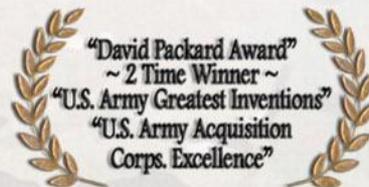




Project Manager, Maneuver Ammunition Systems

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 Ctgs/yr of Day-Night-Thermal (DNT)
- Tactical Production Currently <75K Ctgs/yr
 - New requirements for Advanced Munitions:

Longer Range

"Shotgun"

Door Breaching

Air Burst



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

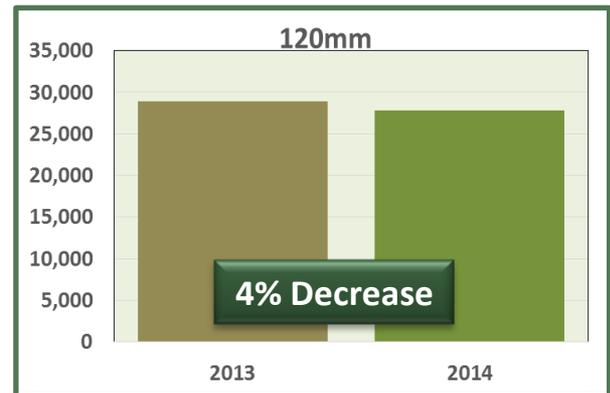
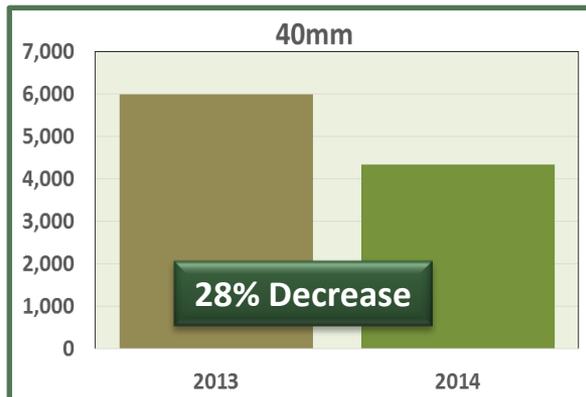
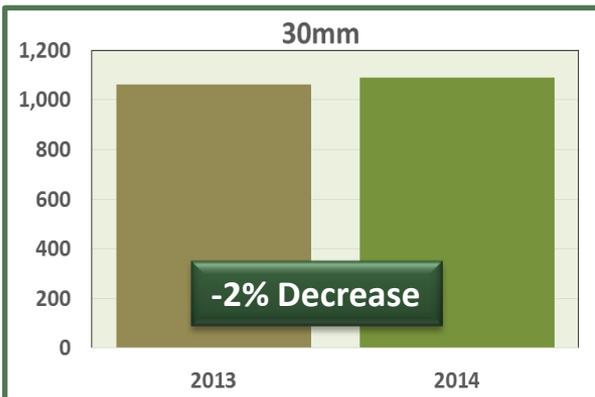
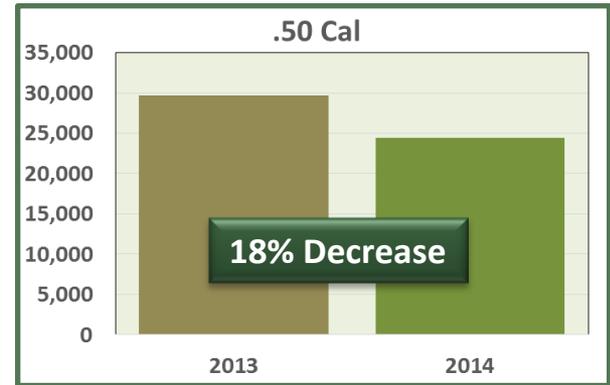
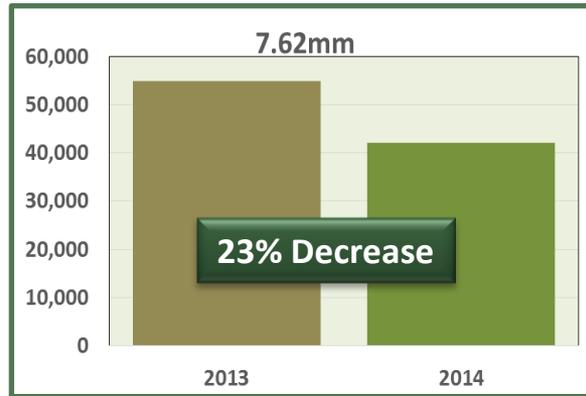
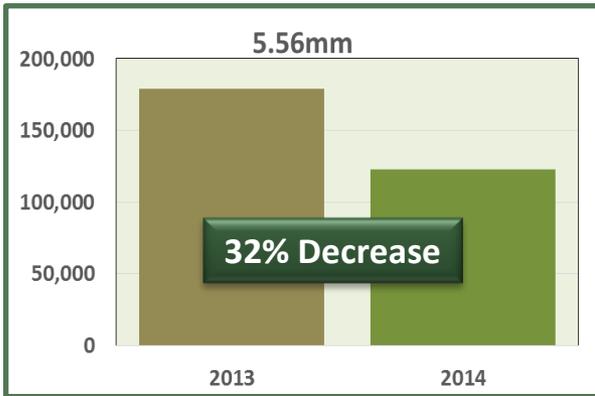
*M829E4
Production*

*AMP
R&D*



Direct Fire

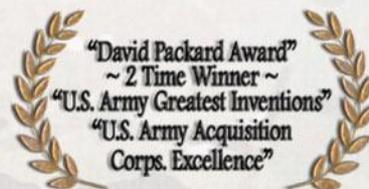
How Training Expectations have changed from last year to this year



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



Medium Caliber Ammunition





Medium Caliber Ammunition



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

**Lethal
&
Versatile**

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 can be used to mark target areas, drop zones and evacuation sites. Additionally, they are used to communicate a prearranged action such as lift or shift fire and provide concealment.

