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

ARDEC Armaments & Munitions Technology Thrusts

Ms. Barbara Machak
Exec Director, Enterprise Systems Integrations Center
13 May 2014

Malcolm Baldrige National Quality Award 2007 Award Recipient

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

MISSION

Empower, unburden and protect the Warfighter by providing superior armaments solutions that dominate the battlefield.

VISION

Innovative Armaments Solutions for Today and Tomorrow

RDECOM Organization

GEN Dennis L. Via
CG AMC

Ms. Heidi Shyu
ASA(ALT) & AAE

Mr. Dale A. Ormond
Director RDECOM

CSM Lebert Beharie
CSM RDECOM

Mr. Jyuji Hewitt
Deputy Director RDECOM

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

BG William E. Cole
DCG RDECOM

- RFEC Atlantic
- RFEC Pacific
- RFEC Americas

AMRDEC
Aviation & Missile Research, Development & Engineering Center

ARDEC
Armaments Research, Development & Engineering Center

ARL
Army Research Laboratory

CERDEC
Communication-Electronics Research, Development & Engineering Center

ECBC
Edgewood Chemical Biological Center

NSRDEC
Natick Soldier Research, Development & Engineering Center

TARDEC
Tank and Automotive Research, Development & Engineering Center

US ARMY RDECOM

Strategic Partners

Assigned/Direct Support
Coordination

Headquarters, Department of the Army

Assistant Secretary of the Army
Acquisition, Logistics and Technology
Ms. Heidi Shyu

Army Materiel Command, AMC
Gen. Dennis L. Via

Joint Munitions & Lethality LCMC
BG Kristin K. French

TACOM LCMC
MG Michael J. Terry

MG Gwen Bingham

Incoming Commander

Research, Development and Engineering Command, RDECOM
Mr. Dale Ormond

PEO Ammunition
BG John J. McGuiness

- **Program Executive Office Combat Support and Combat Service Support**
- **Program Executive Office Ground Combat Systems**
- **Program Executive Office Soldier**

Armament Research, Development and Engineering Center, ARDEC
Dr. Gerardo J. Melendez

ARDEC's Role

Engineering 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

ARDEC provides the technology for over 90% of the Army's lethality and a significant amount of support for other services' lethality

ARDEC Core Competencies

Weapon Systems & Technologies

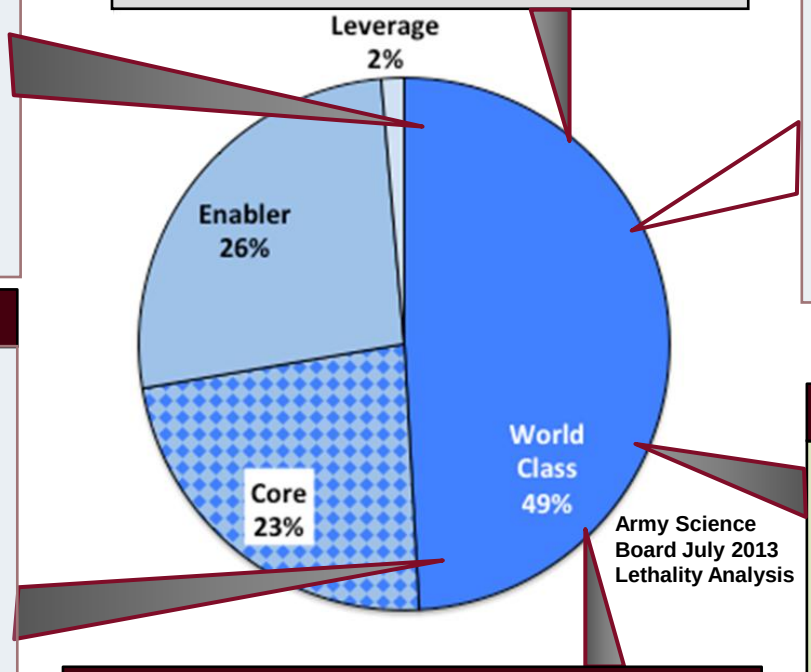
- Integrated Weapon Systems
- Gun / Cannon Tubes & Mounts
- Non-Lethal Weapons & Target Effects
- Remote Weapon Stations/Weapon Pods
- Ammo autoloaders and magazines
- Weapons Manufacturing Technology
- Weapon Evaluation
- Cannon Fatigue Life Testing & Certification
- Directed Energy Weapon Systems
- Weapon Material Applications

Logistics

- Ammunition Unique Packaging, Handling, Storage and Transportation
- Asset Visibility & Distribution Management
- Sets, Kits, Outfits & Tools
- Logistic Engineering & New Equipment Training

