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STATEMENT TESTIMONY OF

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Introduction

Mr. Chairman, distinguished members of the Subcommittee, thank you for this opportunity to appear before you to discuss the Department's FY 2008 science and technology (S&T) program.[1] This is the second year I have had the opportunity to appear before Congress as the Director of Defense Research and Engineering (DDR&E), and I am excited by the direction and focus of the Department's S&T program. I will use the opportunity of this hearing to describe the overall Department of Defense (DoD) S&T program, while also touching on the oversight of the Department's research efforts in counter proliferation and counterterrorism technologies. I am also pleased to have the chance to highlight in this hearing some of the new and expanded initiatives we have undertaken across the Department and within the Office of the Secretary of Defense (OSD) to address desired capabilities described in the 2006 Quadrennial Defense Review (QDR).

Last year, I told you about the vision put in place for the DoD's Research and Engineering (R&E) program: "Develop Technology to Defeat Any Adversary on Any Battlefield." This vision encompasses both state and non-state actors, as well as all potential fields of conflict, from the physical battlefield to cyber space and other nontraditional battlefields. In addition, this vision is consistent with the challenges outlined in the Quadrennial Defense Review and the FY 2008 Defense S&T program submitted by the President, a vision supported by the individual S&T programs of the Services, Agencies, and the Office of the Secretary of Defense.[2] To realize this vision requires:

- *An S&T program that is balanced to address near, mid, and far term needs of the Defense Department*. We will describe an S&T program that seeks to balance investment that addresses the known capability needs and threats of today with the potential capabilities needs and threats of tomorrow. In the short-term, the S&T program should emphasize support to the combatant commander through rapid prototyping, demonstrations, and fielding. In the mid-term, the S&T program should show increased emphasis on the needs of tomorrow's forces and broad based support of DoD acquisition programs. Finally, in the far-term, the DoD S&T program should still deliver both

[1] The formal responsibilities of the DDR&E, as Chief Technology Officer of the DoD, incorporates S&T and Advanced Component Development and Prototyping; the combination of these two makes the research and engineering (R&E) program. There will be segments of this testimony that moves into R&E.
[2] The DoD S&T submission is comprised of the Service (Army, Navy, Air Force, and Marine) programs; Agency programs (DARPA, DTRA, DLA, and SOCCOM), and the Office of the Secretary of Defense (DDR&E and Chemical Biological Defense Program) programs.

technology and intellectual talent that ensures the U.S. military can retain superiority for future generations.

- *An integrated R&E program, with contributions from the Services and Agencies*. We will describe the process called "Reliance 21", which provides a renewed emphasis on integrating and coordinating the S&T investment across all DoD components with a focus on the warfighter. The integrated contributions of the Services and Agencies are critical to optimize the DoD S&T product.

- *New and revised processes to increase the efficiency and affordability leading to fielding enhanced DoD capabilities.* We will describe existing and new processes to integrate S&T more completely into DoD acquisition and sustainment programs for the express purpose of decreasing development time for acquisition programs and reducing the cost of existing and emerging weapons systems.

- *A program that addresses the future science and engineering (S&E) workforce.* We will describe the DoD response to a number of blue-ribbon panels that highlight the need for scientists and engineers capable of executing national security programs for the United States.

- *New areas of emphasis within the S&T portfolio.* We will describe new initiatives within the DoD S&T program focused on "non-traditional" DoD capabilities. In its simplest form, the DoD S&T program is being reshaped to increase "non-kinetic" capabilities while decreasing relative emphasis on conventional platforms and weapons (kinetic systems). Non-kinetic capabilities include information technologies, sensors, persistent surveillance, decision making and cognition, and so forth. Interestingly, these non-kinetic technology areas are consistent with many of those required to improve both counter proliferation and counterterrorism capabilities of the DoD.

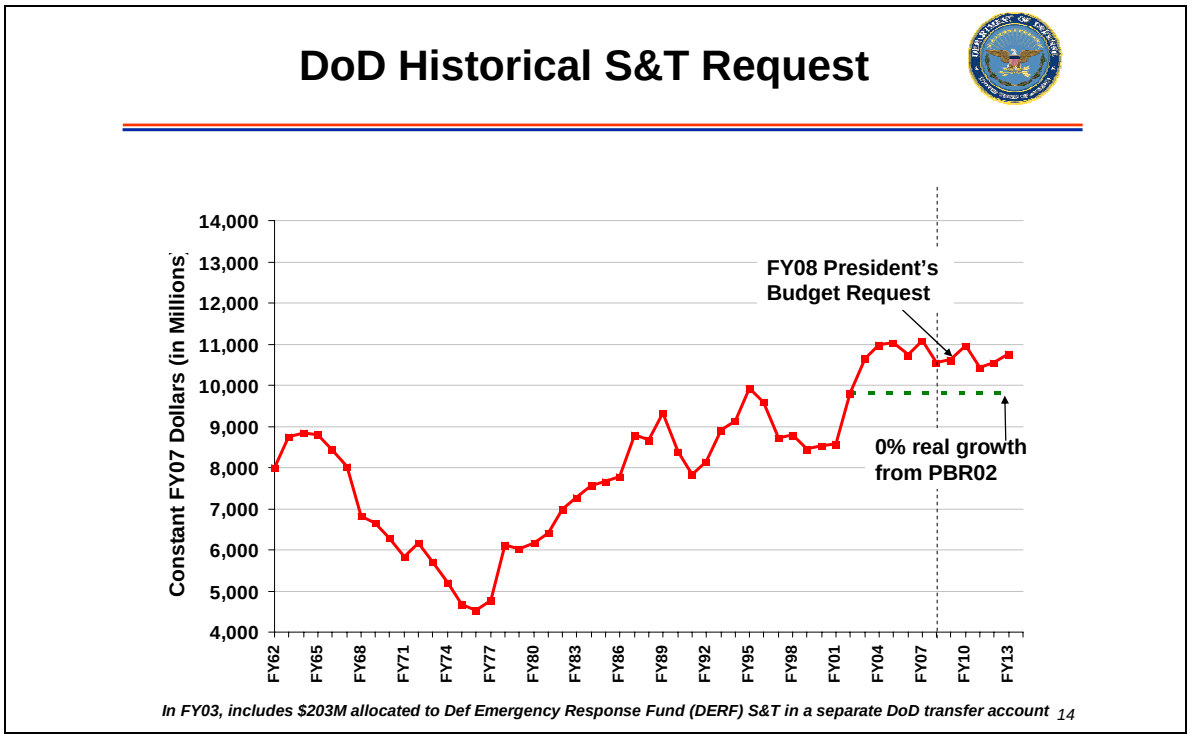
The R&E program we have submitted addresses the "Any Adversary, Any Battlefield" vision while simultaneously maintaining flexibility to address current issues. The body of this testimony addresses the overall DoD S&T program, key Service and Agency components of the program, and specific projects and initiatives in the FY 2008 budget request.

As a whole, the S&T program addresses the Defense Department's requirement to develop capability for today's force and maintain a technology edge across the broad spectrum of conventional military systems. The new initiatives are focused on increasing the U.S. capabilities for "the Long War", as

described in the 2006 QDR, fielding new technologies which enhance our warfighter's toolset, and reducing the cost and time requirements for fielding new weapon systems.

