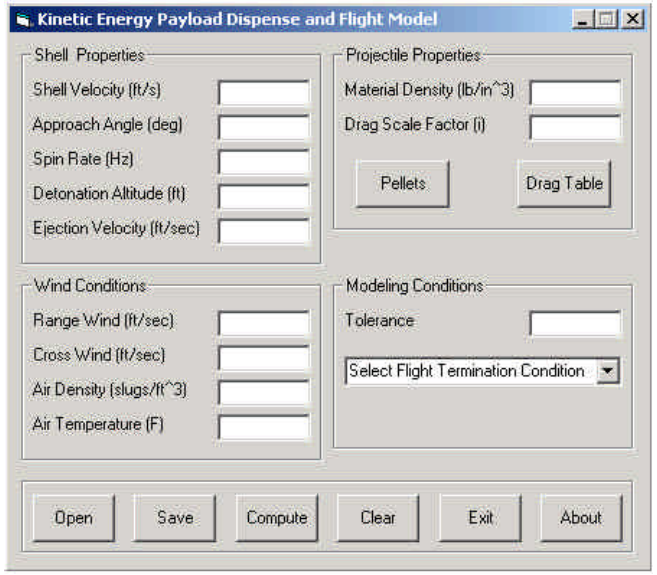
- Structural FEA conducted on all new parts
  - Validated with 6 round test using High Energy Propelling Charges – no anomalies
- Weight, CG, moments of inertia all match or improve upon those of the Cargo Projectile and HIFRAG
  - Validated with ranging test
  - Tighter dispersion than HIFRAG and Cargo





Shotgun Projectile Modeling and Simulation

- Modeled the dispense and flight of the shot shell pellets
- Visual Basic v6.0
- Modeling parameters (sample):

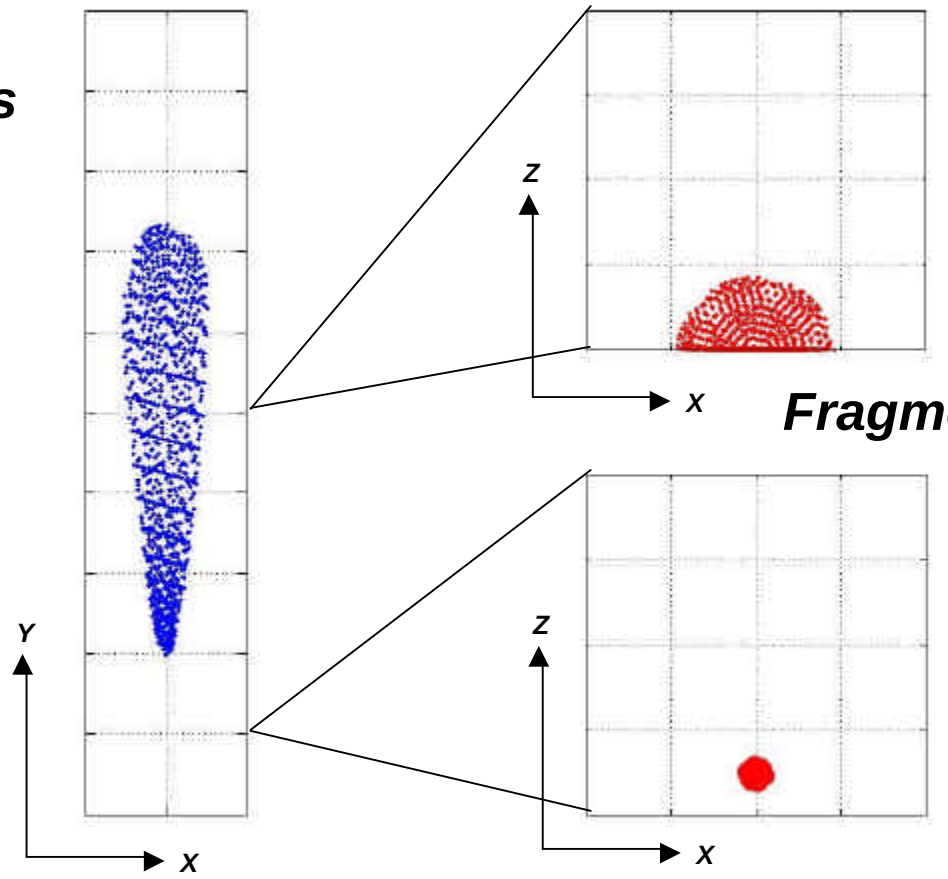


Inputs	Terminal Conditions	Outputs
Projectile Terminal Conditions at Burst Point	Surface Impact	Pellet Location Relative to Burst Point
Pellet Physical Properties & Locations in Shell	Stop on Time	Pellet Velocity Vector
Meteorological Conditions	Stop on Range	Pellet Terminal Kinetic Energy

