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STATEMENT BY

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UNITED STATES ARMY
DEPUTY COMMANDING GENERAL
RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND,
SYSTEMS OF SYSTEMS INTEGRATION

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Mr. Chairman and Members of the Committee, on behalf of the soldiers and civilians of U.S. Army Research, Development and Engineering Command (RDECOM), thank you for this opportunity to appear today. The men and women of RDECOM are deployed around the world to provide the Combatant Commanders, and their soldiers, sailors, airmen and marines immediate access to labs and centers within RDECOM to rapidly bring technology solutions and equipment improvements to the warfighter.

To see our activities in context, it is important to understand the operational environment we face now and in the future. The nature of future warfare is expected to look less like Desert Storm and more like what has been played out in Chechnya, Afghanistan, Iraq and more importantly, the attack on the United States on September 11, 2001. In the old paradigm, we balanced the Soviet Union's superiority in quantity with our superiority in quality. In the new paradigm, we must have superiority in both quantity and quality. We can expect symmetry at the strategic and operational levels of warfare but asymmetry at the tactical level, as our enemies cannot win conventionally. As we are seeing currently, there will likely be a blurring among the strategic, operational and tactical levels. We can also expect increasingly sophisticated opponents exploiting all types of weather conditions and terrain (with urban increasingly likely) and employing both military and paramilitary conventional and unconventional forces. In both current and future warfare, we face the leveraging by adversaries of the global proliferation of weapons technology.

To meet the technological challenges of the current and future operational environment, the Research, Development and Engineering Command was established in October 2003 as a Major Subordinate Command of the Army Materiel Command (AMC). RDECOM includes the Army Research Laboratory (ARL), Army Research Office (ARO), Army Materiel Systems Analysis Activity (AMSAA) and seven Research, Development and Engineering Centers (RDECs). They are the Aviation and Missile RDEC (AMRDEC), Natick Soldier Center (NSC), Armament RDEC (ARDEC), Communications and Electronics RDEC (CERDEC), Tank Automotive RDEC (TARDEC), Edgewood Chemical Biological Center (ECBC) and Simulation Training and Technology Center (STTC). A major part of the RDECOM's mission is to plan and execute the majority of the Army's Science and Technology (S&T) programs. The Command is structured to enhance synergy across technology organizations, eliminate redundancy, improve the capability to do program and system integration, and improve the prioritization of programs. The Command has three major objectives: (1) get emerging technology to the warfighter faster, (2) integrate research, development and engineering across all areas of the Army, other services, universities and all other sources, and (3) demonstrate the agility to rapidly take advantage of technological opportunities no matter where they may arise. To achieve these objectives requires new and innovative approaches to all aspects of the development of technology for the warfighters.

The RDECOM is decisively and aggressively engaged in supporting current operations. The Command created the Agile Integration Demonstration and Experimentation (AIDE) organization, which functions not as a brick and mortar institution, but as a vital collaboration center to accelerate the delivery of technological solutions for warfighter requirements. The AIDE organization succeeds by helping the individual labs and centers as well as the Program Managers (PM) and Program Executive Officers (PEOs) and the Rapid Equipping Force (REF).

RDECOM's AIDE deploys Science and Technology Assistance Teams (STAT) into theaters of operations and charges them with the role of liaison

between the warfighters and the labs and development centers across the Army. Their role is to not only keep the Command informed of warfighter emerging requirements, but to also be our forward eyes and ears for scientists and technologists in our working centers. Additionally, the AIDE's Field Assistance in Science and Technology (FAST) Teams, which are assigned to Combatant Commands , keep the scientists and engineers in RDECOM informed and orchestrate quick responses to the warfighters' needs. The Command also has numerous scientists, engineers and contractor personnel deployed in the theater of operations who are working side by side with solders to maintain and operate equipment employing new technologies that are being used in support of Operations IRAQI FREEDOM (OIF) and ENDURING FREEDOM (OEF).

Some examples of how the Command is supporting current operations today are: ARL/TARDEC has implemented an expedient solution in which Army scientists and engineers designed a novel configuration of steel bars and steel armor that can be added to the doors of the HMMWVs to protect crews from RPG attacks as well as small arms fire; 4,800 HMMWV application armor kits are in production by the Army's depots and arsenals and being deployed in theater, along with M1A1 rear grill door armor and Stryker "bar armor". Defense Advanced Research Projects Agency (DARPA) and ARL developed the Pacbots (portable backpack robots) deployed to Afghanistan to clear caves and buildings. TARDEC, in with cooperation from Utah State University, developed omni-directional under vehicle inspection systems to foreign devices and contraband; and CERDEC developed and fielded an electronic countermeasure (ECM) system that provides force protection in convoy, fixed site and check point missions against booby traps and remotely detonated weapons. By modifying an Electronic Warfare (EW) technology that has been fielded to defeat certain weapons, the R&D community has created a number of systems that can be used by our Soldiers to prevent the enemy from being able to use their IEDs in the vicinity of our operations. We are getting these new devices to the field as quickly as possible and will continue to do so while continuing to employ advances in electronic technology that will allow us to defeat the changing threat

