RDECOM

Malcolm Baldrige National Quality Award 2007 Award Recipient

ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ

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7.62mm, Limited Range Lethal Round For USCG

Informational Brief for **NDIA 2008**

20 May 2008

Project Overview & Objectives

- **Overview**
  - JSSAP funded effort initiated in FY04 to design, develop, and demonstrate a 7.62mm Limited Range Lethal Round (L2R2) that meets the unique needs and requirements of the US Coast Guard for use in harbor security applications.

- **Objectives**
  - Capable of engaging and defeating a variety of seagoing vessels and personnel targets
  - Reduced maximum range to minimize collateral damage to the areas surrounding the locations where the round will be employed.
  - Success of program may lead to future “TC”, production & fielding.

Customer Requirements

- **Defeat 1/4 inch of mild steel at 200 meters when fired from a M240B machine gun, at up to a 45-degree angle**
- **Match trajectory of M80 out to at least 400 meters.**
- **Capable of defeating soft target out to at least 400 meters.**
- **Maximum range of 2000 Meters (1500 Meters desirable)**
- **Capable of being fired from an M14 rifle and M240 Machine Gun with no weapon adapters / modifications**

M80

L2R2

Summary from 2006

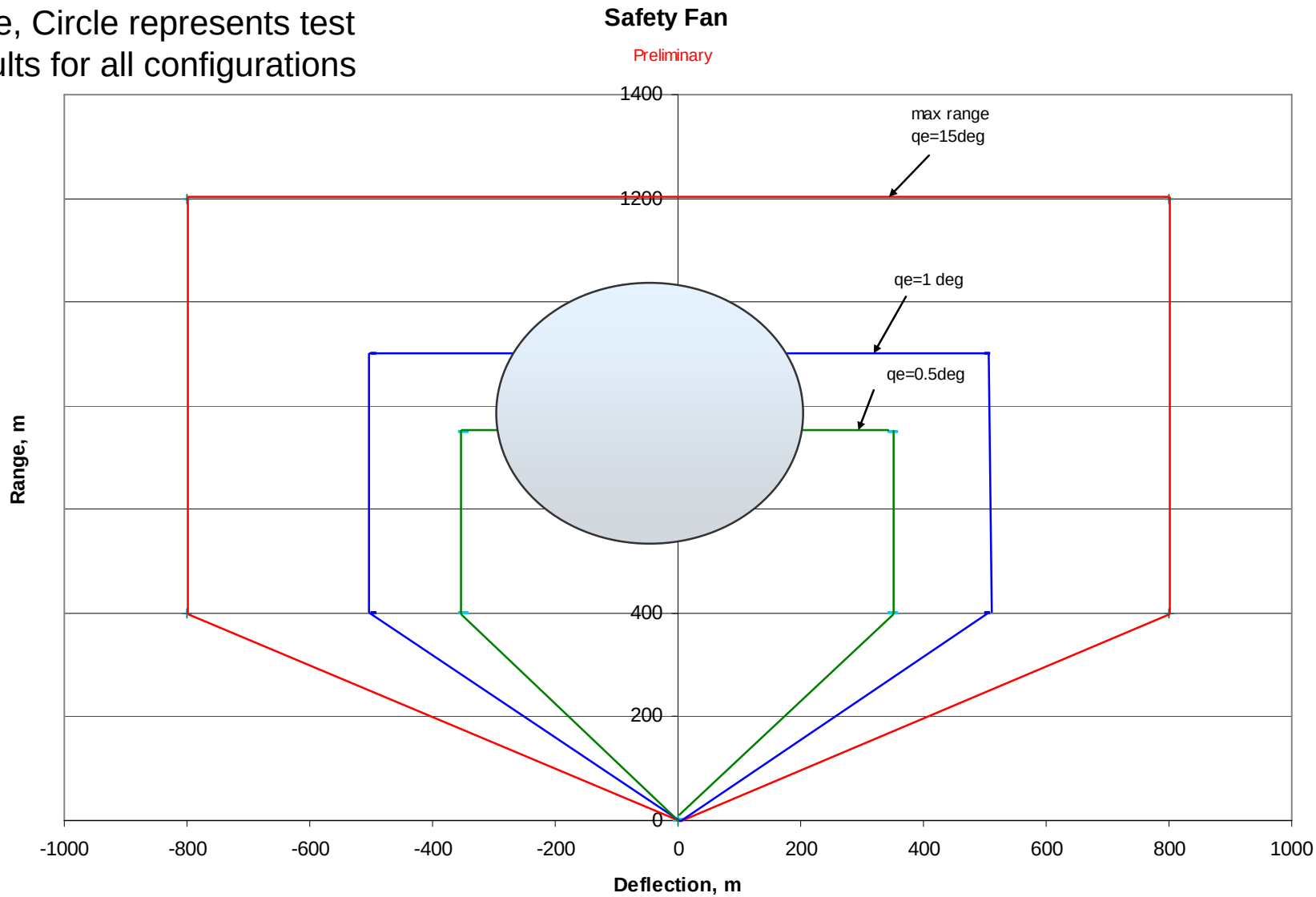
- 3-piece projectile design satisfied penetration requirements
- Radar testing necessary to verify maximum range
- Additional modifications required to improve Dispersion