Shotgun Projectile
Predicted Fragmentation Patterns

Patterns Validated Against Empirical Data
Accurate to 7.5% in Length, 3.5% in Width

Surface Impacts

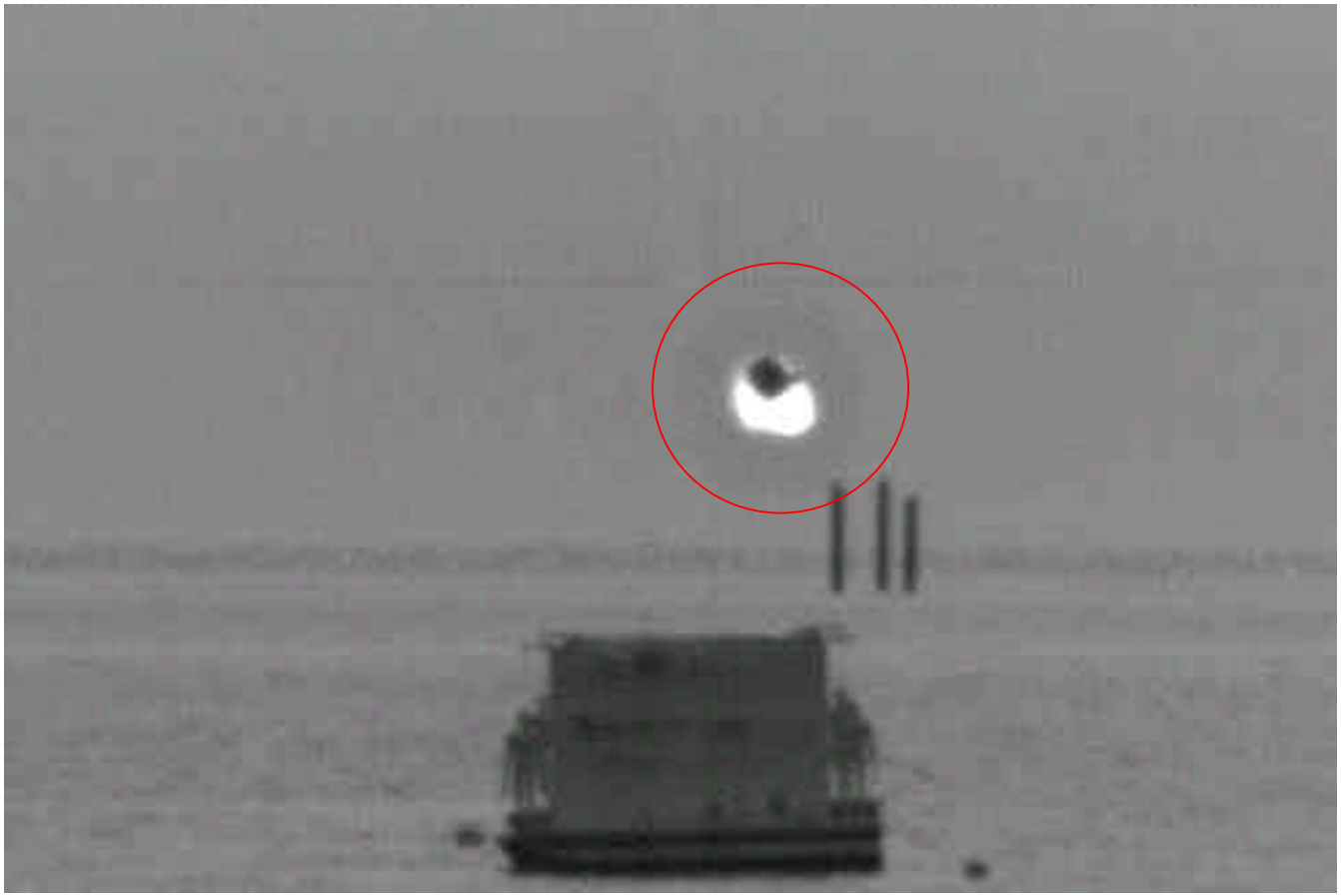


Fragments in Flight

Line of Fire

Shotgun Projectile Modeling and Simulation

