



# Ammunition Enterprise Cross-Service Update

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UNPARALLELED  
**COMMITMENT  
& SOLUTIONS**

*Act like someone's life depends on what we do.*



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RESEARCH, DEVELOPMENT  
& ENGINEERING CENTER



- RDECOM-ARDEC S&T investments over POM being realigned with changing Army priorities while balancing investments for long-term technology advancements
  - Platform agnostic armament systems and multi-role munitions are a major theme
  - ~50-60% per FY for munitions-related technologies
- Threat spectrum and emerging complex environments (e.g. dense urban) will provide both challenges and opportunities for current and future munitions



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# INTEGRATING THREATS AND CAPABILITY NEEDS



## Threat Based Planning

What can our adversaries do?

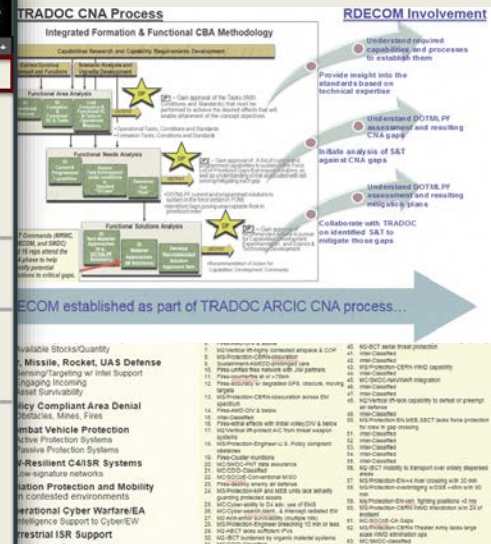
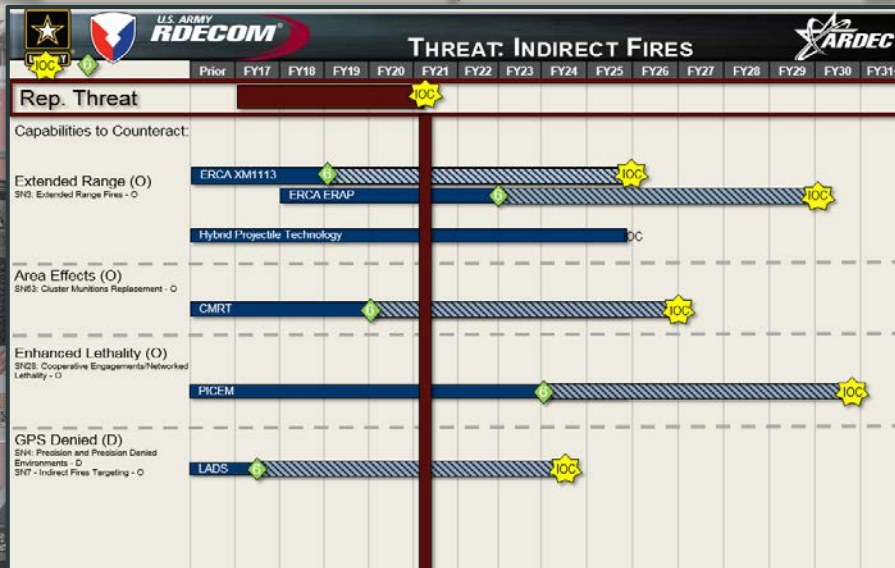
Drives system level trades

*Threat Analysis and Capability Based Analysis are two sides of the same coin and are difficult to decouple*

## Capabilities Based Planning

What do we need to be able to do?

Drives capability/domain level decisions



**RDECOM-ARDEC employing robust systems engineering practices to make the necessary system trades to balance SWAP-C working in concert with our stakeholders**



**EXTEND** - *Range extension with precision*



**ASSURE** - *Assured logistics/resupply – providing Warfighter with the right armaments at the right time, at the right place at the lowest possible cost*



**ENABLE** - *Core enabling technologies – Energetics, Fuze & power, Warheads, Guidance, navigation and control*



**PROTECT** - *Protective technologies (e.g. CUAS, CRAM, APS)*



**ENHANCE** - *Enhancing weapon systems – artillery, medium caliber, aviation*



**AFFORDABILITY** - *Improving affordability of fielded capabilities thru technology*



## Projected Armament trends expected to be available in 2020-2040 timeframe, as assessed by ARDEC:



### Munition Technologies

- Smart/ Collaborative Munitions
- Highly Directional Explosives/Warheads
- Multi-function Munitions
- Reduced health Impact of Expended Munitions
- Design for Demilitarization and Disposal
- Non-Kinetic Effects
- Scalable Munitions
- Enhanced Precision
- Counter Measure Hardened Munitions
- Advanced Fuzing
- Extended Range Effects
- Interceptor Munitions



### Weapon Technologies

- Directed Energy
- Fire Control
- Robotic and Autonomous Systems
- Collaborative Fires
- Signature Reduction
- Modular, Common, Multi-Use Components
- Non-Volume Suppressive Effects
- Improvised Explosive Neutralization
- Fires from Enclosure