Radar Testing

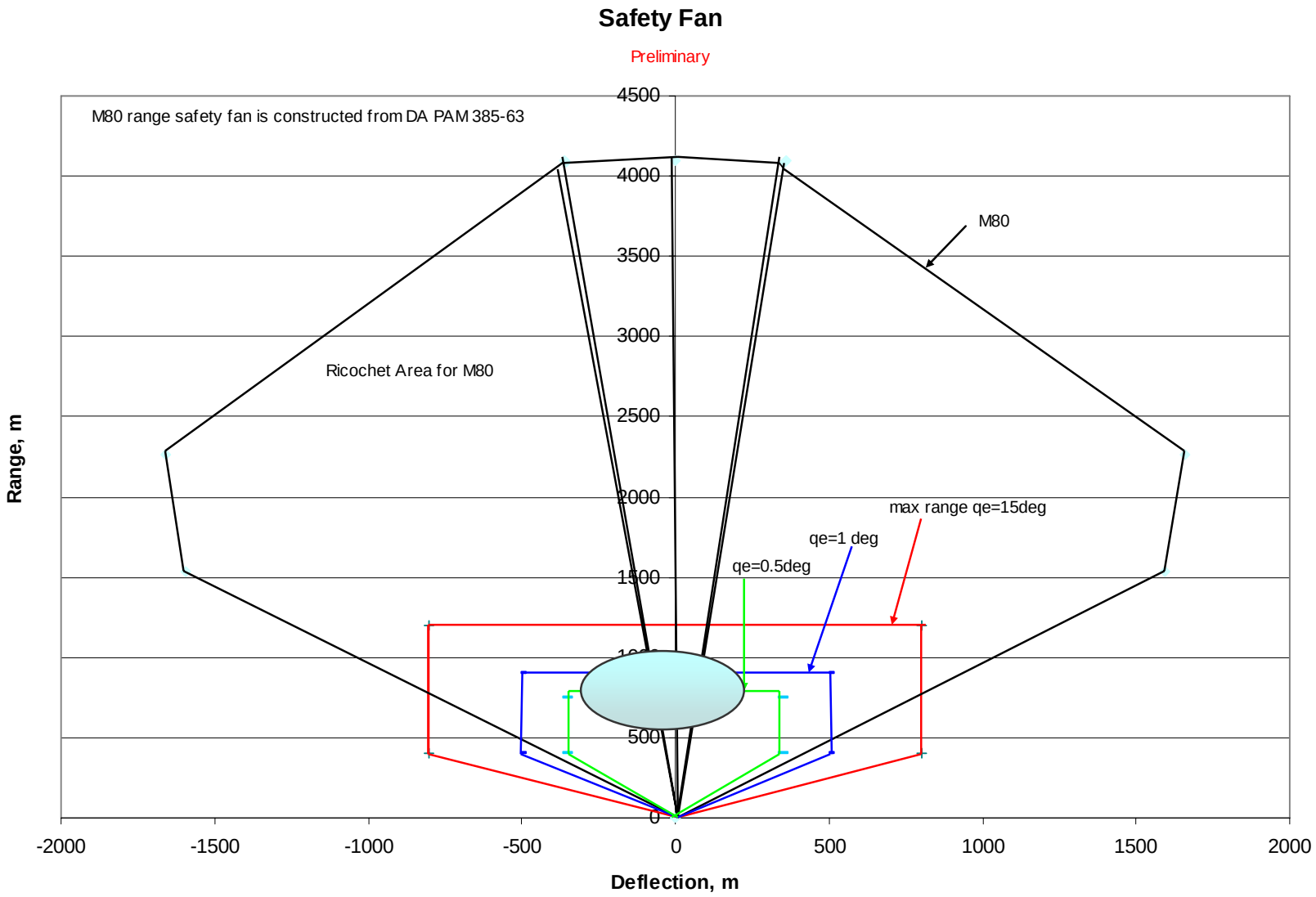
- Radar Testing was performed at the Aberdeen Test Center
- Tested 6 Configurations
  - Long Fin
    - Low Propellant Charge
    - High Propellant Charge
  - Medium Fin
    - Low Propellant Charge
    - High Propellant Charge
  - Short Fin
    - Low Propellant Charge
    - High Propellant Charge

