RECORD VERSION

STATEMENT BY

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BEFORE THE

SUBCOMMITTEE ON EMERGING THREATS AND CAPABILITIES

COMMITTEE ON ARMED SERVICES

UNITED STATES SENATE

FIRST SESSION, 106TH CONGRESS

ON THE ARMY SCIENCE AND TECHNOLOGY PROGRAM

APRIL 20, 1999

INTRODUCTION

Mr. Chairman and Members of the Committee, thank you for this opportunity to appear before you to discuss the proposed Fiscal Year 2000 (FY00) Science and Technology (S&T) budget for the United States Army. It is a privilege for me to represent the Army leadership, the civilian and military members of the Army S&T workforce, and most importantly, America's soldiers.

As part of our Research, Development, Test, and Evaluation (RDT&E) program, Army S&T is a corporate investment in the Army of the future. This investment of approximately $1 billion annually is balanced between essential near-term enhancements and opportunities for future leap-ahead capabilities. Our strategy provides critical military technology today, maintains our technical overmatch in the near- and mid-terms, and ensures our position as the world's most technologically advanced land combat force through the far-term.

S&T VISION

The goal of the Army S&T program is to maintain a balanced and dynamic S&T investment portfolio to ensure, through superior technology, that our future force will have the same decisive combat edge as today's force. The Army vision is: The world's best Army, a full spectrum force--trained and ready for victory. This force must be equipped with the most modern weapons and equipment our nation can provide. Technology is needed to ensure decisive victory with a minimum of casualties.

We must also train soldiers and leaders of the digitized future Army to transform vast quantities of information into a decisive knowledge advantage. Our Training, Leader Development, and Soldier Support (TLS) program is

designed to develop flexible and adaptive soldiers and leaders who can achieve decisive victories in 21st century land combat operations. In supporting the Army vision, our S&T program simultaneously provides upgrades to current systems, technology options for new systems, and enhancements for the Army of 2010, while developing leap-ahead capabilities for the Army After Next (AAN).

INVESTMENT STRATEGY

The Army S&T program is directly linked to the Army Modernization Plan. The five major goals of Army modernization are: (1) Digitize the Army; (2) Maintain Combat Overmatch; (3) Sustain Essential Research and Development (R&D) and Focus S&T to Leap-Ahead Technologies; (4) Recapitalize the Force; and (5) Integrate the Active Component and the Reserve Component.

Maintaining combat overmatch requires the R&D necessary to be able to insert new technologies into current systems. Because of fiscal constraints and the stretch-out or deferral of several Army next-generation systems, we are focusing S&T, R&D, and the industrial base on identifying and developing leap-ahead systems to support AAN.

In FY00, our S&T budget totals $1.267 billion--$187 million for Basic Research (Budget Activity 6.1), $555 million for Applied Research (Budget Activity 6.2), and $525 million for Advanced Technology Development (Budget Activity 6.3). The Basic Research (6.1) program expands our fundamental knowledge in areas relevant to land warfare and is the “heart of knowledge” to enable desired AAN operational capabilities. This investment provides an important interface with university and industry research. The Applied Research (6.2) program turns knowledge into products. It develops components and evaluates technical concepts to increase warfighting capability. The Advanced Technology Development (6.3) program demonstrates the technical maturity of subsystems, systems, and systems of

systems through Advanced Technology Demonstrations (ATDs) and Advanced Concept Technology Demonstrations (ACTDs) to speed technology transition into development and ultimately to our soldiers.

Our near-and mid-term S&T investment (late 6.2 and 6.3) is directed toward enhancements for Army XXI, a versatile Army capitalizing on digital technology for information superiority and essential lethality, survivability, and mobility enhancements. While we are working on Army XXI capabilities, we are also looking far into the future to AAN. As mentioned earlier, one of the major goals of the Army's modernization program is to focus S&T efforts on leap-ahead technologies required for AAN. Our current far-term investment (6.1 and early 6.2) will enable AAN in the 2025 timeframe.