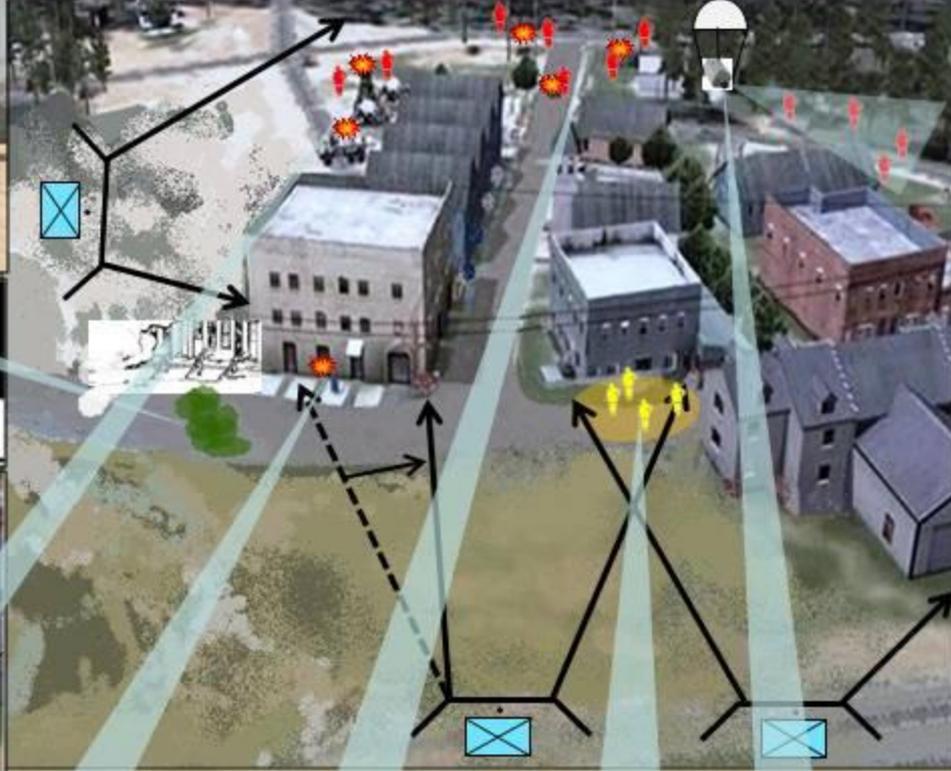
Smoke

Illumination cartridges are used during operations in limited visibility and to communicate instructions or as a signal to initiate a prearranged action.

Illum

The Short-Range Anti-Personnel cartridge is used to engage enemy personnel in close/restricted terrain that are an immediate threat to the unit.

SRAP



HEDP cartridges are used for engaging point and area targets such as personnel and light armored vehicles.

HEDP

The Door Breaching cartridge is used to conduct a ballistic breach of the door allowing the unit to enter a building or other urban structure.

Door Breach

The Increased Range Anti-Personnel cartridge offers an improved capability that allows grenadiers to engage targets in defilade and at great ranges.

IRAP

Marking and Tagging cartridges allow units to maintain observation on targets of military interest and follow their movement.

Mark Tag

Information Collection cartridges send images of dead space and areas concealed by obstacles back to the unit.

