Towards a Robotics Strategy

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Mission: The Army Capabilities Integration Center leads the development and integration of force capabilities across the DOTMLPF for the Army within a Joint, Interagency, Intergovernmental and Multinational (JIIM) environment to support the Joint Force Commander through ARFORGEN.

Vision: World class professionals developing innovative, integrated, resource-informed, and outcome-based solutions for the current to future force.
ARCIC Priorities

- **Army Level Priorities**
  - STRATCOMs – engage OSD, Congress
  - Outreach to ASCCs and COCOMs
  - QDR
  - Environmental Strategy
  - Unified Quest
  - Future Combat Systems
  - Develop a one Army Modernization Strategy

- **Generating Force Priorities**
  - Generating Force Study
  - Leading from the Edge
  - ARCIC Campaign Plan tied to TCP, metrics, and ARCIC organization design
  - Metrics for Future Readiness
  - Campaign of Learning
  - Integration – Trades, Organizational based TCMs
  - FCS COE
  - Capability Needs Analysis
  - People – training, education, certification
  - Link support forms to ARCIC Outcomes (NSPS, 67-9-1, TAPES...)

- **Operating Force Priorities**
  - FCS enabled Army Analysis and Way-ahead
  - Accelerated Capabilities & Spinouts
  - Revised Army Capstone Concept
  - S & T Warfighter Outcomes
  - Unified Battle Command
  - Affordable and Achievable LWN
  - Network Vulnerability
  - More efficient and effective 1.1m Army
  - Energy Strategy for the Operating Force
  - Precision Fires
  - Tactical Wheeled Vehicle Strategy
  - ISR Metrics
  - SOF / GPF
  - Organizational and conditioned Force Protection
  - Joint Future Theater and Tactical Lift
  - Small unit excellence
  - Commander’s Appreciation and Campaign Design FMI
A Robotics Strategy....how far can we go?

Would you mind taking a look & seeing what size batteries I take?
Global Trends

- Globalization
- Population Growth
- Technology
- Resource Demands
- Climate Change
- Natural Disasters
- Proliferation of WMD

Strategic Environment

- “Information Revolution…the death of time and distance”
- Greater disparity creates tremendous “friction”
- Rise in power and influence of Non-State Actors
- Increased willingness to use violence
- Complex challenges require all elements of power to address

Operational Context

- Diverse Actors
  - Hybrid Threats
  - Operations “Among the People”
- Unpredictable
- Global Media
- Radical extremism attacks fragile Institutions
- Joint, Interagency, Multinational and Indigenous Partners

“Interdependent economies, Porous Borders, Decline of the Nation-State”

Persistent Conflict: Protracted confrontation among state, non-state, and individual actors that use violence to achieve their political and ideological ends.
**Landpower in the 21st Century**

**Landpower:** The ability to achieve decisive results on land

**Land Forces:** The military component of Landpower

**Role of Landpower:** To provide the Nation with a full spectrum capability to conduct these essential strategic functions:

- Engage
- Compel
- Deter
- Integrate
- Prevent

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**Land Force Qualities in the 21st Century:**

- Versatile
- Expeditionary
- Agile
- Lethal
- Sustainable
- Interoperable

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**Gaps**

- Interoperability – COP and network
- Agility – too much, too heavy
- Sustainment – still tied to ground LOCs
- Enduring, lightweight, low power
- Not mastered IED threat
- Enhanced individual and unit training
- Tooth to tail ratio

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**Land Power** consists of US and Coalition Armies, Marines, SOF, Interagency teams, and joint integrating effects delivered by Air Force and Navy in the land domain
Big-Five Warfighter Outcomes that Guide S&T Investment

**Battle Command Network**
- Beyond-line-of-sight
- Optimized for mobile operations
- Increase access to the individual Soldier

**Counter IED and Mine**
- Detect, identify and neutralize CBRNE obstacles
- Safe standoff distance
- Maintains maneuver force momentum while protecting Soldiers and platforms

- Enhanced agility to operate worldwide, reducing weight and volume
- Sufficient pulsed power enabling advanced lethality options
- Increased continuous power and fuel economy
- Dismounted Soldiers to possess twice available power, at half the tactical weight

**Power & Energy**

**Human Dimension**
- Enhance & restore cognitive and physical performance
- Soldiers incorporated into highly trained and competent small units
- Access on potential vs. high school performance
- Mitigate the increase in physiological and psychological stress
- Improving mental, moral and physical capacity and performance

