NDIA
Ground Robotics Capabilities Conference
March 24, 2009

U.S Army, Maneuver Support Center
Fort Leonard Wood, Missouri

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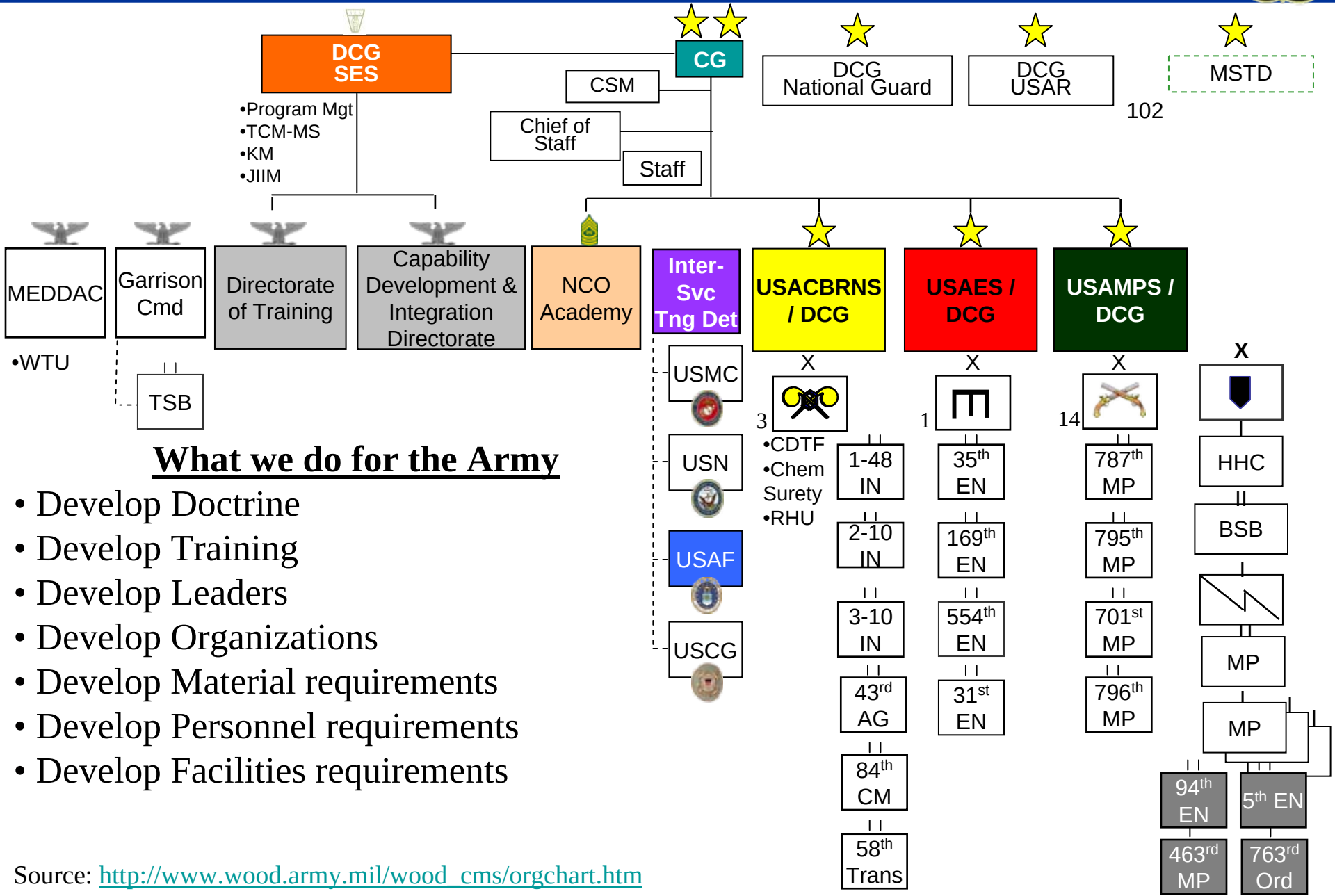
Deputy Commanding General
U.S Army, MANSCEN

