Presented to:
National Defense Industrial Association
52nd Annual Fuze Conference

# U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) Overview



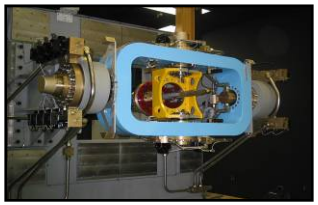
Aviation & Missile AMRDEC Strength Through Technology RD&E Center

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

14 May 2008

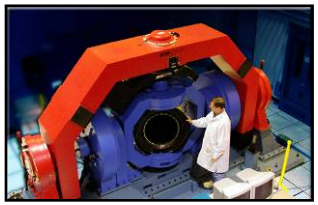
Presented by:
Milton E. "Gene" Henderson, Jr.

# Agenda


- **Who are we?**
- **What do we do?**

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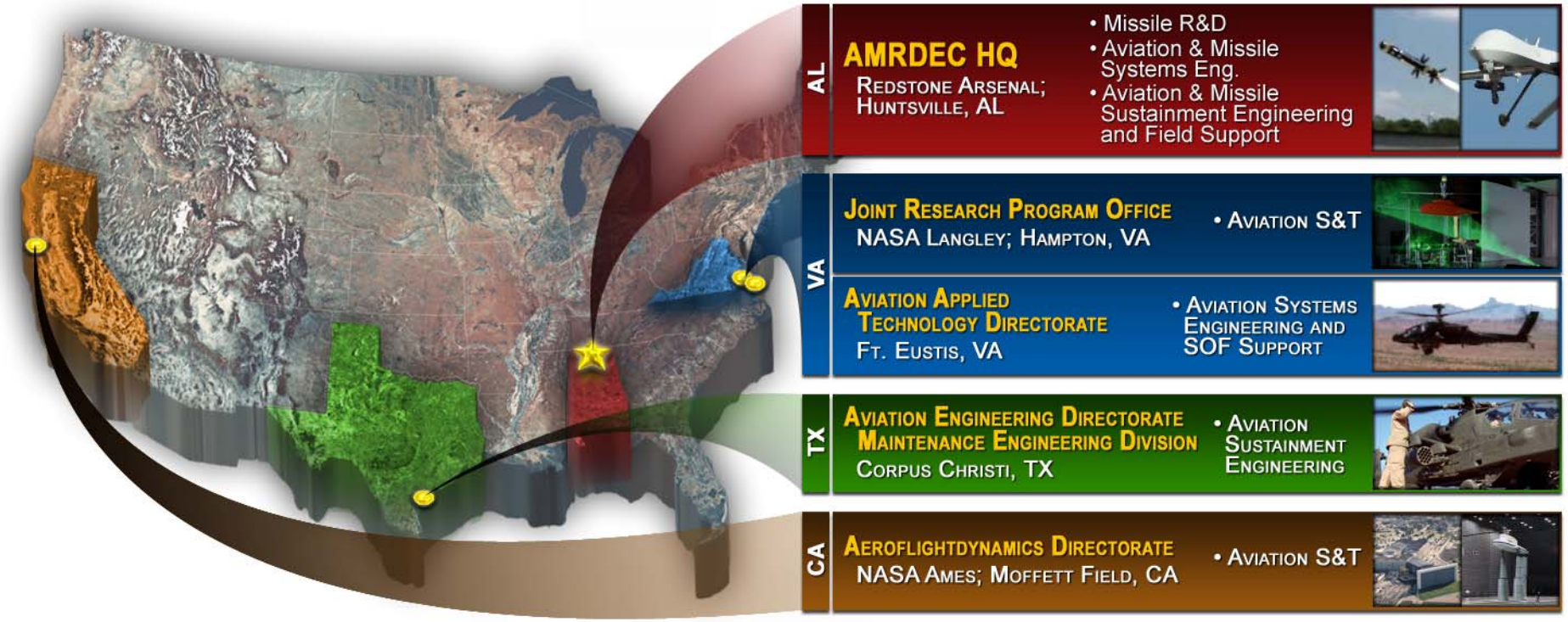
Video

# AMRDEC Mission

1) **Manage and Conduct Research, Exploratory and Advanced Development**
2) **Provide One-Stop Life-Cycle Engineering and Scientific Support for Aviation and Missile Systems and UAV/UGV Platforms**

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# Command Structure

U.S. Army Material Command

RDECOM Research, Development & Engineering Command

| AMSAA | ARL | AMRDEC | ARDEC | CERDEC | ECBC | STTC | NSRDEC | TARDEC |
|---|---|---|---|---|---|---|---|---|
| Army Material Systems Analysis Activity | Army Research Laboratory | Aviation & Missile Research, Development & Engineering Center | Armament Research, Development & Engineering Center | Communications Electronics Research, Development & Engineering Center | Edgewood Chemical & Biological Center | Simulation & Training Technology Center | Natick Solder Research, Development & Engineering Center | Tank Automotive Research, Development & Engineering Center |

ARO
Army Research Office

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# AMRDEC Organizational Relationships

STRATEGICALLY & OPERATIONALLY LINKED

DEPARTMENT OF THE ARMY (DA)

