



U.S. ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND

STRATEGIC PLAN

ENABLING BATTLEFIELD DOMINANCE
THROUGH TECHNOLOGY • FY 2015–FY 2040





FOREWORD

The U.S. Army Research, Development and Engineering Command (RDECOM) published *Maximizing Land Combat Power* in 2013 to provide a vision for guiding the research, development, and engineering (RD&E) of technology solutions that will enable the Army to execute its mission in an increasingly challenging and contentious world. This document serves as RDECOM's revised Strategic Plan, in alignment with Army leadership's revised strategic goals and objectives.

Since its publication, RDECOM has demonstrated more than 60 new technologies to empower, equip, unburden, and sustain the Soldier, including the Field Deployable Hydrolysis System, which is destroying the Syrian chemical weapons stockpile. We demonstrated the Lethal Miniature Aerial Munitions System and the M224 Lightweight 60mm Mortar. We also demonstrated production ready prototypes of body armor and obscurants to enhance force protection, three blast mitigating combat vehicle designs for the Occupant-Centric Platform, and numerous technologies for the Network in support of Mission Command and Actionable Intelligence. Finally, we demonstrated multiple technologies to reduce water and fuel consumption to reduce the logistical tail.

Recognizing the critical impact RD&E has on battlefield success, the Army Chief of Staff's vision for the Army of 2025 and beyond establishes a bi-modal focal point for RDECOM. First, identify those technologies that will permit the Army to reduce the Brigade Combat Team size by 2025, while maintaining, if not increasing combat power. Secondly, focus the Enterprise's RD&E on developing the next generation technologies needed to ensure the Army is highly-deployable and prepared to dominate the battlefield of 2030 to 2040 and beyond.

RDECOM's focus also aligns with the Department of Defense Science and Technology objectives to close capability gaps, address emerging threats, reduce acquisition and sustainment life cycle costs, and provide the innovative technology that will change the nature of the fight.

The RDECOM Enterprise is a unique national asset. Our people, capabilities, and facilities are crucial to the Army's strategic path forward and its future successes in an increasingly competitive fight. As the Army's premier go-to organization for science and engineering expertise, operating in the space between the state of the art and the art of the possible, we will empower, unburden, protect, and sustain the Soldier as we develop and transition innovative technologies and engineered solutions to our Soldiers, enabling the Army's success in combat and future contingencies.

ARMY STRONG



Dale A. Ormond
Director



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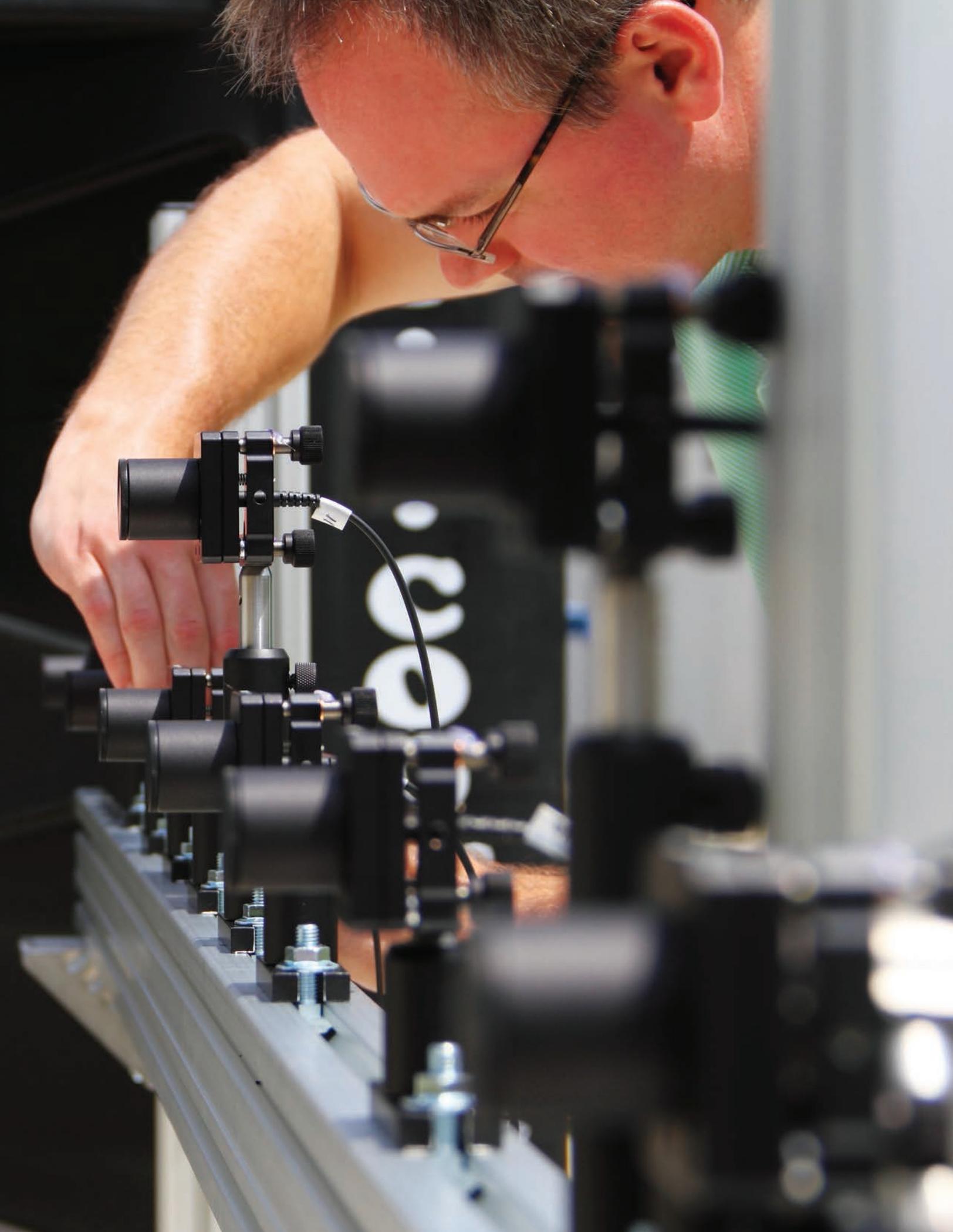
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EXECUTIVE SUMMARY

Army strategy is evolving to meet the challenges of a changing geo-political strategic environment, as well as adapting to a shift toward fiscal austerity in military spending. Facing a reduction in operational forces and budgets, the Army must be prepared to fight and win our Nation's wars. As the Army continues its transition after a decade of war, the strategic environment will continue to be complex, uncertain, dynamic, and increasingly competitive.

Given the challenges of the evolving strategic environment, the Army requires technology that is more lethal, more survivable, and more deployable. Maintaining battlefield dominance will be a challenge in the evolving strategic environment. The Army faces hybrid threats, comprised of conventional, irregular, terrorist, and criminal elements that have increasingly open access to modern technology. Whenever and wherever these threats are encountered, RDECOM will provide the Army with superior technology to achieve tactical overmatch.

The RDECOM Enterprise's focus on the following four strategic goals will enhance its ability to close capability gaps, address emerging threats, reduce acquisition and sustainment life cycle costs, and provide the innovative technology that will change the nature of the fight, enabling the Army's success in combat and future contingencies:

- Grow land combat power through research, development, and engineering (RD&E) to develop innovative technologies and to inform the Army's investment decisions.
- Invest aggressively in human capital and infrastructure to strengthen and grow

the intellectual capital of RDECOM's core competencies.

- Establish and develop a systems engineering (SE) culture to integrate increasingly complex systems requirements, technologies, and capabilities.
- Expand and leverage RDECOM's global partnership base to generate innovation and enhance interoperability.

RDECOM develops the innovative technology that enables the Army's land warfare dominance now and on the battlefield of 2025 and beyond. RDECOM also provides world-class research and engineering support to inform the Army's technology investment decisions across the acquisition and sustainment life cycle.

RDECOM is the Army's premier Science and Technology (S&T) organization, providing new and innovative technology to the Soldier. The RDECOM Enterprise is comprised of more than 22,000 employees, serving at the Headquarters, six Research, Development and Engineering Centers (RDECs), the Army Research Laboratory (ARL) and multiple sites around the globe. **RDECOM's scientists, engineers, military and contract personnel are crucial to the development of innovative, leading-edge technology.**

Not satisfied by the status quo, RDECOM will expand its partnership base to gain

*Opposite Page:
Engineers at Aviation
and Missile Research,
Development and
Engineering Center's
(AMRDEC) Weapons
Development and
Integration Directorate
prepare equipment
before a demonstration.
(U.S. Army photo)*

EXECUTIVE SUMMARY (CONT)

access to new ideas, innovative thinkers, and technology developments generated around the globe. RDECOM leverages not only the talent within the Enterprise, but also that of domestic and global partners to conduct integrated RD&E and provide innovative technology to **collaboratively support the joint coalition fight**.

RDECOM's key enablers (KEs) — enterprise efficiencies and command communications —

are critical to achieving its goals in support of the Army for 2025 and beyond. RDECOM will implement and improve enterprise efficiencies to ensure the most expeditious, cost-effective delivery of technology to the Army. Through proactive command communications, RDECOM will highlight the Enterprise's vital contributions to the Army's continued battlefield success for continued funding and support.

U.S. Army Rangers, assigned to 2nd Platoon, Alpha Company, 2nd Battalion, 75th Ranger Regiment, infiltrate an objective on foot during Task Force Training on Fort Hunter Liggett, Calif., Jan. 27, 2014. (U.S. Army photo by Spc. Steven Hitchcock)

“Our current security challenges are more formidable and complex than those we faced in downturns following Korea, Vietnam, and the Cold War. There is no foreseeable ‘peace dividend’ on our horizon.”

– GEN Dempsey, Chairman of the Joint Chiefs of Staff



INTRODUCTION

RDECOM provides the innovative technology that ensures the Army's dominance in land warfare, today and in the future. In the face of an ever-evolving strategic environment, RDECOM quickly aligned its priorities with the Chief of Staff of the Army's (CSA) challenge to provide the Army with technology that will permit the creation of leaner brigade combat teams (BCT) by 2025. This technology will maintain or improve combat power with enhanced protection, lethality, maneuverability, and command and control. At the same time, the Enterprise will conduct the critical RD&E to provide innovative, leap-ahead capability to ensure Army dominance on the battlefield of 2030 to 2040 and beyond.

RDECOM's core tenets emphasize our commitment to providing the Army with the leading edge technology required to accomplish its mission to defend the Nation:

VISION – RDECOM is the Army's premier go-to organization for superior scientific and engineering expertise that defines the space between the state of the art and the art of the possible and delivers innovative technology solutions that ensures the United States maintains global battlefield dominance.

MISSION – Provide integrated research, development, and engineering solutions to empower, unburden, protect, and sustain the Warfighter.



THE ARMY'S STRATEGIC ENVIRONMENT



U.S. Army Staff Sgt. Shelby Johnson, squad leader, Company C, 2nd Battalion, 30th Infantry Regiment, observes the area around Forward Operating Base Torkham, Afghanistan, while wearing the new Capability Set 13 communications suite. (U.S. Army photo)

The ever-evolving strategic environment offers numerous challenges, each amplified by persistent conflict. The hybrid threats that the Army faces includes a combination of conventional, irregular, terrorist, and criminal elements. The ever-shifting economic power and access to natural resources will challenge the status quo. Demographic changes due to a lack of resources, a desire for improved economic conditions, and changes in climate also create the potential for conflict. The proliferation of technology, including the capability to build weapons of mass destruction (WMD), will level the operational environment and change the way groups interact.

Army strategy is adapting to the changes in this strategic environment, as well as to a resource environment shifting toward fiscal austerity. Identified changes include a strategic transition that directs a rebalance to the Asia-Pacific region and the establishment of Regionally Aligned Forces. As the Army

continues to transition after a decade of war, the strategic environment will continue to be complex, uncertain, dynamic, and increasingly competitive.

RDECOM's strategy and priorities for the future are shaped by guidance and direction from the Office of the Secretary of Defense (OSD), Army leadership, Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)), Army Materiel Command (AMC), Special Operations Command (SOCOM), Program Executive Officer (PEO) customers, the Training and Doctrine Command (TRADOC), and the Combatant Commands (CCMDs). RDECOM will respond to the Army's needs and our higher HQ priorities to provide the innovative technologies that will ensure the Army's capacity to maintain battle-field dominance through tactical overmatch.

An austere fiscal environment will potentially result in the need to extend the lifetime of legacy systems. The cost to sustain the Army's current land warfare systems makes it an imperative to upgrade existing systems to reduce sustainment costs and facilitate future capabilities growth. While RDECOM has continued to support current operations in the Middle East and around the world, we will develop technologies that will enhance the capabilities of the current force to successfully engage the evolving threats.

RDECOM'S APPROACH

Within fiscal constraints, the Army is investing in modernization, while rebuilding readiness and producing a more capable, leaner, and globally responsive Army. RDECOM will align its RD&E efforts to develop the technologies that support the Army's priorities.

