STATEMENT BY

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DEPUTY ASSISTANT SECRETARY OF THE ARMY

FOR RESEARCH AND TECHNOLOGY

BEFORE THE

SUBCOMMITTEE ON EMERGING THREATS AND CAPABILITES

COMMITTEE ON ARMED SERVICES

UNITED STATES HOUSE OF REPRESENTATIVES

ON

THE UNITED STATES ARMY'S SCIENCE AND TECHNOLOGY (S&T) PROGRAM FOR FISCAL YEAR 2012

FIRST SESSION, 112TH CONGRESS

MARCH 1, 2011

NOT FOR PUBLICATION UNTIL RELEASED

BY THE COMMITTEE ON ARMED SERVICES

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Mr. Chairman and Members of the Subcommittee, thank you for having me here today to discuss the fiscal year (FY) 2012 Army Science and Technology (S&T) Program and the significant role we have in supporting the Warfighter while developing the technologies that drive our Army's transformation. We in the Army S&T community are grateful to the members of this Committee for your sustained support of our Soldiers especially in this time of war, and for funding the investments that will provide our future Soldiers with the technology to defend America's interests and those of our allies around the world.

I was appointed Deputy Assistant Secretary of the Army for Research and Technology in July of 2010, and this is my first time testifying before this subcommittee. I have spent my entire 30-year career in Army S&T, most recently as the Director of the Natick Soldier Research, Development and Engineering Center (NSRDEC). It is an honor to appear before the Subcommittee today.

Simply put, my mission is to reinvent Army S&T to foster invention, innovation, and demonstration of technologies for the current and future Warfighter. Soldiers are our decisive weapon, and in this environment of persistent conflict, we must be able to provide the technology enabled capabilities that Empower, Unburden and Protect the men and women who voluntarily put themselves in harm's way for our country and those things we as Americans hold dear. While Army S&T has been doing this for the past several years, it is time we step up our game, and focus on results that will get these capabilities to our Soldiers more quickly and affordably than ever before.

My experience has taught me that in order to best achieve success, Army S&T needs to be better focused, more accountable, and more transparent. I have already begun to use the lessons learned over the past ten years to reshape this organization to better serve the needs of the Soldier, and to ensure Army S&T is the "go-to" place for Army Senior Leadership on all S&T and engineering issues. Coming into this job, I set out nine strategic goals to help guide our success:

- Conduct "World Class" Science and Technology
- Affect timely transition of the right technologies
- Be the recognized leader in Defense Development and Engineering
- Form strong internal and external partnerships

- Maintain high-quality, relevant facilities and capabilities
- Develop and maintain a balanced investment portfolio
- Maintain a highly skilled, motivated workforce that exemplifies our core values
- Build effective, efficient and adaptable processes
- Foster government and public understanding of our value

Many of these goals are well on their way to being met, while others will require a reinvigorated, dedicated effort. Taken together, these goals will ensure that the Army's S&T program provides our Soldiers the world's most advanced capabilities both for the current fight and for the future.

One of the keys to our success, especially in this constrained budget environment, will be to effectively prioritize our programs in better synchronization with the needs of the Warfighter. In the coming months I will be working with the Senior Army Leadership, our partners in the U.S. Army Training and Doctrine Command (TRADOC), the Program Executive Offices and the S&T leaders, to develop a list of their top priorities to help us better focus our research and development efforts. This is less a matter of shifting investments – rather a shift to an alternative and more relevant program management approach.