as our adversaries rapidly adapt. NSC developed Phraselator for fixed phrase speech translation from English to Dari, Pashto or Arabic for use by special operations, civil affairs, military police and medical personnel. ECBC developed chemical detection lab in Baghdad. AMRDEC integrated the Hellfire missile on a Predator Unmanned Aerial Vehicle (UAV). CERDEC developed a Well Camera System that is an alternative to lowering a soldier into a well to identify hidden caches of weapons and munitions; CERDEC developed and fielded two prototypes of the Ground Standoff Mine Detection System (GSTAMIDS), which is a remotely controlled vehicle-mounted mine detection system using a Commercial Off The Shelf (COTS) vehicle (Meerkat) controlled by a follow-on vehicle (Buffalo). ARL developed a new Sniper Detection system for use in Iraq.

In addition to supporting current operations, RDECOM is heavily involved in moving future technologies into the current force. The Command supports PM Future Combat Systems (FCS)/ Lead Systems Integrator (LSI) by inserting advanced technology as it becomes available to increase FCS capabilities, using a spiral development acquisition approach. However, it is transitioning a number of technologies that are in development for PM FCS LSI, for use in current operations. Also, the Command supports the Army Chief of Staff's Focus Area effort through interaction with the Future to Current Task Force. The Task Force is working to provide future capabilities to an army that is in combat today: providing some of the FCS-like technologies that have been in development for the last four years. It is vital that we focus a portion of our S&T on deliverable, affordable products within shorter timeframes while the remainder continues to develop our "next generation" capabilities. The key enabler for this is to take shorter technology jumps and transition incremental improvements to the soldier rather than wait decades for revolutionary materiel and doctrinal changes. Sometimes a 70% solution that is available now can be better than a 99% solution that will be ready for fielding three years from now. For example, the First Strike Ration prototypes out of NSC were demonstrated under a previously completed Science Technology Objective (STO), but deployed to OEF and consumed by elements of the 75$^{th}$ Ranger Regiment. After receiving constructive

comments from the deployed soldiers, the NSC team improved the nutrient-laden ration, deployed the rations again, and now receives continuous requests for them.

Another example of moving technology forward is the Suite of Sense Through the Wall (STTW) system, which will provide mounted/dismounted soldiers with the capability to detect, locate and “see” personnel with concealed weapons and explosives who are hidden behind walls, doors and other visible obstructions. This capability has direct application to the operating forces requirements for military operations in urban terrain (MOUT), prisoner/checkpoint screening or hostage recovery operations.

An additional example where the Command is inserting advanced technological equipment for the warfighter is with the Lightweight Counter Mortar Radar (LCMR), which provides the capability of 360 degree detection of mortar fire out to ranges which are beyond the effective range of most mortar weapons and locating the firing weapon with accuracy sufficient to engage with combat air support. The radar weighs approximately 120 lbs and disassembles for transport. The radar reports target locations to a Personal Data Assistant (PDA) that can communicate with the radar wirelessly so that the radar operator need not remain with the radar. The PDA also provides radar control and receives and displays system status and fault messages.

IED Change Detection is being developed by CERDEC to detect IEDs along travel routes using high resolution aerial/overhead imagery. It uses day and night sights and is currently mounted on manned and unmanned aviation systems. The data is sent to a Change Detection Work Station, where a warfighter views day-to-day thermal or TV imagery that is collected by the airborne asset. This system helps an operator to identify and locate “new” environmental changes on a route which could indicate the presence of IEDs or landmines

The Active Protective System (APS) is the hit avoidance portion of the manned FCS platform against anti-tank threat munitions prior to the threat munitions making physical contact with the platform. The Integrated Army Active

Protective System (IAAPS) is an integrated FCS system that uses soft kill electronic sensors and countermeasures (jammers and decoys) and a hard kill active protection system (physical interruption) to protect a vehicle from direct fire and top attack threats with growth potential for Kinetic Energy (KE) threat defeat. The Command is developing the following two APS programs for integration into the current force in order to increase survivability of our warfighters.

The Full Spectrum Active Protection (FSAP) Close-In Layered Shield (FCLAS) is a cross-technology solution integrating radar, digital signal processing and explosives in a small, self-contained interceptor ready for loading into a smoke tube or an upgraded FCLAS tube. It detects, tracks, and defeats Rocket Propelled Grenades (RPGs).