Fire Control Systems

- Embedded/Real-Time Software
- Fire / Weapon Control Hardware
- Fire / Weapon Control Hardware Integration
- Fire Control Components
- Ballistic Data & Products
- Prognostic / Diagnostics
- TMDE & Automated Test Sets
- Networked Lethality
- Weapon System Information Assurance
- Emergency Management & Anti-Terrorism Systems
- Embedded Training for Ground and Soldier Platforms



Army Science Board July 2013 Lethality Analysis

Munition Systems & Technologies

- Gun Launched Munition Systems
- Non-Lethal and Scalable Munitions
- Maneuver Support Munitions
- Grenades & Demolitions
- Countermeasure Flares / Decoys
- Smoke Munitions/ Grenades Signal Flares
- Guidance, Navigation, and Control
- Propulsion Systems
- Aeroballistics
- Fuzing System
- Telemetry
- Power Systems
- Producibility & Manufacturing Sciences
- Explosive Ordnance Devices
- Munition Evaluation
- Vulnerability Analysis & Assessment
- Interior/Terminal Ballistics

Enterprise Engineering & Business

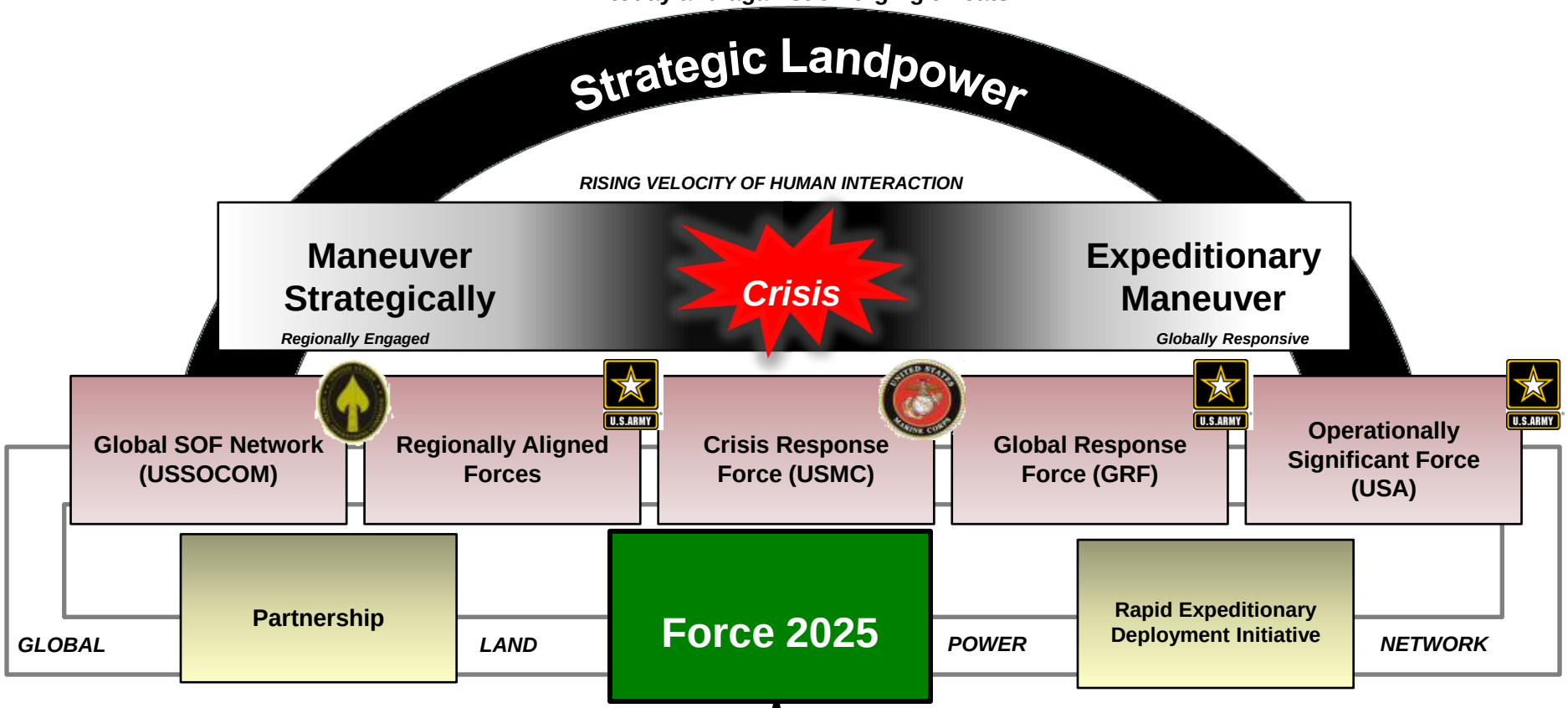
- Systems Engineering & Analysis
- Software Engineering
- Prototyping
- Quality, Reliability & System Safety Engineering
- Product and Technical Data Management
- Modeling & Simulation of Armaments
- Acquisition Support
- Industrial Base Analysis/Obsolescence Mgmt
- Business Process Management (CMMI, ISO, Lean Six-Sigma, Enterprise Resource Planning, Financial Management)

