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SUBCOMMITTEE ON TERRORISM,
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IN SUPPORT OF THE WAR ON TERRORISM,
TRANSFORMATION AND BEYOND

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INTRODUCTION

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to describe the fiscal year 2008 Army Science and Technology (S&T) Program and the significant role Army S&T has in creating, adapting, and maturing technologies to enable the future force, while simultaneously seeking opportunities to enhance the current force.

We want to thank the Members of this Subcommittee for your sustained support of our Soldiers who are now at war and for funding the investments that will provide Soldiers with the dominant capabilities they will need to defend America's interests and those of our allies throughout the world. Your continued advice and support are vital to exploiting the potential of technology to speed victory on the battlefield.

S&T CONTRIBUTIONS TO THE GLOBAL WAR ON TERRORISM

Army technology developments and our scientists and engineers have been and are supporting our Soldiers deployed to fight the Global War on Terrorism (GWOT). We have responded rapidly to a broad range of their needs in three ways: 1) leveraging past investments adapted for current operations, 2) exploiting ongoing technology development for rapid transition opportunities, and 3) using scientist and engineer expertise to develop new technology or create novel solutions that improve the performance of currently fielded equipment. The following paragraphs provide examples of solutions of our responses for GWOT.

1) Leveraging past investments. We are creating new capabilities from past investments by seeking opportunities to rapidly field mature technology to Soldiers. For example, the Lightweight Counter Mortar Radar (LCMR) was adapted from previous efforts to provide capabilities to detect mortar rounds and rockets and to locate shooters for counterfire or other response. Initial fielding started in 2004, and an improved version of LCMR was delivered in 2006. Over 130 LCMR systems have been built to date.

2) Exploiting ongoing technology development. We are exploiting the potential of new technologies that are emerging from our current investments. For example, the Joint Precision Air Drop System (JPADS) was demonstrated in Afghanistan in August 2006. It is a product of a joint Army and Air Force Advanced Concept Technology Demonstration (ACTD). The JPADS is a "GPS-guided" cargo parachute delivery system developed by the Army combined with a common laptop mission planning weather system developed by the USAF. It enables aircraft to deliver essential supplies within 100 meters of the intended point from 25,000 feet and at standoff ranges of up to 10 miles. Currently, JPADS can deliver up to 2,000 pounds of food, water, or ammunition. We are continuing development of technologies to enable payloads of up to 10,000

pounds. The JPADS improves logistics efficiency while enhancing aircraft cargo and ground Soldier survivability. The Unattended Transient Acoustic MASINT System (UTAMS) technology program improved capabilities to detect and locate enemy mortar and rocket fires. A prototype system with software and hardware used with LCMR and the Acoustic Mortar Detection System (AMDS) provided a system-of-systems solution.

3) Using scientist and engineer (S&E) expertise. Our S&Es have demonstrated the knowledge and the ability to provide rapid technology developments and adaptations for many applications in support of GWOT. Examples include the work done by Army engineers to adapt existing armor technology to design effective levels of crew cab protection for the Army's family of heavy tactical trucks (M915 trucks) and enhanced armor protection for the gunner's cupola. Another example is the work to protect personnel by designing ballistic and blast protection technology as well as the methodology to apply effective protection measures for buildings and interior structures. Specific techniques developed included designs to pre-detonate rocket/mortars and defeat ballistic fragments to provide overhead cover, compartmentalization, and sidewall protection. Within 48 hours of testing, laboratory personnel and field engineers were able to begin implementing effective protection modifications at deployed sites. We have developed Projectile Detection and Cueing technology and worked to integrate it on the Common Remotely Operated Weapon Station (CROWS) acquisition program. This system demonstrated the technology to

detect incoming gunfire, automatically slew and aim a CROWS weapon at the shooter. The system also updates the aiming commands while the platform is on the move.

To accelerate development of new and novel solutions for Soldiers in the field, the Army has also benefited from the Agile Integration Demonstration and Experimentation (AIDE) program approved by Congress in 2006. Through the AIDE program, most recently, we have developed a low-cost acoustic gunfire detection system. This year, the AIDE program will demonstrate the UTAMS acoustic detection enhanced with a counter-sniper capability by improving technology to detect individual rifle fires.

FORCE PROTECTION

It is imperative that we provide our Soldiers with the most effective technologies to protect them. Our S&T investments in Force Protection technologies are the single largest investment area in our portfolio. Major investments in Force Protection include development of technology to provide lightweight ballistic protection for Soldiers; active and passive protection for lightweight vehicles and rotorcraft; lightweight armor for tactical vehicles; active protection countermeasures against Kinetic and Chemical Energy munitions for combat vehicles; and active and passive protection against rockets, artillery, and mortars for installations.

