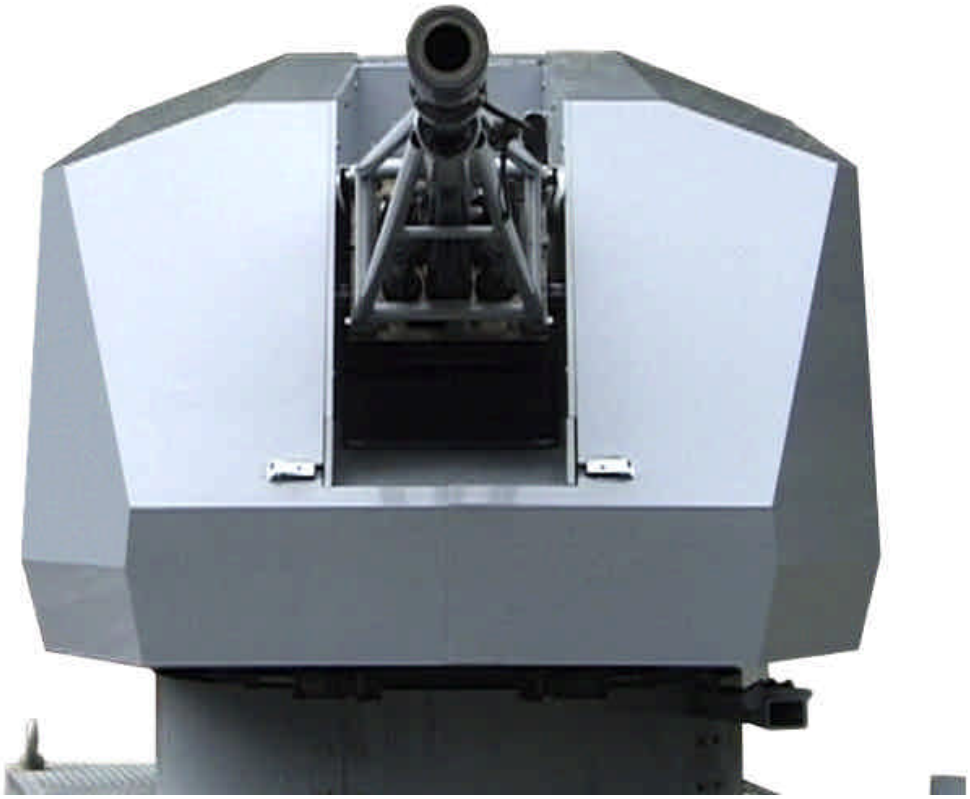
Non-Leth Requirements for Naval Forces



A Possible Solution

OVERVIEW

- The Requirement
- Terms of Reference
- Technology
  - Guns
  - Ammo
- Target Vulnerability
- Tactical Application

