Project Manager, Maneuver Ammunition Systems

COL Paul Hill
Where do we see Funding… Medium Caliber

Present: Medium Cannon Caliber (20mm, 25mm, 30mm)
- Significant drop cartridge production annually by 2018 if A-10 fleet is retired

Future: Medium Cannon Caliber (20mm, 25mm, 30mm)
- New requirement for Air Burst Munition from 30mm Cannon on Apache
- Potential new 30mm family and weapon for retrofit to Bradley or a new vehicle

Future: Medium Caliber (40mm Grenades)
- Training to Grow to 5 – 7M Ctg/yr of Day-Night-Thermal (DNT)
- Tactical Production Currently <75K Ctg/yr
- New requirements for Advanced Munitions:
  - Longer Range
  - “Shotgun”
  - Door Breaching
  - Air Burst

RELIABLE - PRECISE - LETHAL
Where do we see Funding… Large Cal

Present: Large Caliber Tank Ammo (120mm)

- Steady low rate of tank training new and FMS production along with retrofits until 2020-22, at which time new production will increase

Future: Large Caliber Tank Ammo (120mm)

- Steady low level production and retrofit – Incorporation of Safety Improvements
- DU production through 2020
- Potential modernization of tactical ammo
- New R&D for AMP Ctg

M829E4 Production | AMP R&D
Direct Fire

How Training Expectations have changed from last year to this year

- **5.56mm**: 32% Decrease
- **7.62mm**: 23% Decrease
- **.50 Cal**: 18% Decrease
- **30mm**: -2% Decrease
- **40mm**: 28% Decrease
- **120mm**: 4% Decrease

Small Caliber / 40mm shrinking in training
30mm/120mm holding steady
Medium Caliber Ammunition
Medium Caliber Ammunition

20mm
25mm
30mm x 113
30mm x 173
40mm L60

High Velocity

Low Velocity

40mm Grenades
**40-mm Family of Ammunition (FoA) OV-1**

The grenadier using 40-mm FoA provide the small unit with a capability to engage point and area targets in open or vegetated terrain, defilade positions, inside buildings, bunkers, and trenches as well as targets located in dead space unreachable with direct fires. Grenadiers employ lethal, non-lethal, and special purpose munitions supporting operations from peacetime military engagements to major combat operations. The grenadier performs several functions including suppress and destroy enemy personnel and vehicles, deploy smoke to screen or conceal movement and mark enemy positions and employ illumination cartridges to communicate instructions or initiate a prearranged signal and enhance night visibility. Special purpose munitions provide the small unit with the ability to breach doors, engage enemy personnel at close range, provide real time situational awareness and mark or tag targets of military interest.

---

**Smoke Cartridge**
- Used to mark target areas, drop zones and evacuation sites.
- Additionally, used to communicate a prearranged action such as lift or shift fire and provide concealment.

**Illumination Cartridge**
- Used during operations in limited visibility and to communicate instructions or as a signal to initiate a prearranged action.

**Short-Range Anti-Personnel (SRAP)**
- Used to engage enemy personnel in close restricted terrain that are an immediate threat to the unit.

**High Explosive-Direct-Penetration (HEDP)**
- Used for engaging point and area targets such as personnel and light armored vehicles.

**Door Breaching Cartridge**
- Used to conduct a ballistic breach of the door allowing the unit to enter a building or other urban structure.

**Increased Range Anti-Personnel (IRAP)**
- Offers an improved capability that allows grenadiers to engage targets in defilade and at great ranges.

**Marking and Tagging Cartridges**
- Allow units to maintain observation on targets of military interest and follow their movement.

