“Precision Fires as an Enabler for Force Dominance”

Parsippany, NJ

January 10 -11, 2008

Agenda

**Tuesday 10 June 2008**

**KEYNOTE ADDRESS:**
- Major General David W. Eidsaune, USAF—Commander, Air Armament Center, and the Air Force Program Executive Officer for Weapons, Air Force Materiel Command, Eglin Air Force Base, FL

**THE EVOLUTION OF ARTILLERY FOR INCREASED EFFECTIVENESS:**
- Dominic De Mella—Chief Cannon Artillery Division, ARDEC, Picatinny Arsenal, NJ

**ARDEC’s Role in Countering the IED Threat:**
- Ray Carr—ARDEC Counter Terrorism Technology Team Lead, U.S. Army, ARDEC, Picatinny Arsenal, NJ

**HIGHLY PRECISE MUNITIONS OVERVIEW:**
- Charles Kelly—Staff Specialist, Land Warfare & Munitions, OUSD (AT&L)

**ARMY PEO MUNITIONS PROGRAMS PANEL:**
- Colonel Ole Knudson, USA—PM Combat Ammunition Systems (PM CAS), Picatinny Arsenal, NJ
- Colonel Ray Nulk—Office of the Project Manager for Close Combat Systems, Picatinny Arsenal, NJ

**Wednesday 11 June 2008**

**NAVY INTEGRATED SPECIALTY SITE FOR GUNS AND AMMUNITION:**
- Mike Till—Transition Manager for Picatinny Arsenal, NJ

**NAVY ELECTROMAGNETIC GUN PROJECT:**
- Michael Elliott—Deputy Program Manager, Office of Naval Research

**FORT SILL’S ROLE IN PRECISION FIRES:**
- Kirby Brown—Deputy to the Commanding General, U.S. Army Fires & Fort Sill, OK

**GUIDED MISSILES OVERVIEW:**
- Robert Kirby—Deputy Chief Engineer for Precision Fires Rocket and Missile Systems, Redstone Arsenal, AL

**ARMY AMMUNITION REQUIREMENTS:**
- Robert Grubbs—Deputy for Munitions, G3/7-Headquarters, Department of Army, Munitions G-3

**MUNITION LOGISTICS SUPPORT PANEL:**
- Colonel Michael Mc Bride, USA—Deputy Commander/Chief of Staff, U.S. Army Ordnance Center & Schools, Huntsville, AL
- Al Galonski—Chief Future Concept Division, Logistics Research Engineering Directorate, Picatinny Arsenal, NJ
MUNITIONS SAFETY:

- Gary Carney—Director, US Army Defense Ammunition Center and School, McAllister, OK
AGENDA
TUESDAY, 10 JUNE

0730 REGISTRATION/CONTINENTAL BREAKFAST
Sponsored by Kaman Fuzing

0830 WELCOME:
Andy McHugh—Vice-Chairman of the Board
MG Paul Greenberg, USA (Ret)—PSA Executive Director & Event Chair

0840 OPENING REMARKS:
Brigadier General William Phillips, USA—Commander, Joint Munitions and Lethality Life Cycle Management Command and Program Executive Officer for Ammunition, Picatinny Arsenal, NJ

0900 KEYNOTE ADDRESS:
Major General David W. Eidsaune, USAF—Commander, Air Armament Center, and the Air Force Program Executive Officer for Weapons, Air Force Materiel Command, Eglin Air Force Base, FL

0945 NETWORKING REFRESHMENT BREAK
Sponsored by Whitney, Bradley & Brown, Inc.

1015 THE EVOLUTION OF ARTILLERY FOR INCREASED EFFECTIVENESS:
Dominick De Mella—Chief Cannon Artillery Division, ARDEC, Picatinny Arsenal, NJ

1045 JOINT IED DEFEAT ORGANIZATION (JIEDDO) REQUIREMENTS:
Colonel Ray Nelson, USA—United States Military Academy, West Point, NY

1115 ARDEC’s ROLE IN COUNTERING THE IED THREAT:
Ray Carr—ARDEC Counter Terrorism Technology Team Lead, U.S. Army, ARDEC, Picatinny Arsenal, NJ

1145 LUNCHEON
Sponsored by Lockheed Martin Company

1315 U.S. ARMY JOINT MUNITIONS COMMAND ACTIVITIES:
Jyuji Hewitt—Deputy to Commander, Joint Munitions Command, Rock Island, IL

1345 PICATINNY LABORATORY INITIATIVES:
Dr. Joe Lannon—Director US Army ARDEC, Picatinny Arsenal, NJ

1415 HIGHLY PRECISE MUNITIONS OVERVIEW:
Charles Kelly—Staff Specialist, Land Warfare & Munitions, OUSD (AT&L)

1500 NETWORKING REFRESHMENT BREAK
Sponsored by Whitney, Bradley & Brown, Inc.

1530 ARMY PEO MUNITIONS PROGRAMS PANEL:
Panel Chair: Jim Sutton—Deputy PEO Ammunition, Picatinny Arsenal, NJ
• Chris Grassano—PM Maneuver Ammunition Systems (PM MAS), Picatinny Arsenal, NJ
• Colonel Ole Knudson, USA—PM Combat Ammunition Systems (PM CAS), Picatinny Arsenal, NJ
• Colonel Ray Nulk—Office of the Project Manager for Close Combat Systems, Picatinny Arsenal, NJ

1630 MODELING AND SIMULATION FOR MUNITIONS DEVELOPMENT:
Don Carlucci—Chief, Analysis & Evaluation Division, Fuze and Precision Armaments Technology Directorate

1700 EVENING RECEPTION—HEAVY HORS D’ŒUVRES
Sponsored by Raytheon Company
AGENDA
Wednesday, 11 June

0730 CHECK-IN / CONTINENTAL BREAKFAST
Sponsored by ATK

0830 NAVY INTEGRATED SPECIALTY SITE FOR GUNS AND AMMUNITION:
Mike Till—Transition Manager for Picatinny Arsenal, NJ

0915 NAVY ELECTROMAGNETIC GUN PROJECT:
Michael Elliott—Deputy Program Manager, Office of Naval Research

1000 NETWORKING REFRESHMENT BREAK
Sponsored by General Dynamics-OTS

1030 FORT SILL’S ROLE IN PRECISION FIRES:
Kirby Brown—Deputy to the Commanding General, U.S. Army Fires & Fort Sill, OK

1115 GUIDED MISSILES OVERVIEW:
Robert Kirby—Deputy Chief Engineer for Precision Fires Rocket and Missile Systems, Redstone Arsenal, AL

1200 LUNCHEON
Sponsored by Orbital Sciences Corp.

1330 ARMY AMMUNITION REQUIREMENTS:
Robert Grubbs—Deputy for Munitions, G3/7-Headquarters, Department of Army, Munitions G-3
Don Chrans—Headquarters Department of Army, Munitions G-8

1415 MUNITION LOGISTICS SUPPORT PANEL:
- Colonel Michael Mc Bride, USA—Deputy Commander/Chief of Staff, U.S. Army Ordnance Center & Schools, Huntsville, AL
- CW5 Donald Dehnel, USA—Senior Ammo Tech, Munitions System Manager’s Office, Redstone Arsenal, AL
- Al Galonski—Chief Future Concept Division, Logistics Research Engineering Directorate, Picatinny Arsenal, NJ

1515 NETWORKING REFRESHMENT BREAK
Sponsored by General Dynamics-OTS

1530 MUNITIONS SAFETY:
Gary Carney—Director, US Army Defense Ammunition Center and School, McAllister, OK

1600 MQ-9 REAPER UNMANNED AERIAL VEHICLE:
TBD

1645 CLOSING REMARKS:
Andy McHugh—Vice-Chairman of the Board

ARMAMENTS TECHNOLOGY FIRE POWER FORUM COMMITTEE
PSA PROGRAMS CHAIR: Ginny Sniegon PSA PROGRAMS VICE CHAIR: CAPT Pete Murphy USN
SUMMER FORUM EVENT CHAIR: MG Paul Greenberg, USA (Retired)
DIRECTOR OF OPERATIONS & ADMINISTRATIVE CONTACT: Dawn Campbell

U.S. MILITARY WARFIGHTER REPRESENTATIVES: Col Gary Mausolf USAF, Col Bob Valin, USAF
LCDR Scott Wilson USN, LtCol Chuck Kelly USMC (Ret), LTC Ken Britt USA (Ret)
Field Artillery Capabilities Update

Mr. Kirby Brown
Deputy to the Commanding General/ Director
Capabilities Development and Integration Directorate
System of Systems Capability

Desired Capability: Ability to **rapidly** and **accurately locate and attack targets** with the **required operational responsiveness** matched to **desired effects** (lethal and non-lethal) and the **greatest efficiency**.

To achieve this, Field Artillery needs these “enablers”
- Target location error <10M at extended ranges, 360°-mounted and dismounted
- Technical fire direction and limited tactical fire direction on all delivery systems
- Delivery systems that can rapidly emplace/displace with high rates of fire
- Accurate on demand, meteorological data to delivery system ranges
- All munitions with less than 50M CEP at all ranges
- Munitions that provide a variety of effects in any environment

Our goal is to become a “Precision System of Systems”

The Future of Fires Begins Here
Conceptual Areas of Operation

- 300 km Division
- Combat Support
- Battlefield Surveillance
- Combat Aviation
- Fires
- Sustainment

- Heavy BCT
- Infantry BCT
- Stryker BCT
- FCS BCT

AOE

Division
The Future of Fires Begins Here

**Lethality Spectrum**

**TODAY**

**COIN**

Challenge is to find capabilities for today that carry into the future--across the spectrum

**TOMORROW**

Irregular Warfare to Major Combat Operations?

What should we expect in an MCO of tomorrow

What are the projected capability gaps in the future across the spectrum

Dominant target today is personnel in various postures
Assessment and Way Ahead
“Precision System of Systems”

Locate and Designate
- <10M TLE mounted and stationary
- <5M TLE when aided with PSS-SOF
- Need JETS for dismounted operations

Location and Direction
- Moving to “on board” capability
- IPADS for all other

Met
- Target area capability
- Met on demand
- Moving to “embedded”

Computation
- Technical and tactical from same automation system
- Moving to on board technical
- Exploring limited on board tactical

The Future of Fires Begins Here
The Future of Fires Begins Here

**Assessment and Way Ahead**

"Precision System of Systems"

- Theater demanding enhanced capability:
  - 360 acquisition
  - Better accuracy, range and probability of detection
  - Fielding of EQ-36 and LCMR V3 close the gap
  - Working to sustain readiness of current Firefinder fleet in the interim

- Must maintain viability of current systems for many years
- Must address crew protection issues—especially towed systems with larger crews
- Must close gap with on board digitization for M119A2
- NLOS Cannon and LS are great systems but pose some challenges with crew size
The Future of Fires Begins Here

**Munitions - Current Capability**

- Technology demonstration showed initial capability of 30M CEP
- Working form fit for 155mm and 105mm unique challenges
- Funded in POM

**Precision Guidance Kit**

- Technology demonstration showed initial capability of 30M CEP
- Working form fit for 155mm and 105mm unique challenges
- Funded in POM

**“More precise” area effects**

**Desired Future Capability**

- CEP < 50M for all munitions
- Enhanced lethality
- Greater efficiency
- Scaleable including non-lethal

**< 10m CEP for point target attack**

- Excalibur
- Precision Attack Missile
- ATACMS Unitary

**Guided MLRS - Unitary**
GMLRS-Unitary Rocket

Who Requests GMLRS-U:

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<tr>
<td>Army</td>
<td>372</td>
<td>63.37%</td>
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<tr>
<td>Marines</td>
<td>121</td>
<td>20.61%</td>
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<tr>
<td>Other</td>
<td>94</td>
<td>16.02%</td>
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How GMLRS-U is employed:

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<tr>
<td>Troops In Contact</td>
<td>183</td>
<td>31.18%</td>
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<tr>
<td>Pre-Planned</td>
<td>404</td>
<td>68.82%</td>
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Environments GMLRS-U is employed:

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<tr>
<td>Urban/COIN</td>
<td>558</td>
<td>95.06%</td>
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<tr>
<td>Other (TD/Test)</td>
<td>29</td>
<td>4.94%</td>
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Who Shoots GMLRS-U:

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<tr>
<td>US Army</td>
<td>587</td>
<td>79.65%</td>
</tr>
<tr>
<td>USMC</td>
<td>24</td>
<td>3.26%</td>
</tr>
<tr>
<td>UK</td>
<td>126</td>
<td>17.10%</td>
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Capability Gap: Persistent, responsive, all-weather, rapidly-deployable, long-range, surface-to-surface, precision-strike capability.

Description

- GPS-Augmented Inertial Guidance
- 200lb-Class HE IM-Compliant Warhead
- Multi-Fuze Selection (Point Detonating, Delay, Proximity)
- 15-70km Range

Current Targets

- Precisely Located/Mensurated Point targets
- Congested/Complex Urban Targets
- Targets in Areas Where Collateral Damage is of Concern

Effectiveness/Reliability

- BDA Shows High Level of Effectiveness
- Rare Reports of Minor Collateral Damage
- Reliability of US Army Missions: 98.63%

737 Total Rockets Fired As Of 3 June 2008

The Future of Fires Begins Here
Excalibur

The Future of Fires Begins Here

**Issues:**

- **Mission Roll Up**
  - US-OIF
    - Rounds Delivered = 275
    - MSNs Fired = 30
    - Rds Fired = 50
    - Hits w/Detonation = 44
    - Flew to BIP = 4
    - Hit w/no high order = 2
    - Unservicable = 3
    - Rounds Available = 208
  - US-OEF
    - Rounds Delivered = 72
    - MSNs Fired = 2
    - Rds Fired = 2
    - Unserv. = 0
    - Hits w/Detonation = 2
    - Rounds Available = 70
  - Canada-OEF
    - Rounds Delivered = 27
    - MSNs Fired = 2
    - Rds Fired = 2
    - Unserv. = 1
    - Hits w/Detonation = 2
    - Rounds Available = 25

54 Total Rds Fired
48 Hits
88.8% Reliability

1b ORD Requires Excalibur achieve 10m CEP (e.g. 50% land within 10m & statistically 99.8% of rounds that function Detonate within 3 CEPs i.e. 30m)
1a-1 currently achieves 6m CEP

**Trends:**

- **Target Types:** Structures
- **# of Rds/TGT:** 2
- **Firing Platforms:** Paladin & M777A2

**Depicts 10 rounds fired at a target located with a device with 10m TLE accuracy w/6m CEP. Expect 50% of rounds to fall within one CEP.**

**Target Location Error (TLE)**

The difference between the actual location of the target and predicted target location.

**Circular Error probable (CEP)**

The radius of a circle into which a warhead, missile, bomb or projectile will land at least 50% of the time.

88.8% Reliability

**Canada-OEF**

- Blk 1b ORD Requires Excalibur achieve 10m CEP (e.g. 50% land within 10m & statistically 99.8% of rounds that function Detonate within 3 CEPs i.e. 30m)
- Blk 1a-1 currently achieves 6m CEP

**Issues:**

- **PEFCS (service life extension in theater)**
- **EPIAFS PIK Upgrade** (still on-going in theater)
- **Blk 1a-2 IOTE Delay probable (March 2009)**
- **Blk 1b Request for Proposal published 7Mar08**
  - Blk 1b CEP change 10m (T) 6m (O)
Assessment and Way Ahead
“Precision System of Systems”

- View our munitions capability gaps in this priority:
  - Precision
  - Lethality
  - Range
- Distributed operations, precision munitions and rapid delivery may redefine the massing of fires
- Must have greater efficiency without sacrificing effectiveness
- Continue to explore alternatives to cluster munitions
- Need to increase the scalability of the terminal effects of our munitions
- Non-lethal effects like visual and infra-red illumination are still important
- Considerably greater gap in the indirect fires capabilities of the IBCT when compared with the HBCT or SBCT that we are working to reduce
- “Near precision” capabilities like PGK have a place—TLE is rapidly getting better but sometimes may not be there

Precision munitions have significantly added to our contribution to the current fight

The Future of Fires Begins Here
Summary

- COIN environment has highlighted some unique challenges and capability gaps
- Most of our challenges are faced by many of our likely coalition partners
- Must also address capabilities for Full Spectrum Operations
- Current and programmed systems and munitions close or mitigate many of those gaps but we aren’t there just yet
- Significant challenge to maintain the readiness of current capabilities while awaiting next generation capabilities
- Supplemental funding has been and remains very important to modernizing

Enabling Soldiers with the required capabilities—today and tomorrow

The Future of Fires Begins Here
U.S. ARMY DEFENSE
AMMUNITION CENTER (DAC)

Mr. Gary Carney
Director
(918) 420-8901/DSN 956-8901
gary.carney@us.army.mil

★ JMC – Ready – Reliable - Lethal

UNCLASSIFIED
Defense Ammunition Center
(DAC Knows Ammo)

**MISSION**

Center for ammunition logistical support and knowledge; responsible for explosives safety, logistics engineering, transportability, training, doctrine, demil technology, supportability, reliability, technical assistance and career management. Support all ammunition operations and activities from development through disposal.

**CORE FUNCTIONS**

• Supportability
• Transportability
• Reliability
• Safety
• Technology (demil lead)
• Training/Knowledge Management

**CUSTOMERS**

• Department of Defense
  • DDES B
• Department of Army
  • G-4
• Corp of Engineers
• Combat Readiness Center
• PEO Ammunition (LCMC)
• AMC/FORSCOM/TRADOC
• AMCOM

• Joint Munitions Command
  • ARDEC
• National Guard Bureau/Army Reserve
• Coast Guard
• Navy/Marine Corps/Air Force
• International/Foreign Military
• Private Industry/Academia
• Other Federal Agencies

**FACTS**

• Located at McAlester Army Ammunition Plant
• 9001:2000 ISO certified organization since 2002
• Operating budget $64.9M
  • OMA (Direct) Funded – $26.3M
  • Reimbursable – $33.4M
• 219 full-time permanent civilian employees
  • 59 QASAS/Ammunition Managers Interns
Organization Structure

U.S. Army Material Command (AMC)

U.S. Army Joint Munitions & Lethality Life Cycle Management Command (JM&L LCMC)

U.S. Army Joint Munitions Command (JMC)

U.S. Army Defense Ammunition Center (DAC)
Defense Ammunition Center
(DAC Knows Ammo)

Training Directorate
• Ammunition Professionals Training
  – 35,000 DoD military/civilian personnel
  • HAZMAT Training
  • QASAS/Ammo Manager training
  • Knowledge management services
  • Distance Learning & Web based Tng
  • Arms Ammo & Explosives web

Technology Directorate
• Joint demil technology solutions
• PM Demil Enterprise Lead for DoD Conventional Ammo/Large Rocket Motor Demil R&D Technology
  • Munitions parts make-up:
    Munitions Items Disposition Action System (MIDAS)

Engineering Directorate
• (Develop, Design, Fabricate)
  • Engineering assistance for:
    • Ammunition Logistics
    • Ammo
    Transportability
  • Packing/Tiedown Drawings & Testing
  • Ammo Peculiar Equip (APE)

Operations Directorate
• HQDA G4 Ammunition Review/Technical Assistance to Army ammo activities
• DA career programs QASAS and Ammo Mgrs
  • Ammunition Logistics publications
    • (Yellow Book)
    • AmmoHelp Hotline
  • Answer Soldier’s/Unit’s questions and issues on ammo related subjects

DAC provides logistical support to the Warfighter through five integrated mission areas

US Army Technical Center for Explosives Safety
• U.S. Army Explosives and Chemical Agent Safety programs
  • Army/Joint Hazard Classifying Authority/System
• Investigate/Assess Army Accidents – Assist Units with investigating Explosive/Ammunition accidents
• Approve Army Explosive site plans – Help resolve issues
Training Directorate

✓ Mission: To provide ammunition-related training and knowledge management services for Department of Defense (DOD) military and civilian personnel.