RDECOM will focus its S&T investment priorities to provide the innovative technologies to close capability gaps, address emerging threats, reduce acquisition and sustainment costs, and change the nature of the fight. RDECOM will contribute to the Army's near term success by improving the operational

effectiveness, affordability, sustainability, and interoperability of the Army's legacy systems through incremental technology capability upgrades, reduced sustainment costs, and extended capability life. For the mid-term the RDECOM Enterprise will develop technologies to enable leaner BCTs to maintain or increase their combat power by 2025. RDECOM will concurrently develop the leap-ahead technologies to ensure the Army's dominance on the battlefield of 2030 to 2040 and beyond. (See Figure 1 below.)

RDECOM executes the majority of the Army's S&T mission with its unique concentration of

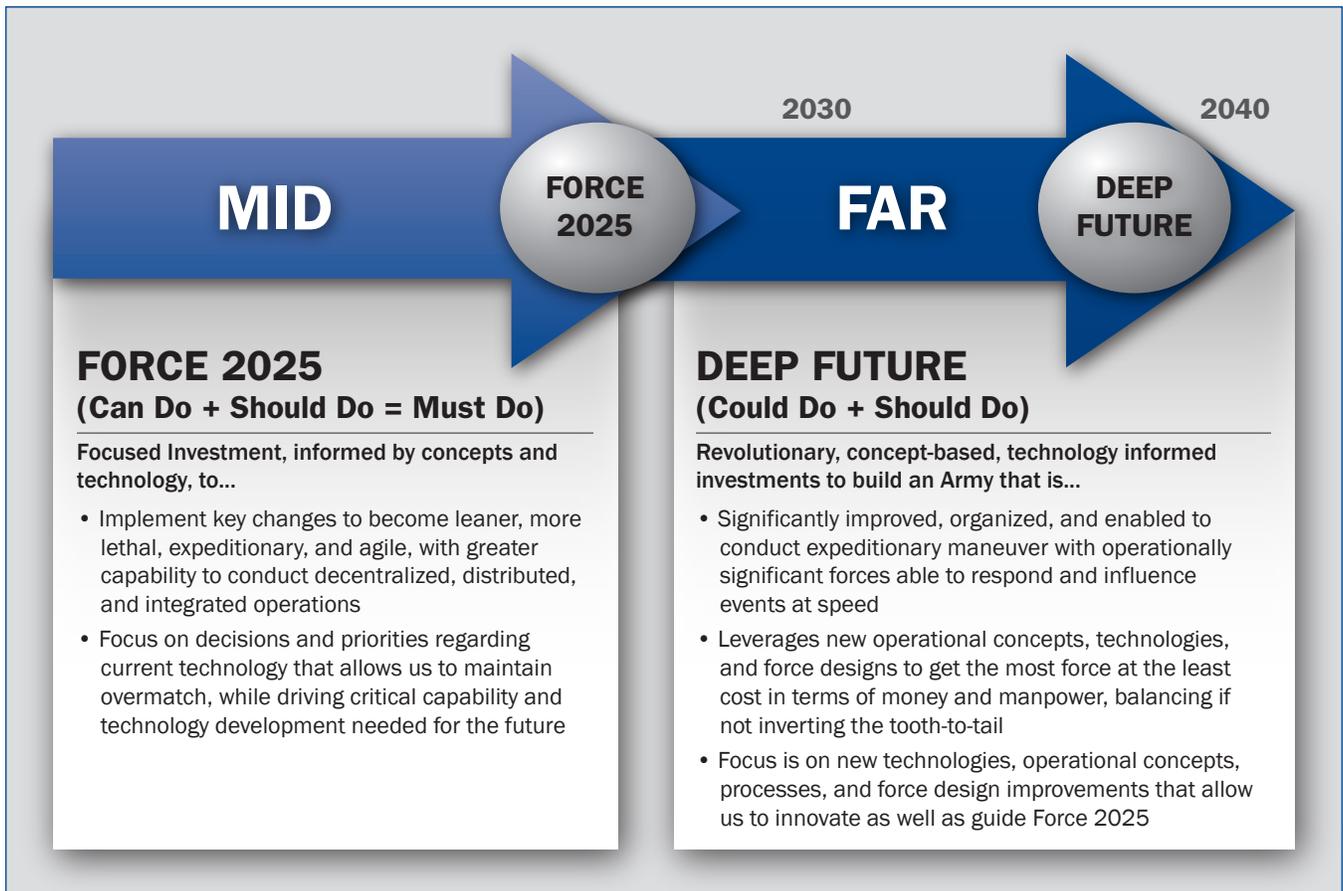


FIGURE 1. Army Force 2025 and Beyond Emerging Path Forward

RDECOM'S APPROACH (CONT)

U.S. Army Staff Sgt. Nathan A. Harrison, along with paratroopers assigned to Battle Company, 2nd Battalion, 503rd Infantry Regiment, 173rd Infantry Brigade Combat Team (Airborne), advance to an objective during a live fire exercise, part of Exercise Rock Proof in Postonja, Slovenia, May 6, 2014. (U.S. Army photo by Staff Sgt. Pablo N. Piedra)



scientists, engineers, and facilities. As the Army's premier S&T advisor, RDECOM also informs the Army throughout the acquisition life cycle on the state of the art and the art of the possible, thereby providing the necessary technological assessment to enable trade-off decisions. Army specified trade-off criteria are defined as follows:

- **Overmatch:** Ability to maintain comparative advantage over adversaries
- **Potency:** Retention of combat power regardless of unit size
- **Capacity:** Improved force effectiveness
- **Deployability:** Improved responsiveness, speed, and staying power
- **Human performance:** Improved cognitive, physical, and social abilities of individual Soldiers and leaders
- **Modular:** Provide new force employment opportunities

RDECOM's leadership will use the Army's specified trade-off criteria to inform both immediate decisions and long term, developmental efforts. RDECOM's RD&E efforts, in turn, will enhance the Army's capacity to provide "expeditionary, decisive landpower to the Joint Force and ready to perform across the range of military operations to Prevent, Shape, and Win in support of Combatant Commanders to defend the Nation and its interests at home and abroad, both today and against emerging threats." *Army Strategic Planning Guidance, 2014.*

THE RDECOM ENTERPRISE AND ITS ROLE WITHIN THE LARGER ARMY ENTERPRISE

Through the direction of ASA(ALT) and under the command and leadership of AMC, the RDECOM Enterprise provides integrated RD&E solutions, while executing technology integration across all aspects of Land Combat Power development. RDECOM provides unbiased technical advice and expertise to TRADOC, Program Executive Officers (PEOs)/Program Managers (PMs), academia, and

industry, while collaborating across the government Research and Development (R&D) community. Closely aligned with this responsibility, RDECOM demonstrates advanced capabilities to provide realistic foundations for the requirements of future Programs of Record (POR). Figure 2 depicts the organization and its relationship to AMC, TRADOC, and ASA(ALT).

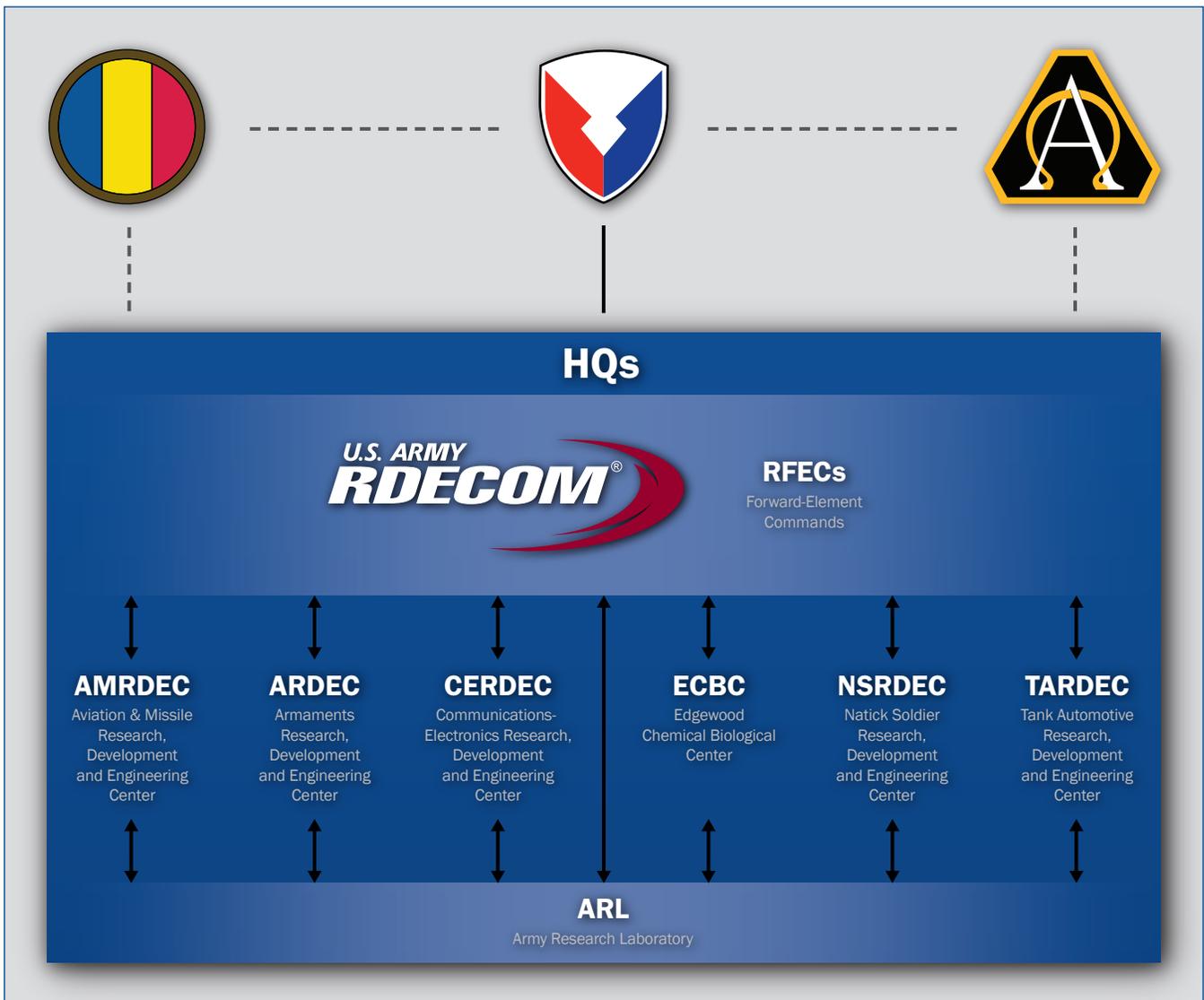


FIGURE 2. RDECOM Organizational Structure

THE RDECOM ENTERPRISE AND ITS ROLE WITHIN THE LARGER ARMY ENTERPRISE (CONT)

The RDECOM HQ, ARL, and the six RDECs make up the RDECOM Enterprise. RDECOM’s HQ provides the overall guidance, integration, and strategic focus to ensure the RDECs and ARL synchronize their efforts to ensure system compatibility, avoid duplication of effort, and provide the right technology solutions to address the Soldier needs identified by TRADOC and the Combatant Commanders (CCDRs). The Enterprise is uniquely capable of ensuring that technology is developed, matured, synchronized, and integrated for enhanced interoperability and to meet the

Army’s capability needs. Appendix A provides expanded information on the RDECs and ARL.

RDECOM’S MISSION

RDECOM provides the innovative technologies that ensure the Army’s land warfare battlefield dominance. To accomplish this, RDECOM leads a collaborative approach to RD&E solutions across the Army’s requirements, acquisitions, logistics, and sustainment life cycle. RDECOM is responsible for identifying and reducing the technical risk to inform the Army’s investment decisions.