Energetics, Warheads & Materials

- Propellants
- Explosives
- Pyrotechnics
- Advanced Materials / Nanotechnologies
- Environmental Technologies
- Stockpile Reliability
- Warheads / Lethal Mechanisms
- Anti-Tamper Devices
- Integrated Explosive Detection Systems
- Demil Technologies

Strategic and Operational Initiatives in Context

Prevent, Shape, and Win in support of Combatant Commanders to defend the Nation and its interests at home and abroad, both today and against emerging threats



ARMY 2020
A more globally responsive force, capable of decisive action across the ROMO

Force 2025
A leaner, more lethal expeditionary, and agile force than today

Beyond 2025
A fundamentally changed force, uniquely enabled and organized to conduct expeditionary maneuver

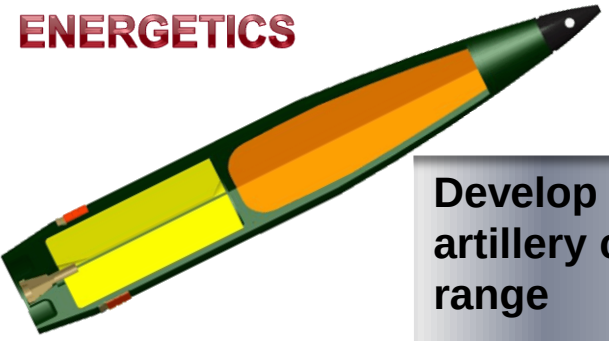
Army Enduring Challenges

- Greater ***force protection (Soldier, vehicle, base)*** to ensure survivability across all operations (16.8% of ARDEC Portfolio)
- Ease ***overburdened*** Soldiers in Small Units (4.0%)
- Timely ***mission command & tactical intelligence*** to provide situation awareness and communications in <u>all</u> environments (0.5%)
- Reduce logistic burden of ***storing, transporting, distributing*** and ***retrograde*** of materials (2.4%)
- Create ***operational overmatch*** (enhanced lethality and accuracy) (69.6%)
- Achieve operational ***maneuverability*** in all environments and at ***high operational tempo*** (2.5%)
- Enable ability to ***operate in CBNRE environment*** (0.8%)
- Enable ***early detection*** *and* ***improved outcomes for Traumatic Brain Injury (TBI) & Post Traumatic Stress Disorder (PTSD)*** (0.0%)
- Improve ***operational energy*** (0.0%)
- Improve ***individual & team training*** (0.0%)
- ***Reduce lifecycle cost*** of future Army capabilities (A metric for all efforts!)

ARDEC Portfolio is Aligned to Army Enduring Challenges!

Enablers: Range Extension w/ Affordable Precision (1/2)

ENERGETICS

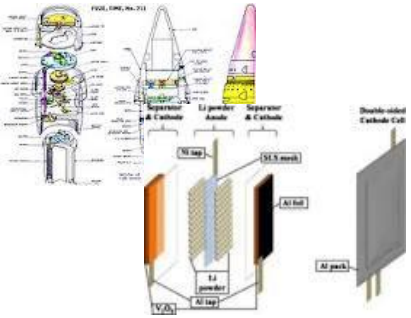


Develop and demonstrate novel artillery charge for enhanced range

PAYOFF

- Extended range with current weapon constraints
- Low residue propellant with improved energy efficiency
- Environmentally compliant gun propulsion
- More energy without exceeding peak pressure

FUZING & POWER

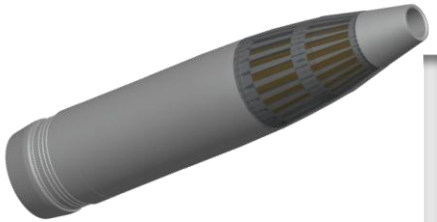


Demonstrate advanced fuzing solutions that enable enhanced lethality

PAYOFF

- Advanced proximity and media identification sensors enable interrogation of the target
- Multipoint initiation enabling enhanced lethality
- Novel high-g power sources w/ greater energy density

WARHEADS



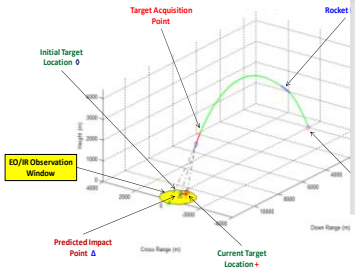
Affordable warhead technologies against threat personnel, vehicles & material