✓ Core Capabilities:
  ð Ammunition training tailored to meet the needs of the Joint Services
  ð Distance learning training products & job aides
  ð Worldwide Knowledge Management (KM) services
  ð LMP/SAP expert user support

✓ Current Initiatives:
  ð 29,454 military & 6,229 civilian students trained in FY 07
  ð Arms Ammo & Explo (AA&E) portal/OSD Strategic Plan action items
  ð Knowledge harvesting & Ammo Communities of Practice (CoP) on AKO/DKO
  ð Ammo Supply Point (ASP) concept of operations/task matrix
Technology Directorate

✓ Mission: Develop Safe, Efficient, Economical, and Environmentally-Acceptable Demil Solutions

✓ Core Capabilities:
  - DoD Munitions Demilitarization Technology Development and Transition Synchronization
  - MIDAS Demil Operations Support
  - Munitions Demil Environmental and Scientific Services

✓ Current Initiatives:
  - Munitions Demil R&D IPT – Analytical Project Prioritization Process
  - Transitioning Robotic Download of ADAM Mines at McAlester AAP – FY 08
  - Near Infrared (NIR) Spectroscopy Propellant and Explosives Scanners
  - MIDAS Website – Constituent Data, Demil Process Maps, Environmental Reporting
  - Global Demil Symposium and Exhibition – Salt Lake City/Tooele Army Depot, UT – May 2008
Mission: Provide engineering assistance to DOD, HQDA, AMC, and SMCA for ammunition wholesale and retail operations; i.e., receipt, storage, issue, transportation, maintenance, surveillance, demilitarization, and modernization.

Core Capabilities:

- Design of methods and procedures for safe handling, unitization, storage and transportation of ammunition.
- Design and development of equipment to support life-cycle management of ammunition.
- Conduct testing to ensure standardized, safe methods and procedures for movement of ammunition.

Current Initiatives:

- Munitions Power Projection Platform (MP3)
- Joint Modular Intermodal Distribution System (JMIDS)
- Ammunition Peculiar Equipment
  - APE 1996 – Automated Tactical Ammunition System (ATACS)
  - Desert Optimized Equipment (DOE)
  - APE 1411 – Spent Small Arms Ammunition Granulator
- Korean Demilitarization Facility
- Ship Motion Simulator (SMS)
Mission:
- Worldwide Ammunition Review and Technical Assistance Program (AR 700-13) for DA G-4
- Manage two DA career programs providing trained QASAS and Ammunition Managers (1000 worldwide careerists)

Core Capabilities:
- Ammunition Logistics Reviews (20+ on-site per year)
- Ammunition logistics publications and guides (Yellow Book; TB 43-0250; Unit Ammo Guide)
- On-Site technical assistance (19th SCE/6th Ord Bn Korea; Armed Forces of the Philippines; Singapore Armed Forces)
- QASAS mandatory mobility program

Current Initiatives:
- AmmoHelp Hotline (4,000+ questions since FY 02)
- Deployment of QASAS and AMs in support of OIF/OEF
- Annual Digest-Logistics Review trend analysis
- Pocket-size Ammo Do’s and Don’ts cards for deployed forces
Mission:
- Preserve warfighting capabilities and enhance the Force by providing a safe and healthy environment for Soldiers, civilians, families, and contractors through execution and management of the U.S. Army Explosives and Chemical Agent Safety Programs.

Core Capabilities:
- Hazard Classifying Authority
- Explosives Site Plan Approval Authority
- Investigate/Assess Army Accidents
- Technical Assistance

Current Initiatives:
- Establish Theater Presence
- Explosives Safety Assistance Visits
- Field Commander’s Seminar
- Automated Site Planning
US Army Technical Center for Explosives Safety Mission

To preserve warfighting capabilities and enhance the Force by providing a safe and healthy environment for Soldiers, civilians, families, and contractors through execution, and management of the U.S. Army Explosives and Chemical Agent Safety Programs.
Why We Need Explosives Safety

- 17 July 1944, Port Chicago, CA
- 4,606 tons of ammunition
- 4.2M lbs NEW
- 320 persons killed, 202 injured
- Damage to 46 miles
- Two cargo ships, locomotive and 16 boxcars destroyed
- E.A. Bryan, pier and surrounding structures completely destroyed
Doha, Kuwait – July 1991

- Uploaded vehicles closely grouped
- Caused by FAASV heater fire
- Assets lost
  - 4 Abrams tanks
  - 7 M109 Howitzers
  - 7 FAASV’s
  - 4 AVLB
  - 40 smaller vehicles (HMMWVs, CUCVs, etc)
- 50 injuries initially; 3 fatalities during clean-up

Debris Field, Doha, Kuwait British HQ in background
Track Park, Doha Kuwait
Destroyed M109 Howitzers at Doha, Kuwait
Near Mosul - May 2003

- 12 Warehouse complex
  - 11 Stored CEA
  - 1 used as troop billets
- QASAS advised Command to have troops vacate
- Troops did vacate, not happy
- CEA exploded one week later
Kirkuk Munitions Storage Area (MSA) - Jun 2004

- Mortar hit near the MSA
- Caught the high grass on fire
- Went through the area exploding outdoor storage - 200K+NEW
FOB Falcon – Oct 2006

- Fire got into ammo container
- Excess ammo present - Ammo stored for weapon systems not present (155 mm)
- Contractors had billets close to the ATHP - CHUs flattened by blast overpressure
- T-Wall falsely believed to give protection to inhabited areas and on base roads – IBD is required for blast protection
Major Program Components

ESTABLISHED 1988
GOSC
DIRECTOR OF ARMY STAFF APPROVAL

DAESC
DIRECTOR OF ARMY SAFETY - CHAIR MAJOR COMMAND COUNCIL

EDES
ARMY MATERIEL COMMAND DEPUTY CG - MAJOR ISSUES/SPECIAL STUDIES

USATCES
DIRECTOR OF DAC/USATCES - TECHNICAL SUPPORT

UNCLASSIFIED
USATCES Functions

- Policy and Regulatory Development
- Explosives and Chemical Agent Safety Site Plans
- Hazard Classification
- Technical Assistance/Guidance
- Accident Investigation Support
- Explosives Safety Assistance Visits
- Explosives Safety Risk Assessments
- Department of Army Explosives Safety Council Support
- DOD/DA Working Groups
Technical Assistance to the Theater

✓ USATCES Team (2 – Iraq / 1 – Afghanistan) 179 days
✓ Three USATCES personnel deployed Jan/Feb 2008
✓ Assigned to 401st and 402nd AFSB
✓ Established Offices
✓ Networking in Theater
✓ Providing Explosives Safety Technical Assistance
  ➢ Site Plans
  ➢ Licenses
  ➢ Risk Management
“An unplanned explosion or functioning of explosive materiel or devices (except during combat). This includes inadvertent actuation, jettisoning, and releasing or launching of explosive devices. It also includes mishaps that result from off-range impacts of ordnance.” (DODI 6055.7)
FY 07 Army Explosives Mishap Trends

- FY07 Explosives Mishaps
  - Class A – 25
  - Class B – 17
  - Class C – 34
  - Class D – 0
  - Other – 60
  - Total – 136

- Small Arms Most Common Munitions Type
- Human Error Most Common Cause
- Training and Handling Most Common Operations
- Weapons-Handling Incidents in Theater Remain Area of Concern
Soldier Loses Arm In Grenade Accident

- Status of lower leg still in question
- Two additional soldiers seriously hurt
- Soldiers were removing tape from grenades
- FM 3-23.30 – NO TAPING GRENADES

Why do Soldiers Tape Grenades?
- Mitigate Noise
- Don’t Trust Safety Features
- Urban Myths
- Common Practice

UNCLASSIFIED
Soldier Permanently Blinded In Fiery Blast...4 Others Injured

- Combat Engineers dispose of excess C-4, Det Cord, etc. in an open fire
- Soldiers with multiple injuries
  - 1 lost both eyes;
  - 2 w/1 eye damaged
  - Punctured chest wounds
  - Facial, body, and extremity lacerations
  - All w/ruptured ear drums
- 1-2LT, 2-SFC’s, 1-SGT, 1-PFC

What Went Wrong?
- Complacency?
- Avoiding Turn-In Paperwork?
- Didn’t Follow Procedures!
- Not Wearing PPE!!
- Accepted Practice?
M2 Explodes….Again

✓ During a pre-convoy function check, a soldier was injured when the .50 cal round in their M2 machine gun exploded
✓ Likely cause is another Head Space and Timing error
✓ The soldier had been trained on Head Space and Timing

Why was Head Space & Timing Wrong?
• Training was long ago
• Worn or damaged weapon
• Leaders didn’t check soldiers proficiency
HMMWV Destroyed by Fire

- Soldiers escape without serious injury
- Caused by burning propellant bags too close to vehicle
- Only available fire extinguishers found inside burned vehicle

What went wrong?
- Didn’t follow established procedures
- Leadership not engaged
- Lack of preparation
Mishandling of 25mm Cartridge Results in Soldier’s Death

✓ Transferring of linked 25mm from a Bradley to a Gator
✓ Primer strikes pointed or rough object…round functions
✓ Cartridge case fragments rip through unprotected torso

What went wrong?
• Leadership not engaged
• Linked too many belts together (100+ rounds)
• Didn’t follow established procedures

UNCLASSIFIED
Soldier Killed in Bleachers

✓ Negligent discharge of M2 Machine Gun
✓ Live .50 cal round inadvertently introduced into dummy munitions
✓ Accident occurs during dry fire exercise

What went wrong?
• Leadership distracted
• Basic Training Soldiers recovered live round from earlier exercise
• Soldiers did not recognize live vs. dummy round
• Didn’t follow established procedures… Linking not allowed by Soldiers
Cardinal Principle

- Exposing the **MINIMUM** amount of personnel
- To the **MINIMUM** amount of explosives
- For the **MINIMUM** amount of time
DAC-USATCES Website

- DA/DDESB Policies
- Deployment Information
- Training/Course Information
- Explosives Safety Toolbox
- Explosives Safety Bulletins
- AmmoHelp
Explosives Safety Toolbox

✓ Web based on AKO
✓ Anyone with a .mil address can access
✓ 131 different files currently available
  ➢ Messages
  ➢ Checklists
  ➢ Publications
  ➢ Forms
  ➢ Templates
Explosives Safety Bulletin

- Published Quarterly
- Special Editions dedicated to specific areas
- Electronically distributed to approximately 6000 individuals
- Available online at our website
Explosives Safety Tools & Resources

✓ AMMOHELP – Response within 24 hours

- Centralized source ammunition technical information
- Web based (automated form) – www3.dac.army.mil
- Email – MCAL.DAC.AMMO.HELP@conus.army.mil
- Toll-free hotline – 1-877-668-2840
Defense Ammunition Center

Need Ammo or Explosives Safety Help: call on DAC because:

“DAC KNOWS AMMO”

WEB Site: https://www3.dac.army.mil/ammohelp
EMAIL: MCAL.DAC.AMMO.HELP@conus.army.mil
COMM PHONE: 1-877-688-2840

Questions?
ARDEC’s Role In Countering the IED Threat

Mr. Ray Carr,
ARDEC Counter Terrorism Technology Team
• Mission, Approach, Introduction
• Some Specific Areas of Influence
  – Explosive Detection
  – Armor
  – EOD tools
  – Training
MISSION: Act as the ARDEC Program Manager to:

- RAPIDLY DEVELOP AND FIELD appropriate technologies to assist the warfighter in countering the Asymmetric threat.
- Develop strategy that leads to C-IED & C-Sniper system acquisitions, TRANSITIONS TO PMS, and create Programs of Record.
- To every extent possible, DEVELOP DUAL USE TECHNOLOGIES

RESOURCES:

- $10M investment over the past 4 years
- $35M annually customer funded C-IED efforts.
- Over 80 engineers and scientists currently work on 20 C-IED and Counter Sniper projects, partnered with academia and industry.
Strategic

Tactical

Funding, Recruiting, Training, Planning

Leadership, Planning, Training

Supplies

Engineering, Manufacture

Predict/Prevent Detect

Neutralize Mitigate

Monitor, Detonate

Greatest effect is realized by disrupting early life cycle activities
**Battle Rhythm...**

- **Monday** – RDECOM Counter IED Task Force
- **Tuesday**
  - CG AMC Operations Brief (AFSB Updates)
  - JIEDDO Line of Operation
  - STAT Team Bi-Weekly Teleconference
- **Wednesday**
  - RDECOM Current Operations IPT
- **Thursday**
  - ARDEC GWOT Project Review
- **Friday**
  - NSA Counter IED IPT
  - MNF-I Tech Solutions

**MNC-I STACA**

**CJTF-82 STACA**

**AMC- STAT 18**

**TF-TROY & TF-PALADIN**

**402 AFSB**

**PEO-AMMO, PM IEDD/PF**

**JIEDDO, REF**

**TRADOC**

Visit units prior to deployment:
29 Palms, NTC & JMTC
“Dusty Boots Council”
Defeat the Device
- EOD Tools
- Directed Energy Systems
- Armor
- Buried IED Detection
- Base Defense

Attack the Network
- Surveillance Sensors
- Cache Detection
- Explosive Detection
- TTL

Train the Force
- Pyrotechnic Training Devices
- Virtual Training
- Surrogates & Simulators
Example ARDEC Laboratories For C-IED System Experimentation

- Rapid Prototyping Facility
- Explosives Detection Laboratory
- Davidson Advanced Warhead Development Facility
- Acoustics Technology Laboratory
- Fuze, S&A, Telemetry
- Armament Software Engineering Center
ARDEC Capabilities for Explosives Detection

- Newly completed explosive test bed facility for trace or bulk detection
  - Conductive floors, explosion proof electrical
  - Clean room, laboratory
- Access to military, foreign, commercial and improvised explosives
- High capacity storage bunkers
- Analytical lab for manufacture and identification of explosives
- Qualified personnel with many years of explosives experience
  - Trace & bulk detection
  - Foreign sample analysis
  - Formulations, manufacturing
  - Testing & analysis, handling and storage
- EOD/Foreign material exploitation experience
- K9 Proficiency program
Recent Efforts with Handheld Explosive Detection

Evaluate & Validate

- System performance
- Sensitivity / Selectivity
- Analysis time
- Ease of use
- Covertness
- Real-time analysis
- Maximum Throughput
- Minimize peripherals
  - e.g. PDA size display
- Durability & High Temp operation
- Key background materials
  - Clothing, Building, Vehicle
- Standoff potential
Explosive Detection System Architecture

Hardware / Software
Bldg 92, 31, 95

Excitation Source
Bldg 95, 407, 329
- Laser
- Acoustic
- Mechanical

Interrogation
Target
Bldg 3028, 3029, 1029
- Military
- Commercial
- HME

Collector
Bldg 95, 407

Signal Processor
Bldg 407

Detector / Spectrometer
Bldg 3022
- Optical
- Vibrometer
Objectives:

Develop Armor Recipes

Defeat multiple threats

Qualify a Lightweight Armor Solution (2 Designs) at ATC

Using IMG as Baseline Vehicle for Integration

Partnerships with ARL and Industry
Robot Improvements for EOD and Engineers

- Enhance IED detection through TALON control, video and power upgrades

- Enhance IED Neutralization by extending TALON life and control
- Access and Disrupt VBIED’s
- Designed for ease of use in field
- Use fielded ammunition items
Training Applications

• Training
  • Situational training
    • Adaptive Thinking and Leadership
    • Future Soldier Trainer
    • Installation Force Protection
    • IED Virtual Trainer
  • Robot and equipment trainers
    • NBC Dismounted Equipment Trainer
    • EOD TALON Trainer
    • SWORDS Trainer
    • PackBot Trainer: EOD and CBRN
  • Shoulder launched weapons
    • Javelin Basic Skills Trainer
AMERICA’S ARMY
EOD ROBOT TRAINER

- Provide a realistic training environment to enable soldiers to fine tune their operating skills without the use of an actual robot.
- Provide virtual operation of the PACBOT MTRS and TALON MTRS robot platforms.
- Able to add additional robot platforms as needed by the EOD community.
- Virtual Joystick must utilize the same type controls as the actual robot.
IED Virtual Trainer

- Scenario Training & replay recent events
- Equipment Training (e.g. TALON)
- Reinforce TTPs
- Installation Security, Emergency Response, Threat Recognition
- Interact as spectator or active participant
SUMMARY

- ARDEC Has a Diverse Talent Pool and facility infrastructure that can rapidly concept and prototype solutions to mitigate an ever changing threat.

- ARDEC Civilians & Military provide invaluable in-theater New Equipment Training (NET), System Technical Support, Staff AMC FAST.

*****Focused on our Ultimate Customer - the Warfighter*****
Questions?

Raymond E. Carr
raymond.e.carr@us.army.mil
(973) 724-5010
The Evolution of Artillery for Increased Effectiveness

June 10-11, 2008
Evolution of Artillery for Increased Effectiveness

Presented at:
Armaments Technology Firepower Forum

Contributors:
Fred Scerbo (L-3), Steve Floroff (ARDEC), Adam Scanlan (ARDEC)

Presented by:
Dominick DeMella
Chief NLOS Cannon Artillery Division
ARDEC, Picatinny Arsenal

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Mission

• To destroy, neutralize or suppress the enemy by cannon, rocket or missile fire ensuring the integration of all supporting fires in a combined arms operation

• Most lethal form of land based armament often referred to as:
  – “King of Battle”
  – “God of War”
  – “Ultima Ratio Regum”
    • “The Final Argument of Kings”
  – “God Fights on The Side With the Best Artillery”
  – “I do not need to tell you who won the war, you know, Artillery did.”
Goal

To provide an overview of historical highlights in the Development / Evolution of artillery and provide a snapshot of future trends

M777A1
Late 19th Century

1897 French 75 Fielded

- Hydraulic Recoil System
- Effective Breech loading (Nordenfeld Breech)
- Modern Sight
- Self contained firing mechanism
- Fixed Shell + Cartridge Ammunition
Evolution of Propelling Charges

- **Black Powder**
  - Low Power
  - Smoked
- **Gun Cotton (Nitrocellulose)**
  - More Powerful than Black Powder
  - Smokeless
  - Unstable
  - Burns Hot
- **Double Based Powders**
  - Nitrocellulose + Nitroglycerin
  - More Powerful than Gun Cotton
  - Smokeless
  - More stable than Gun Cotton
- **Triple Based Powders**
  - Nitrocellulose
  - Nitroglycerin
  - Nitroguanodine

M200 Propelling Charge

M67 Propelling Charge
• 155mm Artillery Upgrades - Infrequent

Towed
- M1-series cannon
- M199 cannon
- M776 cannon

Self-propelled
- M44 cannon
- M126-series cannon
- M185 cannon
- M284 cannon
- NLOS-C cannon

Propelling Charges
- M3-series
- M4-series
- M119-series
- M203-series
- M231 (MACS)
- M232 (MACS)

- M14 / A1 / A2
- M198
- M777
- M109A1
- M109A2 / A3
- M109A4
- M109A5
- M109A6
- M203
- M119A2
- M203A1
- M231
- M232

- M3
- M3A1
- M4 / M4A1
- M4A2
- M119
- M119-A1
- M203
- M203A1

- M549
  HE-RAP (24km)
- M549A1
  HE-RAP (30km)

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Late 19th Century

A Shift from smaller lighter mobile pieces that stayed with infantry to Larger Guns for Indirect Fire

French Cyclone

German Artillery

Paris Gun
World War I

- Predicted Fire Methods Developed
- Over 60% of Combat Casualties attributed to Artillery
- Expenditure of 1 billion rounds fired by all sides
  - Battle of Verdun 1916
    - 1,000 guns
    - 16 million rounds fired over 6 months
      - 200 million rounds produced for French 75
- French 75
  - Range: 6.9 km
  - 12 lb or 16 lb shrapnel round w/290 lead balls
- Smoke round first deployed
- Long Range Harassment Guns developed
  - Paris Gun
    - 75 mile range
Battle of Verdun
Self Propelled Guns come into widespread use