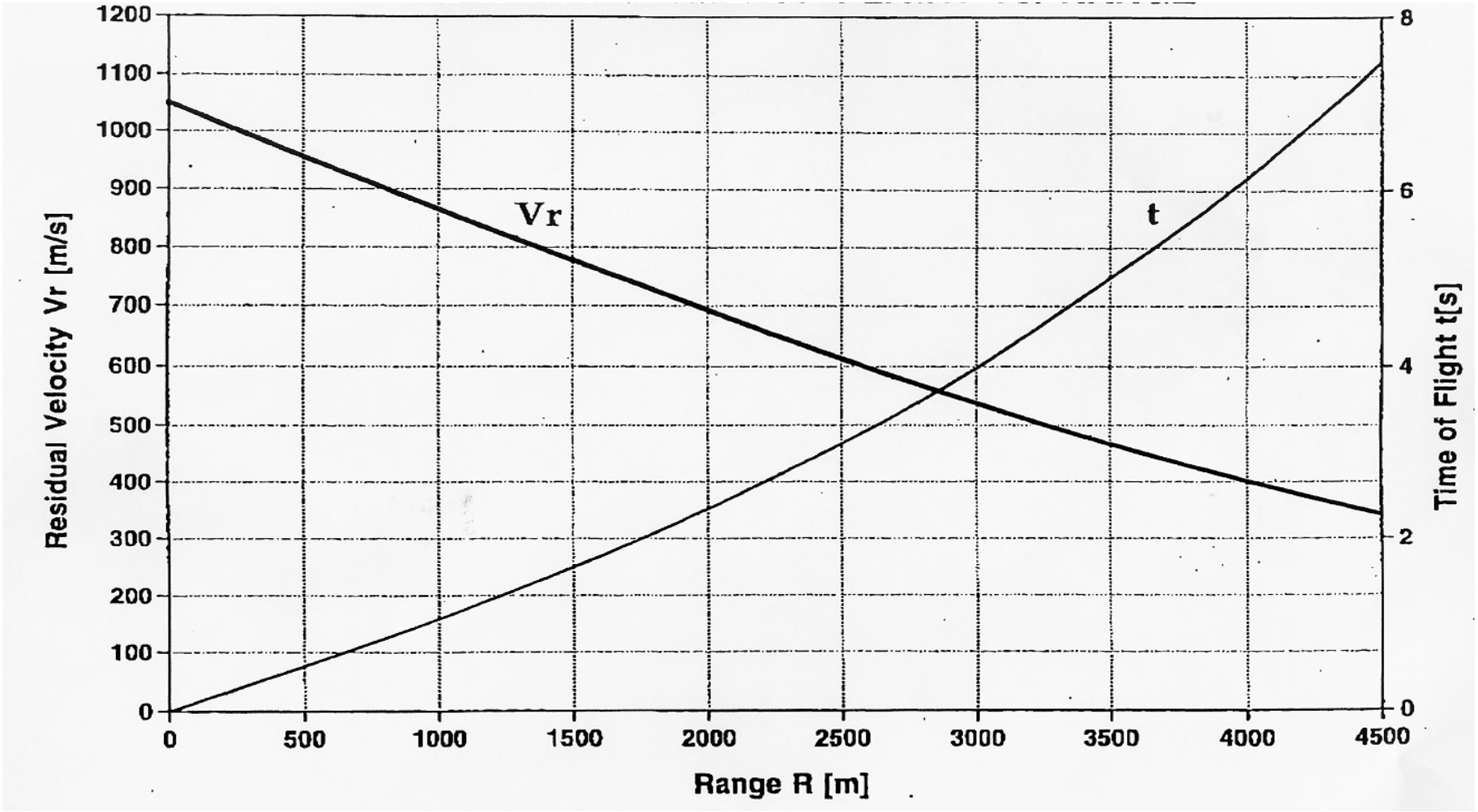
NATO Policy on Non-Lethal Weapons (NLW)

- **Incapacitate or repel personnel, with a low probability of fatality**

- **Expand the range of options available to NATO Military Authorities.**

- **NLW shall not be required to have zero probability of causing fatalities or permanent injuries.**