FY 2008 Science and Technology Budget Request

The FY 2008 President's Budget Request of $10.77 billion represents a continued corporate commitment to maintain strong S&T funding during a year with difficult budgetary demands from the on-going war on terror. Although in real terms this request is lower than the FY 2007 request of $11.08 billion, this year's request still represents a strong investment that demonstrates continuing commitment to S&T. Figure 1 displays the long-term trend of the DoD budget request for S&T. From FY 2002 to 2008 the S&T budget has grown 8% (in real terms) and these years are the seven highest DoD requests for S&T since the current budget process started in 1962.



There is one additional factor that is important when comparing the FY 2007 and FY 2008 President's Budget Submission. Between FY 2007 and FY 2008 the Air Force appropriately migrated over $300M from special program S&T accounts to more mature research and development accounts. Consequently, the true change in S&T work from FY 2007 to FY 2008 is less than is shown by the raw numbers. To accurately compare the FY 2007 and FY 2008 requests, we must

remove the special programs funding[3] from the FY 2007 budget; doing so results in the DoD's FY 2008 S&T request being slightly larger in FY 2008 than FY 2007 in then year dollars, and being only two percent lower than the FY 2007 request in constant year dollars (see Table below).

Comparison of DoD Research and Engineering Requests
(President's Budget – Total Obligation Authority)

Then Year Dollars (in millions)	FY 2007 Request	FY 2008 Request
Basic Research	1,422	1,428
Applied Research	4,478	4,357
Advanced Technology Development	5,183	4,987
Advanced Technology Development (Special Program Migration Adjusted)	4,867	4,987
Total DoD Science and Technology	**11,083**	**10,772**
Adjusted DoD Science and Technology	**10,767**	**10,772**
Advanced Component Development and Prototypes	15,387	15,662
Total DoD Research and Engineering	**26,470**	**26,434**

The FY 2008 request represents a year of transition. We continue to shift the S&T program to focus on transformational technologies, as evidenced in our new technology vectors. Similar to last year, over 40 percent of our investment is in three areas: information systems; sensors, electronics and electronic warfare; and basic research. This profile supports technologies needed to advance counter proliferation and counterterrorism capabilities. Furthermore, the FY 2008 request resulted in a Secretary of Defense-directed shift in S&T funds of over $300M in FY 2008, and a $1.6 billion shift (over the Future Years Defense Program (FYDP)) to develop new capabilities.

The overall DoD S&T program is comprised of contributions by the Services and Defense Agencies. Within the Services and Agencies, the FY 2008 budget is comparable to the FY 2007 budget, as shown in the following tables. It is important to recognize that the Services budget and manage the bulk of DoD S&T funds and thus have critical roles to play in the overall DoD S&T program. Consequently, before going through the DoD S&T program as an integrated whole it is important to highlight some important individual programs from each component.

[3] These funds were formally found in Program Element 0603801F

Army S&T Requests
(President's Budget – Total Obligation Authority)

Then Year Dollars (in millions)	FY 2007 Request	FY 2008 Request
Basic Research	312	306
Applied Research	685	686
Advanced Technology Development	722	736
Total Army Science and Technology	**1,719**	**1,728**

The Army's S&T program has to be as adaptable and responsive as our Soldiers in the field. The Army's S&T strategy is to pursue technologies that will enable the future force while simultaneously seizing opportunities to enhance the current force. Major elements of the Army's FY 2008 S&T budget includes:

- Force Protection technologies, the Army's single largest S&T investment area, which focuses on providing active/passive protection for rotorcraft survivability; active protection for countermeasures against kinetic and chemical energy threats, directed energy weapons; and passive protection such as lightweight armor.
- C4ISR technologies to enable networked surveillance and knowledge systems for collaborative real time mission planning, on-the-move operations and to enable networked lethality. These technologies include secure, mobile, ad-hoc networks for sustained high tempo full spectrum operations; third generation infrared (IR) technologies for extended range threat detection and identification; and a suite of sense-through-the-wall systems.
- Lethality technologies including the 120 mm Line of Sight/Beyond Line of Sight ammunition suite to enhance precision and provide multi-function munitions for the M1A2 Abrams and Future Combat Systems; and the next generation of Non Line of Sight – Launch System.
- Other significant Army S&T investments are found in soldier system technologies, logistics technologies, unmanned systems, advanced simulation, and basic research.

Navy (DoN) S&T Requests
(President's Budget – Total Obligation Authority)

Then Year Dollars (in millions)	FY 2007 Request	FY 2008 Request
Basic Research	456	467
Applied Research	639	678
Advanced Technology Development	505	522
Total DoN Science and Technology	**1,599**	**1,667**

The Navy continues to refine and align their program to meet Department of the Navy needs, and has defined 13 Naval S&T focus areas. Within these areas are the traditional fleet technologies, but the Navy has also established focus areas in power and energy, maritime domain awareness (surveillance coupled with information processing), and assured access to hold an adversary at risk. Among the technologies being pursued in maritime domain awareness are networked sensors across the air and sea environment with a goal to locate, tag, and track any target of interest on, under, or above the water. Within assured access, the Navy is attempting to integrate unmanned vehicles, information from space, communications and weapons (including non-lethal weapons) to allow effect littoral and riverine operations. Throughout the Navy S&T program, a consistent theme emerges. The Navy is aggressively integrating sensors, information processing and communication to provide dominant situation awareness.

Air Force S&T Requests

(President's Budget – Total Obligation Authority)

Then Year Dollars (in millions)	FY 2007 Request	FY 2008 Request
Basic Research	370	375
Applied Research	973	1,011
Advanced Technology Development	805	577
Total Air Force Science and Technology	**2,148**	**1,964**

The Air Force has shown tremendous foresight in adopting its "Anticipate, Find, Fix, Track, Target, Engage, and Assess – Anything, Anywhere, Anytime" technical vision that focuses the Air Force S&T program on fighting the global war on terror and countering the proliferation of weapons of mass destruction. An example of the Air Force's contribution to the ongoing war on terror is an electro-optical staring array called Angel Fire. Angel Fire distributes real-time imagery straight to the warfighter, providing the ability to zoom in and observe an area more closely. Angel Fire also allows for playback of significant events with a "TIVO-like" capability to monitor areas of interest, highlighting Air Force expertise in sensors technology. The Department looks to the Air Force to bring their core competencies to bear on these threats now and in the future, and to continue to provide our warfighters with the best capabilities to defeat the enemy in this new era of irregular warfare.

DARPA S&T Requests
(President's Budget – Total Obligation Authority)

Then Year Dollars (in millions)	FY 2007 Request	FY 2008 Request
Basic Research	151	153
Applied Research	1,503	1,403
Advanced Technology Development	1,590	1,477
Total DARPA Science and Technology	**3,243**	**3,033**

The Defense Advanced Research Projects (DARPA) continues its historical role as the engine for radical innovation in the DoD in FY 2008. This February, DARPA delivered its updated Strategic Plan to Congress, laying out in broad terms its strategic thrusts. This document provides a good sense of DARPA's plans and ambitions. In the area of counter proliferation, DARPA's strategic thrusts in the "Detection, Characterization and Assessment of Underground Structures" and the "Detection, Precision ID, Tracking and Destruction of Elusive Targets" are particularly relevant. In the area of counterterrorism, DARPA's strategic thrust in "Urban Area Operations" and its work in machine translation and biological warfare defense promise to make important contributions to defeating terrorists.

