



U.S. Army Research, Development, & Engineering Command,
Armament Research, Development & Engineering Center
Picatinny, NJ



International Armaments Technology Symposium & Exhibition NDIA

Mid Range Munition MRM

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PRESENTED BY

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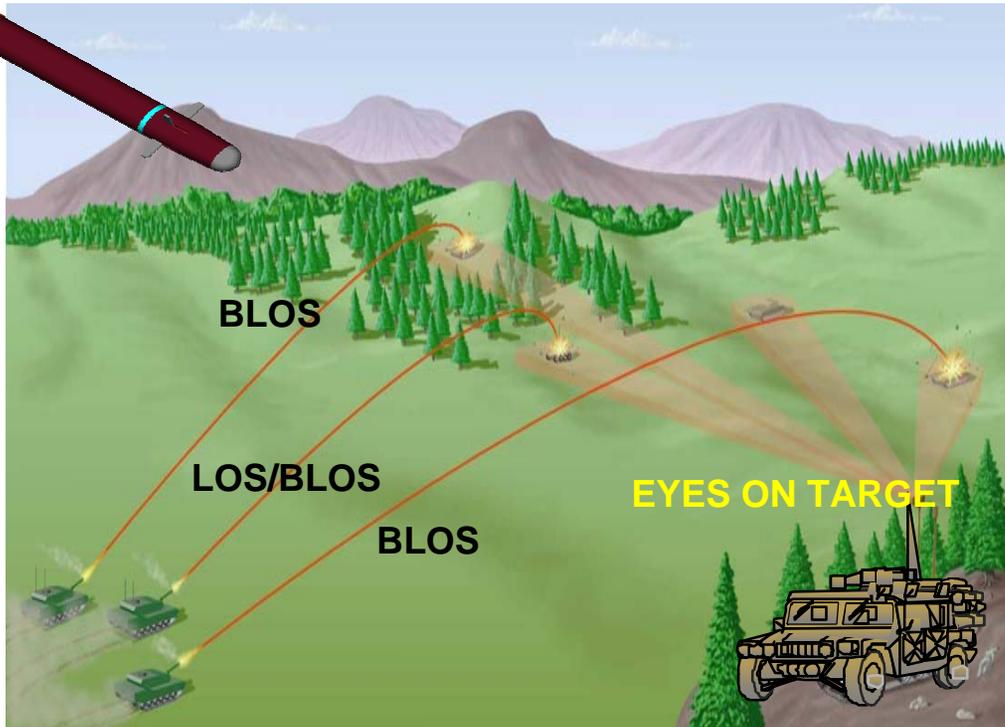


What is MRM???

FCS MCS Mid-Range-Munition (MRM)



Objective: Provide the FCS Mounted Combat System (MCS) with a precision munition capable of defeating LOS/BLOS threats out to 12+km. The goal, as part of the LOS/BLOS ATD was to develop and integrate the necessary technologies to demonstrate a TRL 6 munition, ready for Milestone B and System Development & Demonstration (SDD) Phase.



SYSTEM CHARACTERISTICS:

- Precision Munition for FCS Increment 1 MCS
- Designed to Defeat High Pay-Off
- Fleeting Targets (MBTs with ERA, APCs, Artillery, etc.)
- Incorporates Autonomously and/or with Designation Seeker
- Operates in Line-of-Sight or Beyond Line-of-Sight Modes from 2km out to 12Km (T) 16Km (O)