**Information Collection Cartridges**
- Send images of dead space and areas concealed by obstacles back to the unit.

---

**Legend**
- Green = Legacy item
- Black = New CDD

---

**There’s an App For That**

**Smoke**
- Smoke cartridge

**Illum**
- Illumination cartridge

**SRAP**
- Short-Range Anti-Personnel cartridge

**HEDP**
- High Explosive-Direct-Penetration cartridge

**Door Breach**
- Door breaching cartridge

**IRAP**
- Increased Range Anti-Personnel cartridge

**Mark Tag**
- Marking and tagging cartridge

**Info Collect**
- Information collection cartridge
40mm LV FoA CDD and Product Development Strategy

Phases 1 and 2:
- Phase 1: LV FoA CDD Core, Increased Range Anti-Personnel (A1), Door Breach (A2), Short Range Anti-Personnel (A3)
- Phase 2: Extended Range Guided (A4), Marking or Tagging, Information Collection, Obscuration Smoke, [Blank]

Staffing:
- In 3-star staffing now
- Draft within 6 months

Technology Evolution:
- FY11: M433 HEDP (varied production)
- FY12: M433 IM (NRE)
- FY13: M433 Warhead Lethality (6.6 RDT&E)
- FY14: ManTech, MemS S&A Cost/ MRL Improvements (6.3)
- FY15: JSSAP SAGM (6.3 RDT&E)
- FY16: EPR SEP
- FY17: SAGM, ML, LV SEP
- FY18: 40mm Airburst FCT/SEP
- FY19: IRAP System AoA
- FY20: Door Breach SBIR CPP

Product Revolution:
- M433A1 HEDP (M203/ M320 compatible)
- Increased Range AntiPersonnel (IRAP) EMD
- IRAP Production

Future Additional Annexes (Next Gen Capabilities):
- Conceptual
- Planned
- Draft
- Staffing
- Approved

Marking or Tagging
- ERG
- Door Breach
- SRAP
- Info Collect
- Mark Tag

RELIABLE - PRECISE - LETHAL

DISTRIBUTION STATEMENT A: Approved for Public Release; Distribution is unlimited
Annex 1. Increased Range Anti-Personnel (IRAP)
“...Warfighters lack the ability to achieve desired accuracy and incapacitating effects against personnel targets in defilade at ranges out to 500m”

Annex 2. Door Breaching
“...Squads lack ability to conduct rapid (single-shot) breach up to 50m without pause between actual breach and entry of initial force.”

Annex 3. Short-Range Anti-Personnel (SRAP)
“...Warfighters lack the ability to achieve desired accuracy and incapacitating effects against personnel targets from 0-50m”

Annexes 1, 2, & 3 provide materiel solutions for the highest priority Capability Gaps
Program Description:
- Increased Range Anti-Personnel (IRAP) cartridge seeks to provide small unit grenadier with higher probability of achieving a first shot kill coupled with ability to defeat personnel targets in defilade positions at increased ranges with greater accuracy and lethality
- **Primary Efforts:** FCT Program, SAGM, Warhead Improvement
- **Objective:** Determine system effectiveness; verify performance against IRAP requirements

**FCT Milestones:**
- JUL 13 – BPA Contract Award
- MAY - AUG14 – Baseline Performance Tests
- TBD – Full Qualification Tests

**Programmable Air Burst Munition Effort**

**Overview:**
- Increased lethality - Defeat Level 1 Body Armor (T), Level 3 Body Armor (O)
- Increased engagement ranges - 300m (T), 600m (O)
- Improved accuracy - Reduction of Deflection and Range error by 50%
- Counter defilade (Current M433 provides no air-bursting capabilities)

**SA-CBA Gap:** “...Warfighters lack the ability to achieve desired accuracy and incapacitating effects against personnel targets in defilade at ranges out to 500m”
Annex 2: Door Breach

Program Description:
- Breach all types of doors (steel, wood) with single shot
- SEP Program
- Total Cost Estimate: $895k
- Plan is to replace GREM
- **Objective:** Determine system effectiveness; verify performance against door types as specified within DB requirements

**Milestones:**
- SEP 13 – Contract SOW complete
- DEC 13 – Contract Award (DOTC)
- JUN 14 – Testing

**Overview:**
- Gain access to an existing entry point at range: 25 meters (T), 50 meters (O)
- Limit collateral damage, no life threatening injury to friendly forces positioned to enter within 10m
- Accurate deployment: impact 5 inch diameter at 25 meters (T), 50 meters (O)

**SA-CBA Gap:** “...Squads lack ability to conduct rapid (single-shot) breach up to 50m without pause between actual breach and entry of initial force.”
Annex 3: SRAP

Program Description:

- **Short Range Anti-Personnel (SRAP)** allows grenadier to engage enemy personnel that are immediate threat to small unit in close/complex terrain such as urban combat.

