AMERICA'S ARMY:
**GLOBALLY RESPONSIVE
REGIONALLY ENGAGED**
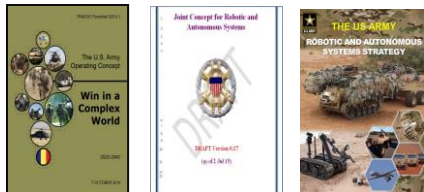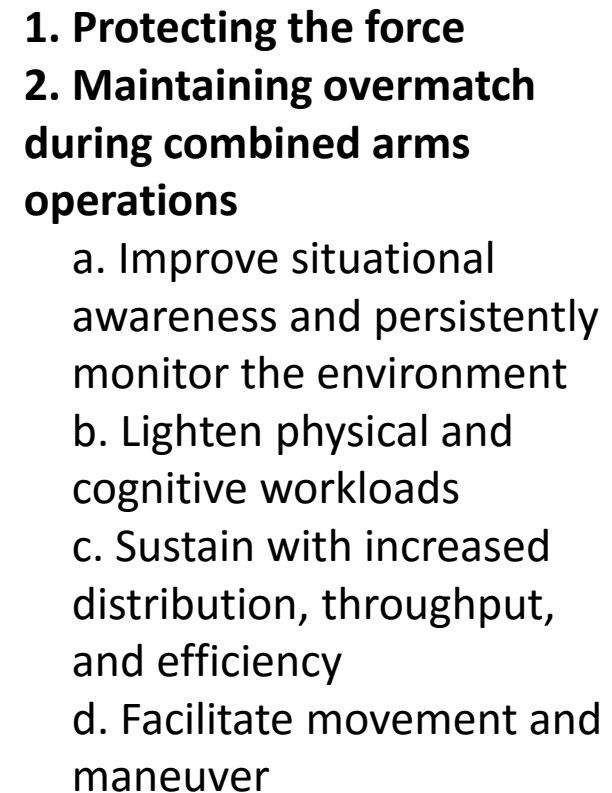
# Army Robotics Modernization
**22 June 2016**

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★ **ARMY STRONG** ★

- **New Developments**

- **Robotics and Autonomous Systems Capabilities**

- **Army Robotics and Autonomous Systems Strategy**

- **Army Requirements Oversight Council (AROC)**

- **Resourcing**

- **Innovation**

- **Challenges**

# *New Developments in Robotics*

- **Army Staff Consolidation for Requirements and Resources**

- **Joint Concept for Robotics and Autonomous Systems (RAS) Aug 2016**

- **Army Concept for Robotics and Autonomous Systems (RAS) Oct 2016**

- **Army Science Board Study on The Role of Advanced Autonomy Within Army Formations (Tactical Wheeled Vehicle, Dismounted, and Armored)**

- **Extended Warfighter Experiment for Leader-Follower Technology**

- **Army Warfighter Assessment for Leader-Follower Technology**

- **Programs of Record Requests for Proposal release**

- **Emerging Requirements Documentation**

# RAS Capabilities



Robotics and Autonomous Systems (RAS)

**Legend:**
- Manned-Unmanned Teaming Collaboration and Coordination
- Planned Route
- Revised Route
- Sensor Field
- CBRN Hazard Area
- X Way Point

Callouts in diagram:
- RAS augment 360 degree Force Protection
- UAS provide force application lethal and non-lethal targeting
- RAS provide real time SA and accurate updating of the COP
- Collaboration and coordination between RAS to team together to accomplish missions
- 360 degree surveillance provided by RAS and Unattended Sensors
- RAS Convoy and Cargo UAS Sustainment Operations
- Autonomous Processing, Exploitation, and Dissemination (PED) of Intelligence reduces Warfighter cognitive workloads
- Network Extension
- RAS provide unattended Precision Target Acquisition and Targeting
- RAS enable Sea Basing through Maritime Domain Awareness and Joint Undersea Superiority
- Interoperability through a common controller
- RAS reduce Warfighter Load
- Provide Standoff from threats
- Hybrid Threats in Complex Urban Environments
- RAS conducting route reconnaissance can identify potential hazards and allows commanders to adjust their plans

**1. Protecting the force**

**2. Maintaining overmatch during combined arms operations**

a. Improve situational awareness and persistently monitor the environment

b. Lighten physical and cognitive workloads

c. Sustain with increased distribution, throughput, and efficiency

d. Facilitate movement and maneuver

- Army Operating Concept (AOC) published November 2014
- Joint Capabilities Robotics and Autonomous Systems (JCRAS) to be published Aug 16
- Robotics and Autonomous Systems (RAS) Strategy to be published Oct 2016