We have implemented an annual assessment process – the Technology Seminar Game (TSG) - to gain insights for shaping the S&T investment strategy in support of the Army vision. The TSG brings together the combat developer – the Army Training and Doctrine Command (TRADOC) – with technologists to understand and help synchronize the application of current and future enabling technologies with future AAN needs. Through the participation of technologists from industry, other Services, and other government agencies, the TSG methodology provides valuable insights on the allocation of the Army S&T investments and suggests areas to leverage S&T investments from the private sector and other government agencies. Through the TSG and other initiatives, a robust S&T investment strategy in support of AAN has been put in place.

The Army level of funding for the S&T program is consistent with the Army's modernization strategy. We conduct annual reviews with TRADOC to ensure that the S&T program directly supports our warfighters' needs. The Army Science and Technology Master Plan (ASTMP) is published each year to document S&T responsiveness to the Army modernization strategy. Since the advent of S&T Reliance in 1991, the Army has been able to focus S&T on areas that are truly Army-unique and leverage other Services, government agencies, and industry to meet our technology needs in their areas of expertise. This

reliance strategy, combined with elimination of substantial S&T infrastructure, has allowed us to redirect funding for specific S&T initiatives required to enable Army XXI and AAN.

The FY00 budget request for the Army S&T program (6.1, 6.2, and 6.3) has +4.4 percent Real Growth over last year's budget request (includes inflation) with an increase for Anti-Personnel Landmine Alternatives. Our FY00 request maintains stability for the overall S&T program while fully funding Army commitments to Defense Technology Objectives.

Almost 60 percent of the S&T budget consists of Basic and Applied Research (6.1 and 6.2 accounts). Activities in these budget categories are critical to achieving the technology leap-aheads envisioned for AAN. We have heeded past Congressional directives in the Basic Research program and have held the program to no real growth with a $187 million budget. The Army must preserve this austere Basic Research effort. We have requested an increase of 6.9 percent real growth in our Applied Research (6.2) program in FY00. This increase, which includes a shift of about $20 million from our Basic Research account is intended to implement several initiatives and augment other research areas specifically for AAN. Our Advanced Technology Development program is also increased 6.9 percent this year to maintain our strong commitment to Joint Oversight Council prioritized ACTDs, as well as implementing the increase to develop Anti-Personnel Landmine Alternatives.

I will discuss these initiatives in greater detail later. Again, I urge the Committee to preserve these carefully designed enhancements.

ARMY TECHNOLOGY – A CHANGING ENVIRONMENT

The Army S&T investment strategy is dynamic and responsive to the ever increasing needs of our warfighters. In an annual report to the Army Chief of Staff, TRADOC acknowledged that its vision for the AAN contingency force is enabled by leap-ahead technologies. These technologies are needed to realize rapid strategic and tactical deployment of future forces, assure lethal

overmatch and survivability against future opponents, and conduct operations for limited periods without resupply. The Army Science Board's (ASB) insights on the AAN vision center on a three times improvement in the effectiveness and mobility of our future warfighting systems while operating with one-third the sustainment support requirements. Because many of the technologies to achieve these capabilities will be based on commercial technologies available in a worldwide marketplace, the Defense Science Board (DSB) finds that these considerations will place greater demands on military technology investment strategies. Specifically, the DSB stated that we must accelerate the "cycle" time for maturing technologies through the technology base and their subsequent integration into fielded systems. Further, the DSB believes that the level of increase in systems performance between each technology insertion cycle must improve significantly. In this environment of changing military needs and constrained resources for S&T investments, the Army S&T program is aggressively exploiting opportunities to leverage current technology investments being made by other Services, other government agencies, including the Defense Advanced Research Projects Agency (DARPA), and the private sector. We are also increasing the level of innovation/risk-taking for high payoff applications. I would like to illustrate the responsiveness of our S&T Investment Strategy to this changing environment by highlighting some of our significant S&T efforts in the FY00 budget request for the near-, mid-, and far-term challenges.