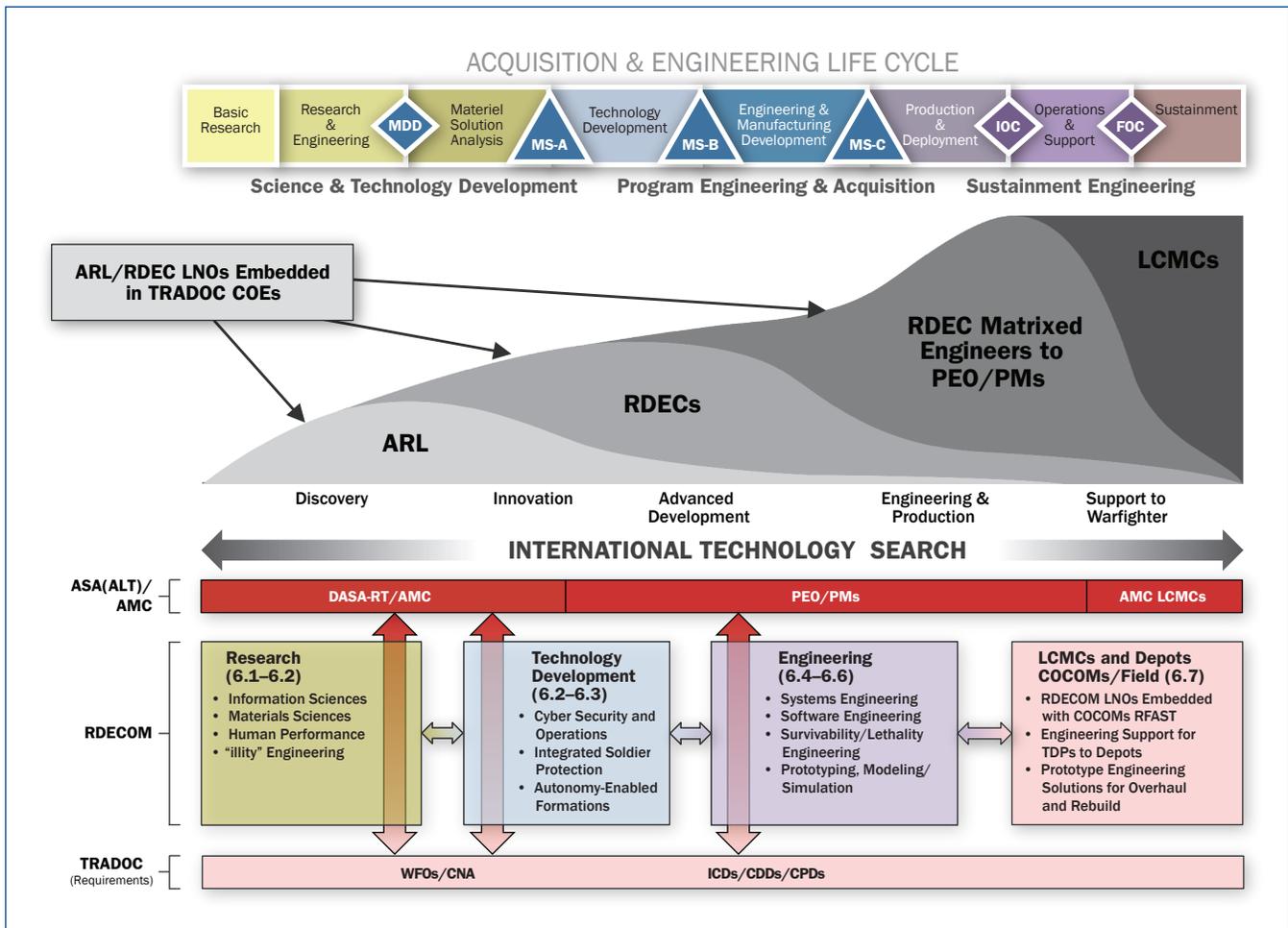


FIGURE 3. RDECOM Business Model



Figure 3 portrays the RDECOM Business Model across the Army's acquisition life cycle.

RDECOM engages TRADOC, the intelligence community, CCDRs, and PEOs to understand emerging threats and the operational requirements that next-generation systems will face. RDECOM further supports the TRADOC Army Capability Integration Center by helping advisors capture requirements and capability gaps for the future needs of the Soldier. From these needed capabilities, a Program Objective Memorandum (POM) identifies the required technological solutions (to include materiel and non-materiel solutions). RDECOM then executes the RD&E to develop the innovative technologies in support of ASA(ALT)'s portfolio priorities.

The RDECOM Enterprise provides the engineering assessment of the state of the art and the art of the possible that enables the Army to be a smart buyer in its acquisition programs. It also influences the POM development process by collaborating with ASA(ALT) on innovative technologies to meet the Army's requirements for Soldiers to achieve tactical overmatch. In collaboration with ASA(ALT), RDECOM develops, aligns and synchronizes the Army's S&T portfolio to ensure Acquisition Programs capitalize on the most promising technology advancements.

RDECOM's matrixed engineers provide critical technical support to the PMs and PEOs for approved programs, to include transitioning mature technology for system development

Tank Automotive Research, Development and Engineering Center (TARDEC), working with nontraditional defense contractors, leveraged each entity's unique qualities while working on the Ultra Light Vehicle (ULV) Research Prototype. The ULV aims to be safe, fuel-efficient, versatile and has been built to blaze a trail to a future fleet stocked with adaptable tactical vehicles. (U.S. Army photo by Brian Ferencz)

THE RDECOM ENTERPRISE AND ITS ROLE WITHIN THE LARGER ARMY ENTERPRISE (CONT)



Ultraviolet light is used to fluoresce oil during wind tunnel tests to aid in the visualization of surface flow and to identify flow transition and vortex locations. NASA's approximately 1/20th scale models were tested in airplane mode at various angles of attack and yaw. (U.S. Army photo by Brian Chan)

and demonstration and, subsequently, to acquisition. RDECOM also provides critical engineering services to the PEOs and PMs through the prototyping capability of its Prototype Integration Facilities (PIF). The PIFs design, prototype, and integrate technologies to validate design and development of hardware, perform Weapons System Acquisition Reform Act performance assessments throughout the life cycle, and rapidly integrate engineered solutions in response to Soldier/acquisition customer requirements. Operating as a single entity, RDECOM's PIF Enterprise (PIFe) delivers competitive prototypes, enhancing our PEO/PM support by capturing "should" cost, optimizing manufacturing readiness, and establishing technical data efficiencies from desktop to factory transition. Appendix G provides additional information on the RDECOM PIFe.

Within AMC's Materiel Enterprise, RDECOM provides critical life cycle management support.

Working directly and indirectly with the Life Cycle Management Commands and the Army Sustainment Command, RDECOM synchronizes the continuous engineering support of technology already in the field.

RDECOM'S CORE COMPETENCIES AND CORE FUNCTIONS

RDECOM's enduring core competencies are defined as the integration of people; RD&E skills; infrastructure; and technology that enable execution of RDECOM's core functions. Together, these core competencies represent a unique national asset that is responsive to the Army's specific materiel and non-materiel technology needs, providing the basis for disrupting the future battle space through provision of innovative technology options.

Our core functions are:

1. Execute an integrated AMC RD&E program.
2. Conduct fundamental research and advanced technology development and demonstrations.
3. Manage RD&E human capital and infrastructure.
4. Synchronize AMC RD&E activities.
5. Provide lifecycle engineering support to PEOs/PMs.

Appendix C provides RDECOM's expanded core competencies. Appendix D lists RDECOM's prioritized core functions.

ENABLING STRATEGIC LAND WARFARE DOMINANCE THROUGH TECHNOLOGY

RDECOM operates in the space between the state of the art and the art of the possible. To achieve this and provide the innovative technologies that will ensure the Army's dominance on the battlefield of 2025 and beyond, RDECOM will focus its efforts to achieve four strategic goals: (1) Grow land combat power through research, development, and engineering to develop innovative technologies and to inform the Army's investment decisions; (2) Invest aggressively in human capital and infrastructure to strengthen and grow the intellectual capital of RDECOM's core competencies; (3) Establish and develop a SE culture to integrate increasingly complex systems requirements, technologies, and capabilities; and (4) Expand and leverage RDECOM's global partnership base to generate innovation and enhance interoperability.

Achieving these goals will enhance RDECOM's ability to close capability gaps, reduce acquisition and sustainment life cycle costs, respond to developing threats, and provide the innovative technology that will change the nature of the fight, ensuring the Army's battlefield dominance through technological overmatch of its adversaries. To this end, RDECOM will develop plans, with the requisite metrics and milestones, to achieve each of these strategic goals.

GROW LAND COMBAT POWER THROUGH RESEARCH, DEVELOPMENT AND ENGINEERING

RDECOM will provide the Army of 2025 and beyond the requisite lethality, protection, maneuverability, and communications technologies to maintain battlefield dominance. To provide the innovative technology the Army requires and to enable the Army to



make well-informed capability acquisition and sustainment decisions, RDECOM established its **first strategic goal**:

Grow land combat power through research, development, and engineering to develop innovative technologies and to inform the Army's investment decisions.

In line with this initiative, RDECOM's prioritized RD&E efforts will ensure the RDECOM Enterprise provides the most innovative technologies to dominate in the Land Domain, which is unique in the complexity and diversity of threats, challenges, and missions. A description of these priorities is provided by RD&E portfolio in Appendix E.

James Zunino, Armament Research, Development and Engineering Center (ARDEC) materials engineer, displays an object that was created by an additive printing process. 3-D printing gives engineers the flexibility to quickly print items of various shapes, materials and structure. (U.S. Army photo by Erin Usawicz)

ENABLING STRATEGIC LAND WARFARE DOMINANCE THROUGH TECHNOLOGY (CONT)

The Army priorities will inform and prioritize the technology initiatives across RDECOM's RD&E portfolios. In this endeavor, RDECOM will holistically examine, validate, modify or recommend termination of programs to the Army with the goal of ensuring funds are programmed, budgeted, and executed against validated requirements, cost/risk informed alternatives, and core competencies. RDECOM will also revalidate the operational value of existing projects against technology needs to inform the Army's continued investment decisions.

Research. RDECOM conducts world-class research to initiate the process to generate innovation. RDECOM has identified a number of strategic research Focus Areas:

- Lethality and effects
- Quantum information sciences
- Materials in extreme environments
- Network science
- Advanced computing
- Human sciences
- Extreme energy science
- Intelligent systems
- Cybernetics
- Synthetic molecular systems
- Modeling and simulation

Further defined in Appendix E, these focus areas have great potential to provide game-changing capabilities for Soldiers of the future. RDECOM executes a broad-based program of fundamental research that generates and transforms leading-edge scientific discoveries

The Dismounted Infantry Survivability and Lethality Test Bed (DISALT) is an indoor weapon simulator for studying the effects of weapon configuration on marksmanship performance, without the expense of live-fire. In addition to data normally collected on a standard shooting range, DISALT measures and records information on where the Soldier is aiming immediately prior to trigger pull. (U.S. Army photo)



into new technologies with substantial military potential. ARL serves as RDECOM's innovation engine to exploit the fundamentals of science that generate and mature ideas for transition to the RDECs for the application of engineering and technology maturation. RDECOM is joined by partners from academia, other Army S&T organizations, government laboratories, sister services through the OSD Communities of Interest, industry, and international partners to conduct research critical to generating innovation. Because of its impact, RDECOM has established a separate strategic goal to expand its partnership base — see [EXPAND AND LEVERAGE RDECOM'S GLOBAL PARTNERSHIP BASE](#).

Development. To ensure the Army maintains tactical overmatch, RDECOM seeks to apply existing technologies in new ways to achieve new capabilities or to enhance current capabilities. RDECOM applies the Deputy Assistant Secretary of the Army for Research and Technology's (DASA (RT)) prioritized objectives for the near, mid, and long-term to focus the development of technology solutions for the Army. The following are the current focus areas within RDECOM's development portfolio and are defined in Appendix E:

- Advanced weapons and target effects
- Joint multi-role aircraft
- Data to decisions
- Cyber security and operations
- Protected ground mobility
- Force projection
- Sustainment
- Human performance
- Expanded operations in chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) environment

- Autonomy-enabled formations
- Integrated Soldier protection
- Modeling and simulation

RDECOM will apply DASA (RT) priorities to focus technology development priorities for the Army.

Engineering. RDECOM transitions technologies and capabilities from academia and ARL to the RDECs. The RDECs take ideas, concepts, and low Technology Readiness Level technologies and matures them through the application of engineering principles. The RDECs then transition promising technologies that solve Army challenges to the Soldier through PORs and industrial partnerships to become capabilities. Through this process, once novel concepts are produced as field-ready materiel solutions. In support of this effort, RDECOM has identified the following focus areas in the engineering portfolio, which are defined in Appendix E:

- Enterprise-wide systems engineering
- Systems analysis and assessments
- Life-cycle engineering
- Prototyping

RDECOM will smartly invest in those technologies to provide the greatest benefit to the Enterprise and acquisition community.

In addition to executing basic, applied, and engineering research, RDECOM supplies engineers to the PEO community on a reimbursable basis. RDECOM owns the unique perspective of being the conduit between

ENABLING STRATEGIC LAND WARFARE DOMINANCE THROUGH TECHNOLOGY (CONT)



Soldiers can leverage the remote operation, observation and interaction capabilities of robotic platforms to gain intelligence about hard to traverse areas while maintaining a safe distance from potential hazards. (U.S. Army photo)

the majority of the Army's S&T efforts and ASA(ALT), TRADOC, and AMC, enabling more effective coordination and leveraging of science, technology, and engineering efforts.

The linkages between RDECOM and stakeholders provide direct reach-back to a robust technology base in ARL and the RDECs that have knowledgeable insight into technology development opportunities with commercial partners. Through this convergence of functions in S&T, PEO support, and sustainment, RDECOM synchronizes the Army's sustainment strategy with technical input for an affordable modernization strategy.

Director's Initiatives. The RDECOM Director has identified several high-risk, high-payoff initiatives, which are defined in Appendix E.

Each will provide the Army with a revolutionary new capability and, together, constitute Future State Demonstrations. The initiatives are informed by the changing nature of the strategic environment, TRADOC's highest priority capability gaps, ASA(ALT)'s Top Challenges, and the potential to provide a leap-ahead capability for the Soldier. Each initiative draws upon a wide range of RDECOM core competencies that require an enterprise approach, thereby focusing multiple RDECs and ARL efforts on high-priority challenges for the future. The RDECOM Director's Initiatives are:

- Expeditionary self-sustaining base camp
- Long-range precision fires
- Counter unmanned aerial systems (UASs)
- Robotic team member
- Assured access to information

INVEST AGGRESSIVELY IN HUMAN CAPITAL AND INFRASTRUCTURE (CORE COMPETENCIES)

The Army requires science, technology, and engineering expertise to ensure it has the right technology at the right time to accomplish its mission. To enable the Army's success, RDECOM strives to ensure the crucial S&T and engineering capacity is retained through the core competencies resident in RDECOM's workforce and facilities. Having this capability ensures the Army retains the capacity to research, develop, and engineer technologies that are unique to the Army's requirements. This crucial, internal capability also ensures that acquisitions are cost-effective and that technology has been integrated to provide maximum interoperability.

