The Future of Robotics & Autonomous Systems (RAS)

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First to the Field... Last to Leave
Strategic Environment

• Operational Concept – “Win in a Complex World”
  • Emerging challenges/threats
  • More diffused and dispersed threats
  • Growing velocity of instability
  • Coalition involved

• Budget
  • Sustained fiscal uncertainty
  • “Do more” without “more”
  • Sequestration in FY 16?

• Army Modernization
  • Force efficacy
  • “No one silver bullet” - buy fewer, more often
  • Force Structure in flux (570K to 450K to ???)
  • Investments balanced against Force Structure and Readiness

• Acquisition Reform
  • Increased competition throughout acquisition process
  • Reduced tolerance for cost/schedule risk
  • Better buying Power III

Uncertainty, Complexity, and Constant Change
PEO CS&CSS RAS Vision

- Evolutionary approach toward delivering autonomy-enabled warfighter capabilities
- Technology (software & hardware) enhancements enable seamless, affordable, and timely programs that field standoff capability & intelligence to existing systems
- Deliberate management of program risk
- Modular, open architecture design philosophy
- Innovative industrial base & acquisition environment
- Attain a common lexicon
  - Automatic, Automated, Autonomous
Challenges Facing the Robotics Portfolio

• Transitioning from JUONS-based procurement to Programs of Record.
  • Requirements documents are key / fundamental (2 year approval process)
    ▪ Must focus on getting requirements “right” at the outset
  • Acquisition process complicated by larger population of critical stakeholders.
    ▪ 6 months from approved requirements document to MDD.
    ▪ 18 months from MDD to potential contract award.
    ▪ Lack of early funding to dedicate manpower to support programs.

• High level interest regardless of program magnitudes
  • Joint issues between Army, USMC & Navy
  • Significant external program dependencies
  • Desire to retain technological edge amid quickly evolving technology

• Complex mix of 80% Non-Standard Equipment (NSE) transitioning to mostly Programs of Records

Requirements & acquisition process takes 4 years to get a contract in place for a portfolio that requires technology upgrades every 5 years.
PEO CS&CSS Robotics Overview

Man-Transportable Robotics System Mark II (EOD)
Husky Mounted Detections System
Common Robotic System Individual
Robotic Enhancement Program
Talon IV
Packbot 510 FASTAC
SUGV 310 Mini-EOD
Dragon Runner
First Look
Non-Standard Equipment
Squad Mission Enhanced Transport

Man-Transportable Robotics System Increment II
Route Clearance & Interrogation System
HMEE-1
Semi-Autonomous Control
Leader/Follower
Automated Convoy Operations
M160 Light Flail
Man Transportable Robotic System Increment II (MTRS Inc II)

**Common Payloads (All Users)**
- PdM Unmanned Ground Vehicles (PEO CS&CSS)

**CBRN Sensors**
- CBRN Sensors for Application on Unmanned Systems ICD, 23 FEB 06, CARDS #028-06 (Payload)

**CBRN Payloads (Chemical Units)**
- JPM Contamination Avoidance (JPEO Chem Bio Defense)

**Base Platform**
- IOP V1.0 Compliant

**RFP release targeted for 2nd QTR 2016**

**Autonomous Mine Detection System**
- PdM Counter Explosive Hazard, (PEO Ammo)

**EOD Payloads (for MK2) EOD**
- Single-Shot Disrupter
- Firing Circuit

**PEO CS&CSS – NDIA Ground Robotics Capabilities Conference**

Distribution A: Approved for Public Release
RCIS Capability Overview: Type

- Route Clearance & Interrogation System (RCIS) CPD consists of two capabilities that are unmanned, semi-autonomously controlled, highly mobile platforms to support Route Clearance Platoons and the BCTs.

- RCIS Type I:
  - Optionally manned or unmanned
  - High Mobility Engineering Excavator (HMEE) capable of enabling Soldiers to semi-autonomously interrogate, excavate, and classify deep buried explosive hazards, IEDs, and caches.

- RCIS Type II to follow, leveraging technology and architecture from the RCIS Type 1 program

RCIS Type 1 RFP release targeted for 1st QTR 2016
**System Description:** CRS-I is a man-packable (<25lbs), miniature, highly mobile, unmanned robotic system with advanced sensors and mission modules for dismounted forces. CRS-I will be designed so that it can be quickly re-configured for other various missions by adding or removing modules and/or payloads. CRS-I will include a Common Controller.