Info Collect



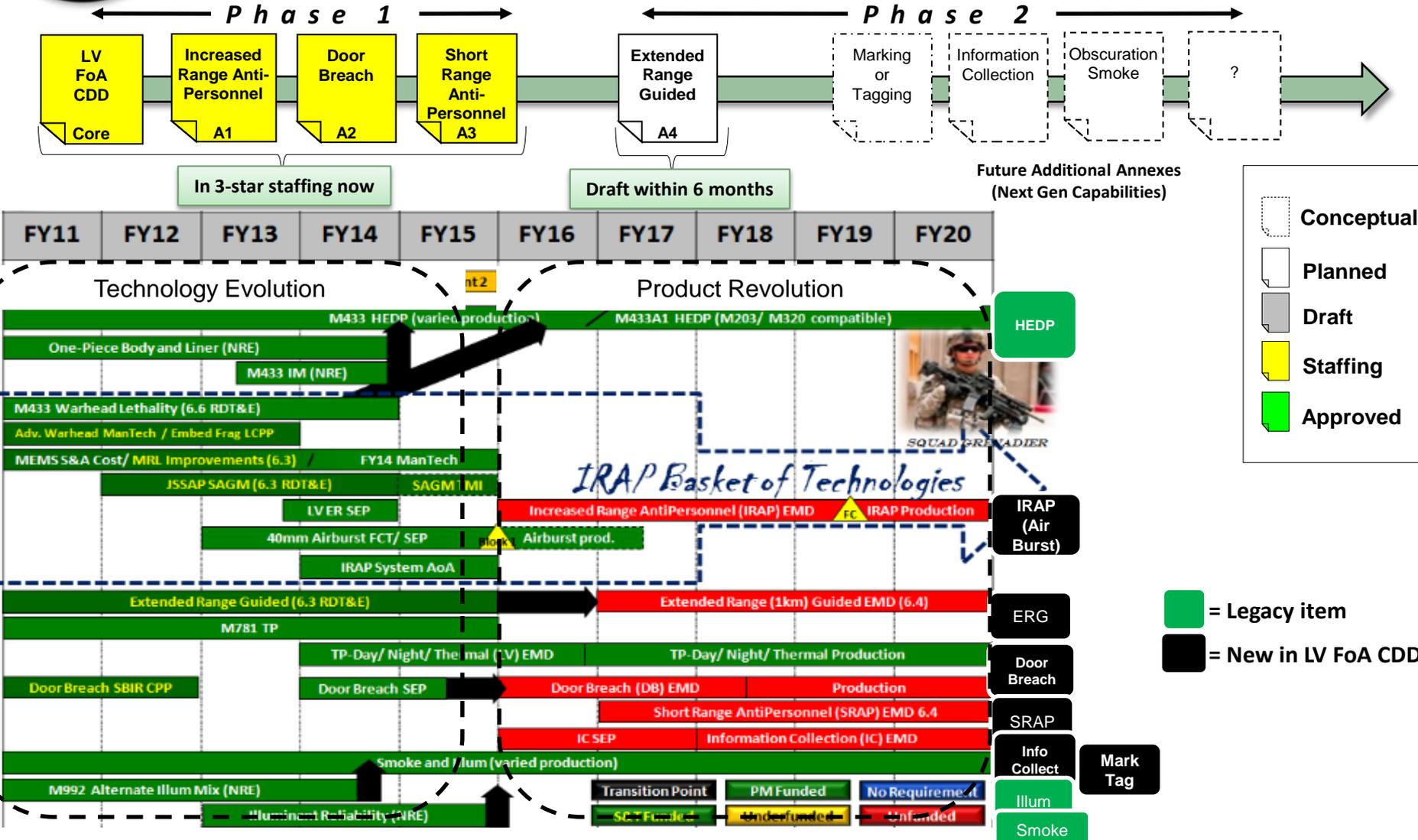
There's an App For That

 = Legacy item
 = New CDD

40mm Round



40mm LV FoA CDD and Product Development Strategy





40mm LV FoA Annexes 1, 2, 3



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



Annex 1: IRAP (Air Burst)



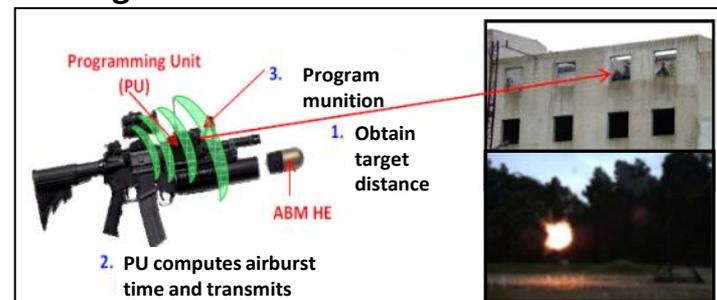
Program Description:

- 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 w/in DB requirements



Milestones:

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

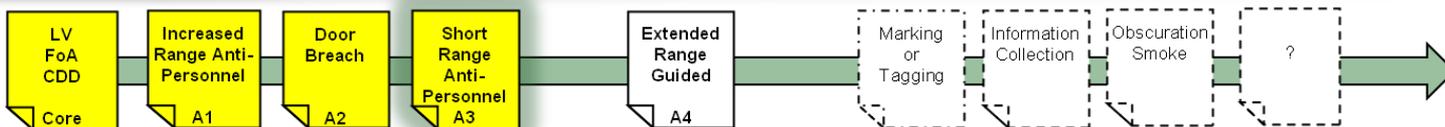
Overview:

- 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"



Overview:

- Operations in Urban/Restrictive Terrain
- Close Quarter Combat
- Enhanced Lethal effects $P_{(i/s)} \leq 1$ second at 0-30m (T), 50m (O)
- Limited collateral damage

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

Rural Target Sets

5-10 yrs Extended Range Guided

1000m

2-4 yrs IRAP (Airburst)

50-600m

Today: M433 HEDP

50 to 350m(Area)

50 to 150m(Point)