ENABLING BATTLEFIELD DOMINANCE THROUGH TECHNOLOGY

To maintain RDECOM's Core Competencies, the Enterprise will execute its **second strategic goal**:

Invest aggressively in human capital and infrastructure to strengthen and grow the intellectual capital of RDECOM's core competencies.

RDECOM's workforce, skill sets, and facilities are unique national assets. The ability to discover and develop technologies is crucial to provide leap-ahead capabilities that will ensure the Army's battlefield dominance in 2025 and beyond, especially when required technology is not available from or not developed by industry to meet military standards.

To ensure the continued capacity of its core competencies, RDECOM must:

- Assess the future required technical competencies for basic research, S&T, engineering and manufacturing development, procurement, operations and sustainment, and matrix support to stay at the leading edge.
- Recruit, develop, and retain a highly capable workforce with expertise in the critical core competencies necessary to support Army current and future technological needs.
- Aggressively develop the next generation workforce through science, technology, engineering, and mathematics outreach, student internships, the military Officer Scientist and Engineering Program, the U.S. Military Academy faculty exchange program, National Research

Council post-doctoral fellows, and employee mentoring, training, and development programs.

- Maintain state-of-the-art technical infrastructure to support the RDECOM Mission, recognizing that infrastructure, as with intellectual capital, must continuously adapt to enable technological advancements.

RDECOM will utilize all authorities provided through legislation, such as the Science and Technology Reinvention Labs and Section 219 of the National Defense Authorization Act, to invest in personnel, equipment, and infrastructure to best support Soldiers and continually advance technology that ensures the Army's battlefield dominance.

ESTABLISH AND DEVELOP A SYSTEMS ENGINEERING CULTURE

The vast majority of identified future Soldier capabilities require integrated and consistent SE solutions across multiple competencies to anticipate and exploit emerging technologies that will deliver enhanced capabilities to the Soldier. To ensure the best possible oversight of the engineering process across the life cycle, RDECOM has established its **third strategic goal**:

Establish and develop a SE culture to integrate increasingly complex systems requirements, technologies, and capabilities.

To establish an effective SE program, RDECOM must:

- Establish an Enterprise SE approach to enable interoperability and collaboration.

ENABLING STRATEGIC LAND WARFARE DOMINANCE THROUGH TECHNOLOGY (CONT)

- Integrate SE practices to decrease acquisition life-cycle **cost, technical, and operational risk.**
- Research innovative SE methods, processes and tools.
- Inform/train/energize workforce to be fluent in SE.
- Create a culture where SE is a day-to-day practice for all engineers.
- Establish communications, relationships and partnerships with AMC, ASA (ALT), its PMs/PEOs, DoD, other government agencies, industry and academia as a trusted agent on SE.

and implement ASA(ALT) policies, to create a career path for systems engineers, and to build uniform tools to use systems engineering practices throughout the command.

In addition to establishing SE priorities, RDECOM will implement a virtual laboratory capability to improve the integration process across all aspects of RD&E. The virtual laboratory will allow RDECOM PMs to search, identify, and consult with scientists and engineers from across the Enterprise who have the specific skills and experience needed for a project. The virtual laboratory will enable RDEC PMs to draw on core expertise from RDECOM's world class personnel to support their specific project without developing a local competency. The virtual laboratory framework will enable the project team to work the requirements, designs, and challenges in a virtual environment, saving time

The RDECOM Director's intent is to create an SE capability at the RDECOM HQ to support

Communications-Electronics Research, Development and Engineering Center (CERDEC) and PEO C3T engineers were instrumental in identifying and helping to resolve issues with the CS 13 network architecture, ensuring a successful deployment and operation. (U.S. Army photo)



and resources while continuing to build and grow intellectual capital.

RDECOM is not constrained by the confines of its facilities and the abilities of its workforce to enable the Army's success. The Enterprise seeks to maximize its access to the most innovative research and ideas through the establishment of global partnerships; therefore, integration of domestic and international RD&E partners in the virtual laboratory is under consideration.

EXPAND AND LEVERAGE RDECOM'S GLOBAL PARTNERSHIP BASE

The Army recognizes the power of coalitions and alliances, not only to reduce the potential for conflict, but also to reduce the burden of any one member or entity bearing the costs of conflict alone. In the RD&E realm, there are similar benefits to establishing and maintaining partnerships, as emphasized in the Command's **fourth strategic goal**:

Expand and leverage RDECOM's global partnership base to generate innovation and enhance interoperability.

The Enterprise seeks to maximize its access to the most innovative research and ideas through the establishment of global partnerships.

RDECOM enhances its knowledge of the state of the art and the art of the possible — and its ability to ensure Army success on the land battlefield — through partnerships (see Figure 4 for a representative depiction of RDECOM's partnerships and collaboration). Through RDECOM leadership and support of global R&D, the Enterprise effectively

shapes the nation's S&T agenda in support of Army requirements.

RDECOM's partnerships help forge coalitions and improve interoperability through the development of compatible equipment.

RDECOM's research is strengthened through the ability to leverage creative partnership mechanisms with academic, industry and international partners in support of groundbreaking S&T development. RDECOM's relationships with national and international partners are crucial to affordably modernizing weapon systems that support the Soldier of today and of the future.

Engaging partners enables increased access to new ideas, innovative thinkers, and technology developments generated around the globe.

RDECOM establishes and maintains these relationships to create an ecosystem of ideas to fuel revolutionary technology development in support of the Army, "crowd-sourcing" RDECOM innovation. To identify opportunities to leverage the latest innovations in S&T, RDECOM also maintains a global presence through the RDECOM Forward Element Commands (RFECs) located in the Atlantic, Pacific, and Americas. Appendix F provides a more detailed discussion of RDECOM forward-deployed organizations.

ENABLING STRATEGIC LAND WARFARE DOMINANCE THROUGH TECHNOLOGY (CONT)

RDECOM has undertaken several initiatives that are closely aligned with this Strategic Goal:

- RDECOM is constantly seeking opportunities to reduce barriers that could

prohibit conducting open research, development, and engineering. One methodology being explored is ARL's Open Campus Concept Pilot Project. This concept provides unprecedented access



FIGURE 4. Representative Partnerships and Collaboration

to and exchange of R&D ideas and innovations with RDECOM's current partners while expanding our access to a vast, diverse range of new, potential partners. A pilot program to demonstrate the potential of this initiative is underway, and development will continue as part of RDECOM's campaign plan.

- In support of its strategy, ARL will establish and staff forward elements of the Army Research Office (ARO) as part of the RFEC teams. Basic and Applied Research Discovery will be enabled through the ARO forward element scientists' enhancement of international relationships by identifying opportunities to fund basic research and discovery with international academic and research institutions.
- To strengthen RDECOM's support to the CCDRs, the Enterprise is expanding its participation in CCMD training and exercises. This effort will concurrently help RDECOM maintain and build upon relationships and expertise acquired over the last 10 years' supporting the Central Command and U.S. forces deployed for operations in the Middle East.
- RDECOM's engagements in support of CCDRs' regional objectives will help develop and strengthen military-to-military ties with current and potential international partners. These combined RFEC efforts are critical to ensuring the Army stays current with the latest developments in state-of-the-art technologies developed around the globe and avoids technical surprise on the future battlefield.



To expand and leverage our partnership base, RDECOM will assess its global presence to ensure the most effective placement of scientists and engineers at locations where innovative solutions are accessible to meet the Army's technology needs. At the same time, RDECOM will respond to the CCDRs' by stationing Science and Technology Advisors where necessary to ensure the CCDRs' technology needs are correctly identified and transmitted to the RDECOM S&T community for analysis and resolution.

Australia's chief defense scientist met with U.S. Army leaders Jan. 27, 2014, to explore opportunities for research and development partnerships. (U.S. Army photo by Conrad Johnson)

KEY ENABLERS

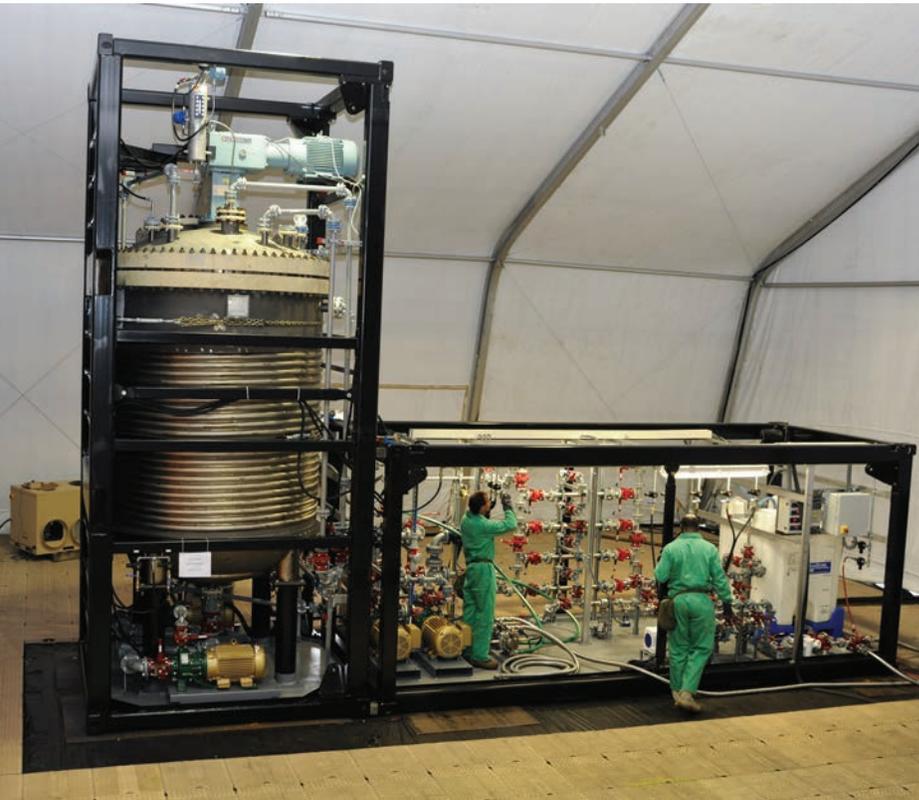
RDECOM's KEs (enterprise efficiencies and command communications) contribute significantly to executing the RDECOM mission and achieving each strategic goal. RDECOM will develop plans to guide the implementation and execution of these KEs.

appropriate, RDECOM will implement policy, management, and financial alignment processes that are forward-leaning and future-focused with specified end states and objectives that will permit the replication of successful best practices across the command.

COMMAND COMMUNICATIONS

Through proactive command communications, RDECOM will highlight the Enterprise's vital contributions to the Army's continued battlefield success — achieved by leveraging the talent within our Enterprise and that of our global partners to conduct integrated RD&E and provide innovative technology.

Maintaining stakeholder support relies on providing the information they need to understand the extent of the service we provide, the extensive skills and knowledge of our Enterprise workforce, and the value of our national and international partnerships in providing cost-effective technology solutions. RDECOM's command communications will focus and sustain our strategic goals, all with the single purpose of providing the Army with innovative technologies to achieve tactical overmatch in the defense of the Nation.



Edgewood Chemical Biological Center (ECBC) engineers perform a routine quality check during the testing of the Field Deployable Hydrolysis System. (U.S. Army photo by Conrad Johnson)

ENTERPRISE EFFICIENCIES

Fiscal reality dictates that RDECOM align its policies and processes to provide cost-effective, innovative technologies to the Army. RDECOM will serve as a responsible steward of constrained resources, while maximizing provision of innovative leading-edge technology to the Soldier. RDECOM will capitalize on the inherent strengths of the individual RDECs and ARL by implementing and maintaining an Enterprise-approach for executing business processes. Where appro-

OPERATIONAL SUPPORT INITIATIVES

As Army strategy evolves, RDECOM is well positioned to support the Army’s associated operational initiatives. Through RDECOM’s forward-deployed elements, coupled with a capable and dedicated workforce and domestic facilities, the Enterprise will provide technologies to ensure Army and CCDR success on the battlefield of 2025 and beyond.

to build partner capacity, develop cooperation, and identify innovative S&T solutions, enhancing technological awareness, while potentially mitigating technological surprise. Figure 5 depicts specific actions occurring in the Pacific theater; RDECOM undertakes similar actions and initiatives in support of each CCDR.

