Agenda
Mortars and Artillery Ammo

- Excalibur
- Precision Guided Mortar Munition (PGMM)
- Precision Guidance Kit (PGK)
- Mortar Fire Control System (MFCS)
- Production Status/Backlog
- Cost Reduction Efforts
- Impacts of BRAC
- Summary
Civil War – Ammunition

- 3.67-inch Sawyer Canister
- 12-pounder Parrott Canister
- 10-pounder Parrott Canister
- 3.8-inch James Hot Shot
- 12-pounder Howitzer
- 12-pounder James Canister Base
- 2.9-inch Quilted Grape
- 12-pounder Stand of Grape
- 6-pounder Smoothbore Canister
- Tennessee Sabot
- 12-pounder Canister Base
- Armstrong
- Absterdam
- Broun
- Dyer
- Archer
- Selma
- Read-Parrott
- Schenkl
- Brooke

Bournemouth time fuse (3-1/4 seconds)
Undeploy
Shrapnel matrix
Lead cone-shot balls
Bursting charge/cavity
Weight iron ring (sabot)
Operational Concept

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

System Initialization

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

Mission Planning

- Latitude / Longitude / Altitude

GPS Acquisition and Track

Deploy Canards prior to Apogee (Ballistic prior to Apogee)

Impact Near Vertical for Max Lethality

Fragmenting Warhead

Structure Top Attack (Detonation after Penetration)

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
Testing Results
Precision Guided Mortar Munition

PGMM
Fire Support Element (FSE)

Fire Direction Center (FDC)

Mortar Squad

Forward Observer

Simple Mission Setting

Ballistic Flight to Target Acquisition

Terminal Guidance
  • SAL Seeker
  • Thrusters

Acquire

Leverages Existing Fire Support Systems
Reduces Collateral Damage

Masonry Structures
Earth and Timber Bunkers
Light Armor Vehicles

Precision Munitions Increase Warfighter Effectiveness
Precision Guidance Kit (PGK)
For Artillery Projectiles
The Need

Customer Needs
- Increased Effectiveness (kills targets quicker)
- Increased Stowed Kills Per Platform
- Reduced Collateral Damage
- Reduced Logistics Burden
- Closer Support of Friendly Troops

Increased Precision Provides Major Improvements to Cannon Artillery Effectiveness
PGK Acquisition Strategy

- PGK is FY06 Army Technology Development (TD) effort
- PGK is a course correcting fuze capability that improves projectile accuracy of the current stockpile of 155mm and 105mm artillery ammunition
- Our strategy is an incremental approach to improve projectile delivery accuracies:
  - Increment 1 - less than 50 meters CEP (155mm HE)
  - Increment 2 - less than 30 meters (all 155mm)
  - Increment 3 - less than 30 meters (Includes 105mm)
- Multiple PGK TD contract awards are planned for April 2006 for a system prototype demonstration / shoot-off in an operational environment in October 2006
Mortar Fire Control System
Mortars were reliable, responsive and lethal

“MFCS allows for greater accuracy than we’ve ever had and that equates to immediately suppressing and destroying the enemy” Maj Karcher 1CD

“A Marine Major from a supported unit literally hugged every crew member that had MFCS and was supporting him. When requesting mortar fire support, that Major specifically wanted the mortar crews that had MFCS. They stated the target reports on all MFCS hits were “Dead On”!”

“60mm provided excellent IR Illumination while used in the hand held mode.”

“D+4 the enemy could not move without a mortar round landing on his head.”

“120mm – Good system for pounding targets up in the mountains and at long distances. Provides good range for base security.”

“MFCS made the difference in every single mission. They dropped 854 rounds using MFCS and every round hit the target!”

“Mortars were very versatile on the battlefield. They were able to reach enemy forces in defilade and within fortifications.”