### Enabling Technologies

- Application of Advanced Materials
- Enhanced Propulsion Science
- Advanced Manufacturing, including Additive and Non-Contact Subtractive
- Verified and Validated Modeling and Simulation tools
- Reduced Life Cycle Environmental Impact
- Logistics Automation and Reduction

*Future capabilities must be:*

Scalable – Affordable – Adaptable – Expeditionary – Domestic Application – Whole-of-Government Approach

## ARDEC Interrogating Early 6.1/6.2 for Game Changing Technologies



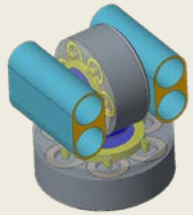
- Extended Range Cannon Artillery STO
- Advanced Lethality and Accuracy System for Medium Caliber STO
- Medium Caliber Armament System
- Cluster Munition Replacement Technology STO
- Affordable Precision Technology STO
- **Multi Role Munitions**
- **Counter UAS**
- **Additive Manufacturing**
- **Swarming/Collaborative Engagement**
- **Subterranean/Dense Urban**

STO = Science & Technology Objective



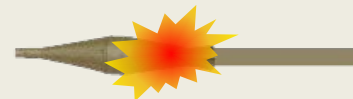
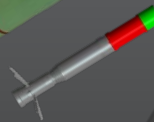
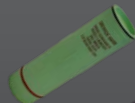
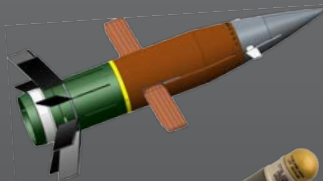
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# MULTI-ROLE MUNITIONS



## Multi-role munitions for expeditionary missions

- Non-dedicated AD systems - Leverage organic capability; focus on multi role armaments
- Scalable, non-caliber-specific munition technologies
- Defeat of multiple threats/targets
  - materiel, personnel, RPG, ATGM, UAS, RAM





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# COUNTER UAS

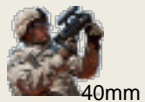


Provides Warfighter with the capability to accurately detect, track and defeat enemy UAS

- Focus on Low, Slow, Small UAS threats Groups 1 -3
- System of Systems approach to address the entire kill chain from target acquisition, detection, tracking, identification to defeat
- Non-dedicated AD systems - Leverage organic capability; focus on multi-role armaments
- Low cost per kill
- Consider swarming threats; high stowed kills



SKYWALL DEMO



40mm

**Long Range Intercept (Extended Range)**  
Super FOB

**Medium Cal CUAS**  
FOB - Bde

**Fixed/Mobile Area Protection**  
COP – Co/Platoon

**Squad Area Protection**  
PB/COP - Squad



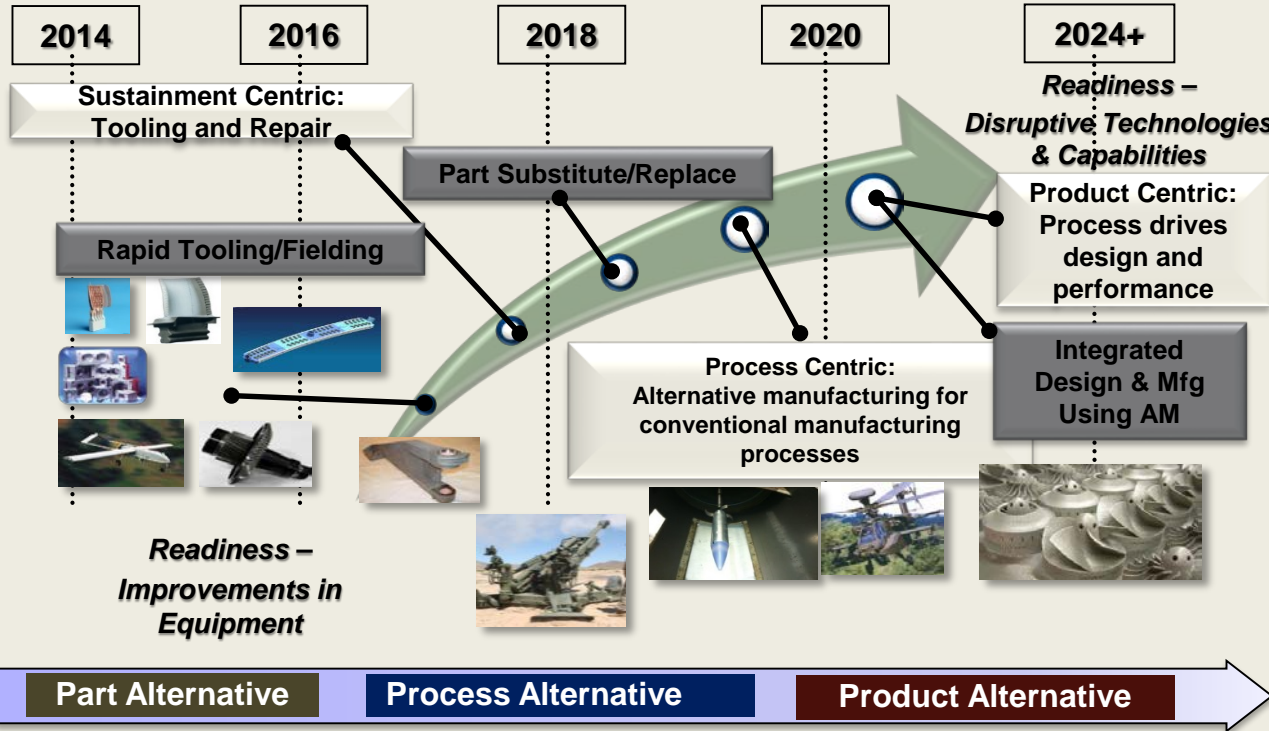


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# ADDITIVE MANUFACTURING (AM)



