

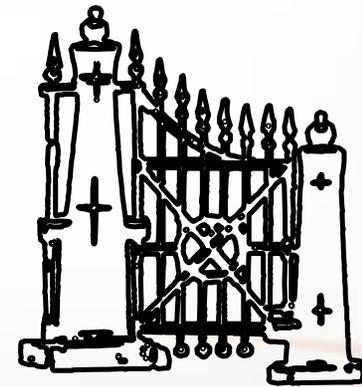
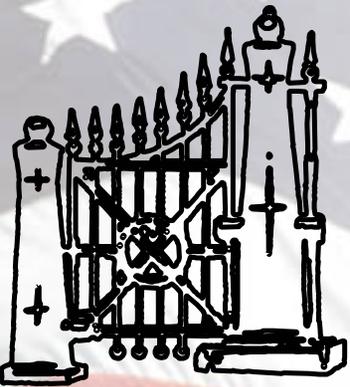


US ARMY ARMAMENT RESEARCH DEVELOPMENT, AND ENGINEERING CENTER (ARDEC)



ARDEC Tech Base Overview

12 June 2007



TM

Ms. Barbara Machak

Associate Technical Director for Tech Base/MANTECH

INNOVATIVE ARMAMENTS SOLUTIONS FOR TODAY AND TOMORROW



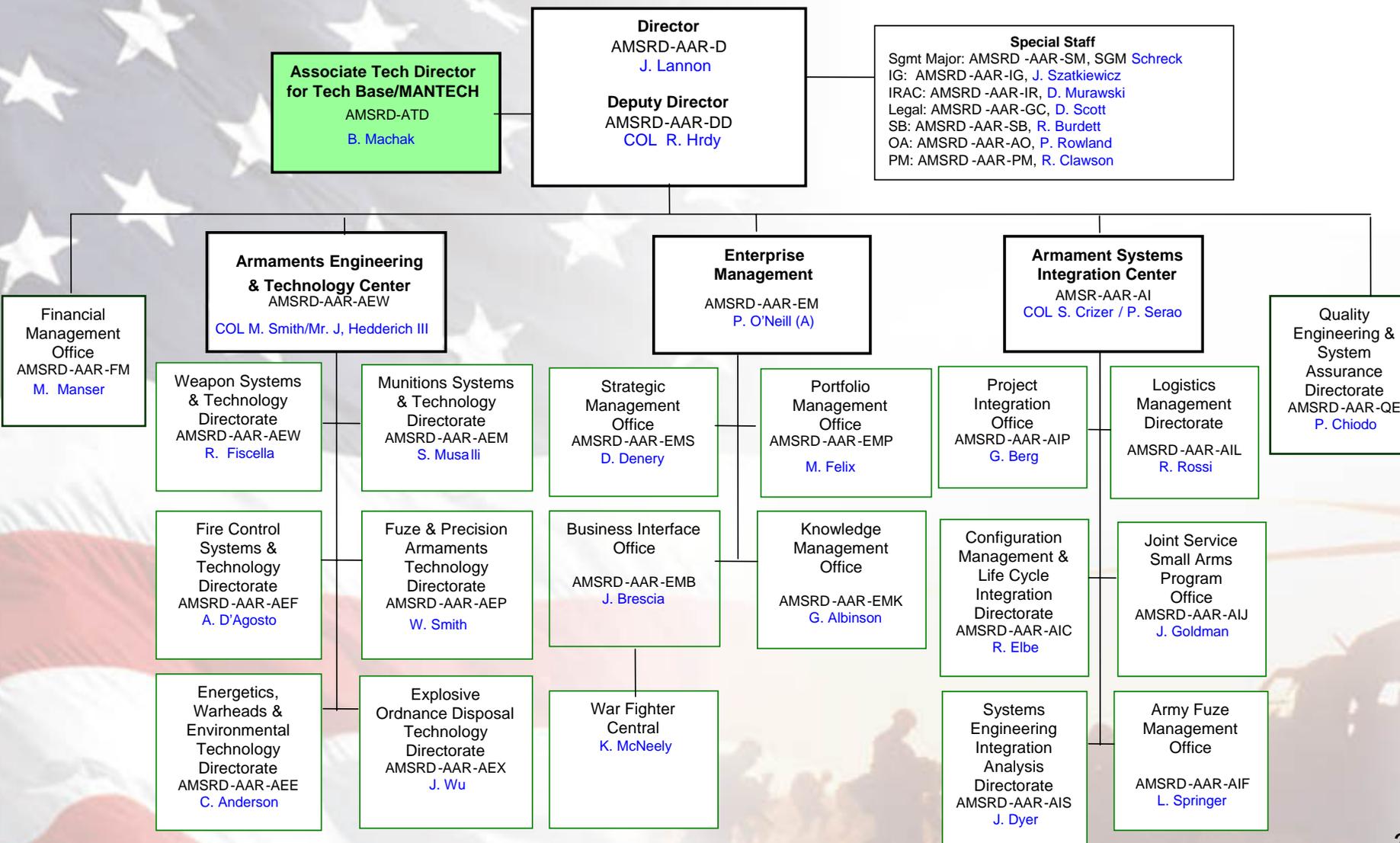
Bottom Line Up Front



- **We are a nation at war – ARDEC seeks to partner with PEOs and industry to accelerate fielding of advanced technologies in support of current operations**
- **ARDEC in maintaining investments in Future Force technologies**
- **ARDEC is applying weapons, munitions/effects, and fire control expertise to emerging technologies including Active Protection Systems, Counter Rockets, Artillery and Mortars, and Countermine/Counter IED**
- **ARDEC has a strong desire to develop joint technology programs with Army, other service, coalition, and industry partners**



ARDEC Organization Chart