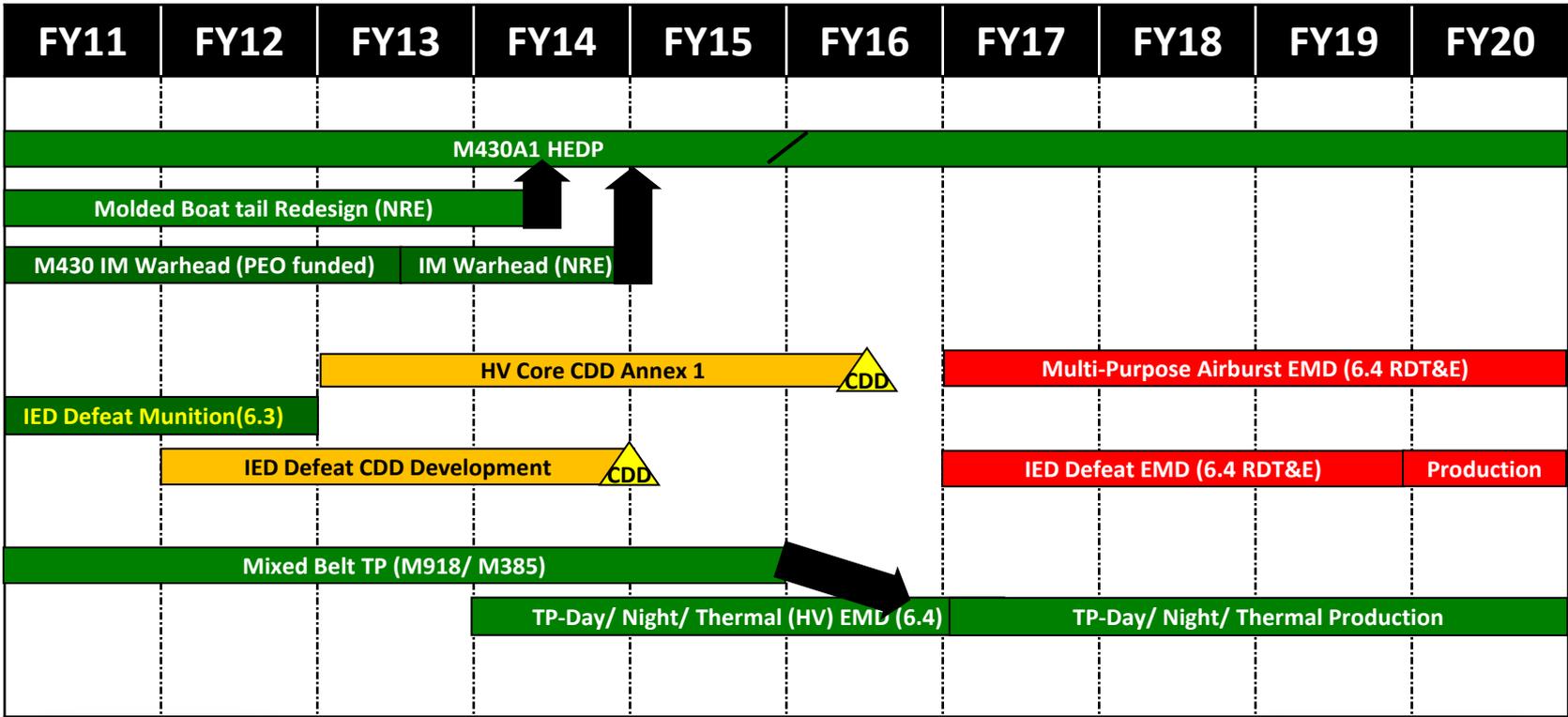
2-4 yrs SRAP and DB

0 to 50m



40mm HV FoA CDD

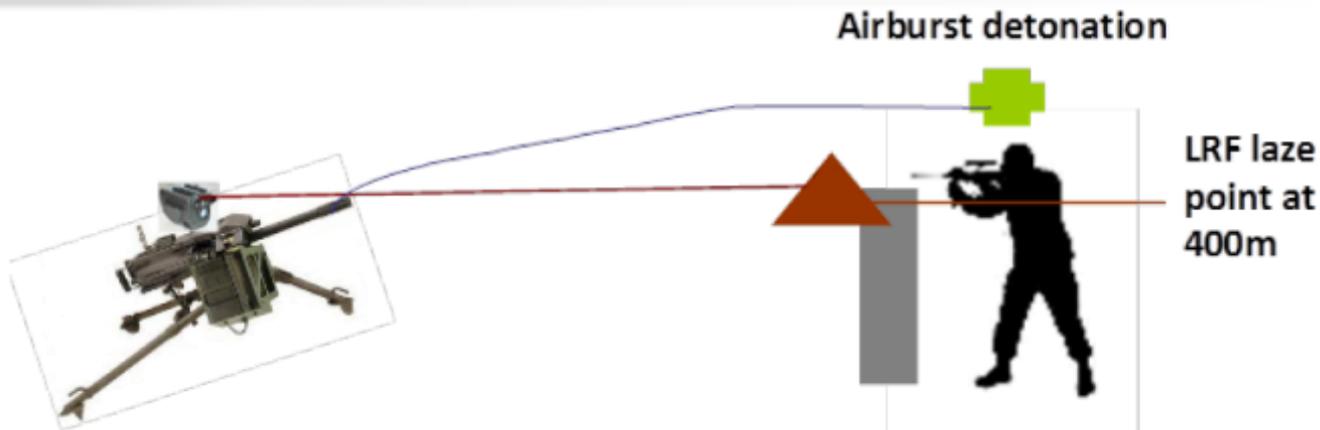
Product Development Strategy



No Requirement	Other Service	Unfunded
Transition Point	PM Funded	△ CDD
S&T Funded	Underfunded	



40mm High Velocity Airburst FCT



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**...

40mm training **TOMORROW**...

Low Velocity

Low Velocity

"Cheese Puff"

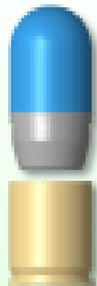


M781

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



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



M781E1



High Velocity

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."