NEAR- TERM (FY00-05) AND MID-TERM (FY06-14)

Advanced Technology Development (6.3)

Several of our major S&T demonstration programs in 6.3 address system-of-systems architectures and their attendant Command, Control, Communications, Computers and Intelligence (C4I) connectivities for highly distributed network-based operations. Emphasis is placed on information dominance, automation to compress operations, increased range to offset

vulnerability, and precision strike to improve accuracy and lethality and limit collateral damage. In the FY00 budget, more than 50 percent of the Army's ATDs and ACTDs focus on information dominance. With these new capabilities, we will be able to project a lethal and effective force quickly anywhere in the world to face a wide array of uncertain threats. These forces will deploy rapidly, seize the initiative, and achieve objectives with minimal risk of heavy casualties.

ATDs provide the path for the rapid insertion of new technologies into Army systems, whether new systems or product improvements. In the 6.3 category, components are built and integrated, and experimental systems are demonstrated to prove the feasibility and military utility of the approach selected. In recent years, the Army has increased its commitment to system-of-systems demonstrations in a battle lab or advanced warfighting experimentation environment to identify the best overall approach to accomplish a particular mission.

Ground Combat

Our first new development towards Force XXI AAN transition is the Future Scout and Cavalry System (FSCS). It is a cooperative United States (US)/United Kingdom (UK) program to demonstrate a ground system with advanced technologies in sensors, armor, signature management, and mobility to provide our warfighters with overwhelming ground scout capabilities. This program exemplifies true acquisition reform in reducing the overall program cost and time to field this important system. Savings in time and money will be achieved by teaming with the UK, with 50/50 cost sharing, and by employing a two-step acquisition whereby we will transition directly from the ATD phase into Engineering and Manufacturing Development (EMD). By teaming with the UK, we also gain the benefits of competition that we could not afford alone. The ATD places strong emphasis on affordability. In late January, 42-month contracts were awarded to two US/UK consortia for the ATD phase. When the ATD is complete, one consortium will be selected for EMD and production. FSCS will

complement other surveillance and reconnaissance assets such as Unmanned Aerial Vehicles and aerial scouts.

The Army push for a Future Combat Vehicle (FCV) stems from a void in concepts to replace its current combat systems, like the Abrams tank, as they approach the end of their original service lives. Army TRADOC is developing a FCV Mission Needs Statement (MSN) that will frame the S&T priorities to satisfy this need. Our S&T investments in leap-ahead technologies are critical to achieve capabilities envisioned for FCV are available when needed.

TRADOC is now developing requirements for FCV as a system or system of systems, with a substantial increase in the lethality and survivability of today's ground platforms, high strategic and tactical mobility, and a greatly reduced logistics demand when compared to current systems. We are reviewing results of ASB studies, wargames, Army and DARPA research efforts, and developments in the commercial sector to develop responses to TRADOC's needs, as they emerge. The Army would like to partner with DARPA to get to the demonstrator phase. DARPA would bring both innovation and cutting-edge technology, as well as financial help in a cost-shared program.

In the near-term, we are committed to perform a system study that will lay the foundation for a demonstration program starting in 2002. This will permit a development program starting in 2006 with fielding between 2015 and 2025. At this point, I cannot tell you what FCV is going to be, because we will not constrain innovation by defining it too narrowly.

MOUT ACTD

Past events like the Army experience in Mogadishu, Somalia, continue to underscore the increasing likelihood of military operations in urban terrain (MOUT). The Army has a joint S&T program with the United States Marine Corps (USMC); the MOUT ACTD focuses on finding the most useful technologies combined with the most effective tactics, techniques, and procedures to deliver technologically advanced, user acceptable, and affordable products to meet user requirements. This ACTD is focused on the near-term by

taking commercial off-the-shelf (COTS)/government off-the-shelf (GOTS) technologies, tailoring them if necessary, and putting them into users' hands during experiments, demonstrations, and in the interim capability phase. The objective is a go-to-war capability. The MOUT ACTD is designed to demonstrate the military utility of new and emerging technologies that, when placed in the hands of soldiers and Marines, will increase their lethality, survivability, mobility, and command and control capabilities in a MOUT environment. The ACTD will significantly improve the U.S. dismounted forces' capabilities to effectively fight on a 21st century urban battlefield.

