Presentation Name: Armaments for Combat Vehicles
Date: October 14th, 2009
Speaker: Dr. Joseph A. Lannon
Speaker Title: Director, ARDEC
Vision:
Innovative Armaments Solutions for Today and Tomorrow

Mission:
To develop and maintain a world-class workforce to execute and manage integrated life-cycle engineering processes required for the research, development, production, field support and demilitarization of munitions, weapons, fire control and associated items

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

ARDEC provides the Technology for Over 90% of the Army’s lethality; Significant support to other services’ lethality
### Supporting the Current Fight

<table>
<thead>
<tr>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
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</thead>
<tbody>
<tr>
<td>Picatinny Blast Shield</td>
<td>SWORDS</td>
<td>CROWS Lightning/PDCue</td>
<td>Objective Weapon Elevation Kit</td>
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<tr>
<td>Hand Emplaced Shape Charge Assembly</td>
<td>Excalibur 1a-1</td>
<td>XM32 Abrams Reactive Armor Tile II</td>
<td>CROWS/PDCue</td>
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<tr>
<td>Rapid Entry Vehicle</td>
<td>M1A1/A2 Gunner/Loader Protection</td>
<td>M110 Semi Automatic Sniper System</td>
<td>Non-standard Vehicle Armor</td>
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<tr>
<td>Bridge Erection Boat - Force Protection</td>
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<td>Sherlock</td>
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**Army's Greatest Inventions**

- Armor - Weapons - Ammo - Entry Control Point
- Modification Kits - Sensors - C-IED

**134 SUCCESSFUL FIELDINGS SINCE 9/11/2001**
Partnerships (Cooperative Research and Development Agreements (CRADAs) in support of the Future Combat System (FCS)

XM360 Lightweight 120mm Primary Weapon Assembly; GDLS/ARDEC CRADA
ARDEC provides primary armament system for FCS Mounted Combat

XM324 Non-Line-Of-Sight Cannon (NLOS-C); BAE/ARDEC CRADA
ARDEC provides primary armament system for FCS NLOS-C Manned Ground Vehicle

MRM CARTRIDGE, 120 MM, XM1111
Mid Range Munition Guided Anti-Armor Multi-Purpose (MRM-GAAMP) will provide a precision, beyond-line-of-Sight (BLOS) capability from 2-12km for the FCS Mounted Combat System. Significant ARDEC Tech Base investment has Directly Transitioned to SDD in Support of FCS.

XM235 Non-Line-Of-Sight Mortar (NLOS-M); BAE/ARDEC CRADA
Provides Mortar tube and breech for FCS NLOS-M Manned Ground Vehicle

ARDEC is prepared to transition products to GCV, Bradley, & Abrams
Primary Weapon for Mounted Combat System

- Provides direct fire in support of forces in the Unit of Action (UA).
- Beyond Line-of-Sight (BLOS) capability to 12 km with Medium Range Munitions (MRM).
- All the Performance of Current 120mm Cannon in a Light Weight, Compact Design
- Over 2,000 lbs lighter than 120mm Gun used on Abrams Tank
- Muzzle Brake & Recoil System Design Enables a 120mm Gun to fire from a Lightweight Vehicle.

Lightweight Gun Mount
- Compact Cradle Design
- Modular Recuperators
- Light Weight Recoil Brakes

Lightweight 120mm Gun Tube
- High Strength Gun Steel
- Carbon Fiber Composites
- Dual Autofrettage
- High Efficiency Muzzle Brake
  - Reduces Firing Shock to Vehicle & Crew
  - Enables Gun to fire from Light Weight Vehicle

Multi-Lug Breech Mechanism
- Long Life, Compact, Light Weight
- 600VDC Electrically Actuated
- Ammo Data-Link Enables Communication to Smart Rounds
ARDEC integrates Remote Weapon Stations (RWS) onto a suite of robotic platforms.

- Picatinny Light Weight RWS onto Ripsaw
- CROWS II RWS onto Ripsaw
- Picatinny Light Weight RWS onto the Tactical Amphibious Ground System-Common Experimental (TAGS-CX).

ARDEC developing next generation Robotic Armament Systems.

- Lethal and Non-Lethal from one system
- Auto Reload for Ammunition
- ARAS ATO – currently at TRL 6

Warfighters can effectively engage threats with lethal and non-lethal rounds while remaining protected.
Additional Weapon Technologies

- Laser Ignition
- Compact Auto Loader
- M3WS
- Anti Fratricide Barrier Material
- LIPC
- XM297
- ON-MT
- M777
EM Guns differ fundamentally from conventional guns; the accelerating force (F) is provided by Electro-Magnetic forces, not rapid expansion of gases as seen in energetic propellants.

- Understand lethality of hypervelocity penetrators against projected future threat protection packages
- Projected future lethality gap can potentially be nullified by novel hypervelocity penetrators
- Powder-based guns cannot efficiently achieve hypervelocity due to tactical infeasibility

<table>
<thead>
<tr>
<th>Impact Velocity</th>
<th>Monolithic Rods</th>
<th>Novel Penetrators</th>
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<tbody>
<tr>
<td>1500 m/s</td>
<td>Adequate data</td>
<td>Insufficient data</td>
</tr>
<tr>
<td>1850 m/s</td>
<td>Adequate data</td>
<td>No data</td>
</tr>
<tr>
<td>2200 m/s</td>
<td>Insufficient data</td>
<td>Insufficient data</td>
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**EM Gun**: · Harnessing Electrical Currents · Forgoing Energetic Chemicals · Innovating Firepower
ARDEC retains proven in-house capability for Lethality/Non-Lethal enhancements
- **Small, Medium, Large Caliber Applications**

Expertise in Armaments System Engineering
- **Weapons, Propulsion, Munitions, Warheads…**

Technology has been matured through Tech Base Investments and CRADAs with Industrial partners.

Government partnerships with Industry & Academia will continue to grow technology for future systems.

ARDEC will continue to work with our TARDEC partners to provide Armaments Technology for current and future vehicles.

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Our products assure decisive victory and bring our people home!
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