Key Initiatives



- ▲ **Partnering is our strongest asset**
 - Brought in key stakeholders into S&T investments
 - Joint Armament programs becoming reality
- ▲ **Transitioning technology to PMs**
 - Executive Black Belt project
 - Tough problem as we don't control requirements or funding
- ▲ **Balance portfolio between current and future force needs**
 - 42% Current Force vs 58% Future Force (based on when we transition)
 - As well as conventional and “disruptive”
- ▲ **Dispel Myth that Army/DoD has “Enough Lethality”**
 - PBD 753 lost 10% over FY06-11 POM
 - Lethality is Survivability

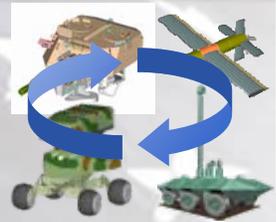
.....Continued Dialog to Ensure ARDEC understands Priorities



Major Lethality Technology Investments



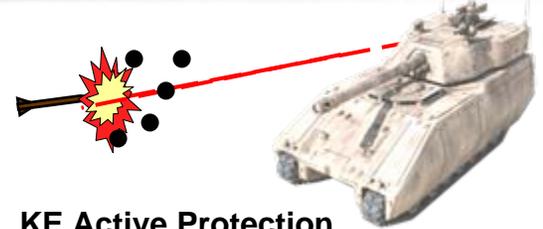
Extended Area Protection & Survivability



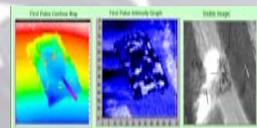
Networked Lethality



Acoustic/Seismic Sensors



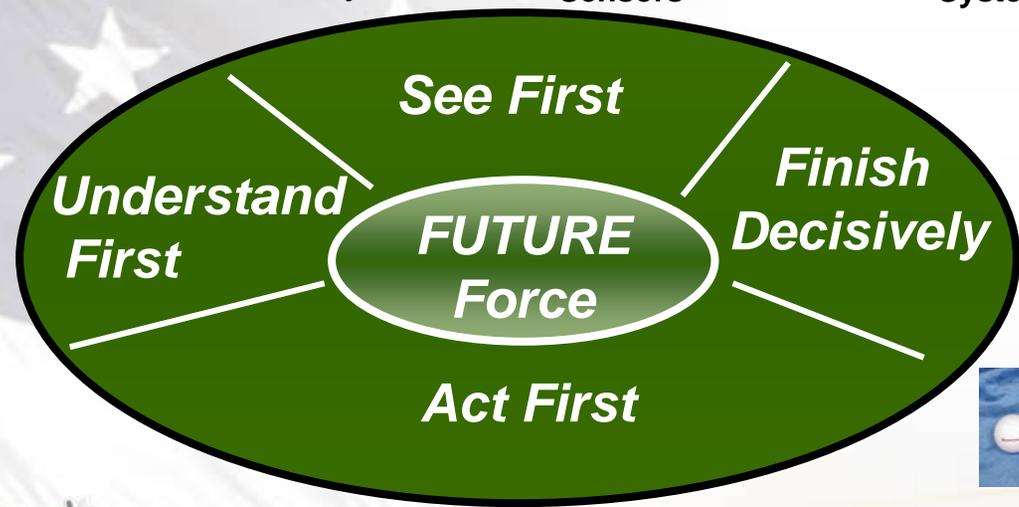
KE Active Protection System Interceptors