The technologies (communications, sensors, lethal and non-lethal weapons systems/munitions, individual protection, and mobility) are being assessed through a series of 10 live experiments conducted at the McKenna MOUT site at Fort Benning, Georgia, and the collective MOUT training facility at Camp Lejeune, North Carolina. So far, the ACTD has completed eight experiments, five at Fort Benning and three at Camp Lejeune. An early winner from this experimentation is the rifle-launched entry munition (RLEM). It is capable of blowing out a door without collateral damage while keeping our soldiers out of harm's way. Based on its compelling experimental success, the Army Chief of Staff signed a letter to Congress designating this as one of five FY99 Force XXI Initiatives (Warfighting Rapid Acquisition Program) candidates in order to get them into the hands of warfighters as quickly as possible. This most promising candidate will be integrated in Joint Army/USMC experiments in July and September and the culminating demonstration during the fourth quarter of FY00. These products will also provide an interim capability for experimental forces such as the 10th Mountain Division.

Overmatch

The Line-of-Sight Antitank (LOSAT) ACTD demonstrates a weapon system with overwhelming lethality – "one shot, one kill" – that provides a volume of extremely lethal, accurate fire at ranges exceeding tank main gun range. With the termination of the Armored Gun System and the inactivation of the 3-73rd

Armor (M551 Sheridan), our light forces need a long-range, high rate of fire weapon system with the overwhelming lethality required to produce the shock effect. LOSAT is the only system that can provide this capability and not be countered by explosive, reactive armor, appliqué, or active protection systems. The system will be deployable on all airlift assets, such C-130 and C-5 aircraft and sling load carried by UH60L Black Hawk and CH-47 Chinook helicopters. LOSAT is a unique complement to our other early entry systems, including Javelin and Apache Longbow with Hellfire missiles.

Medical Operations

The insertion of advanced medical technology into medical operations is the path for continued world-class medical care to the warfighter. Some initiatives are:

- A high-tech litter with resuscitative, stabilizing, and life-sustaining capabilities for far-forward intensive care treatment to critically injured casualties during evacuation.
- Use of telemedicine to leverage healthcare delivery to troops far from sophisticated medical facilities. The Joint Medical Operations - Telemedicine ACTD is an effort to evaluate mature technologies to improve medical situational awareness, minimize need for evacuation, provide new deployable medical capabilities, and minimize the medical footprint in the tactical area of operations.
- A dry fibrin sealant bandage made from the last two proteins in the human blood coagulation cascade and freeze-dried on absorbable packing. The bandage is designed to set a clot within one minute and reduce blood loss by 50 to 85 percent.

To highlight one of these initiatives, the fibrin bandage, and its potential benefit to the warfighter, it is important to know that severe bleeding is the greatest cause of death on the battlefield, accounting for 50 percent of all battlefield deaths. To prevent death, soldiers with uncontrolled hemorrhaging need to be evacuated to a location for hemorrhage-controlling surgery and treatment within the first 30 minutes after wounding. The fibrin bandage is designed to change that.

Fibrin-based bandages, jointly developed by the Army and the American Red Cross, are currently in advanced development and have shown in studies to significantly reduce blood loss from arterial bleeding over conventional wound dressings. The bandage, which is lightweight and doesn't require refrigeration, is coated with fibrinogen and thrombin, naturally occurring human blood proteins necessary for blood clotting. When the bandage is placed with direct pressure onto the wound, the proteins quickly dissolve into the wound and coagulate. The pressure on the bandage slows bleeding, maintains high local concentration of active blood-clotting proteins, and results in the formation of a firm clot.

This product has the potential to revolutionize first-responder, far-forward care and save lives. Follow-on products, such as fibrin foam, could give an added dimension to this care by providing far-forward treatment of internal hemorrhage.

Biological Threats

The biological arena is filled with unknowns and provides some of our greatest challenges. There are many possible biological warfare (BW) agents, and the physiological effects are far more varied than those of chemical warfare (CW) agents. In the not-too-distant future, we will enter the uncharted territory of genetically modified agents. Biological agents are of interest to a number of potential adversaries – both states and non-states – because of the relatively small investment needed for development and the large effects that can be created by small quantities of agent. Biological programs are also among the hardest to track.