SOLDIER SYSTEMS TECHNOLOGY

Our investments in Soldier technologies seek to provide individual Soldiers with "platform-level" capabilities. These include greater protection, networked communications for shared local and extended situational awareness, as well as connectivity to exploit joint lethal fires. The goal is to seamlessly link Soldiers to sensors and platform-based lethality capabilities in real time, to accurately identify and engage targets in less time, and with greater precision lethality. Key Soldier technology investments include advanced body armor, lightweight novel power sources including fuel cells, and next generation chemistries for batteries.

MEDICAL

Our investment in medical S&T provides the basis for maintaining both the physical and mental health as well as performance of Soldiers. To assist in the fight against injuries sustained from improvised explosive devices and other sources of blast-related wounds, the Army is leading a joint medical program to prevent, mitigate, and treat medical blast casualties, and has begun an investment in tissue regeneration research with the ultimate goal of developing technologies that will lessen the impact of severe and debilitating wounds. Other medical technology is also being exploiting for immediate war-related needs such as the “Battlemind Training” system which was designed by our behavioral health scientists and already being used before and after deployments to mentally prepare Soldiers to deal with the rigors of battle. Army medical research and development investments continue to serve a critical role in ensuring the safety and well being of warfighters wherever they are deployed.

UNMANNED SYSTEMS

The Army S&T program is pursuing technologies to enable unmanned and robotic capabilities that include: unmanned aerial systems (UASs), unmanned ground vehicles, and unattended sensors. These systems’ capabilities will be modular in design for spiral technology insertion into the current force based upon priority needs and adaptation for future force applications. Unmanned Systems provide unique capabilities while reducing risks to Soldiers as well as reducing the deployed footprint of the force. In 2006, the Future Combat Systems (FCS) Program Manager (PM) selected the Micro Air Vehicle (MAV), a 13 inch ducted-fan platform for small unit reconnaissance and surveillance and the robotic demonstrator co-developed by Defense Advanced Research Projects Agency (DARPA) and the Army as the baseline capability for FCS Class I UAV. Evidencing the Army’s strategy to “spin-in” technology to the current force, the MAV is currently being fielded with the 25th Infantry Division which also conducted the ACTD evaluation. We will continue to explore opportunities to field unmanned technologies into the current and the future force to provide new capability and reduce risks to Soldiers.

NETWORK-CENTRIC TECHNOLOGIES

The S&T investments in this area seek to enable truly network-centric operations. We are pursuing an unprecedented synergy between traditional "stand-alone" communications, command and control, and sensor technology developments. The networked enabled force will be empowered by sensor-based "knowledge" systems for collaborative real time mission planning, on-the-move operations, and decisive networked lethality. Specific technology investments include software and protocols for secure, mobile, ad-hoc networks; third generation infrared (IR), and multi-functional radars for extended range detection, and identification in foliage, urban areas, through walls as well as individual targeting and tracking. For example, Army scientists and engineers developed a Multi-Purpose Broadband Antenna (MPBA) which has been demonstrated in both communications and intelligence systems. The MPBA provides multi-band capability in a single structure. This technology reduces organization and installation signatures by eliminating the need for separate antennas for separate radios and saves platform design space for other systems.

BASIC AND APPLIED RESEARCH PROGRAM

The Army Basic and Applied Research programs seek to ensure that the Army has overwhelming land-warfighting capabilities against future adversaries. This is accomplished by incorporating new scientific fields into traditional disciplines to advance knowledge. The Army invests in research areas judged relevant to the Army mission with an objective of discovery, invention, and innovation related to physical, chemical and biological phenomenology to enable revolutionary advances and paradigm shifts in operational capabilities. Key research areas include nanoscience, bio-inspired system science, autonomous systems, network and information science, human performance, and energy. In 2008, we will be starting a new Collaborative Technology Alliance on Micro-Autonomous Systems Technology (MAST) that has the potential to provide unprecedented force protection technology for our Soldiers through sophisticated hand-held intelligence, surveillance, and reconnaissance. Some examples of recent progress in Army research include: bacteria based methodology to produce self-ordered materials with the potential to form higher energy density, thin, and flexible lithium ion batteries compared to conventional thin film batteries; creating an avatar (virtual human) by incorporating speech recognition, natural language processing, dialog management, perception, cognition, emotion, animation and cultural attributes; ultra-sensitive sensors to enable technology for accurate robot-integrated detection of explosives; and materials with a negative index of refraction that could lead to smaller, lighter, and better lenses and have potential for “cloaking”; and quantum molecular control that has the potential to revolutionize the remote detection and identification of chemical and biological agents as well as advance chemistry and chemical processes.

