STATEMENT OF

THE HONORABLE RONALD M. SEGA

DIRECTOR DEFENSE RESEARCH AND ENGINEERING

BEFORE THE

SENATE ARMED SERVICES COMMITTEE

EMERGING THREATS AND CAPABILITIES SUBCOMMITTEE

DoD SCIENCE AND TECHNOLOGY PROGRAMS

APRIL 10, 2002

FOR OFFICIAL USE ONLY
UNTIL RELEASED BY THE
SENATE ARMED SERVICES COMMITTEE

Madam Chair and Members of the Senate Armed Services Subcommittee on Emerging Threats and Capabilities,

I appreciate the opportunity to appear before you today to discuss the DoD Research and Engineering (R&E) Program with particular emphasis on Combating Terrorism.

INTRODUCTION

First, I would like to provide you with an overview of the current Research and Engineering (R&E) Program in the Department of Defense (DoD). Many of the capabilities and systems that are in the field today are the result of a conscious decision, years ago, to invest in Science and Technology (S&T) programs. The future security and safety of our nation depends in part on a strong research and development foundation.

The DoD R&E program is being crafted as an integrated science and technology approach to align with the desired operational capabilities described in the Quadrennial Defense Review (QDR). One of the goals set forth in the QDR is to shift the basis of defense planning from the "threat-based" model that has dominated thinking in the past to a "capabilities-based" model for the future. This capabilities-based model focuses more on how an adversary might fight rather than who the adversary might be or where a war might occur. It recognizes that future security threats include more than large scale conventional. Instead, the United States must identify the capabilities required to deter and defeat adversaries who will rely on surprise, deception, and asymmetric warfare to achieve their objectives. Consequently, we are shaping our S&T program to focus on transformation, the need for “Jointness”, and a capabilities-based planning.

Investments in S&T programs are necessary today to broaden the range of options available to the warfighter tomorrow. Advantages we now possess in key technology areas must be maintained, while pursuing new technologies. Our S&T investment must transcend specific requirements. For example, our efforts in advanced electronics should dramatically improve the performance of avionics, regardless of whether the aircraft is manned or unmanned. Missile guidance and targeting should be precise and accurate, regardless of the launch platform or target. Materials will need to be both lighter and stronger—to protect delicate instrumentation in a satellite or the personnel inside a vehicle. Nanotechnology will have application across many of our desired capabilities and our expectations are very high for this emerging technology. And whereas it is science that fuels the generation of technology, and it is the application of technology that enhances capabilities, it is our efforts in technology transition that take technology from the laboratory to the field in an efficient manner.

S&T SUPPORTING TRANSFORMATION

S&T is a key enabler of transformation. It not only provides the technology for future warfighting capabilities, but provides opportunities for changing doctrine that govern the way future forces fight. We are focusing on the areas of knowledge, speed, agility, and lethality to change the face of war. We must, through our S&T investments, continually enhance our technological advantage to provide significantly advanced capabilities to deter future threats and when deterrence fails, ensure that our response is effective with few U.S. and allied casualties and minimal collateral damage. The war in Afghanistan has gone well, but this is no consolation for the families of the military members who have lost their lives during the current conflict. The decisions we are asking you to make

regarding investments in S&T programs will be important today and into the future – a future which we cannot predict, but a future for which we can be prepared.

COMBATING TERRORISM

Combating Terrorism technologies were a key component of our S&T program prior to the attack that occurred on September 11. However, since September 11, our effort in this area has dramatically intensified. Fortunately, the Department's S&T program had numerous program activities well underway, such as Advanced Concept Technology Demonstrations (ACTDs), that when accelerated, helped to meet critical warfighter needs. I would like to briefly describe what we have accomplished in the aftermath of September 11, in providing combating terrorism technology capability to the warfighter. First, we established a DoD Combating Terrorism Technology Task Force (CTTTF) on September 19 that rapidly identified, prioritized, and integrated DoD S&T initiatives to help with combating terrorism. The Task Force included technology leaders from the Services and the Defense Agencies, with participation of the Joint Staff, the Department of Energy, and other federal organizations. Under Task Force direction, four working groups were established to identify needs and technology opportunities that crossed the spectrum of combating terrorism requirements. The working groups were functionally organized into four broad areas of combating terrorism: (1) Deterrence and Indications and Warning; (2) Survivability and Denial; (3) Consequence Management and Recovery; and (4) Attribution and Retaliation. Working groups identified applicable technologies that could help to mitigate capability shortfalls and potential remediation programs. Shortfalls and remediation programs were identified by the users who generated prioritized lists of investment strategies for near-, mid- and long-term technologies.

Two of the projects identified for immediate investment were Nuclear Quadrupole Resonance (NQR) Detection Systems and Thermobaric Weapons.

Nuclear Quadrupole Resonance (NQR) technology was developed by the Naval Research Laboratory and is being used by the Federal Aviation Administration for detection of bulk explosives. There are many advantages of NQR over x-ray detectors but of particular significance is that little interpretation is required. The existing technology is now being modified for use in examining "bulk" packages.