One means to counter the biological threat are vaccines. The DoD Biological Defense Program is focused on a prime systems contract approach for the management of biological defense vaccines. The approach will include: program definition and risk reduction, advanced development, licensing by the Food and Drug Administration (FDA), production, stockpiling, testing, distribution, and maintenance of a comprehensive database. The currently licensed anthrax vaccine is being procured in order to vaccinate the total force. All other requirements for vaccines are based on 1.2M Troop Equivalent Doses (TEDs) for

high BW threats and .3M TEDs for lesser BW threats. With respect to genetically modified agents, the prime systems contract was specifically structured to provide DoD the flexibility to take on these emerging threat agents.

Additionally, several biological devices are being developed to provide a real-time detection capability. Development and fielding emphasize Joint automated multi-agent detection and identification bio suites.

All DoD's bio defense programs are sufficiently funded to meet current requirements.

Information Operations

The deployment of a fully digitized force will make information operations an essential aspect of combat operations. Our reliance on information technologies creates dependencies and potential vulnerabilities throughout the force as our soldiers are deployed across the globe, creating new requirements for defensive information warfare capabilities. The Tactical Command and Control (C2) Protect ATD will demonstrate the ability to protect the Army's tactical C2 information systems, components, and data from modern network attacks. The program develops a security architecture that will include improved network access controls, intrusion detection and response tools, secure network administration, and C2 protect modeling and simulation capabilities for robust enhanced digital communications. Ultimately, we will transition these products into the information system being fielded.

The future objective target acquisition system will be demonstrated through the Multifunction Staring Sensor Suite (MFS3) ATD. This provides scout/cavalry vehicles and future fighting vehicles with a compact, affordable sensor suite for long-range, noncooperative target identification, mortar/sniper fire location, and air defense against low signature targets. To accomplish these objectives the MFS3 will demonstrate a modular, reconfigurable sensor suite that integrates multiple advanced sensor components, including a staring infrared imager, a multifunction laser, and acoustic arrays.

Soldier Systems

The Force XXI Land Warrior (FXXILW) effort is the Land Warrior S&T program to ensure that future Land Warrior procurements are upgraded with technological advancements. It addresses the critical Army need to enhance the performance, lethality, survivability, mobility, and sustainment of the individual soldier. In the near-term, Force XXILW focuses on technology insertions to the baseline Land Warrior system. These technologies include an integrated navigation component that will provide soldiers with accurate geo-location information when Global Positioning System is not available; system voice control to provide hands free operation of the essential Land Warrior functions; and combat identification functionality to provide positive identification of friendly Land Warrior and non-Land Warrior combatants. FY00 program plans include integration of significant advances in lethality with the Land Warrior system, such as the Objective Individual Combat Weapon and the Javelin missile.

FAR-TERM (2015-2025)

In the far-term, revolutionary new warfighting capabilities will be enabled by Army S&T investments to enhance AAN combat overmatch capabilities in knowledge, speed, and power. Significant S&T investments are also directed at ensuring that weapons and platforms of the future can be rapidly deployed, sustained, and employed in a more effective fashion. Army Basic Research (6.1) and early Applied Research (6.2) are focused on the AAN vision of a more lethal, more survivable, more mobile, and more sustainable force than today's force. Realization of this vision requires a long-term partnership among academia, industry, and government to develop militarily unique, niche technologies; focus commercial capabilities on Army needs (spin-on); and foster potentially broader use technologies prior to commercial viability (spin-off).

Army S&T investments over the last 50 years have helped to make possible current U.S. capabilities in areas such as supercomputers, solid state electronics, smart munitions, laser range finders and designators, fiber optics,

and global positioning systems. These investments have helped to strengthen our national defense and our national economy.

Basic Research (6.1)

The FY00 Army Basic Research investment is the minimum required to achieve the vision for AAN and provide U.S. technological superiority in land warfighting capability in the 21st Century. Basic Research is the foundation of the Army S&T investment strategy in an era of scientific and engineering innovation. Partnering with academia and industry is the critical enabler in this strategy. The goals of the Army strategy are to sustain technological superiority in land warfighting capability; to identify and mature emerging S&T in support of force modernization; and to ensure against technological surprise. Army investments, structured to leverage research expertise across academia, industry and government, include the University Affiliated Research Centers, Centers of Excellence, and the University Single Investigator Program; the Army Federated Laboratories; in-house, government research in Army niche areas such as energetic molecules for propellants and explosives, infectious diseases, and cognitive readiness; and Strategic Research Objectives which synergistically focus related research activities on potential high payoff areas such as Compact Power Sources and Mobile Wireless Communications.

