U.S. ARMY RDECOM
TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT, & ENGINEERING CENTER (ARDEC)

Malcolm Baldrige National Quality Award 2007 Award Recipient

Retaining Lethality Overmatch Through Science & Technology

ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NJ

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Mr. Joe Pelino
ARDEC Director of Technology
22 April 2015

ARDEC's Role

Acquisition Lifecycle

RESEARCH

DEVELOPMENT

PRODUCTION

FIELD SUPPORT

DEMILITARIZATION

Advanced Weapons:

Line of sight/beyond line of sight fire; non line of sight fire; scalable effects; non-lethal; directed energy; autonomous weapons

Ammunition:

Small, medium, large caliber; propellants; explosives; pyrotechnics; warheads; insensitive munitions; logistics; packaging; fuzes; environmental technologies and explosive ordnance disposal

Fire Control:

Battlefield digitization; embedded system software; aero ballistics and telemetry

Home of Armament Systems and Munitions for Joint Services

ARDEC S&T Needs & Investment Equation

Needs/Source Documents

DoD/DA
- OSD Elegant 11
- Army Enduring Challenges
- CSA Force 2025
- ASA(ALT) POM Guidance

PEOs
- PEO AMMO Priorities
- PEO Soldier Priorities
- PEO GCS Priorities
- Endorsements
- LIRA

TRADOC
- Army Operating Concept
- Army Warfighting Challenges
- TRAC Top 60
- JCIDs Documents

- Capability Needs Analysis (CNAs)
- Force 2025 CoE Warfighter Needs
- CoE Gaps and Endorsements (MCoE, FCoE, MSCoE, SCoE, ACoE)
- TCM-ABCT, SBCT, IBCT Needs/Gaps

- ✓ Identification, coordination, organization of individual “Source Documents” needs/gaps/priorities into one list
- ✓ Collected from multiple lethality stakeholders

ARDEC S&T Portfolio

- ✓ Sets priorities for future investments (POM)
- ✓ Enables adjustments to on-going efforts
- ✓ Details/communicates opportunities to Service labs, industry, academia, international

Lethality S&T Opportunities

- ✓ Utilized by ARDEC Scientists and Engineers to marry innovation to needs
- ✓ Available to industry partners
  - …to facilitate cooperative long term planning to include IR&D investment
  - …realized in the DOTC Annual Technology Plan

Aligned to Better Buying Power 3.0

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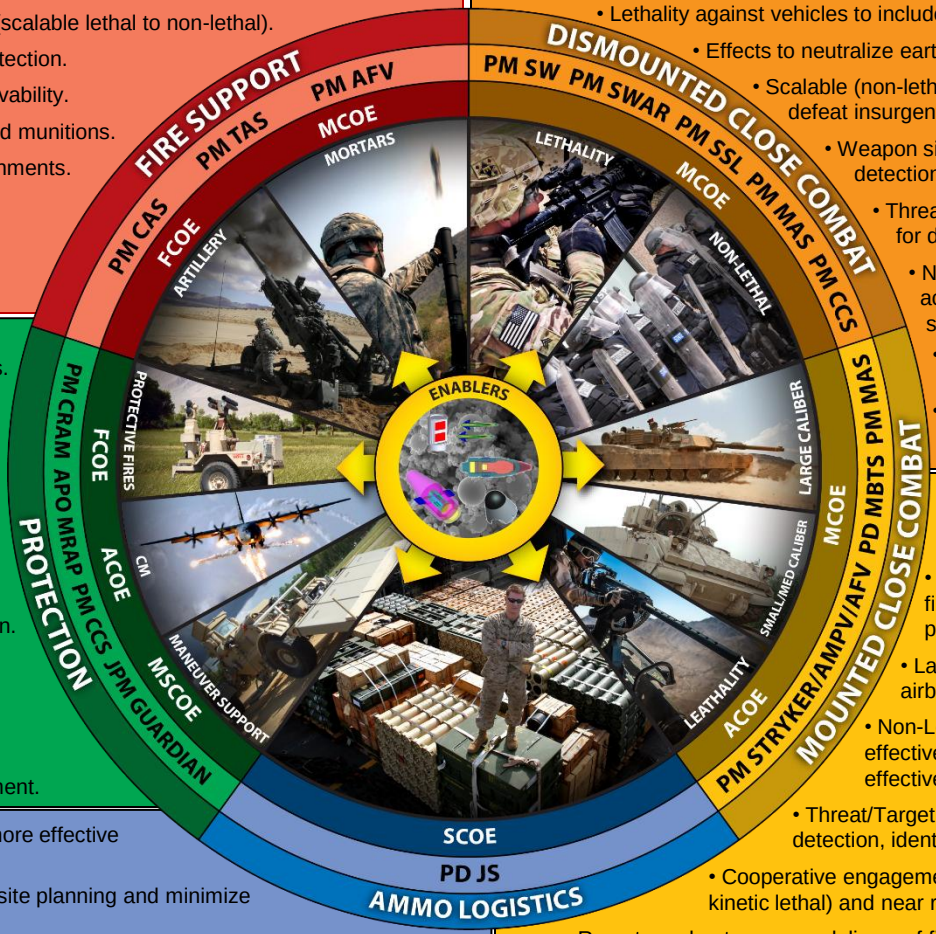
Stakeholder Needs To Be Addressed By Armaments Community