"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.**"



M918E1



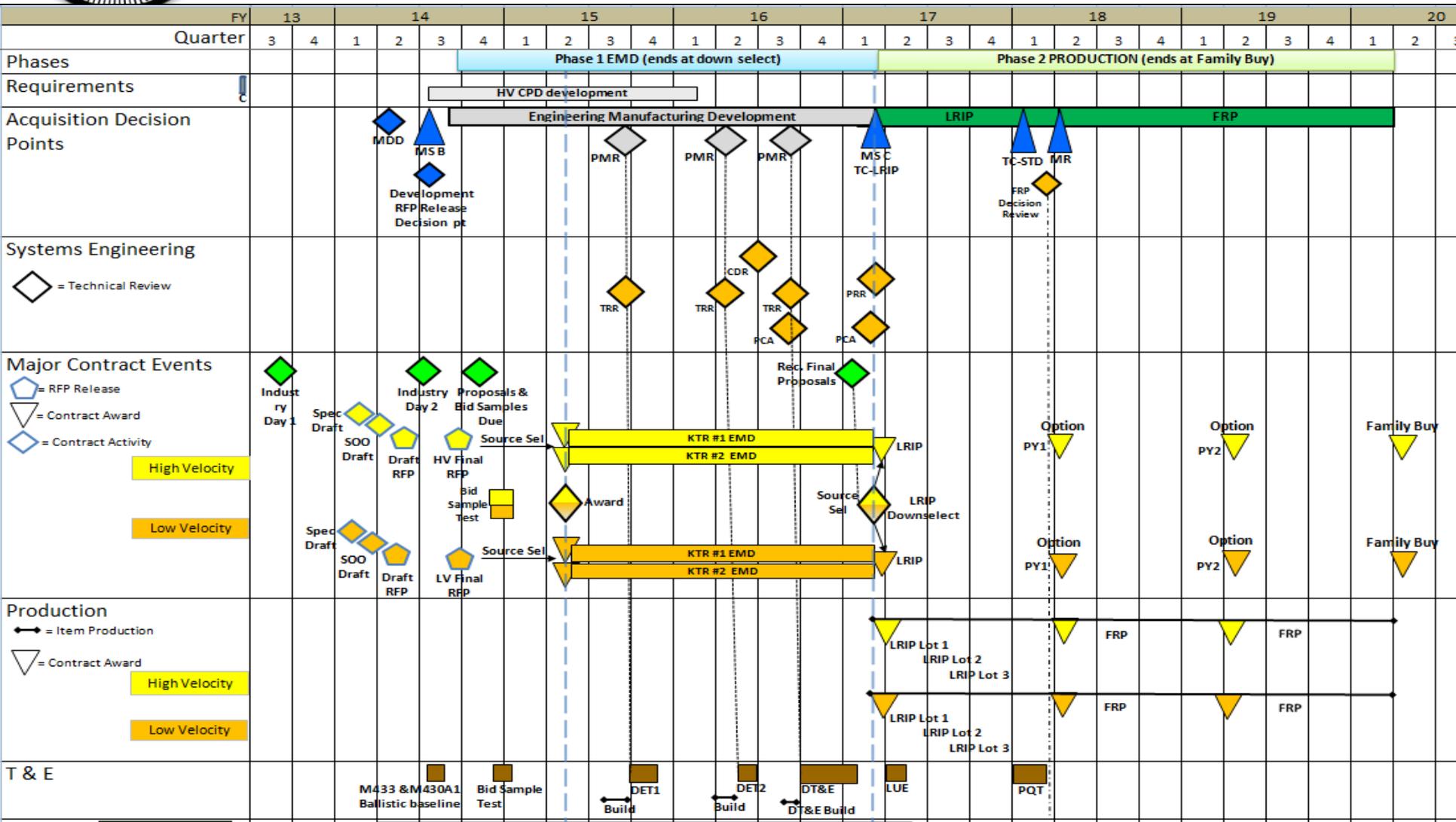


40mm TP-DNT Acquisition Strategy

- **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

AH-64 Apache



- **M789 HEDP Features:**
 - Apache's only 30mm Combat round
 - Shaped Charge provides light armor penetrating capability
 - Fragmenting body provides anti-personnel effects
 - 30mm x 113mm (aka Lightweight 30mm) is Small and Light compared to typical configuration ammunition