Army Federated Laboratories: The Army Research Laboratory (ARL) Federated Laboratory (FedLab) is a fundamental reinvention of how the Army partners with the private sector to exploit commercial innovation. The FedLab is thought of as a collection of geographically distributed "virtual" laboratories building a scientific foundation for the digital battlefield. Current FedLabs address information technology in three critical areas: advanced sensors, telecommunications/information distribution, and advanced and interactive displays. The FedLabs consortium consists of at least one industry partner as the lead, one major university partner, and one Historically Black College or University or Minority

Institution. The Army is very proud that FedLab received in 1998 one of Vice President Al Gore's Hammer Award.

University Affiliated Research Centers and Centers of Excellence: University Affiliated Research Centers (UARCs) and Centers of Excellence (COEs) are the centerpiece of academic linkage to Army R&D organizations. Established in high-interest technical areas, COEs have proven to be effective in many application-oriented projects in areas such as rotary wing technology and electronics. Center programs often couple with graduate education programs to increase the supply of scientists and engineers in areas of Army importance. In addition to the existing university affiliated research centers, a new initiative based on recommendations from a 1997 National Research Council report, "Modeling and Simulation; Linking Entertainment and Defense", will take advantage of the expertise of the entertainment and computer game industry. The computer game industry has become a $25 billion a year industry. A modeling and simulation research center, focused on technologies common to both the defense and entertainment industries, will bring together specialists from industry, academia, and the Army. The center will focus on technologies such as immersion, computer-generated forces, terrain database development, and networked simulation. These technologies can be used to enhance military capabilities in the areas of training, soldier and leader development, and combat mission rehearsal.

University Single Investigator Program: This program provides approximately 600 university research grants to nearly 120 institutions in 45 states, with a major outreach program to Historically Black Colleges and Universities and Minority Institutions (HBCU/MIs). Focused investment in academic investigations provides the Army with the ability to exploit unique, novel research opportunities, leverage world-class academic expertise and facilities, and focus fundamental, academic research on Army-related problems.

Army In-house Basic Research: In-house Basic Research is primarily focused in Army unique business areas where there is no academic research interest or commercial research investment (e.g. armor/anti-armor, energetic materials, gun propulsion, and infectious diseases). It has been the source of many fundamental accomplishments in physics, mechanics, fluid dynamics, electronics, and medicine that have been instrumental in the development of current Army capabilities, such as advanced armors and armor piercing ammunition for the M1Abrams family of tanks, the Hepatitis A vaccine, and fibrin bandages. It also allows the Army to maintain its core competency so the Army can be a smart buyer.

Strategic Research Objectives: To achieve the future technology requirements integral to AAN, a number of Strategic Research Objectives (SROs) have been defined to synergistically focus related research activities on potential high payoff goals. SROs are multidisciplinary areas considered to have significant potential for leap-ahead or revolutionary improvements in capabilities. For example, current research on the design principals found in nature (the area of biomimetics) is enabling the development of novel synthetic materials, processes, and sensors and, in turn, may result in lighter-weight more-protective armor, cost-efficient synthesis of complex materials by self-assembly processes, and effective sensors for explosive/mine detection. The Army has also initiated an SRO in the area of Enhanced Soldier Performance which focuses training, cognitive, and physiological research for the soldiers of AAN. Army SROs are coordinated with the other Services through OSD managed Strategic Research Areas. The Army is focusing approximately 30 percent of its Basic Research resources on SROs.

Applied Research (6.2)

The goals of the Army Applied Research (6.2) program are to capitalize on technology opportunities, reduce technological risk, and exploit emerging technology options for essential AAN capabilities as defined by the warfighter.

