
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



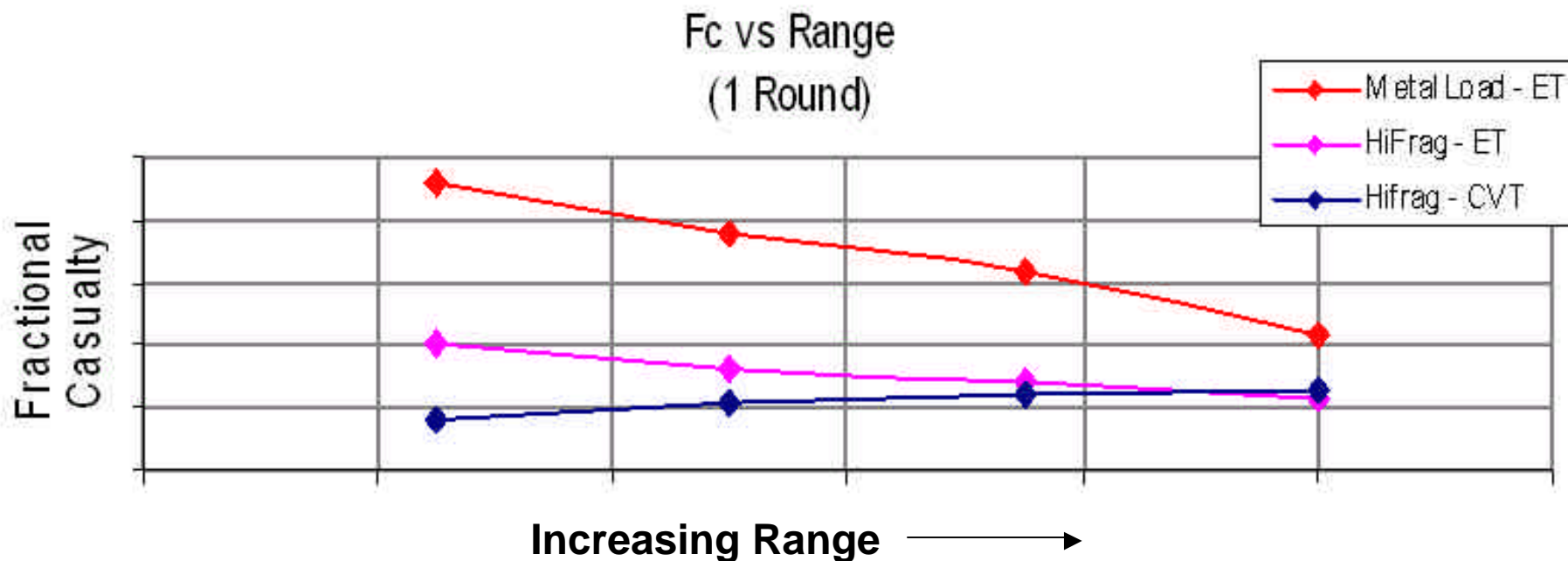
- Program initiated Fall '02 as a demonstration in support of ADM Ulrich's Hip-Pocket Task Force
- Designed to combat threat of small high-speed craft
- Qualification testing is underway
- Shipboard test in June '03