A thermobaric explosive weapon system was accelerated, tested, and certified from the concept stage within 90 days. From "chemistry-to-weapon", the thermobaric explosive was developed and tested in a laboratory setting in October 2001, successfully flight tested in December, and made available to the warfighter earlier this year. This is an example of a successful collaborative effort that included the United States Navy, Defense Threat Reduction Agency, the United States Air Force, the Department of Energy and industry.

We also responded with assistance on the home front. A few weeks after the attacks on the World Trade Center and the Pentagon, letters containing *Bacillus anthracis* "Anthrax" spore powders were sent to several locations in the United States. An interagency technology working group was assembled to address the issues of Anthrax and the Postal Service. DoD expertise and facilities were made available to support this effort. Representatives from the Department of Defense, National Institute of Standards and Technology, Food and Drug Administration, and the House Mail Office met at the Armed Forces Radiobiology Research Institute (AFRRI) to discuss the use of radiation to kill the anthrax spores. AFRRI had established radiation kill data on surrogate spores such as *Bacillus anthracis* type Sterne, a vaccine strain. The spores of the *B. anthracis* Sterne are very similar, if not identical, to the *B. anthracis* Ames spores that were recovered by the

FBI from the contaminated letters. Extending the previous radiation kill work for "Sterne" and other anthrax surrogate spore types, they confirmed the radiation sanitizing dose for the lethal "Ames" strain of anthrax.

Our Combating Terrorism activities continue and are reflected in planning efforts of the Services and Defense Agencies with continuing support of the Task Force.

INITIATIVES SUPPORTING THE QDR

As we further analyzed the QDR from the S&T perspective, we identified three particular areas that warrant special attention to support transformation; (1) integrated national aerospace framework; (2) surveillance and knowledge systems; and (3) energy and power technologies. The technology programs in these areas have broad application towards transformation. They also have intrinsic jointness characteristics. Additionally, we have identified information operations, space, robotics, hard and deeply buried targets, advanced energetics, advanced electronics, hypersonics, and military medical as other joint areas of importance. Within our FY 2003 request, you will see many programs that form the foundation for these efforts. In the coming months, we will work with you to fund a balanced S&T program to enable continuing transition of needed technologies to our warfighters.

I have been working with the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence, other Government organizations, universities, and industry to develop technologies to protect the critical defense infrastructure. For example, many of the targets for cyberattack are in private hands: electric power and telecommunications grids, and financial and transportation systems. We must match the pace brought forth by the information age with persistent work towards reducing vulnerabilities and mitigating

consequences. Viruses and denial-of-service attacks are examples of the pervasiveness of the threat, and the extent of our interconnection. Every gain, every achievement, and every breakthrough in information technology should be accompanied by the notion that it is or could be a target. Our nation must pursue cybersecurity aggressively—to protect not only our military systems and capabilities, but our critical infrastructure as well.

PLANNING AND EXECUTION

We continue to seek ways to strengthen the S&T strategic planning process. Components of this process include the Joint Warfighting Science and Technology Plan and the companion Defense Technology Area Plan and Defense Technology Objectives. These documents represent the collaborative efforts of the Office of the Secretary of Defense, the Joint Staff, the military services, and the defense agencies in planning the S&T program. These documents and the supporting individual plans of the military services and defense agencies guide the annual preparation of the DoD budget and program objective memorandums.

Technology development is normally recognized by the end products, but is managed as an investment continuum that spans basic research through advanced development with close attention to technology transition. We must seek a balance across this continuum. Basic research lays the foundation for tomorrow's innovative development. That part of basic research conducted in the colleges and universities pays dual dividends—providing not only new knowledge but also producing the scientists and engineers for the future. At each level through applied research and advanced development, we make investment decisions in pursuit of the most promising payoff areas.

TECHNOLOGY TRANSITION

Technology transition has been the topic of much discussion, within the Department and Congress. The rate of change of technology influences our program, and at the same time, that creates unique technology transfer and transition opportunities. A "Quick Reaction" ability to respond to an immediate need would be an important addition to the array of tools we have to support technology transition.

During my confirmation process last summer, I was told of a program Dr. John Foster established when he was the DDR&E to respond quickly to the unknown. In the FY 2002 budget request, the Quick Reaction Special Projects (QRSP) was submitted to address this goal, but was not funded. Over the last six months, I have met with many of you and your staff to discuss the merits of the program, and I think we all have a better understanding now of proposed quick reaction support program and of its need. There are three potential triggers for invoking this program: 1) to take advantage of technology opportunities in rapidly evolving disciplines; 2) to reduce the unanticipated risk in acquisition programs, such as information technology or biotechnology; and 3) technology maturation in support of urgent real-world DoD needs. Nothing echoes the need for such funding better than September 11, 2001. For example, the only immediate option we had available at that time to transition the Thermobaric Weapons and the Nuclear Quadrupole Resonance (NQR) Detection Systems from developers to the users was to reprogram/decrement existing programs. We could better accommodate changes in technology and the world situation with additional execution budgetary flexibility. We have requested the Quick Reaction Special Projects again in FY 2003, and I urge your support.