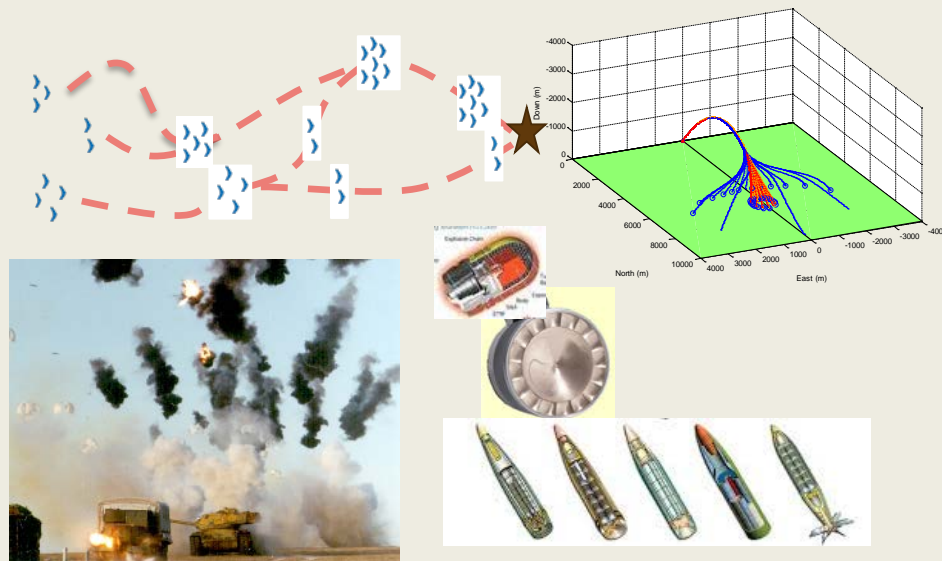
- Warfighting Benefits**
- More Effective & Lethal Weapon Systems
- Tailored Solutions for the Mission and Warfighter.
- Agility of Production Line - New era of supply chain independence
- Reduced Sustainment Costs and Increased Responsiveness
- Accelerated Capability Development



There are opportunities for AM & PE to impact all Army Systems

- Metals**
- Polymers**
- Printed Electronics**
- Energetics**

**RDECOM-ARDEC leading RDECOM  
Community of Practice advancing state of  
AM across all product domains**



**PURPOSE:** Demonstrate Cooperative and Collaborative tactics for indirect fired munitions

**WARFIGHTER PAYOFF:**

- Increased effectiveness given less rounds to defeat threat
- Enables expeditionary warfare given reduced logistics burden
- Enables pre-programmed tactics

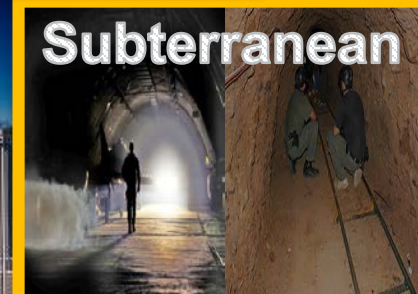
**ATTRIBUTES:**

- Demonstration coupled with Force on Force modeling for cost, lethality and logistics benefits
- Hardware/Software-in-the-loop (H/SWIL) capability for rapid cost effective hardware integration and algorithm development
- Open architecture platform capable of hosting autonomous cooperative and collaborative approaches
- Gun hardened suite of components that enable collaboration and swarming
- Swarming Incremental Capability Demonstrations end of FY18 & 19 with Capstone Demonstration middle of FY21



## How do we fight here?

- Subterranean (SbT) and Dense Urban Environments (DUE) present growing warfighting challenges
- RDECOM and TRADOC constructing an Army Campaign Plan to holistically address SbT/DUE challenges
- An RDECOM-led materiel development working group is currently operating to fully understand and address SbT / DUE challenges, needs and gaps
- Industry / academia partnership opportunities will exist to further technology research and address materiel solutions
  - 1<sup>st</sup> Industry/Academia Day 2QFY18



***"Failing to prepare for military operations in dangerous megacities could leave a future president without the means to do something that he or she considers to be in the national interest."***

- Steven Metz, *Strategic Horizons: How the U.S. Military Might Get Involved in a Megacity*



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.....Continued Dialog to Leverage Collaboration Opportunities



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# We Lead Collaboration for State-of-the-Art Armament Systems



# ALWAYS A STEP AHEAD