Typical Velocity and Time of Flight vs. Range for Minor Caliber Guns



Desirable Ammunition Feature

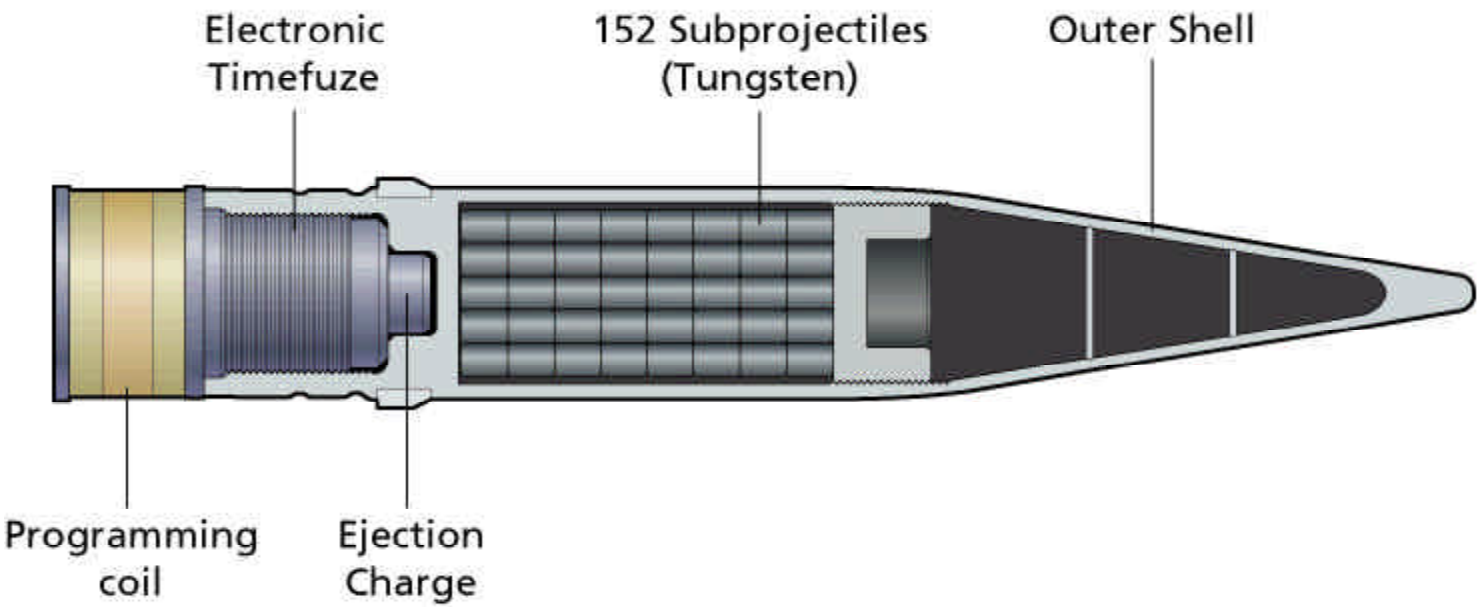
For Lethal To Non-Lethal Engagement Air Bursting Munitions

- Penetration capability (i.e. energy) of fragments (or subprojectiles), and the fragment density (#/M^2) on target
- Programmable by setting the corresponding bursting distance from target (penetration control), and the number of rounds to be fired to attain the fragment density (#/M^2) on target