- Mark 1 Gun Carrier
- 105mm M7 “Priest”
- British Sexton
- 105mm German Wespe
- Soviet Katyusha
  - Self propelled Multiple launch rocket system
- US MLRS and 155mm Paladin

Dec 1944 US Artillery XMAS Present

- First Radar Proximity Fuze
  - Increased Effectiveness against personnel targets
**ENIAC**

- **Electronic Numerical Integrator And Computer**
- Computer developed for Artillery Firing Tables
- Trajectory tables to predict Projectile Flight
- 3D second order differential equations of motion performed manually
Artillery Developments

- Increased Mobility
- Longer Ranges
- Increased Firing Rates
- Increased Precision
- Increased Lethality
- Modern Battery: 6 Guns
  - 43 kg (~95 lbs) projectile @ 4 rounds per minute for 4 minutes yields……….
  - Over 1 metric ton of ordnance delivered per minute
- Desert Storm Massed Artillery Fires
  - 11 Artillery Battalions
  - Devastating Effects
  - Broke Enemy’s “will to fight”
Artillery Ammunition

- **Cannon Ball**
  - Kinetic energy
    - Breach fortifications
    - Slice through Men & Horses

- **Grape Shot**
  - Smaller balls separating at Muzzle

- **Chain Shot**
  - Cannon balls joined by chain

- **1803 British General Henry Shrapnel**
  - Balls blown from shell by burster charge

- **Mid 1800’s**
  - Cylindrical-Conical projectile replaces cannon ball
  - Copper driving bands engage rifling in guns for spin stabilization and thus longer range
• 1950’s
  – BRL (Now ARL)
  – Scientific & Systematic approach to analysis of wound ballistics
  – Fragment Mass striking velocity
  – Random Fragmentation munitions
    • 155mm M107
    • Large fragments reduced velocity, limited area of coverage
  – Controlled fragmentation material improvements
    • High-Fragmenting Steel
      – Smaller high velocity fragments, increased total number of fragments, larger lethal area

• Typical HE
  – Overkill on immediate area of detonation lacking large area coverage
  – Sub-missiling Principle
    • Increased lethality through spreading of munitions
ICM (Improved Conventional Munitions)
First Generation ICM’s combined sub-missiling with controlled fragmentation and ground burst
  – 105mm M413  18 Ground burst
  – 105mm M444  18 Airburst
  – 155mm M449  60 Airburst
  – 8 inch   M404  104 Airburst
### Artillery Effectiveness

<table>
<thead>
<tr>
<th>155mm</th>
<th>Cargo</th>
<th>% Casualty</th>
</tr>
</thead>
<tbody>
<tr>
<td>M107</td>
<td>TNT</td>
<td>4.9</td>
</tr>
<tr>
<td>M107</td>
<td>Comp B</td>
<td>7.9</td>
</tr>
<tr>
<td>M449</td>
<td>60 sub-munitions</td>
<td>31.9</td>
</tr>
</tbody>
</table>

- Advanced ICM Artillery or DPICM
  - 155mm M483A1       88 dual purpose sub-missiles
  - 8 inch M509       195 dual purpose sub-missiles
  - 155mm M864 base bleed 72 dual purpose sub-missiles

**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**
## Combat Comparative Effectiveness (Vietnam)

<table>
<thead>
<tr>
<th></th>
<th>Conventional</th>
<th>ICM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>105mm</td>
<td>155mm</td>
</tr>
<tr>
<td>Rds Expended</td>
<td>7,079</td>
<td>3,465</td>
</tr>
<tr>
<td>Rds / kill</td>
<td>31.6</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>Total Rounds</td>
<td>Three Tanks</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>ICM 155mm, M483</td>
<td>145</td>
<td>47</td>
</tr>
<tr>
<td>M107: 155mm</td>
<td>432</td>
<td>2</td>
</tr>
</tbody>
</table>
## Delivery Accuracy As a Function of Range

<table>
<thead>
<tr>
<th>Projectile</th>
<th>Range (km)</th>
<th>CEP (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M795</td>
<td>20</td>
<td>119</td>
</tr>
<tr>
<td>M864</td>
<td>20</td>
<td>96</td>
</tr>
<tr>
<td>M864 (BB)</td>
<td>28</td>
<td>186</td>
</tr>
<tr>
<td>M549 (RAP)</td>
<td>30</td>
<td>267</td>
</tr>
</tbody>
</table>

- Delivery Error increases with Range
- Solutions to overcome delivery error
  - Smart or Precision Projectiles
Copperhead

First Cannon launched Precision round developed by U.S. Army

- 16 km Range
- Ground Laser locator designator
SADARM

• Initially developed for 8 inch Gun
  – Shifted to 155mm in 1980’s
  – Sense And Destroy ARMor submunition

• Combat Proven 2003 Invasion of Iraq
  – 108 Rounds Fired
  – 48 vehicle kills

• Employs:
  – Infrared telescope
  – Millimeter wave Radar
• A Joint United States / Kingdom of Sweden Program
• Fin stabilized, gliding airframe uses GPS & Inertial Navigation System Guidance

• Accuracy of Less Than 10M CEP
• Minimizes Collateral Damage
• Employment Flexibility – Danger Close Fire Missions
• High Impact Angle
  - Ideal For Urban Terrain
  - Optimal Effects
• Increased Effects With Fewer Rounds
• Status
  - Initial Capability Fielded in 2007

Makes Cannon Artillery Relevant in today’s Urban Conflicts!
The Next Generation of Artillery

- Precision Guidance Kit (PGK)
- Infrared Illumination Round (XM1064/6)
- Very Affordable Precision Projectile (VAPP)
  - Common Smart Submunition (CSS)
- Proximity Initiated Submunition (PRAXIS)
- Extended Range Artillery (ERA XM1113)
  - Hybrid Propellant (XM350)
  - Selectable Technology for Adaptive Response (STAR)
- Electromagnetic Gun System
PGK (XM1156)

- Fits in standard 155mm High Explosive artillery projectile fuze wells (deep intrusion)
- GPS guidance (incorporates SAASM)
- 20 Year Storage Life (no battery)
- Proximity & Point Detonating Fuzing

2007 Tech Demo Firing
PGK Delivery Accuracy

CEP Comparison - Guided vs. Unguided
M109A6 – Paladin – 27km
155mm (HE) M549A1 with 1 mil Aiming Error at Low Angle
IR Illumination provides the user with battlefield illumination in the infrared wavelength.

Allows user to witness movements of enemy in a dark battlefield.
**Description**

- Design and demonstration of 105mm precision artillery to focus on affordability and performance

**Performance Highlights**

- GPS guidance augmented by Magnetometer
- $10,000 AUPP objective
- Range objective 24 km
- \( \leq 10 \text{m CEP} \)
- Greater lethality than legacy 105mm
Common Smart Submunition (CSS)

Payoff

• Enables single round-multiple kill capability.
• Multi-platform applicability across projectiles/missiles/mortars/UAVs.
• On board target discrimination capability.
• Reduced logistics footprint.
• Clean Battlefield

Mission Objectives

• Develop and demonstrate the next generation target discriminating submunition (school bus vs. tank)

Improvements to meet ICM current requirements

• Near Surface bursting
• Warhead optimization for Anti-personnel capability
• Weapon integration – carrier for CSS

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
PRoXimity Initiated Submunition

- Extreme Reliability Tri-Mode Proximity Fuze (0.99999)
  - Proximity 0.97
  - Impact 0.98
  - Time 0.98
- Goal-99 Proximity/Impact/Time reliabilities at 0.99 provides **1 in a million UXO**
- Pre-Formed Fragmentation (PFF) Dual Sized Tungsten Ball Matrix for anti-personnel and light materiel effects
- Fragmenting Steel Casing for Anti-Materiel Effects
- IM Explosive

Reutilize M483A1 Metal Parts

PGK Compatible

Patent Pending

5 Full Bore Submunitions

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
- Reach NLOS-C ORD requirement of 30 km (Threshold)
- Exceeds 40 km range in current 39 Cal systems
- Low cost solution based on proven technologies
XM350 Hybrid Propellant

- Goal: To replace M67 and M200 with a single propelling charge
- Consists of 6 Semi-fixed bag increments marked 1-6
- Combined the 6 bags create 1 zoned charge
Scalable Technology for Adaptive Response (STAR)

- Description: Develop enhanced capabilities for Artillery
  - Scaleable Output/Controlled Lethal Effects
  - Hardened for structures
  - Lower fire mission costs
  - Broader target set using adaptive response
  - Reduced collateral damage

- Warheads for:
  - 155mm: M483A1 & M795
  - 105mm: M913

- When Available: 3rd QTR FY11
- Metrics: Adaptive lethality (increase X% vs. materiel targets) and reduce collateral damage by 25% (min)
Technical Approach for STAR

Weapons Technology Thrusts

- Scaleable/Adaptive Lethality
- Fuze/Power
- Energy Management

Develop and integrate new technologies
- Novel Energetics (Explosives & Propulsion)
- Combined Effects & Scaleable Effects Explosives
- Enhanced Fragmentation
- Advanced Fuzing
- Precision Guidance Kits

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Objective:
• To evaluate and demonstrate ElectroMagnetic (EM) launch technology as related to the missions of an advanced mortar weapon for the Future Combat Systems (FCS).

Goals:
• Design and demonstrate EM guns (coilgun and railgun) capable of firing modified 120 mm mortar rounds at velocities up to 420 m/s.
• NLOS – Non Line of Site
• MLRS – Multiple Launch Rocket System
• HE – High Explosive
• ICM – Improved Conventional Munition
• TNT – Tri-Nitro Toluene
• DPICM – Dual Purpose Improved Conventional Munition
• CEP – Circular Error Probability
• BB – Base Bleed
• RAP – Rocket Assist Projectile
• HOB – Height of Burst
• SAASM – Selective Availability Anti-Spoofing Module
• CFD – Computational Fluid Dynamics
• UXO – Unexploded Ordnance
Dominick DeMella
Phone:  (973) 724 – 4422
E-mail: Dominick.demella@us.army.mil
Artillery and Missile Applications

PRAXIS
- G-MLRS (65)
- M915 (3)
- 155mm (5)

4.0
3.16
4.25
5.04

CSS
- LADAR/IR Sensor Suite
- Tantalum Combined Effects Warhead
- G-MLRS (12)
- 155MM (2)
- 105MM (2 Resized)

After Deploying Samara Wing

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Air Armament Center

Deliver War-Winning Technology, Acquisition, Test, Sustainment…
Expeditionary Capabilities to the Warfighter

Precision Strike:
Enabler for Force Domination

Dave Eidsaune, Maj Gen, USAF
Program Executive Officer for Weapons
Commander, Air Armament Center

10 June 2008

Integrity - Service - Excellence
Air Force Acquisition Leadership

Mr Michael Wynne
Secretary of the Air Force

Ms Sue Payton
Asst Sec for Acquisition

Maj Gen Eidsaune
PEO Weapons

Lt Gen Hudson
PEO Aircraft

Lt Gen Bowlds
PEO Electronics

Maj Gen Riemer
PEO F-22

Brig Gen Davis
PEO F-35
AF Materiel Command Leadership

Gen T. Michael Moseley
Air Force Chief of Staff

Gen Carlson
AFMC/CC

Maj Gen Eidsaune
AAC/CC

Lt Gen Hudson
ASC/CC

Lt Gen Bowlds
ESC/CC

Maj Gen Close
OO-ALC/CC

Maj Gen Reno
OC-ALC/CC

Maj Gen Owen
WR-ALC/CC
Eglin Land Ranges

463,448 Acres
724 Square Miles
Eglin Water Ranges

123,000 Sq Miles of Water Range Available

134,000 Sq Miles Total Airspace Available

Eglin AFB

200 Miles

400 Miles
Eglin AFB – Full Spectrum Operations

Transition Technology to Weapon Systems and Provide War Winning Capabilities On Time, On Cost

Research
Development/Acquisition
Developmental Test
Operational Test
Combat Operations

Arming the Warriors
Air Armament – Revolutionary Change

AIM-9
AGM-65
M-117
MK-82
MK-83
MK-84
AGM-84
AGM-88 HARM
AGM-88 WCMD
AGM-130
AGM-114 Hellfire
AIM-9X
AGM 88 SLAM
SLAM-ER
CBU-103 WCMD
CBU-105 WCMD
CBU-107 WCMD
SDB
GBU-38
GBU-24
GBU-27
GBU-31
GBU-32
GBU-35
GBU-37
JASSM
JASSM (ER)
Active Denial System 2

Prior 70s 80s 90s 00s Future
**Mission:** Deliver war-winning technology, acquisition, test, sustainment...expeditionary capabilities to the warfighter

**Vision:** War Winning Capabilities... On Time, On Cost
Advanced Medium Range Air-to-Air Missile (AMRAAM)

- Joint AF/USN program; 33 international customers
- Radar guided, launch and leave, beyond visual range, all weather missile
- Army/USMC international & surface-launched programs
- Entered inventory in 1989
- Over 14,000 delivered
- Combat proven in Bosnia, & Kosovo, and Iraq (9 kills)
Joint Dual Role Air Dominance Missile (JDRADM)

- Single missile for USAF/USN Air-to-Air and Air-to-Ground missions – potential follow-on to AMRAAM and HARM
- Defeat evolving air and ground threats
- Increased standoff, load-out flexibility
- Enhanced lethality, propulsion, agility
- Integrate on F-22, F-35, legacy aircraft
- Notional Schedule:
  - Risk Reduction – FY08-09
  - Concept Refinement – FY10-11
  - Tech Development – FY12-13
Miniature Air Launched Decoy (MALD)  
MALD Jammer (MALD-J)

- Low-cost, Air-launched, Expendable Decoy - Can Represent Fighter/Attack/Bomber
- Increase Enemy’s "Fog Of War“-Global Strike CONOPS Enabler
  - Profiled in the Airborne Electronic Attack (AEA) Systems of Systems Approach
  - Degrades Awareness, Highlights Location, and Depletes IADS Resources
  - Increases Survivability of “Kick Down the Door” Force
- Threshold aircraft F-16 & B-52
- Currently in DT with RAA projected for FY 09
- MALD-J Will Add a Stand-in Jamming Capability
Joint Air-to-Surface Standoff Missile (JASSM)

- Autonomous precision strike cruise missile
- Fixed and re-locatable targets
- Insensitive munition compliant 1000 -lb class warhead
- Guidance: Inertial Navigation / GPS
- Operational on: F-16C/D, B-1B, B-2A, B-52H
- Entered inventory in 2003
- Over 600 delivered
- Nunn-McCurdy Certification – May 08
JASSM 16 Shots
Sensor Fuzed Weapon (SFW)

- Anti-armor wide area coverage weapon
- Moving and stationary enemy armor (main battle tanks and support vehicles)
- Multiple kills per pass
- Operational on:
  - F-16C/D, F-15E, A-10, B-52, B-1B, B-2
- Entered inventory in 1996
- Over 4,000 delivered
- Combat Proven in OIF
- Production ongoing
Joint Direct Attack Munition (JDAM)

- Global Positioning System (GPS) aided Inertial Navigation System (INS) tail kit
- Mk 80 series / BLU-109 warhead compatibility
- Accurate <5 meters, in-flight retargeting
- Autonomous and adverse weather
- Entered inventory in 1998
- Over 179,000 delivered
- Over 19,000 used in combat (OAF, OEF, & OIF)

Warfighter’s Air-to-Ground Weapon of Choice
Laser JDAM

- Response to Urgent Operational Need
- Adds Field-Installable Precision Laser Guidance Kit to GBU-38 JDAM
- Extends JDAM Capability to include Moving Targets up to 70 mph
- Production: 400 Air Force, 200 Navy
- Accuracy: 6m at 70 mph
- Mk-82, BLU-111, BLU-126 Compatibility
- F-15E, F-16, F/A-18
- Initial Kits Are in the AOR
Small Diameter Bomb (SDB)

- All-weather, autonomous, precision strike, 250 lb class GPS/INS weapon
- Reduced collateral damage
- Flexible attacks with standoff ranges
  - SDB derives its own non-ballistic flight path (0.4M glide) based on release range, altitude, speed, climb, and winds
- Increased loadout--multiple strikes per sortie
- Cockpit-selectable electronic fuze
- Operational on F-15E, 700 delivered
  - F-15E radar or Sniper pod can self generate accurate coords or receive data-linked transfer of coords and imagery
- Combat proven in OEF/OIF
SDB Flight Characteristics
F-15E/SDB Systems Integration

- Up to 28 SDBs planned per F-15E, or mix of LGB, JDAM, and SDB – current loadout of 20 per aircraft
Small Diameter Bomb
Small Diameter Bomb Focused Lethality Munition (SDB FLM)

- FY06 Out-of-Cycle JCTD
- CENTAF urgent need
- Low collateral damage variant of SDB
- Precisely delivers lethal, short range blast
- Completed JCTD testing – Dec 07
- 50 residual assets delivered to AOR – Mar 08

New Technology
- Composite Case Warhead
- Multi-Phase Blast Explosive
- Blast Only
System Description
• **Capable against moving targets**
• **Compact, all weather, standoff weapon**
• **INS/GPS guided, precision weapon**
• **Tri-mode seeker (IR, radar, laser)**

Acquisition Activities
• Currently in risk reduction
• Two competing contractors
• Milestone B - FY10
Hard Target Void Sensing Fuze

- System to be employed against new and emerging hard and deeply buried targets
- Detects multiple voids
- Survives and operates after penetrating 5K-15K PSI concrete target
- Programmable from cockpit
- Competitive Prototype JCTD FY08-10
Universal Armament Interface (UAI)

Program Objective: Decouple weapon integration schedules from aircraft OFP update cycle
Future Weapon Capability Themes

- Low Collateral Damage
- Moving Targets
- Non-Lethal/Non-Destructive
- Hard/Deeply Buried Targets
- Flexibility
  - Targeting on the Net
  - “Dial-a-Yield”
- Supersonic/Hypersonic
- Extended Ranges
- Perpetual/Persistent
- Directed Energy

Small, Low Collateral Damage, Flexible Yield Weapons
Directed Energy Opportunities

- Supporting SOCOM Advanced Tactical Laser (ATL) Demo
- Planning ATL Extended User Evaluation
- Transitioning Active Denial Systems from ESC
- Conceptual Counter Electronics Munition
Advanced Tactical Laser (ATL)

- Ultra-precise target engagement
- 100KW-class high-energy laser
- Integrated in C-130 airframe
- Speed of light weapon
- Deep magazine
- Scalable effects
- Reduced collateral damage
- ACTD ends 4TH qtr FY08
- Extended User Evaluation continues thru FY10
- Developing CONOPS for solid state laser
Active Denial System (ADS)

- Warfighter Urgent Need
- Counter-personnel, non-lethal DE weapon
  - Deters advancing adversary--perimeter protection
- Induces intolerable sense of heat
- Uses antenna to direct focused, invisible beam
  - Heat sensation ends when beam removed—no permanent injury
- Gov’t acceptance – Jun 08
- Possible deployment in Jul 08
- Planning for program of record in FY10
High Power Microwave - Counter Electronics

• Overview
  – Packaged in inventory munitions mold line
  – Weapon services multiple targets
  – Established effectiveness in realistic scenarios
  – Selective target engagement

• Strategy
  – Industry Technology Assessment, FY08
  – JCTD submission, FY09
  – FY10 POM Submission
Industry’s Role – How Can You Help?

- Robust Systems Engineering
- Vendor and Supplier Management
- Reliable, Quality Products
- Cost and Schedule Realism

Thank You For Your Efforts and Dedication to Excellence
To the Air Armament Center Commander.
War-winning Capabilities ...

