RDECOM

ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ

Malcolm Baldrige National Quality Award
2007 Award Recipient

Extended Area Protection and Survivability (EAPS) ATO

46th Annual Guns & Missile Systems Conference

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Manfredi Luciano
973-724-3473
manfredi.luciano@US.army.mil
EAPS ARDEC APO

12 April 2011

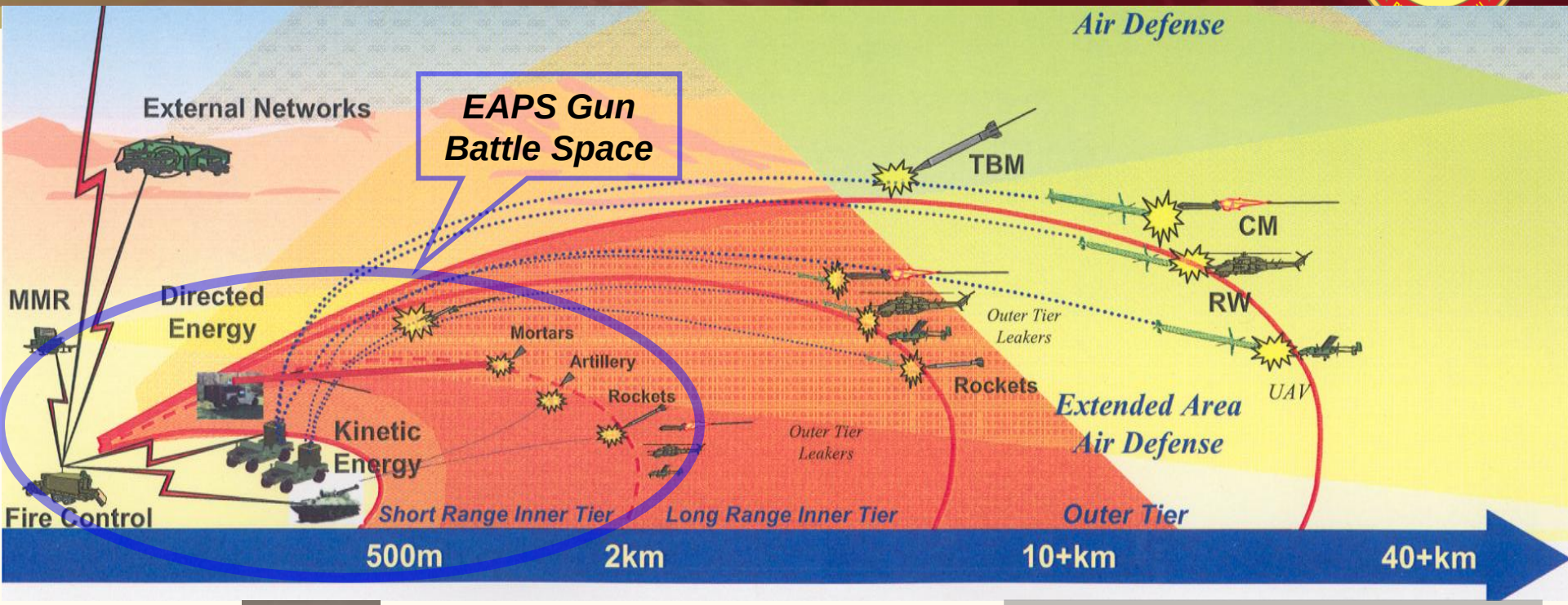
Distribution A: Unlimited Distribution

Presentation Structure

A. Program Overview & Update

B. Flight Body Evolution of EAPS Interceptor

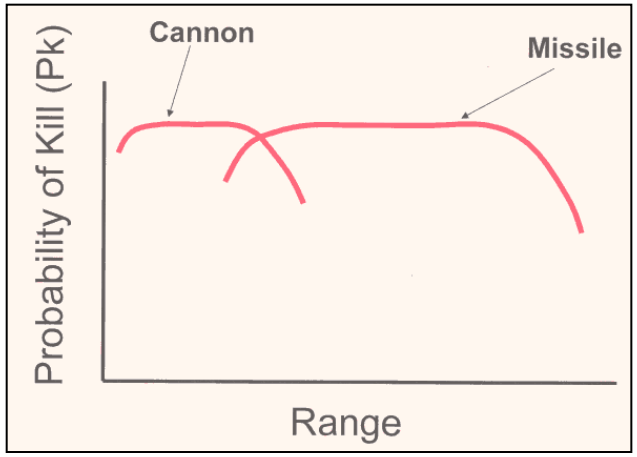
Program Goal and EAPS Battle Space



Target List

- Rockets: 107 mm-240 mm
- Artillery: 122 mm-152 mm
- Mortars: 60 mm – 120 mm

- **Goal is to Develop Technologies for 360 Degree Mobile Air Defense Against Rockets, Artillery and Mortars (RAM)**
- **ARDEC ATO Program Pursuing Gun Based Solution for Short Range Inner Tier – Need to fill range Gap of present systems**