- Munitions against advanced armors and hardened above/below ground targets.
- Cluster munitions replacement for area fires or imprecisely located targets.
- Tailorable effects that match munitions to targets (scalable lethal to non-lethal).
- Threat/Target acquisition for Fire Support and Protection.
- Remote and autonomous delivery of fires for survivability.
- Artillery extended range w/conventional and guided munitions.
- Artillery increased precision in GPS denied environments.
- Artillery increased rate of fire.
- Mortars extended range and increased precision.
- EMP/HPM Mortars to disrupt enemy electronics.

- Lethality against personnel to include volume and precision fires, airburst, counter-defilade target engagement.
- Lethality against vehicles to include Small Cal Armor Piercing, Shoulder Launched.
- Effects to neutralize earth, bunkers, and walls.
- Scalable (non-lethal and non-lethal to lethal) to shape the fight, defeat insurgents, reduce casualties, minimize damage.
- Weapon signature suppression to prevent enemy detection of U.S. forces.
- Threat/Target acquisition and sensor fusion/mgmt. for detection, identification, and targeting.
- Networked fires for weapon/sensor targeting acquisition sharing (cue-to-target) and from external sources.
- Integrated approach to reduce both Soldier marching load and fighting load.
- Soldier power for required missions & wireless power distribution to Soldier worn systems.

- Explosive detection/neutralization above/below ground, at standoff distances, and convoy speeds.
- CUAS at close range and extended ranges.
- CRAM for base protection and armored vehicles OTM.
- Detect and counter electromagnetic or DE.
- Counter Mobility Engineering to shape the battle space not using “dumb” mines.
- Multispectral obscurants/illumination to include non-toxic/incendiary smoke, limit freedom of action.
- Passive platform protection/survivability to include Artillery, Stryker (Armor, Detection, Transport).
- Aviation survivability from weapons and defeat/ suppress enemy air defense.
- ESOH to include Soldier Safety, IM, DU Replacement.



- Efficient handling/throughput of cargo for faster/more effective deployment/sustainment.
- Explosives safety techniques to improve storage site planning and minimize footprint at base camps.
- Real-time, automated, asset tracking and prognostics/diagnostics systems for Ammo.
- Automated weapon system re-arm/re-supply to reduce manpower req. and soldier exposure to risk.
- Lightweight renewable/recyclable/reusable packaging to reduce energy usage during distribution and retrograde.
- Aviation sustainment to maintain high operational readiness rate, and conduct rapid refueling, rearming, and aircraft recovery operations.

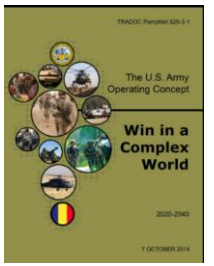
- Lethal overmatch and tactical standoff to extend the close combat battle against tanks and armored vehicles.
- Mobile protected firepower to apply long range fires against bunkers, light armored vehicles, and personnel.
- Large Cal to defeat ATGM teams with precision airburst munitions.
- Non-Lethal anti-material weapon within required effective ranges; Non-Lethal AP weapon within required effective ranges.
- Threat/Target acquisition and sensor fusion/mgmt. for detection, identification, and targeting.
- Cooperative engagements (sensor to shooter, LOS, NLOS, kinetic, non-kinetic lethal) and near real-time networked fire.
- Remote and autonomous delivery of fires for increased survivability.
- Aviation lethality to destroy, neutralize, or suppress enemy targets.