- **FY17 estimated EMD start**

- **Objective**: Determine system effectiveness; verify performance against SRAP requirements.

**Old M576 “Buckshot”**

**SA-CBA Gap**: “…Warfighters lack the ability to achieve desired accuracy and incapacitating effects against personnel targets from 0-50m”
Future Grenadier Battle Space

Goal: Complete Lethal Overmatch

Urban Target Sets

Today: M433 HEDP
50 to 350m (Area)
50 to 150m (Point)

2-4 yrs: SRAP and DB
0 to 50m

5-10 yrs Extended Range Guided
1000m

Rural Target Sets

2-4 yrs: IRAP (Airburst)
50 to 600m

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Approved for Public Release; Distribution is unlimited
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**40mm HV FoA CDD Product Development Strategy**

**MK 19**
Program Description:
- Airburst capability will defeat enemy personnel in defilade; addresses Small Arms CBA; High Velocity Family of Ammo CDD (draft) requirements; Endorsed by MCoE and PEO Ammo
- Provides U.S. Army with leap ahead anti-defilade capability on Mk19 weapon system without addition of another weapon or requiring weapon modification
- FY16 estimated test start
- Objective: Determine system effectiveness; verify performance against draft CDD requirements

Overview:
- High Velocity Grenade Airburst technologies
- Programmable ammo using RF or IR data links for airburst detonation against enemy in defilade
- Fired from Mk19 Grenade Machine Gun – range out to 1500m
40mm Training
Today and Tomorrow

40mm training **TODAY**...

**Low Velocity**

M781

“**Cheese Puff**”

“Current M781 **only allows me to train during the day** on my M320/M203 GL. I have to use tactical rounds for night training.”

**High Velocity**

Mixed Belt

M918

M385A1

“**Current M918 has a fuze and energetics (UXO risk) which prevents maneuver training with my Mk 19 grenade machine gun.**”

40mm training **TOMORROW**...

**Low Velocity**

M781E1

“New M781E1 **enables me to train day AND night using all my night vision and thermal sights** on my M320/M203 GL”

**High Velocity**

M918E1

“**New M918E1 does NOT have a fuze or energetics (eliminates UXO risk) which enables vehicle maneuver training using my Mk 19 grenade machine gun, and I can still use my NVGs and thermal sights.**”

RELIABLE – PRECISE – LETHAL

DISTRIBUTION STATEMENT A:
Approved for Public Release; Distribution is unlimited
40mm TP-DNT Acquisition Strategy

- **Strategy**: Full & Open Competition - Best Value Source Selection
  - 806 restricts LAP, cartridge case, propellant, NC

- **Contract Type**: FY14-19 Firm Fixed Price (FFP)
  - Bid Sample shoot-off mandatory to compete for contract
  - Base Awards for competitive EMD, plus three options (LRIP & 2 Production Years)
  - Up to 2 awards for HV
  - Up to 2 awards for LV
  - After EMD, downselect to 1 contractor for each program (LV and HV)
  - Offerors may bid, and be awarded, on both HV & LV - one or the other
  - FFP NTE prices will be requested and will include EMD through LRIP/Production options
    - Contractors will have opportunity, prior to downselect, to update their pricing for LRIP/Production (cannot exceed initial proposed NTE prices)

- **Government Purpose Data rights pursued**

- **Contracting Office**: Picatinny ACC-NJ

- **Contract award date**: APR 2015
HV&LV TP-DNT Programs Schedule
Apache 30mm Munitions

M789 HEDP Features:
- Apache’s only 30mm Combat round
- Shaped Charge provides light armor penetrating capability
- Fragmenting body provides anti-personnel affects
- 30mm x 113mm (aka Lightweight 30mm) is Small and Light compared to typical configuration ammunition
## LW30mm Product Development Strategy