AAN Applied Research efforts include a number of high priority enabling technology thrusts such as Compact Kinetic Energy Missile, Electro-Magnetic Gun, Full Spectrum Active Protection Systems, Lightweight Passive Armor, Command and Control on the Move, Warrior Extended Battlespace Sensors, Robotics, Cognitive Engineering for advanced low power displays, and maximizing 21st Century soldier and leader performance. Examples of four Army Applied Research initiatives are:

Leap-Ahead Technologies for Future Combat Vehicle—a Multi-Mission Combat System (MMCS): The emerging vision for AAN includes a multi-mission, ground combat "system of systems" capability. The Army-industrial-academic S&T partnership has been challenged to provide the technologies that will make such a system more lethal, more survivable, more mobile, and more sustainable than current combat vehicles. Key enabling technologies for MMCS include lightweight materials and structures, high mobility-agility drives and suspensions, ultra-reliability, fuel-efficient vehicle propulsion, signature management, full-spectrum active protection, lightweight passive armor, advanced Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), comprehensive situational understanding, and advanced weapon systems to provide both direct and indirect fire capability for long-range attack against air and ground targets.

Future Lightweight, Low Power Warrior: This applied technology program is focused on enhancements to the soldier system to significantly improve team and individual cognitive and physical performance beyond current levels. This represents a fundamental shift in modernization philosophy as it takes a human-centered, rather than equipment-centered, approach. Key technologies include: cognitive engineering to enable system design to maximize compatibility with the cognitive capabilities and limitations of the soldier; advanced decision support aids; lightweight soldier systems; and advanced individual and team training and mission rehearsal techniques to minimize effects of combat stressors and

maximize unit performance in highly dispersed environments. Technological advances are also expected in the areas of individual communications; low-powered sensors and displays; improved individual weapons; medical monitoring; and personal protection. However, it will be the integrated system design of these component technologies in concert with the fundamental human science underpinnings that will lead to the revolutionary warfighter of the future.

Information Technology: The bridge from mid-term to far-term capabilities is information technology. It will link the mental agility inherent in Army XXI with the physical agility of air and ground operations gained in AAN. Some of the top level goals on the information technology area are: transparent/seamless communications between and across command levels/echelons; common architectures as a framework to achieve transparent distribution of information and affordable robust information-processing systems through effectively integrated software, hardware, and connectivity infrastructure; and C2 on-the-move. These efforts to seamlessly integrate battlefield situational awareness, synchronize joint forces, and correlate intelligence data from airborne and space based sensors will give the Army an advanced C4ISR capability unmatched in the world.

Advanced Rotorcraft Technology: The Army is DoD's lead agency for rotorcraft S&T. The Joint Transport Rotorcraft (JTR) is identified in the Army's Modernization Plan as the far-term replacement for the aging CH-47 Chinook helicopter. In the Army S&T program, JTR is also being explored as an AAN concept to support the cargo / troop transport needs of the "Strike Force." JTR also has the potential to serve as the replacement for the United States Navy / Marine Corp (USMC) CH-53 Super Stallion.

Leveraging the Commercial Sector

The Army has been aggressively partnering with the commercial sector to better exploit commercial technology for military applications. Such efforts

include inserting commercially available technology into existing platforms and developing innovative manufacturing techniques to improve systems and reduce costs. The dual-use nature of the technology provides opportunities for industry and the Army to share the development costs. Two programs currently being pursued are the Dual Use S&T Program and the Army Industrial Preparedness Manufacturing Program.

Dual Use S&T Program: The Dual-Use S&T Program (DUST) is a cost-sharing program between the Army and industry. The Army strongly supports the concept of focusing Applied Research funds on dual-use technology projects because in this development phase dual-use potential is highest and industry is most willing to co-invest. An example of such an effort is the Commercial Active Braking System for Medium Duty Wheeled Vehicles. This project brings together Continental TEVES and the National Automotive Center to develop a cost effective, performance enhanced active breaking system and low speed tractor control for light and medium duty vehicles. This technology will have applications not only in the military sector, but also in the commercial sport utility vehicle and truck market. Projected savings are $1,500 per vehicle and $30 million for the entire Army fleet.