Radar Test Results/L2R2 Safety Fan

Note, Circle represents test results for all configurations



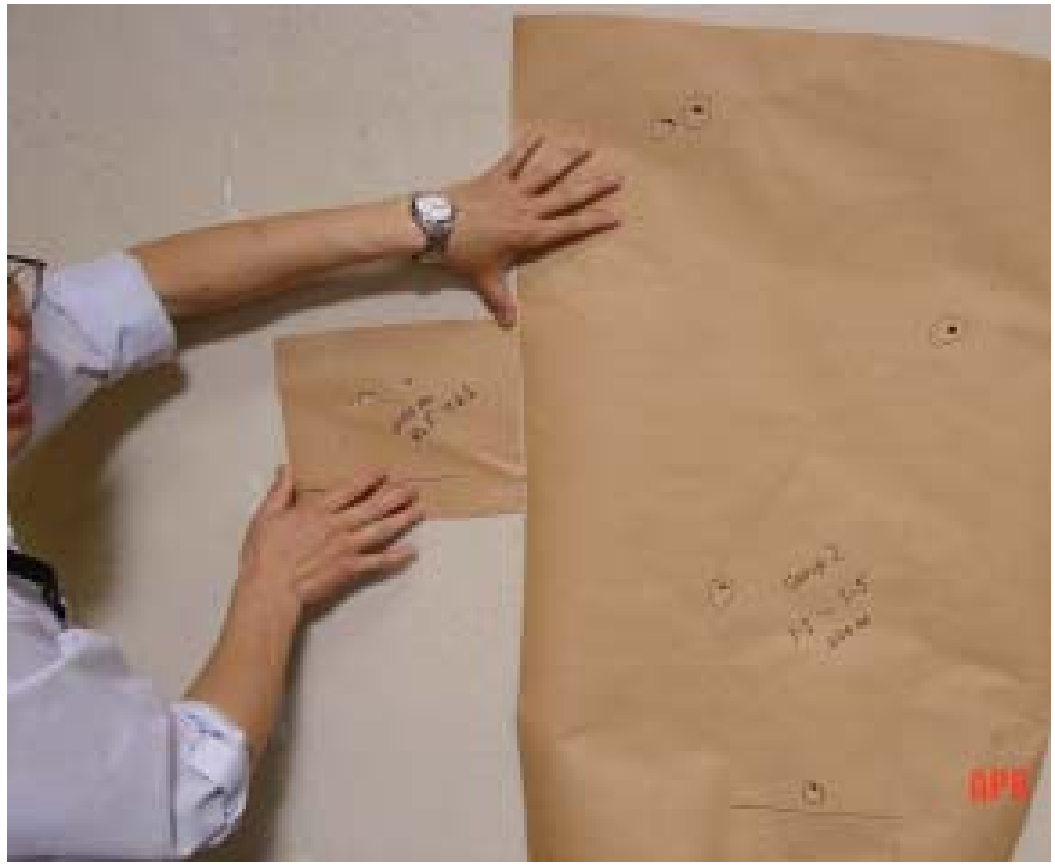
M80 and L2R2 Range Safety Fan Comparison