ARMY MATERIAL COMMAND (AMC)

Command
Matrix
Functional

Research, Development, and Engineering Command (RDECOM)

Aviation & Missile Life Cycle Management Command (AMCOM)

PEO Aviation

Aviation & Missile RDEC (AMRDEC)

PEO Missiles & Space

Missile Defense Agency

Redstone Technical Test Center

Marshall Space Flight Center (NASA)

REDSTONE ARSENAL

53 Other Tenant Activities

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# Organized for Success

## Office of the Director

**Executive Director**
Dr. William McCorkle
(SES)

**Military Deputy Director**
COL John Wright

**Associate for Systems**
Mr. Phil Hodges
(SES)

**Associate for Aviation & Missile Technology**
Dr. James Bradas
(SES)

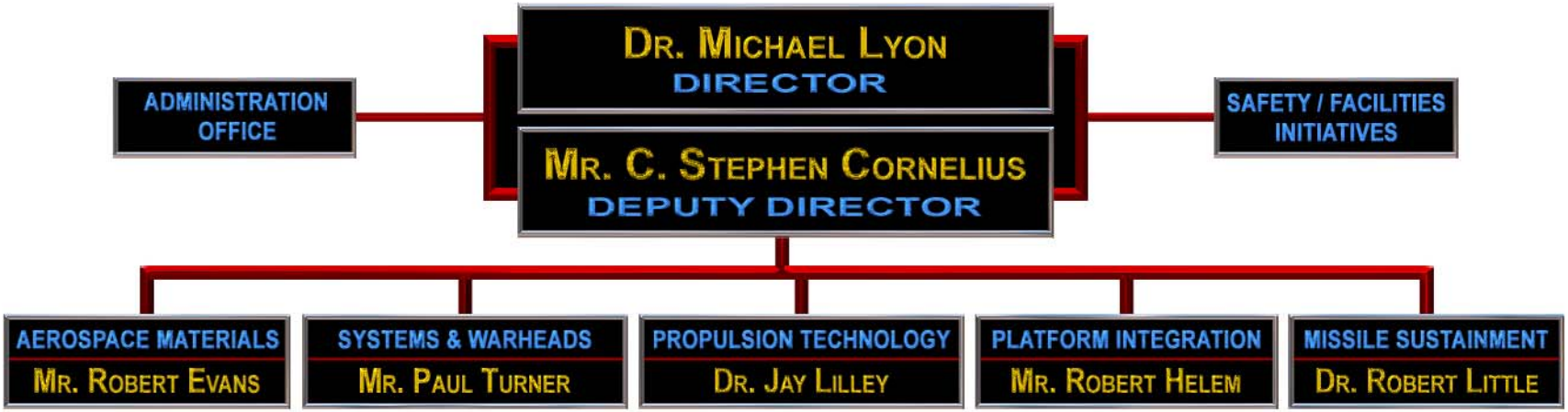
**Deputy Director for Transformation**
Mr. Barry Ward

**Deputy Director for Laboratory Operations**
Mr. Kelley Griswold

## 13 Directorates

- Center Support
- Aviation Engineering
- Advanced Science & Technology
- Software Engineering
- Applied Sensors, Guidance & Electronics
- Aviation Applied Technology
- Applied Technology Initiatives
- Engineering
- Propulsion & Structures
- Aeroflightdynamics
- Technical Management
- System Simulation & Development
- Weapon Sciences

# Propulsion & Structures Directorate




- New Materials
- Composite Design
- Composite Fabrication
- Metallurgy
- Corrosion Prevention & Control

- Warhead Development & Integration
- Fuze Development & Integration
- CAPS
- APS
- Component & System Testing
- Advanced Missile System Concepts
- CKEM
- Missile Requirements Definition
- Missile System Integration
- Lethality Enhancement
- Impact Modeling
- End Game Analysis

- Pintle Nozzles
- Propulsion Development
- Gel Propulsion
- New Ingredients
- Solid Propellant
- Air-Breathing
- Motor Ignition System
- Vortex Engine
- Propulsion Design
- Signature Characterization

- Instrumentation
- Launcher Design & Analysis
- Ground Support Equipment
- Aviation Platform Integration
- Platform Design
- Hybrid Electric
- Thermal Analysis
- Dynamic Analysis
- Structural Analysis
- System Modeling
- Shock/Vibration
- Design
- Computer Network
- Virtual Design Coordination

- IM
- Service Life
- Analytical Chemistry
- Batteries
- System Failure Analysis
- Energetic Materials Characterization
- Demilitarization
- Environmental

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# Focus: Lifecycle Support

## AMRDEC Provides Scientific & Engineering Expertise and Support to PEO's, PM's and Users Across the Full System Lifecycle