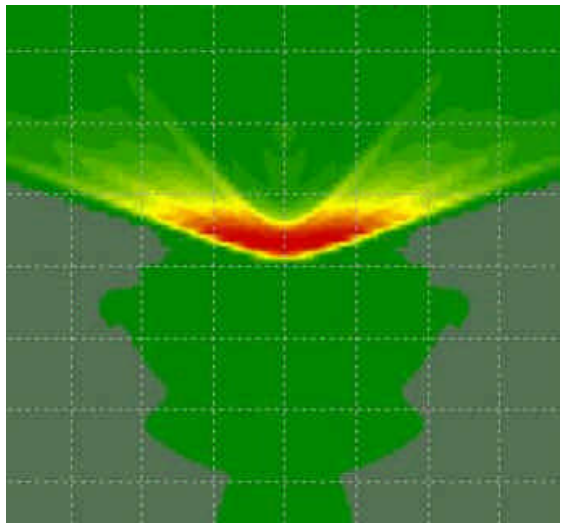
High-Speed Video Capture of Airborne Fragment Pattern Just After Expulsion



Shotgun Projectile Lethal Area Program

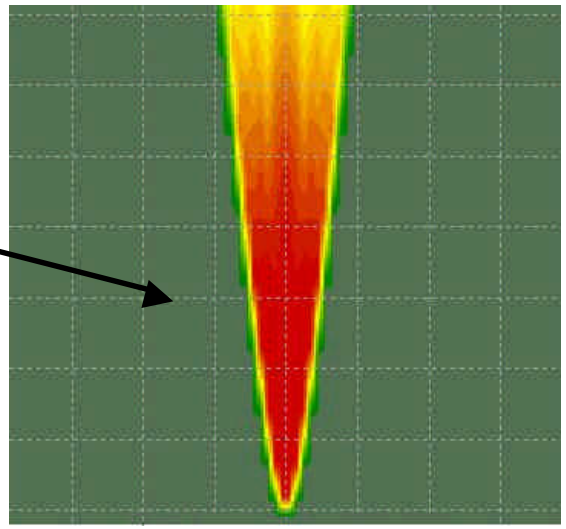
- JTCG/ME Accredited Model
- Shows Lethal Areas of Blast and Fragmentation Warheads