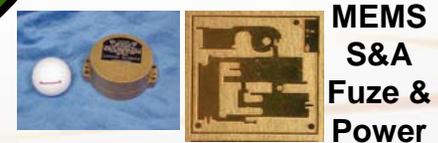
Common Smart Munitions



EM Gun



Multi-Mode Warheads



MEMS IMU

MEMS S&A Fuze & Power



SWORDS w/Remote Armament System



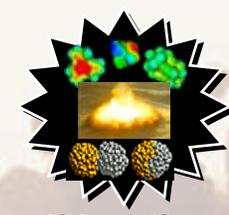
Mid-Range Munition



Scaleable Effects



LtWt Dismounted Mortar



Novel/Nano-Structured Energetics



LtWt Small Arms Technologies



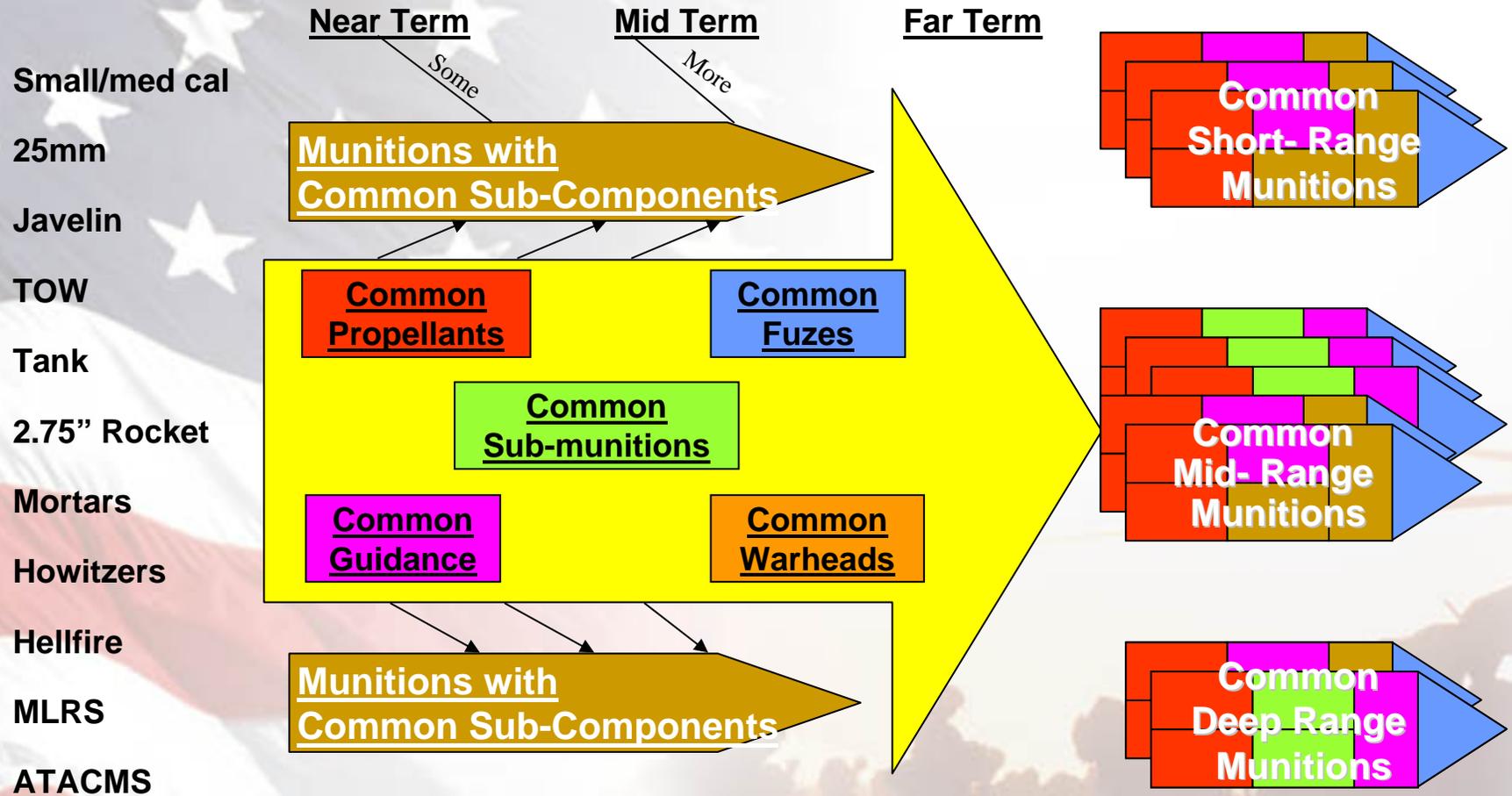
Technology Investment Strategy



CURRENT MUNITIONS

COMMONALITY PLAN

ENDSTATE



.....Low Cost Common Components for all Joint Conventional Munitions



FY07 Non-ATO Portfolio

Non ATO Tech Base:

- Light Weight Small Arms Technology
- High Power Microwave, Non-Lethal
- MOUT Technologies
- G-Hardened Sensor Tech for Munitions
- Dual-Use Composites
- Reliability for the Future Force
- Nanotechnologies for the Future Force