Mission Roles-Targets

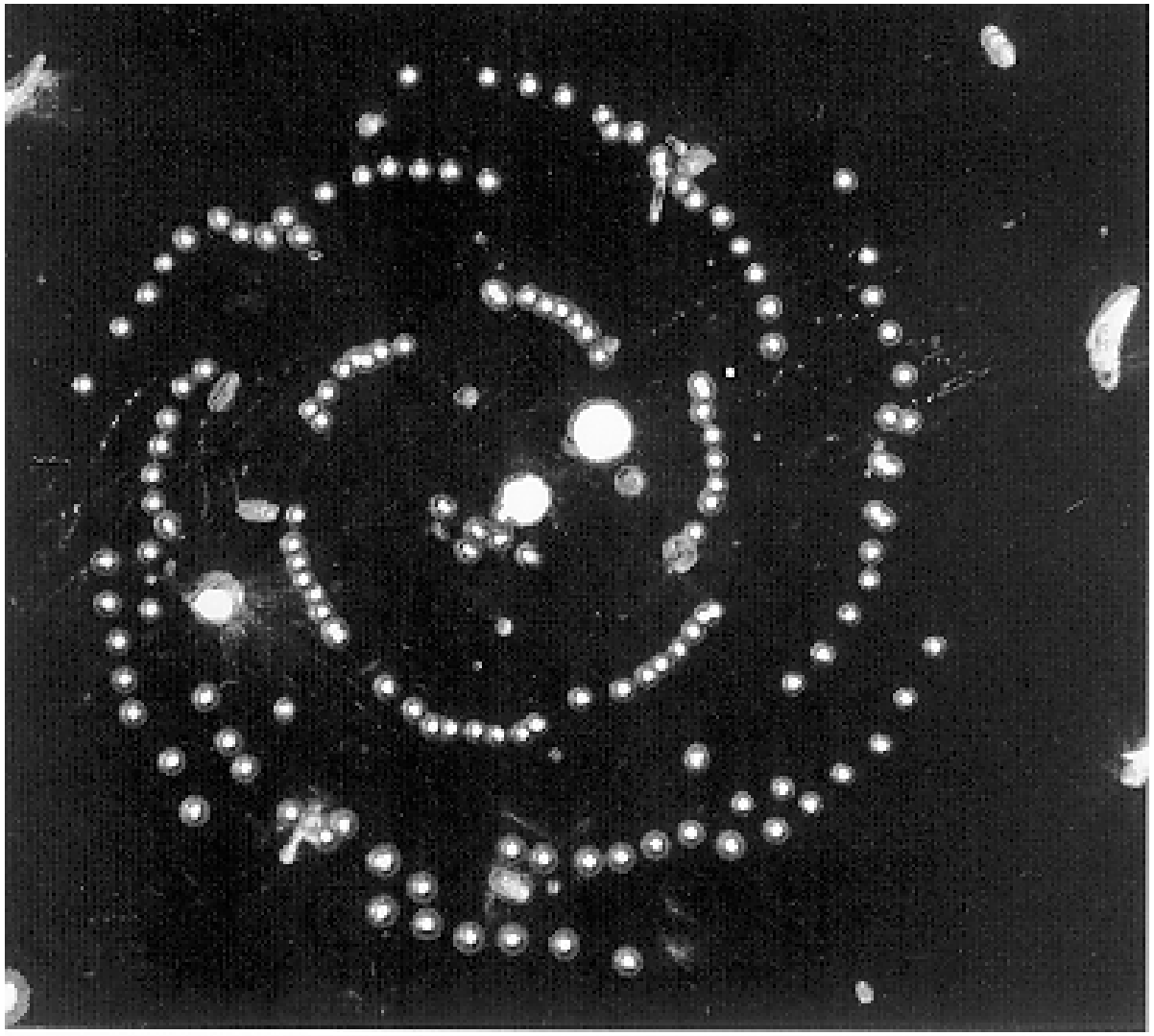
- **Mission Roles**
  - Dissuasion (from Non-Lethal/Less Than Lethal)
  - Destruction (Lethal Mission Kill/Hard Kill)
- **Targets (Anti Material/Anti Personnel)**
  - Combatant Vessels
  - Support Vessels & Merchant Ships
  - Patrol Craft
  - Inflatables To Speed Boats
  - Helicopters To Aircraft
  - Drones To Missiles