EAPS Gun Baseline Concept

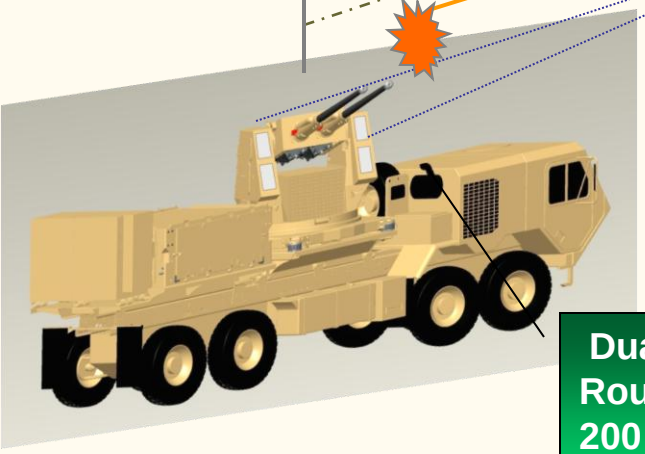
50mm Bushmaster Cannon

RF Data Link

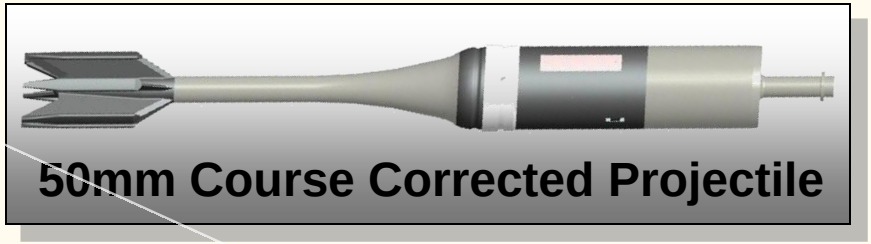
Radar Track

Forward Fragmentation Warhead Detonation

Mid-Flight Course Correction



Dual Barrel,10 Round Burst at 200 Shots per Minute Per



50mm Course Corrected Projectile

Phase II Program Goals and Objectives

- Demonstrate a prototype 50mm auto cannon that fires at 200 rds/min w/ a feed system for a ten round burst.
- Demonstrate a fire control sensor & commo station to simultaneously track burst of ten interceptors and two threats and command the ten interceptors to maneuver and warhead function.
- Demonstrate a 50mm cartridge to meet threshold performance.

Demonstrate integrated system (System Level TRL-6) by defeating two stationary threats in a simultaneous emulated scenario.