### S&T Program Development

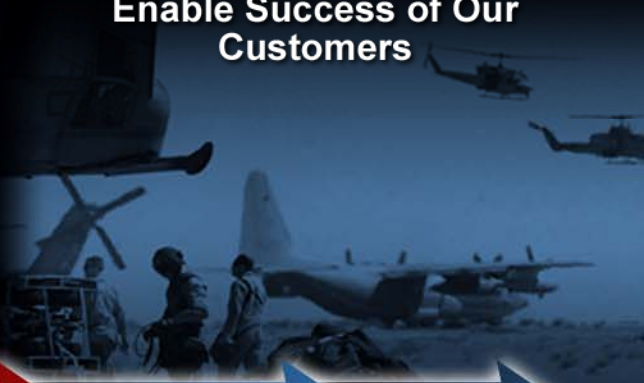
Focused on Cutting-Edge Technology Development

### Future Systems Development

Focused on Integrating Cutting-Edge Technologies into Systems

### Fielded Systems Support

Focused on Providing Full-Spectrum Engineering Support of Fielded Systems to Enable Success of Our Customers



CONCEPT REFINEMENT → TECHNOLOGY DEVELOPMENT ATO/ATD → SYSTEM DEVELOPMENT/ DEMONSTRATION → PRODUCTION/ OPS SUPPORT → DEMIL/ DISPOSAL

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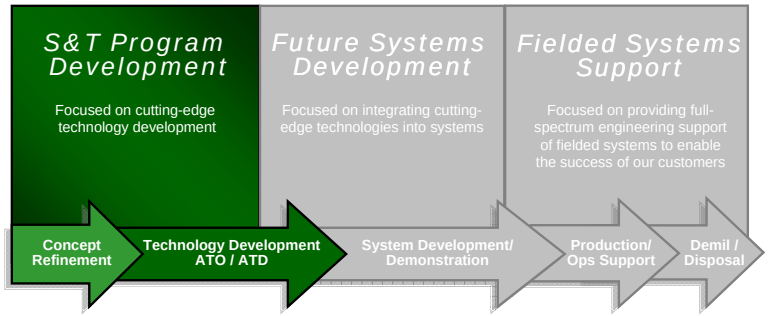
# Focus: Lifecycle Support
# Science & Technology Programs





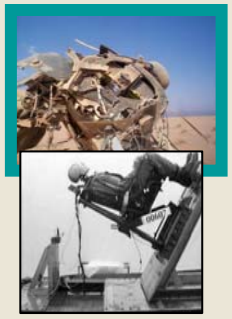

## *AMRDEC provides...*

Next Generation Technology Development of Component-Level, State-of-the-Art Aviation and Missile Technologies Providing Payoff at the System Level

## Aviation Technology Programs

**Improved Situational Awareness**

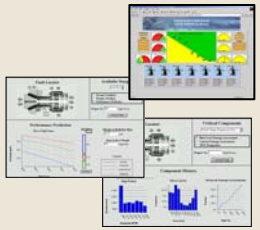
**Aircraft/Aircrew Survivability**



**Rotor Durability**

**Advanced Affordable Turbine Engine**

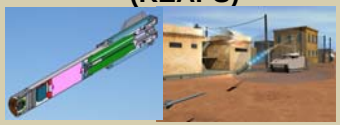
**Condition Based Maintenance**



## Missile Technology Programs

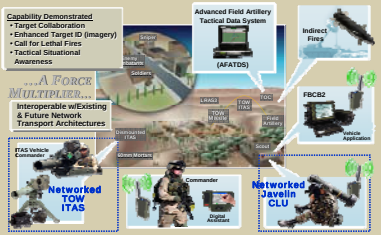
**Deeply Integrated Guidance & Navigation Unit**

**Kinetic Energy Active Protection System (KEAPS)**



**Extended Area Protection & Survivability (EAPS)**


**Close Combat Networking of Weapons & Sensors**




**Smaller, Lighter, Cheaper**

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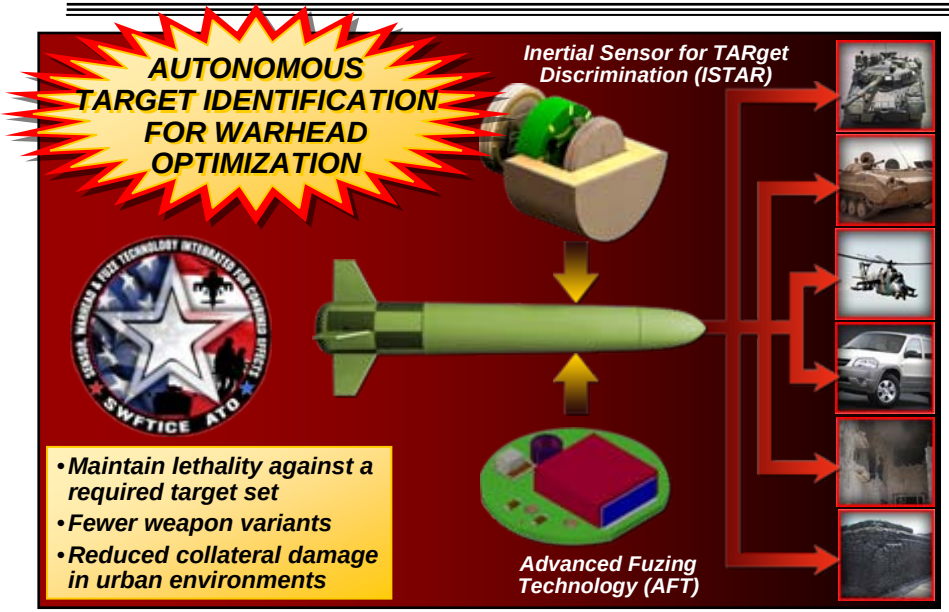
# Sensor, Warhead & Fuze Technology Integrated for Combined Effects