With this approach in place, I believe the FY 2012 budget request we have submitted to the Congress will provide the correct levels of investment for our enterprise. Our S&T program request (6.1-6.3) for FY12 is $2.3 billion, a 15.8% increase over our FY11 request. This increase includes the assumption of the High Performance Computing Modernization Program and the Historically Black Colleges and Universities program, and increased investments for research on Soldier load, vehicle survivability, armor materials, and other areas. As we look at this budget, we must rethink the way we manage these investments for maximum accountability and transparency. As such, I have reorganized my office to allow for more holistic management and oversight across our lines. I am using a portfolio management approach to organize our investments. The four portfolios are Soldier, Air, Ground and Command, Control and Communications (C3). In addition, I have new responsibility for a small amount of 6.4 funding for competitive prototyping. This line will enable us to better meet the competitive prototyping requirements of the Weapons System Acquisition Reform Act (WSARA) and mature promising technology capabilities to a higher Technology Readiness Level (TRL) level within S&T. At this time, we are establishing a governance structure and an annual selection and review process to pick the most promising, relatively mature technologies or sub-systems for funding. These programs will be selected based on their potential to transition to a high priority Program of Record

(POR) and their potential to demonstrate a TRL of six or greater within one to two years. This initiative will establish a closer alignment between S&T and acquisition, and expedite our capability to transition technology enabled capabilities from the lab to operational use.

By looking at our enterprise in terms of these four portfolios, and not merely in terms of funding lines or Laboratories/Research, Development and Engineering Centers (RDECs), we are better able to synchronize our efforts across the S&T enterprise. Each of the four portfolios is managed as investments in: (1) far-term, basic research for discovery and understanding of phenomena; (2) mid-term, applied research for laboratory concept demonstrations; and (3) near-term, advanced technology development for demonstrations in relevant environments outside the laboratory. Each draws from complementary efforts in other portfolios, and each also benefits from the Army's investments in manufacturing technology.

Soldier

In keeping with a renewed commitment to making the Soldier the Decisive Weapon, the Soldier portfolio includes technologies for Soldier and Small Combat Unit lethality, protection, equipment, shelters, clothing, food, safety, training and medical technologies, as well as initiatives to address Soldier Power and to Lighten the Soldier's Load. In the coming years, improving mission performance in both a cognitive and physical sense will be one of the greatest challenges for the Army. This cuts across many areas of research, from the physical weight of equipment, to technology enabled capabilities to overcome information and sensory overload in an increasingly digital and networked environment, to Soldier knowledge, skills and training. In coordination with the C3 portfolio, we are looking at methods of ensuring that correct information is delivered to the correct Soldier or unit, without inundating them with non-critical data. This involves better understanding how individuals learn so information delivery systems can be tailored to specific human characteristics and the development of management algorithms that lower the cognitive burden on Soldiers. In the physical realm, we are investigating the trade-offs between the limits of human physical performance and the capabilities they will require in the field. This includes advanced mission planning technologies and training to allow Soldiers and units to better tailor necessary loads based on mission requirements. This will allow the future Soldier to maximize the potential of advances in off-loading, nutrition science and physical fitness, among other areas.

Another major area of effort in this portfolio is Post-Traumatic Stress Disorder (PTSD)/Traumatic Brain Injury (TBI). At least 20-40% of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) Soldiers report symptoms of PTSD. The effect of PTSD can be far-reaching and its symptoms often negatively impact a person's

mental and physical health, work and family relationships. Individuals with PTSD are six times more likely to attempt suicide. Due to the number and severity of explosive weapons, it is estimated that 12-20% of OIF/OEF veterans have possible TBI, which ranges from mild to severe. Although most OEF/OIF veterans experience mild TBIs (a loss of consciousness that lasts for 30 minutes or less, or a period of amnesia that lasts for less than 24 hours), some of these Soldiers may be diagnosed with PTSD, and are more susceptible to substance abuse, adjustment, and anxiety disorders.