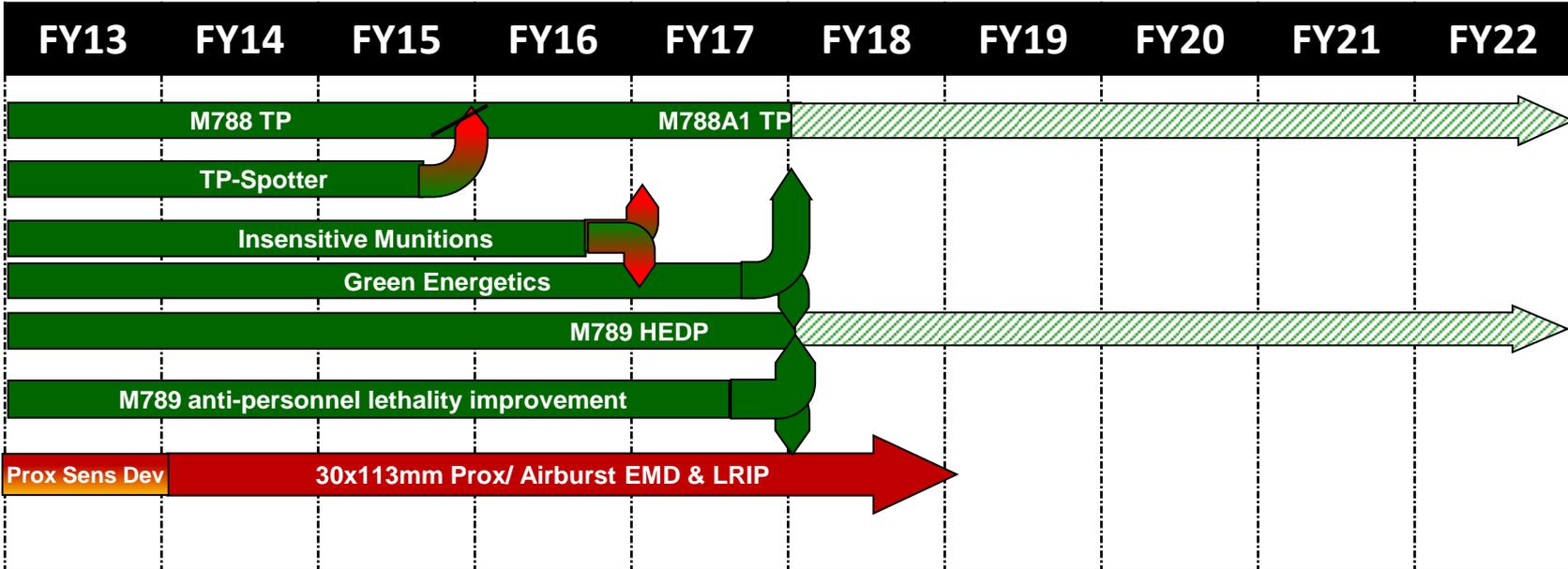


M788
Target Practice



LW30mm

Product Development Strategy



Projected	Funded
S&T Funded	Unfunded



LW30mm TP-Spotter

■ Background:

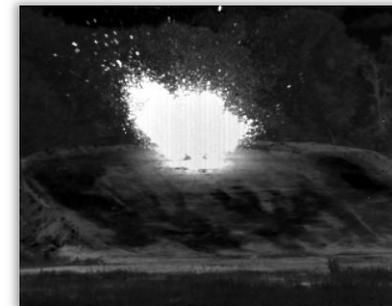
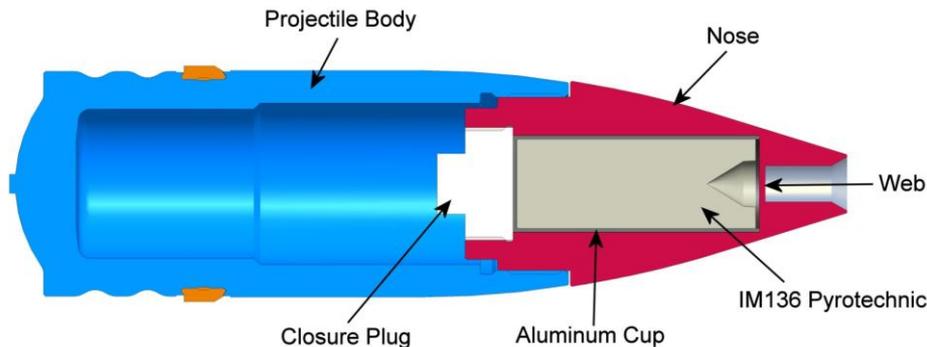
- Current LW30mm training ammunition is untraced with no spotter. Fulfilled user requirement for training ammunition when tactics were to engage targets from stationary hovering helicopter
 - Tactics have changed and Apache now engages targets on the move
 - In running and diving engagements the crew 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 know energetic used in several fielded items

CONS

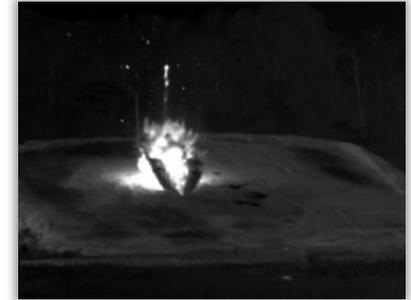
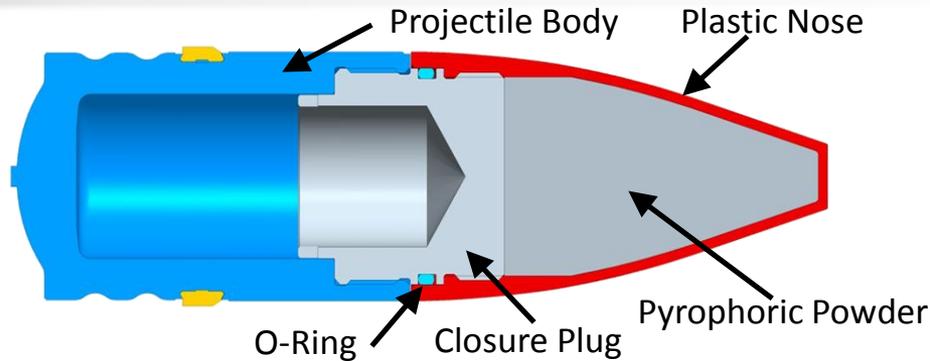
- Moderate to poor reliability at typical Apache engagement ranges because impact energy is far less than proven 40mm/AC130 application and/or low impact angles
- One spotter on target with remainder off target is problem for gun/sight harmonization
- Estimated 50% higher cost than M788
- Potential Range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