SYSTEM RESILIENCE/COST AND TRAINING

- System Resilience and Life Cycle Cost (development, integration, sustainment, etc.).
- Weapon Systems Training and immersive operational environment integration.

Near-Term Investments Driven By…

- Range extension with precision
- Enhancing weapon systems – artillery, medium caliber, aviation
- Protective technologies (e.g., CUAS, CRAM, APS)
- Core enabling technologies – fuzing & power; energetics; warheads; guidance, navigation & control
- Technologies for asymmetrical warfare (e.g. Subterranean, Megacities)
- Improving affordability of fielded capabilities thru technology
- Enabling and unburdening the Soldier through fire control, ammunition & weapons enhancements



Future Armaments Assessments: Munition Technologies

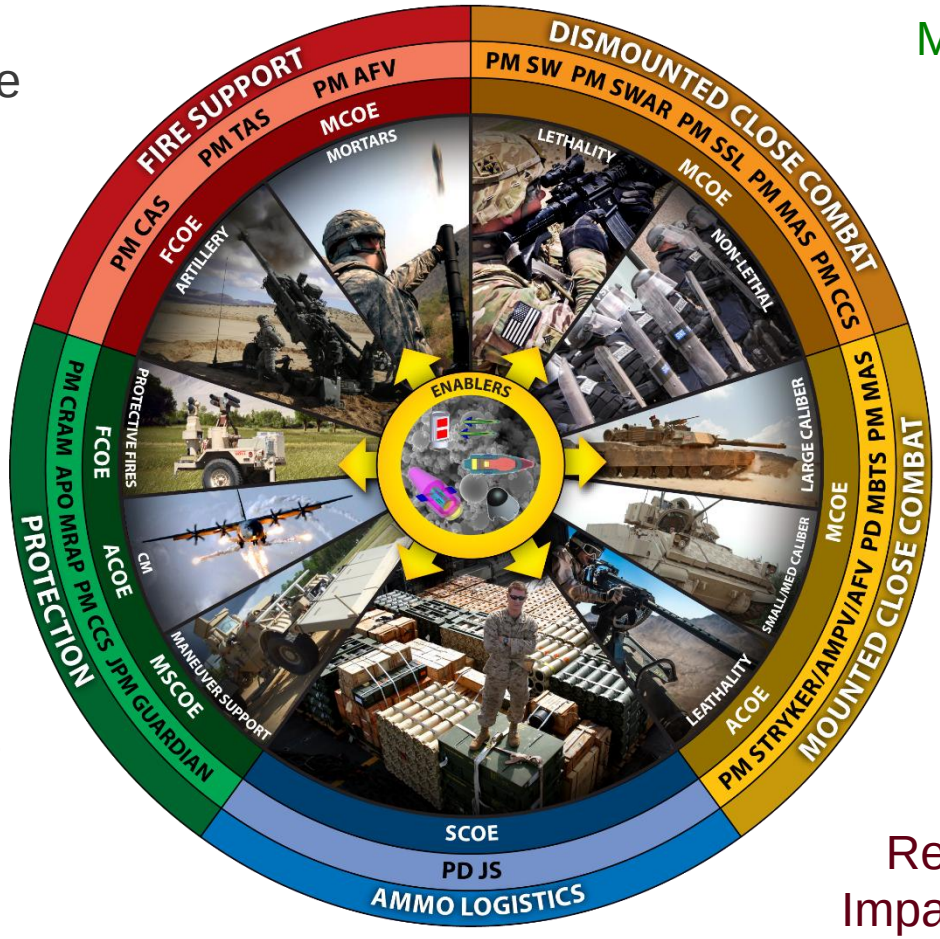
Smart/Collaborative Munitions

Highly Directional Explosives/Warheads

Non-Kinetic Energy Effects

Extended Range Effects

Enhanced Precision



Design for Demilitarization and Disposal

Multi-function Munitions

Counter-Measure Hardened Munitions

Scalable Munitions

Advanced Fuzing

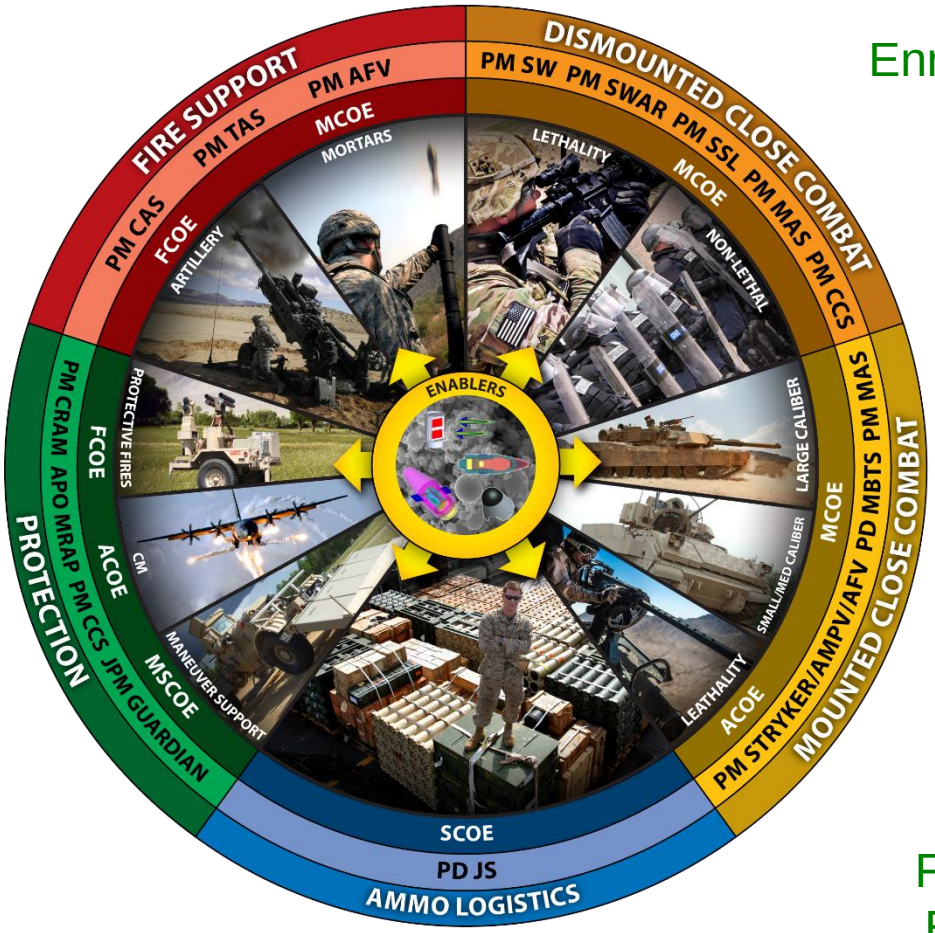
Reduced health Impact of Expended Munitions

Future Armaments Assessments: Weapons Technologies

Directed Energy

Robotic and Autonomous Systems

Non-Volume Suppressive Effects



Enriched Fire Control

Collaborative Fires

Signature Reduction

Fires From Enclosure

Modular, Common Multi-use Components

Future Armaments Assessments: Enabling Technologies