PAYOFF

- Submunition warheads that provide enhanced lethality over large areas
- Warhead configured into the projectile body reduces cost per kill

Enablers: Range Extension w/ Affordable Precision (2/2)

GUIDANCE, NAVIGATION & CONTROL



Integrate affordable imaging and control systems into munition guidance, navigation and control in challenging environments

PAYOFF

- Extended Range given ability to glide
- Improved Circular Error Probable at an affordable cost

FIRE CONTROL

Provide advanced fire direction, position location, orientation and meteorological capabilities

PAYOFF

- Vehicle and training reduction
- Technology insertion reducing both weight and size by ~75%
- Enables mass fires in a GPS denied environment

Low-power, low-cost, light-weight fire control system based on commercially available single board computer hardware

PAYOFF

- Power, weight, time, and cost savings by elimination of cumbersome Personnel Computer technology
- Reduced logistical burden and life cycle cost

US ARMY RDECOM

Weapons: Extended Range w/ Enhanced Lethality

EXTENDED RANGE CANNON ARTILLERY (ERCA)

Integrated extended range 52 caliber cannon/gun w/fully automatic ammunition handling system/loader

PAYOFF

- Extended Range, Increased rate of fire, Improved precision
- Common Fire Control System
- Technologies are transferrable to M777

AUTOMATED DIRECT/INDIRECT FIRED MORTAR (ADIM)

Remotely operable direct/indirect fire mortar system suitable for mounting on multiple platforms

PAYOFF

- Increased rate of fire enabling multi-target engagement
- Reduced emplacement times

LAND BASED ELECTROMAGNETIC GUN

Collaborating with Navy for development of land based EM Gun with common system components and projectile

PAYOFF

- Increased velocity and range
- Common system components

US ARMY RDECOM

Weapons: Extended Range w/ Enhanced Lethality

SMALL ARMS TECHNOLOGIES

Family of lightweight weapons integrated with fire control systems, advanced munitions, integrated day/night sight, and magnified optics

PAYOFF

- Fire control system for increased accuracy/lethality
- 20% reduction in weight
- Integrated optics

MEDIUM CALIBER GUN

Improved accuracy, lethality, ammunition handling and advanced sensor suite capable of using next gen munitions

PAYOFF

- Increased lethality
- Increase in precision and accuracy
- Integrated ammunition handling system
- Graphical user interface fire control system

ARDEC Strategy in Countering – UAS, CM & RAM Threats

Leveraging core technical competencies for cost effective solutions

20km+

Far-Term Effort

Trades

TARGET SET

Address Long Range UAV Intercept in addition to current target set

Near-Term Effort

Mid-Term Effort

Multiple simultaneous engagements

Trades

Extended Range Technologies

Trades

Trades

M240 (7.62)

Trades

40mm

60mm

Long Range Intercept (Extended Range)	EAPS - Extended Area Protection System	Fixed/Mobile Area Protection	Squad Area Protection
Super FOB	FOB - Bde	COP – Co/Platoon	PB/COP - Squad

Teaming with ARDEC

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

- **CRADAs/Patent Licenses/Testing Services/Engineering Services**
  POC: Tim Ryan, timothy.s.ryan.civ@mail.mil

- **IR&D Technical Interchange**
  POC: Sylvester Anyanwu, sylvester.o.anyanwu2.civ@mail.mil

- **Small Business Innovation Research**
  POC: Carol L'Hommedieu, carol.j.lhommedieu.civ@mail.mil

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

- **DOTC**
  POC: Don Geiss, donald.a.geiss.civ@mail.mil
  - **Small Arms Consortium**
    POC: Mike Tauber, michael.j.tauber.civ@mail.mil

… Continued dialog to leverage collaboration opportunities

Challenges Going Forward

- CSA Challenge 2025 and beyond
  - 3 Main Objectives
    - Reduction in manpower
    - Increase lethality
    - Reduction in logistic support trains
- Budget Realities
  - Acquisition funding reductions (Procurement and RDT&E)
  - Increasing user needs; must prioritize S&T investments at same funding level
  - Prototyping capability = ready off the shelf
- Pivot to Asia & Pacific and concerns over near-peer threats
  - Focus on longer range and increased precision in GPS-denied environment
  - Enhanced lethality as force structure is reduced
- How can you help?
  - Transitioning from Wartime Operations to Sustainment Operation: **NEW FOCUS**
  - Joint overarching Armament Strategy for the future
  - Reduction of funding; imperative WE WORK TOGETHER

What can we do collectively to overcome this new environment!


"Without lethality
it's just another parade"