DTRA S&T Requests
(President's Budget – Total Obligation Authority)

Then Year Dollars (in millions)	FY 2007 Request	FY 2008 Request
Basic Research	5	5
Applied Research	318	182
Advanced Technology Development	105	213
Total DTRA Science and Technology	**428**	**401**

The Defense Threat Reduction Agency (DTRA) continues to emphasize research that will enhance our counter proliferation capability and ability to counter weapons of mass destruction (WMD). These include technologies that improve our ability to assess vulnerability and enhance survival, such as DTRA's advanced modeling of weapons and munitions effects and the integration of our modeling tools into a WMD Toolset for broader applicability. We are also investing in means to deter threats and defeat potential threat sites through better target assessment and tailored ordnance, such as hard target penetrators and massive ordnance blast technologies. Heavy penetrator sled tests are being conducted to demonstrate the key technologies of penetrator materials, shapes, and controlled detonation devices. Technologies for improved radiation-hardened microelectronics and electromagnetic pulse assessments will reduce our

vulnerability, and new solid-state neutron detectors and particle counters will advance our ability to detect and categorize threat materials.

S&T for Today's Force

In this section, we will highlight S&T programs that generally deliver products or technology over the next three years, that is, the early years of the President's Future Years Defense Program (FYDP).

As the Global War on Terrorism (GWOT) continues, the combatant commanders need new capabilities to be rapidly transitioned from the S&T program to use in the field. Thus, we have seen a much greater need to develop and harvest technology as fast as possible. To address these requests, we sought and harvested technology over the past several years to deliver new tools and systems that address the critical military needs of our battlefront customers. We continue to expand our work on experimentation, demonstrations and prototypes to shorten development cycle time. The Department has been successful because of Congressional support of several rapid reaction programs allowing the DoD to quickly develop and deploy technology. The S&T efforts of the Rapid Reaction Technology Office (RRTO), the Quick Reaction Fund (QRF), and the Joint IED Defeat Office (JIEEDO) are essential to our warfighters who are engaged daily in the war on terrorism. These programs complement each other, which each focusing on a specific part of the challenge.

The Rapid Reaction Technology Office (RRTO) focuses primarily on technologies that can mature in 6-18 months to be used in the broader GWOT. The RRTO will also work on less mature technology for defeat of emergent and future improvised explosive device (IED) threats. The RRTO's initial objective was to focus DoD technologies on counterterrorism issues. This counterterrorism mission continues, but over time, the RRTO has focused on several key areas, including leveraging the DoD S&T base and those of other Federal Departments; stimulating interagency coordination; anticipating adversaries' exploitation of available commercial technologies; and accelerating fielding of new capabilities. While most aspects of RRTO programs are classified, previous areas of focus include test and fielding of capabilities for wide area surveillance and tracking; standoff detection of explosives; special communications capabilities; counter IED applications; and counter weapons of mass destruction capabilities. Generally, all of these technologies are directly consistent with the tools needed to address counter proliferation mission. Through the several years of its existence, the RRTO has had a number of successes, and a few examples are outlined in the following paragraphs.

The Joint Experimental Range Complex (JERC), Yuma Proving Grounds, is a 24/7 expansive test area with roadways, buildings and infrastructure representative of the Iraq operating area. The facility has become the "gold standard" for technology/hardware to be tested prior to deployment to Iraq or Afghanistan. The JERC facility offers a broad range of infrastructure for systems demonstration and testing prior to deployment. Representatives from each Service, numerous government labs and industry have tested at the JERC.

The Persistent Threat Detection System (PTDS), which is a persistent surveillance capability consisting of an aerostat with embedded camera, distributed cuing sensors and a control module. When an event of interest is detected, the camera, in an integrated suite, is slewed to the target and tracked until reaction forces arrive. Acoustic, IR and radar sensors cue an optical sensor aboard an aerostat. The camera can be automatically or manually slewed to the target while the control module communicates with reaction forces. The RRF developed the PTDS capability, then transitioned it to the JIEDDO for subsequent fielding. In this case, the Rapid Reaction Fund (RRF) developed the technology, and the JIEDDO rapidly matured it for fielding.

The Biometric Identification System for Access (BISA), which is a semi mobile biometrics enrollment station that collects fingerprints, iris scans and other biometric information on personnel seeking access to a controlled facility. BISA allows for rapid enrollment and queries of biometric data bases to screen personnel. The system fuses commercial-off-the-shelf biometric enrollment equipment into a module and packets the collected information in a format used to query national data bases. Since the first unit was operationally deployed, BISA has been responsible for detecting numerous persons of interest. Additional units are in procurement through the Army's biometrics task force.

The JSTARS Ground Motion Target Integrator (GMTI), which deployed a trained group of GMTI analysts to an operational theater to form a target fusion cell to support counter-insurgency operations within in area of interest. Although specific details can't be described here, a 90-day demonstration was successfully conducted. The results have led to the establishment of a permanent capability.

The Quick Reaction Fund (QRF) allows us to take a different approach, investing in capabilities that can be demonstrated within a 12 month window and working on new capabilities or technologies that can transition to acquisition programs or address a very short term need for GWOT. The QRF is a complementary program to rapidly develop and demonstrate technologies to support today's force. The QRF is differentiated from the RRF in that QRF has a shorter time horizon and focuses on technology beyond the more narrow scope of

GWOT. The Joint Staff validates the need for the QRF projects. A couple of recent examples will highlight this difference.

The M1A1 tanks had no infrared (IR) sights for the .50 caliber gun system. Using QRF, we designed, packaged, and tested an integrated IR sight for the tank. This was done in a matter of months, and led to the retrofit by U.S. Marine Corps Systems Command of nearly 500 M1A1's in the Marine Corps inventory--all within a year.

In another case, the QRF funded the development and packaging of a 24-hour battery to be used with the boomerang counterfire sensor. Boomerang will locate the source of a sniper based on sound. The limitation with the initial system is that batteries needed to be replaced many times a day, creating a logistics burden and potentially exposing the force during resupply. Using QRF, we developed a high-quality fuel cells power source that lasts over 400 hours--providing an enhanced force protection capability. The fuel cell has returned to the lab for ruggedization, but demonstrated the capability using QRF.

The JIEDDO uses mature S&T to engineer and develop capabilities to combat IEDs in a near term (3-9 month) window. In February, 2007, the Director, Defense Research and Engineering and senior representatives from the DDR&E organization participated in a series of meetings with senior representatives of the JIEDDO to address current counter IED capabilities and JIEDDO's strategic S&T plan to counter the IED threat. These meetings built on an existing interaction where the DDR&E representatives participate in the resourcing, evaluation and approval process for new counter IED related capabilities. This close interaction has resulted in JIEDDO plans to allocate funds for 19 counter IED projects to be launched with coordinating oversight of DDR&E representatives.