The Advanced Concept and Technology Demonstration (ACTD) program is a "mid-term" tool supporting transition. These demonstrations involving the

CINCs, Service Users, and Technologists are a formal preplanned part of the S&T program that facilitates the rapid transition of cutting edge technologies into defense acquisition systems. The Predator, which originated in the Defense Advanced Research Project Agency (DARPA), is a product of the ACTD program and is in use today in Afghanistan. On March 5, 2002, the Under Secretary of Defense for Acquisition, Technology, and Logistics, Pete Aldridge announced the FY 2002 selection of 15 new ACTDs.

Large acquisitions follow the process described in the Department's 5000 series acquisition policy documents. The S&T Program is being called upon to fulfill an important role in the acquisition decision making process. In the acquisition policy documents, the S&T community is viewed not only as a source of technology and capabilities, but a source of expertise for determining the technical maturity of key system technologies. Prior to Milestone B and Milestone C decisions, the acquisition program offices and the S&T community prepare and submit to OSD for review a technology readiness assessment. This requirement not only provides important information for decision making, but necessitates an increased collaboration between the technologists and the developers. This collaboration is strengthening the communication between the two communities and we believe this will contribute to shortening the acquisition cycle time. For example, the Joint Strike Fighter used the technology readiness assessment as part of the decision making process.

The Services' S&T Executives and their Service laboratories provide a stable, mission-oriented (Service specific) focus to the Defense S&T program. The mission of the Defense Advanced Research Projects Agency (DARPA) is to support high-risk, high-return research that bridges the gap between fundamental discoveries and military use. A DARPA role is to predict what a military commander might need in 20 years, and then create that future by changing

people's minds about what is possible. Over 50 percent of our basic research is conducted at universities, another 30 percent in federal laboratories and the balance by industry and nonprofit institutions other than universities. As we move forward through our applied research efforts, our federal laboratories take a more prominent role, and in the advanced research phase, industry becomes the major player. The fact that our laboratories have some participation in all three phases is also key to providing them with the technical agility to facilitate technology transition. Throughout the process we leverage international S&T where feasible to meet the Department's needs as well as ensuring strong defenses for our allies.

SCIENCE AND TECHNOLOGY WORKFORCE

The quality of our S&T workforce and the management of the laboratory infrastructure in which they work are very important factors in the overall R&E equation. They too are critical elements for transformation. Our S&T workforce has been downsized considerably in the last twelve years. This has left us with a very knowledgeable workforce, but one that is also reaching retirement age. We are at a critical point that requires a focused effort to bring stability to the workforce that will attract and retain talent. To lead this effort, I have established an office, reporting directly to me, for Laboratories and Basic Sciences. We are applying our energies to ensure we are capitalizing on the authorities you have given us to demonstrate innovative ways for improving the workforce. The issue is not people alone. Also, the infrastructure supporting these men and women is in need of updating. We are in the early stages of developing a comprehensive plan to address the total workforce. Over the next several months, we will work closely with you as we develop a plan that will ensure we have the workforce and supporting infrastructure required to maintain technological superiority.

PARTNERSHIPS

The Department's R&E program is dependent upon active partnerships with activities internal and external to the Department. Our customer partners are the warfighter and the Joint Staff. Our focus is on their known needs and the technology developments we must invest in today to ensure their future needs are met. The internal DoD partnerships include the Services, Defense Agencies, and other OSD organizations that guide and execute the S&T program as well as critical external interactions with other government agencies, universities, industry, international partners and the Congress.

OUTREACH

In response to the September 11 attacks, the Department released a Broad Agency Announcement (BAA) that was open from October 23 through December 23, 2001. The BAA sought ideas in the areas of combating terrorism, location and defeat of hard or difficult targets, protracted operations in remote areas, and countermeasures to weapons of mass destruction. Anyone, from individuals to large corporations, was encouraged to apply. The Department received approximately 12,500 responses, including approximately 1200 from 85 other countries. The DoD Technical Support Working Group (TSWG) has completed their review of the Quad Charts submitted, and have requested approximately 600 White Papers that will be considered for contract award. Announcements from the TSWG are posted on the Web at www.bids.tswg.gov.

Broader opportunities for supporting the Department's science and engineering programs are announced as Requests for Proposals or Requests for Quotations on a wide array of subjects . They are published in Federal Business Opportunities; the government's designated point of entry on the Internet for providing public access to notices of procurement actions. FedBizOpps is found at

www.fedbizopps.gov. The appropriate points of contact (POC) for submitting unsolicited proposals are available in the handbook, "Selling to the Military." The handbook is available at: www.acq.osd.mil/sadbu/publications/selling.

CLOSING

As stated in the Quadrennial Defense Review, "a robust research and development effort is imperative to achieving the Department's transformation objectives." It further states that "the Department must maintain a strong science and technology (S&T) program that supports evolving military needs and ensures technological superiority over potential adversaries." Funding of the FY 2003 President's budget request for S&T is needed to support these objectives that help provide for the future security and safety of our nation. We have appreciated your previous support and look forward to working with you on this request. Thank you for the opportunity to appear before you today.