EAPS Gun ATO
Integrated Demo Roadmap

Technology Demonstration Plan

Baseline Gun (112rds/min)
Baseline Projectile Design
New E-Scan Radar

→ Fixed Gun, Stationary Targets Demo

FY14

Performance Demonstration Plan

Revisit Syst Study For Optimum Caliber

High Rate Gun (200rds/min)
Optimized Projectile Design
New E-Scan Radar

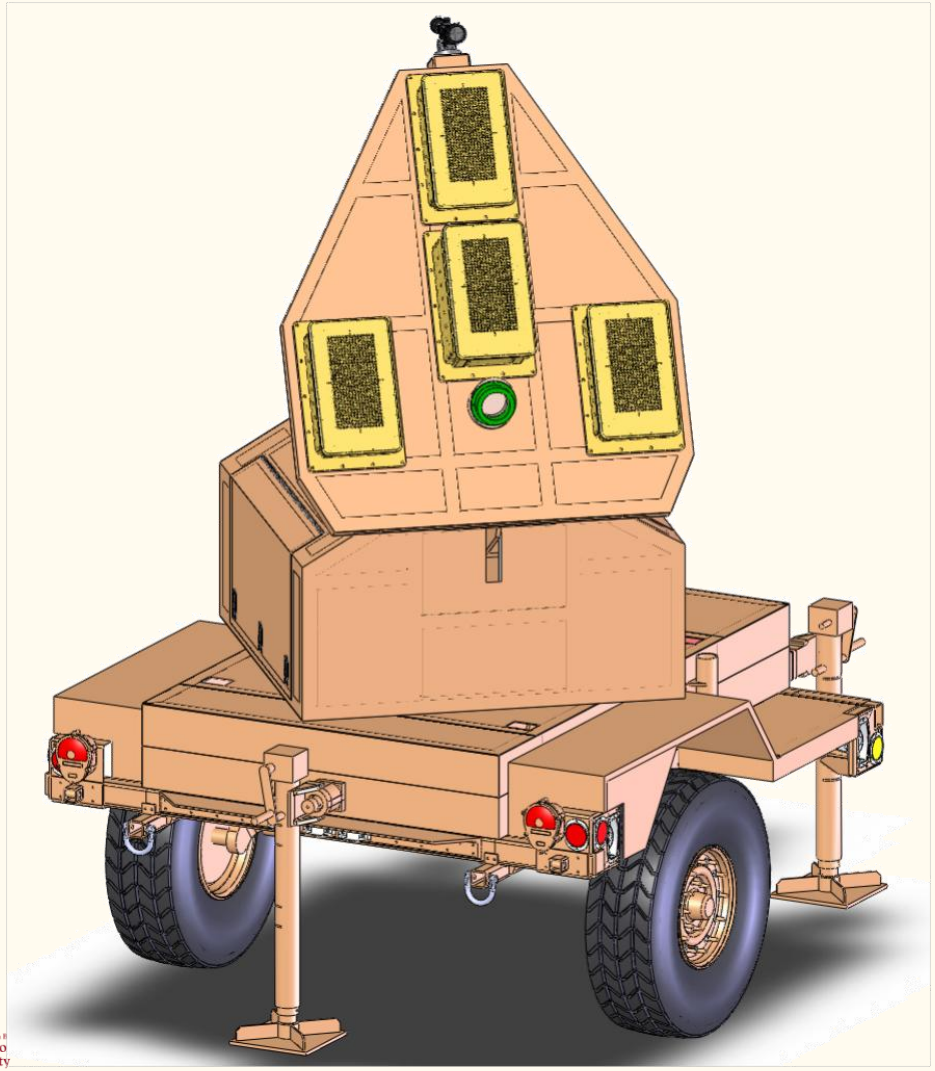
→ Indiv Component Demo

Smaller Battery
MEMS S&A
Reduced Antennae
Smaller Electronics
More Lethal Warhead

EAPS Gun System HEMTT Mount

- C5, C17, C130 Transportable
- Meets Mobility Requirements
- More Cost Effective Than the Stryker – Stryker Also An Option