Topics

- Maneuver Support Center Overview
- Missions and UGV Capabilities
  - Chemical, Biological, Radiological, and Nuclear (CBRN)
  - Engineer
  - Military Police
- UGV Assessments, Prototypes, Programs of Record
- Future Combat System Unmanned Ground Vehicle Integrated Product Team *An Insiders View*
- Lessons Learned
- UGV Concerns, Opportunities, and Recommendations

Maneuver Support Organization



What we do for the Army

- Develop Doctrine
- Develop Training
- Develop Leaders
- Develop Organizations
- Develop Material requirements
- Develop Personnel requirements
- Develop Facilities requirements

Source: http://www.wood.army.mil/wood_cms/orgchart.htm

Missions and UGV Capabilities

Chemical
Engineer
Military Police

Chemical Force Missions

- **Chemical, biological, radiological, and nuclear (CBRN) defense.**
- **Weapons of Mass Destruction (WMD) support to civil operations.**
- **Tactical CBRN reconnaissance**
- **Transport, escort, or destroy chemical agents**
- **CBRN decontamination**

Source: http://www.wood.army.mil/wood_cms/usacbrns.shtml

Chemical UGVs

- CBRN Unmanned Ground Reconnaissance (CUGR) ACTD conducted FY 06.
- Addressed two major thrust areas:
  - the Joint Contaminated Surface Detector (JCSD)
  - And the CBRN Unmanned Ground Vehicle (CUGV).
- CUGV addresses several war fighter shortfalls and limitations of dismounted CBRN reconnaissance
  - included requirements to survey potential contamination in vehicle inaccessible areas.

Packbot version of MTRS

Radiation Detection Radiac Set, AN/UDR-14

Lightweight Chemical Agent Detector (LCD 3.2E)

Explosive Gas and O2 Detector MultiRAE Plus

Sorbent Tube

Engineer Missions

- Sapper Combat Engineering
  - IED Defeat, assault breaching, area clearing, and bridging, fight as Infantry
- Diving
- Fire Fighting
- Construction of buildings, roads, airfields, utilities
- Search and Mine Dog operations
- Civil Works
- Global Mapping (Geospatial)
- Disaster Response
- Well Drilling

Source:
http://www.wood.army.mil/usaes/Building%20Great%20Engineers%20Content/STRATCOMS/Corps_of_Engrs_Branching_Trifold.pdf

Engineer UGVs

- MV-4 light flail is a Commercial Off the Shelf (COTS) remote controlled mine clearing machine designed for the destruction of all existing types of Anti Personnel mines.
- Assigned to Army Engineer Clearance Companies.

Source: http://www.armedforces-int.com/categories/mine-clearing-technology/doking-croatian-mechanical-application-humanitarian-mine-action.asp http://www.dok-ing.hr/Production/products.htm

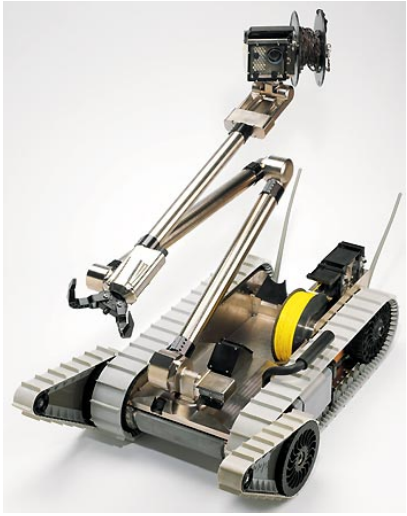
Engineer UGVs

- Autonomous Mine Detection System (AMDS) A new program of record (POR) based on successful field experiments to develop robotic tactical behaviors and three UGV payloads to detect, mark and neutralize landmines and explosive hazards from man packable size UGVs.