In the Global War on Terrorism, our adversaries are learning and adapting quickly as this Nation employs our best technology, weapon system tools and tactics. The GWOT adversary adapts with great speed to each step we take. Authorization and appropriation of these quick response funds have allowed the Defense Department's research and engineering leaders to work with industry and universities to address urgent, emerging warfighting needs. Today's GWOT timelines are often much faster than our Nation's budget process and procedures. The Congress' support for these flexible high value programs has been extremely helpful in keeping pace with our adversaries and providing the best available tools to the men and women who are performing GWOT missions.

The Congress has also provided great support for a number of programs which use more traditional budget and program processes while still seeking to get available technology and products quickly into the warfighters toolbox and

existing or new weapon systems. Each of these programs takes a different approach to the same fundamental goal -- capability for U.S. military forces.

The Defense Acquisition Challenge (DAC) program process allows anyone to demonstrate a product or concept which can enhance a current warfighting tool or deliver a new capability. The DAC differs from the RRTO and QRF programs in that DAC funds test and evaluation of late stage technologies and commercial products for insertion into current acquisition programs or fielded systems. By seeking and testing non-developmental items with Technology Readiness Levels of 7 or higher, the DAC program minimizes or precludes R&D costs and time investments. It may be useful to briefly describe a couple successful DAC effort to illustrate the important benefits of this program.

The Army improved combat medical readiness through the Mini-Combat Trauma Patient Simulator (Mini-CTPS). Combat operations require considerable trauma-and-stabilization-skills autonomy due to long evacuation legs, as well as a minimal footprint in the field. The Mini-CTPS system answered this need by providing a patient simulator with extremely realistic physiological models specially tailored for emergency medicine. Since testing successfully under the DAC program, the Mini-CTPS system has been used to train over 3,500 U.S. Corpsmen and Medics in mass casualty and triage, meeting the immediate combat-training need. The Army procured four systems with over 400 mannequins, reducing the attrition rate in corpsman training from an average of 23% to just 6% through the use of Mini-CTPS.

Through the DAC Program, and in collaboration with the Air Force, Angel Fire will provide “Google Earth”-like persistent tactical situation awareness in high resolution (.5m), zoomable, city-sized images of infrastructure, tracking vehicles and people in real-time to hundreds of users simultaneously. This expansive and persistent coverage over a selected area will enhance counter proliferation and counterterrorism capabilities, forensic analysis, and predictive analysis. Angel Fire was successfully demonstrated at the Marine Corps Air/Ground Combat Center in summer 2006. By request of and through the support of the Marine Corps, along with deployment funding support from JIEDDO, Angel Fire is currently enroute to the theater and will be providing real-time, high-resolution, city-sized, zoomable images by April 2007. The DAC program accelerated transition and deployment of Angel Fire by six months to a year and saved over $10M in research and development.

The Foreign Comparative Test (FCT) program provides a mechanism exclusively dedicated to identifying and testing existing foreign military components and systems for potential use with today’s warfighters. It is very similar to DAC, except FCT works with allied and coalition nations. FCT also

integrates mature technology. For example, Special Operations Forces required a highly reliable and modular combat rifle to replace the aging, 1960's-technology, M4A1 carbine. Under the Foreign Comparative Testing Program, U.S. Special Operations Command competitively evaluated the Special Forces Combat Assault Rifle (SCAR) Light (5.56mm) and SCAR Heavy (7.62mm), both with the 40mm Enhanced Grenade Launcher. SOCOM selected the model made by FN Herstal of Belgium in their Columbia, SC, plant. The SCAR triples the service-life, barrel-life and mean-time-between-failures when compared to any of the six aging weapons it replaces, including the current M4A1 carbine. All SCAR versions cost less than existing weapons it replaces in the inventory. The initial contract resulted in an production of over 1,000 rifles, with follow-on production for 14,889 rifles, at a total procurement value of $28 million. FCT accelerated the SCAR deployment by at least three years, while avoiding $2.2M in R&D and $6M in procurement costs through competition and innovation.

Filling an urgent need for more reliable machine guns that performs even under extreme environments—including when wet or full of sand or mud—the lightweight MK-46 5.56mm and standard MK-48 7.62mm machine guns were evaluated by the U.S. Special Operations Command on an accelerated schedule. SOCOM tested the weapons in just seven months, initially fielding them to Navy SEAL teams in combat in less than 12 months from starting the Foreign Comparative Testing project, saving over $9M in R&D. The DoD has procured and deployed over 1,700 of these machine guns, made by FN Herstal of Belgium.

In addition to capability and performance, evaluation of FCT candidate projects includes maintenance, sustainment, and procurement cost avoidance. Procurement cost avoidance often results from the competitive aspect of the program. For example, the Buffalo mine protected clearance vehicle now in use in Iraq and Afghanistan avoided over $35M in R&D alone, while delivering life-saving capability to the warfighter in just two years.

Another program that has the capability to support today's force is the Technology Transition Initiative (TTI). The TTI differs from other programs for today's force in that it specifically identifies technologies for insertion into formal acquisition programs, and address technology insert in a 2-3 year window. The approach is to work with the acquisition executives to identify and move developmental technology to a formal acquisition program for fielding.

For example, TTI accelerated the transition of the Digital Planning Tools for Joint Ground Warfare for the Army and Marine Corps by approximately two years. TTI funding was used create an asymmetrical warfare planning capability for Joint Forces. The capability will transition from the Agile Commander Advanced Technology Demonstration and the Combined Arms Planning and

Execution System (CAPES) to provide a Stability and Support Operations (SASO) and Military Operations on Urbanized Terrain (MOUT) asymmetrical warfare planning capability for Joint Forces. The First Marine Expeditionary Force and the 101st Air Assault Division used early versions of this capability during their Operation Iraqi Freedom rotations in FY 2006. Full capability will transition to these programs with the first software release in FY 2007.

New Initiatives to Support Today's Force

In the FY 2008 budget request, the DDR&E initiated several new initiatives support today's force.

Synthetic Aperture Radar Coherent Change Detection (SAR CCD) enables tactical users to detect minute changes in terrain due to human activity or develop a persistent picture of activities within an area of interest. Currently, SAR CCD requires post mission processing and extensive human analysis to develop a product that is time late and not easily accessible by tactical decision makers. The objective of the SAR CCD project is to engineer a real time CCD capability aboard an existing tactical UAV equipped with mini-SAR equipment. The goal is to reduce the cost of the real time SAR CCD system by a factor of 50% compared to current SAR CCD assets.

Currently, there is a need for a low cost communications relay capability to support convoy movements within the Iraqi theater; in some cases, aircraft which can perform other surveillance missions are being pressed into service for communications relay missions. It may be possible to expand the communicating relay capability into an airborne network gateway that will integrate different networks (such as EPLRS and SINCGARS) currently found in an area of operations. The "network gateway" can be thought of as a hub for the various networks to come together with information which is then relayed through the other networks in the area. Building on supportive prior investments by DARPA and the Services, the DDR&E program will focus on urgent delivery of a communications relay or airborne gateway solution to meet the needs of current operations.

S&T for Tomorrow's Force

The S&T team is also focused on the challenges of delivering technology and products to the Nation's military force of tomorrow. For this discussion, we will review programs and initiatives which deliver results in the next 3-6 years – basically the mid-to-later portion of the President's FYDP.