SUPPORT TO ARMY’S REBALANCE TO THE PACIFIC

As the Army rebalances its focus to the Pacific, RDECOM will engage and execute initiatives

SUPPORT TO ARMY RESTRUCTURING

RDECOM will assist Army restructuring through development of multiple, ongoing efforts, to include but not limited to the expeditionary, self-sustaining base camp, and support of

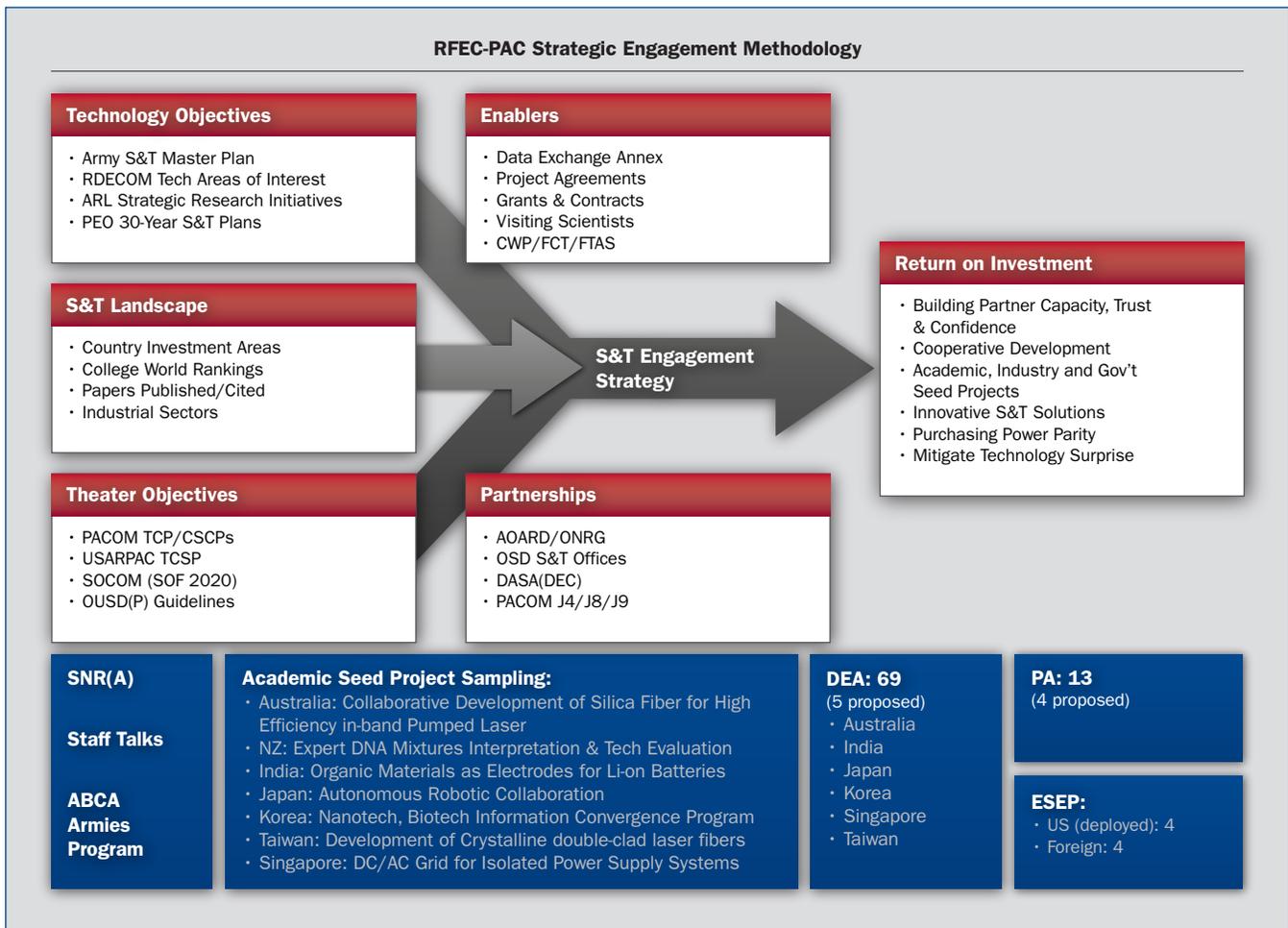


FIGURE 5. Support to the Army’s Rebalance to the Pacific Identifies the Best S&T to Address Customer Requirements

OPERATIONAL SUPPORT INITIATIVES (CONT)



U.S. Army Pacific Soldiers test clean energy sources during 2014 Rim of the Pacific training exercise, July 11, 2014. (U.S. Army photo by Staff Sgt. Kyle Richardson)

autonomous formations such as the development of robotic convoys. RDECOM will provide restructuring support by meeting the CSA's challenge. The Enterprise will provide enhanced lethality, survivability, maneuverability, and communications. RDECOM will expand support to the CCMDs and SOCOM not only with technology, but will also provide continued staffing and increased exercise participation.

SUPPORT TO SUSTAINMENT

RDECOM provides technological solutions to support Army sustainment and reduction of the Army's logistical footprint. Examples of ongoing RD&E efforts with potential to reduce the number of Soldiers engaged in logistic functions include development of autonomous vehicles, improving vehicle performance, enhancing personal equipment protection and survivability, improving system reliability and performance (such as extending the Mean Time Between Failure), and improving weapons and ammunition effectiveness.

Second, as the Army draws down its forces in the Middle East, emphasis will be on the repair and refurbishment of equipment to enable the operational Army to achieve full combat readiness posture. As part of this effort, RDECOM engineers evaluate equipment for potential upgrade, enhancing the Army's capability to decide whether to upgrade or replace more than 150 weapons systems.

SUPPORT TO TRAINING

In collaboration with PEO-Simulation, Training, and Instrumentation (STRI), RDECOM provides technology innovation to lead military unique training applications as the Army transitions to a home-station focus. RDECOM must also provide integration expertise in the leverage of industrial modeling and simulation. RDECOM provides the requisite research and development and works closely with PEO-STRI to determine the most effective and efficient method to execute training aids, devices, simulators and simulations to support Army operations and training.

CONCLUSION



A U.S. Army Ranger assigned to 2nd Battalion, 75th Ranger Regiment, moves across a ridge line during Task Force Training on Fort Hunter Liggett, Calif., Jan. 22, 2014. (U.S. Army photo by Spc. Steven Hitchcock)

RDECOM is the Army's premier organization for science, technology, and engineering support, ensuring the Army's tactical overmatch on the battlefield. The Enterprise provides leading-edge technology to the Soldier — now and in support of future contingencies. RDECOM serves as the Army's honest broker, assessing **the state of the art and the art of the possible** and providing engineering input to inform Army leadership on its technology investments.

RDECOM's global presence provides the Army direct and unprecedented reach back capability to its expansive S&T community. The Enterprise is focusing on the following strategic goals to close capability gaps, address emerging threats, reduce acquisition and sustainment life-cycle costs, and provide the innovative technology that will change the nature of the fight, enabling the Army's success in combat and future contingencies that:

- Grow land combat power through RD&E to develop innovative technologies and to inform the Army's investment decisions.
- Invest aggressively in human capital and infrastructure to strengthen and

grow the intellectual capital of RDECOM's core competencies.

- Establish and develop a SE culture to integrate increasingly complex systems requirements, technologies, and capabilities.
- Expand and leverage RDECOM's global partnership base to generate innovation and enhance interoperability.

The RDECOM Enterprise is a unique national asset, providing the most innovative and cost-effective technology solutions through its science and engineering expertise, coupled with its unique facilities and global access to innovative ideas. Wherever and whenever the Army is called upon to defend the Nation, RDECOM will be there to provide leading-edge technology to achieve land warfare dominance.

APPENDIX A – RDECOM ORGANIZATIONS

Figure A-1 portrays RDEC and ARL locations as well as the numerous supporting locations throughout the continental United States. The subsequent pages provide a short overview of each RDEC and ARL.

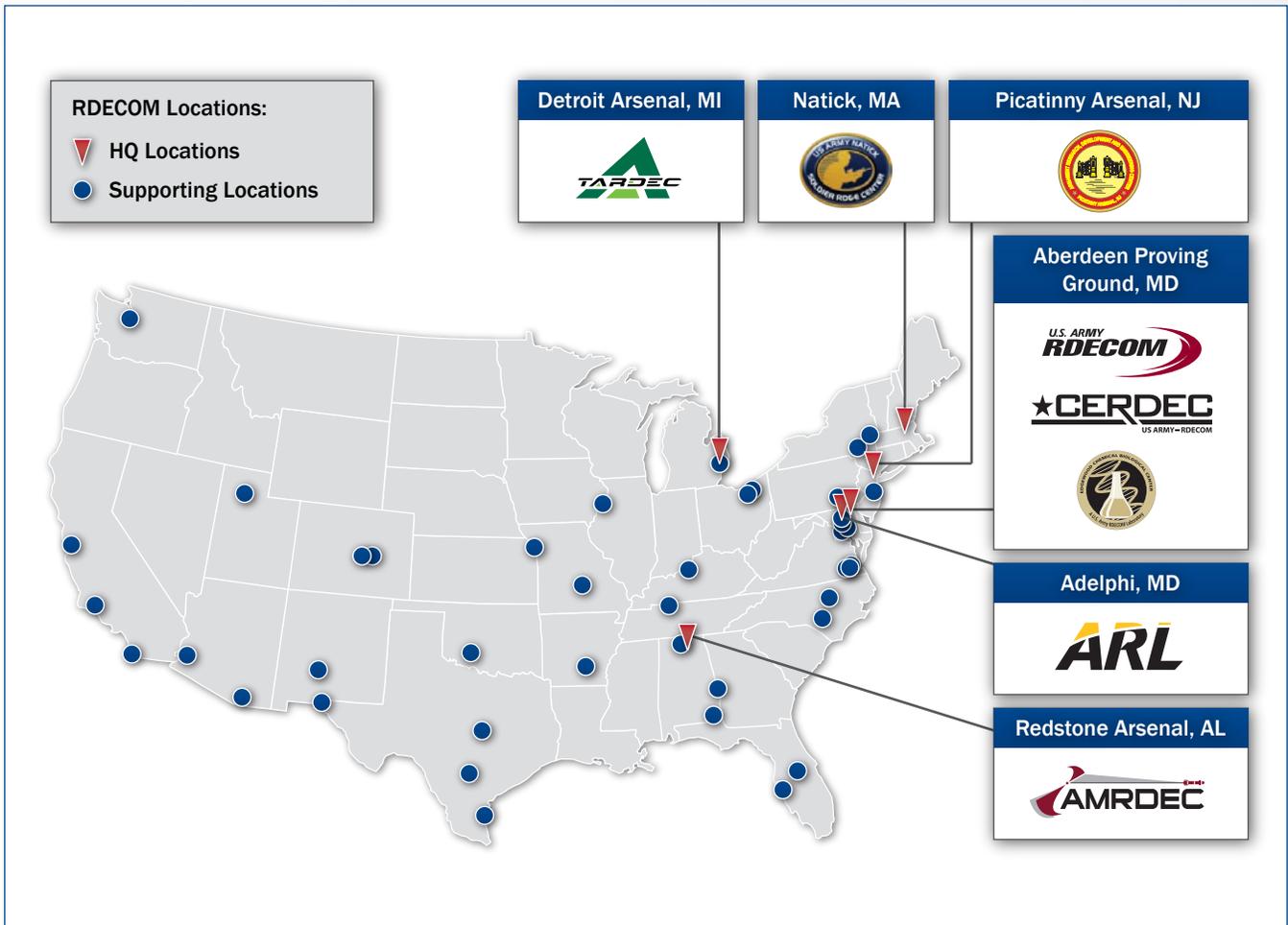


FIGURE A-1. RDECOM's Expansive Reach

APPENDIX A – RDECOM ORGANIZATIONS (CONT)

AVIATION AND MISSILE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (AMRDEC)



Mr. James Lackey

Deputy Director for
Aviation and Missiles,
RDECOM/
Director, AMRDEC

MISSION:

Deliver collaborative and innovative technical capabilities for responsive and cost-effective research, product development, and life cycle SE solutions.

OVERVIEW:

As part of the RDECOM Enterprise, AMRDEC is the Army's focal point for providing RD&E technology and services for aviation and missile platforms across the life cycle. AMRDEC provides a wide array of technologies, hardware and software applications, and products and services — from game-changing technologies to detect and destroy threats; enhance performance, lethality, survivability, and reliability of aviation and missile systems; and programs to miniaturize missile and aircraft components, provide modeling and simulation applications for these technologies and systems, and the associated training applications.

AMRDEC serves as the DoD lead for rotorcraft S&T as well as gel propellants. AMRDEC has one of the few CMM Level 4 software engineering facilities in the Army, certified by the world-renowned Software Engineering Institute. The enormous capability of the AMRDEC PIF has made it the Army's premier rapid response organization.

PEOPLE:

- 3,140 civilians
 - 2,504 scientists and engineers
 - 102 doctorates
 - 806 master's degrees
 - 1,578 bachelor's degrees
- 22 military
- 6,326 contractors

SAMPLE OF UNIQUE FACILITIES

Advanced Prototype Experimentation



National Full-Scale Aerodynamics Complex



ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC)



Ms. Barbara Machak
(Acting)

Deputy Director
for Armaments,
RDECOM/
Director, ARDEC

MISSION:

Empower, unburden, and protect the Soldier by providing superior armaments solutions that dominate the battlefield.

OVERVIEW:

As part of the RDECOM Enterprise, ARDEC strives to support the Army by providing world-class Soldier engineering, design and development support. This support is essential to the rapid delivery of critical technologies to U.S. Soldiers. ARDEC develops and provides advanced weapons, ammunition, and fire control systems for the U.S. Army, to include the energetics, warheads, directed energy, integrated weapon systems, and networked fire control technology that represents more than 90 percent of the Army's lethality. Understanding the importance of working with Soldiers to provide solutions to their unique challenges and equipment requirements, ARDEC has won 34 out of 100 Army's Greatest Inventions awards, as judged by Soldiers, since 2002.