“All enemy KIA came from the 120mm mortar…”

Comments from 1st MAR DIV AAR, 3rd IN DIV, and 1st CAV DIV, 101st ABN DIV, the 75th Ranger Regt and the 10th Mountain Division
### 120mm Mortar Actual CLFCC VL Illumination Usage

#### Quantity per Month

<table>
<thead>
<tr>
<th>Month</th>
<th>120mm Mortar Actual CLFCC VL Illumination Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 04-Feb 05</td>
<td>522  293  320  244  148  203  722  306  107  226  12  74</td>
</tr>
<tr>
<td>Mar 05</td>
<td></td>
</tr>
<tr>
<td>Apr 05</td>
<td></td>
</tr>
<tr>
<td>May 05</td>
<td></td>
</tr>
<tr>
<td>Jun 05</td>
<td></td>
</tr>
<tr>
<td>Jul 05</td>
<td></td>
</tr>
<tr>
<td>Aug 05</td>
<td></td>
</tr>
<tr>
<td>Sep 05</td>
<td></td>
</tr>
<tr>
<td>Oct 05</td>
<td></td>
</tr>
<tr>
<td>Nov 05</td>
<td></td>
</tr>
<tr>
<td>Dec 05-Jan 06</td>
<td></td>
</tr>
</tbody>
</table>

**Monthly Average:**
- Nov 04-Feb 05: 130
- Mar 05: 16
- Apr 05: 52
- May 05: 75
- Jun 05: 289
- Jul 05: 324
- Aug 05: 281
- Sep 05: 245
- Oct 05: 567

**Overall Monthly Average Increased from 130 to 411**

**Constrained Supply Rate Lifted 1 Mar 05**

**Urgent Materiel Release/ 1st Delivery to Theater 22 Feb 05**

**Requirements met through April 2009**
Reducing Production Backlog*

Production backlog has been reduced by 43% through Jan 06

All Back-Log Eliminated by 1 Dec 06

*FY04 & Prior
Training Ammo Cost Reduction Concepts

- Use more mortar FRPC (75/25 FRPC/HE Mix)
- Use 81mm insert for much of 120mm mortar training
  - 81mm HE, Smoke and Illum rounds significantly less costly
- Use stockpile inventory that’s above the required level to partially meet training needs
- Staggering year by year of Mortar Illum and Smoke procurements to achieve larger and more economical production buys
- Efficiencies in ESIP and TDPs
- Focusing IM efforts on developing low cost melt pour IM explosive fill alternatives
- Using System contracting where cost effective

Assessing Industry Base Impact for all Cost Reduction Ideas
Our goal is to align S&T and IR&D initiatives with existing programs and future needs

- Develop an Integrated technology strategy driven by need, and urgency
- Pull IR&D and ATO’s into the Acquisition Process sooner
- Engage DARPA, ARDEC, & Industry to ensure technology is available to meet future program and operational requirements

The focus is to integrate technology efforts across Army organizations into a coherent strategy
Technology Gaps

- Low Cost IM
- Scalable Non-Lethal (N-L) Effects
- Power Source Alternatives
- Proximity fuze technology which cannot be exploited
- Low Cost Precision for 105mm & 155mm Artillery
  Projectiles and 60mm & 81mm Mortars bombs
- Environmentally Friendly obscurants
- Scalable Lethal Effects
- Brilliant Sensors
- Lt Wt Projectile Technology
- Lt Wt Mortar Pointing Devices
## BRAC & PM CAS Products