In 1995, the Department of Defense initiated the Advanced Concept Technology Demonstration (ACTD) to get new technologies and innovative concepts into the hands of the warfighter as quickly as possible. After ten successful years of ACTDs and recent rapid capability application to the joint warfighter in the new era of the Global War on Terrorism, we initiated the Joint Capability Technology Demonstration (JCTD) Program to further refine the process of rapidly bringing emerging technologies to the joint warfighter. This rapid capability application approach is tied directly to the Combatant Commander's most critical needs, and is meant to provide a faster, more integrated joint and coalition response to meet the emerging asymmetrical threats facing our nation.

The JCTD program supports tomorrow's forces and often delivers early products to today's forces. JCTD projects develop and demonstrate capabilities on a 2-4 year or shorter timeline, giving the Defense Department a process which is more agile than formal acquisition programs. Over 60 ACTDs deployed capability and products in support Operations ALLIED FORCE, NOBLE EAGLE, ENDURING and IRAQI FREEDOM. Some illustrative recent projects that have spun capability out to the warfighter are Coalition Combat Identification (CCID) and Joint Precision Airdrop System (JPADS) ACTDs.

The nine-nation Coalition Combat Identification (CCID) ACTD was initiated in 2001; however, this year, it was extended to focus on improving coalition combat identification interoperability and exchange from an intelligence, surveillance, reconnaissance airborne platforms. The major component of CCID is the Battlefield Target Identification (BTID) system. BTID enhances coalition task force combat effectiveness, reduces fratricide, and improves situational awareness and interoperability in coordination with Blue Force Tracking command and control battle command systems. The Army and Marine Corps have budgeted $695M in the FY 2008-2013 program to transition CCID components. These technologies will be assessed and demonstrated in Joint Forces Command's Exercise Bold Quest this September.

Another successful JCTD is the Joint Precision Airdrop System (JPADS) ACTD. JPADS was initiated in 2004 to address the Joint Warfighter requirement to sustain forward deployed combat power using high altitude, precision airdrop into a dispersed and unsecured battle space. The JPADS ACTD has demonstrated airdrops from 25,000 feet of sequential 10,000 pound precision airdrop systems fully integrated with the JPADS mission planner from both C-17 and C-130 aircraft with in-flight wireless updates sent to each system to multiple targets within 250 meter accuracy. This was most recently demonstrated during the second of three planned joint military utility assessments last month. JPADS will be transitioned to Army and Air Force programs. During the development

process, the program manager identified a lightweight system that is being bought off-the-shelf to meet immediate needs of the combatant commanders.

The Weapons Data Link Network (WDLN) ACTD was initiated in 2005 and successfully demonstrated interface standards and datalink message sets for future weapon data links to enable a fully-integrated, joint weapons grid to collaboratively address the find, fix, track, target, engage, and assess "kill chain" requirements. WDLN prototyped the hardware and software datalink solution set and standards for five major weapons programs like Small Diameter Bomb Phase II, Joint Standoff Weapon (JSOW), and Joint Air-to-Surface Standoff Missile. WDLN is providing the ability to fully exploit weapons delivery platform capabilities, including in-flight dynamic re-tasking for improved time-sensitive targeting and is an example of rapid software prototyping and application.

Finally, our prototyping efforts are addressing a rapid application solution for an urgent operational need to negate unintended collateral damage while destroying the intended target. The Focused Lethality Munition (FLM) JCTD**,** initiated in 2006, will rapidly develop and deploy a solution to this need. The existing Small Diameter Bomb I (SDB) airframe will marry two technologies resulting in a precision-guided weapon with sub-four meter accuracy that delivers a warhead with focused lethality. This solution will minimize potentially lethal fragments, which may cause unintended damage to persons or structures. Under the JCTD model, FLM will deliver capability to the warfighter in 22 months and, if successfully demonstrated, will transition into the formal acquisition process at Milestone C for Low Rate Initial Production. The targeted Program of Record is the Small Diameter Bomb Program. This vital capability will greatly improve the combatant commander's decision-making process, enabling the prosecution of targets located near potentially high collateral damage areas like urban targets.

New Initiatives to Support Tomorrow's Force

Working toward delivery of products in the later half of the President's FYDP, the Department has a number of new initiatives driven by the priorities of QDR, GWOT and the pressing military issues identified by the Joint Staff. Because of the QDR emphasis on counterterrorism (CT) and counter proliferation (CP), these new initiatives are important tools for delivering capability for the CT and CP missions.

To date, military applications of biometrics exploitation to date have largely focused on the use of fingerprints to identify personnel for entry into controlled areas. During the past three years the military value of biometrics technology in counterterrorism, combating terrorism, and counter insurgency operations has been repeatedly demonstrated in forensics application in support of

irregular warfare operations and in the identity verification of foreign nationals working in support of U.S. Forces.

The DoD does not currently have a strategic, synchronized, integrated, and coordinated R&D approach to expand the forensic exploitation for the broad range of biometric markers to exploit all biometrics information available for identification of personnel. We are developing a comprehensive biometrics Science and Technology (S&T) program to address aspects of identity management ranging from information security to forensic analysis. This plan will also address all facets of intra-DoD and interagency coordination, including standards and development of common data bases to share biometric data across agencies at the federal, state and local levels. This follows an October 2006 designation, by the Deputy Secretary of Defense, of my office as Principal Staff Assistant (PSA) for biometrics. The scope of the PSA responsibilities is to fully address and exercise control over all facets of the Department's biometrics programs, initiatives, and technologies.

A second new initiative is Clandestine, Tagging, Tracking and Locating (CTTL). Over the past year, the DDR&E and component staffs have been working with U.S. Special Operations Command (USSOCOM) to advance the capability of our forces to clandestinely tag, track, and locate high value individuals in the Global War on Terrorism. We also know that this is an important effort from recent reviews by the Defense Science Board. The analyses concluded that serious gaps exist in current capabilities and that the S&T program needs to be enhanced and focused on clandestine measures to prosecute operations against high value individuals (targets). We have developed a roadmap that represents the Special Operations Forces' priorities and the S&T community's opportunities for making important advances. The 2006 QDR reconfirmed the importance of this area, and we have taken an action to increase investment for clandestine TTL across the Department. Our activities are coordinated with those of the Intelligence Community (IC) and will emphasize advanced nanotechnology, biology, and chemistry to give us a means to find, identify, and track individual human beings with minimal exposure of our forces and with an ability to project this capability into areas of limited access.

The third initiative is Human, Social, Culture and Behavior (HSCB) modeling. This new initiative springs from a lesson learned in the on-going GWOT. That lesson learned is that the DoD has capability gaps in software tools and decision aids that will allow U.S. commanders to better understand different cultures. The QDR highlighted these lessons in stating current and future military operations will require enhanced capability to understand social and cultural "terrains" as well as various dimensions of human behavior. The HSCB will develop the required scientific base and will field matured technologies that

support human terrain understanding and forecasting across a span of missions and geographic regions. The DDR&E staff worked with the components and IC in 2006 to identify capability needs in 75 areas; there were gaps in roughly 70 of these areas. The HSCB initiative will address these gaps and integrate complex human factors into the pre-planning, planning and execution cycle of military operations. HSCB modeling is focused on filling capability gaps within data collection/infrastructure and knowledge management, and then developing the models to forecast societal and cultural behaviors. Deliverables from this program will include software modules that are fully integrated into DoD command and control and other systems.