Long Fin Dispersion Testing

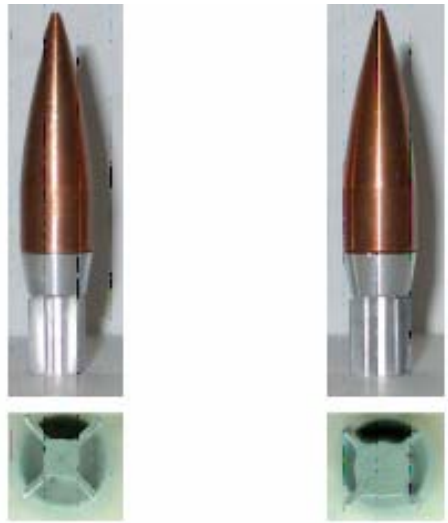
- Fired three five round groups
- Average Circular Error Probable (CEP)
  - 1in for M80
  - 9in for 3-Piece Rear Fin Design
- Unacceptable dispersion
- Redesign 3-piece projectile and fabricate a new alternative

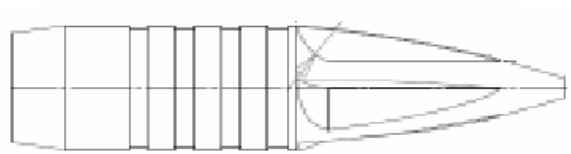
L2R2 and M80 @ 200m

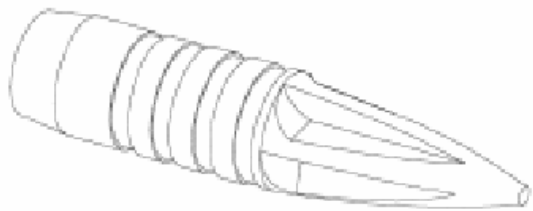


Technical Description of New Designs

- Three new designs have been investigated:
  - Three (3) piece design:
    - Aluminum fins with small stem at the center
    - Copper jacket
    - Tungsten penetrator
  - Three (3) piece design:
    - Aluminum fins with a large stem at the center
    - Copper jacket
    - Tungsten penetrator
  - One (1) piece design:
    - Brass Banded Solid with sections removed from the ogive (forward facing fins)
- Standard 7.62mm, M80 ball cartridge case, primer, and propellant
- Limited testing demonstrated reliable weapon function and ability to meet desired muzzle velocity