R.LE.2009.02






## Schedule & Cost

| Milestones | FY09 | FY10 | FY11 |
|---|---|---|---|
| Target signature characterization | | | |
| Dev/test ISTAR sensor array | 3 | 4 | 5 |
| Dev/test ISTAR mini electronics | | 4 | 5 |
| Go / No Go Decision | | ◆ | |
| Dev/test AFT | 3 | 4 | 5 |
| Interface ISTAR & AFT with MMME/SYU warheads | 3 | 4 | 5 |
| Army / Other ($M) | | | |

## Purpose:

*Provide the Warfighter with the capability to identify the target class on impact and autonomously configure the warhead detonation mode to optimize the desired effects against the target*

## Results:

- *Technical data package for ISTAR sensor and AFT*
- *Data on interfacing of ISTAR sensor & AFT with Multi-Mode, Multi-Effect (MMME) Selectable Yield Unitary (SYU) warheads*

## Payoff:

- *$P_i$ for MOUT targets increased from X.X to X.X ; $P_i$ increase for vehicles classified*
- *Reduced logistics tail & gunner workload*
- *Reduced collateral damage in MOUT ops*
- *Close coordination of technology with TOW, Javelin, HELLFIRE, JAGM, GMLRS Unitary, NLOS-LS PAM to facilitate transition at the end of planned follow-on ATO-D (FY14)*

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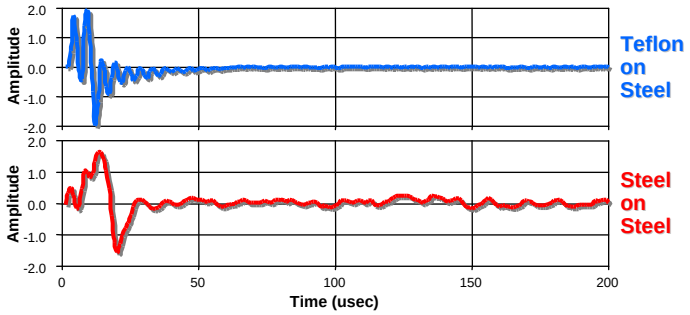
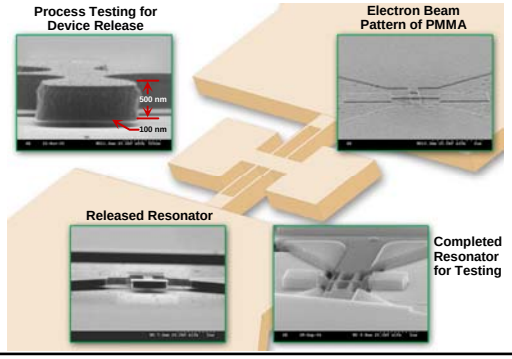
# Sensor, Warhead & Fuze Technology Integrated for Combined Effects
R.LE.2009.02

## Target Impact Phenomenology Predicted Through Modeling, Validated Through Tests

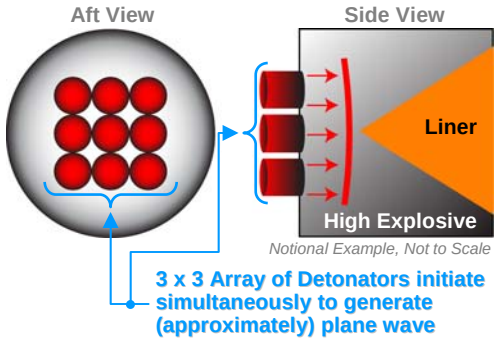



## Advanced Design, ISTAR Transducers

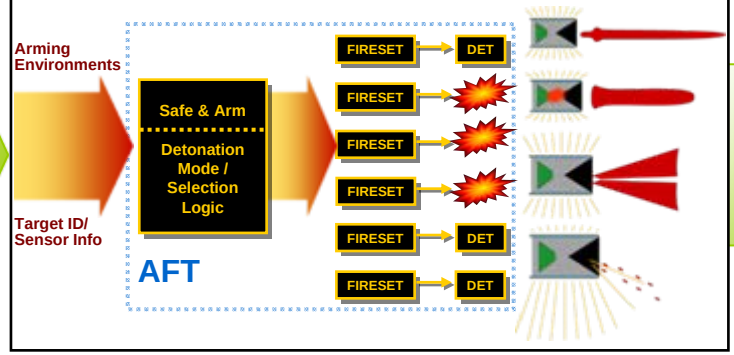



## Integrated ISTAR Sensor

## Static, Multi-Point Initiator




## Selectable, Multi-Point Initiator and ESAD




## SWFTICE Technology:

- Improves anti-armor missile effects against urban and complex targets
- Improves capability of conventional, multi-purpose and multi-mode warheads
- Enables "multi-mission" missile concept
- Decreases gunner workload through autonomous operation
- Provides increased capability for legacy systems – no launcher upgrades required due to "smart missile"