- Future Force Gun and Munition Technology

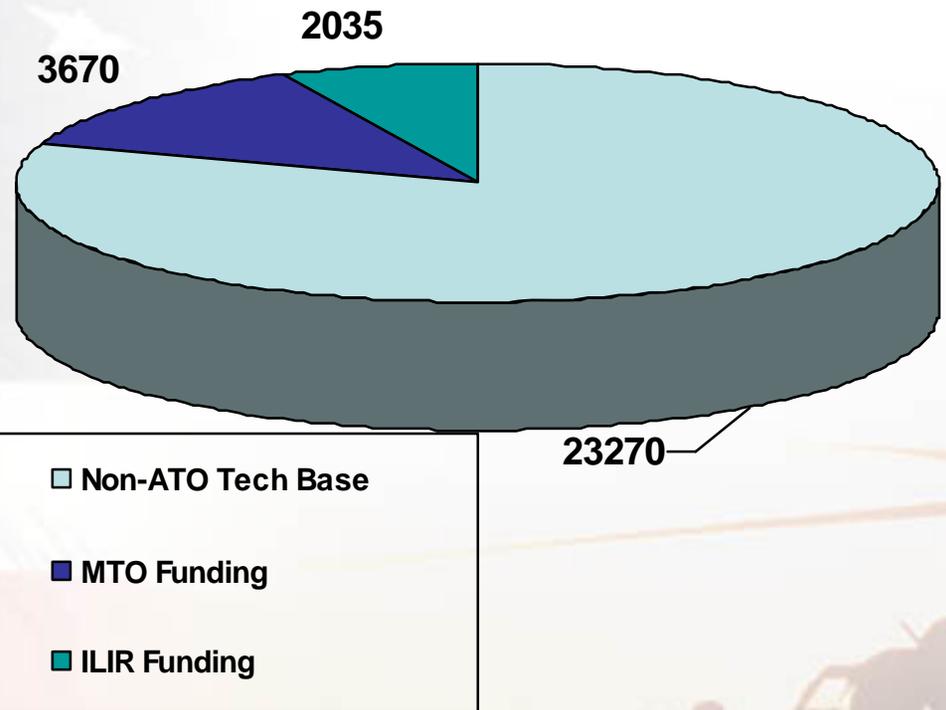
MTO:

- MEMS/IMU for Common Guidance
- MEMS S&A
- Optimization of PAX-41 Formulation and Loading

ILIR:

11 Projects:

- Nano-tech-3
- Sensor-tech-5
- Energetics/Lethality-3



Total: \$28,975



FY07 ATO Portfolio



LOS/BLOS:

- EM Gun Technology Maturation & Demo (USN)
- MCS Ammunition System Technologies (ARL)
- Hardened Combined Effects Penetrator Warhead (AMRDEC/ARL/ERDC)
- MEMS Inertial Meas. Unit for Com. Guidance (AMRDEC)
- Novel Energetics for the Objective Force (ARL)

NLOS:

- Fuze and Power for Advanced Munitions (AMRDEC/ARL/ERDC)
- Common Smart Submunition (USAF)
- Non Lethal Payloads for Personnel Suppression
- Insensitive Munitions Technologies (ARL)
- Near Autonomous Unmanned Systems (TARDEC)