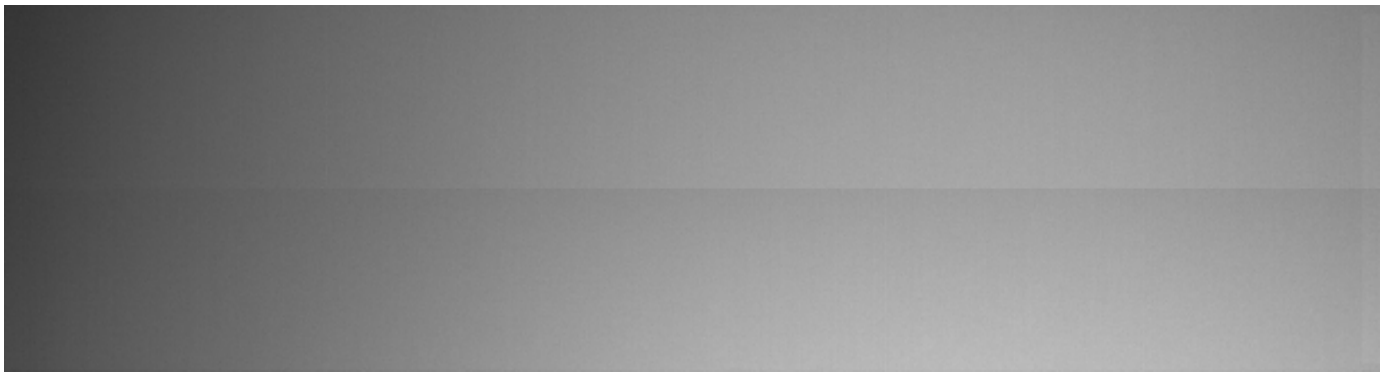


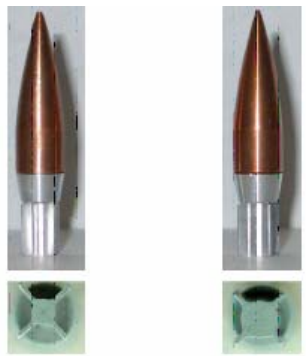
New Designs Testing

- Tested dispersion and target penetration
  - Banded Brass Projectile without fins penetrated target, low dispersion
  - Both 3-Piece design penetrated target, no improvement in dispersion
  - Banded Brass Projectile with fins didn't impact target.

Rear Finned Projectile

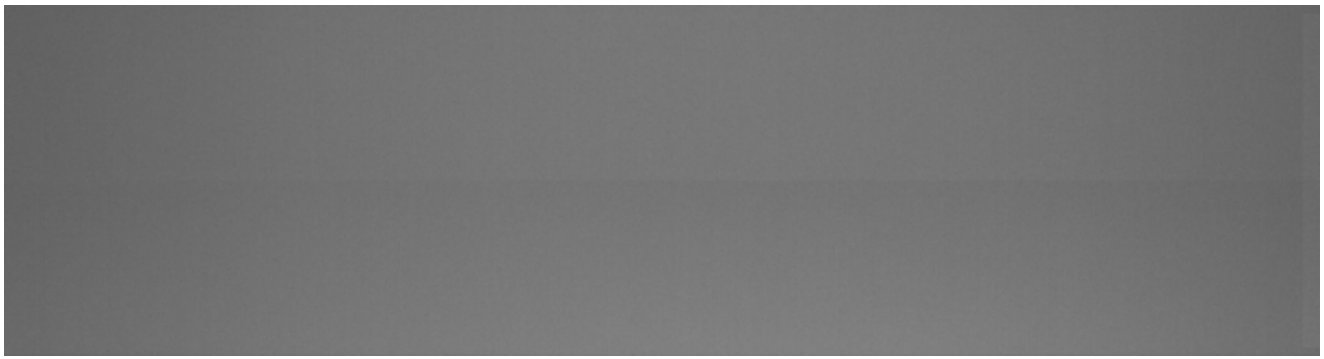
High-speed video of rear finned 3-Piece projectile with center stem @ 15ft from muzzle