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# Smaller, Lighter, Cheaper Munition Components (SLCMC) ATO


| MILESTONES | FY06 | FY07 | FY08 |
|---|---|---|---|
| Requirements Definition | 3 | | |
| Trade Studies | | | |
| Design | | | |
| Prototype Development | | | |
| Testing | | | 5 |

## Purpose:

- Invest in technologies to reduce size, weight, and cost of seekers, electronics, and control mechanisms for precision munitions and integrate a multipurpose warhead that efficiently defeats armor, fortified structures and personnel

## Benefits:

- More affordable precision munitions and reduced ammunition weight, stowage space, logistics burden, supply chain management
- Transition to PM CCWS (Javelin, TOW) and other potential candidates

## Products:

- 20% smaller, 50% cheaper IR seeker
- 80% smaller, 50% cheaper electronics unit-packaged
- 90% smaller, 80% cheaper control system for munitions
- Multi-purpose warhead that efficiently defeats armor, fortified structures and personnel

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# Scalable Technology for Adaptive Response - STAR


***Schedule & Cost***

| MILESTONES | FY08 | FY09 | FY10 | FY11 |
|---|---|---|---|---|
| Multi-output explosive & coupled Reactive Materials development | 3 | 4 | 5 | |
| Novel dynamic propellants & thruster development | 3 | 4 | 5 | |
| Advanced fuze & power development | 3 | 4 | 5 | |
| Warhead scaleable/selectable performance against multiple targets | | 4 | 5 | 6 |
| Integrated Demos of Prototype Adaptive Munitions | | 4 | 5 | 6 |

***Purpose:***

- *Provide capability for scalable, selectable, and adaptive lethal effects against platforms and personnel to selectively destroy target function and/or neutralize attributes while limiting damage to surrounding structures/personnel*

***Products:***

- *Demonstration of agile technologies for scalable, selectable & adaptive lethal effects in large, medium, and small diameter munitions & missiles*
- *Development of controlled lethal effects, multi-purpose energetics & formulations, reactive materials and advanced fuzing and power technologies*

***Payoff:***

- *Improved weapon effectiveness/lethality*
- *Reduced collateral damage*
- *Rapid mission execution with less ammunition expended (reduced logistics)*
- *Tech transition to PEOs, AMMO, M&S, Soldier: 155 VAPP, Javelin, TOW, JAGM, XM1069, MAPAM, M430*
- *Demos: 250mm (GMLRS), 155mm (Excalibur), 30mm (M789/Mk238)*

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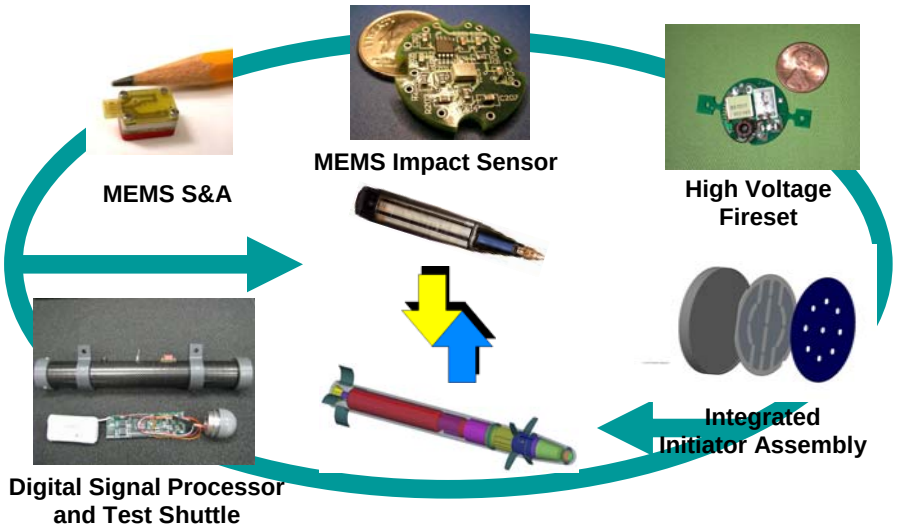
# ATO III.WE.2006.01 Fuze for Advanced Munitions




***Schedule & Cost***

| *Milestones* | *FY05* | *FY06* | *FY07* | *FY08* |
|---|---|---|---|---|
| • *MEMs & Multi-point Fuze ESAD*<br>• *Component design*<br>• *Build & Lab tests*<br>• *Flight tests* | 3 | 4 | 5 | 6 |
| • *Sensors*<br>– *MEMS Based flight safety/impact*<br>– *Proximity (RADAR and LADAR)*<br>– *Models/HITL simulations* | 3<br>3 | 4<br>4 | 5<br>5 | 6 |
| • *Power sources*<br>• *Thermal batteries*<br>• *Organic liquid reserve batteries*<br>• *Alternative/Hybrid energy systems* | 5<br>5<br>5 | 6<br>6<br>6 | 7<br>7<br>7 | |