Shotgun Projectile

Why We Started This Program



Engagement of Personnel Target

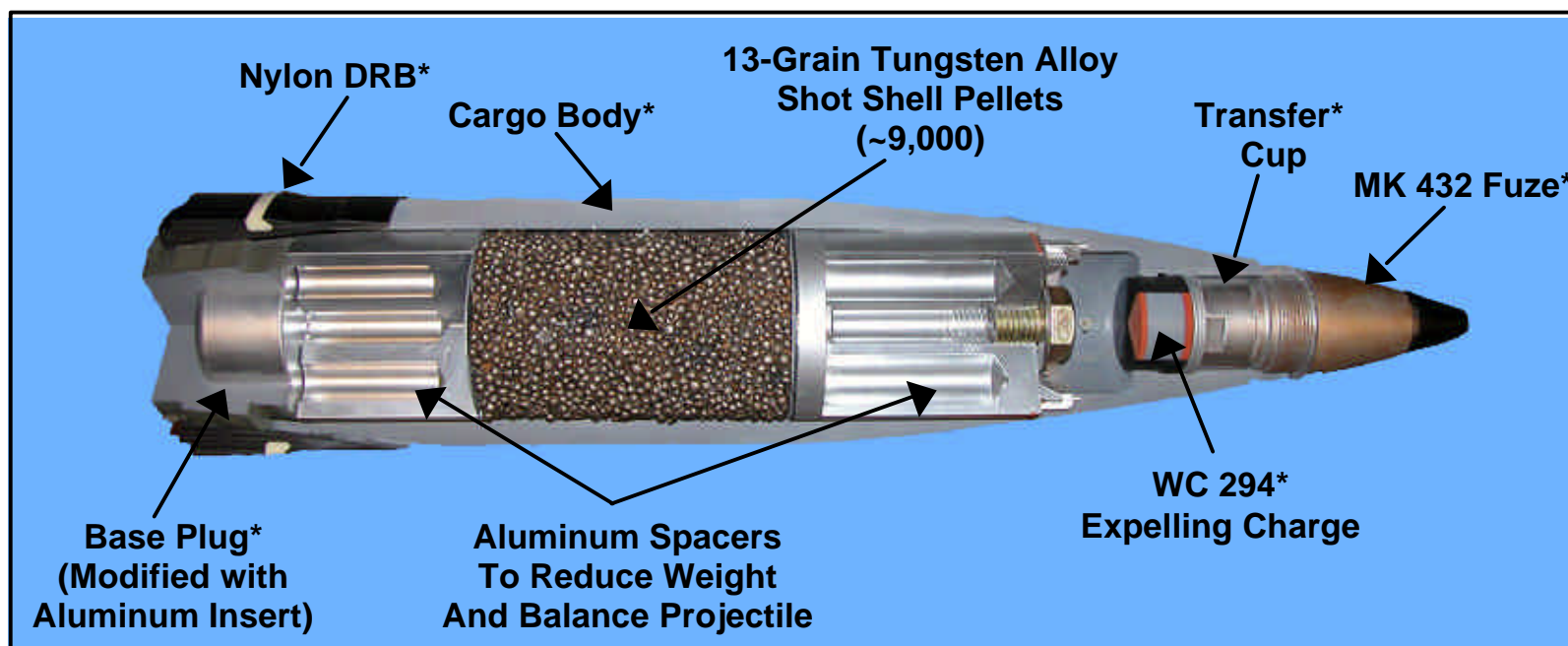


- Includes all GWS errors for stationary targets
- Does not include moving target prediction error

Shotgun Projectile Design



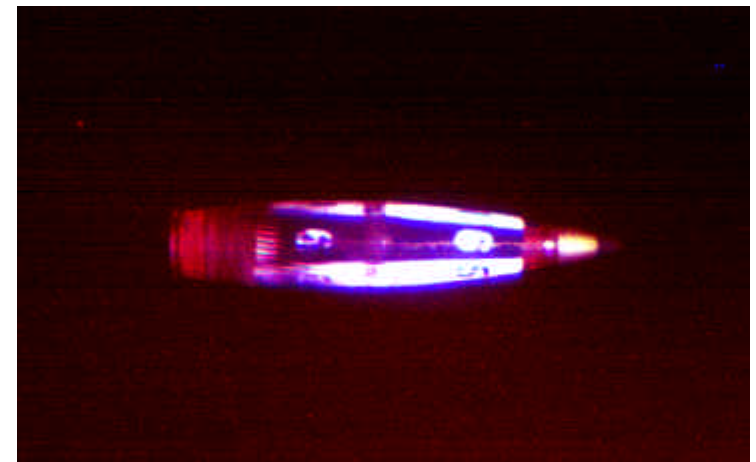
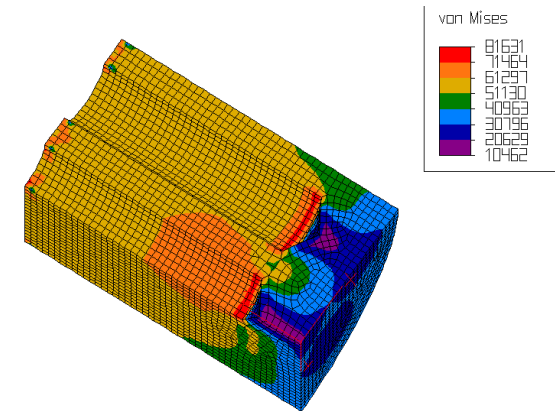
Leveraged Off 5-Inch HE-ICM (Cargo) Projectile Program