The DDR&E is also sponsoring an initiative to provide options for future precision geopositioning. The DoD is making an investment in FY 2007 to support an enabling technology development program exploiting the on-orbit capabilities of the existing Iridium constellation innovatively coupled with current GPS assets to accelerate, by up to 6 years, the availability of anti-jam and positioning, navigation and timing capabilities to the warfighter. iGPS offers the potential to provide anti-jam capability an order of magnitude greater than planned for GPS-III, location accuracies to decimeter levels, navigation signal coverage in urban environments, and bi-directional communications for Joint Blue Force Tracking/Situational Awareness. These iGPS capabilities are fully compatible with current and planned future GPS capabilities. Following successful demonstrations of capabilities in this enabling technology development program, in FY 2008 the Department will initiate funding for a technology concept demonstration effort that will provide rapid development and earlier operational implementation of iGPS capabilities in a theater sized area of operation employing existing high power space-to-ground antennas and a limited number of modified user equipment for field tests. It is anticipated that the post development efforts will transition to operations by users such as SOCOM.

The Secretary of Defense's Strategic Planning Guidance (SPG) tasked DDR&E to lead an effort to handle the sharing of track information between respective Service surveillance platforms. The Combatant Commander will have significantly greater capability and flexibility if we ensure that systems like AWACS, Patriot, Aegis and JLENS can share information and create a single integrated air picture. The Department is allocating necessary funding to developing the tools to integrate this information across the Service platforms and to testing of these capabilities in live, joint demonstration exercises. We have also initiated with the Air Force, a largely classified program to integrate hyperspectral technology with tactical UAV to provide greater in-theater discrimination of targets.

S&T Enablers for the Future Force

The true center of gravity of the S&T program appropriately continues to be developing and delivering advanced technology for the future force – providing tools for the men and women who will serve this Nation in the year's beyond the President's FYDP. We also have a key role in minimizing the threat from potential adversaries using technology to disrupt our military advantages. The Department's S&T program has a long history of developing critical capabilities that have forged our conventional military advantage—many of these capabilities did not emerge from short term needs or acquisition programs. For instance, the global positioning system emerged from basic research into precision timekeeping at the Navy Research Laboratory; night vision goggles emerged from early work in infrared detection at the Army's Night Vision Laboratory; and the internet came from work on the "arpanet" at DARPA. Similarly, technology work within the DoD is shaping the capabilities of tomorrow. These capabilities may be different than today's, but the goal remains the same -- retain U.S. military superiority.

The S&T tools in this area are the Department's vital basic and applied research (6.1 and 6.2) funding as well as the advanced technology development (6.3) funding budgeted within the Services and Defense Agency program elements. Using a variety of programs and processes, these efforts address a broad spectrum of needs from developing game changing new technology to lowering the cost of weapon systems to training a new generation of scientists and engineers. First, we will present just a few examples of emergent research areas that should improve ourcounter proliferation and counterterrorism capabilities.

The FY 2006 Strategic Planning Guidance asked us to work with the Defense Threat Reduction Agency to review and implement a plan to improve the capability to remotely detect fissile materials at standoff distance. My staff worked with DTRA and DARPA to identify possible solutions. The result is an increase in emphasis of applied research to address the problem by DTRA, because there is no immediate solution. DTRA is increasing their work in sold-state neutron detectors and novel scintillation detectors in the FY 2008 budget request. We will continue to monitor the progress in this area, and continue to seek new ideas through solicitations at places like DARPA.

Research in the DoD Chemical and Biological Defense Program has made important progress in both medical and physical protection. Advancements in the medical program include protection of two animal species against lethal Ebola virus infection using genetic strand material, protection of monkeys against multiple strains of Marburg virus using a single-dose vaccine, and development of the first drug to demonstrate 100 percent protection against the human smallpox

virus in primates. Gains in the physical program include demonstration of materials using self-detoxification for chemical agents, laboratory-scale systems to detect and discriminate among chemical agents one kilometer away, and a joint-service monitor to detect biological warfare agents in potable water. Integrated solutions from this program include chemical biological radiological nuclear unmanned ground reconnaissance and a system for contamination avoidance at seaports of debarkation.

The Army's Future Force Warrior not only demonstrates the Department's ability to develop and field new technologies but also highlights our success in migrating breakthroughs across Service boundaries. An initiative to develop and demonstrate revolutionary capabilities for soldier systems, Future Force Warrior is creating a lightweight individual combat system that includes weapon, head-to-toe individual protection, netted communications, power sources, and enhanced human performance. As a result of cross-Service information exchange, Army's Future Force Warrior will adopt an Air Force advancement that combines state-of-the-art hearing protection with an improved microphone. This will enable our troops to communicate clearly with one another through the overwhelming noise of close combat or aircraft operations, and will preserve their ability to communicate with their families when the mission is completed.

Military personnel must be able to operate safely in environments that may be dominated by laser energy, including high-energy laser weapons. The battlespace may be at the edge of space or deep in an urban alley. Air Force sponsored research has extended our understanding of interactions between lasers and tissue, thereby advancing health hazard assessment, development of battlefield triage and treatment for laser eye injuries, and specifications for laser eye protection. One key success is greatly improved and affordable laser eye protection—for aircrews and other warfighters—against a wider range of laser threats and compatible with combat-vision needs, life-support equipment, corrective-prescription requirements and color-discrimination demands.

Research investments in materials technologies are providing enhanced properties for ultimate performance and affordability through durability and greater damage tolerance. A product of DoD nanotechnology that incorporates hard ceramic nano-particles, such as tungsten carbide, titanium carbide, and zirconium oxide, in a strong but tough metal matrix is being tested as low friction, hard yet tough coating for gears and bearings. These materials have been transitioned to industry for demonstration testing on the lift-fan gears of the Joint Strike Fighter. Longer range basic and applied research in nano-materials promises to provide new non-linear optical polymers that can be used in optical limiting for laser-eye protection or optical switching, molecular sieves for highly

selective filtration, nano-textured surfaces that better capture light for photovoltaic cells, and additive nano-particles that increase the power of explosives.

In May 2006, DDR&E initiated a task force to define an investment roadmap to lower DoD energy requirements and to identify alternative energy sources in response to an SPG tasking from the Secretary of Defense. As a result of the Task Force, the FY 2008 defense budget increased funding for energy efficiency programs for weapons systems, tactical vehicles and in facilities and technologies to identify new, cost effective energy sources. We increased funding for the Highly Efficient Embedded Turbine Engine, the fuel efficiency element of the Versatile Affordable Advanced Turbine Engine program, enabling some technologies to be spiraled into programs earlier than planned. The small heavy-fueled engine quick demonstration will enable long duration UAVs and mobile ground power. We are also prototyping a carbon composite UAV that could fly for up to six days. We added funding to the Army's hybrid electric vehicle program to build a lightweight fuel efficient demonstrator, and successful technologies may be integrated into the Joint Light Tactical Vehicle. The Navy reinstated the legacy energy conservation program to continue to test and integrate fuel efficient technologies on ships.