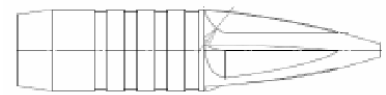


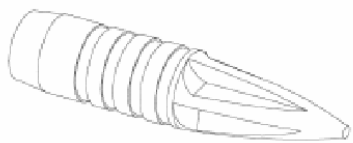


Forward Facing Finned Projectile

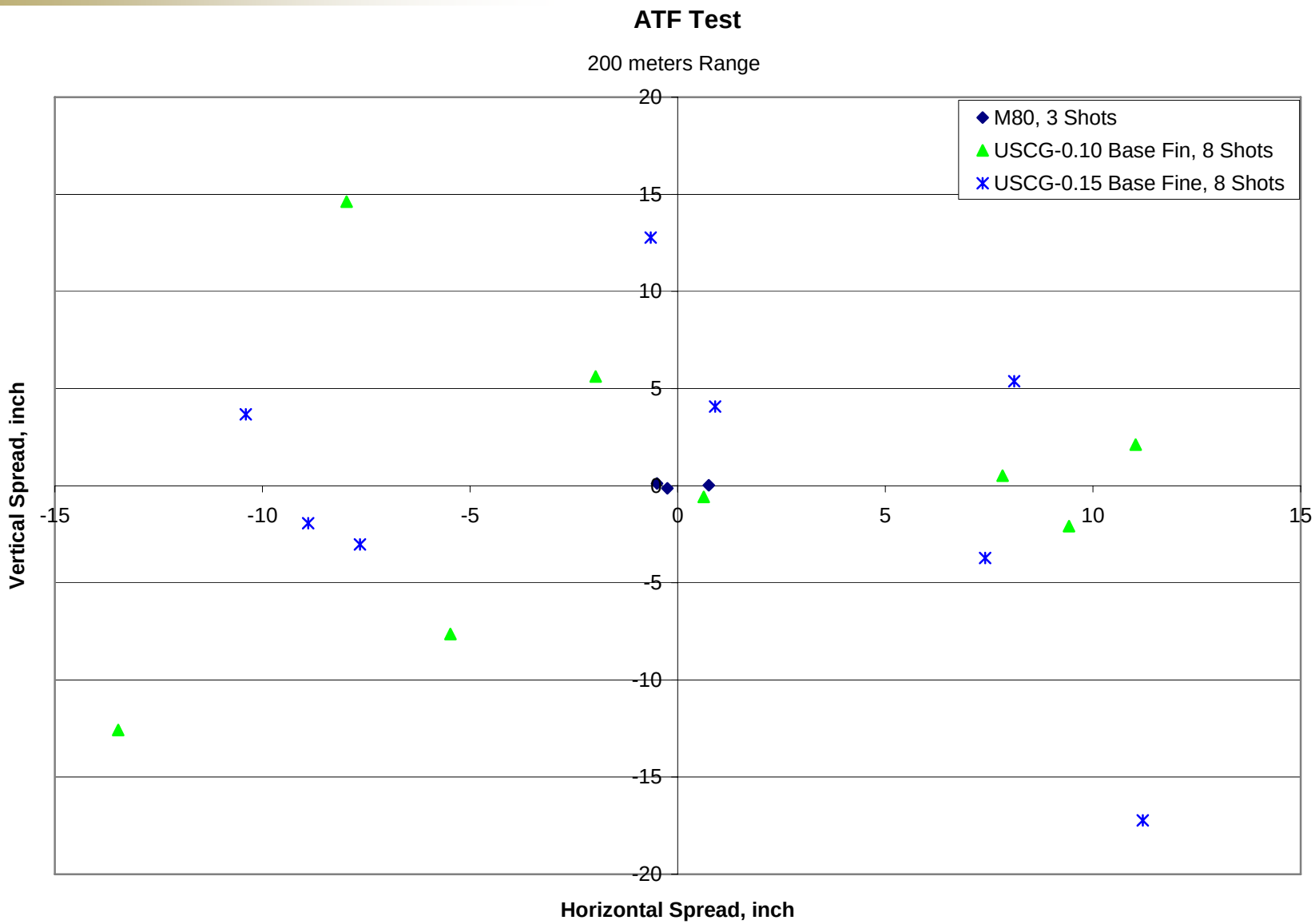
High-speed video of Banded Solid with Forward Facing Fins @ 15ft from muzzle