**Robotics and Autonomous Systems (RAS) extend the area and time over which a force can be effective.**

# Robotic and Autonomous Systems Strategy

Purpose: The strategy synchronizes Army RAS activities, fosters unity of effort, and identifies opportunities to accelerate RAS capabilities in a resource-constrained environment. The Army will employ RAS to protect Soldiers and increase capabilities to maintain overmatch. This vision has *realistic objectives* in the **near-term**, *feasible objectives* in the **mid-term,** and *visionary objectives* for the **far-term.**

### Near-Term Vision- *Adapt (16-21)*



AEWE Spiral I Mobility Systems

Wheeled CaMEL v2        MUTT2

### Mid-Term Objectives:

➢ *Improve the autonomy of unmanned ground systems*
➢ *Unmanned air cargo delivery*
➢ *Increase payloads for ground and air platforms*
➢ *Introduce exoskeleton technology*

### Mid-Term Vision- *Evolve (22-31)*



*Joint Combined Arms Maneuver*

Sources for objectives:
-*Army Operating Concept*, **App C-2**
-**TRADOC S&T Imperatives**
-**Capability Needs Analysis**
-**RDECOM S&T Focus Areas**

### Near-Term Objectives:

➢ *Protecting the force at increased standoff distances*
➢ *Improving sustainment through Automated Ground Resupply*
➢ *Lighten the Soldier load*
➢ *Improve situational awareness*
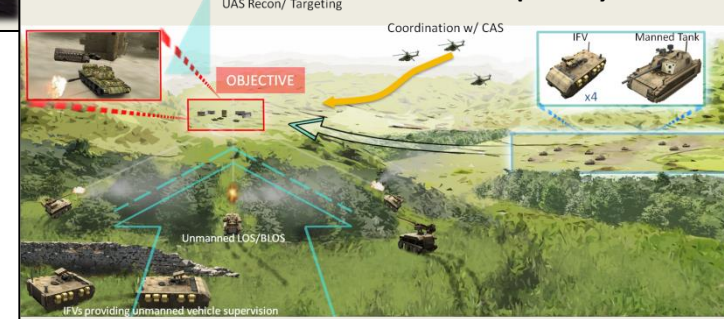➢*Facilitating movement and maneuver*

### Far-Term Objectives:

➢ *Machine intelligence, perception, reasoning*
➢ *Provide information that facilitates onward movement of early entry forces*
➢ *Operate in advance of maneuver forces to establish network, provide long-range fire data and local security*