Residual Energy Projectile Design

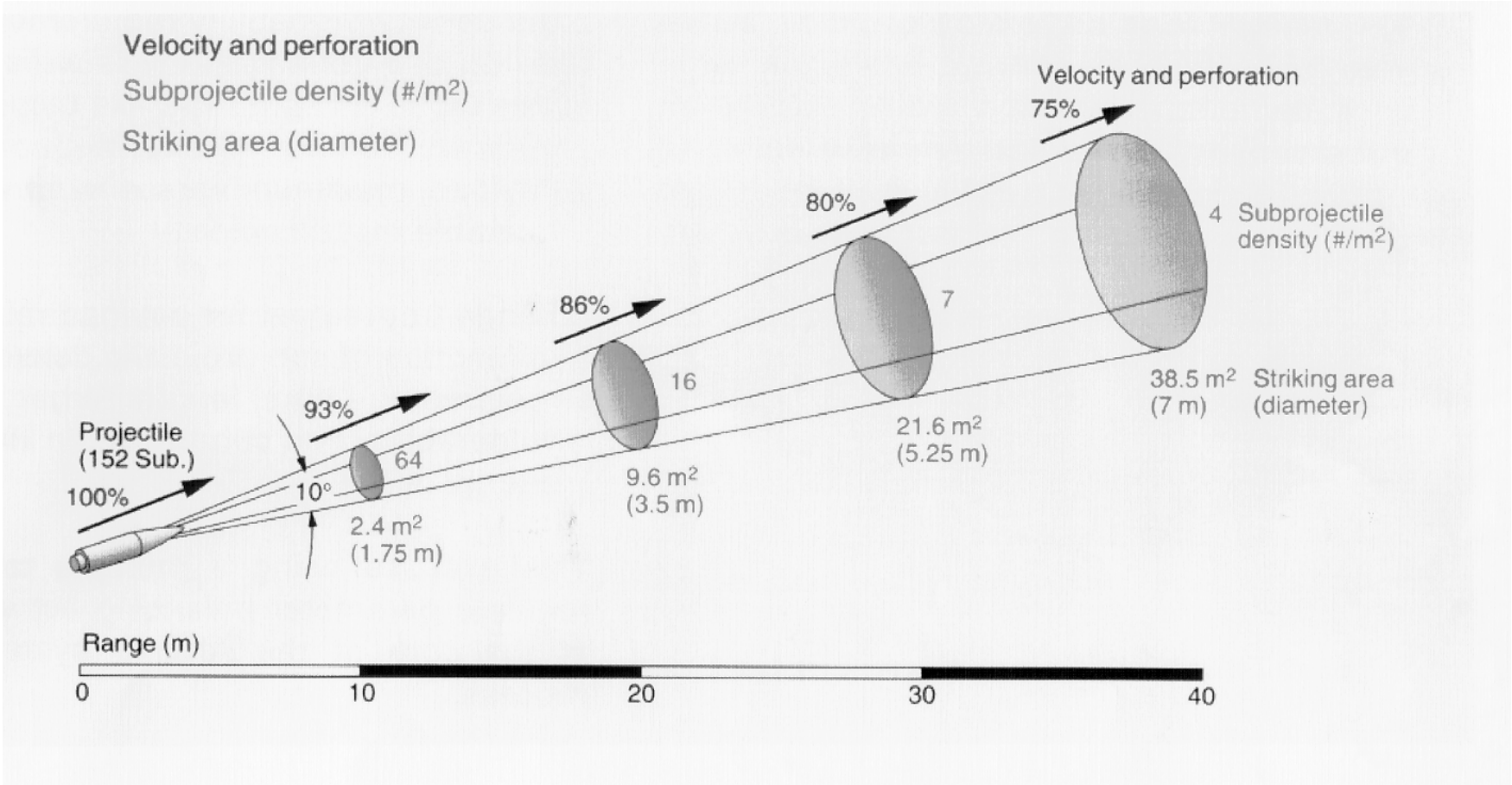


Dispensing Subprojectiles from