**Training**
- Live, virtual, constructive and mixed venues
- Impart more skills, faster, at lower cost, with greater retention than currently achievable
- Use non-traditional home station training techniques; train prior to employment
- Enhance and account for individual proficiencies and learning rates (outcome based)
**Battle Command Network**
- Reduce time lag in the “sensor-to-shooter” chain via reconnaissance and target designation
- Communications / data relay
- Synergy with C4ISR systems for autonomous capability

**Counter IED**
- Detection and removal
- Increased standoff

**Power and energy**
- Increased range of unmanned fighting systems
- Possible use of alternative fuels for extended range and mission duration

**Human Dimension**
- Extend human perception and action
- Assist with or conduct physically demanding tasks
- Improve tooth to tail ratio (More effective and efficient use of Soldier resources)

**Training**
- Ability to train on use of unmanned systems in simulations or simulators

- Leader training required to ensure effective integration of manned-unmanned systems
- Requires sufficient availability of systems to enable training at home station, power projection platforms, and CTCs

- Impact on available bandwidth and network spectrum management
- Socio-moral implications
Current Army Robotics Strategy

• Future Combat System Inserts
  - UAS CL I and IV
  - ARV-AL
  - MULE-T
  - Small Unmanned Ground Vehicle (SUGV)
  - MULE-CM

• OIF / OEF developmental items and fielding (ONS & JUONS)
  - Multiple platforms & payloads

Initial Priorities
  - Reconnaissance and Surveillance Systems
  - Target ID and Designation
  - CBRNE Reconnaissance
  - Counter-Mine Warfare

Other Developments
  - Convoy Active Safety Technologies
  - Exoskeleton – Sustainment Variant
  - Battlefield Extraction Assist Robot
  - Robotic Combat Casualty Extraction & Evacuation

• On-going S&T developments – Studies and Road maps

The objective is to empower Soldiers and Small Units
A Next Step in the Army Robotics Strategy

Current Strategy

- Future Combat System Inserts
- OIF / OEF developmental items and fielding (Multiple platforms and payloads)
- On-going S&T developments

+ Manpower intensive tasks for which robotics provides a technical solution
  - Combat, CS, CSS tasks from UJTL and AUTL
- Include CONUS and forward deployed operations

- Leverage emerging robotics technologies – commercial and military applications that reduce the burden on the Soldier and the Force
- Adhere to designated DoD interoperability standards and objectives
Some Guiding Principles for Continued Development

• Robotics **enable the humans**

• Humans should **not have to accommodate** the technology

• Good design early user and technology developer collaboration -- **User Juries are an effective means!**

• Robotics – the potential **to get more from force structure**
  – Explore all mission areas
  – Move beyond capability gaps and JUONS. Pursue new paradigm to determine emerging technologies investment
  – Unambiguous and defensible Return on Investment
  – Leverage modeling and simulation for comprehensive DOTMLPF impact and effectiveness analysis

• Use “system of system” to measure effectiveness
Thoughts on Autonomous Robots

• **Seamless integration** of robots into military and civilian society
  – Trust and confidence: transparency of action, cues to activity, tolerance to failure
  – Operating within society: adaptability to varying social cues and context
  – ARL via the Robotics Collaborative Technology Alliance program

• **Autonomy is “conditional”** … largely based on three factors
  – Reliability: what are the effects of an inability to control the system?
  – Task complexity – what are interdependent tasks and subtasks?
  – Variety of the operational environment – how rapidly does it change and can it be “conditioned?”

_Soldiers must be able to control autonomous systems to suit conditions as they change over time_
How you can help …

• TRADOC and TARDEC **Robotics White Paper**:  
  - Feedback is welcome and encouraged. Provide feedback to:  
    - COL Jim Henderson, TRADOC ARCIC  
    - Dr. Jim Overholt, Director, Joint Center for Robotics

• **Technology Information Exchanges (TIE)**  
  - The TIE Program provides a two-way dialogue mechanism to address Army “warfighter” needs and to help industry focus their Research and Development resources and efforts.  
  - ARCIC, Science and Technology Division is responsible for facilitating the program.  
  - Forward Inquiries to Mr. Kenneth Hamilton  
    - Telephone: (757) 788-5749  
    - Facsimile: (757) 788-3445  
    - Email: Kenneth.hamilton4@us.army.mil

“I’ll be happy to give you innovative thinking. What are the guidelines?”
Back-up