Source: http://www.inl.gov/adaptiverobotics/findinglandmines/index.shtml

Engineer UGVs

- Man Transportable Robotic System (MTRS)
  - Used for IED detection, light interrogation, confirming, and neutralizing
  - Required by Engineer Clearance Companies



Packbot EOD Version of MTRS

Talon EOD Version of MTRS

Military Police Missions

- Police Intelligence Operations
- Internment/Resettlement
  - Detainee Operations,
- Law and Order
- Area Security
  - Base Defense, Reconnaissance, Site Security
- Maneuver and Mobility Support
  - Route Reconnaissance, MSR Regulation

Source: http://www.wood.army.mil/usamps/usamps_MP_functions.htm

Military Police UGVs

- **Mobile Detection Assessment and Response System (MDARS)**
  - **The Robotic Security Guard**
- **A semi autonomous unmanned ground vehicle with intrusion detection, product & barrier assessment payloads.**
- **The Armies first fielded Semi Autonomous UGV.**
- **Currently on patrol at Hawthorne Army Depot (HWAD).**
- **Provides technology base for other Army Semi Autonomous UGV programs.**

Sources: http://www.gdrs.com/robotics/programs/program.asp?UniqueID=27
http://www.pm-fps.army.mil/programs.htm

Military Police UGVs

- Fido-PackBot
  - Military Police Urgent field requirement to remotely detect explosive hazards and contraband.
  - Fido is a new Capability Development for Rapid Transition (CDRT) candidate

Fido XT Explosive Vapor Detector

+

Packbot Version of MTRS Fido XT Sensor Payload

Source: http://asc.army.mil/docs/pubs/alt/2007/4_OctNovDec/articles/12_Technology_Transition_---_Lessons_Learned_From_Fido_Packbot_200710.pdf

UGV Field Assessments

To Prototypes and Programs of Record

A Success Story

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND
FORT MONROE, VIRGINIA 23651-5000

20 DEC 1994

REPLY TO ATTENTION OF
ATCD-RM (71-3c)

MEMORANDUM FOR COMMANDER, U.S. ARMY ENGINEER SCHOOL, ATTN: ATSE-CG, FORT LEONARD WOOD, MO 65473-5331

SUBJECT: Proponent for Ground Robotics Technology Assessment

1. The U.S. Army Engineer School is designated proponent for Ground Robotics Technology (GRT) Assessment. Assume the following proponent responsibilities: maintain a central repository on ground robotics technology, be consultant/subject matter expert, and assess ground robotics technology initiatives. These responsibilities extend to both current GRT initiatives and future GRT efforts.

2. As GRT assessor, coordinate with other proponents to help eliminate redundancy and foster commonality (where appropriate).

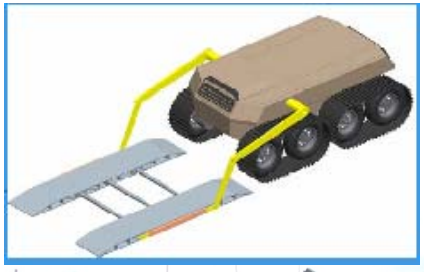
Maneuver Support Battlelab
UGV Assessments to Programs of Record

Mini Flail

MV 4 Flail

Robotic Mini
Backhoe Loader

Route Clearance
Interrogation System (RCIS)
(New Requirement)



Robotic
Bridge

Autonomous Delivery
of Engineer Payloads;
(New Requirement)