Extended the Capability to Defeat Heavy Armor out to 12+Km



MRM

BLOS Engagement Animation





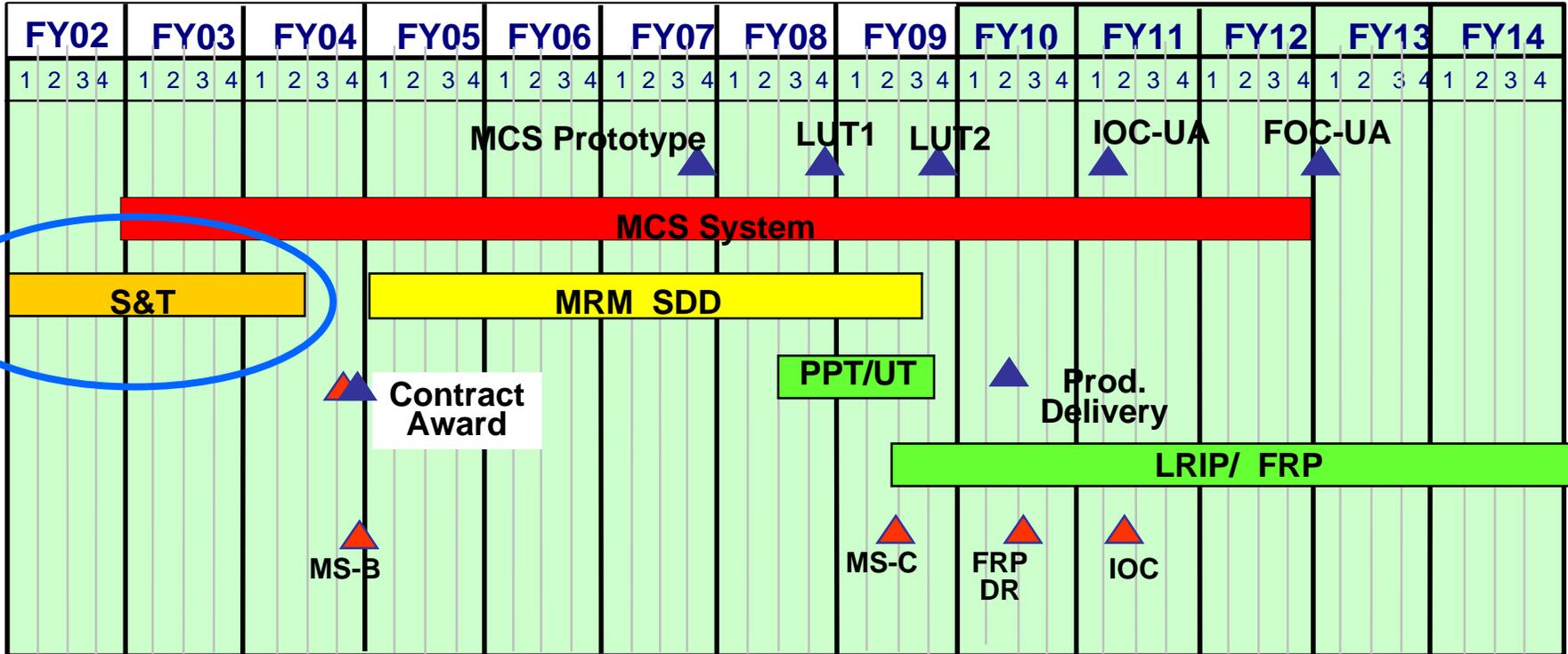
MRM's Success Criteria towards TRL6



- **TRL6 Major Test/Demonstrations:**
 - ❑ Complete Captive Flight Test Seeker Demo's.
 - ❑ Complete Lethality Tests.
 - ❑ Complete Seeker/GNC component "Hi G" Testing.
 - ❑ Airframes successfully gun-launched to BLOS ranges 2-12kms.
 - ❑ Software/Algorithms developed and tested in simulation.
 - ❑ Conduct seeker subsystem integration/test.
 - ❑ **Integrated BLOS Guide to Hit Demo's to be completed by 2Q FY04.**
 - **Prototype projectile or cartridge fired at ambient with telemetry shall launch, survive, deploy, sense, maneuver and hit a Modern Battle tank in the 3-8km range (5km target)**
 - **Autonomous mode seeker**