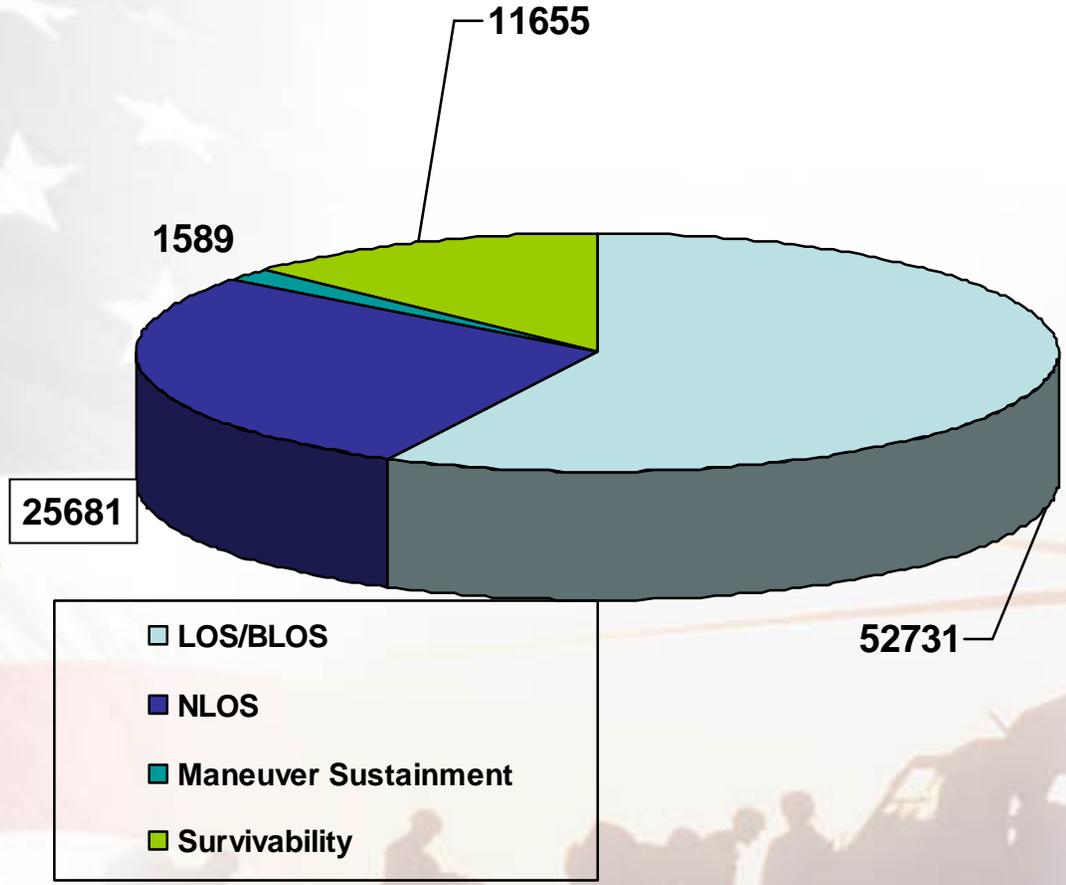
Maneuver Sustainment:

- Joint Modular Intermodal Distribution System JCTD
- Prognostics & Diagnostics for Operational Readiness (ARL)

Survivability:

- Kinetic Energy APS (RDECOM)
- Countermine/ IED Neutralization (CERDEC)
- Extended Area Protection (AMRDEC)

Total: \$91,665





FY08 Start - Scalable Technology for Adaptive Response - STAR



Scaleable/Adaptive Lethality

Fuze/Power

Energy Management

Weapons Technology Thrusts

Controlled Response

Accurate & Precise

Low Collateral



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:

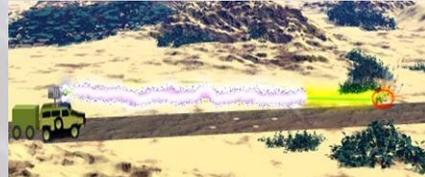
- Demos: 250mm (GMLRS), 155mm (Excalibur), 30mm (M789/Mk238)
- Improved weapon effectiveness/lethality
- Reduced collateral damage
- Rapid mission execution with less ammunition expended (reduced logistics)
- Tech transition to PEOs, AMMO, M&S, Soldier: Javelin, TOW, JAGM, XM1069, MAPAM, M430