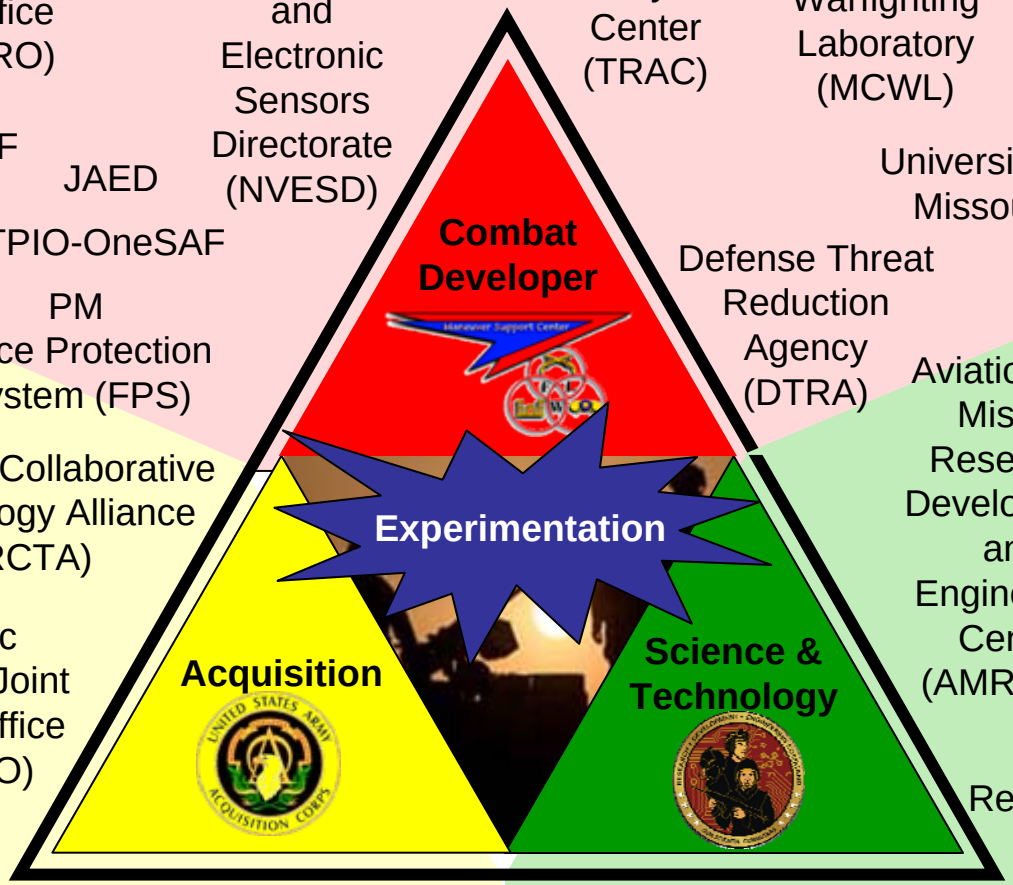
Robotic
Decontamination

Automated
Decontamination
Advanced Technical
Demonstration (ATD)

Robotic Mine
Detection
Tactical Behaviors

Autonomous
Mine Detection System
(New Requirement)

Maneuver Support Battlelab
Strategic Partnerships for UGV Assessments



Army Engineer Research and Development Center (ERDC)

Joint Requirements Office (JRO)

US Army Night Vision and Electronic Sensors Directorate (NVESD)

TRADOC Analysis Center (TRAC)

Marine Corps Warfighting Laboratory (MCWL)

Army Training and Doctrine Command Army Capabilities Integration Center (ARCIC)

PM-OneSAF

JAED

University of Missouri

Joint Center for Robotics Army Tank Automotive RDE Center (TARDEC)

TPIO-OneSAF

PM Force Protection System (FPS)

Defense Threat Reduction Agency (DTRA)

National Center for Defense Robotics (NCDR)

Robotics Collaborative Technology Alliance (RCTA)

Aviation and Missile Research, Development and Engineering Center (AMRDEC)

Edgewood Chemical Biological Center (ECBC)

PM Combat Support Systems (CSS)

Robotic Systems Joint Project Office (RS-JPO)

Army Research Lab (ARL)

Space and Naval Warfare Ctr (SPAWAR)

Joint Program Office Executive Office Chem Bio Defense (JPEO CBD)

PM Guardian

Joint Ground Robotics Enterprise (JGRE)

Air Force Protection Battle Lab (AFPBL)

Leonard Wood Institute (LWI)

Air Force Research Lab (AFRL)