At the U.S. Army Medical Research and Materiel Command (MRMC) we are conducting a wide variety of research to optimize and enhance Warfighter behavioral health, psychological resilience and diagnosis/treatment for blast-induced brain injury. Basic research is conducted to provide fundamental knowledge for biomedical solutions that protect Soldiers and enhance their performance in operational and training environments that include multiple internal and external stressors. Other fundamental research is conducted to understand the basic mechanisms of severe trauma in order to advance treatment and surgical procedures, and to develop experimental models to support in-depth trauma studies. MRMC is developing mechanisms for detection of physiological and psychological health problems, enhanced screening, diagnosis and treatment for mild TBI, PTSD, suicidal behavior and other psychological conditions. Efforts in FY12 will also mature and demonstrate a neuroprotective drug to treat TBI as well as a deployable diagnostic device to assess brain trauma in the field.

Ground

The Ground portfolio includes technologies for manned and unmanned ground platforms and mobility systems, ground-based sensors and weapons systems, active and passive protection systems and deployable small base protection.

We are very concerned about the serious injuries and loss of life inflicted on our Soldiers in all types of ground vehicles by Improvised Explosive Devices (IEDs). Recognizing this, for FY12 we have developed a concerted effort in Underbody Blast (UBB) Protection. We currently possess a limited capability to predict blast injury to vehicles and personnel with enough fidelity and robustness to improve existing and future blast protection technology. As a result, we are looking at the entire blast kill chain comprised of the energetic event, system response, occupant response and injury, and platform and component interaction to design solutions for this critical problem.

To this end, we are focusing on three areas of research: Modeling and Simulation (M&S) activities, physiological effects, and development of a representative test dummy. M&S activities take advantage of the wide range of expertise across the S&T enterprise. At NSRDEC we are increasing the fundamental understanding of blast effects on

humans and personal protective equipment, validating range of motion measurements with operationally-relevant assessment techniques for body armor, and analyzing data to optimize protection concepts and advance state-of-the-art design rules for individual armor. The Tank Automotive Research, Development and Engineering Center (TARDEC) is addressing model information gaps that include sensitivity of the elements of the blast kill chain, human effects and injury modeling, and blast injury mechanisms. TARDEC is also increasing fidelity in end-to-end M&S tools for occupant protection and vehicle underbody and Soldier blast protection. The Army Research Lab (ARL) is incorporating energy absorbing seats and local soil characteristics into models of full-scale blast events, and the Simulation and Training Technology Center (STTC) is quantifying models for deviations in vehicle structural materials.

MRMC is initiating physiological research to develop UBB human tolerance limits and injury prediction tools for blast injury prevention standards to use in survivability assessments and protection systems development as well as evaluating hazards to head, neck, spine, eyes, and ears, and the standards for rapid return-to-duty.

Finally, the Warrior Injury Assessment Manikin (WIAMAN) effort is creating a Warrior-representative test dummy and associated injury assessment tools for use in live-fire test and evaluation and vehicle development efforts.

Another key concern is preventing and defending from assaults on small bases, such as the attack near Wanat, Afghanistan in July 2008. In FY12, we are continuing to make key investments in Deployable Force Protection (DFP) to provide capabilities to deployed troops operating in smaller, expeditionary bases (less than 300 persons), particularly at outposts or those bases more integrated within local communities, but with a less overt security posture. Solutions drive toward resilient, low-logistics, lightweight, easily transportable, minimal manpower products that readily scale and integrate with other base defense systems. A key part of this effort is adaptive red teaming experiments. These are conducted to develop a more thorough understanding up-front and throughout the fielding process of the defeat mechanism for systems - what can be overcome or mitigated by engineering and what can be mitigated by tactics, techniques and procedures (TTP). Technologies include, but are not limited to, sensors, blast and ballistic materials, remotely operated and precision active protection systems, communications, denial and deception, and enablers to achieve situational awareness and understanding. This holistic approach to DFP allows us to leverage the expertise of a wide variety of our labs and centers, as well as S&T efforts throughout the Services and OSD.