HIFRAG



Shotgun Projectile

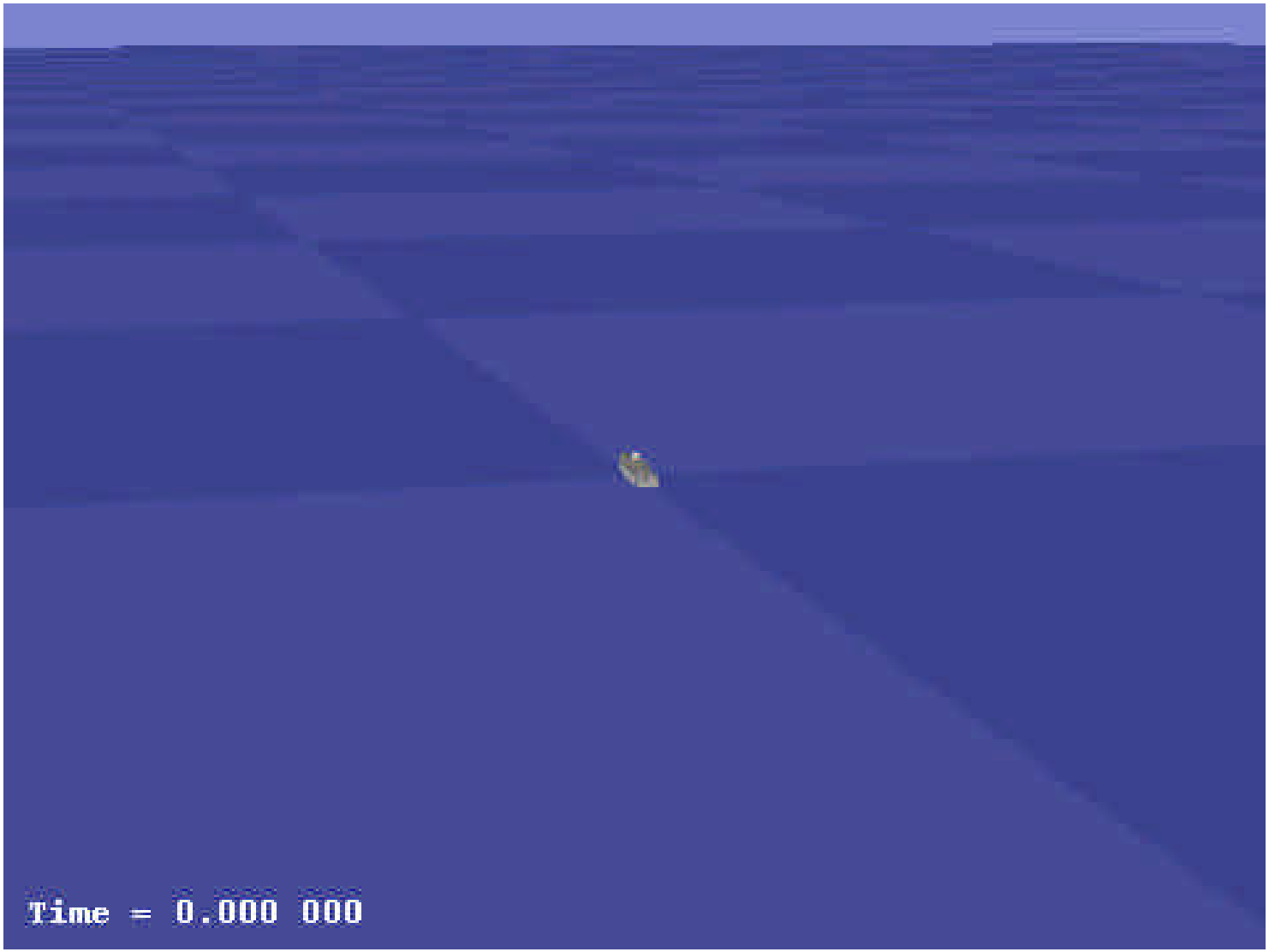
Twice the Lethal Area



Shotgun Projectile
Joint Gun Effectiveness Model

- Monte Carlo Model (JTCG/ME Accredited)
- Random maneuvering path
- High speed target
- Personnel in open boat
- Personnel description meets ONI criteria
- MK 86 fire control error budget used
- X, Y, Z burst points for every round fired for all engagements

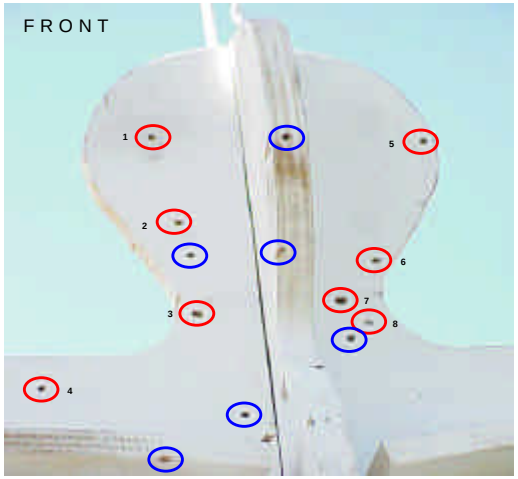
Shotgun Projectile
Simulated Engagement



Shotgun Projectile Target Test

Shotgun Projectile Target Test High-Speed Video

Shotgun Projectile Test Results



Shotgun Projectile Conclusions

- The KE-ET projectile shows, from both testing and modeling, significant effectiveness improvement over current 5-Inch rounds
- KE-ET Advantages
  - Better lethality against given target set
  - Better IM properties
  - Potential for upgrade
- Compatible with High Energy Propelling Charges

Shotgun Projectile
Conclusions - Potential Upgrades

- Upgraded payload
  - Different pellet sizes and materials
  - Flechettes
- Upgraded payload capacity
  - Aluminum base plug
  - Composite materials
- Increased muzzle velocity
  - Higher energy propelling charges
- Forward expulsion system
  - Similar to Army Beehive Round