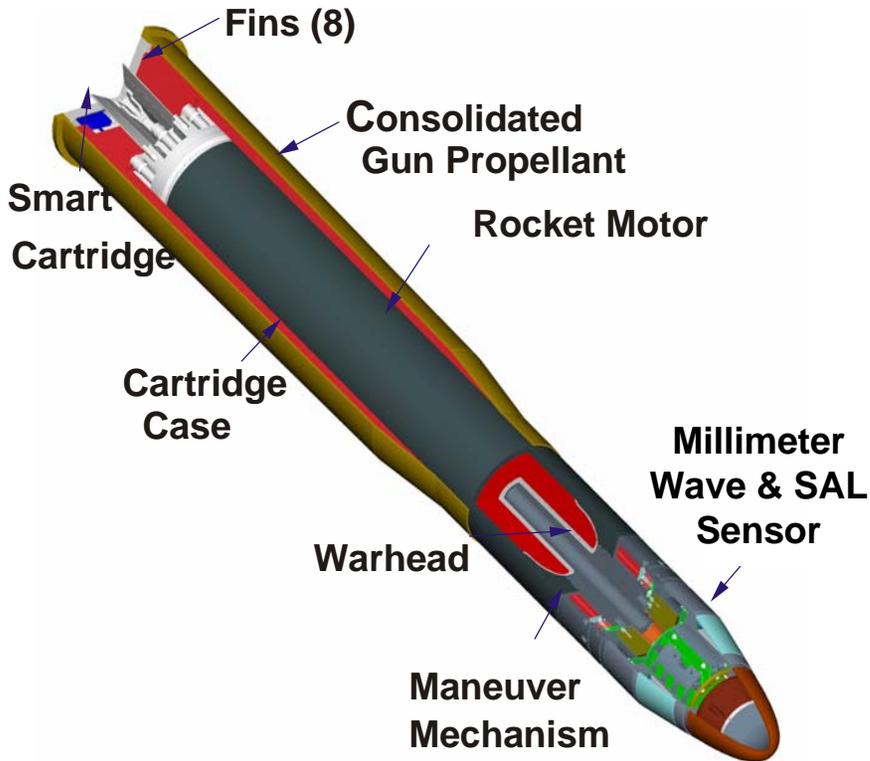
MRM Master Program Schedule



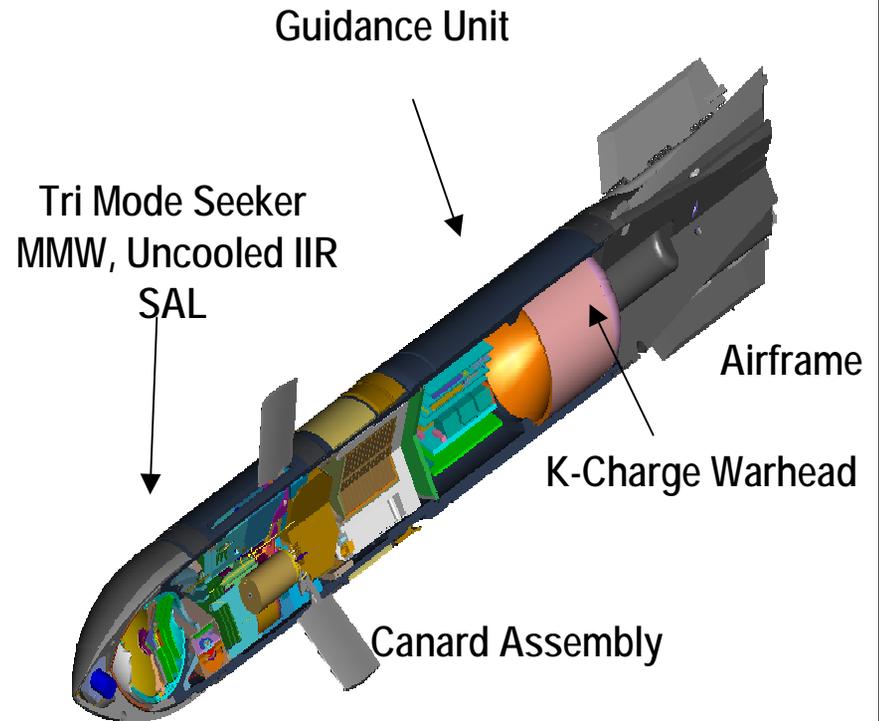
MRM has been a successful Joint ARDEC & PM Maneuver Ammunition Systems Effort