Technovative Applications
EAPS Fire Control System

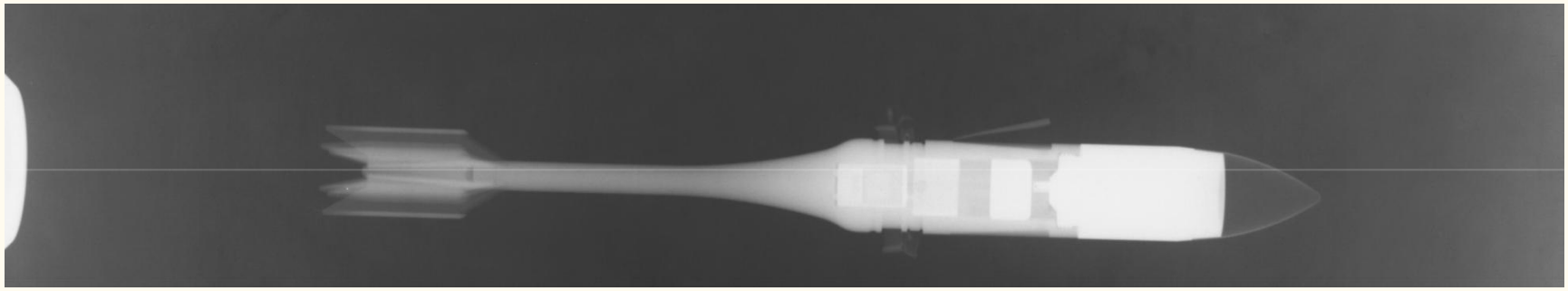


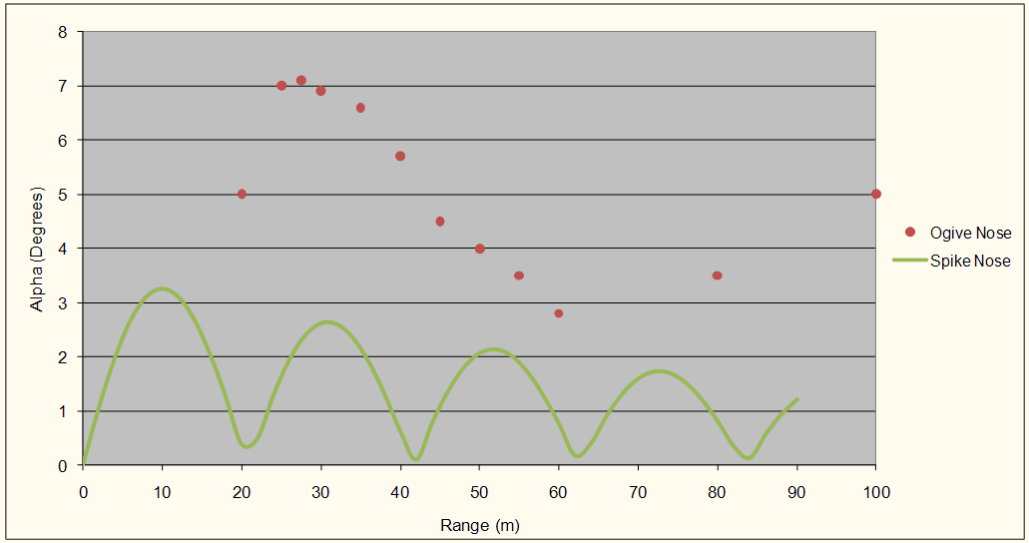
- 512-element Transmit Antenna based on PPS with improved cooling
- 512-element Receive Antennas (3) based on PPS
- 1 meter interferometer baseline for high angular accuracy
- PPS electronics group with upgraded processors
- Fire control software adapted from PPS
- Multi-target tracking and RF communications