*** Existing parts from FY98 Procurement**



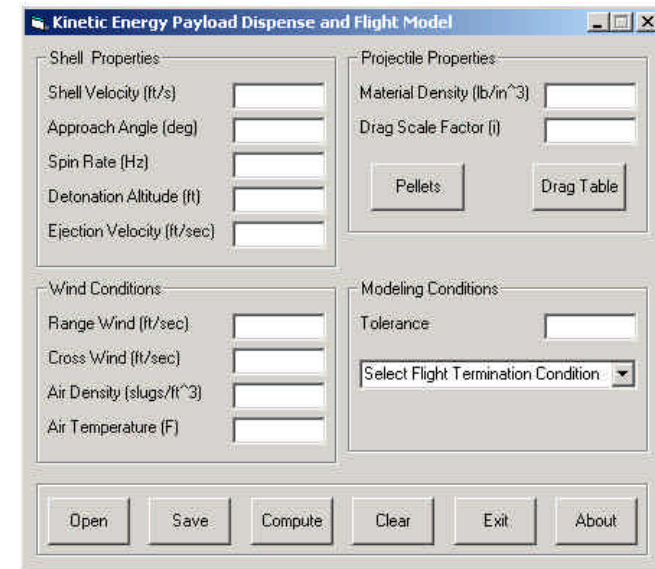
- Structural FEA conducted on all new parts
 - Validated with 6 round test using High Energy Propelling Charges – no anomalies
- Weight, CG, moments of inertia all match or improve upon those of the Cargo Projectile and HIFRAG
 - Validated with ranging test
 - Tighter dispersion than HIFRAG and Cargo



Shotgun Projectile Modeling and Simulation



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



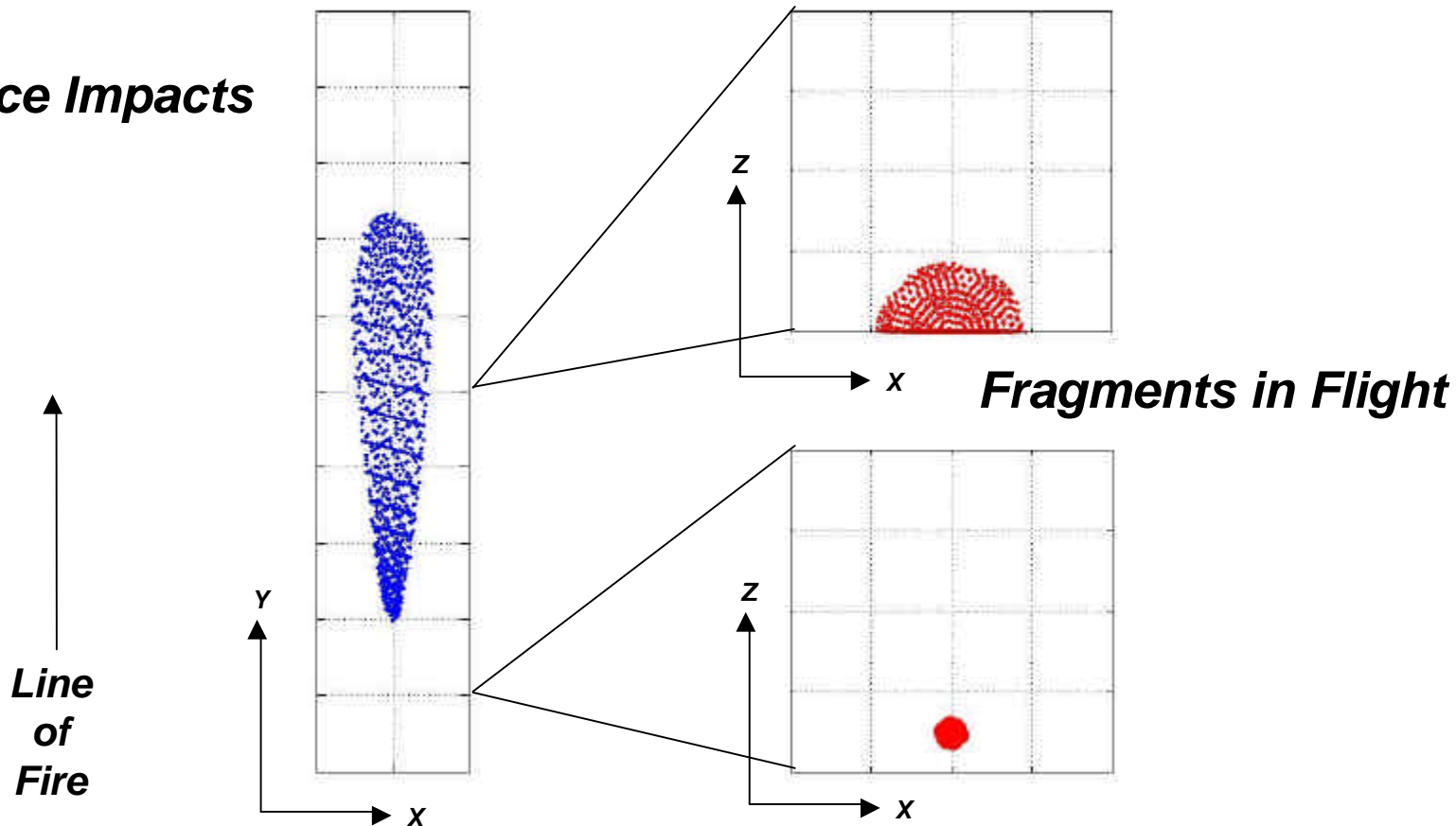
Inputs	Terminal Conditions	Outputs
Projectile Terminal Conditions at Burst Point	Surface Impact	Pellet Location Relative to Burst Point
Pellet Physical Properties & Locations in Shell	Stop on Time	Pellet Velocity Vector
Meteorological Conditions	Stop on Range	Pellet Terminal Kinetic Energy