... On Time, On Cost
BACK-UPS
Accomplishments

**MALD/MALD-J**
- MALD completed DT - Feb 08
- MALD production award - June 08
- MALD-J risk reduction contract award - Mar 08

**Laser JDAM – JUON**
- OUE completed/Fielding authorized
- First units delivered to AOR - Apr 08 (2 months early)

**JASSM**
- Successful reliability tests - Feb 08
- Nunn-McCurdy Certification - May 08

**SDB FLM – UON**
- Completed JCTD testing – Dec 07
- 50 residuals to AOR - Mar 08 (2 months early)

**FUZES**
- HTVSF JCTD: 2 competitive contracts
- Second JPF production line now operational

**AMRAAM**
- AIM-120C-7 fielding – Dec 07

**P5 Combat Training System**
- Declared operational at 5 USAF & 1 Navy Site
Universal Armament Interface (UAI)

- UAI Implementation on Aircraft and Weapons is Underway
- Initiative to Provide Standardized Software Interfaces in Platforms, Weapons, and Mission Planning
- Decouple Weapon Integration Schedules from Aircraft Platform Block Upgrade Cycle
- Industry Consortium Developed New Interface Standard
  - Baselined Dec 05; Rev 01 May 06; Rev 02 in work
  - Managed at Aeronautical Systems Center:
    - Ms Nadine Thomas, (937) 255-7089 or DSN 785-7089
  - F-15E, JASSM, & JDAM UAI – Ready for the Unexpected in FY09

First Fielded Capability Without Aircraft OFP Change: SDB II on F-15E in FY14
Network Enabled Weapons

• Government and Industry Team developed Interface/Message Standard
  – Expect CY08 start for Link-16 NATO coordination
  – Already released to Australia and United Kingdom

• Aggressively tackling operational challenges
  – Common key handling procedures for munitions
  – Common Joint Mission Planning Components
  – Network Designs
  – Changes to ATO, MTO, OPTASK LINK

• CONOPS and CONEMP JROC items of interest

First Fieldings Expected ~ 2010: JSOW, HARPOON
• Counter Superior Fielded Threat (16 Years)
• Extremely Maneuverable, High Off-Boresight
• Beyond and Within-Visual-Range Combat

• Increased Pk
• Interoperable
• Full Day/Night Capability
• Enhanced IRCCM Capability
• High Off-Boresight Acquisition and Launch
• Improved Acquisition in Blue Sky / Clutter
• Improved Maximum and Minimum Range
• Operational deliveries to date – 816 to USAF, 560 to USN
• Operational on F-15C/D, F-16C/D, F/A-18
SDB Takeaways

• Evolutionary leap in combat capability
  – Precision, increased standoff, and reduced collateral damage

• Challenges to overcome
  – Long and unpredictable TOF
  – Deconfliction considerations
  – Battle damage assessment

IOC Declared – 3 Oct 06
1st Combat Drop – 11 Nov 06
Small Diameter Bomb (SDB I)

- 250-lb class GPS/INS weapon providing very accurate CEP
- All-WX, autonomous, reduced collateral damage
- Flexible attacks with significant standoff range
- SDB derives its own non-ballistic flight path (0.4M glide)
  - Depends on release range, altitude, speed, climb, and winds
Small Diameter Bomb II (SDB II)

• System Description
  – Capable against moving targets
  – Compact, all weather, standoff weapon
  – INS/GPS guided, precision weapon
  – Tri-mode seeker (IR, radar, laser)

• Acquisition Activities
  – Currently in risk reduction
  – Two competing contractors
  – Milestone B - FY10
Helmetless High Off-Boresight (HHOBS) (USAF WRAP)

Lock-on After Launch Phase 1

Improved IRCM Performance

Improved Acquisition Performance

Improved Lethality Performance

ORD Requirement

USAF Warfighter Rapid Acquisition Program (WRAP)

Risk Reduction for Block II
C4I and C2 Systems Testing
Internetting the Warfighter

- Deliberate/Crisis Action Planning Execution Segment (DCAPES)
- Integrated Broadcast Service (IBS)
- Global Combat Support System – Air Force (GCSS-AF)

- Air Operations Center (AOC)
- Theater Battle Management Core System (TBMCS)
- Time Critical Targeting
- Control/Reporting Center (CRC) Upgrades
- Regional/Sector AOC (R/SAOC)
Tactical Comm and Datalinks
Test Center of Expertise

- JTIDS
- FDL
- JTRS
- B1 IDL
Wind Corrected Munitions Dispenser (WCMD)

- Tail kit for guiding dispenser weapons
- INS corrects for winds, launch transients and ballistic errors
- Accuracy: 100’ req’d; ~50’ demo’d
- Fielded on B-1, B-52, F-15, F-16
- Future fielding on A-10, F-35
- Combat proven: 1,650 used in OEF/OIF
- Full Rate Production completed Oct 06
  - 27,596 tail kits built
  - AUPP (BY94): $25K req, $13.5K actual
- WCMD-Extended Range SDD cancelled on 9 Aug 06
“The Heart and Soul of the Air Force is Range and Payload”

Gen T. Michael Moseley
Chief of Staff
**Evolution of Precision**

**1943**
- **WWII**
  - 1500 B-17 sorties
  - 9000 bombs (250#)
  - 3300 ft CEP
  - One 60’ x 100’ target

**1970**
- **Vietnam**
  - 30 F-4 sorties
  - 176 bombs (500#)
  - 400 ft CEP
  - One target

**1991**
- **Desert Storm**
  - 1 F-117 sortie
  - 2 bombs (2000#)
  - 10 ft CEP
  - 2 targets per sortie

**2004**
- **OAF/OEF/OIF**
  - 1 B-2 sortie
  - 16 bombs (2000#)
  - 7 ft CEP
  - 16 Targets per Pass
Air Dominance

AMRAAM

AIM 9X

HTS

MALD / MALD-J
Long Range & Area Attack

JASSM

WCMD

SFW

49
Direct Attack & Miniature Munitions

- JPF
- JDAM
- SDB I
- SDB II
Attack Modes

Normal Attack Modes

KPP / KSA (T) Scenario

Coordinate Attack

Semi-Active Laser Modes
PEO - Weapons RADAR Scope

- GWOT Urgent Needs
- JASSM Follow Through
- Continued Success
  - JDAM, AMRAAM, SDB
- New Opportunities
  - CRIIS, QF-16, MALD-J, HTVSF
- Program Challenges
  - MALD, AIM-120D
- Future - Directed Energy
GWOT Successes

Over 30,800 Total Combat Drops OEF/OIF
(JDAM, DSU-33, JPF, SDB, SFW, WCMD)

- JDAM
  - FY08: Delivered 11,734 Units – 1,925 Combat Drops
  - Proven Ability to End Combat Engagements

- JPF
  - FY08: Delivered 4,914 Fuzes – 1,412 Combat Drops
  - Operational Reliability 98% (95% requirement)

- SDB
  - 49 Total Combat Drops
  - ~40,000 Captive Flight Hours on F-15E

Government / Industry Team Delivering Capability to the Warfighter
• Target/Kill Enemy Radar
• Supports Suppression Of Enemy Air Defenses (SEAD) Wild Weasel Mission Area with HARM
• New R7 Pod Allows PGM Targeting  
  -Brings JSOW, JDAM, JASSM, & SDB to SEAD mission
• Operational on F-16CJ
• Entered inventory in 1994  
  –Over 200 delivered
• Combat proven in Operation Deliberate Force (Bosnia), Operation Southern/Northern Watch, Operation Enduring Freedom, and Operation Iraqi Freedom
Networked Weapons

Joint Air Operations Center (JAOC)

Global Hawk / Sensorcraft

Bombers/Strike Fighters/UAVs Deploy ADM Constellation

Reach Back

MC2A (Airborne AOC)

Autonomous In-Flight Refueling

Gateway/Refueling Vehicle

Air Support Operations Center (ASOC)

Microprobe Sensors Deployed From Dominators
Naval EM Railgun
Innovative Naval Prototype

Overview
Precision Strike Armaments
Technology Fire Power Forum
June 2008
World Record Media Event
EM Railgun – Game Changing

Above Sensible Atmosphere
Simplifies deconfliction

Ballistic Trajectory

GPS guidance, navigation, & control

500,000 ft

Hypervelocity Electromagnetic Launch (MACH 7.5)

Indirect Fire (200+ nm in 6 minutes)

Direct Fire (Horizon in 6 seconds)

Hypervelocity Impact (MACH 5.0)

Fixed and Relocatable Targets at Long Range

Support for Distributed Ops
HE versus KE Projectiles

- Blast Overpressure
- Large Area of Fragment Spray
- High Collateral Damage

- No Blast Overpressure
- Focused Fragment Pattern
- Minimal Collateral Damage
Navy Electromagnetic Railgun

What is it?
• Gun fired with electricity rather than gunpowder
• Revolutionary 250 mile range in 6 minutes
• Mach 7 launch / Mach 5 hit
• Highly accurate, lethal GPS guided projectile
• Minimum collateral damage

Why is it important?
• Volume & Precision Fires
• Time Critical Strike
• All weather availability
• Variety of payload packages
• Scalable effects
• Deep Magazines
• Non explosive round/No gun propellant
  – Greatly simplified logistics
  – No IM (Insensitive Munitions) Issues
• Missile ranges at bullet prices

Who needs it?
• Marines and Army troops on ground
• Special forces clandestine ops
• GWOT
• Suppress air defenses

When?
• Feasibility Demo 2011
• System Demo 2016
• Fielding Objective 2020-2025
**Naval Railgun – Key Elements**

**Launcher**
- Multi-shot barrel life
- Barrel construction to contain rail repulsive forces
- Scaling from 8MJ (state of the art) to 32MJ to 64MJ Muzzle Energy
- Thermal management techniques
- M&S – Represent interaction between bore and projectile

**Pulse Forming Network (PFN)**
- Energy Density
- Rep rate operation & thermal management
- Switching
- Torque management and multi-machine synchronization (rotating machine)

**Projectile**
- Dispensing and Unitary Rounds
- Gun launch survivability
  - 20-45 kGee acceleration
  - Thermal Risk Management
- Hypersonic guided flight for accuracy
- Lethality mechanics

**Ship Integration**
- Dynamic Power Sharing
- Space and Weight
- Thermal and EM Field Management

- Blue – INP Phase 1
- Gray – INP Phase 2
## ONR INP Phase I Program

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<td>Program Initiation Aug 05</td>
<td>Initial 8MJ Test Capability</td>
<td>World Record Launch - 11MJ</td>
<td>Initial 16MJ Test Capability</td>
<td>S&amp;T Go – No Go Decision Point</td>
<td>32 MJ LAUNCHER 100 SHOT BORE LIFE DEMO</td>
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- **Exercise Options:**
  - Concept Design
  - Design
  - Technology Development & Preliminary Design
  - Detail Design & Fabrication
  - Modeling & Simulation V&V
  - General Atomics
  - Boeing
  - Draper
  - Government

- **32 MJ LAUNCHER 100 SHOT BORE LIFE DEMO**

- **Program Initiation**
  - Aug 05

- **32 MJ ADVANCED CONTAINMENT DEMO**

- **100MJ Capacitor Bank For Launcher Testing**
  - Initial 8MJ Test Capability
  - 16MJ Test Capability
  - World Record Launch - 11MJ
  - Initial 16MJ Test Capability

- **Continuing Army Efforts**
  - Projectile Trades & Develop 4 Year Plan
  - Integrated Launch Package (ILP) Development
  - Rotating Machine Component Development

- **Multiple Awards**
T&E is a multi-tiered effort with basic research conducted at the smallest (quickest & least expensive) scale.
- Promising results are analyzed and promoted to the next appropriate scale for confirmation & maturation.
- Modeling and Simulation
  - Critical element for design
  - Updated after test & analysis results
Bore Life
Electromagnetic Launch Facility (EMLF)

Pulsed Power

High Energy Lab Launcher

Terminal Back-Stop Construction

9.8 MJ Shot Fired
Environmental Considerations

- **Electromagnetic Interference (EMI)**
  - EMI fields at Dahlgren Facility being quantified
    - Field probes in facility
    - Standard computer models
  - Assessment of shipboard impact
  - Industry prototypes to be measured

- **Particulates**
  - Particulates emitted from launcher when fired
  - Safety procedure followed at labs
  - Particulates studied at Naval Research Laboratory

- **Mitigation and safety strategies** being developed as required per DoD instructions and Industry standards.
Path to Integrated System Demo

INP I
- EM Lab Gun for Bore Life Development
- Launcher Trades & Concept Dev.
- Projectile Trades & Concept Dev.
- Electromagnetic Test Facility

INP II
- INP Phase I EM Railgun Demonstration Launcher
- INP Phase II EM Railgun Demonstration Launcher
- ILP Interface in bore dynamics
- Endo-Exo Testing
- Mid-Range
- Terminal High Velocity Powder Gun
- Long-Range

INP Phase II Long Range Integrated System Demo
Army & Navy Collaboration

Revolutionizing firepower for land & sea

A strong collaboration continues to benefit both programs, increasing political stability, execution efficiency, and technical achievement.
Summary

• Naval EM Railgun is a “Navy after Next” Game Changer
• Navy & Army EM Railgun Collaboration
• Risk Mitigation
  – Establish Bore Life Consortium
  – Advanced Containment Launchers – Competitive solutions
  – Integrated Launch Package (ILP) and Projectile development
  – Understand Ship and Weapons System Requirements Integration

Challenges Understood and Being Addressed
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Future Ammo Logistics Initiatives

11 June 2008
Ammunition Logistics
R&D Strategic Plan

OBJECTIVE:
- Develop strategy for ammunition logistics system improvements
- Synchronize current and future US Army ammunition logistics R&D efforts
- Develop organizational relationships between key ammunition logistics system stakeholders
- Leverage and develop joint programs with other Services and Department of Defense programs

Multi-agency Six-Sigma IPT
Joint Modular Intermodal Distribution System (JMIDS)
Joint Capabilities Technology Demonstration (JCTD)

JMIDS - A system of standard sized multimodal modular containers, platforms, and off the shelf information tags

Benefit – JMIDS enables rapid/“seamless” movement of supplies by air, land and sea

Mission: Evaluate JMIDS Military Utility and transition to program of record

Participants
Lead Service: ARMY ARDEC
Partnering Service: US Navy
Sponsoring CoCOM: USTRANSCOM
Technical Manager: ARMY, ARDEC
Operational Manager: TRANSCOM, J5
Deputy Op Manager: USACASCOM
Indep.Test Agency: COMOPTEVFOR
Transition Manager: ARMY, ARDEC
Program of Record: ARMY, PM-FSS
DoD Agencies: DLA
Supporting Services: USMC, USAF
Supporting CoCOMs: JFCOM

DoD Agencies: DLA
Supporting Services: USMC, USAF
Supporting CoCOMs: JFCOM

Joint Modular Intermodal Containers (JMIC)

16 Joint Modular Intermodal Containers (JMIC)

Joint Modular Intermodal Platform (JMIP)

• Interlocking
• Intermodal
• Re-configurable
• Joint Compatibility

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
JMIDS
A System of New Capabilities

Moveable Tie-down Rings
Collapsible Container Interlocks
Adaptable Aircraft Interlocks

AIT Nesting
Satellite Tracking
RFID Sensor Tags

Manual/Auto Tie-down
STD Size/Configuration
Helo Sling-Lift

Collapsible

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
JMIC Capabilities

**Features**
- Integrated tracks for ISO-7166 fittings internal and external
- Collapsible to 1/3 height without tools
- Lockable panels, removable for content access, even while stacked
- Top liftable and interlockable
- AIT - integrated protected location
- 4-way fork truck & pallet jack entry
- Accessories - lock in casters, bins, shelves, and more...

**Handling & Shipping**
- Rapid Ship Upload without reconfiguration
- APPROVED for vertical and connected ship - ship replenishment
- Compatible with all classes of supply - throughout DOD
- Size optimized for ISO containers - 16 JMICs in a 20' with minimal dunnage
- Eliminates the need for repackaging - Ability to span the COMPLETE logistic cycle to the "LAST TACTICAL MILE"

**System Flexibility**
- Multiple size JMIC capability - double long, double high, ...
- Varied types - including user defined special purpose JMICs
- Stackable and interlockable - varied sizes and types

**Future Capabilities:**
- Automated Storage & Retrieval Systems
- Trailers, flatracks, and magazine decks, equipped with integrated interlock fittings - eliminating chains, and straps

**Technology Driven. Warfighter Focused.**
Bridging the Gap to Future Packaging

Current

- Containers are all different sizes
- Requires slow and manpower intensive blocking, bracing and strapping

Future Vision

- Standard size containers
- Six standard sized sub-module containers will accommodate nearly all munitions and other supplies

Joint Modular Intermodal Configuration
Objective: Conduct unmanned resupply of FCS Manned Ground Vehicles: NLOS-C, MCS & NLOS-M

- JMIC & HEMTT-LHS Compliant
- Autonomous Re-supply of main weapon ammo only
- Interface with ammo in legacy packaging
Objective: Conduct Emergency Freedrop resupply from moving helicopters at low altitudes

Goals:
• Inexpensive-$100 per package
• Low altitude drops - 50 to 100 feet
• Hovering or moving 65 to 130 knots
• Easily recovered by 2 Soldiers w/o MHE
• 100% Survivability

Accomplishments:
• Conducted prototype drop tests at Rutgers U & Tobyhanna AAD
• Transition Agreement with PM FSS

Cooperative effort in support of G-4 - Logistics Innovation Agency
Objective: Develop a suite of solutions from low tech low cost to high tech to enhance confidence of munitions readiness throughout its lifecycle

- **Thermochromic Color Changing Materials**
  - Irreversible visual indication of temperature exposure
  - Research to tailor the materials for various temperatures and exposure times

- **Electronic Environmental Sensors**
  - Electronic sensor device developed by PNNL
  - Prognostic Algorithms can be integrated into the device
  - RF or hardware interface
  - Down loads to ASIS-MHP

- **Joint Modular Intermodal Distribution System - AIT**
  - Introduced temperature and humidity enable RFID TAG at the pallet level compatible with ITV server
  - Evaluated Satellite communication tags

- **COTS Passive shock sensor**
  - Range needs to be increased to meet Ammo requirements
Virtual Engineering Center

ARDEC Collaboration Centers

• Established at Picatinny & Rock Island
• Helps customers to evaluate design concepts, accelerate project schedules and saves time and money by eliminating costly building of physical models
• Supported PM-SKOT & USMC maintenance system design projects

ARDEC Advanced Visualization Center
PROBLEM: Ammunition accountability brigade and below lack accuracy & timeliness resulting in suboptimal logistics related actions. Updates are manual, ad hoc and infrequent and therefore not conducive to anticipatory resupply.

Round counting sensors and/or modified Fire Control Software capture ammo expenditures

Ammo Data sent via Vehicle’s FBCB2

Accurate Data = Improved Decision Making & Responsiveness

Brigade Tactical Op Center
Property Book Unit Supply Enhanced (PBUSE)

For Health Management System (VHMS) equipped vehicles

Leveraging:
- Benet Labs Barrel Fatigue Sensors
- PM-HBCT VHMS
Insensitive Munitions

IM Explosive and Venting Technologies help mitigate thermal threat
(Example: Slow Cook-off test result)

Without IM Technologies

Recent incidents remind us of the seriousness of explosive safety
We don’t need another Doha !!!