Dept of Energy Idaho National Labs (DOE INL)

DARPA

PM-CRAM

Future Combat System Unmanned Ground Vehicle Integrated Product Team (FCS UGV IPT)

An Insiders View

FCS UGV IPT Review

- Multifunction Utility/Logistics Equipment (MULE) variants

MULE-Transport (MULE-T)

Armed Robot Vehicle Assault (Light) (ARV-A(L))

MULE-Countermine (MULE-C)

- Small Unmanned Ground Vehicle (SUGV)

FCS UGV IPT View

- MANSCEN and the Army will benefit from FCS advances:
  - Migrate FCS UGV technologies and payloads into our current modular force.
  - Spin Out some FCS UGV systems to the current modular force such as the SUGV to MANSCEN forces in BCTs.

MANSCEN Assessment

- MANSCEN Soldiers have accepted UGV capabilities
  - Will require more UGVs in the future
- UGV technology assessments work!
  - Creates re-usable prototypes for Soldier assessments
  - Accelerates UGV Programs of Record & Refines User Requirements.
  - Builds a community of strategic partners focused on Soldiers

Concerns and Opportunities

- UGVs “Good but not all they can be”
  - Must go beyond Teleoperation
  - UGVs must collaborate with manned and other unmanned systems
- Strategic Partner Communication and Support
  - Good but not as good as it should be.
    - UGV strategic partners fused into a Soldier centered conversation.
  - More UGV Prototypes for Warfighter Experiments

Future UGV Capabilities

What tasks from the Mission Essential Task Lists can the robot perform?

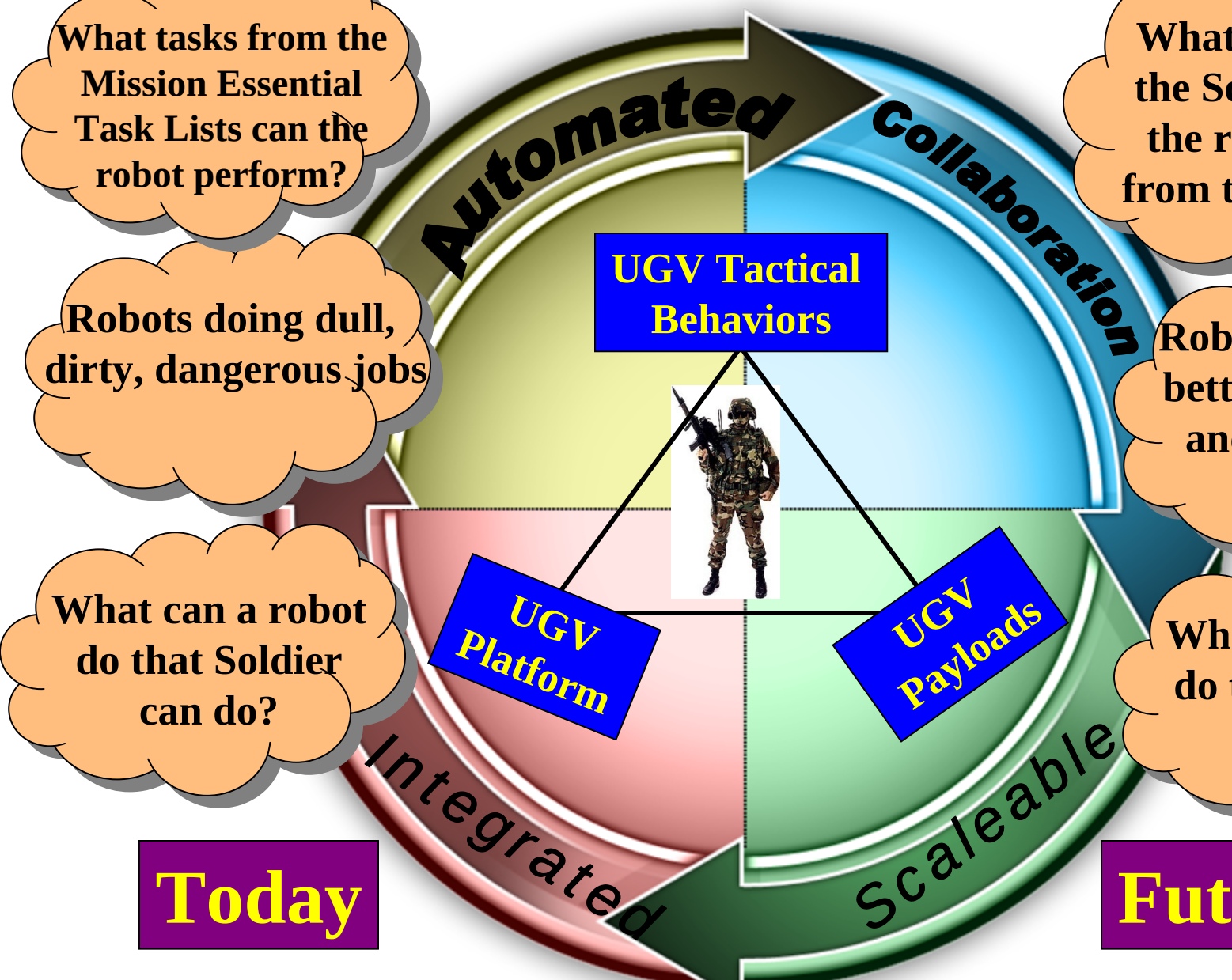
What missions can the Soldier do with the robot fighting from the sanctuary?