These ongoing DFP efforts have already paid off. The Small-base Leader Entry Control Point (ECP) Guide was completed in August 2010 as a 90-day Quick Reaction Fund Initiative to provide a practical guide for planning, design, construction and operation of

entry control point locations at small bases. This tool provides guidance to the small-base leader to enable him in constructing and operating an ECP that will reduce casualties at these highly vulnerable locations. This product is top rated 4-stars by over 300 Army Training Network Users and has been described as a favored document for training by deploying units at the Center for Army Lessons Learned. Beyond our current successes in this area, we still have much more to do. Our program provides focus on making these contingency base camps not only safer but more effective and efficient in supporting our Soldiers' mission.

Air

The Air portfolio is focused on five broad areas of research: platform technology; operations and support; survivability; rotors and flight controls; and unmanned systems. Our vision for Army aviation S&T is to provide the best possible aviation technology enabled capabilities to deliver Soldiers, weapons, supplies and equipment where they are needed when they are needed.

In order to provide Soldier support over future Areas of Operation (AO) sixteen times larger than current AOs, the Army needs a faster, more efficient rotorcraft, with significantly improved survivability against current and future threats. Operating in conditions of 6000 feet and 95 degrees (high/hot), this aircraft will need to transport and supply troops while providing close air support and Intelligence, Surveillance and Reconnaissance capabilities. A major platform development effort currently underway within S&T is technology development for the Department of Defense's next potential clean sheet design rotorcraft, the Joint Multi-Role (JMR) aircraft. S&T will lead the way in the development of innovative vertical lift technologies that provide significant improvements in speed, range, survivability, and operational costs. The JMR program goal is to develop and integrate these technologies into two technology flight demonstrators, or X-planes, that provide transformational operational capabilities, while also improving operating efficiencies, and platform survivability.

Reduced cost of ownership is a critical aspect of any new weapon system, and this is particularly true for aviation systems. While helicopter operations have been uniformly praised by combatant commanders in Afghanistan and Iraq as one of the critical nodes of successful counterinsurgency operations, their high availability rates under the stressing optempo of the last several years has come at a cost. Significant maintenance augmentation by contractor teams has been the key to maintaining flight readiness rates. The good news is that data from these deployed units is being used today to better understand wear and failure mechanisms in our complex aircraft systems, operating in stressing environments. We have made great strides in mechanical sensing, diagnostics, and prognostics to enable reduced unnecessary maintenance actions and improved anticipation of imminent part failure before accidents

occur. We also have investigated innovative composite materials and fabrication techniques that optimize load distribution and stress alleviation. All of these technologies will be incorporated into the JMR program to demonstrate transformational performance at an affordable cost of ownership.

C3

The key to successful operations in an increasingly complex battle space is the capability for seamless and timely communications across all echelons of the system, from headquarters to the Soldier on the ground and in vehicles. Within the C3 portfolio we are working to define and develop the next generation communication and networking capabilities.

One current effort in the C3 portfolio is the Multi-Access Cellular Extension (MACE), a program that inserts commercial-off-the-shelf smartphone technologies from multiple vendors into the tactical environment, applies appropriate security measures, and integrates them into military network operations management capabilities. This will allow Soldiers to take advantage of the flexibility and ease-of-use of these devices, operating seamlessly in a mixed WiFi/cellular environment. One benefit of smartphone technology is bundling functionalities, such as voice, data, military-purposed smartphone applications, and position/location information into a single device to save weight, space, and power. Another benefit of this approach is to unburden Soldiers and simplify their training by providing them with tools and interfaces that many of them are already familiar with. MACE also seeks to improve Soldier position/location understanding by augmenting the GPS in smartphones with radio frequency ranging to better adapt to GPS-challenged urban environments and complex terrain.

The MACE program explores smartphones operating through a cellular base station that is connected to a military network such as the Warfighter Information Network – Tactical (WIN-T. This allows Soldiers to take full advantage of the mixed WiFi/cellular capabilities of the smartphone while maintaining interoperability with the military network. The WiFi mesh networking application will allow groups of Soldiers with smartphones to automatically form into a local network when they are not able to connect to a cellular base station or WiFi hot spot on the military network, and then reconnect to the larger network when they come back within range. This will allow dismounted Soldiers to remain connected with each other when they lose connectivity with the tactical networks.