Shotgun Projectile Predicted Fragmentation Patterns



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

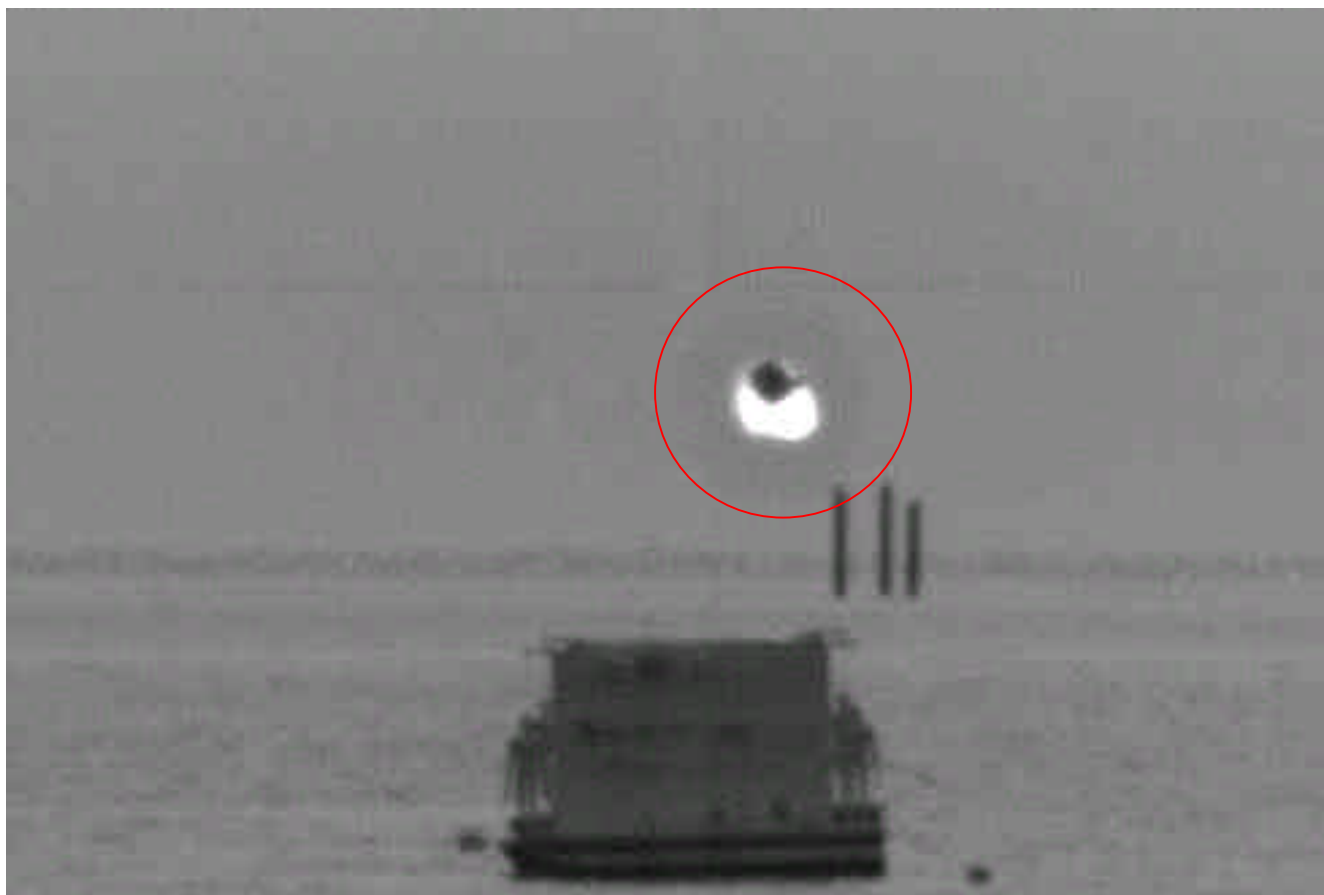
Surface Impacts



Shotgun Projectile Modeling and Simulation