FLIGHT DESIGN REFINEMENT TO REDUCE AEROBALLISTIC DRAG

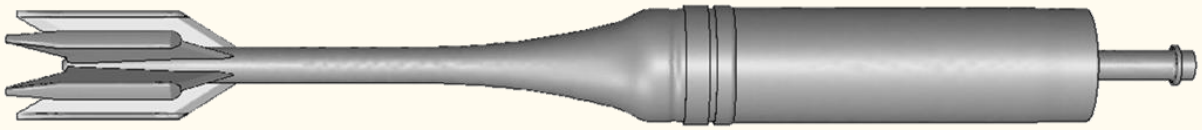
Original Ogive Design

Flight Design, Nov 2007

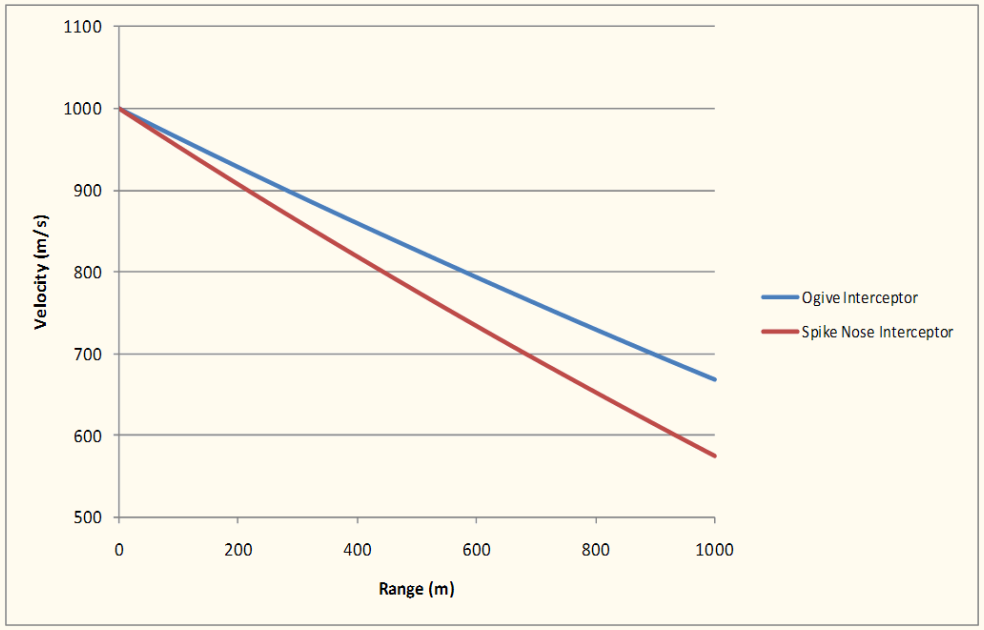




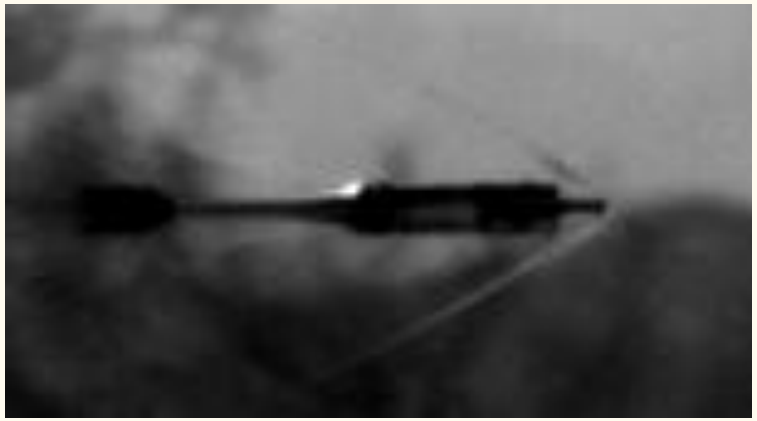
Spike Nose Fix – Demo Round



Flight Design from Feb 2008 to Mar 2009, Demo

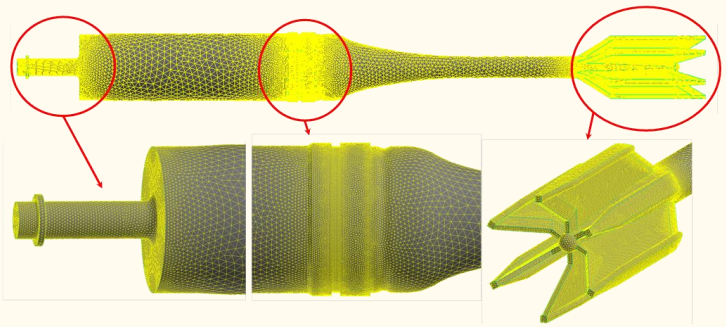


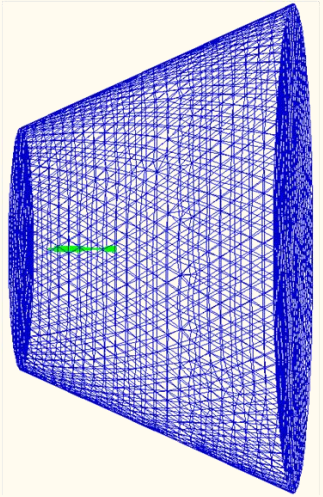
Velocity Comparison

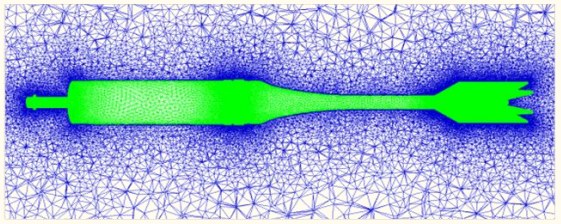


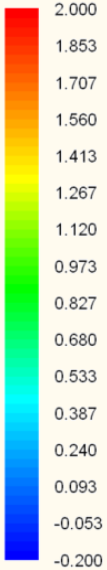
Increased Stability at the Expense Of Drag