Residual Energy Ammunition

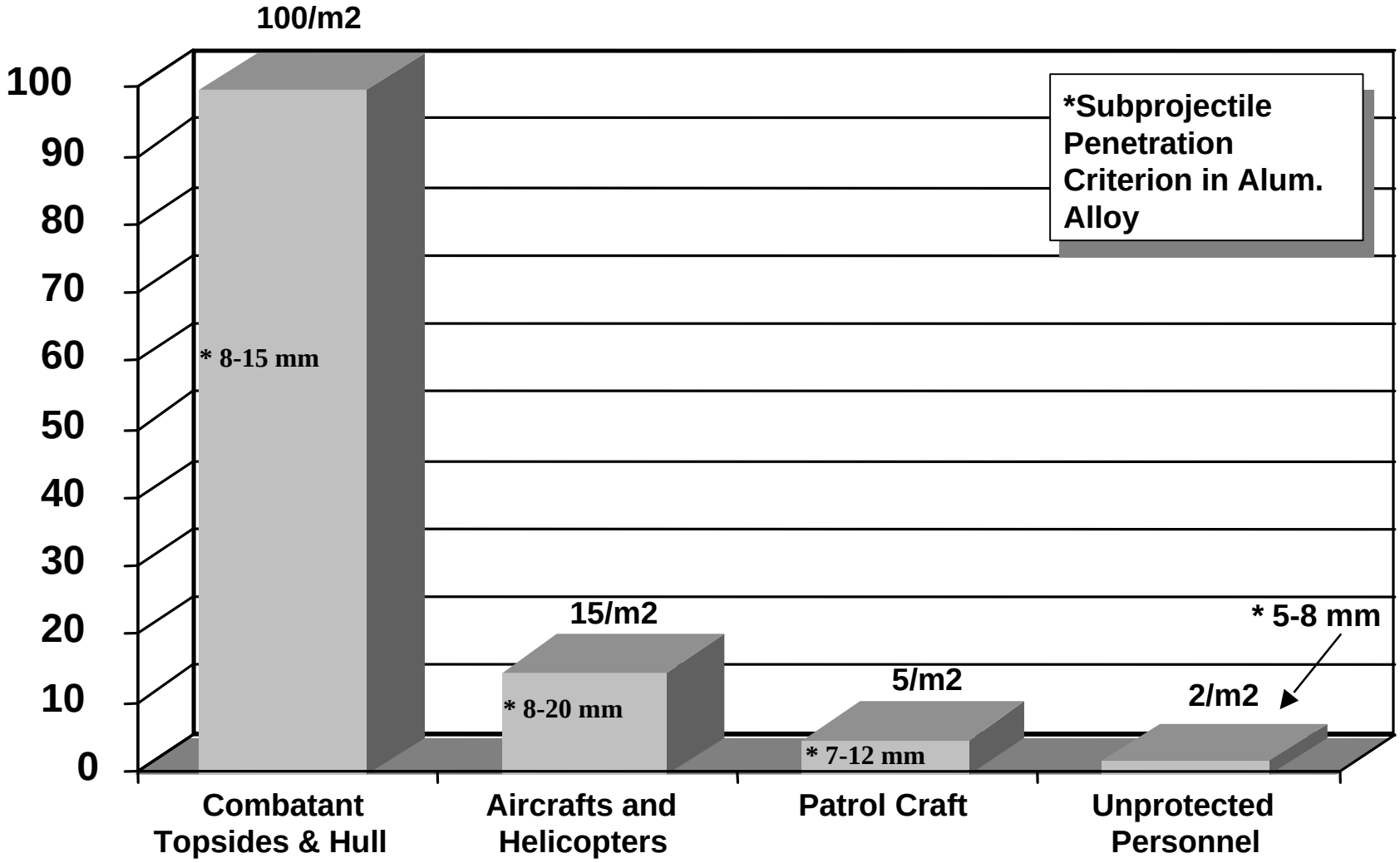
Single Round Subprojectile Pattern