Another important on-going energy effort is the Department's Energy and Power Initiative which is focused on providing both advanced technologies and technology options to warfighters and military systems. Energy storage capacity associated with lithium-ion batteries has been increased across a militarily significant range of operating temperatures and lithium-ion systems have been transitioned to the B-2. Capacitors are being made a viable energy storage medium, which permits serious consideration being given to electromagnetic armor and electromagnetic launch systems. We have now demonstrated the capacity to operate a 600 kilowatt fuel cell using Navy logistics fuel. The initiative also includes electronics technology associated with power conditioning and high-power semiconductors and diodes based on silicon-carbide for high temperature, high current applications. These technologies together are making more electric and more efficient ships, aircraft, and ground vehicles realistic alternatives for future procurement.

New Initiatives for the Future Force and Workforce

The DDR&E generated several new initiatives that should provide dividends to the future force. The Computational Research and Engineering Acquisition Tools and Networking Technology initiatives are a product of excellent collaboration between the Services and the DDR&E team. The Department's Manufacturing S&T initiative is largely a result of a Defense Science Board study recommendation and the need to take more than incremental

steps to reduce the cost of manufacturing defense systems. Finally, we have expanded current programs and initiated new efforts in training and attracting the Nation's next generation of scientists and engineers.

Computational Research and Engineering Acquisition Tools and Environments known as CREATE is a new project within the High Performance Computing Modernization program. CREATE develops and deploys computational engineering tools for acquisition programs to use supercomputers to design military aircraft, naval ships, and RF antennae for military platforms. Benefits derived from CREATE include reduced acquisition costs and schedule overruns, early integration of major vehicle subsytems, improved flexibility and agility. CREATE should enable rapid development or optimized designs with fewer flaws and better performance.

The second new initiative strives to improve and accelerate network capabilities. This initiative fills gaps in existing DoD S&T programs that were identified in 2006 by a multi-agency joint analysis team chartered by DDR&E. The planned S&T investments will concentrate on network interoperability and on improving network capacity in mobile, tactical settings. The thrust will analyze, model, and develop protocols and technologies to allow ad hoc communications between different groups while on the move and without benefit of a stationary transmission tower, as is commonly used for cellular telephone technology. This thrust will also develop options to improve the use of the available frequencies, known as spectrum management.

The Defense-wide ManTech S&T Program includes several pilot projects in its introduction phase. These projects aim to realize a large return on investment that will be shared by each of the Services: propulsion systems for air and surface vehicles; manufacturing and application of low-observable materials, system-on-chip initiative aimed at communications; and rapid prototype manufacturing for prosthetics--the latter effort being pursued in cooperation with the National Naval Medical Center at Bethesda and with Walter Reed Hospital.

The future force also includes the scientists and engineers who are vital to development and delivery of the military systems that will continue to ensure our Nation's security through technical superiority. The Department of Defense employs almost half of all Federal physical scientists and engineers (S&E). Our work requires highly educated, technically experienced, and security-cleared United States citizens. The DoD investment to recruit, educate, and train our future S&E should begin today, as our current "boomer" workforce is retiring. Over the next 10 years, the DoD laboratories expect to lose about 13,000 S&Es.

The available pool of qualified S&E's in critical areas of interest to DoD is declining. In the U.S., only 15% of undergraduates receive degrees in natural science or engineering as compared to South Korea (38%); France (47%); China (50%) and Singapore (67%). In 2005, there were more engineering students enrolled in Mexico than in the United States. At the same time, the total demand for scientists in the U.S. is projected to increase by 17 percent and 22 percent for engineers.

Under the National Defense Education Program, DDR&E sponsors four initiatives that encourage, stimulate, support, and educate the students that are vital to our future workforce.

- **Science, Mathematics, and Research for Transformation (SMART) Defense Scholarship Program** competitively awards scholarships and fellowships to clearable United States citizens in defense-critical S&E disciplines. Scholars are obligated to one year of DoD employment in return for each year of scholarship support received. Thirty SMART scholars received awards in FY 2005; 32 received awards in FY 2006. Ten graduates are already at work in DoD facilities. More interesting is the response in the FY 2007 for roughly 50 scholarships. In FY 2007, we received over 1,400 applications and almost a thousand complete applications have been submitted for this year's competition.

- **National Security Science and Engineering Faculty Fellows (NSSEFF)** creates a competitive award program for outstanding, clearable, university faculty scientists and engineers that is large enough to be attractive ($600K annually), and long enough (5 years) to produce quantifiable research results. We start the program with a modest $5.4M investment in FY 2008. Biased toward early-career faculty members, NSSEFF funds 50 top-flight university researchers over the FYDP, all working in fundamental DoD research areas.

- **Pre-Engineering Curricula Modules** are practical, middle and high school curriculum enhancements that tie physical science and mathematics concepts to real-world applications. This effort augments successful work that increases middle and high school students interest in science and engineering, points up the value of college preparatory high school courses, and results in more college-bound high school graduates prepared to do secondary work in science and engineering.

- **Investment in S&E enrichment programs** for pre-college students and teachers associated with the current Materials World Modules (MWM) program and the requested Pre-Engineering curricula module program. A

recent experiment evaluating the effects of the MWM program showed significant increase in science and engineering knowledge gained and very significant increase in science interest (over the control group).

Refine the Business Processes of the DoD S&T

The DSTAG serves as a strategic coordination board for the S&T program. The DSTAG is comprised of the S&T Executives representing the components having a large S&T program and includes a representative from the Joint Chiefs of Staff. This regular forum provides the primary means for coordination on the execution and planning of the Defense Department S&T program. In recognition of the need to focus on all aspects of S&T development, we have made the Chief Scientist of the JIEDDO a member of the Defense Science and Technology Advisory Group (DSTAG).

A vital element to technology development for the future force is a vibrant capacity to coordinate ideas. The past year has seen substantial advances in the process by which the Department ensures that its S&T enterprise is strategically well-focused, coordinated, and responsive to warfighting needs. The new Reliance 21 S&T management process, developed collaboratively by the DSTAG, emphasizes strategic alignment with the Department's highest priorities, and rapid budgeting for S&T efforts for underinvested needs. Reliance 21 is founded on the principle that transparency fosters higher quality research, greater efficiency, and improved effectiveness. Central to the goal of transparency is a comprehensive database of DoD S&T investments to enable DoD scientists, engineers, and executives to formulate and conduct well-coordinated research programs. For the first time, all the DoD S&T organizations prepare biennial S&T strategic plans that are informed by and harmonized with an overarching DoD S&T strategic plan prepared by DDR&E.

In addition, the DoD S&T leadership conducts an annual S&T Strategic Overview to share their investment plans, assess progress of high-priority thrusts, and identify gaps and overlaps. The most recent review held in February identified key research areas in large data set reduction, software producibility, and urban operations that are now being examined by multi-agency teams to develop S&T investment recommendations. Six additional multi-agency technology focus teams, on topics including directed energy, human systems, and combating weapons of mass destruction, have begun work to formulate S&T investment roadmaps that will inform future S&T budget development.