SCIENCE AND ENGINEERING WORKFORCE

To maintain technological superiority now and the future, we need top quality scientists and engineers in the Army Laboratories and Research, Development, and Engineering Centers. We recognize this challenge as the Army must compete to obtain its future workforce. We have taken important steps to attract and retain the best science and engineering talent. Our laboratory personnel demonstrations have instituted initiatives to enhance recruiting and reshaping the workforce such as pay banding that is unique to each laboratory allowing the laboratory directors the flexibility to establish a pay-banding scheme that takes into consideration administrative, organizational, and position management; and separate career group for scientists and engineers that allows a dual career track for scientists and engineers and greater competitiveness with academia and private industry. Finally, we have long recognized that a scientifically and technologically literate citizenry is our nation’s best hope for a diverse, talented, and productive workforce. To achieve this goal, we have created the Army Educational Outreach Program to leverage the numerous resources across our programs and DoD to engage America’s youth in science, mathematics and engineering.

TECHNOLOGY TRANSITION

Successful transition of Army S&T products is central to enabling the Army's transformation and accelerating new technologies into the current force. We use Technology Readiness Level metrics to assess and communicate the estimated maturity of a technology to the acquisition PMs, who buy the systems that are provided to our Soldiers. The S&T community's outcome-oriented approach to technology development has yielded significant progress over the past few years. Examples of successful S&T efforts that have transitioned to programs of record include:

Small Arms Protective Inserts Plates. Army S&Es defined the technology metrics to achieve the lightest weight to defeat specific small arms threats, and tested solutions to determine the most effective technology applications that would meet stringent weight requirements. Ceramic-based Small Arms Protective Inserts (SAPI) plates are made from the latest composite materials and consist of a ballistic nylon spall cover, ceramic tiles, and Kevlar™, Spectra®, or other reinforced plastic backing material. Various compositions of Kevlar, fiberglass, Spectra, and aluminum are used. We also focused Manufacturing Technology (ManTech) to achieve a significant reduction in production costs for SAPI plates resulting in a cost avoidance of more than $150 million based upon an investment of less than $500,000 in ManTech.

FCS Engine. The FCS Engine technology program was focused on developing a high power density compact engine for the FCS manned ground vehicles. This technology program transitioned to the FCS program in 2005. The program increased the power density from three to six sprocket HP/cu-ft to meet FCS weight, space and mobility requirements. This effort provided increased vehicle speed, mission range, maneuver responsiveness and dash speed compared to current equivalent class combat vehicles. The smaller volume of this new engine technology provided more space for fuel, ammunition, and mission equipment.

Non Line of Sight Launch System (NLOS-LS). The Networked Fires weapon technology demonstration designed, developed, and demonstrated a platform-independent, container-launcher (CL) system and two missile variants. The program was executed by DARPA and the Army with joint funding. This program successfully transitioned technology in fiscal year 2004 into the NLOS-LS System Development and Demonstration. The NLOS-LS is part of the unmanned Future Combat Systems core program for spin-out one.

120mm Line-of-Sight/Beyond-Line-of-Sight Gun. The 120mm gun technology was transitioned to the FCS program in 2004. This light weight gun weighs 2,600 pounds less than the 120mm gun on the M1 Abrams Tank which was needed to meet FCS weight requirements. The Army developed new fabrication techniques for high strength steel to yield 20 percent higher strength than current cannon tube technology.

Tactical Command and Control protection algorithms to PM Future Combat Systems. Tactical Wireless Network Assurance (TWNA) technology program integrated tactical public key infrastructure (PKI) components into FCS's System of Systems Common Operating Environment (SOSCOE). The TWNA program also transitioned an intrusion detection technology to SOSCOE for its automated intrusion detection and response component. These technologies will reduce FCS system and network vulnerabilities.

CONCLUSION

With the continued support of Congress, the Army will be able to maintain funding for a diverse S&T portfolio that is adaptive and responsive to unanticipated needs in the current force and to exploit technology opportunities for the future force. The Army's scientists and engineers are expanding the limits of our understanding to provide our Soldiers, as well as our Joint and coalition partners, with technologies that enable transformational capabilities in the ongoing war on terrorism to ensure that the Army remains a victorious, relevant, ready land component of the Joint Force. The Army S&T community is the "engine" of change seeking to accelerate the Army's transformation.