Dispersion Testing Results



Testing Conclusions

- Rear Finned Projectile
  - Redesigned twice to improve dispersion
  - Minimal improvements in dispersion
  - Design abandoned due to possible tracer requirement
- Forward Facing Finned Projectile
  - Poor stability, didn't impact target
  - Promising concept, cg must be shifted closer to nose
  - Design can accommodate tracer mix

Corrective Actions

- Needed more stable baseline design
- Chose the Standard 7.62 NATO Design, M80
- Designed a solid brass projectile with dimensions equivalent to M80
- Machined forward facing fins
- Modeling showed that it would meet max range requirement

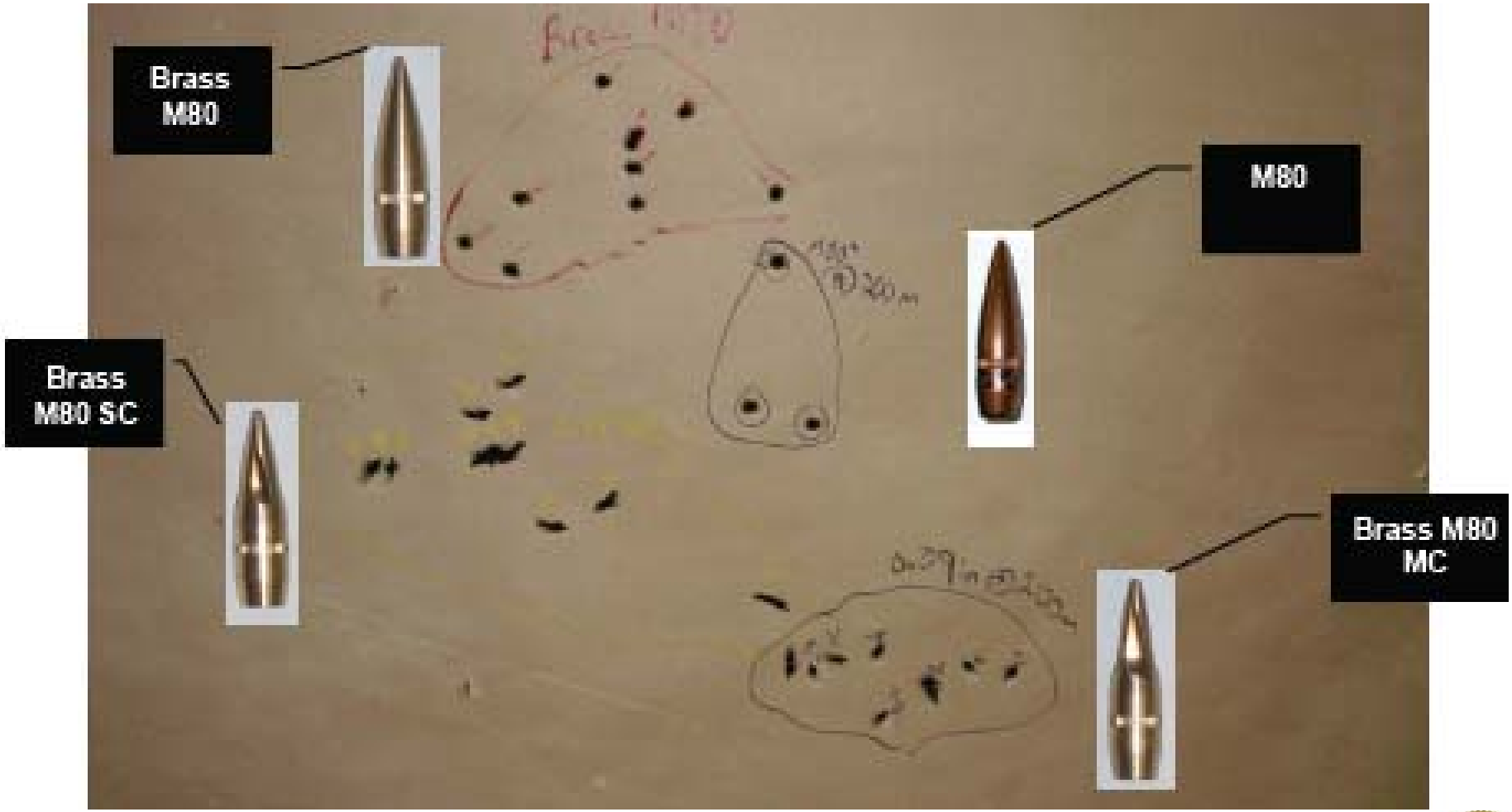
New Designs Testing

