U.S.ARMY

PROGRAM EXECUTIVE OFFICE
CS CSS
First to the Field... Last to Leave
COMBAT SUPPORT & COMBAT SERVICE SUPPORT

The Future of Robotics & Autonomous Systems (RAS)

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Strategic Environment

- **Operational Concept – "Win in a Complex World"**
  - Emerging challenges/threats
  - More diffused and dispersed threats
  - Growing velocity of instability
  - Coalition involved

- **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

- **Budget**
  - Sustained fiscal uncertainty
  - "Do more" without "more"
  - Sequestration in FY 16?

- **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

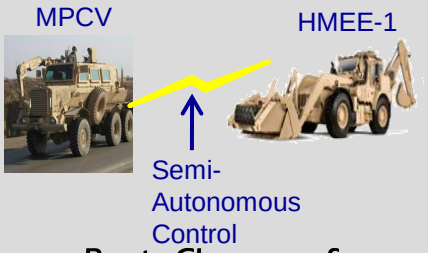
- Transitioning from JUONS-based procurement to Programs of Record.
  - Requirements documents are key / fundamental (2 year approval process)
    - Must focus on getting requirements "right" at the outset
  - Acquisition process complicated by larger population of critical stakeholders.
    - 6 months 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

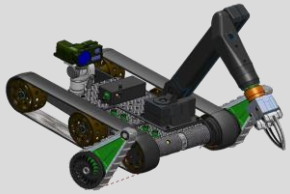
Man-Transportable Robotics System Mark II (EOD)

Husky Mounted Detections System



Route Clearance & Interrogation System

Man-Transportable Robotics System Increment II



Common Robotic System Individual

Robotic Enhancement Program

Leader/Follower

Automated Convoy Operations

Talon IV	Packbot 510 FASTAC	SUGV 310 Mini-EOD	Dragon Runner	First Look
				

Non-Standard Equipment

Squad Mission Enhanced Transport

M160 Light Flail

Man Transportable Robotic System Increment II (MTRS Inc II)

Fiber Optic

Optics

Manipulator

Radios

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

Engineers

Autonomous Mine Detection System

PdM Counter Explosive Hazard,
(PEO Ammo)

Base Platform
IOP V1.0 Compliant

EOD Payloads (for MK2) EOD

Single-Shot Disrupter

Firing Circuit

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

CBRN Sensors

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

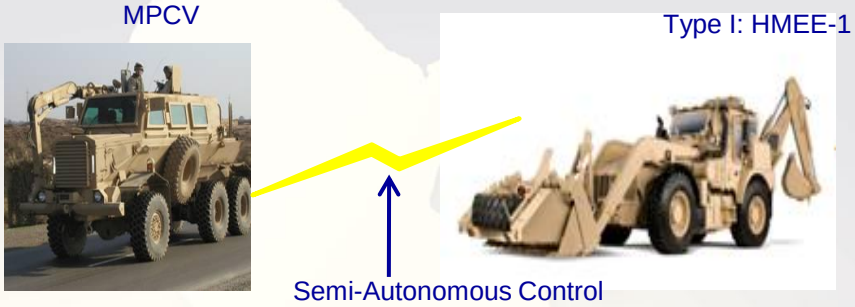
Robotic Deployment System
PM Assured Mobility Systems

RFP release targeted for 2nd QTR 2016

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



RCIS TYPE 2 (unfunded)

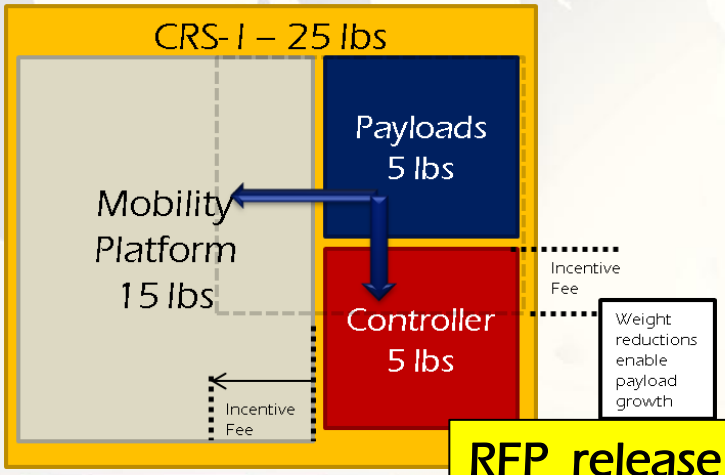
RCIS Type 1 RFP release targeted for 1st QTR 2016

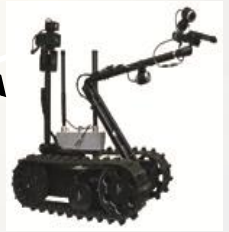
Common Robotic System – Individual (CRS-I)

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

25 lbs system weight

Additional UGV

RFP release targeted for 3rd QTR 2016

**Robot & controller diagrams are notional.*

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 reduce 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