With IM Technologies

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Interactive Electronic Technical Manuals

LRED
3-D Technology Integration and IETM Application

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Ammunition Adage

A Soldier can survive in Combat

Forever Without Mail

30 Days Without Food

3 Days Without Water

3 Minutes Without Air

But Not One Second Without Ammunition!
Al Galonski
Chief, Future Concepts Div, LRED &
Chief, AMMOLOG Div, PM-Joint Service
(973)724-2349
al.galonski@us.army.mil
U.S. Army Munitions
HQ DA G-3/5/7
Agenda

- DA G-3/5/7 Munitions Mission
- Current Operational Trends and Observations
- Munitions Requirements Process (MRP)
- Major On-going Actions/Initiatives
DA G3 Munitions Mission

- Serve as Army Staff focal point for integrating all munitions issues

- ARSTAF Team of Teams = G-3/5/7, G4, G8 and ASA (ALT)

- Where do we focus?
  - Determine ALL munitions requirements
  - Sustain the warfight
  - “Operationalize” munitions issues and recommend priorities
  - Coordinate munitions resourcing strategy
  - Synchronize munitions policy
  - Oversee Army weapons training program
  - Monitor munitions and industrial base readiness
Munitions “Team of Teams”

Validation, Prioritization, Resourcing, Policy

G-3/5/7
- CIC: Capability Rqts
- SSW: War Plans
- FM: Force Structure
- TRA: Develop Requirements
- CIR: Develop priorities

G-4
- Sustainment
  - Munitions Div

G-8
- Programming & Budgeting
  - BOS Div’s (Missiles)
  - Ammunition Div

ASA(ALT)
- Acquisition & Program Management
  - Missile Systems & Ammunition Directorate

Requirement Generators

DoD MRP
- TRADOC
  - STRAC, POI, CBT Loads

Joint Staff JCIDS
- CAA QWARRM

AR2B
- ATEC TEST

Other CMDS ONS

Acquisition and Logistics

AMC
- AMCOM LCMC
  - Life-Cycle Mgr of Acquisition & Production of Missiles, Logistics Readiness, and Sustainment

JM&L LCMC
  - Life-Cycle Mgr of Acquisition & Production of SMCA, Logistics Readiness, and Sustainment
Current Operational Trends and Observations
Modernization of conventional munitions stocks is well underway; missile stocks are approaching obsolescence.

Our inventory is not necessarily tuned for “full spectrum” operations, and change is slow going (e.g. 2.75” rockets, 40mm NL).

We must not “prepare” for the last fight (2.75” rockets, VL/IR Illum).

We must be more responsive to rapidly changing Tactics, Techniques and Procedures to support the current warfight and persistent conflict (e.g. 2.75” flechette rockets, Blast/Frag Hellfire).

Anti-armor does not always equal anti-personnel.

Phase IV Operations and “Persistent Conflict” require more than small arms (e.g. demo, precision-guided munitions, non-lethals, etc.)

Joint and Coalition munitions planning and training is critical. Technology cannot outpace slowest runner (7.62 Dim Trace, Aphids)
Continued…

- We are and will continue to fly (fixed and rotary) 155mm and more (intra and inter theater)

- Buying foreign to make up for shortfalls should never happen again (e.g. UK small arms)

- Ammunition Foreign Military Sales (FMS) are on the rise and must be leveraged for; Strategic Shaping/Coalition building and Industrial Base readiness

- Reduction in inventory (due to overall reduction in force structure, increased lethality and precision) has led to a greater reliance on near real time inventory and expenditure data (not there yet)

- Non-lethals must quickly transition to lethal effects to best support Escalation of Force, detainee operations, etc. (no more FN303’s). Extended range (150m) for NL is critical to buy standoff time.
Current Operational Trends and Observations

Continued…

- Just in time production does not equate to just in time logistics

- Precision vs dumb munitions balance is not easy. TRADOC is conducting a detailed study to support senior decision makers

- TRADOC also working a study to help focus PEO- Missiles and Space RDT&E and S&T funding requests in FY12-17 POM

- Operational Needs System (ONS) system is working

- Significant increase in ammunition and explosive related accidents with fatalities

- We have a knowledge gap among junior to mid-grade officers
Munitions Requirements Process (MRP)
DoD Instruction 3000.4, Munitions Requirements Process (MRP), directs all Services to develop munitions requirements biennially.

The MRP is a deliberate planning process that supports long-range POM planning and investments.

As part of the deliberate planning process, we use the “Quantitative War Reserve Requirements for Munitions” (QWARRM) process to develop War Reserve / Operational requirements.

The Center for Army Analysis (CAA) conducts theater-level modeling based on input from multiple sources including:

- Strategic Planning Guidance
- COCOM OPLANS
- DIA Threat reports
- Projected Force Structure
- Approved / projected munitions
- Munitions caps
- Approved Combat Loads (CL)
- Munitions / system performance data

Training and test requirements are developed separately from the QWARRM process.
QWARRM Development

Account for Everything; Double-count Nothing

Army Simultaneity Stack

- **Major Combat Operations**
  - MCO WD + MCO SDTE
  - Stability OPS (OIF/OEF expenditures)
  - Post-MOB / CONOPS training
  - Residual Capability
  - Main rounds modeled + Combat loads

- **Deter Aggression**
  - 4 Baseline Security Postures
  - Current Operation / Fwd Presence
  - SOF Operational
  - Combat-load based RQMT

- **On-going Operations**

- **Homeland Security**
  - DRBs & OP Projects
  - CCMRF
  - Generating Force
  - Combat-load based RQMT

- **Transformation**

- **Generating Force**

Translation

MRP Stack

- **Major Combat Operations**

- **Current Ops & Forward Presence**

- **Strategic Readiness**
QWARRM does not address immediate operational needs. These are approved and resourced through the Army Requirements and Resourcing Board (AR2B) via Operational/Urgent Needs Statements (ONS/UNS) (e.g. Pen Flares)

QWARRM requirements + training (6 years) + testing (6 years) = Total Army Munitions Requirements (TAMR)

FY10-15 TAMR provided to OSD o/a 1 Jan 08
Total Army Munitions Requirements (TAMR)

Account for Everything; Double-count Nothing

Army Simultaneity Stack
- Major Combat Operations
- Deter Aggression
- On-going Operations
- Homeland Security
- Transformation
- Generating Force
- Training & Test

Translation
- MCO WD + MCO SDTE
- Stability OPS (OIF/OEF expenditures)
- Post-MOB / CONOPS training
- Residual Capability
- Main rounds modeled + Combat loads
- 4 Baseline Security Postures
- Current Operation / Fwd Presence
- SOF Operational
- Combat-load based RQMT
- DRBs & OP Projects
- Generating Force (11th ACR NTC; 1-509 IN (ABN) JRTC; 1-4 IN JMRC; NG IN BCT ISO Post-MOB)
- Combat-load based RQMT

MRP Stack
- Major Combat Operations
- Current Ops & Forward Presence
- Strategic Readiness
- Training & Test

QWARRM
- TOTAL ARMY MUNITIONS REQUIREMENT
- TNG/TEST

Strategic Planning Guidance (SPG)
- CDDR OPLANS
- DIA Threat Report
- TAA Force Structure
- "Strike Unfavorable" Conditions

"Strike Unfavorable" Conditions

"Strike Unfavorable" Conditions

"Strike Unfavorable" Conditions
Army War Reserve / Operational MRP

**G-3/5/7**
- **TRADOC**
  - Combat Developers
  - Capabilities Development Document (CDD)
  - Combat Loads
- **Army CMDS**
  - Deploying Units
- **ASCCs**
  - Deployed Units

**Guidance Requirements**
- **OSD** (DoDI 3000.4)
- **Joint Staff**
- **CCDRs/ASCC**
- **OPLANS**
- **CAA**

**Munitions Requirements Resourcing Integrator**
- Publish Study Directives
- Validate Combat Loads
- Staff / refine CAA outputs
- Conduct QWARRM CoC
- Collect inventory data
- Sufficiency Assessment
- Publish approved requirements

**Key inputs:**
- CCDR OPLANs IAW SPG
- DIA Threat Report
- Projected TAA resourced force
- Projected munitions
- AMSAA system performance data
- TRADOC Combat Loads
- OIF / OEF MUREP data
- Munitions caps
- “Strike Unfavorable” conditions

**Key outputs:**
- Near-year constrained / unconstrained RQMT
- Out-year constrained / unconstrained RQMT

**War fighter**
- Forecast
- Authorize Stockage Objective
- Procure/Produce
- G-3/5/7 Approval
- POM
- TAMIS
- TA4C
- JMC
- **OSD MRP**
  - AT&L
  - J8-FAAD
  - OPLANS

**G-37/TRA**
- Capabilities
  - JCIDS AR2B
- War Plans
- Total Army Analysis
Training Munitions Requirements Process

**Combat Developers**
- TRADOC
- Validates, Approves, Authorizes

**G-3/5/7**
- G-37/-CI: Validates and approves capabilities requests.
- G-37/TRA/C/I: (Munitions Council of Colonels) approves weapons resourcing strategies.

**Training Developers**
- (Develops weapons training strategies)
- Capabilities Development Document (CDD)
- Commandants Approve POIs; Recommends Wpns Strategies

**Warfighter**
- Army Organizations
- (Execute training strategies)
- Forecast
- Authorizations
- Procure/Produce
- TAMR
- TAMIS
- DA PAM 350-38 & POIs
- Living documents
- $POM

**G-37/TRA: (TA4C)** authorizes ammunition against approved requirements.
On-going Actions/Initiatives
Ongoing Actions/Initiatives

 ➢ Sustain the Warfight
  - Hellfire (AP/AT)
  - 2.75" rockets (HE, flechette)
  - 30mm
  - Fast Obscurant Grenade (FOG)
  - Unitary Guided MLRS
  - Excalibur
  - 12ga breaching rounds
  - Non-lethal (40mm, CS, 12ga)
  - Escalation of Force (EOF)

 ➢ Manage Army Munitions Requirements and Prioritization
  - Green Ammo
  - COCOM missile distribution
  - ATACMS shelf life extension program (SLEP)
  - Operational Needs Statements (e.g. PGMM, Thermo LAW, PGK)

 ➢ Army Munitions Strategy
  - Overarching Army Munitions Strategy
  - Highlight current and pending shortfalls
  - Munitions/Missile Industrial Base
  - Support Reposture/Reset of munitions stockpile
  - Joint Materiel Release Process
  - Currently Working DRAFT

 ➢ FY10-15 POM / Total Army Munitions Requirements (TAMR)
  - QWARRM is our war reserve munitions requirements development process
  - Developed IAW Department of Defense Instruction 3000.4, Munitions Requirement Process (MRP)
  - OSD AT&L Implementation Guidance dictates Defense Planning Scenarios for use in MRP
  - Training Ammunition requirements developed IAW STRAC and TRADOC POI’s

 ➢ Army Ammunition Vision- 2030
  - Soldiers/Civilians
  - Equipment
  - Training
  - Organizations
  - Strategic reach back

Chief of Ordnance initiative
Committed to fixing knowledge gap
Don Chrans DA G8
Programming and Budgeting
Backup
50m line represents the distance where less than 3% of the population is capable of throwing an object large enough to cause serious injury.

Experimental extended range rounds shipped to SWA in 2006.

Proposed optimal range for nonlethal munitions.

Launched from 12ga shotgun.
Modeling Guidance to CAA

- Model OSD-directed Major Combat Operations.
- Develop constrained / unconstrained near- and out-year requirements.
- Use MUREP to develop PH IV requirement.
- Develop Strategic Readiness requirements, to include Homeland Defense, treaty obligations, etc.
- Update the Theater Sustainment Model to reflect munitions needed to support a modular force.
- Special emphasis items include: FCS systems, Patriot, ATACMS, Hellfire, DPICM (all types), 30mm, 25mm, and Precision Guidance Kit (PGK) requirements.
FY10-15 POM Missile Requirements Methodology

OLD PROCESS
G8 develops missile requirements

Unconstrained:
• CAA model allowed to fight theater war fight without constraint.
• Model defaults to the most lethal, suitable weapon / munition available for the target set.

Constrained:
• Requirements based on programmed quantities.
• Provided by EE PEG BOS reps.
• No missile UFRs. Procurement = requirement.

NEW PROCESS
G3/5/7 develops missile requirements

Unconstrained:
• No change.

Constrained:
• CAA models unconstrained requirement.
• G3 (DAMO-TRA) develops operations-based critical requirement.
• DAMO-TRA briefs proposed RQMT to G-3/5/7 for approval.
• EE PEG provides assessment of how much of the RQMT it intends to fund.
• CAA models programmed quantities provided by EE PEG BOS reps.

Funding < critical RQMT = CUFR.
• Funding > CUFR but < full RQMT = UFR.

Note: OSD directs each Service to provide unconstrained and constrained requirements.

• Previous missile requirements process was fiscally driven vice operations-based.
• G-3/5/7 can’t determine where he may have risk.
Unconstrained Requirement

- CAA model is allowed to fight theater level war fight without constraints
- This is the very top level munitions requirements estimate, by DODIC

Constrained Requirement

- G-37/TRA uses the CAA generated unconstrained requirement to develop an operations based Critical Requirement
- EE PEG provides assessment of how much of the RQMT it intends to fund
- Critical Requirement is briefed to G-3/5/7 leadership for approval
- CAA models programmed quantities provided by EE PEG BOS
- CUFR = Funding < Critical Requirement
- UFR = Funding > CUFR but < Full Requirement

* Missile X TAMR requirement will be the capped qty, but show the Full and Critical Requirements for reference
ATACMS SLEP Process

**Expired Missile**

**ATACMS Block I**
- (M39)
- 950 APAM Sub-munitions
- 165 KM Range
- Inertial Guidance

**SLEP PROCESS**
(New Warhead, New Electronics, New Guidance System)

**New Missile**
- 10 Year Shelf Life

**ATACMS Unitary**
- (M57)
- 500# Unitary Warhead
- 270 KM Range
- Vertical Attack capability
- GPS-aided Inertial Guidance
War Reserve Requirements Process

Validate, Prioritize

- DAMO-CI: Validate capabilities
  - JCIDS
  - AR2B
- DAMO-TRA: Validate resourcing
  - Combat Loads (CoC)
  - Other Army inputs.

G-3/5/7

- SSW: War Plans
- FM: Force Structure

Total Army MRP

Quantitative War Reserve Requirements for Munitions (QWARRM)

- OSD Scenarios
- DIA Threat Report
- Projected munitions
- Projected force structure
- TRADOC Combat Load

Modularity + OIF/ OEF

Munitions caps

Add-on factors

"Strike Unfavorable"
The Army’s QWARRM process produces a Requirements Estimate that:

- Reflects the quantities of munitions the Army needs to successfully execute ground-based maneuver force Campaign Plans (versus achieving specific target attrition goals).

- Considers the objectives and munitions demand for each phase of the campaign plan.

- Is derived from detailed functional analysis of Division/BCT-level performance of opposing force weapons systems in an environment representative of the theater.
  - Uses approved shooter / munitions / target probability-of-kill data from AMSAA.
  - Reflects appropriate doctrine and tactics for employment of the weapons systems.

- Provides a comprehensive theater / scenario-specific, auditable estimate of munitions requirements throughout a campaign.
Validation of Campaign Results

- CAA’s Campaign Analysis Review (munitions):
  - Rounds per Tube per Day
  - Inventory caps
  - Tonnage
  - Kills and hits
  - Phasing
  - Quantities Expended vs Carrying Capacity
  - Sequence of Expenditures

- Only after validation is complete are study results briefed to the Director, CAA, for release to the Army G-3 (DAMO-TRA).

- Army G-3 (DAMO-TRA) conducts Council of Colonels to further validate QWARRM outputs, leveraging input from “Team of Teams.”

- Outputs approved by DA G-3 before release to OSD
The QWARRM process has evolved over time, as the Army and CAA have refined it to meet the demands of the munitions requirements process and the OSD MRP.

CAA’s OPLAN analysis support to ASCCs that are associated with major Defense Planning Scenarios significantly enhances the Army’s ability to faithfully represent the ASCCs’ intent during the campaign.

The Army is confident that scenario based munitions requirements accurately reflect what the Army needs to successfully execute a specified theater campaign plan (vice the estimated munitions required to kill a specific number of targets).
Weapons Capability Portfolio

Chuck Kelly
OUSD(AT&L)
Land Warfare & Munitions
10 June 2008

OUSD(AT&L)/A&T/PSA/LW&M
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What’s In the Portfolio?

• Highly Precise Munitions

• Not so Precise Munitions

• “Volume Fire” Munitions
Assessing the Portfolio
Agenda

• AT&L Perspective

• Budget Trends

• Assessing the Portfolio
  – Proficiency
  – Sufficiency

• Road Ahead
Secretary of Defense
Hon. Robert Gates

Deputy Secretary of Defense
Hon. Gordon England

Under Secretary of Defense for Acquisition, Technology & Logistics
Hon. John Young

Principal Deputy: Vacant

Secretary of the Army
Hon. Pete Geren

Secretary of the Navy
Hon. Donald Winter

Secretary of the Air Force

DUSD(Acquisition & Technology)
Hon. James Finley

Director, Portfolio Systems Acquisition
Mr. Dave Ahern

Land Warfare & Munitions
Mr. Tony Melita
USD (AT&L) Strategic Thrusts

**Strategic Thrust 1** – Define Effective and Affordable Tools for the Joint Warfighter

**Strategic Thrust 2** – Responsibly Spend Every Single Tax Dollar

**Strategic Thrust 3** – Take care of our people

**Strategic Thrust 4** – DoD Transformation Priorities

**Warfighter is #1 Focus** – Need to Understand Operational Concepts & Needs to:
- Guide Technology
- Design Effective Systems
- Provide Logistics and Facility Support

[http://www.acq.osd.mil/goals/]
• Outcomes
  – New programs are born joint, interoperable, and affordable
  – Opportunities are constantly identified to deliver greater enterprise efficiencies
  – Roadmaps guide development and integration of programs in portfolio areas
  – Cost to the Defense Enterprise is continuously reduced
Strategic Thrust 1 Roadmap Metrics

- Initiate a Joint Weapons JAT and develop Joint Weapons Roadmap Version 1.0 focused on weapons capability investment strategies beyond POM10.

- Initiate an Electronic Warfare JAT … focus coordinating EW investment options for POM 10.

- Initiate Directed Energy JAT and deliver Roadmap Version 1.0.
Budget Trends
Past and Projected Funding for Defense

(Billions of 2008 Dollars of Total Obligational Authority)
Figure 3-1 Updated

Funding for Investment, by Budget Account and Weapon Type

(Billions of 2008 Dollars of Total Obligational Authority)
FY 2009
Strategic Modernization Breakdown

Total Budget $183.8B
Smart Munitions vs. Other Munitions
Procurement Trend

[Graph showing the procurement trend for Smart Munitions and Other Munitions from FY06 to FY13. The graph indicates a steady increase in Procurement for Smart Munitions compared to a more stable trend for Other Munitions.]

- **General Purpose Bombs**: A horizontal line indicating the procurement trend for General Purpose Bombs remains relatively stable over the years.
- **GPS Guided Munitions**: A green area representing GPS Guided Munitions shows a consistent increase over the fiscal years.
Move to Precision

• **AIR**
  – Dumb bombs to smart bombs
  – Unguided rockets to guided rockets
  – Single mode seekers to multi-mode seekers

• **Ground**
  – Ballistic artillery to guided artillery
  – Unguided rockets to guided rockets
  – Precision mortars

• **Maritime**
  – Unguided surface fires to guided fires

What / How Much Do We Buy?
Two Munitions Processes

Proficiency

"WHAT DO WE BUY?"

JCIDS

3170.1C

Capability Based

PPBES

3000.4

Threat Based

Sufficiency

"HOW MUCH OF EACH DO WE BUY?"

Purpose

ITSCP

Driver

Implementing Doc

Guidance and Action

Decision and Action

Validation

Assessment and Analysis

Threat Based

Capability Based

"WHAT DO WE BUY?"

"HOW MUCH OF EACH DO WE BUY?"

JCIDS

3170.1C

Capability Based

PPBES

3000.4

Threat Based
Proficiency Factors

- Targets Effects Desired
- Threat Environment
- Domain Requirements
- Target Environment
Identify Targets

SMALLER YET COMPREHENSIVE LIST TO ASSESS GAPS
Traditional Target Vulnerabilities

**Desired Effects:**

- Blast
- Frag
- Crater
- Structure

![Graph showing desired effects and traditional target vulnerabilities](image-url)
Non-Traditional Target Effects

- Non-Kinetic – I/O & EW
- Non-Lethal

Layered Capabilities & Confidence Factor?