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<td>M788 TP</td>
<td>M788A1 TP</td>
<td>TP-Spotter</td>
<td>Inert Munitions</td>
<td>Green Energetics</td>
<td>M789 HEDP</td>
<td>M789 anti-personnel lethality improvement</td>
<td>Prox Sens Dev</td>
<td>30x113mm Prox/ Airburst EMD &amp; LRIP</td>
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**Legend:**
- **Projected**
- **Funded**
- **S&T Funded**
- **Unfunded**

**Institute:**
- **Green Energetics**
- **Apache**

**M788**
- **M789**

*DISTRIBUTION STATEMENT A: Approved for Public Release; Distribution is unlimited*
LW30mm TP-Spotter

- **Background:**
  - Current LW30mm training ammunition is untraced with no spotter. Fulfilled user requirement for training ammunition when tactics were to engage targets from stationary hovering helicopter
    - Tactics have changed and Apache now engages targets on the move
      - In running and diving engagements the crew finds it difficult or impossible to see impacts of current ammunition. Also during night firings impacts against non-metallic targets are impossible to see

- **Status:**
  - Two Candidates have been developed and evaluated by engineering community against representative targets fired from ground mounted guns with ground based observation
LW30mm TP-Spotter Pyrotechnic

**PROS**
- Visual and Thermal Signatures very similar in intensity and duration to M789
- Proven design used on UASF 40mm fired from AC130
- Dud projectiles are safe to handle
- Design owned by DoD
- Well known energetic used in several fielded items

**CONS**
- Moderate to poor reliability at typical Apache engagement ranges because impact energy is far less than proven 40mm/AC130 application and/or low impact angles
- One spotter on target with remainder off target is problem for gun/sight harmonization
- Estimated 50% higher cost than M788
- Potential Range Clean up costs (of duds)

**Path Forward:**
Impact sensitivity may be increased to acceptable levels by decreasing web thickness
LW30mm TP-Spotter Pyrophoric

Pros
- High functional reliability at all impact angles and all ranges
- Signature similar to M789
- No gaseous output or fragment producing when functions as intended
- Duds are safe to handle

Cons
- Powder degrades when subjected to hot humid conditioning resulting in build up of internal pressure which creates a safety hazard and significantly reduces functional reliability
- Currently only one source for powder
  - Powder design is Proprietary to source
- Estimated 50% higher cost than M788

Path Forward:
Unknown – at this time the mechanism degrading the powder in hot humid environment is unknown
LW30mm TP-Spotter Pyrophoric
LW30mm Anti-Personnel/Lethality Improvements

- **Background:**
  - During combat operations in Iraq and Afghanistan Apache Gunship pilots developed tactics and techniques to engage personnel targets utilizing M230 30mm Cannon and M789 High Explosive Dual Purpose (HEDP) Round
    - While the round is dual purpose it tended to penetrate into sand prior to detonation greatly reducing its fragmentation and personnel effects
      ➢ multiple bursts were required to take out target resulting in increased usage per engagement greatly reducing Apache’s combat effectiveness

- **Status:**
  - Several projects have been identified to increase lethality of existing M789 HEDP and preliminary development/proof of concept has been accomplished on both a shear liner and proximity sensor
LW30mm Shear Liner
Lethality Improvement

- Shear Liner enhances lethality by forming uniform fragments
  - Feasibility Demonstrated in LW30

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<th>Fragmentation Comparison</th>
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<td>M789</td>
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<td>Average Size (grains)</td>
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<td>Average Velocity (fps)</td>
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LW30mm Lethality Improvement
Proximity Sensor

- Greater lethality against personnel
- Potential capability against light boats
- Potential capability against UAS

- Basic Sensor designed, built and tested by ARDEC
  - Feasibility demonstrated through ballistic testing of both on board recorder and live HE rounds
    - Very good initial performance

PM MAS and PM Apache are attempting to make this a formal program
Medium Caliber Ammunition
Summary