First Look


Dragon Runner


SUGV 310 Mini-EOD


Packbot 510 FASTAC


Talon IIIB/IV

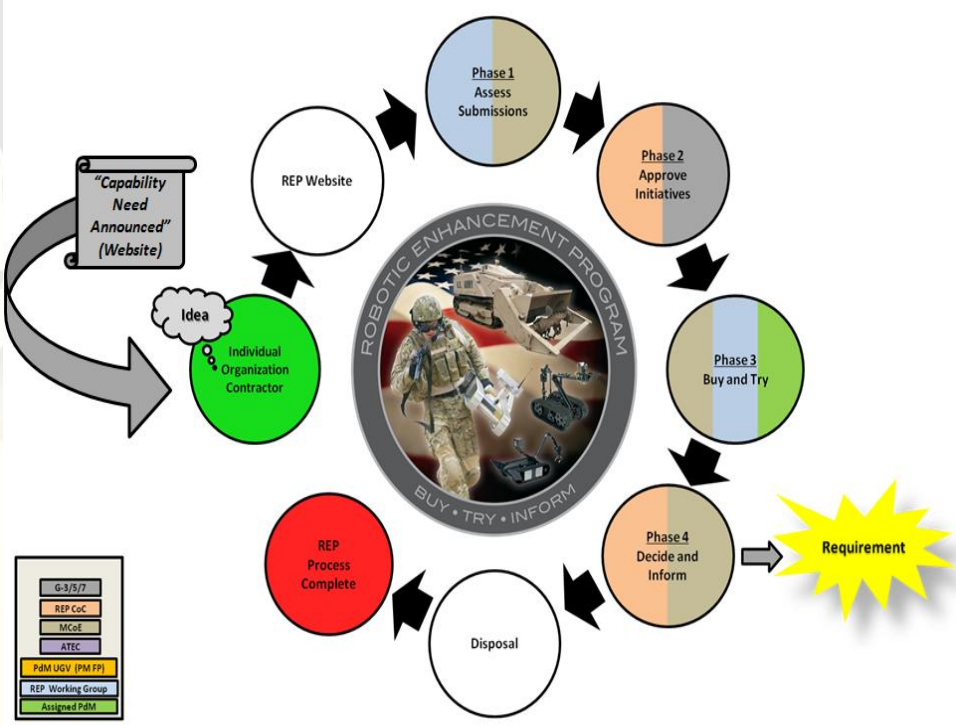
Robotic Enhancement Program (REP)

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 Solider 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

http://www.peocscss.army.mil/REP.html

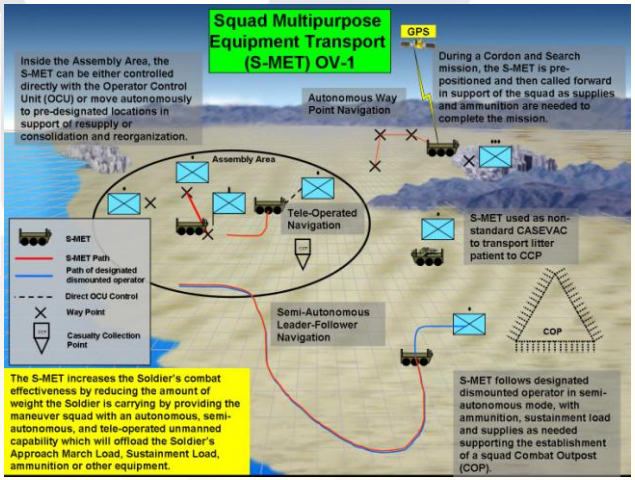
Emerging Requirements

Squad Multipurpose Equipment Transport

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.

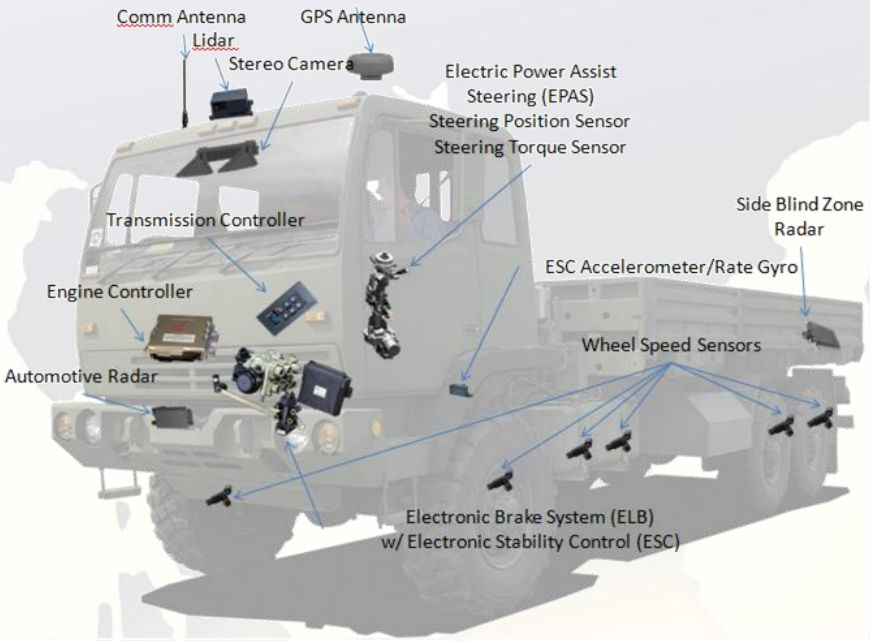
	SMET	L	M	S
Capacity		1000 lbs.	600 lbs.	300 lbs.
Range	On-road	250 km	100 km	50km
	Xcountry	125 km	60 km	30 km



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.

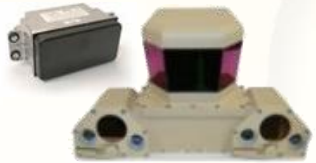
Automated Convoy Operations



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

PEO CS&CSS RAS Design Philosophy

- 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

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Discussion