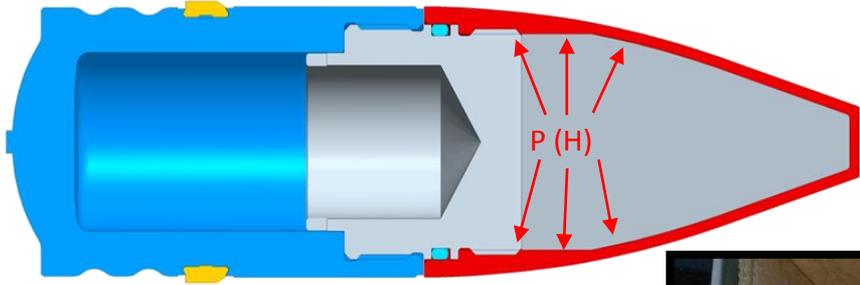
- Powder degrades when subjected to hot humid conditioning resulting in build up of internal pressure which creates a safety hazard and significantly reduces functional reliability
- Currently only one source for powder
 - Powder design is Proprietary to source
- Estimated 50% higher cost than M788

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

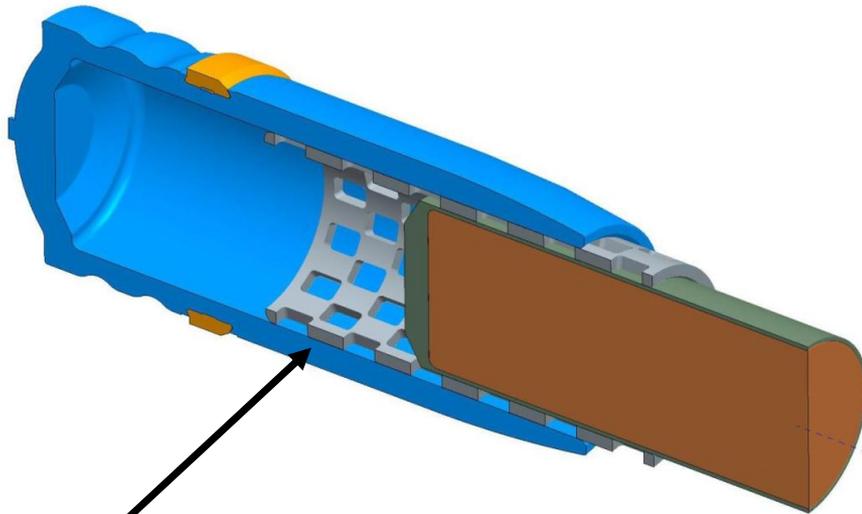
■ Status:

- 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



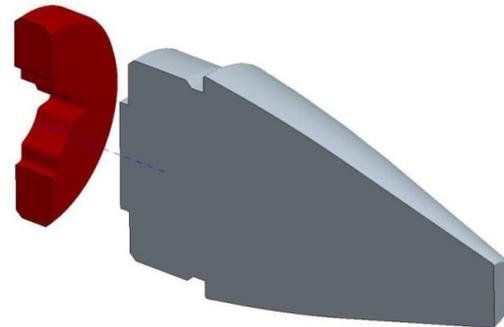
LW30mm Shear Liner Lethality Improvement

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



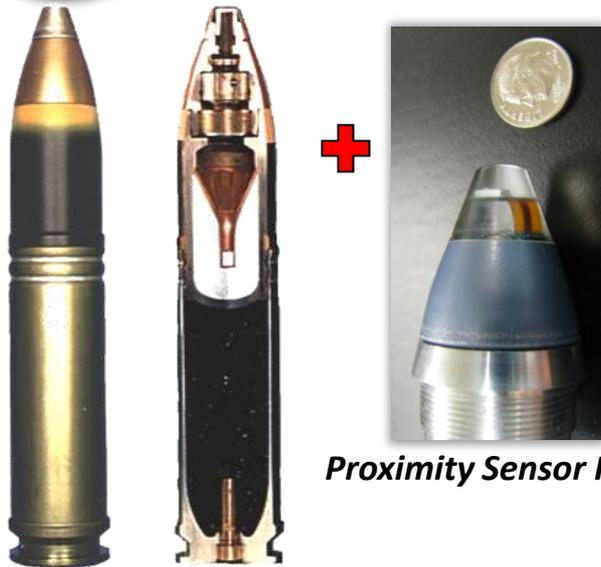
Shear Liner

Fragmentation Comparison		
	M789	LW30 Frag Liner Projectile
Average Size (grains)	2.5	5.95
Average Velocity (fps)	3000	3500



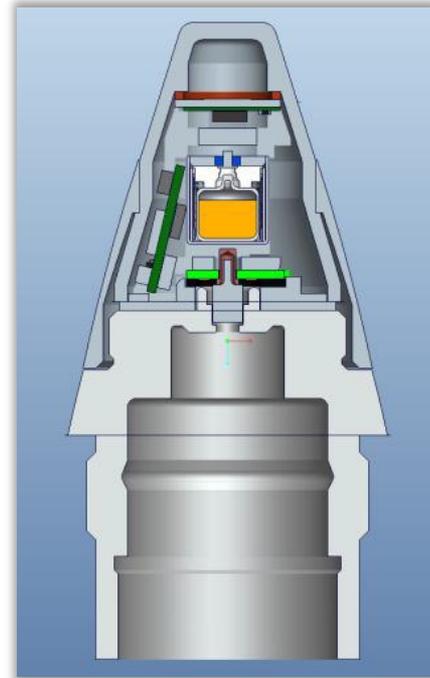


LW30mm Lethality Improvement Proximity Sensor



Proximity Sensor Fuze

- 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

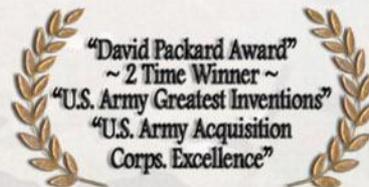
Bottom Line:

**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



105mm
FMS Only

RELIABLE - PRECISE - LETHAL

DISTRIBUTION STATEMENT A
Approved for Public Release; Distribution is unlimited

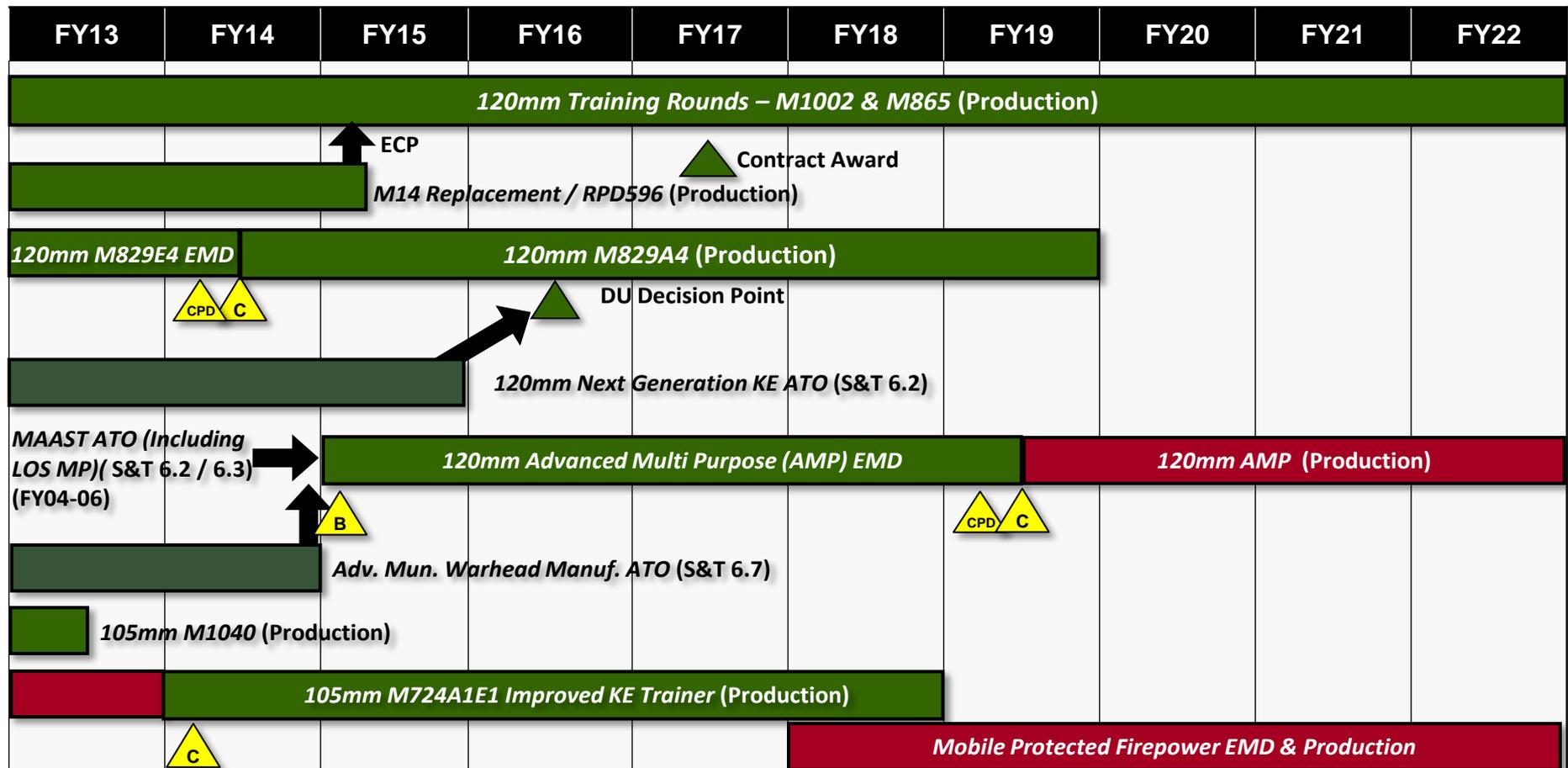


Large Caliber Focus and Outlook

- **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



MS

Underfunded	PM Funded	S&T Funded	Unfunded
Transition Point	No Requirement	Other Serv. Prod. Funded	



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
 - Battlecarry 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)



Four Rounds to One With Increased Capability



Bunkers
 Dismounts < 500m
 Light Armor
 Obstacle Reduction



+
 Breach Reinforced Walls
 Dismounts / ATGM Team Out To 2000m

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



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

	M724A1		M724A1E1
	X	Safe to fire at all MGS gunnery ranges	✓
	Partially	Ballistically Emulates Tactical M900	✓
	X	Physically emulates Tactical M900	✓
	X	Allows MGS crews to meet gunnery standards	✓
	X	Corrosion resistant	✓











- 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



Summary

■ 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?