Bottom Line:
A lot of great work and opportunity in Medium Caliber ammunition development

Our Mission:
Equip Warfighters with complete overmatch capabilities in all situations through ammunition improvements
Large Caliber Ammunition
Large Caliber Ammunition

120mm, 105mm Training & Tactical Ammunition
Large Caliber Focus and Outlook

- Complete M829E4 MS C; initiate LRIP
- Award AMP EMD in FY15
- Award M724A1E1, 105mm Range Limited KE Trainer
- Set conditions for Foreign Military Sales; preserve IB
- Continue Tank Training Cartridge Production; set conditions for next contract in FY17
- Implement Safety Enhancements
Large Caliber (120mm & 105mm) Technology Transition Roadmap

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**120mm Training Rounds – M1002 & M865 (Production)**
- ECP
- M14 Replacement / RPD596 (Production)

**120mm M829E4 EMD**
- CPD

**120mm M829A4 (Production)**
- DU Decision Point

**120mm Next Generation KE ATO (S&T 6.2)**
- CPD

**MAAST ATO (Including LOS MP) (S&T 6.2 / 6.3) (FY04-06)**

**Adv. Mun. Warhead Manuf. ATO (S&T 6.7)**

**120mm Advanced Multi Purpose (AMP) EMD**

**120mm AMP (Production)**
- CPD

**105mm M1040 (Production)**

**105mm M724A1E1 Improved KE Trainer (Production)**
- C

**Mobile Protected Firepower EMD & Production**

### Funded Status:
- **PM Funded**
- **S&T Funded**
- **Unfunded**
- **Other Serv. Prod. Funded**
- **No Requirement**

### Transition Points:
- **Transition Point**
- **Underfunded**
- **MS**

**Distribution Statement A:**
Approved for Public Release; Distribution is unlimited
120mm Advanced Multi Purpose (AMP)

- 120mm Line of Sight Multi Purpose Munition for Abrams Tank with Three Modes of Operation: Point Detonate, Delay, & Airburst
- Consolidates Capabilities of Four Current 120mm Munitions
  - Increase Logistical Efficiency
  - Address Aging Stockpile Issues
  - Battlecary Single Munition for Multiple Engagement Scenarios
- Provides New Capabilities
  - Defeat ATGM Teams / Dismounts out to 2000m
  - Breach Reinforced Concrete Walls
- Requires Abrams Ammunition Data Link (ADL) Modification for Mode and Range (Ongoing Abrams ECP 1 & M829E4 Effort)
- JROC Approved CDD (JUN 08)

AMP Provides Versatility Required by a Balanced Force to Defeat Future Hybrid Threat

Four Rounds to One With Increased Capability

M830 HEAT-MP-T
M830A1 HEAT-MP-T
M908 HE-OR-T
M1028 Canister

Bunkers
Dismounts < 500m
Light Armor
Obstacle Reduction
Dismounts / ATGM Team Out To 2000m

Advanced Multi-Purpose (AMP)
Short Range 105mm KE Trainer (M724A1E1)

Training round for MGS crews designed to replicate form, fit, function, and dispersion of M900 (105mm KE Tactical Round) out to 2,000m

- M724A1E1’s max range will be limited to 7,000m by employing design similar to 120mm KE Trainer (M865)
- Identify replacement cartridge case NLT FY17

Acquisition Approach
- Five Year Firm Fixed Price IDIQ Contract
  - Low Rate Initial Production (LRIP)
  - Four Full Rate Production (FRP) Option Years
- Full and Open Competition
- Government TDP (For Info only)
- Solicitation Release 1QFY14
- Target Award Date 4QFY14

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SOLVES DEFICIENCIES  X DOES NOT
Summary

- Training projections for the future go down or hold steady
- Medium Cal base is in trouble
- FMS is a key piece to the 120mm tank training IB
- A lot of potential new R&D programs in the next few years

Points to Ponder

- Strategic positioning of the medium caliber base for the long term – How do we keep the two source base?
- How will these R&D programs affect the IB?