Tested dispersion and target penetration (0.25” mild steel) for the designs displayed below.

Forward Facing Finned Projectile

High-speed video of Brass M80 with Forward Facing Fins @ 15ft from muzzle

Test Results, Dispersion @ 200m



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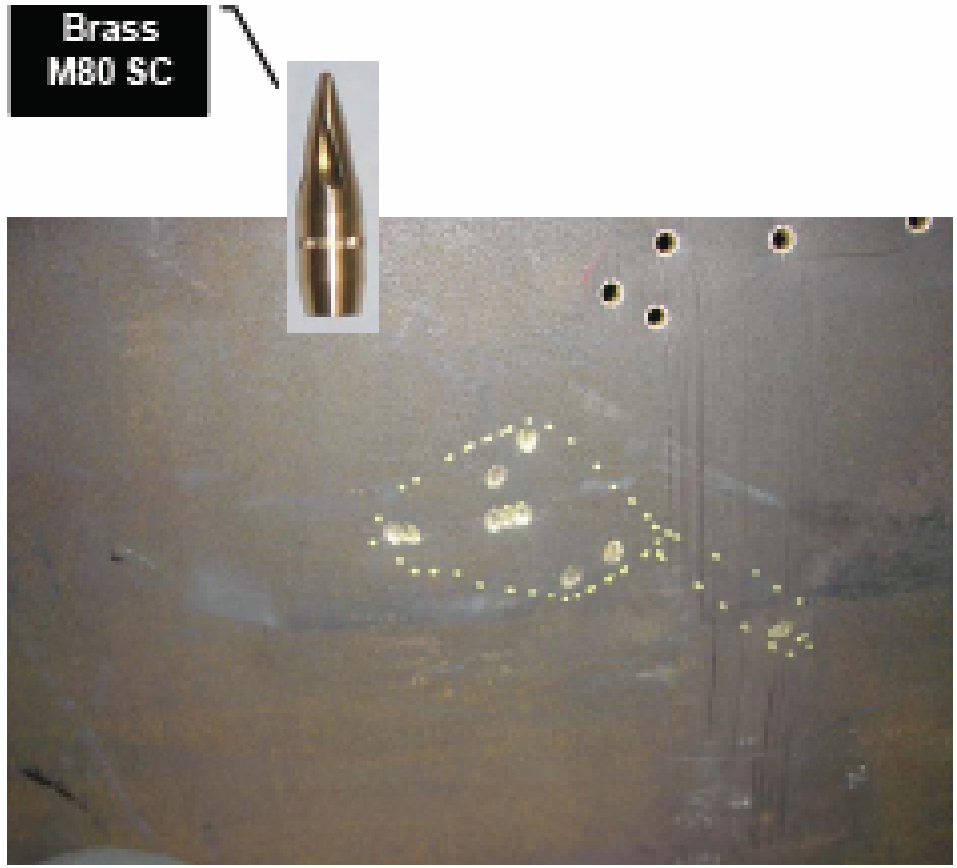
Test Results, Penetration



Summary & Future Tasks

- Brass M80 with forward facing fins
  - Low dispersion
  - Poor target penetration
- Future Tasks
  - Model and Simulate projectile target penetration
  - Perform Spark Range Testing
  - Redesign for penetration and improved dispersion
  - Dispersion test at 400m
  - Radar test for max range

Questions?

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