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

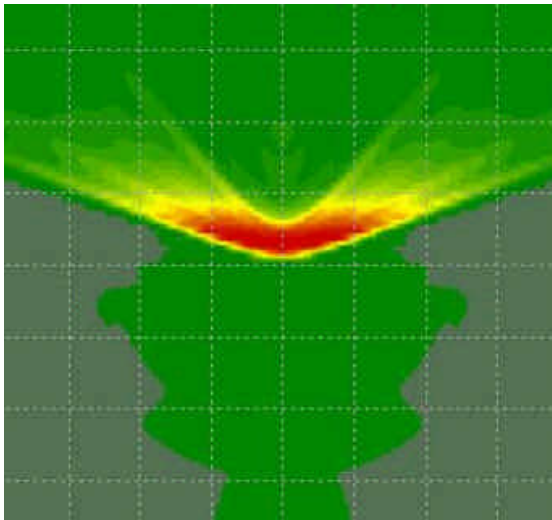


Shotgun Projectile Lethal Area Program

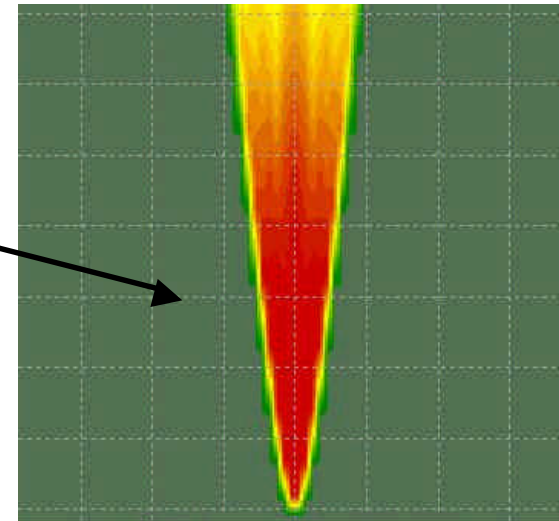


- JTCG/ME Accredited Model
- Shows Lethal Areas of Blast and Fragmentation Warheads