***Purpose:***

***Develop munition fuze technology that supports multi-purpose multi-mode warhead designs for FCS***

***Products:***

- ***MEMS Safe & Arm devices for artillery***
- ***Omni-directional inertial MEMS sensor Multi-point initiation supports Common Smart Submunition***
- ***Advanced proximity sensors for direct fire***

***Payoff:***

- ***Multi-mode and tailorable effect warheads***
- ***Reduced cost and increased reliability for munition***
- ***Transitions Plans***
  - ***FY09 to PEO Ammunition***
  - ***MEMS S&A to PM Soldier Weapons in FY08***

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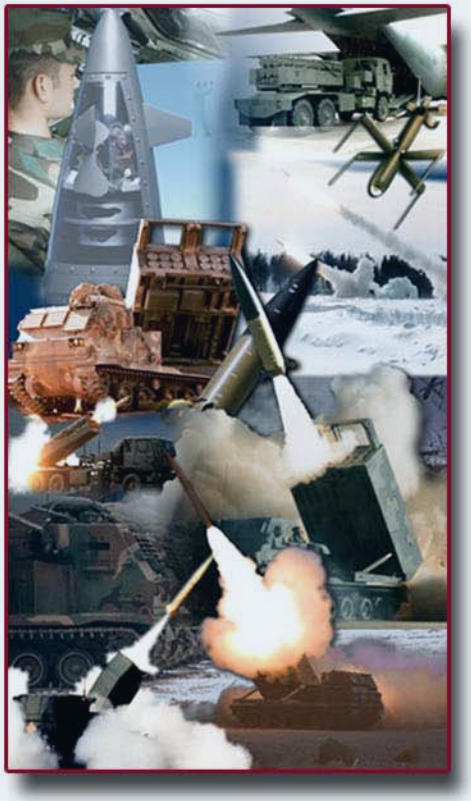
# AMRDEC Support Efforts
# PEO-MS SDD (or other) Programs

## Precision Fires Rocket and Missile Systems (PFRMS) PMO

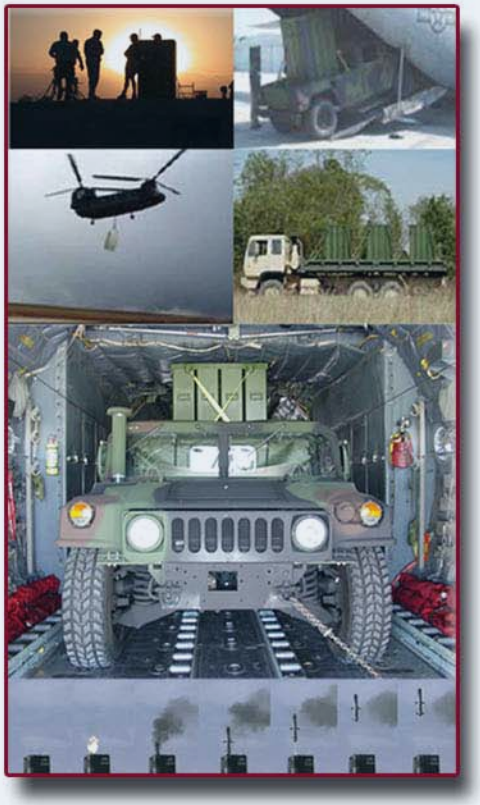


- GMLRS DPICM ESAD
- GMLRS Unitary ESAF
- TACMS Unitary Fuze(s)

**Precision Fires for Current and Future Forces**

## Non-Line Of Sight (NLOS) PMO

- Electronic Safe & Arm Device
- Inline Ignition Safety Device
- Note: Joint Development with USN



**Unmanned Fire Support**

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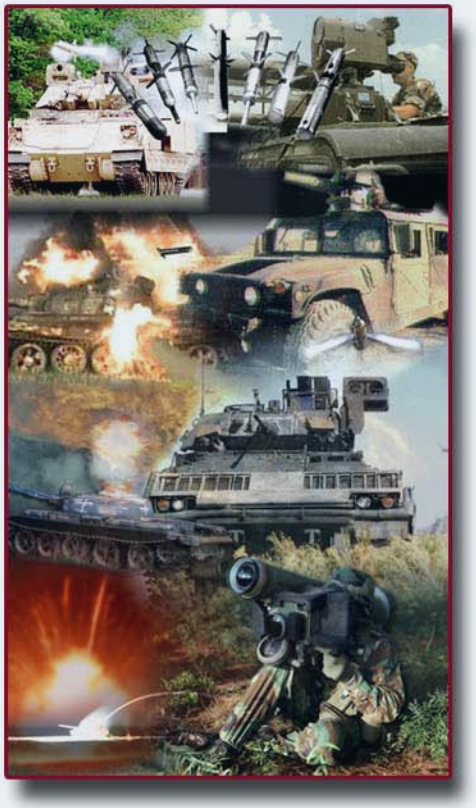
# AMRDEC Support Efforts
# PEO-MS SDD (or other) Programs

## Close Combat Weapon Systems (CCWS) PMO



- TOW Fuze (In-house design transitioned to PMO)