<table>
<thead>
<tr>
<th>CP Tasks</th>
<th>CM Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Deny Access Into/Out of an Area to Individuals</td>
<td>• Stop Vehicle</td>
</tr>
<tr>
<td>• Move Individuals Through an Area</td>
<td>• Disable Vehicle</td>
</tr>
<tr>
<td>• Disable Individuals</td>
<td>• Stop Vessel</td>
</tr>
<tr>
<td>• Suppress Individuals</td>
<td>• Disable Vessel</td>
</tr>
<tr>
<td></td>
<td>• Stop Fixed-Wing Aircraft on the Ground</td>
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<tr>
<td></td>
<td>• Disable Aircraft on the Ground</td>
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<tr>
<td></td>
<td>• Divert Aircraft in the Air</td>
</tr>
<tr>
<td></td>
<td>• Deny Access to Facility</td>
</tr>
</tbody>
</table>
Threat Environment

Direct Attack

In Close

Outside Point Defense

Outside Area Defense

Outside Theater Defense

LOS  BLOS
Domain Requirements

• Air
  – Bomber
  – TacAir
  – Helo

• Ground
  – Direct Fire
  – Indirect Fire

• Maritime
  – Surface
  – Subsurface

• Cyber??

Overlap vs. Redundancy
Target Environment

• Enemies

• Friendlies

• Non Combatants

• Infrastructure
  – Power
  – Water
  – Transportation
  – Hospitals

• Effects – Desired / Undesired
Target Environment

SDB-FLM

MK-82-FLM

Low Collateral & MK-82

Practice Bombs

Dial A Yield

How Do We Capture Needs / Desires?
Weapon Attributes

Capabilities

Attributes

Metrics

- SSPK
- Suppressive Effects

Effective

Collateral Damage

- Human Damage Radius
- Guidance Robustness
- IM
- Lingering Effects

Persistence

Time On Station

Environmental Ability

Responsive

Operational Flex

Range

Employment

Weapon

Agile

Survivable
Measures of Effectiveness

Capabilities

Attributes

Metrics

MOEs
Capability - Range

- FW Bomber
- FW Tactical
- Rotary
- Ground
- Maritime

- Munition Cost (Thousands of $)

- AGM-158
- AGM-86D
- AGM-86C
- AGM-158
- AGM-84H/K
- GBU-39
- AGM-154C
- CBU-105 ER
- GBU-31
- GBU-38
- CBU-105
- GBU-16
- E/GBU-15
- E/GBU-24
- E/GBU-28
- E/GBU-27
- AGM-114L
- AGM-114M
- AGM-114K
- AGM-84H/K
- AGM-109H
- AGM-109E
- AGM-109C
- RGM-109H
- RGM-109E
- RGM-109C
- RGM-109C

- LOS
- BLOS
- NLOS

NOTATIONAL
Capability - Environment
Sufficiency
DoD Munitions Requirements Process

Threat Report
- Maneuver Forces
- Air
- Maritime
- IADS
- Infrastructure
- Strategic

Phased Threat Distribution
- Allies
- SOCOM
- USMC (Air & Ground)
- USA
- USN
- USAF
  - Phase I: $w\%$
  - Phase II: $x\%$
  - Phase III: $y\%$
  - Phase IV: $z\%$

Total Munitions Requirement
- Combat Requirement
- Strategic Readiness Requirement
- Current Operations/Forward Presence Requirement
- Test & Training Requirement

Service Processes
- NNOR
- NCAA
- QWARRM

Services
Operationalizing the Strategy – 2006 QDR
Force Planning Construct – 2006 QDR
Danger
Road Ahead – The Challenges

• Build & Update Roadmaps
  – Weapons
  – Directed Energy
  – Electronic Warfare
  – Non Lethal Weapons

• Improve Munitions Requirements Process
  – Incorporate Increased Transparency, Visibility, and Collaboration into DoD Instruction 3000.4 (MRP)
  – Ensure Credible Guidance (Policy and Joint Staff Collaboration)

• Maintain Visibility into Munitions Budgets
  – Address Priority Capabilities
    • Identify Gaps
    • Identify Redundancies
  – Address Capability “Balance” (Across Sensors, Platforms, & Munitions)
Questions?
Hard Target Fuzing Challenges

Need to address HT related M&S, material properties, & testing

Issues:

• Harder Targets

• Weapon Response & Survivability

• Material Properties
  • Filler & Explosives

Fuze Well from Characterization Tests
Need for MRP

– Provides the foundation for credible Service inventory numbers.
  • Near Year requirement provides sanity check for stockpile positioning
  • Out Year requirement “sets the bar” for inventory build
    – Requirement is the driver for weapon purchases in FYDP
    – Requirement is the driver for establishing new weapon system acquisition programs

– Ensures the equities of all participants are addressed, i.e. CoCOMs, Joint Staff, Services, and OSD.

– Prevents multiple requirements from being generated, i.e. a separate CoCOM and Service munitions requirement (ensures BOTH requirements will be discredited).
FA Assessment—Scoping

- No Joint Fires ⇒ Engagement - Kinetic – Lethal – EFFECTS

- Integrated Systems - Required
  - F2T2EA Chain

Need all 3 to engage—
Following assessment is scoped to weapon only
Cost-Benefit Analysis

Cost ($K)
Questions/Comments?????
DoD MRP Products

- Combat Requirement (CR)
- Current Operation/Forward Presence Requirement (CO/FPR)
- Strategic Readiness Requirement (SRR)
- War Reserve Munitions Requirement (WRMR)
- Training & Testing Requirement (TTR)

Total Munitions Requirement (TMR)
Terminology - Force Application Attributes

**Effective** – Able to precisely generate desired effects through a variety of kinetic and non-kinetic means in all environments.

**Discriminating** – Able to limit collateral damage and second order consequences of engagement.

**Agile** – Able to rapidly maneuver forces throughout all domains of the battlespace in all environments.

**Survivability** – Able to effectively maneuver and engage in a dynamic and uncertain threat environment.

**Persistent** – Able to apply the necessary force continuously and sustain those operations as required to meet mission objectives.
Terminology - Mission Context

– Fires in Support of Forces In Contact

– Fires to Enable Freedom of Ground Maneuver

– Fires to Enable Freedom of Air Maneuver

– Offensive Fires (Fires Independent of Maneuver/Contact)
DoD Munitions RDT&E and Procurement

Desert Storm Buy-Back

OIF and OEF Buy-Back

FY07 $B CONSTANT

FY86 FY87 FY88 FY89 FY90 FY91 FY92 FY93 FY94 FY95 FY96 FY97 FY98 FY99 FY00 FY01 FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11

RDT&E  Procurement
Smart Munitions vs. Other Munitions
Procurement Trend
Past and Projected Resources for Defense

(Billions of 2007 dollars)

Source: Congressional Budget Office.

Note: FYDP = Future Years Defense Program; OMB = Office of Management and Budget.
Past and Projected Resources for Investment

(Billions of 2007 dollars)

Source: Congressional Budget Office.

Note: FYDP = Future Years Defense Program; C4ISR = command, control, communications, computers, intelligence, surveillance, and reconnaissance.
Topics

• Precision Fires products and performance
• Rocket and missile industrial base
• Contemplated capabilities
• GMLRS with Self Destruct Fuze
• All systems are supporting the Global War on Terrorism
• Currently supporting Operation Iraqi Freedom and Operation Enduring Freedom
• Performance is above Army Standards
• Launchers returning in excellent condition requiring only routine & minimal maintenance

M270A1
98% Readiness Rate

HIMARS
99% Readiness Rate

GMLRS Unitary
747 Rockets Fired
98% Reliability

ATACMS
537 Missiles Fired
98% Reliability

Play Video 1
Play Video 2
Q: SDF needed by the user?

A: Requirement remains valid
   ✓ TCM-RAM
   ✓ TCM-Cannon

GMLRS
- Less than 1% hazardous duds

Assumptions:
- No degradation of primary mode (95% reliability)
- SD mode operates as well as in artillery (95% reliability)

XM864
- 97% Primary Mode Reliability
- 95% Self Destruct Mode Reliability
- 99.85% Overall Fuze Reliability
Comparison Of M26 And GMLRS M30 DPICM w/SDF Engaging SAM Missile Site

- **M26**
  - Engagement Site (SA-6)
  - 75 Rockets Required To Destroy Target
  - 644 Grenades Per Rocket
  - At 5% Dud Rate, Over 2400 Unexploded Grenades Throughout Engagement Site
  - Grenades Spread Over 12 Grid Squares

- **M30 w/SDF**
  - Engagement Site (SA-6)
  - 15 Rockets Required To Destroy Target
  - 404 Grenades Per Rocket
  - At <1% Dud Rate, Less than 60 Unexploded Grenades Remain At Engagement Site
  - All Grenades Contained Within 1 Grid Square
MLRS Worldwide

MOU Partners

- United States
- United Kingdom
- France
- Germany
- Italy
- Norway
- Denmark
- Finland
- Slovakia
- Greece
- Portugal
- Slovenia
- United Arab Emirates
- Japan
- South Korea
- Singapore
- France
- South Korea
- Japan
- Singapore

* Potential Customer

Distribution A: Approved for Public Release
MLRS Worldwide

MOU Partners

- United States
- United Kingdom
- France
- Germany
- Italy

Potential Customer

Distribution A: Approved for Public Release - Release

* Potential Customer
The spectrum of threats requires a mix of missile system capabilities.
Contemplated Capabilities

- Precision, precision, precision
- Elimination of UXOs
- Selectable warheads
- In-flight redirect
- Programmable trajectory
- Reduced signature
- Demil
Suggestions

- PM / TCM relationship and requirements
- Get plugged into G-3 Ammo
- ASA(ALT)
- OSD
- Media – tell your story
we never forget our real customer...
Cannon Artillery and Mortar Precision Effects

Presented by: COLONEL Ole Knudson
Project Manager for
Combat Ammunition Systems
973 724-2003, ole.knudson@us.army.mil

"The presentation to the effect that disclosure of information does not imply any specific intent or commitment on the part of the U.S. to provide further information on the topic."
Cannon Artillery and Mortar Precision Effects Capabilities

- All weather 24/7 continuously “loitering” precision capability
  - Responsively and precisely attack targets…can precisely “mass” fires
  - Minimizes collateral damage…“discretion” & “close” engagements
  - Inherent scalability with multiple shooters and multi-round missions
  - Dramatically reduced logistics burdens (less qtys and transport/storage)

- Employed with current cannon artillery & mortar systems and structure…and accurate targeting systems (FS3, LLDR, PSS-SOF)
  - Easily additive to current systems and capabilities…“compatibility” is key
  - Maintains current smoke & Illum capabilities…“precision” smoke w/PGK?
  - Maintains area fire & suppressive fires capabilities…“precise” area fires?

- PM CAS Indirect Fire Precision Efforts
  - Excalibur provides 155mm artillery <10m CEP capability out to 40 kms
  - Precision Guidance Kit (PGK) for 155mm & 105mm artillery projectiles
  - Exploring 105mm artillery & 120mm mortar precision with ARDEC / ARL
XM982 Excalibur

System Characteristics/Description:
- Precision Guided 155mm Cannon Ammunition (CEP < 10m)
- Fin Stabilized, Gliding Air Frame
- All Weather, Day/Night, Fire & Forget, Urban/Complex Terrain
- Compatible with NLOS-C, Paladin and LW155 Howitzer Platforms
- One Meter Length / 106 lb
**Excalibur Concept of Operations**

- Precision Delivery Regardless of Range
- Limits Collateral Damage
- Increases Range to 40 kms
- Decreases Volume of Fire Per Engagement
- Enhances Soldier Survivability

**System Initialization**

- Gun Target Location
- Trajectory Information
- GPS Crypto Keys
- Precise Time
- Fuze Setting
- Power

**GPS Acquisition and Track**

- Latitude / Longitude / Altitude

**Deploy Canards prior to Apogee (Ballistic prior to Apogee)**

**Mission Planning**

- Principles of Engagement

**Impact Near Vertical for Max Lethality**

**Structure Top Attack (Detonation after Penetration)**

- Fragmenting Warhead

**Top Attack, 3 Fuzing Modes:**
- Height of Burst
- Point Detonating
- Delay/Penetration

**Sensors:**
- M707 Knight w/FS3
- Stryker FSV w/FS3
- M7 & M2A3 BFIST
- Shadow PIP TUAV

**Deployment Location**

- Excalibur Concept of Operations
Excalibur Video

Excalibur M982
155mm Artillery
Precision Projectile
Excalibur Program Status

- Excalibur Block Ia-1
  - Operational use in theater
  - Block Ia-1 production deliveries ongoing

- Excalibur Block Ia-2 (longer range version)
  - Block Ia-2 operational test planned for Jun 09

- Excalibur Block Ib
  - Increased reliability and significantly reduced unit costs
  - Competitive Source Selection ongoing
Precision Guidance Kit (PGK) 155mm Projectile Accuracy

- Increased effectiveness (kills targets quicker)
- Increased stowed kills per platform
- Reduced collateral damage
- Reduced logistics burden
- Closer support of friendly troops

PGK Increment 1 Provides CEP Accuracy of < 50 Meters
Operational Benefits

Today’s Capability: 183m CEP*

- Village Destroyed
- Refinery Destroyed
- Target May Have Been Hit

PGK: ≤50m CEP

- Target Destroyed
- Minimal Collateral Damage

* M109A6 (Paladin) at 27km: 155mm (HE) M549A1

- Improves Accuracy – Significantly Reduces Ballistic Dispersion
- Significantly Decreases the Time Needed to Achieve Desired effects
- Minimizes Collateral Damage
- Increases Number of Kills per Basic Load of Ammunition
- Greatly Reduces Logistics Burdens
• Fits in standard 155mm High Explosive artillery projectile fuze wells (deep intrusion)

• GPS guidance (incorporates SAASM)

• 20 Year Storage Life (no battery)

• Proximity & Point Detonating Fuzing
**PGK Incremental Schedule**

**PGK Increment 1**
- ≤ 50m CEP
- 155mm HE only
- Paladin & M777A2

**PGK Increment 2**
- ≤ 30m CEP
- Adds 105mm (HE)*
- NLOS-C (O)

*Requires Digitized M119A2

**PGK Increment 3**
- ≤ 30m CEP
- Adds 105mm & 155mm Cargo
- NLOS-C (T)

---

**Fielding Inc. 1 in FY10**

17 Oct 07
Emerging Needs/
Future Requirements

- IBCT Organic Precision Requirements
  - 40 Plus IBCTs within Army structure…have mortars & 105mm
  - PGK-2 is funded…implemented with 105mm digitization
  - Need for organic very responsive precision with <10m CEP

- “Cheap” or “Very Affordable” Precision is “coming soon”
  - Key technologies…IMUs, GPS, S&As, Power, AJ, & SALs
  - ARDEC/ARL VAPP effort to mature components and integrated concepts…applicable to artillery and mortars
  - Several Industry efforts ongoing…will enable competition
  - Wider use in training…confidence, proficiency, and quantities
**BLUF:** OD Corps continues to execute core competence to ARM THE FORCE and work with the total ammunition logistics community to support Soldiers and shape the future of ammunition logistics

**BRIEFING OUTLINE**

- OD Ammo Team
- OD Corps in Sustainment Center of Excellence
- Change in OD Corps Support
- OD Ammo Vision 2030
- OD Ammo Log Collaborations/Initiatives
Chief of Ordnance – Proponent, Deputy CDR CASCOM

Ordnance Center and Schools
• Ordnance Mechanical Maintenance School
• Ordnance Munitions and Electronics Maintenance School w/ TRADOC Munitions System Manager Office OPCON

Combined Arms Support Command
• Capabilities Development and Integration
• Training Development

WE ARE – Ammo Doctrine, Organization, Training, Materiel, Leader Development, Personnel, Facilities (DOTML-PF)
FROM OUR FOXHOLE - NOW

- Army Transformation (BCT, SB, ESC, TSC) is working
- Multifunctional Logistics is necessary and also working
- Ammo Modular Unit Organization - a success story
- Ammo Soldiers
  - Building the force to meet Transformation
  - Training Ammo Soldiers to be Mod Force experts
  - Leader Dev – OD ammo officer Tng/PD a challenge
  - Unit-level proficiency – an on-going challenge
- Ammo Logistics Support Teaming – Improving with great coordination from Army, JMC/DAC, PEOs, ARDEC ammo log leaders

GO ORDNANCE!

20 June 2008
HISTORICALLY

WE HAVE **ALWAYS** BEEN ABLE TO:

- Maneuver Oriented Ammo Distribution System – 1987
- MOADS PLS – 1989
- Container Roll-on – Roll Off Platforms (CROPS) 1997
- Modular Medium/Heavy Ammo Platoons – 1994 concept
- IBCT Ammo Resupply System 2001

**BUT...**

And … The OD Corps has been a leader in Log Innovation!

**GO ORDNANCE!**

20 June 2008
EVOLVING MISSIONS INCLUDE

- Safe Mgmt of Ammo / CEA
- Log Self-Protection
- Recover-Repkg- Redeploy
- Issued CL V
- E-2-E Vis/Accountability
- Ammo Soldiers in fwd combat resupply opns

GO ORDNANCE!

20 June 2008
We will support an evolving mix of future forces

AMMO SUPPORT - THE TOTAL FORCE

Mod Force BCT

Future Force

SBCT

OUR FUTURES CHALLENGE

- Ammo support to High-Low tech mix of forces for the near-mid future
- With limited budget, less log footprint
- Improved Joint support to other services
- Continued support to coalition forces

20 June 2008
Ammo Soldiers are operating at combat battalion and lower level
- JMC LARs and DAC QASAS deploy with HQs and sustainment units
- PEOs are rapidly developing and fielding new systems to deployed units
- Contractors perform support missions at all levels including BCTs
- Ammo units are supporting and being trained at installation level
- Experts from all organizations are developing and exchanging LLs and changing TTPs/doctrine, training

The future of ammo logistics requires a new Vision

GO ORDNANCE!
Ordnance Corps Vision is Dated
- Pre Modular Force
- Pre OIF/OEF
- Considerable change/LL across the spectrum

Chief of OD directed a new vision

“Answer these 3 Questions…”
- Where are we today?
- What has Changed and What is Missing?
- What do we need to look and be like in 2030?
KEY AMMO ISSUES

- Where (and Who…) are all the Experts? Across the full life-cycle spectrum of ammo logistics
- Professional Development / Military Education
- Skilled BAO teams for the BCT CDR
- Perishable skills lost at home station
- Surveillance & Quality Assurance
- BCS3 vs. MUREP vs. LOGSTAT
- Battlefield Task Migration – New missions, new support elements – not all wearing your patch, some civilians
- Ammo Automation MOS – New 89A
- New families of smart, brilliant, scalable, munitions and missile requiring new handling, packaging, maintenance

GO ORDNANCE!
AMMO WARRIOR 2030

- Officer
- Warrant Officer
- Non-Commissioned Officer
- Enlisted
- DA Civilian
- Contractor

Each with different areas of responsibility and expertise – but ALL with a solid tactical and technical understanding of ammunition and ammo support systems. They share a common operating picture of the battlefield and status of ammo.
FROM OUR FOXHOLE
THE FUTURE

- **Ammo and Ammo Soldiers** – We will have less of both, they will need to be smarter, multi-mission, rapidly deliverable, safe, survivable, accessible, and completely reliable

- **Training** – Life-long, adaptive, integrated across ammo log SME team, best of virtual, on-line, and resident capabilities

- **Information Technology** - Leverage best solutions for ammo accountability, ammo health monitoring, SA, and C4

- **Rearm Systems** – Mobility, survivability, rapid rearm

- **Distribution Platforms and MHE** – Common across the Future Force, designed to fully meet all needs – seamless interface with rearm systems, minimize man-in-the-loop

GO ORDNANCE!
CURRENT OD AMMO TEAMING

- **Army G-3** - Munitions Strategic Campaign Plan
- **Army G-4** - Unit Munitions Visibility, Accountability, Expenditure IPT
- **PEO Ammo/PD Joint Services** – Ammo Logistics R&D IPT Initiative
- **ARDEC** - Dev Team member to review munitions supportability analysis, training requirements
- **DAC and CASCOM Training Dev** – Ammo Training Community of Practice, Knowledge Harvesting
- **DAC Theater Assessment** – Capturing ammo LLs

GO ORD NANCE!
A PARTING SHOT

**FACT** - NO MATTER HOW AMMO LOG UNITS AND MANAGERS HAVE BEEN ORGANIZED, TRAINED, EQUIPPED, DEPLOYED, AND UTILIZED - THE ARMY HAS NOT LOST AN ENGAGEMENT BECAUSE OF A FAILURE OF AMMO LOGISTICS

A GREAT RECORD THAT **ALL** AMMO LOGISTICIANS CAN PROUDLY OWN ...