Robots doing dull, dirty, dangerous jobs

Robots doing tasks, better, faster, safer, and more efficient

What can a robot do that Soldier can do?

What can a robot do that a Soldier can't do?



Today

Future

FOB OPERATED UNMANNED SYSTEMS UGV TO UAV TEAM

Task/Mission/ Description

Teams of Unmanned Systems providing Tactical Situation Awareness while being mobilized to mitigate the threat.

- FOB receives SA from ERMP of enemy force moving into Operating Area, FOB deploys MDARS.
- FOB receives SA from High Altitude (HA) systems of insurgents placing an IED on a cleared route, FOB deploys and engage target w/ ARV A(L)/MDARS.
- UAS detects mounted enemy patrol, FOB directs Raven to respond to threat.
- UAS detects possible mine field, MULE countermine mitigates obstacle.
- UAS detects threat attack on chemical plant, FOB request fire missions from NLOS, CUGV deployed to detect for contamination
- FOB receives SA from SUGV images of possible sniper, TUAS verify and ARV A(L) responds.
- FOB receives SA from Tactical Video Surveillance System (TVSS), FOB deploys SUGV to search BLDG for insurgents', ARV A(L) over watches.

Closing

- MANSCEN and the Army are using UGVs to protect Soldiers today and into the future.
- Ground robotic Military User Assessments work!
- UGV strategic partnerships work.
- There are opportunities to maximize the effectiveness of UGVs
  - Re-useable UGV prototypes
  - Interoperability with manned and unmanned systems.
  - Coordinate UGV Soldier supported assessment activities
- Finally, when you build it, Show Me through our Maneuver Support Battle Lab @ telephone 573.563.4084 (DSN 676)

A bad day for a UGV

A great day for a Soldier that lived to tell about it.

Questions

Dr. Rebecca Johnson
Deputy Commanding General
U.S Army, MANSCEN

Backup Slides

Autonomous UGV Development

- Autonomous Robotic Countermine Capability (ARC2)

Phase I (2005-2006)
Develop portable re-configurable tactical behaviors to enable teams of small UGVs and UAVs to collaboratively conduct semi-autonomous countermine operations in live and virtual environments.

Phase II (2007-2008)
Develop re-configure tactical behaviors to enable teams of small UGVs to collaboratively conduct semi-autonomous CBRNE reconnaissance in buildings, bunkers and tunnels.

Prototype UGV with Mine Detector and Mine and Lane Marking System