ARDEC has validated its best value status by external assessment in national and international organizational competition, having garnered both the Malcolm Baldrige National Quality Award and Shingo Prize for Operational Excellence awards — the only DoD organization to have received the Baldrige award. ARDEC is also the sole U.S. government organization to hold the CMMI level 5 Development maturity distinction for at its Armament Software Engineering Center.

PEOPLE:

- 3,390 civilians
 - 2,567 scientists and engineers
 - 66 doctorates
 - 862 master's degrees
 - 1,639 bachelor's degrees
- 29 military
- 547 contractors

SAMPLE OF UNIQUE FACILITIES

Davidson Advanced Warhead
Development Facility



Soft Recovery System Facility
(Scat Gun)



APPENDIX A – RDECOM ORGANIZATIONS (CONT)

ARMY RESEARCH LABORATORY (ARL)



Dr. Thomas Russell

Chief Scientist,
RDECOM/
Director, ARL

MISSION:

Provide innovative science, technology, and analysis to enable full spectrum operations.

OVERVIEW:

As part of the RDECOM Enterprise, ARL is the Army's corporate laboratory, which provides the underpinning basic and applied research for materiel technology to support the Soldier. The Soldiers of today and tomorrow depend on ARL to deliver the scientific discoveries, technological advances, and the analyses that provide Soldiers with the capabilities with which to execute full-spectrum operations. ARL has consistently provided the enabling technologies in many of the Army's most important weapons systems.

ARL's investment portfolio is focused on discovery, innovation, and technology transition principally to the RDECs, but also to our other partners in the Army Transformation PEOs/PMs, the Army Test and Evaluation Command, the TRADOC Battle Labs, other services, and the private sector. ARL is committed to positioning internal and external science and technology assets to fulfill the requirements defined by or requested by the Soldier. ARL also strives to assist the Army user in understanding the implications of technology on doctrine and in defining future needs of opportunities.

PEOPLE:

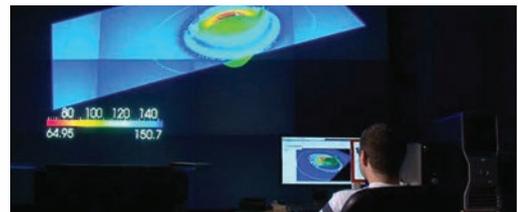
- 1,975 civilians
 - 1,379 scientists and engineers
 - 552 doctorates
 - 479 master's degrees
 - 348 bachelor's degrees
- 37 military
- 914 contractors

SAMPLE OF UNIQUE FACILITIES

Environment for Auditory Research



DoD Supercomputing Resource Center



COMMUNICATIONS-ELECTRONICS RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (CERDEC)



Ms. Jill Smith

Deputy Director for
Communications and
Electronics, RDECOM/
Director, CERDEC

MISSION:

To develop and integrate Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance technologies that enable information and cyber dominance, and decisive lethality for the networked Soldier.

OVERVIEW:

As part of the RDECOM Enterprise, CERDEC is the Army's applied research center for Communications and Electronics. CERDEC provides the diverse technical expertise and operational awareness and understanding to foresee Army needs. CERDEC develops and engineers the technologies essential to mission command and intelligence, as well as applications and networks designed to connect and protect the Soldier.

Whether Soldier-borne, on a vehicle, or aviation platform, CERDEC provides the technical expertise to develop or find innovative technologies that address Soldier needs. CERDEC advances Army capabilities that enable situational awareness and understanding, establish and secure communications, and protect Soldiers from surprise attack. CERDEC works with DoD and national research organizations and labs to influence research investment and adopt, adapt and mature relevant scientific breakthroughs. Working with the Army, CERDEC tracks the evolving Soldier environment to anticipate challenges, refine requirements and inform operational tactics, techniques and procedures.

PEOPLE:

- 2,108 civilians
 - 1,620 scientists and engineers
 - 105 doctorates
 - 941 master's degrees
 - 515 bachelor's degrees
- 42 military
- 1,044 contractors

SAMPLE OF UNIQUE FACILITIES

Soldier Radio Waveform Reference Implementation Lab (SRW RIL)



Antennas and Spectrum Analysis Lab



APPENDIX A – RDECOM ORGANIZATIONS (CONT)

EDGEWOOD CHEMICAL BIOLOGICAL CENTER (ECBC)



Mr. Joseph Wienand

Deputy Director
for Chemical and
Biological Defense,
RDECOM/
Director, ECBC

MISSION:

Integrate life-cycle science, engineering, and operation solutions to counter CBRNE threats to U.S. forces and the nation.

OVERVIEW:

As part of the RDECOM Enterprise, ECBC is the Nation’s principal research and development laboratory for countering chemical and biological weapons of mass destruction. ECBC addresses the Nation’s unique needs by providing solutions to complex CBRNE threats for both the military and the Nation. Products, scientific advances, and critical advice are provided to support the total military acquisition life cycle from basic and applied research through demilitarization.

ECBC leverages a talented workforce with specialized experience, as well as state-of-the-art CBRNE equipment and facilities. Utilizing these intrinsic capabilities, ECBC can safely design, build, test, and support projects from original conception to a final product completely in-house.

Long considered a national resource for CBRNE solutions, ECBC will continue to sustain the core competencies and workforce to counter enduring and emerging chemical and biological threats. ECBC continues to create success for Soldier and CBRNE clients to meet the evolving CBRNE defense needs.

PEOPLE:

- 1,198 civilians
 - 674 scientists and engineers
 - 95 doctorates
 - 179 master’s degrees
 - 396 bachelor’s degrees
- 1 military
- 331 contractors

SAMPLE OF UNIQUE FACILITIES

Chemical Transfer Facility (CTF)



Sample Receipt Facility (SRF)



NATICK SOLDIER RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (NSRDEC)



Dr. Laurel Allender
(Acting)

Deputy Director for
Soldier Systems,
RDECOM/
Director, NSRDEC

MISSION:

Conduct research, development, acquisition and sustainment to maximize combat effectiveness and survivability of freedom's defenders.

OVERVIEW:

As part of the RDECOM Enterprise, NSRDEC synchronizes Soldier-related efforts across the command and identifies Soldier technology capability gaps. NSRDEC focuses on the Soldier domain by developing and using the latest innovations in S&T to maximize the Soldier's survivability, sustainability, mobility, combat effectiveness and field quality of life. NSRDEC treats the Soldier as a system.

NSRDEC leads the integration of Soldier systems through global partnerships and collaboration to deliver advanced capabilities through S&T innovation, generation, and application. This approach supports the current fight while transforming the future force with Soldiers as the decisive edge.

Leveraging the strengths of its workforce and partners, NSRDEC brings the most capable equipment solutions to Soldiers quickly. NSRDEC supports RDECOM by continuing to empower, unburden, and protect Soldiers through basic science, technology generation, application, and transition. This enables rapid fielding of the right equipment at the right time and Soldier systems technology integration and transition.

PEOPLE:

- 695 civilians
 - 340 scientists and engineers
 - 53 doctorates
 - 162 master's degrees
 - 313 bachelor's degrees
- 25 military
- 76 contractors

SAMPLE OF UNIQUE FACILITIES

Ouellette Thermal Test Facility



Center for Military Biomechanics Research



APPENDIX A – RDECOM ORGANIZATIONS (CONT)

TANK AUTOMOTIVE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (TARDEC)



Dr. Paul Rogers

Deputy Director for Tank and Automotive, RDECOM/
Director, TARDEC

MISSION:

Develop, integrate, and sustain the right technology solutions for all manned and unmanned Department of Defense (DoD) ground vehicle systems and combat service support equipment to improve current force effectiveness and provide superior capabilities for the future force.

OVERVIEW:

As part of the RDECOM Enterprise, TARDEC is the Nation’s laboratory for developing advanced military ground vehicle technologies, product integration expertise, and system-of-systems engineering solutions for force projection, ground vehicle power and mobility, ground vehicle robotics, ground systems survivability, and vehicle electronics and architecture.

TARDEC also leverages its global partnerships to harness new technologies for emerging systems, integrate new energy and propulsion alternatives, and reduce life cycle costs of fielded systems to provide Soldiers with the best, most reliable and easiest to maintain ground vehicles in the world.

PEOPLE:

- 1,419 civilians
 - 1,086 scientists and engineers
 - 43 doctorates
 - 465 master’s degrees
 - 439 bachelor’s degrees
- 11 military
- 221 contractors

SAMPLE OF UNIQUE FACILITIES

Ground Systems Power and Energy Laboratory



Ride Motion Simulator/Ground Vehicle Simulation Laboratory



APPENDIX B – HIGHER ECHELON HQ AND RDECOM PRIORITIES

Department of Defense

- Rebalance to the Asia-Pacific Region to preserve peace and stability
- Maintain a strong commitment to security and stability in Europe and the Middle East and Africa
- Sustain a global approach to countering violent extremists and terrorist threats
- Protect and prioritize key investments in technology
- Invigorate efforts to build innovative partnerships and strengthen key alliances and partnerships

Department of Army

- Adaptive Leaders for a Complex World
- A globally responsive and regionally engaged Army
- A ready and modern Army
- Soldiers committed to our Army profession
- The premier All Volunteer Army

Assistant Secretary of the Army for Acquisition, Logistics, and Technology

- Network our forces
- Incorporate lessons learned
- Modernize aging equipment
- Develop critical S&T to enable the next generation of capabilities to the Army unavailable anywhere else in the world
- Reinforce professionalism, expertise, and leadership development of our acquisition workforce

Army Materiel Command – Major Objectives

- Manage AMC’s research, development, test, and evaluation (RDT&E) investment strategy
- Synchronize POM development processes
- Facilitate technology transition
- Provide analytical foundation to support key decisions
- Foster innovation and optimize engineering support to augment acquisition processes
- Maintain the Army’s technological advantage

Research, Development and Engineering Command – Strategic Goals

- Grow land combat power through RD&E to develop innovative technologies and to inform the Army’s investment decisions.
- Invest aggressively in human capital and infrastructure to strengthen and grow the intellectual capital of RDECOM’s core competencies.
- Establish and develop a SE culture to integrate increasingly complex systems requirements, technologies, and capabilities.
- Expand and leverage RDECOM’s global partnership base to generate innovation and enhance interoperability.

APPENDIX C – CORE COMPETENCIES

A list of RDECOM’s Core Competencies is provided below. Our current workforce and facilities support these core competencies.

Fundamental Research

- Materials Sciences
- Information Sciences
- Ballistics
- Aeromechanics
- Human Performance

Aviation Systems Technologies

- Aerodynamics/Aeromechanics (Structures, Flight Control, Crew Station, Survivability)
- Weapons and Sensor Integration (Avionics)
- Propulsion
- Aviation Autonomy and Teaming (Manned and Unmanned)

Weapons and Munitions Technologies

- Warhead/Lethal Mechanisms and Fuzing (Energetic, Guidance/Navigation/Control)
- Weapons and Sensor/Fire Control Integration (Lethality)
- Directed Energy/Non-Lethal
- Fire Control

Chemical and Biological (CB) Technologies

- CB Warfare (Aerosol Physics, Inhalation Toxicology, Filtration Science, CB Testing)
- CB Spectroscopy/Algorithms
- Chemical Munitions (CB Agent Handling/Surety/Demilitarization)
- Smoke and Obscurants

Ground Systems Technologies

- Ground System Design (Propulsion, Mobility, Survivability, Structures)
- Robotics
- Alternative Fuels and Lubricants
- Weapon and Sensor Integration (Vehicle Electronics and Power Management)

Communications and Electronics Technologies

- Space and Terrestrial Communications (Spectrum Management)
- Sensors (Position, Navigation, and Timing, EO/IR, Counter Improvised Explosive Device (IED), Radar, SIGINT, ELINT)
- Countermine/IED Neutralization
- Mission Command
- Cyber/Electronic Warfare (EW)
- Power Generation and Storage

Missile and Rocket Technologies

- Structures (Propulsion, Energetics, Lethal Mechanisms, Flight Control)
- Guidance/Navigation (Embedded Electronics and Computers, Infrared Sensor/Seekers)

Soldier Technologies

- Protection Materials (Individual, Collective, Shelter Systems)
- Physical/Physiological/Cognitive Performance (Behavior Research/Embedded Cognition, Collective Performance/Teaming)
- Aerial Delivery/Insertion/Exfiltration
- Biological Anthropology/Biomechanics
- Combat Feeding/Food Science

Cross Command Engineering Specialties

- Systems Engineering (Soldier-centric Systems Engineering, Systems Integration)
- System/Subsystem Concept Design and Assessment
- Software Engineering
- Reliability Engineering
- Sustainment Engineering/Industrial Base Analysis/Obsolescence Management
- Prototyping, Modeling/Simulation
- Quality Engineering and Management
- System Safety
- Human Factors Engineering
- Manufacturing/Production Support (Product/Technical Data)
- Survivability, Lethality, Vulnerability Analysis and Assessment

APPENDIX D – PRIORITIZED CORE FUNCTIONS

RDECOM's Prioritized Core Functions, shown with their key requirements, are:

Execute an integrated AMC RD&E program

- Integrate RD&E Portfolio across RDECOM, other stakeholders, both domestically and internationally
- Execute RD&E in accordance with approved policies & budget
- Coordinate across the service to help shape investments to align with Army priorities

Conduct fundamental research and advanced technology development and demonstrations

- Conduct basic research, advanced technology development & demonstration, and manufacturing for unique needs of the operational Army
- Influence and leverage external community research in support of the operational Army
- Demonstrate capabilities aligned with TRADOC CNA gap analyses for PEO/PM Programs of Record and Future Programs
- Prototype and/or transition technologies to the Warfighter, PEOs/PMs, and industry

Synchronize AMC RD&E activities

- Synchronize AMC RD&E activities with TRADOC CNA gaps
- Ensure S&T Portfolio is synchronized with and responsive to PEO/PM needs
- Help inform Army requirements for the future through technology forecasting

Optimize and sustain RD&E human capital and infrastructure

- Maintain workforce and infrastructure that keeps pace with state-of-the-art technology in critical mission areas
- Maintain a robust safety program

Provide lifecycle engineering support to PEOs/PMs

- Perform/Deliver Systems Engineering, knowledge products, material analyses, data assessments, test support, TDPs, etc.
- Provide subject matter expert matrix engineering support to PEO/PM Programs of Record
- Maintain reimbursable customer support

APPENDIX E – RESEARCH, DEVELOPMENT AND ENGINEERING FOCUS AREAS

RDECOM's focus areas listed below were originally identified in the document, *Maximizing Land Combat Power*. The focus areas have been updated and align with the Army's priorities and timeline to prepare for land warfare in 2025 and beyond.