The Close-In Active Protection System (CIAPS) consists of a radar staring in all directions that can detect an incoming threat at very short range and launch one of an array of pre-positioned interceptors to intercept and destroy the threat shaped charge warhead before it hits the protected vehicle. It is effective against anti-tank guided missiles (ATGMs) as well as rocket-propelled grenades (RPGs) and can defeat threats launched from very short range.

The Command not only collects lessons learned from the FAST and STAT Teams, but each RDEC also has teams that deploy with the soldiers to gather on-site operational lessons learned. For example: One of the NSC's programs is called the Operational Force Interface Group (OFIG), which is in place to gather soldier feedback on equipment. The OFIG conducts numerous visits to operational units, after redeployment, where they survey hundreds of soldiers about their equipment. The OFIG also has teams that deploy to the area of operations to gather soldier feedback on problems with equipment. The NSC also has a "Greening Program", which allows engineers, project officers and scientists the opportunity to participate in a field training exercise with a unit for a four to five day period.

In order to ensure that the RDECOM has knowledge of and access to the best technologies in the world, the command has established International Technology Centers (ITC) throughout the world. As regional representatives, the

Command's ITCs understand and anticipate U.S. technology requirements and initiate proactive, innovative approaches to expanding contacts with foreign military R&D organizations, foreign commercial industry and foreign universities involved in S&T. Based on their discoveries (to include non-developmental items (NDI), they recommend to the laboratories, RDECOM-AIDE, PEOs, PMs and the REF, potential opportunities for cooperative projects, commercial contracts, university studies, etc., that will leverage International S&T in support of Army Campaign Plan.

The Command has established a formal relationship with the TRADOC Futures Center (FC). This relationship insures the integration of technology into holistic Doctrine, Organization, Training, Material, Leader Development, and Personnel (DOTMLPF) solutions for the warfighter. The RDECOM becomes the entry point for the FC for all Army Material Command (AMC) Science and Technology (S&T) products through multiple channels that includes resident liaison officers assuring that the FC is cognizant of emerging technology enablers and the potential to deliver capabilities to the warfighter. The FC/RDECOM team provides a decision making framework for Army leadership by analyzing S&T developments linked to operational capability to validate the S&T investment. The Command plays an integral role with the FC in addressing shortfalls in future operating capabilities (FOCs) and providing the technologies to assure that warfighter capability goals are met. The Command's technology integrated product teams (IPT), including strong FC participation, insure that all pursued efforts will result in operationally relevant solutions to warfighter requirements and that the warfighter requirements are met. The focus for this new command has been in the power and energy, lethality, robotics, modeling and simulation, countermine, supportability, survivability, networking, nanotechnology, and biotechnology areas.

The role of RDECOM is to provide a single integrated strategy toward the research, development and engineering of materiel solutions addressing user requirements. One major player in the strategy is that of experimentation. The linking of experimentation insures that RDECOM technology demonstrations are

operationally relevant, while providing a venue to develop operational concepts for new technologies in FC experiments. By adhering to a Code of Best Practices for Experimentation, and institutionalizing the system engineering processes and disciplines throughout the RDECs, the Command provides a broad base of consistent and innovative approaches to developing the DOTMLPF solutions for the warfighter today and tomorrow. Using a variety of tools, ranging from hardware platforms, through virtual simulations, in either stand-alone or integrated mode, the centers perform a variety of experiments, from discovery, through hypothesis testing, and demonstration, leading to a developed and refined military capability. One of the tools that the Command will use is the Modeling Architecture for Technology, Research and Experimentation (MATREX) STO, that is developing a persistent, secure, distributed and reusable environment where models can be "plugged" into an established architecture as needed and then "played" for engineering analysis, evaluations, supportability and technology trade-offs in support of Army transformation. The MATREX will be a key enabler of Simulation and Modeling for Acquisition, Requirements and Technology (SMART) initiatives throughout the command and the Army that will enable the Army to field equipment to the warfighters more speedily. Together with the Army Training and Doctrine Command (TRADOC) and the Army Test and Evaluation Command (ATEC), the RDECOM plays a vital role in experimentation and development, from concept to fielding.

But most importantly, we have worked closely with the Air Force and Navy research and development community and the National labs to ensure we are on a clear path to success in our warfighting missions in the twenty-first century.

Today the Army is both at war and continuing its efforts towards transformation. As we move from our current force to the future force that is strategically responsive and dominant at every point on the operational spectrum, the nation's science and technology assets are essential to success. We must provide technology solutions essential to current and future warfighter needs across the full spectrum of Army operations. Our diverse S&T programs will enable the Army to support evolving and emerging capabilities.

The RDECOM fields the technologies which sustain America's Army as the premier land force in the world.

Thank you, Mr. Chairman for the opportunity to testify before the subcommittee. I would be happy to answer any questions you or the Members of the Subcommittee may have.