### Far-Term Vision- *Innovate (32-41)*

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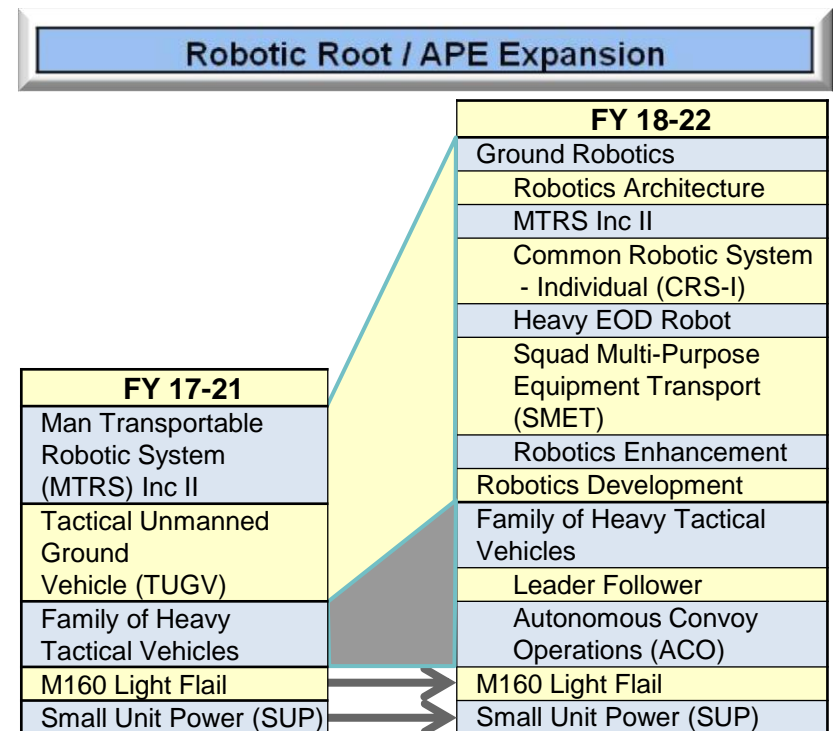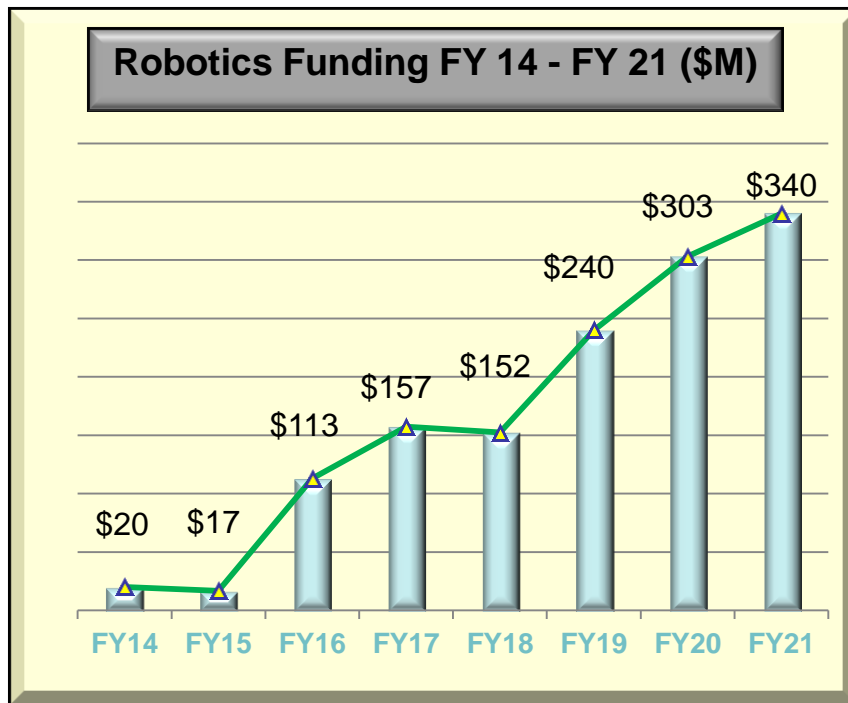**REGIONALLY ENGAGED**

CSA guidance:

- AROC is a decision making forum for the CSA/VCSA on all matters of requirements and modernization
- AROC will be driven by commanders (mainly TRADOC, FORSCOM, and AMC)
- AROC will be held every Friday
- CSA/VCSA are the only authority to cancel or delay AROC
- CSA/VCSA are the only authority for approving requirements and changes to requirements

Operating Rules:

- AFC's goal is to ensure AROC issues are clearly articulated and presented for AROC decisions => Consensus is NOT the goal
- Non-concurs will be noted and will not slow the process
- Voting members must be prepared and be empowered to represents the command's position
- Votes will be by name from all commands and agencies
- G8 Hardware Divisions will maintain control of the briefing slides and products
- Pre-briefs are responsibility of each command/agency