HIFRAG



Shotgun Projectile



*Twice the
Lethal
Area*





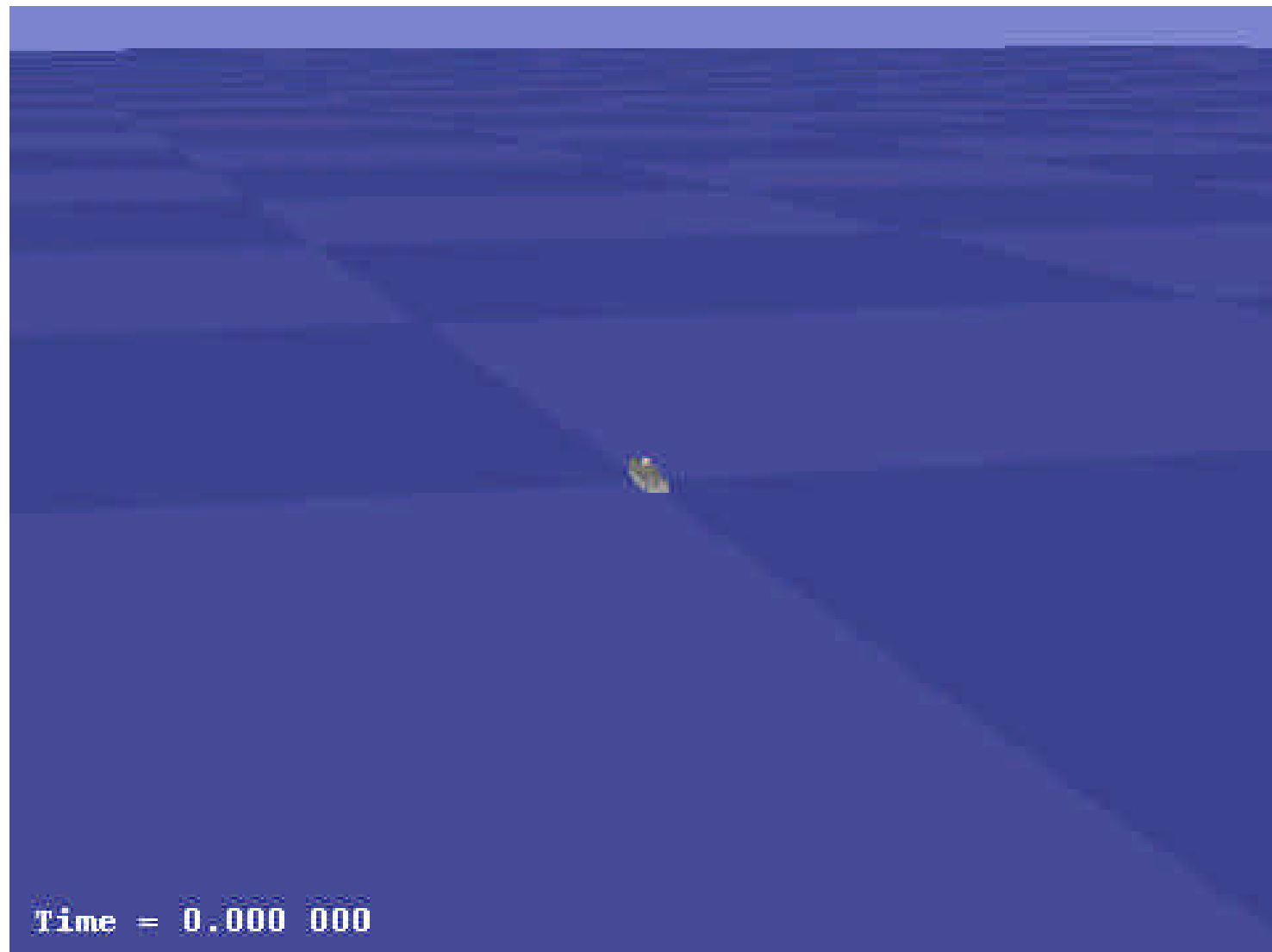
Shotgun Projectile Joint Gun Effectiveness Model



- Monte Carlo Model (JTTCG/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



KE Demo
Round #4
(Test Round #3)

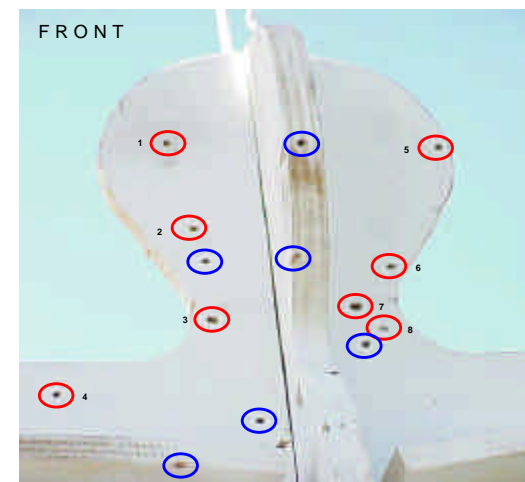
19 Sept 2002



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