**Addresses the Following Operational Capabilities Gaps:**
- Standoff short range Intelligence, Surveillance, & Reconnaissance (ISR)
- Remote Chemical, Biological, Radiological, and Nuclear (CBRN) detection
- Explosive Obstacle Counter Measure (EOCM)
- Explosive Ordnance Disposal (EOD)
- Future Users: Engineer, CBRN, INF, EOD

**Army Common Robotic System – Individual (CRS-I) with a Common Controller**

*Robot & controller diagrams are notional.*

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**RFP release targeted for 3rd QTR 2016**
Non Standard Robots (NSR)

- The Army purchased and has sustained over 7,000 robots over the past 10 years to support Combat Operations under the auspice of the JUONS process.
- Established and emerging Robotics Programs of Record (POR) will not be fielded until 2019-2024.
- In March 2012, the Army issued a directed requirement establishing a “Bridging” strategy for 7 Robotic Systems to be retained. This was subsequently reduced to 5 systems (over 1500 robots).
- The Robotics Logistics Support Center has responsibility to:
  - Provide Level I/II maintenance, reset, and recap as the robot depot source of repair for all Army EOD and Engineer non-standard non-POR robots until POR equipment are fielded.
  - Sustain and train non-standard, non-POR robots for the joint services (Army MTOE, Army Contingency Forces (ACF), Global Response Forces (GRF), GRF, Combat Explosive Hazards Course (CEHC), Explosives Ordnance School (EOCA), FORSCOM (Pre-Deployment Training), USAF, USMC (Route Reconnaissance and Clearance (R2C) program of record robot).
- Non Standard Robots are currently undergoing RESET and will be fielded over a two year period (2016-2017) under a Condition Materiel release.
Problem: Robotic technology is rapidly evolving. The standard requirements/acquisition timeline of 3 to 7 years increases the risk that robotic systems will be obsolete before it is fielded or more likely, before it even reaches Initial Operational Capability (IOC).

Mitigation: Evaluate small quantities of state-of-the-art robotic systems and/or payloads to inform the requirement and acquisition process.

Concept:
• Concept based off of Soldier Enhancement Program (SEP)
• REP is a special project (not a full life cycle acquisition program)
• Uses a “buy, try, and inform” methodology to better inform future Army requirements
• Approved proposals will be forwarded to DA G-3/5/7 for validation, prioritization, and funding

Status:
✓ Funded in FY15 (New Start)
✓ PEO approved the acquisition concept 21JAN15
  - REP initiated

Emerging Requirements
**Operational Concept**

The S-MET should be capable of operating in three control regimes; tele-operation, semi-autonomous and autonomous. Semi-autonomous navigation will include wireless leader/follower and waypoint navigation. The speed of the S-MET will allow for the squad to maintain its momentum during all operations.

**Mission**

The S-MET will lighten Warfighter’s load and sustain the force during ops. The S-MET will maneuver with the dismounted force and enable Warfighters to conduct continuous ops without the individual Warfighter carrying equipment required to conduct 96 hours of dismounted operations.

<table>
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<th>SMET</th>
<th>L</th>
<th>M</th>
<th>S</th>
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<td>Capacity</td>
<td>1000 lbs.</td>
<td>600 lbs.</td>
<td>300 lbs.</td>
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<tr>
<td>Range</td>
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<td>250 km</td>
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<tr>
<td></td>
<td>Xcountry</td>
<td>125 km</td>
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Automated Convoy Operations

Appliqué Kit

A-Kit
Universal Brain

B-Kit
Vehicle Specific Connectors

C-Kit
Modular Sensors

Provides *optional* unmanned capability to *any* manned vehicle; from driver assist to automated driving and navigation.
• While the exact composition of the PEO’s future RAS portfolio of systems remains dynamic, there are several intended design philosophies that our industry stakeholders can plan to – regardless of exact requirements.

1. Modular Open Systems Approach thru IOP
2. Common Mobility Platforms & Varying Mission Payloads
3. Design for Growth & Technology Evolution
4. Limit Unnecessary Redundancy
5. Materiel Development Preference (NDI>GOTS>COTS>Developmental Item)
6. Utilize Modular “Kits” Where Appropriate
7. Provide Intelligent Behavior to Existing Systems
8. Take Advantage of Intelligent Systems (i.e., CBM+)
9. Warfighter Centric Design
Enablers for Success

• Government/ Industry Communication & Engagement
  • Frequent dialogue
  • Industry Days
  • Robotic Enhancement Program (REP)

• Modular Open System Architectures (MOSA)
  • Plug & Play capabilities
  • Interoperability Profile (IOP)
    ▪ Compliance, adoption, expansion

• Common Autonomy Lexicon
  • Semi-Autonomous: “Human in the loop”*
  • Human-supervised Autonomous: “Human on the loop”*
  • Fully Autonomous: “Human out of the loop”*

* Paul Scharre, “War on the Rocks” Feb 18, 2015
Discussion