Schedule & Cost

MILESTONES	FY08	FY09	FY10	FY11	
Multi-output explosive and Advanced Dynamic Propellant development		3	4	5	
Reactive Material 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
Total					



FY08 Start - Multimode HPM and Laser Induced Plasma Channel Technology



Laser Induced Plasma Channel

High Power Microwaves

Solid State HPM Source Technology

Multi-Mode Directed Energy Armament System

Schedule & Cost

MILESTONES	FY08	FY09	FY10	FY11	FY12	FY13
• Design Multi-Mode Directed Energy	Technology Decision Point					
• High Power Microwave	TRL 4					
• RF source Development	Multiple Effectors					
• Antenna/Transmitter	TRL 5					
• Power Source Development- Modulation/Pulsed power						
• DE Armament System Integration/ Portable IED system development						
• Transition to Vehicle Integration/ Portable IED Defeat system	TRL 6					
Total	Army 6.2 (\$M) Army 6.3 ARL 6.2					

Purpose:

Demonstrate Laser Induced Plasma Channel (LIPC) guiding HPM/High Voltage/RF. Reduce the size and weight of Solid State power sources. Optimize steering and control of various HPM/High Voltage effects.

Product (s): TRL 6 :

- Multi-mode Directed Energy Weapon Demonstrator
 - Defeats/Neutralizes full spectrum of materiel threats at stand off
 - Portable/mobile IED defeat system
- ARL will provide technical expertise in design and development of pulse power and antenna technology.

Warfighter Payoff:

- Multi-mode DE effects from one platform for anti-personnel and anti-material
- Automated and Portable Checkpoint IED neutralization system
- Sized for FCS class vehicles
- Scalable effects from non-lethal to lethal



FY08 Start - MOUT/Urban Lethal Technologies



MOUT Target Set

Advanced Warhead Designs

Schedule & Cost

		FY08	FY09	FY10
Wall Breacher (WB)				
Wall Target Effects Perf. Modeling/Eval		[Green bar]		
Subsystem Development (Energetics, Fuzing, Timing)		4		
Breaching Sys Optimization			5	
Lightweight, single shot explosive wall breaching system eval and demo				6*
Demo remote emplacement				5**
Shoulder Fired (SF)				
Baseline initial charge design		[Green bar]		
Opt forward charge for MOUT targets			5	
Follow through charge development for tandem configuration				5
Multimode fuze dev and eval		[Green bar]		
Final munition and Target Demo				6
Total	ARDEC ERDC			

Purpose:

WB) Improve the Rapid Wall Breaching Kit (RBWK) by providing a single shot demolition device to create a Soldier size entry hole in a spectrum of walls, cut all rebars when present and minimize collateral damage

SF) Provide a single Shoulder Launched Munition for the individual Soldier capable of incapacitating / defeating personnel inside urban structures & light armored vehicles

Product:

WB) Demonstrate state of the art warhead technologies for Rapid Wall Breaching that can create a man-sized hole in double-reinforced concrete wall in a single step, reduce time on target and enhance soldier survivability

SF) Demonstrate a multi-purpose Shoulder Fired Munition which can incapacitate personnel within Bunkers, behind 12" Triple-Brick and 8" Double Reinforced Concrete Walls, and within light armored vehicles

Payoff:

Wall Breacher (WB)

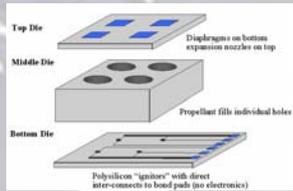
- Improved survivability by reducing time on target
- Reduced overall system weight

Shoulder Fired (SF)

- Single shoulder-launched weapon system with increased lethality and survivability for all required targets
 - Reduced logistics burden & unit training requirements
 - Reduced Soldier's combat load
- Transition both technologies to PM-CCS for SDD**



FY08 Start - Advanced Lethal Armament Technology Small Arms



Note: Modeling & Simulations Activities are coincident with efforts

Schedule & Cost

Milestones	FY08	FY09	FY10
<u>Advanced Lethality Component</u>			
• Concept small warheads with modeling.	2		
• Experiment geometric & directionality warheads			
• Breadboard lethal & frag concepts comp.			4
• Miniature Proximity fuze electronics	3		
• Demo critical electronic comp.		4	
• Develop adv. recoil concepts	2		
• Tradeoff materials and recoil absorption technology. Experiment with recoil absorption			3
• Critical breadboard of weapon launch survivability			4

Purpose:

To demonstrate advanced lethal armament component technology for providing improved munition effectiveness to targets.