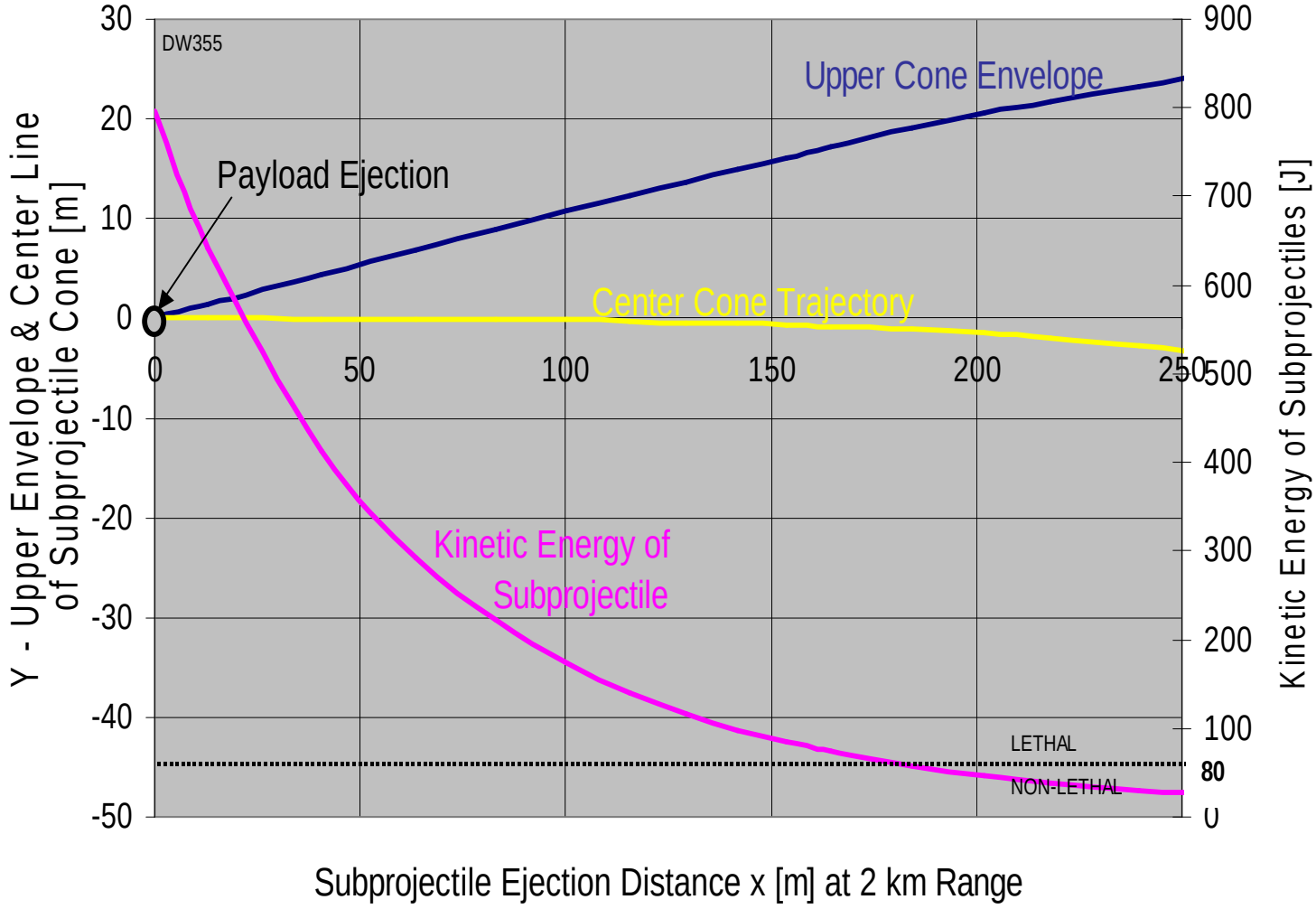
Subprojectile Dynamic Parameters 35-mm Residual Energy Ammunition