The C3 portfolio also looks to fully leverage multifunction assets that are networked, and can be programmed/tasked to support whatever pillar of Electronic Warfare (EW) that needs additional assistance; Detection, Identification, Threat Mapping, Electronic Jamming, etc. This networking capability will be based on an integrated and distributed

EW framework and should lead to the effective management and coordination of friendly Electromagnetic dependent systems while countering & exploiting adversary systems. These efforts provide direct support to the Soldier, Air and Ground portfolios, and will provide an unprecedented capability to shape the electromagnetic battle space in our favor.

Underpinning all of our efforts is a strong basic research program, which is essential to realizing superior technology enabled capabilities. The search for new fundamental knowledge through high-risk/high-payoff basic research is very important to me and to our highly skilled scientific workforce. My goal in this area is to ensure that the Army Basic Research program is of extremely high quality and is focused in areas that provide the foundation for a broad range of potential applications or technology enabled capabilities, with a specific eye on relevance to the Soldier and to the Army mission. To accomplish these goals the Army maintains a robust basic research effort that extends across a variety of disciplines, leveraging some of the best minds in the country.

For FY12, we will continue to enhance our investments in robust research in materials modeling efforts across scales – from the molecular/atomistic to the material system level – to create materials with new or enhanced structural, electronic, chemical, biochemical, or energetic properties. This effort will be conducted both in-house and with our extramural partners in academia and industry and will lead to new methods and materials for a broad range of potential applications across the Army including lightening our Soldiers load and providing new capabilities for force protection for Soldiers, platforms and facilities.

President Obama has continued to put forth the need for increased national attention to building our capabilities in the fundamental sciences to ensure our nation remains a global leader in technology. The Army as well continues strong support for university research and research education of students through its competitive single investigator program. Single investigator investments will lead to fundamental discoveries in areas such as electronics, quantum imaging, mechanical chemistry, brain-electronics interfaces, bio-forensics, and harnessing bacteria for micro-scale manipulation of materials, while educating the next generation of scientists, engineers and mathematicians and familiarizing them with the Army's research community.

I also believe in the importance of engaging with smaller companies doing innovative research outside of the realm of the traditional defense industry. The Army Small Business Innovation Research (SBIR) program is designed to provide small, high-tech businesses the opportunity to propose innovative research and development solutions in response to critical Army needs. We work hard to ensure that these efforts complement our programs and provide direct value to our Soldiers. Each year, the Army SBIR office allocates over 200 topics to the laboratories, TRADOC and the

program executive offices that are based on Army requirements. In response to these topics, small businesses submit over 3000 proposals each year, which are evaluated by the Army SBIR office and which result in more than 600 Phase I and Phase II awards to the small businesses valued at approximately $250M.

Many of these Phase II SBIR projects move up to Phase III SBIR, Phase II enhancements, or the Commercialization Pilot Program (CPP) on their way to becoming a part of an Army program of record. A recent example of one such program is a small electronic device that increases the flow of blood to the brain and heart to treat traumatic brain injury. It received CPP money and has begun field integration. Another SBIR company has developed a way to attach biocides to textiles and equipment surfaces to make self-decontaminating uniforms as well as coatings for vehicles and equipment for use against biological agents. This has also moved to Phase III SBIR and has received $3.4M from several DoD programs. A third Army SBIR company developed a new, durable, ceramic composite tile for Soldier body armor that is low cost, low weight, and high performance. To date, over 250,000 tiles have been sold for use by Soldiers and Marines. Army SBIR is a dynamic and active program that is promoting the power of small business to meet Army needs

Of course, none of our efforts would be possible without a solid infrastructure and workforce. To maintain technological superiority now and in the future, the Army must continue to hire top quality scientists and engineers into the Army Laboratories and Centers. We continue to work to attract and retain the best science and engineering talent. Our laboratory personnel demonstrations give us the flexibility to enhance recruiting and afford the opportunity to reshape our workforce, and I appreciate Congress' continued support for these authorities. These initiatives are unique to each laboratory, allowing the maximum management flexibility for the laboratory directors to shape their workforce and remain competitive with the private sector.