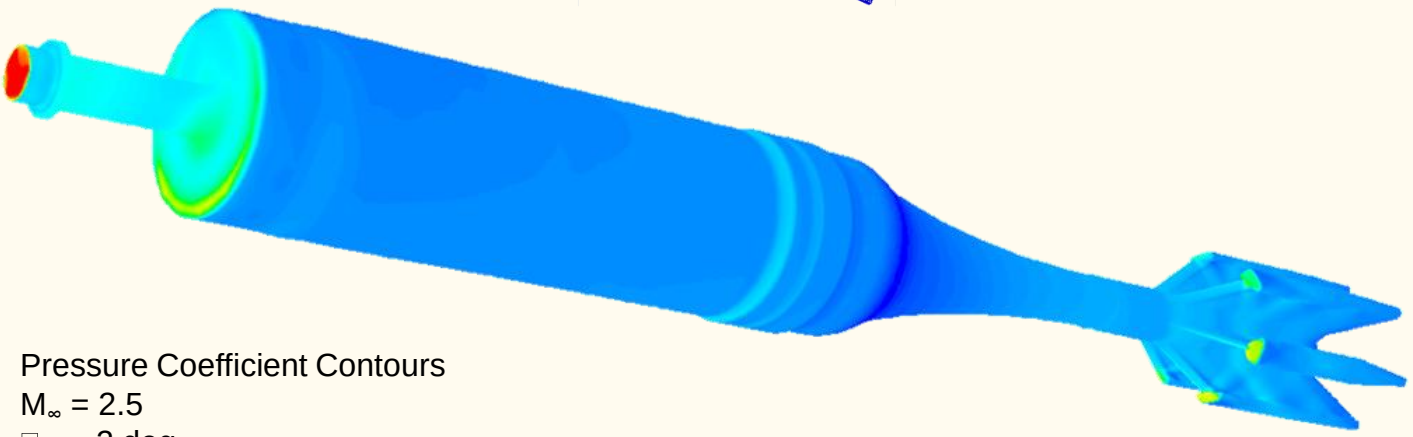
Computational Fluid Dynamics









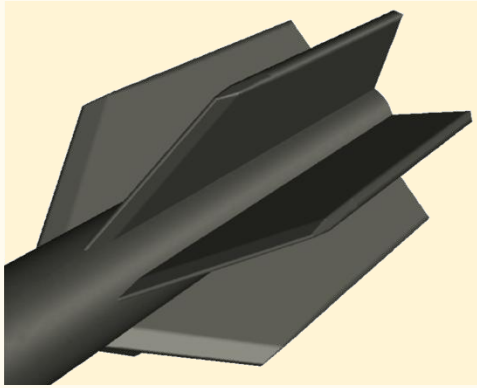


Pressure Coefficient Contours
M_∞ = 2.5
α = 2 deg

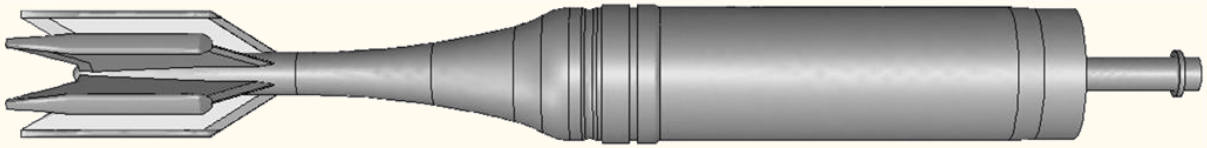
Identified Spike & Boom Lengths & Fin Design As Variables for Drag Reduction

Test 405 Matrix

1.5 Caliber Spike



No T-Tab Fin



1.5 Caliber Shorter Boom, T-Tab Fin

1.5 Caliber Spike, No T-Tab Fin

Interceptor description	@ Mach 2.5	
	Prediction	Test 405
1.5 caliber spike nose	0.57	0.54
No T-Tab fin	0.61	0.63
1.5 caliber spike + no T-Tab fin	0.54	0.50

Drag Reduction Summary

	Velocity @ 1000 m [m/s]	Difference in velocity from test 303 [m/s]
Test 303	567	-
1.5 caliber spike	634	+67
No T-Tab fin	585	+18
1.5 caliber spike + no T-Tab fin	658	+91

Gained Back Lost Velocity

Summary

Fire Control Sensor Contractor Allows Program to Move Toward Integration Phase

- Demonstration in FY14.

Interceptor Optimization (still ongoing) Will Meet Performance Requirements

- Lethality Assessment tests to optimize warhead design.
- System study to select optimum caliber.
- Flight design and refinement to reduce aeroballistic drag.