AND CANNOT LOSE!

**GO ORDNANCE!**
COL MICHAEL T. McBRIDE
Deputy Commander / Chief of Staff
US Army Ordnance Center and Schools
(410) 278-3285  (DSN) 298

CW5 DON DEHNEL
Deputy, TRADOC MSM Office, OMEMS
(256) 876-9179  (DSN) 746
BACKUP SLIDES

- Definitions
- Briefing Support
- Current Theater Operations
- Army Mod Force Units
- Army Ammo Transformation
- OD Training Overview
## DEFINITIONS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>AOE</td>
<td>Army of Excellence, pre-Mod Force Army organization</td>
</tr>
<tr>
<td>APE</td>
<td>Ammunition Peculiar Equipment</td>
</tr>
<tr>
<td>APS</td>
<td>Army Pre-positioned Storage</td>
</tr>
<tr>
<td>ASA</td>
<td>Ammo Supply Activity, any ASA in theater</td>
</tr>
<tr>
<td>ASP</td>
<td>Ammo Supply Point, receives, stores, issues ammo to units</td>
</tr>
<tr>
<td>ATHP</td>
<td>Ammo Transfer and Holding Point, mini-ASP at BCT level</td>
</tr>
<tr>
<td>ATP</td>
<td>Ammo Transfer Point, AOE Div team to</td>
</tr>
<tr>
<td>BCT</td>
<td>Brigade Combat Team</td>
</tr>
<tr>
<td>CEA</td>
<td>Captured Enemy Ammunition</td>
</tr>
<tr>
<td>COP</td>
<td>Community of Practice or Common Operating Picture</td>
</tr>
<tr>
<td>ESC</td>
<td>Expeditionary Support Command</td>
</tr>
<tr>
<td>E-TO-E</td>
<td>Joint End to End distribution process</td>
</tr>
<tr>
<td>IBCT</td>
<td>Interim Brigade Combat Team</td>
</tr>
<tr>
<td>IPE</td>
<td>Industrial Plant Equipment</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>LHS</td>
<td>Load Handling System, similar to PLS but on HEMTT truck</td>
</tr>
<tr>
<td>MHE</td>
<td>Materiel Handling Equipment (forklifts/cranes)</td>
</tr>
<tr>
<td>MOADS</td>
<td>Maneuver Oriented Ammo Dist System, a distribution-based ammo spt system that moved Army away from supply point support</td>
</tr>
<tr>
<td>PD</td>
<td>Professional Development</td>
</tr>
<tr>
<td>PLS</td>
<td>Palletized Load System – self-loading truck and platform system</td>
</tr>
<tr>
<td>POD/POE</td>
<td>Port of Debarkation/Embarkation</td>
</tr>
<tr>
<td>QASAS</td>
<td>Quality Assurance Specialist (Ammo Surveillance)</td>
</tr>
<tr>
<td>SA</td>
<td>Situational Awareness</td>
</tr>
<tr>
<td>SB</td>
<td>Sustainment Brigade, Mod Force primary support unit</td>
</tr>
<tr>
<td>SBCT</td>
<td>Stryker Brigade Combat Team</td>
</tr>
<tr>
<td>TAV</td>
<td>Total Asset Visibility</td>
</tr>
<tr>
<td>TMDE</td>
<td>Test, Measurement, and Diagnostic Equipment</td>
</tr>
<tr>
<td>TSC</td>
<td>Theater Support Command</td>
</tr>
<tr>
<td>TTP</td>
<td>Tactics Techniques, and Procedures</td>
</tr>
</tbody>
</table>
CASCOM Today

CG

Special Staff

Deputy to the CG

Knowledge Management

QA/LL Directorate

TCM Sust BC & ESD

AL&T

CSM

Deputy Commander for Training

Directorate of Training

Directorate of Training Support

Foreign LNOs GE, CA, FR, KO

HHC, CASCOM

Executive Operations

Command Planning Group

Secretary of the General Staff

G1/Personnel

G6/Automation

G8/Resource Mgt

Chief of Staff

Special Staff

Deputy to the CG

Knowledge Management

QA/LL Directorate

TCM Sust BC & ESD

AL&T

Directorate of Training

Directorate of Training Support

Foreign LNOs GE, CA, FR, KO

HHC, CASCOM

Executive Operations

Command Planning Group

Secretary of the General Staff

G1/Personnel

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G8/Resource Mgt

20 June 2008
# AMMO LOGISTICS

## “The Future Ain’t What it Used to be”

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>Warsaw Pact, Extreme Lethality, Primarily Conv CL V, Army, Joint/Cbd, AirLand Battle Force, Linear Battlefield, Fwd Based Forces, Supply Point Log, Pre MOADS-PLS, Breakbulk Ammo</td>
</tr>
<tr>
<td>2008</td>
<td>GWOT, Measured Lethality, Conv/Precision Mun, Army evolving to Joint, BCT-SBCT- Mod Force, Non Linear Battlefield, Mixed - Expeditionary, Supply Pt/Dist Mixed, Flex Mod Log PLS/LHS, CROPS, Mix CL/Single</td>
</tr>
<tr>
<td>2018</td>
<td>Full Spectrum Threat, Selective Lethality, Precision Munitions, Joint Forces, Mod/Future Force, Noncontiguous, Joint – Expeditionary, Dist Based Logistics, CLV Pkg/Auto Rearm, Constrained Budget, Reduced Log Foot</td>
</tr>
</tbody>
</table>

*We’ve come a long way, but – a long way to go...*
AMMO LIFECYCLE

- Reqmts to Funding
- R&D
- Produce GOCO/Contractor
- Install
- POE/APS
- Depot

Ammo Flow: Reqmts -> Funding -> R&D -> Produce GOCO/Contractor -> Install -> POE/APS -> Depot

Information Flow: Reqmts -> POD -> ASA Mod Ammo Plt/Co -> ATHP

POD: COCOM, TSC, JMC, HQDA

ASA Mod Ammo Plt/Co: ESC/ Sust Bde Ammo Mgt Ctrs

ATHP: BAO

Combat Unit: Consume

Retrograde for Demil, Redist, or Redeployment

Traditional OD/CASCOM Ammo Log Focus

GO ORDNANCE!
CHIEF’S GUIDANCE:

Three Core Competencies:
- Maintenance
- Ammo
- EOD

Bring the full spectrum of ammo stakeholders together –
Army Staff, DESB, AMC, TRADOC, PEO Ammo, JMC/DAC, CASCOM, OC&S, HRC, USAR, others

Completed May 2008
MAJOR TOPICS

Equipment: Munitions, MHE/APE/IPE, Info Tech, Distribution, TMDE, Packaging/Handing

Organizations: Integrated - tactical to Strategic, Joint, Modular, Split-Based, Full Lifecycle Functions

Training: Tactical/Technical, core munitions competencies, career-long path, certification, best mix of virtual, web-based, and resident training

Reach Capabilities: True TAV/SA, tele-presence, direct, real-time knowledge collaboration/management
Current Theater Ammunition Operations

Matured Theater
Quarterly Theater Re-supply
Retrograde Operations
FOB Closures
Air/Ground Distribution

1st TSC
Redeployed back to Ft. Bragg

OIF
316th/3rd ESC

ESC
SB x5
ASA x5
ATHPs(19)

ESC
TSA
ASA x2

JLC
SB (-)
ASA x3
ATHPx3

KUWAIT
311th

20 June 2008

GO ORDNANCE!
# ARMY SUPPORT UNITS

**TSC (3 WO)**
- 1<sup>st</sup> TSC Ft. Bragg
- 8<sup>th</sup> TSC Hawaii
- 21<sup>st</sup> TSC Germany

**ESC (2 WO)**
- 3<sup>rd</sup> ESC Ft. Knox
- 13<sup>th</sup> ESC Ft. Hood
- ?? Ft. Lewis
- 19<sup>th</sup> ESC Korea

_Sustainment Bdes (currently 2 WO going to 1)_
- 1<sup>st</sup> SB Ft. Riley
- 3<sup>rd</sup> SB Ft Stewart
- 4<sup>th</sup> SB Ft. Hood
- 7<sup>th</sup> SB Ft. Eustis
- 10<sup>th</sup> SB Ft Drum
- 15<sup>th</sup> SB Ft. Hood
- 16<sup>th</sup> SB Germany
- 29<sup>th</sup> SB
- 43<sup>rd</sup> SB Ft. Carson
- 45<sup>th</sup> SB Hawaii
- 64<sup>th</sup> SB
- 82<sup>nd</sup> SB Ft. Bragg
- 101<sup>st</sup> SB Ft. Campbell
- 501<sup>st</sup> SB Korea
- 507<sup>th</sup> SB
- 593<sup>rd</sup> SB Ft. Lewis

Red is a part of Grow the Army - GTA
ACTIVE DUTY
AMMUNITION UNITS

• 3 Ord BN-none are true Ord Bn w/numbered TOE Ammo Co’s:
  – 80th Ord Bn, Ft. Lewis, WA (to convert to a CSSB w/AAE)
  – 83rd Ord Bn, Japan (to convert to an CSSB w/AAE)
  – 6th Ord Bn, Korea

• 5 Ord Companies CONUS*
  – 8th Ord Co, Ft. Bragg, NC (HQ & 3 plts)
  – 24th Ord Co, Hunter Army Airfield, GA (HQ & 5 plts)
  – 60th Ord Co, Ft. Carson, CO (HQ & 3 plts)
  – 63rd Ord Co, Ft. Lewis, WA (HQ & 3 plts)
  – 664th Ord Co, Ft. Hood, TX (HQ & 5 plts)

• OCONUS*
  – 23rd Ord Co, Germany (HQ & 2 plts)
  – 17th Ord Co, Korea
  – 52rd Ord Co, Korea
  – 84th Ord Co, Korea

*Permanent station - units/plts may be deployed
<table>
<thead>
<tr>
<th>Location</th>
<th>BCTs Information</th>
</tr>
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<tbody>
<tr>
<td>Ft. Benning</td>
<td>HBCT (1 - HBCT)</td>
</tr>
<tr>
<td>Ft. Bliss</td>
<td>HBCT (6 – 4 HBCT/2 IBCT)</td>
</tr>
<tr>
<td>Ft. Bragg</td>
<td>IBCT (4 – IBCT(ABN))</td>
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<tr>
<td>Ft. Campbell</td>
<td>IBCT (4 – IBCT)</td>
</tr>
<tr>
<td>Ft. Carson</td>
<td>HBCT (5 – 3 HBCT/2 IBCT)</td>
</tr>
<tr>
<td>Ft. Drum</td>
<td>IBCT (3 – IBCT)</td>
</tr>
<tr>
<td>Ft. Hood</td>
<td>HBCT (4 – HBCT)</td>
</tr>
<tr>
<td>Ft. Knox</td>
<td>IBCT (1 – IBCT)</td>
</tr>
<tr>
<td>Ft. Lewis</td>
<td>SBCT (3 – SBCT)</td>
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<tr>
<td>Ft. Polk</td>
<td>IBCT (1 – IBCT)</td>
</tr>
<tr>
<td>Ft. Riley</td>
<td>HBCT (3 – 2HBCT/IBCT)</td>
</tr>
<tr>
<td>Ft. Stewart</td>
<td>HBCT (4 – 2 HBCT/2 IBCT (1 – IBCT))</td>
</tr>
<tr>
<td>White Sands</td>
<td>HBCT (1 – HBCT)</td>
</tr>
<tr>
<td>Alaska</td>
<td>IBCT(ABN)/SBCT (2 – IBCT(ABN)/SBCT)</td>
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<tr>
<td>Germany</td>
<td>SBCT (1 – SBCT)</td>
</tr>
<tr>
<td>Hawaii</td>
<td>IBCT/SBCT (2 – IBCT/SBCT)</td>
</tr>
<tr>
<td>Italy</td>
<td>IBCT(ABN) (1 – IBCT(ABN))</td>
</tr>
<tr>
<td>Korea</td>
<td>HBCT (1 - HBCT)</td>
</tr>
</tbody>
</table>

Red is a part of Grow the Army - GTA

20 June 2008
<table>
<thead>
<tr>
<th>Fires Bdes (6)</th>
<th>Avn Bdes (11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Ft. Bliss</td>
<td>Ft. Bliss</td>
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<tr>
<td>1 – Ft. Bragg</td>
<td>Ft. Bragg</td>
</tr>
<tr>
<td>1 – Ft. Hood</td>
<td>Ft. Campbell (2)</td>
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<tr>
<td>1 - Ft. Lewis</td>
<td>Ft. Drum</td>
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<tr>
<td>2 – Ft. Sill</td>
<td>Ft. Hood</td>
</tr>
<tr>
<td></td>
<td>Ft. Riley</td>
</tr>
<tr>
<td></td>
<td>Ft. Stewart (HAAF)</td>
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<tr>
<td></td>
<td>Germany</td>
</tr>
<tr>
<td></td>
<td>Hawaii</td>
</tr>
<tr>
<td></td>
<td>Korea</td>
</tr>
</tbody>
</table>

Red is a part of Grow the Army - GTA
RC AMMUNITION UNITS

- 1 Ammo Group:
  - 303 Ord Group, Springfield, IL
- 4 Ord Bn:
  - 125th Ord Bn, Billings, MT
  - 320th Ord Bn, Lincoln, NE
  - 321st Ord Bn, Cross Lane, WV
  - 322nd Ord Bn, Kenova, WV
- 13 Ord Ammo Co.
  - 163rd Ord Co, Santa Ana, CA (HQ, HLP & MLP)
  - 221st Ord Co, Ft. Wayne, IN (HQ, HLP & MLP)
  - 261st Ord Co, Cross Lane, WV (HQ, HLP & MLP)
  - 266th Ord Co, Aguadilla, PR (HQ, HLP, MLP)
  - 295th Ord Co, Hasting, NE (HQ, HLP & MLP)
  - 351st Ord Co, Romney, WV (HQ, HLP & MLP)
  - 395th Ord Co, Appleton, WI (HQ, HLP & MLP)
  - 452nd Ord Co, Aberdeen, SD (HQ, HLP & MLP)
  - 592nd Ord Co, Billings, MT (HQ & MLP)
  - 802nd Ord Co, Gainesville, GA (HQ & MLP)
  - 811st Ord Co, Rainelle, WV (HQ, HLP & MLP)
  - 826th Ord Co, Madison, WI (HQ, HLP & MLP)
  - 962nd Ord Co, Plattsburg, NY (HQ & MLP)

GO ORDNANCE!
Transformation - Arm

From

- Modular Ammo CO HQs and PLTs, BNs and Groups based on geographical support using supply point logistics
- Reliance on other echelons for support
- Corps provided ASP and storage areas in Division AO

To

- Modular Ammo CO HQs and PLTs, BNs based on METT-TC
- Tailored configured loads delivered forward in the battle space
- Supports Mission Staging Operations (MSO)
- TSC / ESC
  - Receive, store, issue and reconfigure Configured loads (CL) and build Mission Configured Loads (MCL)
    - Maintain, manage, theater level stockages
    - Support theater opening
    - SAAS-MMC in SUS DMC for AMMO management
- Div / Corps - limited reconfiguration of MCLs and reconfigures and redistributed retrograde - METT-TC organized with mix of Med and Hvy PLTs
- BCT / Bdes - Embedded Ammo management function (SAAS-DAO)
  - Brigade organic 13 soldier ATHP design allows for munitions accountability and limited storage (SAAS-ASP)
  - Distro platoons and companies distribute to unit level
  - Limited ability to reconfigure loads
## OK…What’s Different at MY BDE Level – AOE vs BCT?

<table>
<thead>
<tr>
<th>Personnel - 6</th>
<th>Equip</th>
<th>Mission</th>
<th>Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>From</strong></td>
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<tr>
<td><strong>DIV</strong></td>
<td>From</td>
<td></td>
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</tr>
<tr>
<td>E-6 89B</td>
<td>SAAS</td>
<td>Provide</td>
<td>“Transfer Point”</td>
</tr>
<tr>
<td>E-5 89B</td>
<td>ATP</td>
<td>ammo spt</td>
<td>PLS Flatrack Exch</td>
</tr>
<tr>
<td>E-4 89B x 2</td>
<td></td>
<td>to Bde</td>
<td>or transload ammo</td>
</tr>
<tr>
<td>E-3 89B x 2</td>
<td></td>
<td>sector.</td>
<td>stocks from corps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Receives</td>
<td>trucks to combat unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mission</td>
<td>trucks.</td>
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<td>guidance/</td>
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<td></td>
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<td>priorities</td>
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<td>from DAO.</td>
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<table>
<thead>
<tr>
<th>Personnel - 13</th>
<th>Equip</th>
<th>Mission</th>
<th>Capabilities</th>
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<tbody>
<tr>
<td><strong>TO</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>BCT</strong></td>
<td>From</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 890A</td>
<td>From</td>
<td></td>
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<tr>
<td>E-6 89B</td>
<td>SAAS</td>
<td>Provide</td>
<td>“Mini-ASP”</td>
</tr>
<tr>
<td>E-5 89A*</td>
<td>ATP</td>
<td>ammo spt</td>
<td>Receive, store,</td>
</tr>
<tr>
<td>E-5 89B x 2</td>
<td></td>
<td>to BCT.</td>
<td>Issue, acct for</td>
</tr>
<tr>
<td>E-4 89A*</td>
<td></td>
<td>Receives</td>
<td>Bde ammo stocks</td>
</tr>
<tr>
<td>E-4 89B x 4</td>
<td></td>
<td>mission</td>
<td>Limited inspection</td>
</tr>
<tr>
<td>E-3 89B x 3</td>
<td></td>
<td>guidance</td>
<td>and maint of CL V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and priorities</td>
<td>Stocks.</td>
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<td>from BAO.</td>
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<td></td>
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<td></td>
<td>BCT manages, accounts</td>
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<td></td>
<td></td>
<td>for, and distributes its</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ammunition</td>
</tr>
</tbody>
</table>

### 89B - Ammo Specialist

### 89A - Ammo Stock Records and Acct Spec – New MOS

**Note:**
- AOE Division managed/distributed ammo to bdes
- BCT manages, accounts for, and distributes its ammunition

**Table:**
- REC/ISS 62 STONS
- STORE 14 STONS
- SURGE 138 STONS

---

20 June 2008
# Ordnance Enlisted Training & Development Model

<table>
<thead>
<tr>
<th>RANK</th>
<th>PV1-SPC</th>
<th>SGT</th>
<th>SSG</th>
<th>SFC</th>
<th>MSG/SGM</th>
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<td>PME</td>
<td>AIT</td>
<td>WLC</td>
<td>BNCOC</td>
<td>ANCOC</td>
<td>SMA</td>
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<td>89A/B</td>
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</tr>
</tbody>
</table>

## AMMO DEVELOPMENTAL & UTILIZATION ASSIGNMENTS

- Ammunition Specialist/Stock Cont & Acct Spec
- Ammunition SGT
- Ammo Supply SGT
- Ass’t Sec Chief
- Sect Chief
- Ammo Inspector
- Ammo Supp Sergeant
- Logistics Sergeant
- Sr. Ammo Inspector
- Operations Sergeant
- Chief Ammunition NCO