Test, Diagnostic and Maintenance Tools

Reduced Lifecycle Environmental Impact

Immersive Training and Gaming

Materials Science

Additive Manufacturing

Distributed Software Services

Validated and Verified Modeling and Simulation Tools

Logistics, Automation and Reduction

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Teaming with ARDEC

- **Science & Technology**
  POC: Joseph Pelino, joseph.pelino.civ@mail.mil

- **Cooperative R&D Agreements (CRADAs)/Patent Licenses/Testing Services/Engineering Services**
  POC: Tim Ryan, timothy.s.ryan.civ@mail.mil

- **IR&D Technical Interchange**
  POC: Timothy Ryan, timothy.s.ryan.civ@mail.mil

- **Small Business Innovation Research**
  POC: Benjamin Call, benjamin.d.call.civ@mail.mil

- **International Cooperation**
  POC: Lu Ting, lu.c.ting.civ@mail.mil

- **Department of Defense Ordnance Technology Consortium (DOTC)**
  POC: Don Geiss, donald.a.geiss.civ@mail.mil

…..Continued Dialog to Leverage Collaboration Opportunities

Summary

- Budgets will continue to be constrained
  - Less Programs of Records to transition technologies
  - Seek early partnering with industry
  - Enhance technology transition thru material change efforts
- S&T investment guided by Warfighter gaps and needs
  - OSD and DA are fiscally committed to maintaining investment in S&T
- Threat will continue to challenge US overmatch via asymmetrical means
- To ensure an innovation driven portfolio must maintain a Govt – industrial partner balance