MRM Concepts

MRM-KE Concept Alliant Techsystems



MRM-CE Concept Raytheon



Bringing Two Concepts to TRL 6 Reduced Risk



MRM Status



- **Both Concepts Completed Tech Base TRL 6 effort:**
 - ✓ Both completed Captive Flight Test Seeker Demo's.
 - ✓ Both completed Lethality Tests.
 - ✓ Both completed Seeker/GNC component "Hi G" Testing.
 - ✓ Both Airframes successfully gun-launched to BLOS ranges 2-12kms.
 - ✓ Both Software/Algorithms developed and tested in simulation.
 - ✓ Conducted seeker subsystem integration/test.
 - ✓ **Integrated BLOS Guide to Hit Demo's to be completed by 2Q FY04.**
 - **Prototype projectile or cartridge fired at ambient with telemetry shall launch, survive, deploy, sense, maneuver and hit a Modern Battle tank in the 3-8km range (5km target)**
 - **Autonomous mode seeker**
- **In March of this year draft RFP for MRM SDD was released.**
- **MS-B is 4QFY04 & SDD is 1QFY05**
- **The MRM program has demonstrated technical maturity and performance sufficient for SDD entry.**

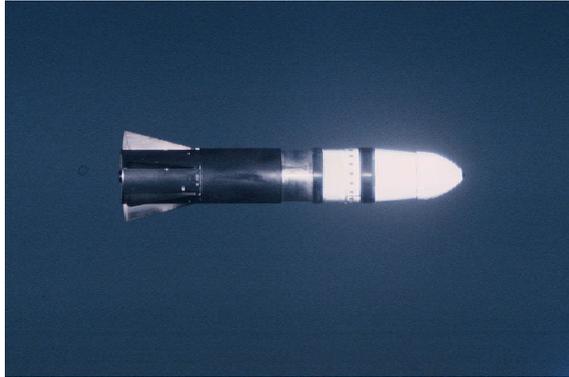


MRM GTH

Gun Launch Survival



MRM-CE (Raytheon)



Smear Picture - 45 feet

Muzzle Exit Camera



MRM-KE (Alliant)



Smear Picture - 45 feet

Muzzle Exit Camera 0 - 300 ft



Both contractors delivered and tested 3 GTH Projectiles



MRM-KE GTH SUMMARY



Example of in-flight maneuvers executed during GTH test

- Projectile survived hi-g gun launch
- Flew stable throughout flight
- Electronics functioned and telemetry transmitted data as expected
- Sensor acquired tank target
- Projectile executed multiple maneuvers toward target

FINAL MRM PROJECTILE HITS TANK.....