I am greatly concerned with the health and long-term viability of our labs. We have long worked to make improvements at the margins, and where possible we have used the Defense Base Closure and Realignment (BRAC) Commission process to modernize facilities and infrastructure. This is not a long-term solution, and I intend to take an in-depth look and assess what needs to be done to truly maintain world-class facilities. With the support of the Committee, our labs and centers are now able to spend a portion of their funding on minor military construction projects. While this authority has been helpful, this will continue to be one of our major challenges in the years to come.

As I mentioned earlier, for FY12 the High Performance Computing Modernization Program (HPCMP) and office will transition from the Office of the Secretary of Defense (OSD) to my office for management and funding. The U.S. Army Corps of Engineers currently manages a large portion of the program, so it makes sense for them to

manage the entire portfolio. HPCMP is and will remain a tri-service and agency program managed by the Army. Plans and discussions are underway between OSD and the Army in order to ensure a smooth transition. The HPCMP supports a network of supercomputing centers that provide high performance computers, scientific and engineering software, and expertise to DOD scientists and engineers, and has three main components: Operating six DOD Shared Resource Centers, operating and maintaining the Defense Research and Engineering Network, and Software Application Development. DOD scientists and engineers use HPCMP resources in support of many disciplines, including physics, chemistry, materials, acoustics, and aerodynamics. The Army, with the Services and OSD, is fully committed to managing and executing this effort.

First and foremost, I am a teacher by training. I strongly believe we have an obligation to educate our young people in all disciplines to ensure their future success, and the success of our country. In particular, I believe that strong science, engineering and mathematics education at all grade levels and from a diverse population is critical to both the ongoing success of the Army S&T enterprise and the nation as a whole. In FY12, the Army has been assigned the responsibility to execute the DOD program to manage and increase the research capacity of Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) and the training of minority students in Science, Technology, Engineering, and Mathematics (STEM) disciplines. In order to ensure the continued success of DOD's HBCU/MI program, the Army is and will be an active member in the DOD HBCU/MI Program Advisory Group, providing guidance and promoting opportunities for these valuable students to excel. Additionally, Army S&T contributes to the future success in STEM through the Army Educational Outreach Program (AEOP) which comprises 17 outreach efforts, either through direct oversight or through active participation. In the 2009-2010 academic year AEOP received over 12,797 student online applications, engaged nearly 85,000 students as well as 198 teachers, involved 199 universities and utilized the experience and personal commitment many of our Army scientists and engineers. An instrumental initiative that is expected to have the single biggest impact on how the programs run is the Army's Education Cooperative Outreach Agreement (COA) which was awarded in FY11. The Educational COA will bring together government and a consortium of organizations working collaboratively to further STEM education and outreach efforts nationwide. An additional thrust is the enhancement of the online, comprehensive application tool located on the AEOP website. The application tool will provide important data that assess attitudes, motivation, qualifications, and experiences that gauge program effectiveness. The website and the online application tool as well as the COA will work together to provide a coherent and coordinated approach to address the STEM workforce shortfall throughout the Army. For FY12, we are concentrating on ways to

expand the reach and influence of successful existing programs by leveraging partnerships and resources with other services, agencies, industry and academia.

These are exciting and challenging times for the Army's S&T program. We need to continue the support we've provided to the current and future force, while adapting our culture to become better focused, more accountable, and more transparent. We need to do all this in a time of budget constraint. I am confident that our programs and most importantly our people can rise to the challenge and ensure that the Soldier is the Decisive Weapon. I would like to thank the members of the Committee again for all you do for our Soldiers, and would be happy to take any questions you have.