ARDEC Tech Base Overview

12 June 2007

Ms. Barbara Machak
Associate Technical Director for Tech Base/MANTECH
• 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

….. Rapid Transition of Technology to Warfighters
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

See First
Finish Decisively
Act First

FUTURE Force

EM Gun
Mid-Range Munition
LtWt Dismounted Mortar
Scaleable Effects

SWORDS w/Remote Armament System
LtWt Small Arms Technologies
Novel/Nano-Structured Energetics
MEMS S&A Fuze & Power
MEMS IMU
Multi-Mode Warheads

Understand First

Extended Area Protection & Survivability
Networked Lethality
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Technology Investment Strategy

CURRENT MUNITIONS
- Small/med cal
- 25mm
- Javelin
- TOW
- Tank
- 2.75” Rocket
- Mortars
- Howitzers
- Hellfire
- MLRS
- ATACMS

COMMONALITY PLAN
- Near Term
  - Munitions with Common Sub-Components
- Mid Term
  - Common Propellants
  - Common Sub-munitions
  - Common Guidance
- Far Term
  - Common Fuzes
  - Common Warheads
  - More

ENDSTATE
- Common Short-Range Munitions
- Common Mid-Range Munitions
- Common Deep Range Munitions

…..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
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 PEÖs, AMMO, M&S, Soldier: Javelin, TOW, JAGM, XM1069, MAPAM, M430

Schedule & Cost

<table>
<thead>
<tr>
<th>MILESTONES</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
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<tbody>
<tr>
<td>Multi-output explosive and Advanced Dynamic Propellant development</td>
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<td>Reactive Material development</td>
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<tr>
<td>Advanced fuze &amp; power development</td>
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<td>Warhead scaleable/selectable performance against multiple targets</td>
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<tr>
<td>Integrated Demos of Prototype Adaptive Munitions</td>
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Total
FY08 Start - Multimode HPM and Laser Induced Plasma Channel Technology

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

Schedule & Cost

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

Total Army 6.2
Total ARL 6.2

10
FY08 Start - MOUT/Urban Lethal Technologies

**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**
**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 Lethal Armament Technology Small Arms

#### Milestones

<table>
<thead>
<tr>
<th>Advanced Lethality Component</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
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</thead>
<tbody>
<tr>
<td>Concept small warheads with modeling.</td>
<td>2</td>
<td></td>
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<tr>
<td>Experiment geometric &amp; directionality warheads</td>
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<td>3</td>
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<tr>
<td>Breadboard lethal &amp; frag concepts comp.</td>
<td></td>
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<td>4</td>
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<tr>
<td>Miniature Proximity fuze electronics</td>
<td>3</td>
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</tr>
<tr>
<td>Demo critical electronic comp.</td>
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<tr>
<td>Develop adv. recoil concepts</td>
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<tr>
<td>Tradeoff materials and recoil absorption technology. Experiment with recoil absorption</td>
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<tr>
<td>Critical breadboard of weapon launch survivability</td>
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Note: Modeling & Simulations Activities are coincident with efforts
FY08 Start - Advanced Fire Control Technology for Small Arms

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.

<table>
<thead>
<tr>
<th>Milestones</th>
<th>FY08</th>
<th>FY09</th>
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<tbody>
<tr>
<td>Laser Steering / Adv. Range Finding</td>
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<tr>
<td>• Concept Studies</td>
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<tr>
<td>• Component Experimentation</td>
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<tr>
<td>• Component analysis/define parameters</td>
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<tr>
<td>• Critical breadboard proof of concepts</td>
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<tr>
<td>• Selection for breadboard fabrications</td>
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<tr>
<td>• Integration of breadboard components</td>
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<tr>
<td>• Component banding/maturation</td>
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</table>

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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

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

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

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

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

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

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

  - Nanotechnology
    POC: Mark Mezger
    (973) 724-8535

…..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

…..Continued Dialog to Leverage Collaboration Opportunities
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

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