MRM-KE TARGET IMPACT





MRM-KE TARGET IMPACT





AMC

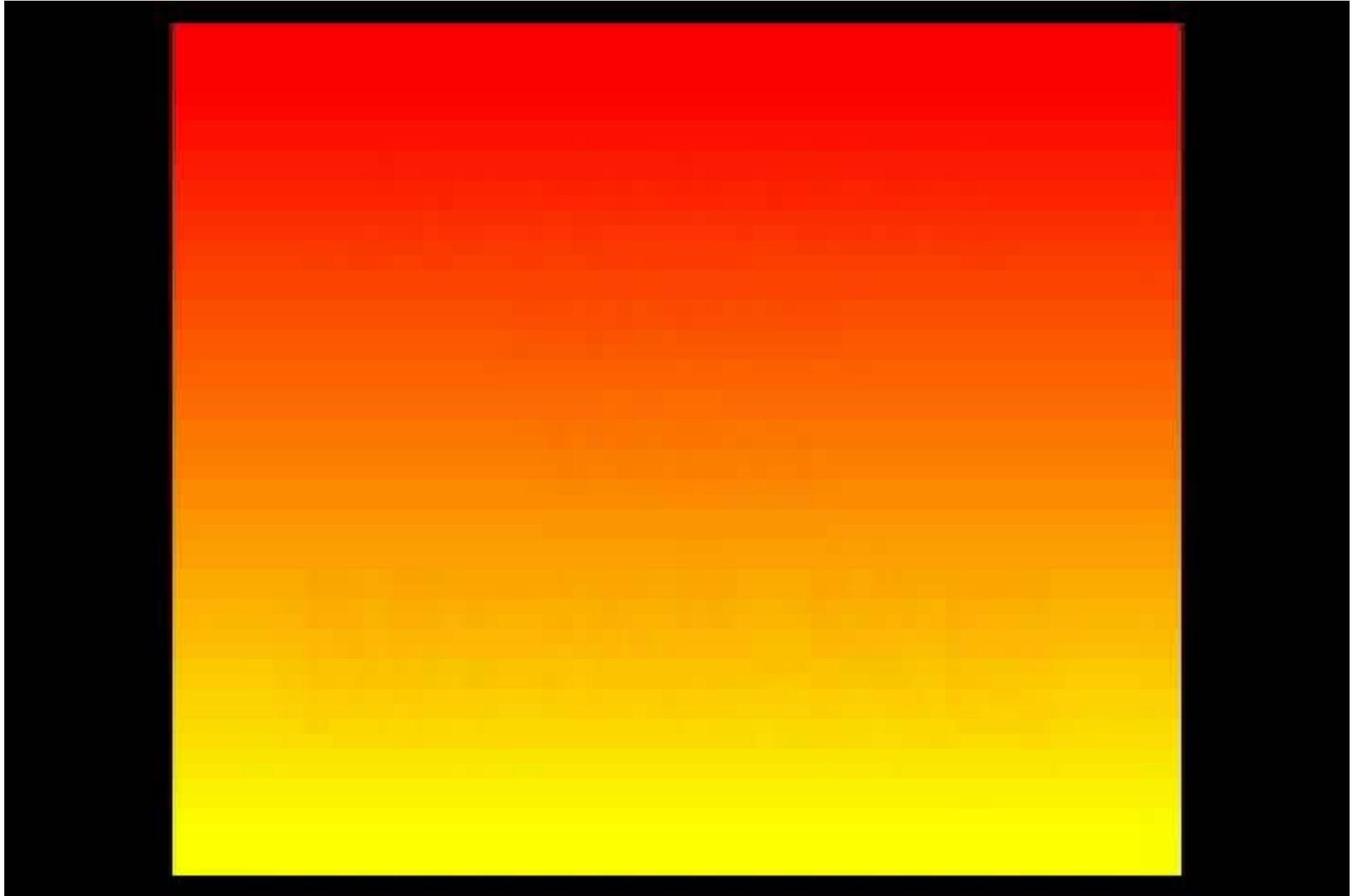
MRM-KE IR Tracker Video



IR TRACKER (10fps) @ 300m (behind the target) looking back towards the gun



MRM Lethality Demonstration against Bunker





MRM-CE CFT TESTING





MRM-CE GTH SUMMARY



Flight Follower Video 0 – 300 ft from gun



Side Tracking Video 0 – 5 km from gun

- Projectile survived hi-g gun launch
- Flew stable throughout flight
- Protective shroud discarded and canards deployed
- Electronics functioned and telemetry transmitted data as expected
- Sensor captured target in footprint
- Navigation anomaly prevented projectile guiding to target

MRM ACHIEVES TRL 6.....



MRM Summary



- ***MRM First Precision Munitions to demonstrate BLOS Capability from Tank launched platform***
- ***The MRM program has demonstrated TRL6 technical maturity and performance sufficient for SDD entry.***
- ***Draft RFP released on 25 Mar by PM MAS***

Critical Technology	TRL	Rating	Projected TRL	Status
Warhead Lethality	6		6	Demonstrated
Airframe	6		6	Demonstrated
Guidance & Control	6		6	Demonstrated
Seeker	6		6	Demonstrated
Gun Propulsion	6		6	Demonstrated