**Anti-Armor and Target Acquisition for the Front-Line Warfighter**

## Joint Attack Munition Systems (JAMS) PMO

- Hellfire Fuzing (Prox & SA)
- 2.75” Rocket Common Fuze

**Aviation Rockets and Missiles for the Joint Force**

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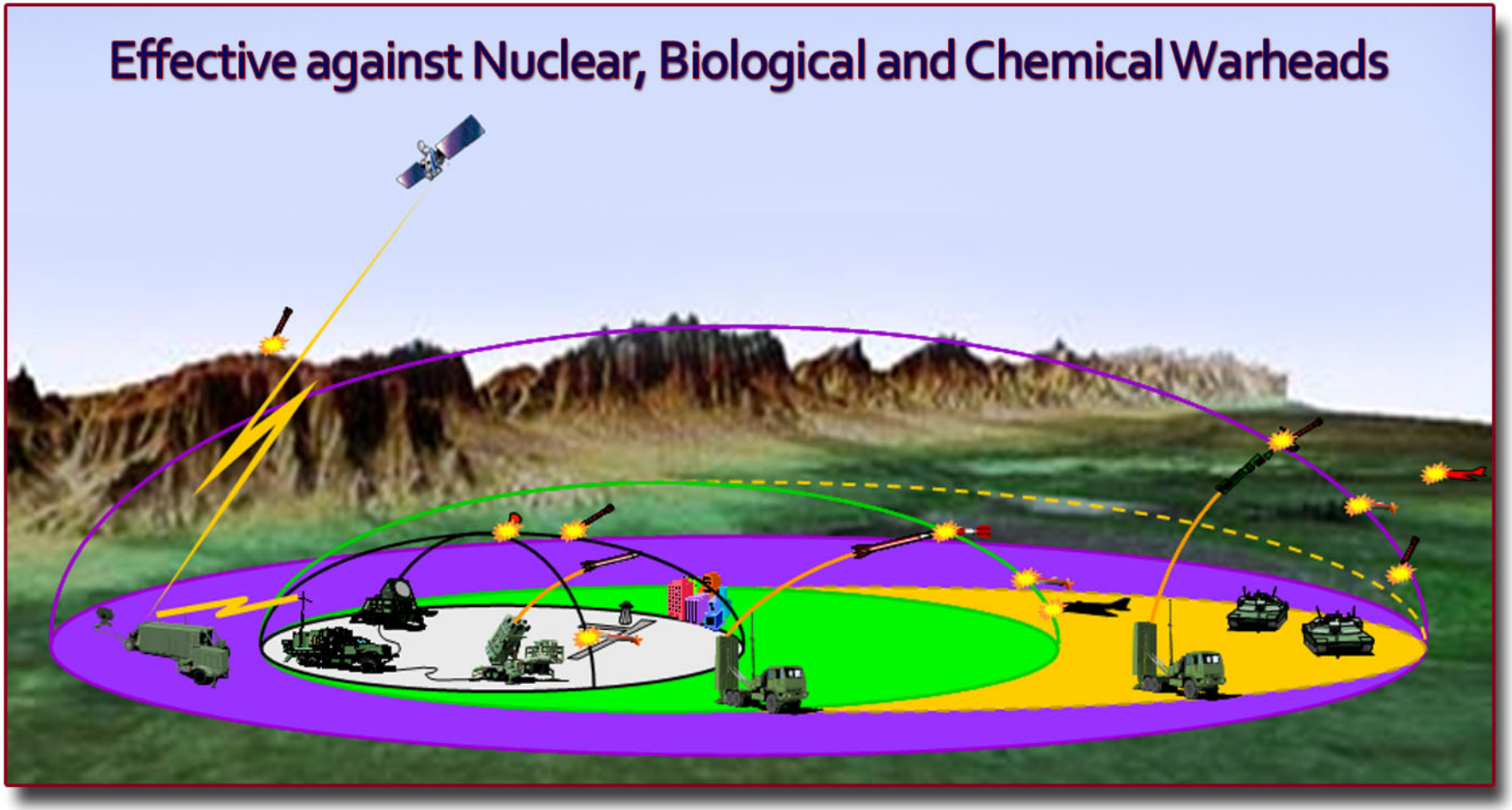
# LOWER TIER PMO: PAC-3 MSE – IGNITION SAFETY DEVICE (ISD)

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# AMRDEC " Community " Participation

- **Fuze Engineering Standardization Working Group (FESWG)**
- **U.S. Army Fuze Safety Review Board (AFSRB)**
- **U.S. Army Ignition System Safety Review Board (ISSRB)**
- **Defense Ordnance Technology Consortium – Fuze Subgroup**
- **Technical Coordinating Group X (TCG-X) – Firing Systems**
- **DOD Fuze IPT**

# AMRDEC Successes

## Recent Global War on Terror Efforts :

**M4 Carbine Stowage System**

**Integrated IR Zoom Laser Designator**

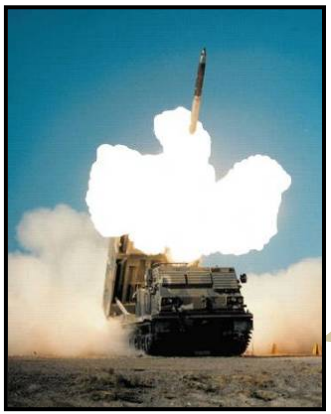
**Fido/PackBot Remote Explosive Detector *(Rapid Integration and Fielding)***

### Predator/HELLFIRE

For the First Time Anywhere, the AMRDEC / PM ARM / USAF / Industry Team Demonstrated that a UAV could Locate, Identify, and Destroy a Small High Value Target on the Other Side of the World … in Real Time … and did it in less than 5 months!