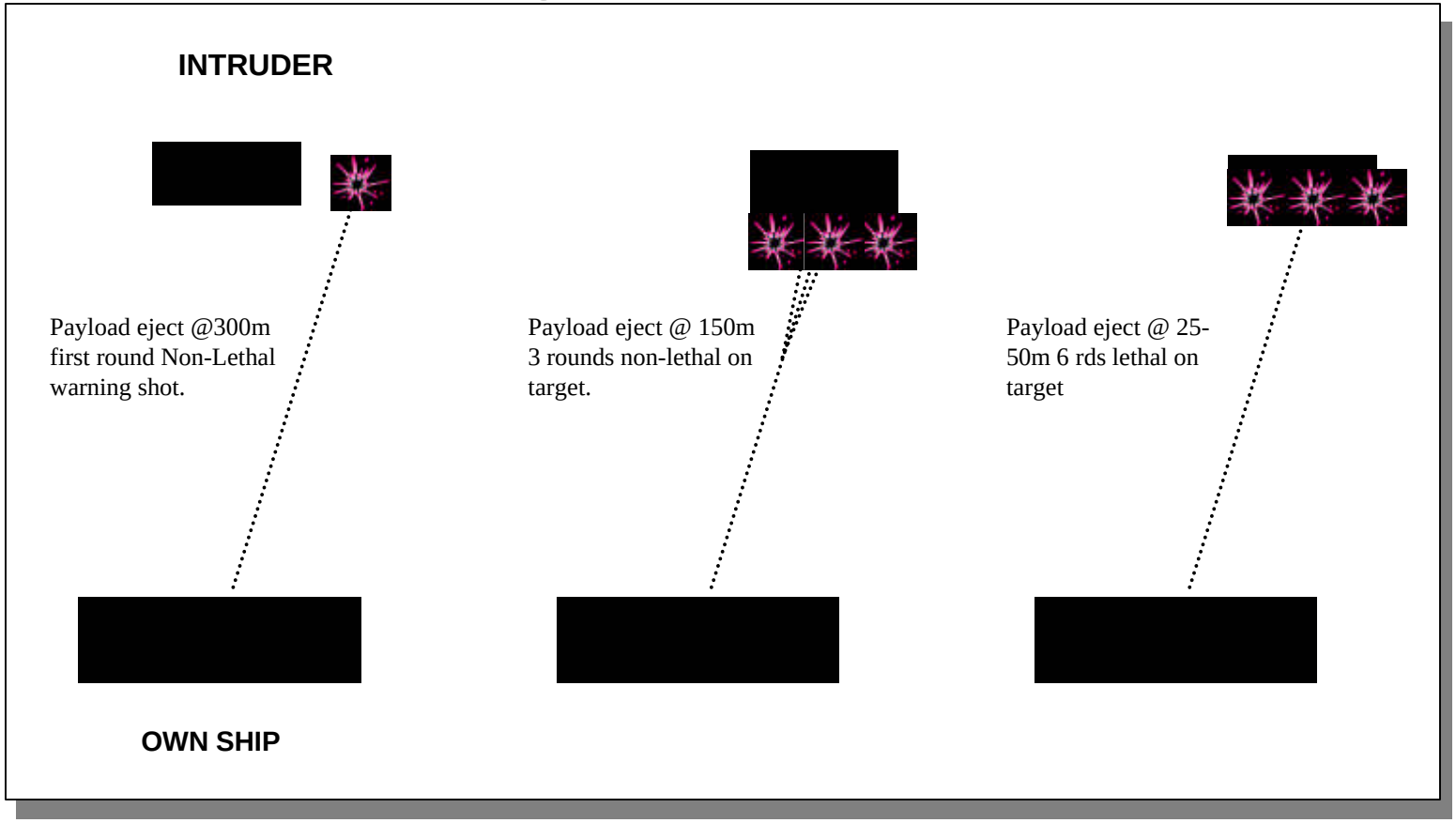
Target Vulnerability in a Surface to Surface Role



35-mm Residual Energy Ammunition Subprojectile Performance at 2-km Range



Tactical Scenario for Policing and Littoral Engagements Using Residual Energy Ammunition



Summary

- **Naval gun systems can extend their mission capabilities from lethal through near lethal to non-lethal.**
- **Demonstrated technology exists that can be applied in the development of naval weapons systems. The vulnerability of a broad range of targets could be accommodated within the mission profile.**