UNMANNED GROUND VEHICLES UPDATE

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June 2012

Distribution Statement A: Approved for public release; distribution is unlimited.
RS JPO Robots Currently in Combat

Mini-EOD (SUGV-310)
PackBot Family
Recon Scout XT
MARCBot
XM1216 SUGV Family
TALON Family
M160

Current fleet predominantly COTS sustained with OCO Funding
Bridging Strategy

• Army G-3 Directed Requirement
  Sustain select COTS systems as bridging strategy until PORs are procured and fielded (MTRS Increment II and SUGV XM1216E1)

• Allows for base budget maintenance funding beyond OCO

• Bridging systems (primarily Talon and Packbot families) utilized for up to 6-8 more years

• Interoperability and counter-obsolescence key to extending useful service life and reducing operations and support costs
UGV Interoperability – The Challenge…

• Current systems generally not interoperable with each other

• Current systems not optimized to share information into other domains

• Payloads, sensors, software & computing devices anticipated to evolve much faster than base platforms

• User requirements calling for interoperable family of UGV platforms

“Interoperability is the countermeasure to obsolescence”
– LTC Hatfield, TRADOC ARCIC
RS JPO Interoperability Effort – Scope & Objectives

• Define interoperability standards for integration across UGVs leveraging other standards work to the greatest extent possible
  ➢ Open Architecture & Interfaces
  ➢ Common Control Standards
  ➢ Communications Data Links
  ➢ Modular Payload Interfaces
  ➢ Conformance & Validation Criteria

• Interoperability Profile Version 0 (IOP V0) defines baseline capabilities
  ➢ Fundamental system capabilities and functionality of fielded systems
  ➢ Standard message sets & requirements for interoperability across platforms

• Successive IOPs (V1, V2, etc.) expand capabilities based on Combat Developer guidance
RS JPO Interoperability Initiatives
2011-2012 Activities

- Working Groups consolidate findings for WIPT Leads
- WIPTs generate consensus on their IOP documents

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<tr>
<td>Full IOP Draft</td>
<td>Package Assembled</td>
<td>Exec board review &amp; finishing touches</td>
<td>Prep for exec board review</td>
<td>OPSEC review</td>
<td>IOP V1 Capability Plan Development</td>
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- Overarching
- Payloads
- Control
- Communications
- JAUS Profiling

Interoperability Profile (IOP) Version 0 Finalized in Dec 2011
IOP Version 1 Plan has finished development
# Army Ground Robotics Capability Sets*

## Class of Vehicles / UGV Platforms

*(Photos are Notional Representations Only)*

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<td>Crew Served Bot</td>
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<td>Small Bot</td>
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### Soldier Transportable

- Crew Served Bot
- Small Bot
- Micro Bot
- Nano Bot

### Vehicle Transportable

- Mounted or Towed
- Armed
- Humanoid

### Self Transportable

- Soldier Follower
- Robotic Wingman
- Squad Member

### Appliqué

- Remote Operation
- Supervised Autonomy
- Full Autonomy

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*Slide courtesy of TRADOC Army Capabilities Integration Center*
Robotics Requirements

• Overarching Unmanned Systems (UxS) Initial Capabilities Document (ICD)
  ➢ Joint Army and Marine Corps interest

• Army UGV Campaign Plan

• Emerging Requirements:
  ➢ Autonomous Mobility Appliqué System (AMAS)
    » Add-on appliqué system to virtually any manned vehicle
  ➢ Squad Multi-Purpose Equipment Transport (S-MET)
    » Self-transportable utility platform
  ➢ Route Reconnaissance and Clearance (R2C) Robot
    » USMC route clearance POR
  ➢ Engineering Squad Robot (ESR)
    » USMC Man-portable, lightweight robot
  ➢ Micro (Ultralight/Throwable) Robots
    » Multiple agencies (USA, USMC, REF)
  ➢ Man Transportable Robotic System (MTRS) Increment II
    » Army Route Clearance robot program of record
  ➢ Small Unmanned Ground Vehicle (SUGV)
    » Follow-on to current fielding effort
  ➢ Tactical Robot Controller
    » Draft CDD for Program of Record

Guided by:
• Operational Assessment data
• User feedback
• Risk Reduction programs
• Performance of current contingency programs
Joint approval of the Unmanned Systems (Air, Ground, Maritime) Initial Capabilities Document will create an overarching relationship for emerging Programs of Record and link various Unmanned System Roadmaps.

*Slide courtesy of TRADOC Army Capabilities Integration Center
Autonomous Mobility Appliqué System (AMAS)*
(PHotos are Notional Representations Only)

Provides *optional* unmanned capability to *any* manned vehicle; from driver assist to autonomous driving and navigation

*A Kit Universal Brain
*B-Kit Vehicle Specific Connectors
*C-Kit Modular Sensors

*Slide courtesy of TRADOC Army Capabilities Integration Center
AMAS Joint Capability Technology Demonstration (JCTD)

- JCTD Provides Risk Reduction to the AMAS Program
- AMAS goal provides scalable autonomy in a single material solution agnostic of platform
  - Autonomy Kit
  - Drive By-wire Kit
  - Common Interfaces and Frameworks

- Scalable and flexible to address multiple task such as convoys, security, reconnaissance, sustainment, maneuver, maneuver support
  - Scenarios use a secure mixed of manned/unmanned platform convoys
- Demonstrate increased vehicle safety with high op tempo in complex conditions
Unmanned Ground Systems Roadmap
July 2011

- 2012 Addendum this summer
- RSJPO Organization
- Maps Enablers to Technology/Needs
- Modernization Strategy
- Systems/Programs Portfolio

www.rsjpo.army.mil

RS JPO Roadmap was developed to help define the desired direction and investments in UGSs based on the current and projected states of technology
Future UGV Capabilities
Modularity, Commonality and Interoperability

- UGVs providing standoff protection
- Robots doing dull, dirty, dangerous jobs
- UGVs providing Standoff protection
- 1 Soldier to 1 UGV Teleoperation Control Some Limited Autonomy
- 1 Soldier to Many UGVs nearly autonomous
- Robots doing tasks, Better, faster, safer, &more efficient
- UGV-UAS Teaming For Full Spectrum Operations

UGV Tactical Behaviors

Today

Future

Leadership • Service • Innovation
Unmanned Ground Vehicles Way Ahead: Challenges and Opportunities

• Emerging Requirements...

• Affordability
  ➢ Resource constrained environment

• Size Weight and Power
  ➢ Battery performance, endurance, weight
  ➢ Robot Class vs. Capability (More with less)

• Interoperability and Commonality goals
  ➢ Interoperability profiles – industry participation
  ➢ Modeling and Simulation

• Teaming
  ➢ UGV/UGV
  ➢ UGV/UAV

• Communications
  ➢ Range
  ➢ NLOS

• Common Control

• Payloads
  ➢ Improved/different sensors

• Institutionalizing robotics
  ➢ Culture
  ➢ Standards and policy
  ➢ Infrastructure

• Partnering between Defense and Industry
  ➢ NDIA, AUVSI, RTC are all good examples
Questions?