Army Industrial Preparedness Manufacturing Program: This program consists of the Army Manufacturing Technology (ManTech) program and the Commercial Operations and Support Savings Initiative (COSSI). The goal of the **ManTech** program is to provide essential manufacturing technologies that will enable the affordable production and sustainment of future weapon systems. The major program objectives are to: solve pervasive Army manufacturing problems that will result in more affordable weapon systems; advance the state-of-the-art in manufacturing; improve manufacturing processes and end item quality through process control; and transfer technology to the domestic industrial base. The ManTech program is especially important in the current environment because of the large decline in weapon system production investments as a

large share of manufacturing technology was formerly accomplished within individual production programs. One example of an ongoing ManTech effort is the development of affordable composite structures. This program will result in a cost avoidance of more than $450 million, cutting across the spectrum of Army weapon systems including Comanche, Crusader, and the M829E3 Sabot Round.

The purpose of **COSSI** is to insert of commercial technology into fielded systems to reduce operations and support (O&S) costs. Commercially available off-the-shelf technology is modified to meet military needs through a cost-sharing program where the industry partner is expected to contribute 25 percent of the development costs. The insertion of commercial items is expected to reduce O&S costs by reducing the costs of parts and maintenance, reducing the need for specialized equipment, increasing reliability, and increasing the efficiency of subsystems. An example is the adaptation of commercially available sand erosion resistant components into the auxiliary power units of the Apache Longbow to increase the operational life of the unit.

The purpose of the **National Automotive Center (NAC)** is to serve as a focal point for dual-use technologies and applications to military ground vehicles. The NAC is an especially important example of the significant role played by industry to the Army in identifying commercial automotive technologies that can be applied to military systems to reduce our cost of ownership and to provide improved capabilities. The Center is positioned to provide valuable products in both the near-term for product improvements and further out for the needs of AAN. Improved fuel efficiency and cleaner engines are areas where we expect the Center to increase its focus.

The purpose of the **National Rotorcraft Technology Center (NRTC)** is to serve as an innovative partnership of government, industry, and academia to maintain U.S. preeminence in rotorcraft technology. The principal government participants in the NRTC are the Army and the National Aeronautics and Space Administration (NASA), with the Navy and Federal Aviation Administration (FAA) also playing key roles. The rotorcraft industry focal point is the Rotorcraft

Industry Technology Association (RITA), a non-profit corporation which encompasses the major US rotorcraft manufacturers and their suppliers.

LABORATORY INFRASTRUCTURE

The Army laboratories and Research, Development and Engineering Centers (RDECs) are key organizations responsible for technical leadership, scientific advancement, and support for the acquisition process. Army scientists and engineers conduct research, develop technology, act as "smart buyers," and provide systems engineering support to fielded systems for the total Army. Highly motivated, competent, well trained people are essential to the success of the Army S&T strategy. Keeping the in-house workforce technically competent in a rapidly changing environment is a high priority. The Army has initiated five personnel demonstrations at the Missile and Aviation RDECs, ARL, the Waterways Experiment Station, and the Medical Research and Materiel Command. Further S&T Laboratory personnel demonstrations at the Army's remaining labs and RDECs are planned for FY00. In addition, the Army continues to pursue initiatives for reducing and consolidating infrastructure.

CONCLUSION

America's Army is on the leading edge of change. Through our Force XXI process, we are moving to create, shape, test, and field a force prepared to meet the impending challenges of the next century. It is an exciting time for us. We are constantly looking for more efficient and effective ways to do business. And, we are making smart investments in technologies that will pay dividends for decades to come.

Throughout history, America's Army has been the force of choice to fight and win our nation's wars. This fact has not changed in this century, nor will it change in the 21st century. Today's Army is the world's premier land combat force. We must keep it that way. The value of the American soldier in

responding to a full spectrum of crises at home and abroad is unquestionable. More than 60 percent of the participants in 32 of 36 deployments since 1989 have been soldiers.

Our commitment to America's men and women in uniform is steadfast. Soldiers on the ground are our nation's strongest signal of resolve and the ultimate express of American will. America's security and its continued role in maintaining world stability cannot be guaranteed without a first-rate, modern Army.

With your support we will continue to provide our brave soldiers with world-class equipment. Thank you for your interest in Army S&T, and thank you for helping to keep America's Army the world's premier land combat force.