### TOW Bunker Buster

Capability to breach masonry walls and defeat bunkers… Expertise in Precision Guided Missiles Enabled Quick Reaction Modification to Support Urgent Mission Requirement



### Guided Multiple Launch Rocket System (GMLRS)

***Testament from Commander 2-3FA, 1/1AD, Ramadi, Iraq:***

**"... Since I've been in Ramadi (3 weeks RIPPING with 2-222FA), I've observed the capabilities that GMLRS is bringing to the fight. It is completely changing the dynamics and relevance of the indirect fire community; AND it is clearly saving US and CF lives. I believe that GMLRS rockets in May have killed more AIF than any other system/unit in theater...."**

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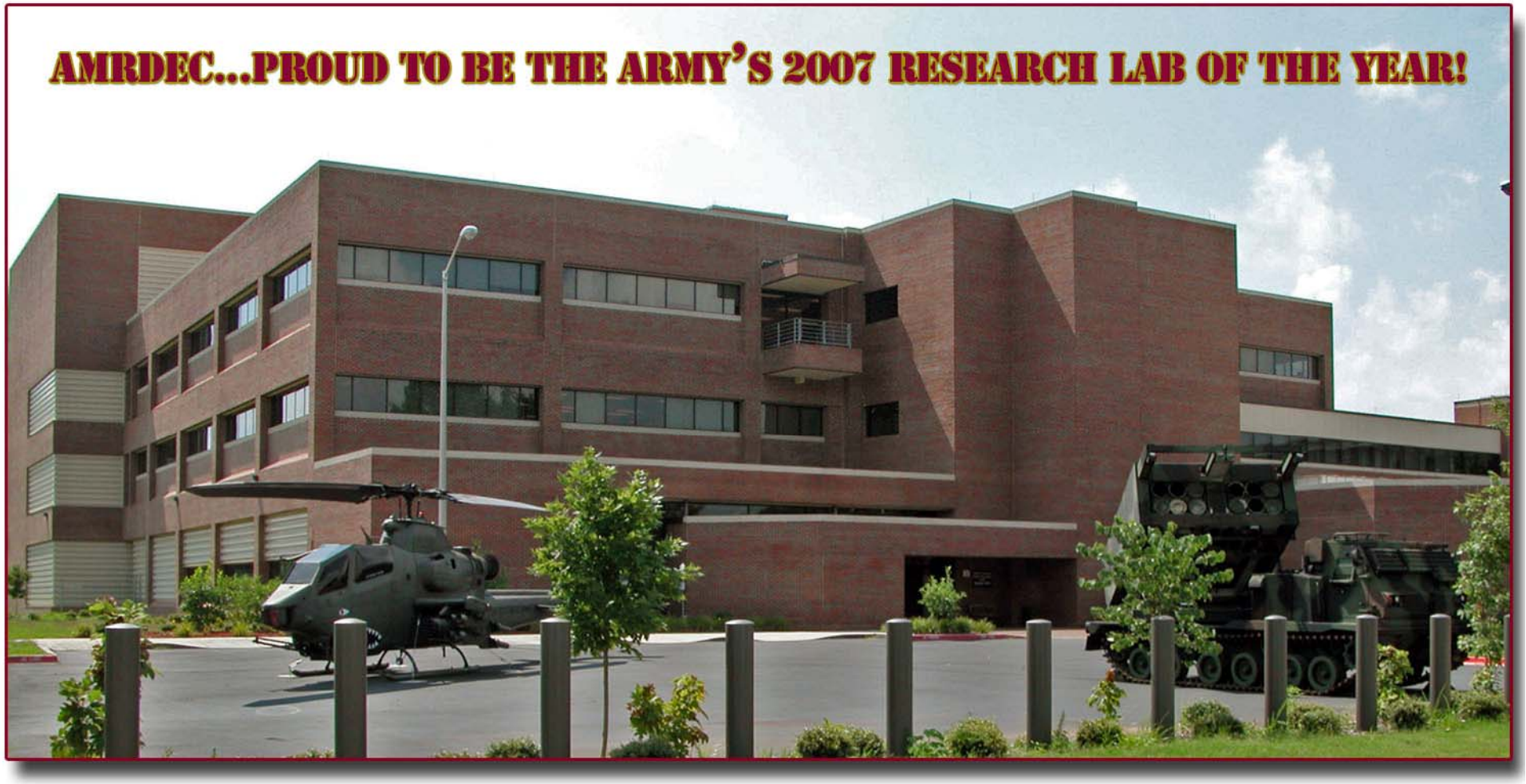
# AMRDEC
# 2007 Research Lab of the Year

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