★★★★
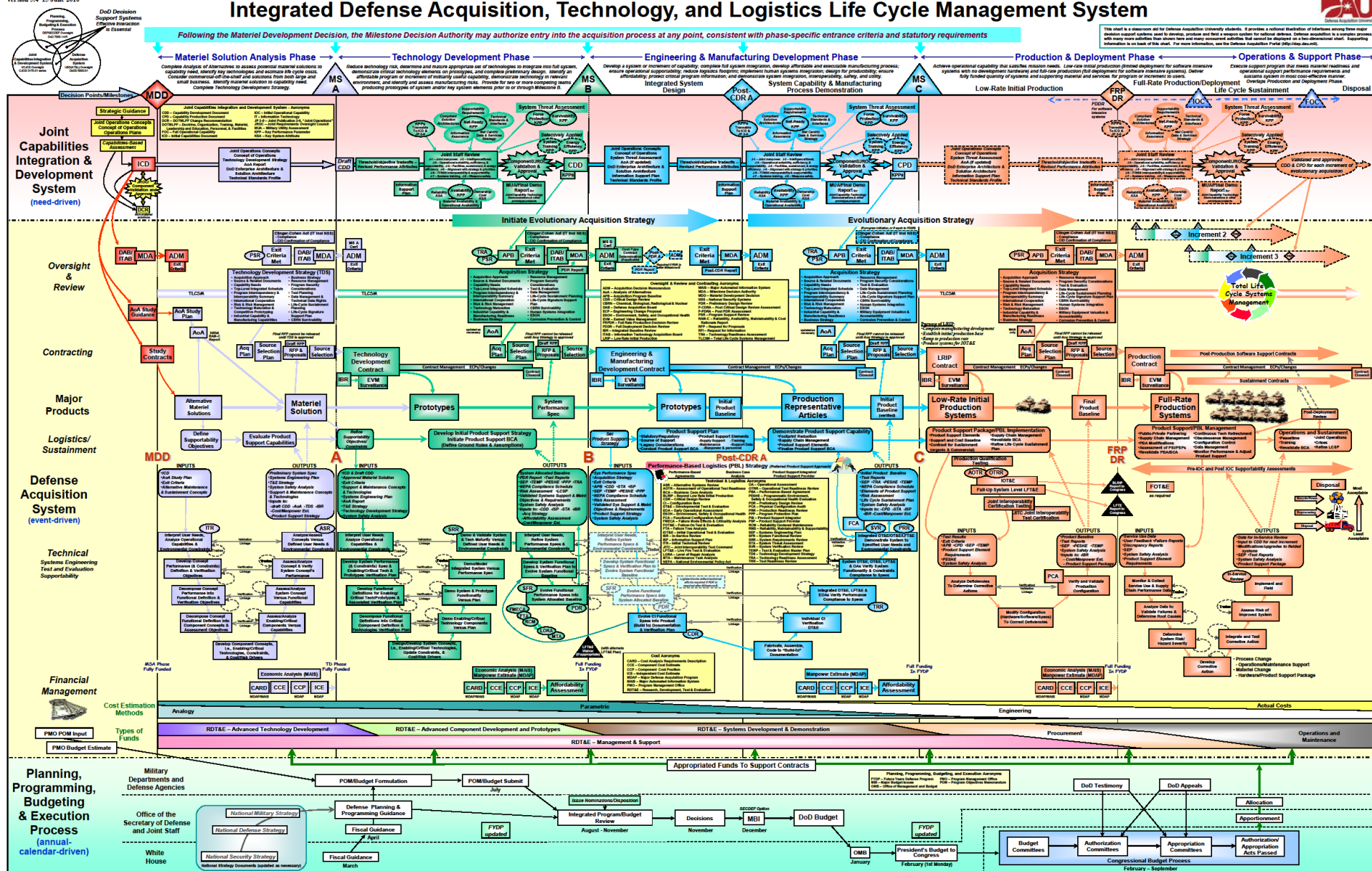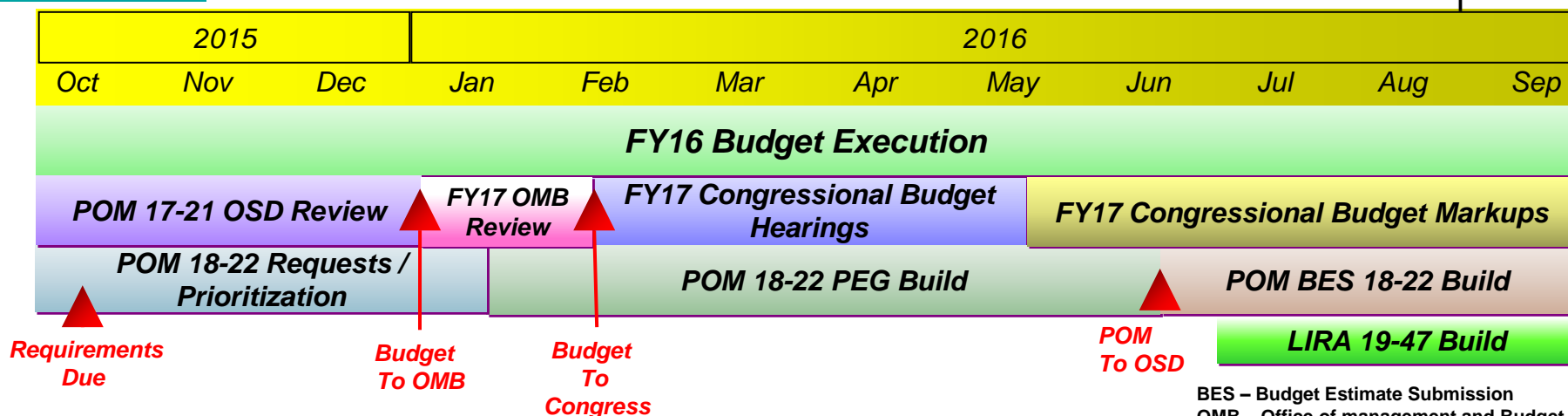Army Requirements Oversight Council (AROC)