<table>
<thead>
<tr>
<th>Relocate To:</th>
<th>Rock Island Arsenal</th>
<th>Iowa</th>
<th>Milan</th>
<th>McAlester</th>
<th>Crane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>Artillery Cartridge Case Metal Parts (16%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverbank</td>
<td>105MM/155MM HE</td>
<td>155MM ICM Artillery</td>
<td></td>
<td></td>
<td>Detonators/Relays/Delays</td>
</tr>
<tr>
<td>Kansas</td>
<td>155MM ICM Artillery Metal Parts</td>
<td>Mines</td>
<td>105MM/155MM Artillery ICM (2%)</td>
<td>60MM/81MM Mortar</td>
<td>Demolition Charges</td>
</tr>
<tr>
<td>Mississippi</td>
<td>155MM ICM Artillery Metal Parts</td>
<td>105MM/155MM Artillery ICM (2%)</td>
<td>60MM/81MM Mortar</td>
<td>Primers</td>
<td>PM CAS Products Significantly Affected by BRAC</td>
</tr>
<tr>
<td>Lone Star</td>
<td>Mines</td>
<td>Detonators/Relays/Delays (5%)</td>
<td>60MM/81MM Mortar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tech Challenge**
- Significant
- Moderate
- Minimal

**Significantly Affected by BRAC**
- 60MM/81MM Mortar
- MLRS Artillery (1%)
- Hand Grenades
- Primers
- Detonators/Relays/Delays
- Demolition Charges
Working to field Excalibur, PGMM, PGK and MFCS as Soon as Possible

Low Cost Mortar and Artillery Guidance and Low Cost IM fills are needed most

Working to eliminate Ammo Production Backlog

Army Modularity Increases Mortar and Artillery Ammo Requirements

Evaluating Ideas to Reduce Training Ammo Costs
  ✓ Assessing Industrial Base Impacts

Mortar and Artillery Planned Fuze Support Two US Sources

Engaged in BRAC Process
Back Up
Gov’t Teaming for Seamless BRAC Transition

Government Team: PEO/PM(s), PEO-AMMO IBO, GOCO, GOGO, AMC, JM LCMC, ARDEC.

- PM CAS working with PEO-AMMO Industrial Base Office (IBO) to leverage current technologies to implement within organic base
- IBO Life Cycle Pilot Process (LCPP) pursues AMMO Pilot Processes in Gov’t/Contractor facilities to assist in resolution of manufacturing issues.
- IBO/PM/JMC analyze NTIB current capabilities for
  - “Right sizing” to POM capacity requirements (AR700-90 guidance)
  - Modernize IB by identifying cost efficiencies/new technology
- Analyze/Coordinate numerous “Transition Issues”
  - Current & future AMMO production requirements
  - Coordination of Facility Use Contracts with production intent
  - Intellectual Property strategy relevant to GOCO’s
  - Assimilation of mutually exclusive Gov’t vs Contractor equipment
  - Identification of NTIB and non-NTIB capability outside of GOGO/GOCO
  - Coordinate Acquisition Strategies to support organic base and NTIB
Technology Gaps

- **Dynamic Retargeting**
  
  **Need:** To increase effectiveness and reduce logistic footprint dynamic retargeting capability among the SFM is desired. Dynamic retargeting will permit a single round to address two or three separate targets.

- **Power Source Alternatives**
  
  **Need:** Future Munitions will require Power Sources with Higher Densities and Power in order support increased performance requirements (e.g. guidance, fuzing, penetration sensing).

- **Scalable Non-Lethal (N-L) Effects**
  
  **Need:** N-L at all artillery ranges to suppress personnel, equipment and provide area denial.

- **Proximity fuze technology which cannot be exploited**
  
  **Need:** A proximity sensing capability that does not lend itself to countermeasures or an approved tamper proof method to house the critical components.

- **Low Cost Precision for 105mm & 155mm Artillery projectiles and 60mm & 81mm Mortars bombs**
  
  **Need:** A low cost extended range precision projectile.

- **An Artillery Battle Damage Assessment capability**
  
  **Need:** Having this capability reduces the number of rounds fired, frees unit for other fire missions or verifies need for additional strikes.
Technology Gaps (cont.)

- **Brilliant Sensors**
  - **Need:** Autonomously identify friend or foe with high reliability

- **Target “Tagging”**
  - **Need:** Tag a target with electro-optical signature from safe position for sensor to home in on: *Does not require a constant “lasing” in end game like traditional laser designators*

- **Environmentally Friendly obscurants**
  - **Need:** Environmentally friendly obscurants.

