Accelerating Innovation and Discovery at ARL and Beyond

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Director
U.S. Army Research Laboratory
The Future Army’s Emerging Path Forward

Deep Future (Could Do + Should Do)

Revolutionary, concept-based, technology informed investments to build an Army that is …

- Significantly improved, organized, and enabled to conduct expeditionary maneuver with operationally significant forces able to respond and influence events at speed
- Leverages new operational concepts, technologies, and force designs to get the most force at the least cost in terms of money and manpower, balancing if not inverting the tooth-to-tail
- Focus is on new technologies, operational concepts, processes, and force design improvements that allow us to innovate as well as guide Force 2025

Force 2025 (Can Do + Should Do = Must Do)

Focused Investment, informed by concepts and technology, to …

- Implement key changes to become leaner, more lethal, expeditionary, and agile, with greater capability to conduct decentralized, distributed, & integrated operations
- Focus on decisions and priorities regarding current technology that allows us to maintain overmatch, while driving critical capability and technology development needed for the future

Army 2020

Reinvesting in modernization, with selected improvements to …

- Rebuild readiness and produce a more globally responsive and capable, and leaner Army, with an improved, resilient network
- Leverage leader development, human performance and professionalism
- Focus on executing decisions already made, capturing lessons learned, and setting conditions for the future

Army 2014

Taking risk in modernization, focusing on Intellectual and organizational change …

- Reorganize the Army and develop an expeditionary mindset to be more responsive
- Reorganize bureaucracy and processes to simultaneously adapt and innovate to maintain the Army’s position of relative advantage and set conditions for the future
ARL S&T Campaigns

Human Sciences
Fundamental understanding of Warfighter performance enhancement, training aids, and man-machine integration.

Information Sciences
Fundamental understanding of information generation, collection, assurance, distribution, and exploitation.

Sciences for Lethality & Protection
Fundamental understanding of emerging technologies that support weapon systems, protection systems, and injury mechanisms affecting the Warfighter.

Sciences for Maneuver
Fundamental understanding of the design, integration, control, and exploitation of highly adaptive platforms in complex environments.

Computational Sciences
Fundamental understanding of computer hardware, high efficiency algorithms, and novel mathematical methods.

Materials Research
Fundamental understanding of structural, electronic, photonic, and energy materials & devices.

Assessment and Analysis
Quantitatively assess the development and application of analytical tools and methodologies to quantitatively assess the military utility of Army, DoD, and select foreign combat systems.

Extramural Basic Research
Steering and oversight of the systematic study to increase fundamental knowledge and understanding in physical, engineering, environmental, and life sciences related to long-term national security needs.
Critical Member of S&T Ecosystem with DoD, Academia, Industry and Small Business

- Build awareness of Army S&T problems in the national conversation on security, defense, science, and education
- Develop a joint workforce with flexible career options
- Enhance employment potential
- Attract new staff/faculty by access to collaborative network
- Strengthen academic programs in the sciences, engineering, and mathematics
- Introduce Small Businesses to ARL scientists & engineers

Align & Leverage Resources

- Expertise, facilities, capabilities and perspectives
- Access to real data for enhanced simulation and emulation, e.g. of cyber and mobile networking domains
- Inform R&D for improved Army system integration by collaboration with Industry
- Ensure rapid technology transition to the marketplace
- Opportunities to shape technology maturation timelines
Rate-Activated Tether for Reduction in Ground Impact-Induced TBI

- Collaboration with NFL/Under Armour/GE/ARL
- Concept: Use tether to reduce head velocity during backward falls, and severity of head-to-ground impact
- Rate-activated tether provides over 100X more force during high speed extension, compared to low speed extension

*ARL POC: Eric Wetzel (Material Sciences)*

Information Exploitation Research

- Research to develop analytical solutions to manage uncertainty, speed contextualization, and assist reasoning across multiple sources of information to promote accurate situational awareness.
- ARL and LM(ATL) will endeavor to exploit open source information, characterize the value of information from an analyst’s perspective, and research advance assisted-reasoning techniques.
- Predictive Analytics
- Characterization of Information
- Exploitation of Open Source / Social Media
- Army Intelligence for Megacities

*ARL POC: Tim Hanratty (Information Sciences) / Kevin Barry LM(ATL)*
Research Exchanges:

Prof. Patrick Mather, Syracuse University (Material Sciences)
- One year sabbatical at ARL to investigate the rate dependent mechanics of polymer blends
- Exploring the processing-structure-mechanics relationships in novel phase separating polymer blends
- Modeling the polymer blends with well controlled chemistry, composition, and morphology.

Dr. Steven Keller, ARL (Material Sciences)
- Three year detail at UMass Amherst
- Investigating feasibility of textile-integrated carbon nanotube antenna fabrication with U. Cincinnati
- Collaboration with NSRDEC and UMass (Amherst and Lowell) on conductive textile and flexible antenna research and fabrication

Cyber Collaborative Research Alliance with Penn State (Info Sciences)
- 20 graduate and undergraduate researcher have completed a research experience at ARL
- 5 undergraduate students hired through pathways program

Expanding the Ecosystem:

ARL West (Human Sciences and Information Sciences)
- Local hub for west coast university interactions & recruitment
- Leverage ongoing research at ICT & USC Information Sciences Institute
- ARL-distinct facilities are available at the USC Institute for Collaborative Technology (ICT) UARC
- Excellent potential for increased innovation through closer collaboration with USC & ICT research staff
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Australia  
POC: Dr. James Carroll  
CRADA in Information Sciences |
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National Technical University of Ukraine - "Kyiv Polytechnic Institute"  
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POC: Dr. Govind Mallick  
CRADA in Materials Research |
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POC: Tomoko Sano  
CRADA in Material Sciences |
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POC: Dr. Angelique Scharine  
CRADA in Human Sciences |  
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The Nation’s Premier Laboratory for Land Forces
Aberdeen Proving Ground, MD

Adelphi, MD
Army Cyber Research Center
Intelligent Systems Research Center (APG/ALC)
Center for Research in Extreme Batteries
Network Science Research Center
Specialty Electronics Center

White Sands Missile Range, NM
Atmospheric Sciences Center

Orlando Florida
Simulation and Training Technology Center
Backups
The Nation’s Premier Laboratory for Land Forces

Will Today’s Investments Secure the Future?

The current path is UNLIKELY to sustain our current competitive advantage.

Tailor our investment in the future where it needs to be to fulfill the needs of the Nation … influence events at the speed they unfold … with less?

Can we ensure US advantage?

CURRENT PATH
WEIGHTING ADAPTATION
AND EVOLUTION

ALTERNATIVE PATH
WEIGHTING INNOVATION

Current US Advantages
Make Risk Manageable

US Competitive
Advantage Challenged

Can we ensure
US advantage?

Platoon Leader of 2025

Company Commander of 2030

Battalion Commander of 2040

Today-2013
The Nation’s Premier Laboratory for Land Forces

Changing the Paradigm

Open Campus Business Model

**ARL**

Transformation Principles
Flow, Agility, Quality, Efficiency & Effectiveness

- ATTRACT AND RETAIN BEST & BRIGHTEST
- OPEN CAMPUSES
- SHARED MODERN FACILITIES
- INNOVATION PRACTICES

DEFENSE LABORATORIES
ACADEMIA
INDUSTRY

Efficient, effective and agile research system

Extramural Basic Research
- Human Sciences
- Information Sciences
- Sciences for Lethality & Protection
- Sciences for Maneuver

Computational Sciences
Materials Research
Assessment and Analysis

**http://www.arl.army.mil/publications**