In addition, to identify opportunities for accelerated or more coordinated fielding of technologies, Reliance 21 employs joint analysis teams focused on key technologies, including networks, jamming-resistant global positioning system

augmentation, radars, and energy security. And, to take greater advantage of the unrivaled reservoir of technical knowledge resident in DoD's S&T workforce, Reliance 21 charters defense support teams of expert scientists and engineers inside and outside the Defense Department to assist DoD acquisition programs to resolve difficult technical challenges. Current defense support teams are providing assistance to efforts related to space-based detection of missile launches and biometrics-based identity management.

A key component of Reliance 21 is almost a standalone element – enhanced interaction between the intelligence and S&T communities. As stated in the QDR, the strategic environment of the U.S. has shifted significantly over the last two decades. The threat has evolved from a few nation-state threats to decentralized network threats including non-state enemies, from single- focused threats to multiple complex challenges, from "one size fits all" deterrence to tailored deterrence for rogue powers, terrorist networks and near-term competitors. Embedded in this framework is a need to place more emphasis on potential adversary development of disruptive technology. We continue to increase our efforts to monitor global technology developments and to better understand their implications for U.S. national security. Over the past two years, my office has worked closely with the Under Secretary for Intelligence and the National Intelligence Council to strengthen our ability to anticipate new and evolving technology-based threats. We have conducted a series of technology net assessments that determine where differences between U.S. and foreign technology trends and capabilities exist and assess whether the differences pose a discernable threat to U.S national security. We are engaged with our Allies in collaborative programs to assess emerging and disruptive technologies and their effects. These assessments are only the beginning of our efforts; we will continue to expand programs that provide us with a more robust capability to anticipate disruptive technology challenges and reduce the possibility of technological surprise.

The Militarily Critical Technology Program (MCTP) is a Congressionally mandated program to provide DoD's input to the Export Control process. In response to a program assessment by the Government Accountability Office (GAO) last year, DDR&E has launched a three-pronged effort to re-focus the MCTP. A new Deputy Under Secretary of Defense for International Technology Security (DUSD(ITS)) has been appointed and staffed his office to re-engineer the program. Further, the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) has made the urgent update of the MCTP a 2007 Strategic Goal. DUSD(ITS) is working closely with Commerce Department Export Licensing Officers to improve usability and searchability of MCTP information, and with technology working groups on a wiki-like interface to make virtual collaboration on MCTP creation as easy as possible. As part of this re-

engineering process, DUSD(ITS) has commissioned the Defense Technical Information Center (DTIC) and Google, Inc. to conduct a "fly-off" of web-enabled systems to better support both the creation and access of MCTP information. The urgent update of the MCTP content will be completed in April 2007; the reengineering effort prototype will complete in FY 2007 and final system in FY 2008.

The Department's policy is to ensure that Major Defense Acquisition Programs (MDAPs) receive approval to go forward into system design and development or low-rate production only when all critical technologies have demonstrated that they meet acceptable levels of maturity. Experience shows that acquisition programs that proceed with immature technologies are more likely to suffer cost and schedule overruns. Technological maturity for critical technologies is determined through a formal Technology Readiness Assessment (TRA) at Milestones B and C performed under DDR&E oversight. The DDR&E staff works closely with staff of the acquisition program, often over a period of many months or even years to foster verification of technology maturity. The DoD's efforts are consistent with Section 2366a of Title 10 USC that requires the USD(AT&L) to submit certification to the Congress that MDAPs do not receive Milestone B approval until the Milestone Decision Authority certifies that "the technology in the program has been demonstrated in a relevant environment."

In May 2006, the USD(AT&L) issued an implementation memorandum to ensure full compliance by the Department with this law. Recent Milestone B TRAs conducted by DDR&E in concert with Service acquisition executives include: the Navy Amphibious Assault Ship Replacement Flight 0; the Combat Search and Rescue helicopter (CSAR-X); the Navy Enterprise Resource Planning (ERP) program; the WIN-T Warfighter Internet – Tactical, and the National Security Agency Public Key Infrastructure Increment 1. In addition, we have initiated a process of "quick-look" technology readiness evaluations at a much earlier stage of the acquisition process to identify potential technology maturity gaps prior to Milestone B. In this way, if we find immature critical technologies early in the acquisition process, alternative technical approaches can be found or S&T investments can be made to address the technology immaturity at an earlier stage of acquisition. In addition, the Joint Staff and my office have begun to develop a process to advise the Joint Requirements Oversight Council on technology maturity, risk, and suitability as criteria for requirements validation and capability document approval. One recent example of a technical assessment to inform requirements validation was provided for the F-22 block upgrade. The evaluation of technology maturity is now a major tool to assist both the requirements development process and the formation of major acquisition programs. It also serves to improve integration of the S&T and acquisition communities.

Building on the positive benefits of conducting TRA's, the DDR&E team is moving forward with defining a process for assessing manufacturing readiness levels (MRL). One of DDR&E's ManTech priorities during the past year has been to standardize terminology and assessment processes that describes and determines MRLs. Working with ManTech representatives from the Services, and with manufacturing executives from the private sector, we are producing MRL tools to assist project managers in government and the defense industry in assessing readiness of technologies for production.

The final business process improvement involves S&T information reuse. The 21st Century has brought a new form of war that is being fought against groups of extremists, who use modern technology and unconventional weapons including biological agents, improvised bombs, and small nuclear devices to attack the U.S. and our allies. As the focus of the Nation's defense priorities shifts to counter these threats, DoD scientists, engineers, program managers and others simply will not have time to sift through mountains of data to find significant pieces of information to meet critical requirements. It is essential to our Nation's technological superiority that we develop innovative information discovery and analysis tools that will provide essential information rapidly, accurately and reliably to support DoD's newly-emerging priorities.

Information is key to effective decision making. Data that is unknown, inaccessible, or incorrect leads to duplication of effort; delays and potential failure in reaching strategic and near term goals; jeopardizes our forces; and places our nation's security at risk.

In this era of ever-changing technology and shifting requirements, the value of central information sources, which acquire, organize, analyze and disseminate information, has become more apparent. The implementation of an information gateway to Defense scientific, research and engineering information will serve as the centerpiece of DDR&E's information innovation initiatives providing single sign-on access to both public and limited access data sources within the DoD and world-wide. In addition, this information gateway will facilitate the collection and dissemination of program information and tools that will assist program managers in analyzing the cost effectiveness of DoD's research and development programs.

DDR&E launched the first phase of the gateway in 2005 at the Defense Technical Information Center with the R&E Portal which was aimed at the DoD research and engineering community. Based on the success of the Portal in supporting the needs of DDR&E program managers, we now plan to expand the concept to meet the needs of DoD scientists, engineers and managers in the test and evaluation Community. The expanded features for the gateway will include a

unified search capability and additional analysis tools, as well as collaborative environments where scientists and engineers can identify others working in their area of interest and form virtual research communities to leverage the knowledge investment in the broader Defense scientific community.

Conclusion

The need for a stable, healthy DoD S&T program is a central element to fighting the global war on terror. This Long War has stretched the S&T community into expanding our support role in providing balanced product to today's force, tomorrow's force, and the future's force. We believe we are meeting this challenge, and we truly appreciate the continued support of this committee in providing us the tools and resources to carry out this vital mission.