## ADDITIONAL TRAINING

- 89A
- ASP MOU
- dl
- eOrdnanceU/BCKS/AKO/MMT/L2

## LEADERSHIP ENGAGEMENT

- Army e-Learning/DANTES/COOL/SOCAD/ACES

**SD Goals**

20 June 2008
Warrant Officer Training & Development Model

**RANK**

- **WO1**
- **CW2**
- **CW3**
- **CW4**
- **CW5**

**PME**

- **WOBC**
- **WOAC**
- **SWOC**
- **SWOSC**

**AMMO DEVELOPMENTAL & UTILIZATION ASSIGNMENTS**

- BSB ATHP
- Accountable Off
- MOD Ammo PL/CO
- Advisor
- Instructor/ Writer
- Distro Management Center (DMC) (SB/ESC/TSC)
- Advisor
- Instructor/ Writer
- DMC (ESC/TSC)
- TNG/Combat Developer
- Combat Readiness Ctr
- Sr. Advisor/Manager (ASCC/Joint Command)
- DA (G-3/G-4)

**ADDITIONAL TRAINING**

- WOBC SL
- eOrdnanceU/BCKS/AKO/L2

**SD Goals**

20 June 2008

Baccalaureate Degree/Professional Cert

Graduate Studies/Professional Certification
Ordnance Officer Training & Development Model

YEARS
0
10
20
30

RANK
LT
CPT
MAJ
LTC
COL

PME
BOLC III
CLC3
ILE
SSC

AMMO DEVELOPMENTAL & UTILIZATION ASSIGNMENTS
BSB ATHP Control Off
MOD Ammo CO
Ammo Bn Staff
BAO

DIV/Corps/ Theater Staff
Instructor/ Writer
Sust BDE SPO
Ammo Branch
ESC/TSC DMC Ammo

JMC Branch Chief
Ammo Depot Cdr
Ammo Bn Cdr

Joint/ Combined Staff
Theater/ Army Staff
AMC
Key Billet Depot

ADDITIONAL TRAINING
BAO Course
Theater Ammo Course
eOrdnanceU/BCKS/AKO/L2

SD Goals
Baccalaureate Degree/Professional Cert
Graduate Studies/Professional Certification

20 June 2008
Precision Strike Association &
NDIA Picatinny Chapter

Intelligent Munitions System (IMS)

June 2008

COL Ray Nulk
Project Manager
(973) 724-7041
raymond.nulk@us.army.mil

LTC James Winbush, Jr.
Product Manager
(973) 724-4606
james.winbushjr@us.army.mil
PM CCS Mission

Provide the Warfighter world-class close combat, force protection & assured mobility capabilities across full spectrum operations through professional, integrated Joint Life-Cycle Management.
Intelligent Munitions System (IMS) Characteristics (1 of 2)

- **IMS SYSTEM CHARACTERISTICS:**
  - Evolutionary acquisition program developed in an incremental approach
  - An integrated system of sensors, lethal anti-vehicle (AV) and anti-personnel (AP) munitions, software & communications
  - Capable of employment for the detection, classification, tracking, and engagement of ground targets
  - Operational Capabilities:
    - Force Protection
    - Networked Lethality
    - Enables Assured Mobility
    - Enhances Situational Understanding
    - Denies the enemy freedom of action
    - Enables the Urban fight
Intelligent Munitions System (IMS) Characteristics (2 of 2)

- Provides the Force with a networked munitions system that provides enhanced capabilities over traditional stationary obstacle/barrier systems
- IMS supports transitions, hasty and deliberate defense, cordon and search, isolation of urban areas, route and convoy security, thereby enabling a scalable response as situations develop
- IMS will protect the Force during operations by tailoring protective counter-mobility and survivability support as well as by providing temporary and fixed site security
- IMS is a building block that can be used to emplace larger fields and cordon/isolate urban areas through means of persistent surveillance and screening

Anti-Vehicle/ Anti-Tank System
System Overview

Command & Control (C2)
- Via handheld controller
- Can control other munitions
- Spider radio as interim for Joint Tactical Radio System

Dispensing Module (DM)
- Hand-emplaced
- 100m protective obstacle
- Employed in 5 minutes
- 145 lbs (max), 24”x24”x14.5”

Effects Electronics Module
- Provides central C2 in the field
- Sensor fusion
- Munition controller

Sensors
- Enable coordinated attack
- Acoustic, seismic, & terminal sensors

Effects
- Lethal AV & self-protect AP
- Initiate Demolitions
- Munitions Adapter Module (MAM)

System Capabilities
- Self-Destruct & Self-Deactivate
- ON-OFF-ON — “Safe Passage”
- Transfer of control
- Large lethal engagement (100m)
- Provides situational awareness information
- Re-usable, modular design reduces log footprint
- 30-day operational life (tactical)
- Immediate kill “out of the box”
- Multiple DMs can create larger field

Modular Components

Control Station

Four Launcher Assemblies w/one AV effect each

Four Spider Miniature Grenade Launchers w/one AP effect each

Two Battery Modules, 30-day life

1500-3800 m
IMS Area of Influence

Effective Situational Awareness Coverage (200m radius)

Effective Lethal Range of AV Effect (50m radius)
Ground Algorithm

- Acoustic Array
- Seismic Array
- Sensor Processing Algorithms
- Acoustic Information
- Seismic Information
- Range Data
- Range Rate Data
- Acoustic Information
- Seismic Information
- Seismic Bearings

From Other DMs
- Range Data
- Range Rate Data

TS Processing Algorithms
- C-Band Radar

Vehicle Tracking and Classification
- Cartesian Tracks
- Range Tracks
- Cartesian Track Engagement
- Radar Track Engagement

Personnel Detection and Tracking
- Cartesian Tracks
- Personnel Engagement
- Engagement

Personnel Detection and Tracking
- Engagement

Sensor Processing Algorithms
- Engagement
- Engagement

C-Band Radar
- Engagement

TS Processing Algorithms
- Engagement

C-Band Radar
- Engagement
Airborne Algorithm

- Urban Environment Detection Algorithm
- Active IR
- Filter
- Obscurant Detection Algorithm
- Passive IR Array
- Passive IR Adaptive Threshold Algorithm
- Minimum Threshold
- Fixed Step Threshold
- Active IR Edge Detection Algorithm
- Active IR
- Active Only Fire Logic Algorithm
- Active Only Fire Logic Algorithm
- Active/Passive Fire Logic Algorithm
- Passive IR Filtering and Detection Algorithm
- Revert to Passive Fire Logic Algorithm
IMS Vehicle Engagement

- Detects, classifies & tracks using acoustic & seismic sensors
- Engages using Terminal Sensor (radar) & tracking data
- Launches SFKM
- SFKM uses active/passive infrared sensor to detect vulnerable region of target
- SFKM initiates a copper combined effects warhead to defeat both heavily & lightly armored targets
IMS Urban Testing
McKenna MOUT
Dec 22, 2007
Tactics and Obstacle Effects

• IMS can be deployed in multiple ways to fit the Warfighter’s needs
  – Offensive / defensive engagements
  – Open field and complex urban situations
  – Hasty Protection

• IMS Delivery Methods:
  – Hand Emplacement (Current Increment)
  – Ground Vehicles (Future Increments)
  – Remote (Future Increments)

• Types of Obstacle Effects:
  – Disrupt
  – Fix
  – Turn
  – Block
Fix

<table>
<thead>
<tr>
<th>OBSTACLE GROUPs:</th>
<th>PURPOSE:</th>
<th>FIRES &amp; OBSTACLES MUST:</th>
<th>OBSTACLE CHARACTERISTICS:</th>
<th>FM 3-90, Tactics, Appendix B</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIX</td>
<td>Slow an attacker within an area so he can be destroyed. Generate the time necessary for the friendly force to disengage.</td>
<td>Cause the enemy to deploy into attack formation before encountering the obstacles. Allow the enemy to advance slowly in an EA or AO. Make the enemy fight in multiple directions once he is in the EA or AO.</td>
<td>Arrayed in depth. Span the entire width of the avenue of approach. Must not make the terrain appear impenetrable.</td>
<td></td>
</tr>
</tbody>
</table>

**TODAY**

- F
- MORTAR FPF
- TRP 01
- TRP 03
- TRP 04

**With IMS**

50-60% probability of encountering a DM lethal radius across a company frontage. Prob of Kill is .5 to .6 kills/meter.

Initial State – ARMED

Initial State – SAFE...ARM as situation develops

DM

TGT GRP (NEUTRALIZE)

TGT GRP (DESTROY)

FPF

TRP 01

TRP 03

TRP 02

TRP 04

MORTAR FPF
## Block

<table>
<thead>
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<th>OBSTACLE CHARACTERISTICS:</th>
<th>FM 3-90, Tactics, Appendix B</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOCK</td>
<td>Stop an attacker along a specific avenue of approach.</td>
<td>Prevent the enemy from bypassing or penetrating through the belt.</td>
<td>Must tie into impassable terrain.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevent an attacker from passing through an AO or EA.</td>
<td>Stop the enemy’s advance.</td>
<td>Consist of complex obstacles.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stop the enemy from using an avenue of approach and force him to use another avenue of approach.</td>
<td>Destroy all enemy breach efforts.</td>
<td>Defeat the enemy's mounted and dismounted breaching effort.</td>
<td></td>
</tr>
</tbody>
</table>

### TODAY

- Block
- Linear TGT (DESTROY)

### With IMS

85+% probability of encountering a DM lethal radius across a company frontage. Prob of Kill is 1.1 kills/meter.

![Diagram of Block TODAY and With IMS](image)
Summary

• IMS is the program of record to replace the current persistent anti-vehicular/anti-tank landmines

• Provides the Warfighter with “ON-OFF-ON” and “Safe Passage” capability.

• Provides the Warfighter with immediate lethality “out of the box”

• SFKMs achieve precision kills with minimum logistics footprint

• IMS leaves a clean battlefield

• IMS complies with US National Landmine Policy
NSWC Dahlgren Division
Picatinny Detachment

Firepower Conference
10-11 June 2008
Parsippany, NJ

Michael Till
NSWC Dahlgren
Head, Gun Systems &
Light Weapons Division (G30)
michael.till@navy.mil

Dave Rogers
NSWC Dahlgren
Picatinny Detachment
Transition Manager (G307)
david.l.rogers@navy.mil

BRAC Implementation – Recommendation #186
Integrated Weapons and Armament Specialty Site
for Guns & Ammunition at Picatinny Arsenal
Move Gun and Ammo RD&A functions to Picatinny Arsenal, NJ from:

- NSWC Crane Detachment at Fallbrook, CA
- NSWC Crane, IN (except energetics and RD&A T&E in support of Special Operations)
- NSWC Port Hueneme Detachment Louisville, KY
- NAWC China Lake, CA (except energetics)
- Adelphi Laboratory Center, MD (Army)

Move Weapon and Armament Packaging, Handling, Storage and Transportation (PHS&T) RD&A and T&E function from NSWC Indian Head Detachment Earle, Colts Neck, NJ
Integrated Weapons & Armaments
Specialty Site for Guns & Ammunition

BRAC 2005 RECOMMENDATION 186 TECH 0018B

NSWC Weapons Division
Division Crane, IN
NSWC Weapons Division
China Lake, CA
NSWC Division Crane, IN
Detachment Fallbrook, CA
NSWC Division Port
Hueneme, CA
Detachment Louisville, KY
Picatinny Arsenal, NJ
NSWC Division Indian Head
Detachment Earle, NJ
Adelphi Lab Center,
MD (Army)

Losing
Receiving
Approved Business Plan End-State
Realign 220, Eliminate 37

Crane (236 FTE)
- Guns & Ammo T&E (24 FTE)
- Special Ops RDA (127 FTE)
- Guns & Ammo Sustainment
- Guns & Ammo PM
- Guns & Ammo RDA (85 less 12 eliminations)

(73 FTE)

Fallbrook (118 FTE)
- Guns & Ammo T&E (108 FTE)
- Guns & Ammo RDA (9 FTE)

Earle (63 FTE)
- Weapons & Armament PHS&T (63 less 9 eliminations) (54 FTE)

Indian Head (43 FTE)
- Energetics (43 FTE)

Louisville (223 FTE)
- Guns & Ammo RDA (95 less 15 eliminations) (80 FTE)
- OEM On-site support (23 FTE)
- Non-Guns functions (105 FTE)

Picatinny
Specialty Site for Guns & Ammo

Adelphi (44 FTE)

Army Action

Legend: Excluded by BRAC
Realigned by BRAC
Criteria: Gov’t FTEs based on BRAC certified data. On-site contractor FTEs not included
Transition Status

- Detachment established by Commander, Naval Sea Systems Command
  - Naval Surface Warfare Center, Dahlgren Division, Picatinny Detachment
  - Type II Detachment
  - Site UIC Assigned: 38634
### Transition Implementation Schedule

<table>
<thead>
<tr>
<th>FY 07</th>
<th>FY 08</th>
<th>FY 09</th>
<th>FY 10</th>
<th>FY 11</th>
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</thead>
<tbody>
<tr>
<td>Brief to NSWC – 18 May 07</td>
<td>Brief to Army-Navy G&amp;A BOD Executive Comm</td>
<td>Navy Forward Team Transition</td>
<td>Transfer of PM4 Complete</td>
<td>Inter-Service Support Agreement In Place</td>
</tr>
<tr>
<td>Detachment Stand-Up</td>
<td>Navy Forward Team Transition</td>
<td>Transfer of PM4 Complete</td>
<td>Inter-Service Support Agreement In Place</td>
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</tr>
<tr>
<td>Personnel / Equipment Transfer</td>
<td>Personnel / Equipment Transfer</td>
<td>China Lake &amp; Fallbrook</td>
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<td></td>
</tr>
<tr>
<td>Administrative Re-Alignment</td>
<td>Crane *</td>
<td>Earle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRACCON Construction</td>
<td>BRACCON Construction</td>
<td>Earle &amp; Louisville Personnel / Equipment Transfer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Highlights**
- Staggered Transition Of Functions
- Accelerate Transition As Possible
- Driven By Equipment/Facility Dependencies & Funding Availability

*Accelerated from FY10 to FY09 pending space and funding availability*
Transition Status

• Crane early transition
  – PM Conventional Ammunition transition complete
  – Hired Requirements Manager 31 March 08
  – Currently have 7 people onboard
  – New employees are developing primarily through on the job training
  – Retained one experienced PM4 employee as a contractor to assist with the transition
Conventional Ammunition Program
Office PM4 NSWC Crane

- Responsible for the management, in-service engineering and acquisition support of 2T Cog (Surface) Conventional Ammunition for the US Navy
- Provides Program Management of Ammunition in the following categories:
  - Small Caliber (thru .50Cal)
  - Minor Caliber (20MM thru 40MM)
  - Intermediate Caliber (57MM and 76MM)
  - Major Caliber (5 inch and 16 inch)
  - Pyrotechnics and Demolition Material
  - Ammo In-Service/Malfunction management
- SMCA & JOCG in-service interface for NAVSEA items.
- Manages 414 ammo configurations with an annual budget of approximately $150M.
2T COG  Conventional Ammo
Organization

Conventional Ammunition APM
LtCol Robert White
202-781-1880

Ammunition Engineer
Steve Pitzel
202-781-1512

Business and Financial Manager (PANMC)
Janette Yates
202-781-3556

Deputy Program Manager
Dion Serben
973-724-4286

Small Caliber Ammo Manager
Timothy Riffel
973-724-9301

Major Caliber Ammo Manager
Elias Vainchenker
973-724-9609

Minor/Intermediate Caliber Ammo Manager
Karen Ross
973-724-9250

Pyro/Demo Material Manager
Michael Hagn
973-724-6137

Ammo Requirements Manager
Elizabeth Kamp
(973) 724-9231

Ammo In-Service/Malfunction Manager
Mike Bottass
973-724-9782

Support Staff
Crane, IN

Program Management
John Niehaus
812-854-3987

Financial Analyst
Melissa Ranard
812-854-4352

Acquisition Analyst
Lindsay Skinner
812-854-4351

Wash, DC
Navy Yard

Picatinny Detachment
Transition Status

• Crane Transition
  – Ammunition RD&A positions
    • Acquisition Engineering (AEA) function
    • In Service Engineering (ISEA) function
  – Planning a phased transition with potential hiring in FY 09
  – Positions identified
    • Includes journeyman and entry level
  – Swing space has been identified at Picatinny in building 3342
  – Concern is forward funding of BRAC $ to support
Transition Status

• Earle Transition
  – Administrative transition to NSWC Dahlgren in FY09
  – Benefits the employees by aligning with future command earlier
  – MOA developed between IHD and DD to agree on the transition date and the process, currently in review
  – Expect to transition mid FY 09
  – No physical changes until BRACON complete
  – Majority of functions are facility dependant
Transition Status

- Louisville and China Lake
  - Facility dependent
  - Planned for later transition
BRACON Fully Funded by Navy

NSWC Crane
PM4

NSWC Crane
Code 40

NAWC China
Lake

NSWC PHD Det
Louisville

NSWC IHD Det
Earle PHST

Tech Data Facility
$13M
Remodel Existing
PN 65527
Building 61, Downtown Pica

Systems Tech Data
Ordnance Lab
Remodel Existing
PN 65527
Building 25, Downtown Pica

Auto Gun Test Facility
Remodel Existing
PN 65527
Explosive Area, Range 647

Turret Facility
$11.5M
Remodel Existing
PN 65525
Building 3150, Navy Hill Area

PHST Facility
$26M
New Construction
PN 65425
Located Next to Bldg. 455

PN 65527
$13 M

PN 65525
$12 M

PN 65425
$26.0 M

$51 M
Navy BRACONs
Spread across Picatinny

- 647 Range
- 3150 Turret
- 25 Lab & Shop
- 61 RD&A
- 455 PHST
- 1 HQ

Distances:
- 3 miles
- 2.0 miles
- 3 miles

Range: 3 miles
Lab & Shop: 2.0 miles
HQ: 3 miles
BRACON Status

• DD-1391 65425 PHST Center
  – Recent Activities
    • Final Concept Report Issued Feb 2008
  – Upcoming events
    • 30% Design May 2008

• Project Schedule Milestones
  – Award Construction Contract Mar 2009
  – Construction Complete Jan 2011
  – Moves complete Aug 2011
BRACON Status

• DD-1391 65525 Weapons Systems Lab (Turrets):
  – A&E contract Awarded
  – Site visit to Louisville conducted 27 April 08
  – Design Planning Charrette kickoff held at Picatinny 1 May 08
  – Design Charrette scheduled for 3-6 June 2008 at Picatinny

• Construction Project Milestones
  – Construction Contract Ready-to-advertise (RTA) Mar 2009
  – Award Construction Contract Jun 2009
  – Construction Complete Sept 2010
  – Moves Completed Mar 2011
BRACON Status

• DD-1391 65527 Tech Data Center
  – Tech Data Center Building 61 Renovation
  – Auto Gun Test Facility Range 647 New Construction
  – Gun Weapons Systems Lab Building 25 Renovation

• Recent Accomplishments
  – All sites visited by A&E in Feb-Mar
  – Design Charrette review at Picatinny 10-14 March
  – Charrette parametric design report issued
  – Design review held 5-7 May at Picatinny
Transition Tools

- Cross Service Guns and Ammo Executive Board of Directors
  - Rotating Chair, ARDEC about to turn over lead to NSWC HQ
  - Chartered with developing the Guns and Ammo enterprise vision for the future
Transition Tools

• Transition IPT
  – Wide participation with affected sites as well as Navy and Army leadership

• Tech Data IPT
  – Chartered to identify issues and challenges associated with bringing mass volumes of Navy tech data to Picatinny

• Human Capital IPT
  – Chartered with developing strategies to encourage people to come with the function as well as strategies to transition the knowledge

• Quarterly News Letter
Summary

• Phased Transition Roadmap In Place
• Ammo PM Transfer complete
• Accelerating Transition within Funding and Facility Constraints
• Human Capital and retention of expertise is a major concern being addressed by an Integrated Product Team with membership from each site
Questions?

Historic

Picatinny Naval Detachment’s Commander’s Quarters