Product:

- Demonstrate advanced lethality components spiraling to weaponization includes terminal fragmentation effectiveness trades.
- Miniaturize Proximity electronics for 40 mm application. Integration of improvement to SWAP of proximity fuze for small arms.
- Demonstration of technical material components improving durability, reliability and weight to include Recoil attenuation technical advancement components
- Modeling and Simulation assessments integrated with critical technology demonstrations

Payoff:

Multiple critical technology demonstrations enabling maturity measurement coupled with cross integration analysis fulfilling broad small arms capability gaps for spiral transition.

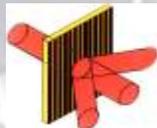


FY08 Start - Advanced Fire Control Technology for Small Arms



Target Tracker &

Laser steering



Note: Modeling & Simulations Activities

are coincident with efforts

Schedule & Cost

Milestones	FY08	FY09	FY10
<u>Laser Steering / Adv. Range Finding</u>			
• Concept Studies	█		
• Component Experimentation		█	
• Component analysis/define parameters		█	
• Critical breadboard proof of concepts			█
• Selection for breadboard fabrications			█
• Integration of breadboard components			█
• Component banding/maturation			█

Purpose:

To demonstrate advanced fire control component technology determining correct range to moving targets and further power sharing within weapon for current and future warfighters.

Product:

- Harvest and target, for small arms, the technologies of automatic target detection, laser steering to increase the soldier's ability to accurately determine range to non cooperative moving targets. Improved lethality in direct and indirect fire situations for unsupported firing positions.
- Develop range determination overcoming man machine 1.5 hertz wobble human hold.
- Investigate weapon wireless net centric access coincident with power sharing mounting rails.

Payoff:

Critical technology demonstrations enabling maturity coupled with cross integration analysis fulfilling broad small arms capability gaps defilade and covered targets for spiral transition.



Emerging Investment Areas

- ARDEC expertise applies to emerging capability gaps.
- ARDEC is leveraging S&T for current and future threats:

**Remote Armament
Systems**
POC: Leon Manole
(973) 724-6753

**IEDs /
Asymmetric Threats**
POC: Ray Carr
(973) 724-5010

**Novel Power &
Energy Systems**
POC: Maria Allende-Pastrana
(973) 724-2278

Networked Lethality
POC: Norm Coleman
(973) 724-6279

**Rapid Prototyping
For the Current Force**
POC: Bernie Rice
(973) 724-8501

Nanotechnology
POC: Mark Mezger
(973) 724-8535

**Industrial Base/
Mfg Science**
POC: John Blackmer
(973) 724-8519

Homeland Defense
POC: Floyd Ribe
(973) 724-6165

.....ARDEC is Actively Seeking Investment Partners in These Areas

Issues/Concerns



- ▲ Industry/Government Tech Base investment must be **focused on warfighter requirements** – both from Combat Developer (TRADOC) and Materiel Developer (PEO/PM)
- ▲ “Best of Breed” low-cost, multipurpose munition components are needed – **IP concerns must be not impede this and must be negotiated up front**
- ▲ Industry proposals must be timed to support Army budget process - **Out-of-cycle proposals by exception only**



Teaming with ARDEC



- ▲ **ATOs/Tech Base – POC: Allan Aprea, (973) 724-5015**
- ▲ **Test Agreements/IR&D/CRADA – POC: Tim Ryan, (973) 724-7953**
- ▲ **Rapid Prototyping – POC: Bernie Rice, (973) 724-8501**
- ▲ **DOTC – POC: Ray Pawlicki, (973) 724-3386**
- ▲ **Small Arms Consortium – POC: Frank Puszycki, (973) 724-6081**



In Summary...



- **We are a nation at war – ARDEC seeks to partner with PEOs and industry to accelerate fielding of advanced technologies in support of current operations**
- **ARDEC in maintaining investments in Future Force technologies**
- **ARDEC is applying weapons, munitions/effects, and fire control expertise to emerging technologies including Active Protection Systems, Counter Rockets, Artillery and Mortars, and Countermine/Counter IED**
- **ARDEC has a strong desire to develop joint technology programs with Army, other service, coalition, and industry partners**