Research. RDECOM has identified a number of strategic research focus areas for their potential to provide game-changing capabilities for Soldiers of the future and essentially make current capabilities obsolete.

- **Lethality and effects:** concentrate on understanding and exploiting the fundamental aspects of launch and control; electronic attack; directed energy mechanisms; and target effects to enhance the Army's ability to close with and destroy the enemy.
- **Quantum information sciences:** conduct fundamental research and investigation of deep properties of quantum mechanics, such as entanglement and superposition, and their consequences, which can lead to revolutionary capabilities beyond the limits of classical physics in information processing, sensing, communications, and imaging.
- **Materials in extreme environments:** develop a fundamental understanding of, and an ability to model and design materials across, a wide range of scales (e.g., atomistic, nano, micro, continuum) to ultimately provide material technologies that enable next-generation multifunctional performance in integrated protection, lethality, electronics, and power and energy concepts that drastically reduce weight while enhancing capability over a range of operational and threat environments.
- **Network science:** derive the fundamental laws of the evolution and behaviors of living and constructed networks, treating them as holistic organisms to enable revolutionary advances in the ability to model, design, analyze, predict, and control the joint behavior of secure communications, sensing, and command-and-control networks.
- **Advanced computing:** focus on ways to harness an ever-growing set of computers, from use of large-scale supercomputers to hand-held devices, to ultimately put the power of supercomputing in the hands of the Soldier for better control of the operational space.
- **Human sciences:** focus on gaining a fundamental understanding of Soldier performance, to include study of human neuro-cognitive processes, neural-based monitoring of health and functional states, and intelligent Soldier-system interactions.
- **Extreme energy science:** provide dense component technologies from the nano to the micro scales that provide efficient energy production, storage, and use to enhance Soldier mobility, survivability, and lethality while reducing the logistical burden.
- **Intelligent systems:** conduct research in perception, intelligence, mobility, manipulation, and human systems integration to enable a range of air and ground robotic platforms to empower and unburden Soldiers in complex terrain.

APPENDIX E – RESEARCH, DEVELOPMENT AND ENGINEERING FOCUS AREAS (CONT)

- **Cybernetics:** assimilate the learning, cognition, adaptation, social control, communication, and connectivity that will enable efficient and effective control and cooperation between humans and machines.
- **Synthetic molecular systems:** use the tools of synthetic biology to design materials and manufacturing processes that are not found in nature and are difficult or impossible to replicate via traditional chemical or physical processes.

Development. As DASA(RT) prioritizes its near, mid, and long term objectives within the technology categories, RDECOM will apply these priorities to inform the development of technology solutions for the Army. The following are the focus areas within the RDECOM's Development portfolio:

- **Advanced weapons and target effects:** develop and integrate advanced weapons technologies capable of delivering scalable target effects (non-lethal to lethal) to achieve operational overmatch for mounted and dismounted units in multi-mission scenarios to enhance the Army's ability to close with and destroy the enemy.
- **Joint multi-role aircraft:** pursue a number of new technologies to address the challenges presented by the current vertical lift capability lack of sufficient speed, endurance, and lift to perform a number of critical missions in the Pacific theater as the Army pivots to the Pacific Theater.
- **Data to decisions:** develop tools and techniques to assimilate, integrate, and process large volumes of heterogeneous data and information from a variety of sources to provide robust situation awareness for decision-making at the operational, tactical, and strategic levels.
- **Cyber security and operations:** conduct research and development to identify and minimize cyber vulnerabilities of Army tactical networks and systems and develop agile tools and networks that can react quickly and operate through cyber attacks.
- **Protected ground mobility:** develop and integrate innovative, 360-degree protection technologies to achieve an order of magnitude weight reduction in ground combat vehicles to provide tactical, operational, and strategic mobility necessary to support national strategic goals in the Pacific theater.
- **Force projection:** develop and integrate advanced airborne, sea (landing craft), and ground capabilities into a cohesive force and utilize novel C2 and communications systems to support forced entry operations.
- **Sustainment:** conduct research and development in food, aerial resupply, and shelter technologies to support the highly mobile future force.
- **Human performance:** conduct research and development to enhance physical and cognitive performance of the Soldier, to include improved resilience, increased socio-cultural awareness, and individual and team training technologies.

- **Expanded operations in chemical, biological, radiological, nuclear, and high-yield explosive environment:** provide the research, development, and engineering efforts to protect our military and nation from the deadly effects of WMD. This includes capabilities to identify, secure, and eliminate WMD materials; respond to potential WMD events through detection, protection, and decontamination technologies; and establish attribution through forensic analysis of samples taken from the field.
- **Autonomy-enabled formations:** develop and integrate autonomous technologies into ground vehicle formations to unburden Soldiers and empower them to focus on mission-critical tasks and improve tooth-to-tail ratio.
- **Integrated Soldier protection:** develop integrated Soldier protection that combines multiple protection capabilities (e.g., lightweight, breathable, blast and ballistic, fire resistance, extreme environmental, anti-vector, microbial) into one Soldier system.

Engineering. Based on this vision of the future, RDECOM has identified the following focus areas in the engineering portfolio:

- **Enterprise-wide systems engineering:** Develop, provide and sustain state-of-the-art SE solutions to meet the Army's and customer needs, in an integrated and consistent manner, today and tomorrow.
- **Systems analysis and assessments:** conduct integrated analyses and assessments in support of requirements, concept designs, human-system integration, vulnerability assessments, and forensics across a broad range of technologies, threats, and operational environments.
- **Life-cycle engineering:** provide an integrated cradle-to-grave resource for the development of new systems and life extension of legacy systems.
- **Prototyping:** provide manufacturing technology readiness, performance and design baselines, technical data packages, cost driver identification, reverse engineering capabilities, rapid response to urgent design and manufacturing requirements (to include temporary and limited production lines), and the replacement of obsolete components and subsystems.

Director's Initiatives. The Director has identified several high-risk, high-payoff initiatives, each designed to provide the Army with a revolutionary new capability and which constitute Future State Demonstrations. Each draws upon a wide range of RDECOM core technical competencies that will require an enterprise approach, thereby serving to focus the efforts of multiple RDECs and ARL on high-priority challenges for the future.

- **Expeditionary self-sustaining base camp:** Develop an expeditionary, self-sustaining base camp as an integrated and rapidly deployable system to provide Soldier life-support functions and enable efficient operations. This will be accomplished through the research and development of both materiel and non-materiel solutions and a global engineering architecture

APPENDIX E – RESEARCH, DEVELOPMENT AND ENGINEERING FOCUS AREAS (CONT)

whose net result is increased Soldier readiness and improved operational flexibility.

- **Long-range precision fires:** Develop a long-range fires capability that provides affordable precision fires at extended ranges in a GPS-denied environment. This capability will be organic to small units and provide scalable effects on target with minimal collateral damage. This will be accomplished through development of novel energetics and guidance technologies whose net result is timely, adaptive, and increased lethality over a larger area of operations.
- **Counter Unmanned Aerial Systems (UASs):** Develop a capability to detect, identify, and defeat UASs, which potentially represent the next generation of improvised explosive device (IED) threats. This capability will be effective over a wide range of potential threats, from small platforms to larger, more sophisticated platforms. This will be accomplished through the development of sensors, networks, and defeat mechanisms whose primary goal is increased Soldier survivability.
- **Robotic team member:** Develop a robotic team member with the capability to provide logistics support, situational awareness, and direct and indirect fires for the small unit. This capability will include the ability to operate as a team member with minimal supervision by the Soldier. This will be accomplished through development and integration of novel mobility and manipulation technologies with sensors, fires, human-machine

interface, and intelligent-processing technologies whose ultimate objective is to extend the situational awareness, survivability, and lethality of the Soldier and small unit.

- **Assured access to information:** Develop options that provide for cyber defense, access to space, and the ability to operate through a GPS-degraded environment. The Army fully expects and must be prepared to operate in a GPS-degraded environment.

APPENDIX F – RDECOM PROTOTYPE INTEGRATION FACILITY

As AMC's engineering command, RDECOM provides engineering services and support work as needed for design, fabrication, and assembly through its PIF enterprise. RDECOM established its PIFe for the purpose of designing, fabricating, prototyping and integrating capabilities to validate design and development with hardware. They also perform Weapons Systems Acquisition Reform Act performance assessments throughout the life cycle and rapidly integrate engineered solutions in response to Soldier/acquisition customer requirements. RDECOM's PIFe operates as a single entity from geographically dispersed locations that

are able to deliver competitive prototypes with the goal of capturing objective "should" cost, optimized manufacturing readiness, and established technical data efficiencies from desktop to factory transition.

The PIFe provides the Army with the capability to reverse engineer components in the absence of Technical Development Packages in support of the Organic Industrial Base (OIB) and Depots. The PIFs are the engineering service provider for all phases of a system's life cycle that is customer focused, customer driven, and customer funded.

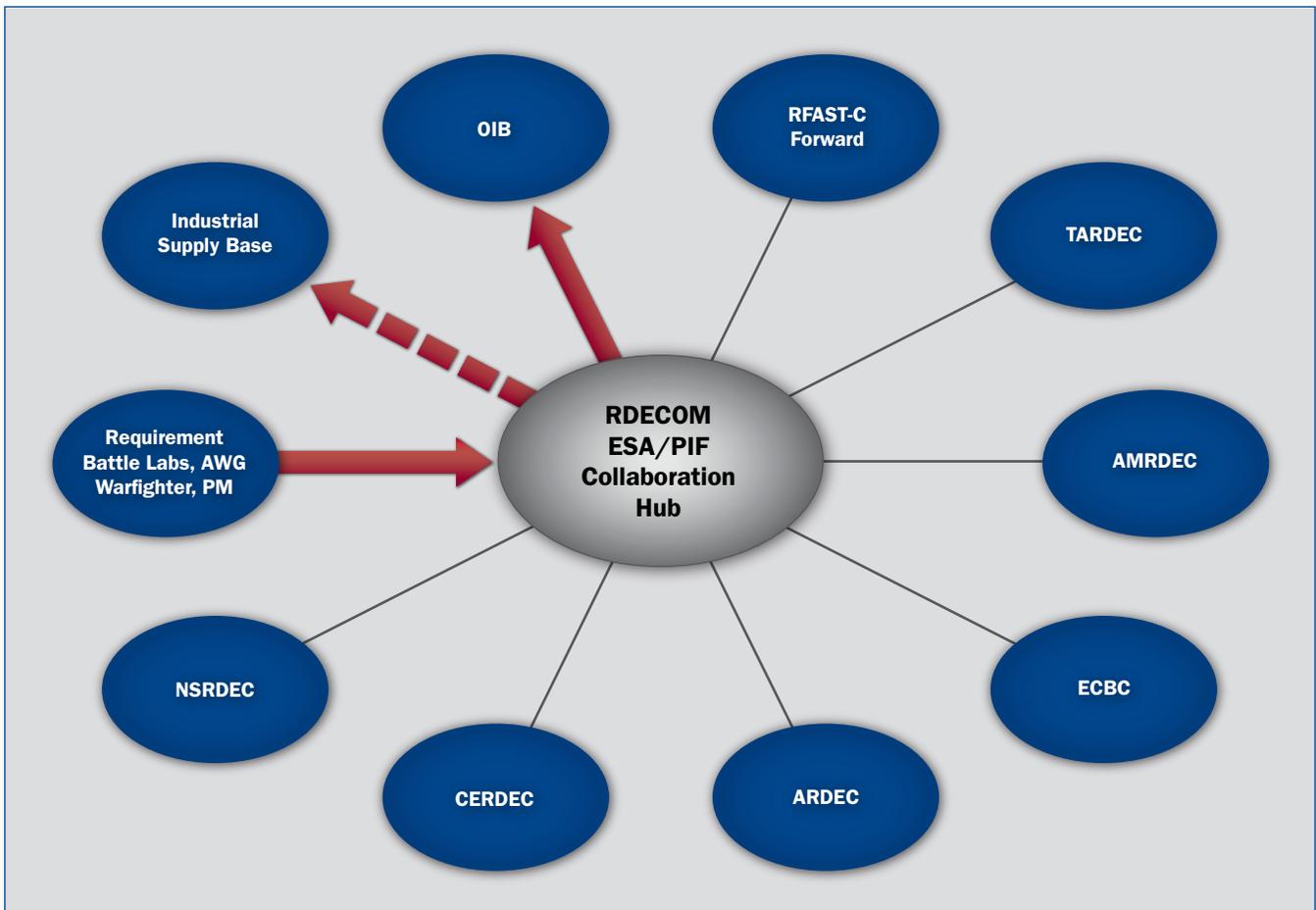


FIGURE F-1. RDECOM PIF Enterprise

APPENDIX F – RDECOM PROTOTYPE INTEGRATION FACILITY (CONT)

The PIFe’s core competencies focus command-wide capacities and capabilities to develop and validate engineered solutions to empower, unburden, protect, and sustain the Soldier. This is achieved by integrating researched, developed and engineered technologies into current and future systems. The requirements vary significantly, ranging from purchasing manufacturing technical expertise, to developing “objective cost data” that support smart buyer acquisition teams, to requiring fabrication of component or system quantities to prove out the system or meet a rapid response need.