- **Precisely attack moving targets with inexpensive sensors**
  - **Need:** A low cost sensor for precision munitions to address moving targets.

- **Very Long range guided artillery projectile for disrupting support elements**
  - **Need:** A cost effective extended range 155mm projectile for addressing high value targets in all weather conditions.

- **Scalable Lethal Effects**
  - **Need:** A scalable lethal warhead to apply the right lethality to the target set and minimize collateral damage.

- **Low Cost IM**
  - **Need:** A low cost melt-pour IM alternative
Potential S&T Projects

- **Increase Range**
  - **Need:** Much greater coverage area from indirect fire weapons

- **Increased Lethality**
  - **Air Burst DPICM**
    - **Need:** Increased effectiveness and helps in reducing log footprint
  - **Enhanced Lethality Explosives**

- **Reduced Logistics**
  - **Need:** Reduce Log footprint & Tail

- **Lt Wt Mortar Pointing Devices**
  - **Need:** Increase accuracy and responsiveness

- **Muzzle Velocity variations Improvements**
  - **Need:** Reduce propellant variations and tube wear improve accuracy

- **Lt Wt Projectile Technology**
  - **Need:** reduce logistics and solider weight burdens

- **Low Cost IM Alternatives**
  - **Need:** Solutions that are comparable to current costs for large volume munitions

- **Lt Wt Mortar Components**
  - **Need:** reduce logistics and solider weight burdens

- **Common Mortar Components across calibers**
  - **Need:** reduce logistics, training, and maintenance burdens
<table>
<thead>
<tr>
<th>Mortar</th>
<th>Before</th>
<th>After</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>60mm</td>
<td>630</td>
<td>734</td>
<td>17%</td>
</tr>
<tr>
<td>81mm</td>
<td>396</td>
<td>356</td>
<td>(-10%)</td>
</tr>
<tr>
<td>120mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M1064 Mortar Carrier w/ M121 Carrier Mortar</td>
<td>656</td>
<td>462</td>
<td>(-30%)</td>
</tr>
<tr>
<td>M1129 Stryker Mortar</td>
<td>216</td>
<td>252</td>
<td>16%</td>
</tr>
<tr>
<td>M120 Towed Mortar</td>
<td>32</td>
<td>528</td>
<td>-</td>
</tr>
<tr>
<td>Total 120mm Mortars</td>
<td>872</td>
<td>1242</td>
<td>42%</td>
</tr>
<tr>
<td>Artillery System</td>
<td>Before</td>
<td>After</td>
<td>% Change</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>105mm M119 M102</strong> (ARNG)</td>
<td>540</td>
<td>656</td>
<td>22%</td>
</tr>
<tr>
<td><strong>155mm M109A6 (Paladin) M109A5 (ARNG)</strong></td>
<td>1002</td>
<td>646</td>
<td>(-36%)</td>
</tr>
<tr>
<td><strong>155mm M777 LW M198</strong></td>
<td>512</td>
<td>252</td>
<td>(-51%)</td>
</tr>
</tbody>
</table>
PM CAS Fuze Strategy

- **Inventory**
  - Sufficient Artillery Fuze Stocks On Hand
  - Recurring Mortar Training Demand
  - Some Buys Required to Support IB

- **Production**
  - Sufficient dollars in POM to Maintain at Least Two NTIB Competitive Producers in Electronic and Mechanical Fuzes
  - Will Continue Competitive NTIB Awards by Commodity Line

- **Development**
  - Accelerated development/fielding of PGK supports IB
  - Precision munitions have small impact to IB due to quantity and integrated approach

- **Technology**
  - Continue Support of Basic Technology Efforts (Power Sources/Prox/etc)
  - Continue Technology Insertion Programs to address producibility; obsolescence and single point failure issues
  - Evaluate Emerging Opportunities