2 Weeks ⬆ Approval

★★★
AROC Capability Board (ACB)

2 Weeks ⬆ Recommendation

★★
AROC Review Board (ARB)

2 Weeks ⬆ Topic Refinement

AROC Functional Council (AFC)

2 Weeks ⬆ Topic Development

AFC Working Group

# Robotics Funding

## Robotics Funding FY 14 - FY 21 ($M)

| FY | $M |
|----|-----|
| FY14 | $20 |
| FY15 | $17 |
| FY16 | $113 |
| FY17 | $157 |
| FY18 | $152 |
| FY19 | $240 |
| FY20 | $303 |
| FY21 | $340 |

## Robotic Root / APE Expansion

| FY 17-21 | FY 18-22 |
|----------|----------|
|  | Ground Robotics |
|  | Robotics Architecture |
|  | MTRS Inc II |
| Man Transportable Robotic System (MTRS) Inc II | Common Robotic System - Individual (CRS-I) |
|  | Heavy EOD Robot |
|  | Squad Multi-Purpose Equipment Transport (SMET) |
| Tactical Unmanned Ground Vehicle (TUGV) | Robotics Enhancement |
|  | Robotics Development |
| Family of Heavy Tactical Vehicles | Family of Heavy Tactical Vehicles |
|  | Leader Follower |
|  | Autonomous Convoy Operations (ACO) |
| M160 Light Flail | M160 Light Flail |
| Small Unit Power (SUP) | Small Unit Power (SUP) |

# Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System

**Needs Driven**

**Good idea to initial fielding averages seven years!**

DOTMLPF Analysis → DCR

CBA → ICD

Analysis of Alternatives → CDD

CPD

**Event Driven**

ICD → MDD → Materiel Solution Analysis → MS A → Technology Development → MS B → Engineering Manufacturing Development → MS C → Production and Deployment

| 1 – 2 years | 1 – 3 years | 1 – 3 years | 1 – 4 years | 3 – 10 years |
|---|---|---|---|---|

- ▢ Sponsor Activity
- ⬠ JCIDS Document
- △ Acquisition Decision

**Where can we accelerate?**

**Calendar Driven**

| 2015 | | | 2016 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |

**FY16 Budget Execution**

| POM 17-21 OSD Review | FY17 OMB Review | FY17 Congressional Budget Hearings | | FY17 Congressional Budget Markups |

| POM 18-22 Requests / Prioritization | | POM 18-22 PEG Build | | POM BES 18-22 Build |

**LIRA 19-47 Build**

*Requirements Due*

*Budget To OMB*

*Budget To Congress*

*POM To OSD*

BES – Budget Estimate Submission
OMB – Office of management and Budget
OSD – Office of the Secretary of Defense
PEG - Program Evaluation Groups
POM – Program Objective Memorandum

**No Requirement in FY15 = No Money in FY18 = No Program**

# Challenges to Developing PoR

- **The establishment of Programs of Record (PoR) requires the synchronization of technology development, requirements, and resources**

- **S&T technology development (Conditions based):**
  - **Understanding the Environment / Perception**
  - **Human-Robotic Interaction**
  - **Object Manipulation**
  - **Mobility**
  - **Machine Intelligence**

- **Operational Concepts and Requirements (Conditions based)**
  - **Force 2025 and Beyond**
  - **Improved protection, persistence, and endurance across the Warfighting Functions**
  - **Manned – Unmanned Teaming**
  - **Role of increased autonomy within formations; RAS transition from tool to team member**
  - **Government Owned Interface Standards / Specifications**
  - **Interoperability / Commonality / Modularity**
  - **Capability thresholds**

- **Resources (Calendar based):**
  - **Force Structure**
  - **Budget cycle**
  - **Approved Requirement documentation and supporting analysis**
  - **Affordability thresholds**
  - **Increased competition to reduce cost**
  - **Congressional Support**

# Questions ?