The PIFe Enables a Requirements-Driven, Collaborative Enterprise that:

- Fabricates to Customer Requirements
- Engineers solutions utilizing integrated engineering, fabrication, evaluation capabilities under one Command
- Fills rapid supply chain gap to counter Asymmetrical Warfare threats
- Responds to requirements in months, not years
- Provides full scale production of items that transition to Depot, Arsenal or commercial source in accordance with customer acquisition strategy

APPENDIX G – ACCESSING INNOVATION – RDECOM FORWARD DEPLOYED ASSETS

RDECOM’s Forward Element Commands are located in London, Tokyo and Chile. Comprised of our International Technology Centers (ITCs) and the Field Assistance and Science and Technology (FAST) advisors, the RFECs have a hybrid mission of scientific discovery, Soldier support and allied interoperability. Their goals are to promote cooperation between RDECOM and international researchers in areas relevant to the Army mission; provide support to CCMDs and component commands for battlefield-

generated requirements; and advance Army Theater Security Cooperation initiatives with partner nations.

The ITC mission is focused on supporting and facilitating international armaments cooperation and standardization programs. ITCs promote international partnership through the development of S&T collaborations with foreign universities, industry, and governments to obtain the most advanced state-of-the-art technology. They serve as science



FIGURE G-1. RDECOM’s Global Presence

APPENDIX G – ACCESSING INNOVATION – RDECOM FORWARD DEPLOYED ASSETS (CONT)

and technology envoys to foreign defense research establishments on behalf of the entire Army RDT&E community as well as the Office of the Secretary of Defense S&T leadership where appropriate. Ideas gleaned through our international interchange are then provided to the ARL and RDECs for analysis and to inform development of technological enablers. These RDECOM international collaborations also provide support to US Army PEOs that are actively engaged in

collaborative projects with foreign nations and who are supported by the RDECs.

RDECOM’s FAST teams extend technical expertise to CCDRs and the U.S. Forces Command (FORSCOM). S&T advisors who understand the operational needs of each major Army command are co-located with the commands they serve. They help the commands identify and document capability gaps and requirements, codify urgent requirements,

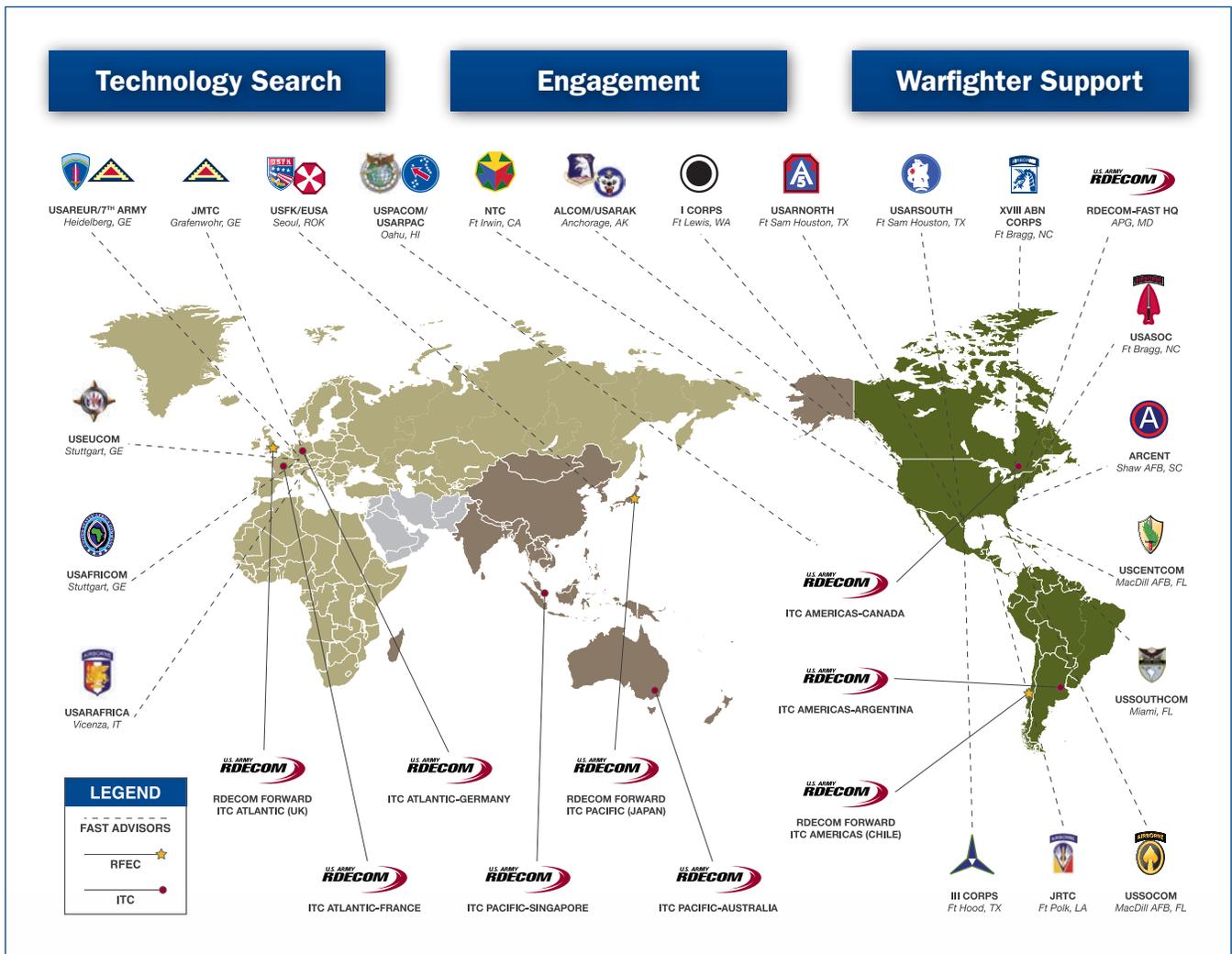


FIGURE G-2. RDECOM Military-to-Military Engagement and Support

ENABLING BATTLEFIELD DOMINANCE THROUGH TECHNOLOGY

provide reach back to RDECOM, and identify and exploit game-changing technologies that resolve or fill these needs.

Similarly, S&T advisors are provided at the Combat Training Centers and at select operational Army organizations to provide the same support as is provided to the CCDRs.

Information from the S&T advisors is sent directly to RDECOM's ARL and RDECs to resolve real-time capability needs and to identify long-term strategic S&T focus areas. This direct access to the RDECOM Enterprise allows RDECOM to provide real time solutions to the Soldier. Being forward deployed, the FAST assets provide the Army with reach back to the S&T Enterprise, as well as access to the RDECOM's PIFs for real time solutions to existing needs discovered during the exchanges. The development and modification of solutions at our PIFs provides an added benefit by permitting PEOs and PMs to assess the solutions for possible adoption for Army-wide use.

All of RDECOM's forward deployed elements maintain a dialog with Army Sustain-

ment Command's CCMD-aligned Army Field Support Brigades. The dialog facilitates synchronization of RDECOM capabilities with other AMC efforts and assets in the region to assure the full capability of AMC is integrated to provide the best support to the CCDR.

Expanding this presence, RDECOM'S ARL has proposed to establish and co-locate ARO Elements with the RFECs. The ARO international mission is to conduct S&T outreach and promote international collaborations with foreign universities and research institutions to build trust between nations. In addition, they shape the building blocks of discovery and innovation that form the foundation for future technology transitions. In order to leverage resources and knowledge, AROs also pursue increased collaborations on basic and applied research with U.S. Navy and U.S. Air Force international organizations in each region. Joint technical exploration and collaborations will allow all services to benefit from increased technological situational awareness, and capitalize on each other's network of scientists and researchers while leveraging respective investments in international S&T.

APPENDIX H – REFERENCES

USA Strategic Planning Guidance V3, 2013

USA Equipment Modernization Strategy, March 2013

USAMC Strategic Plan, FY 2014–24

Strategic Plan for the Office of the ASA(ALT) FY12–16, March 2012

TRADOC Strategic Plan, January 2013

Maximizing Land Combat Power, HQ RDECOM, April 2013

APPENDIX I – ACRONYMS

ABCA – American, British, Canadian, Australian and New Zealand Armies’ Program
ALCOM/USARAK – U.S. Alaskan Command/U.S. Army Alaska
AMC – Army Materiel Command
AMRDEC – Aviation-Missile RDEC
AOARD – Asian Office of Aerospace Research and Development
ARCENT – U.S. Army Central
ARDEC – Armaments RDEC
ARL – Army Research Laboratory
ASA(ALT) – Assistant Secretary of the Army for Acquisition, Logistics, and Technology
BCT – Brigade Combat Team
CBRNE – Chemical, Biological, Radiological, Nuclear, and high yield Explosive
CCDR – COCOM Commander
CCMD – Combatant Command
CDD – Capability Development Document
CERDEC – Communications-Electronics RDEC
CJCS – Chairman, Joint Chiefs of Staff
CMMI – Capability Maturity Model Integration
CNA – Capability Needs analysis
COE – Centers of Excellence
CPD – Capability Production Document
CSA – Chief of Staff of the Army
CSCP – Certified Supply Chain Professional
CWP – Coalition Warfare Program
C2 – Command and Control
DASA (DEC) – Deputy Assistant Secretary of the Army for Defense Exports and Cooperation
DEA – Data Exchange Agreement
ECBC – Edgewood Chemical-Biological Center
ERDC – Engineering Research and Development Center
ESEP – Engineer and Scientist Exchange Program
FAST – Field Assistance in Science and Technology
FCT – Foreign Comparative Testing
FOC – Full Operational Capability
FTAS – Free Trade Agreements
GPS – Ground Positioning System
HQ – Headquarters
ICD – Initial Capabilities Document
IED – Improvised Explosive Device
IOC – Initial Operational Capability
ITC – International Technology Center
JMTC – Joint Multinational Training Command
JRTC – Joint Readiness Training Center

APPENDIX I – ACRONYMS (CONT)

KE – Key Enabler
LCMC – Life Cycle Management Command
LNO – Liaison Officer
MDD – Materiel Development Decision
MS-A – Milestone A
MS-B – Milestone B
MS-C – Milestone C
NSRDEC – Natick Soldier RDEC
NTC – National Training Center
NZ – New Zealand
OIB – Organic Industrial Base
ONRG – Office of Naval Research Global
OSD – Office of the Secretary of Defense
OUSD – Office of the Under Secretary of Defense (Policy)
PA – Partnership Agreements
PEO – Program Executive Officer
PIF – Prototype Integration Facility
PIFe – Prototype Integration Facility enterprise
PM – Program Manager
POM – Program Objective Memorandum
POR – Program of Record
R&D – Research and Development
RD&E – Research, Development and Engineering
RDEC – Research Development and Engineering Center
RDECOM – Research, Development and Engineering Command
RDT&E – Research, Development, Test, and Evaluation
RFEC – RDECOM Forward Element Command
SE – Systems Engineering
SNR (A) – Senior National Representative- Army
SOCOM – Special operations Command
S&T – Science and Technology
S&TA – Science and Technology Advisors
STRI – Simulation, Training, and Instrumentation
TARDEC – Tank Automotive RDEC
TCP – Theater Campaign Plan
TCSP – Theater Campaign Support Plan
TDP – Technical Data Package
TRADOC – Training and Doctrine Command
UAS – Unmanned Aerial System
USAFRICOM – United States Africa Command
USAPACOM/USARPAC – United States Pacific Command/U.S. Army Pacific

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USARAFRICA – U.S. Army Africa
USAREUR – U.S. Army Europe
USARNORTH – U.S. Army North
USARSOUTH – U.S. Army South
USASOC – U.S. Army Special Operations Command
USCENTCOM – U.S. Central Command
USEUCOM – United States European Command
USFK/EUSA – United States Forces Korea
USSOCOM – United States Special Operations Command
USSOUTHCOM – U.S. Southern Command
WFO – Warfighter Outcomes
WMD – Weapons of mass Destruction
XVIII ABN Corps – 18th Airborne Corps

