Technology Demands on the Future Industrial Base

Achieving Efficiencies in an Uncertain Budget Environment

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Ammunition Executive Summit

Presented by: Dr. Gerardo Melendez
Director, US Army RDECOM-ARDEC

Distribution A: Unlimited
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 Fire; Beyond Line of Sight Fire; Non Line of Sight Fire; Scalable Effects; Non-Lethal; Directed Energy; Autonomous Weapons

Ammunition - Small, Medium and Large Caliber; Propellants; Explosives; Pyrotechnics; Warheads; Insensitive Munitions; Logistics; Packaging; Fuzes; Environmental Technologies; Explosive Ordnance Disposal

Fire Control - Battlefield Digitization; Embedded System Software; Aeroballistics; Telemetry

ARDEC Provides the Technology for over 90% of the Army’s Lethality and Significant Support to other Services Lethality
**Purpose:**
- Demonstrate an ultra reliable, lethal NLOS Cluster Munition (CM) Alternative which is compliant with signed DoD CM Policy and achieve <1% UXO

**Products:**
- 155mm cannon ballistic demonstration of integrated “full bore” sub-munition prototype
  - Flight demonstration of ultra reliable multifunctional sub-munition fuzes
  - Demonstrate optimized dispense/stabilization systems and Warhead Structural Integrity/Safety
- Arena test demonstrating enhanced lethality blast fragmenting submunition & effective lethal area
- Application scalability analysis across multiple calibers and delivery systems

**Payoff:**
- Warfighter operational benefits
  - Enables continued use of critical lethality capability
- Specific Transitions Concepts
  - FY14 EMD start with PM CAS to meet 2018 IOC deadline
- Benefits (ATO-D)
  - DoD CM Policy dated 19 June 2009 compliance (<1% UXO)
  - Lower costs via reuse of demilled 155mm metal parts

**Metrics**
- Unexploded Ordnance (UXO)
- Payload Lethal Area (Normalized)
- Number of Submunitions in 155mm Carrier
- Total Payload Weight
- System Reliability
120mm Next Generation Anti-Tank Cartridge

Purpose:
Demonstrate 120mm cartridge technology enabling defeat of current and future heavy armor threat without Depleted Uranium (DU).

Products:
- Specific novel penetrator designs providing lethal overmatch vs. most difficult threat targets.
- Fully integrated 120mm Cartridge System without DU flight test demonstration at Ordnance velocity.
- Flight demonstration of improved precision and overall system effectiveness of 120mm KE penetrator with surrogate fire control at long range.
- Penetration and lethality data and models proving novel penetrator performance vs. advanced full-scale armor threat targets from Ordnance through Hypervelocity impact.

Payoff
- War fighting operational benefits
  Maintain the Warfighters over match of current and future armor threats even if DU is no longer available.
- Specific Transitions Concepts
  Transitions to PM MAS follow-on developments (multiple calibers) end of FY14
- Benefits (ATO-D)
  Removes current dependence on single supplier for penetrator material

<table>
<thead>
<tr>
<th>MILESTONES</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Perform. Evaluation</td>
<td>4</td>
<td>Ordnance Velocity</td>
<td>Hyper-Velocity</td>
<td></td>
</tr>
<tr>
<td>Novel Penetrator Lethal Effects</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Tactical Deploy Mechanism</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>DU Replacement Materials</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Integrated System Tests</td>
<td>Lethal Mech Select</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Lethality Demonstration</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>System Accuracy Demo (LC³)</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

Metrics

<table>
<thead>
<tr>
<th>Normalized Penetration @ range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hit Probability improve @ range</td>
</tr>
</tbody>
</table>
Purpose:
• Reduce unit production cost, system weight and enable design optimization for manufacturing advanced munitions including:
  • MOUT ATO Shoulder Launched munition
  • Extended Area Protection & Survivability ATO (EAPS)
  • 120mm Advanced Multi-Purpose (AMP)
  • Next Gen Artillery Improved Conventional Munition (ICM)/ Cluster Munition Replacement (CMR) ATO

Product:
• Reduced warhead production costs, manufacture times and improved integration of advanced system technologies in warheads, reduced system weight and design time
  • Example: 120mm AMP; 3 lbs lighter, $2523.00 lower cost/round, a 30% per round cost reduction
  • Example: MOUT; Reduced design constraints enabling optimized system weight

Payoff:
• Lower cost, more reliable munitions with reduced number of manufacturing processes
• Improved safety by decreasing touch labor during munition manufacture
Purpose:
Establish a capability to manufacture IMX-104 with optimum parameters to reduce unit price and maintain its IM properties. IMX-104 will support the production of the 81MM HE mortar and is the leading candidate to replace Comp B and its equivalence, PAX-21 and PAX-41 as the HE fill in various munitions items.

Products:
- Optimized production process
- Improved manufacturing efficiency
- Product with consistent IM properties
- ROI - 24.7:1

Payoff:
- IM compliant product for warfighters
- Reduce unit cost by 20%
- Ability to manufacture IMX-104 on a large scale
- Better understanding of operating condition on the quality of final product
ASA(ALT) & RDECOM Priorities

ASA(ALT) S&T Vectors

- Lighten the Load
- Enhanced Prot./Survivability
- PTSD/TBI
- Expeditionary Base Camps
- Network the Force
- Supply Chain Logistics
- Small Combat Teams
- Power and Energy
- Manned Unmanned Teaming
- Combat ID
- Converting information & data...

RDECOM CG Priorities

- Logistics (O&S Cost Reduction)
- VCSA Portfolio Reviews
- Robotics
- OPORD 10-010 FRAGOs
  - ACT VI (FRAGO 1/7)
  - BCT Mod (FRAGO 2)
  - CIED (FRAGO 3)
  - JMR (FRAGO 8)
- SID -TFT Gap Analysis
- OSD
  - Future Vertical Lift
  - Mobile Base Camps
- Technology –enabled Capability Demonstrators (TCD)
  - JMR
  - Lightening the Load
  - ACT VI (GCV)
  - IBD and EBC
  - Data to Decision

Current/Planned ARDEC S&T Projects

- Scalable Technology for Adaptive Resp
- Advanced Warhead Technologies
- Advanced Energetics
- Gun Propellant Technologies
- Affordable Precision
- Tunable Pyrotechnics
- Networked Munitions
- Cluster Munitions Replacement
- Next Generation KE
- Lightweight Small Arms Technology
- Small Arms Fire Control and Lethality
- MOOUT/Urban Lethal Technologies
- Extended Area Protection & Survivability
- Advanced Lethality and Accuracy System – Medium Caliber
- Stand-off Weapon System & Ammo
- Advanced Remote Armament System (ARAS)
- HPM Non-Lethal
- Active Denial Technology
- Laser Induced Plasma Channel
- Advanced Fire Control Technologies
- Ammunition Logistics
• Funding concerns
• Improve Tech Base to IB transitions

• Looking for help from the Industrial Base to get the job done
  – Over past year, closer coordination with IR&D reviews have been helpful. Needs to continue.
  – We have strategies for future investments. Need your support and assistance.
  – CRADAs, experimentation agreements, early partnerships
  – Focus on cost of technology solution.
  – Joint planning to overcome future obstacles (laws, safety, interoperability, etc.)
  – Assistance to overcome the Valley of Death – what prevents us from getting projects transitioned?
    • Leverage partnerships, capability sharing
    • Identifying efficiencies to take us closer to transitioning technology
  – DOTC as a vehicle to execute S&T programs

... S&T will have impact on Industrial Base - let’s work it together
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
“Without lethality, it’s just another parade”