DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE SENATE ARMED SERVICES COMMITTEE

SUBCOMMITTEE ON EMERGING THREATS AND CAPABILITIES

UNITED STATES SENATE

SUBJECT: Fiscal Year 2000 Air Force Science and Technology

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(Acquisition)

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Mr. Chairman, Members of the Subcommittee, and Staff, the Air Force is committed to a strong Science and Technology (S&T) Program. We believe it is the technical foundation for implementing our vision of Global Engagement. We know investment in S&T is crucial to maintaining our technology edge and transforming ourselves into a 21st Century expeditionary aerospace force. Our job in some respects is tougher than it was during the Cold War. We are less certain today who our future adversaries will be or the kinds of technologies they will employ. Advances in weapon-related technologies are proliferating at an alarming rate. Information and space technologies have become dramatic force multipliers as well as potential Achilles' heels requiring a balanced focus on their use as well as defense against adversarial attack. It is increasingly clear that achieving space and information superiority will not only be crucial to the success of any future military action, but that we will also no longer have a near-monopoly in the most advanced technologies required.

THE AIR FORCE S&T PROGRAM

Our strategy is to build a focused, yet balanced, portfolio of Air Force S&T investments to ensure warfighters have the technology they need now and 20 years from now. As technological superiority is increasingly a perishable commodity, we work hard to not only "invent the future" ourselves, but also to introduce new technologies fast regardless of their origin. One way we do this is by aggressively leveraging commercial developments and other government technologies through the use of strategic partnerships. We also rely heavily on U.S. industry and academia to execute the majority of our S&T funds, while performing selected in-house research efforts. Early involvement of industry speeds transition of new technology to the warfighter, allows us a window into current industrial developments,

improves our technology integration skills, and helps us maintain our ability to be "smart buyer" of technology for the Air Force.

The goal of the Air Force S&T Program is to address the needs and opportunities for new technology to support the National Military Strategy, the Joint Vision 2010, and the Air Force Vision of Global Engagement. The S&T investment strategy interfaces with two principal planning activities: (a) the Air Force strategic and long-range planning, derived from Global Engagement and focusing on the realization of an Expeditionary Aerospace Force; and (b) the Defense S&T Strategic Plan executed through Defense Reliance. Air Force S&T directly supports not only Air Force priorities, but DoD objectives and the Air Force is an active, contributing partner in Defense Reliance as documented in Defense Reliance's Basic Research Plan, Defense Technology Area Plan, and the Congressionally-mandated Joint Warfighting S&T Plan. In order to better align ourselves with the Air Force Strategic Plan, we have recently consolidated our individual Air Force Technology Area Plans into a single, integrated Air Force S&T Plan. This plan ensures we properly balance and support the near-, mid-, and far-term needs of the joint warfighter. To ensure program relevance, we employ well-established and effective links to warfighters' current and future needs through the Air Force Modernization Planning Process (MPP). The MPP provides for strong involvement of system developers and warfighters, facilitating inclusion of new capabilities in mission area plans and focusing of efforts on warfighters' most urgent needs. Finally, to ensure the relevance and technical quality of the program, the Air Force Scientific Advisory Board, Defense Reliance Technology Area Review and Assessment Teams, the Defense Science Board, and other peer review groups, such as those commissioned by the National Research

Council, regularly evaluate and critique the programs as well as their organization and management.

In these times of very tight budgets, we must assess our requirements for S&T funding against competing needs within the Air Force budget. As part of the Fiscal Year 2000 President's Budget submission, the Air Force maintained its Basic Research budget at last year's level and its overall S&T budget at nearly last year's level.

This year, the Air Force has begun detailed planning to implement an Expeditionary Aerospace Force. Part of that concept calls for continued migration from an air force to a fully integrated aerospace force which relies on space-based information-gathering and communications technologies to enable lean forces to find, fix, assess, target, track, and engage any potential target, worldwide. As a result, we have adjusted, and will continue to vector, the content of the Air Force S&T Program to focus on technologies, especially space technologies, that support Air Force strategic planning.

Specifically, in Fiscal Year 1999, the Air Force invested approximately 13 percent of the S&T portfolio in space-only programs, with the remainder going to efforts that were either primarily aeronautical technologies or programs applicable to both air and space. By Fiscal Year 2005, we plan to reach a level of S&T investment in space-only efforts of approximately 30 percent while retaining our current level of investment in technologies applicable to both air and space at approximately 25 percent. This shift toward space will include increased research in Space Based Laser, large deployable optics, space-based radar (Discoverer II), reusable space vehicles, hyperspectral imaging, and microsatellites. Placing increased emphasis on space-related technologies will require elimination, reduction, or restructuring of other S&T programs, most of which are non-space in nature. We believe, however, these changes are

necessary to ensure the Air Force invests in the technologies it needs in the 21st Century. The sooner we act in building the technological underpinnings of a truly Expeditionary Aerospace Force, the faster our transformation into a force capable of meeting the challenges of the 21st Century will occur.

STRETCHING LIMITED S&T DOLLARS

The funding level for Fiscal Year 2000 forces us to be very selective about investing in the right technological opportunities. This requires carefully integrated planning by the Air Force Research Laboratory (AFRL) and leveraging our S&T dollars by cooperating with other Services, Agencies, the private sector, and international partners. An example of a well structured Service partnership with industry is the Integrated High Performance Turbine Engine Technology (IHPTET) program designed to significantly improve jet engine propulsion. The Air Force is also partnered with the Defense Advanced Research Projects Agency (DARPA) to demonstrate an unmanned combat air vehicle (UCAV), and with both DARPA and the National Reconnaissance Office (NRO) to demonstrate lightweight, lower power, electronically steerable antennas (ESAs) for Discoverer II. We have strong inter-Agency efforts such as our program in aging aircraft, which is focused on detection and amelioration of corrosion and fatigue in aging structures. It is closely coordinated with civilian aging aircraft research programs at the National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA). The Air Force is also involved in international technology cooperative efforts for S&T such as the Four Powers cooperative technology development programs in tactical missile propellants, insensitive high explosives, and aircraft battle damage repair. This last effort led to the adoption of simple and effective method for doing field repairs on bullet-scarred aircraft windshields. Another type of

international cooperation is the work we are doing in evaluating Russian K-36D ejection seat technology. Lessons learned from this effort will enable higher speed, adverse attitude ejections in current aircraft, and will have possible application to the Joint Strike Fighter as well. It is a natural complement to ongoing Air Force crew escape research efforts that are aimed at finding design solutions for a wider range of occupant sizes and weights, and improving aircrew safety overall. International cooperative efforts help us increase the number of sources for innovative ideas and transition new capabilities to the warfighter. Cooperation in the early stages of technology development also helps to ensure any ensuing technology product will be interoperable with the equipment of potential allies in coalition operations. The Air Force S&T Program is now a highly-leveraged, highly-interdependent, "lean and mean" focused effort that the Air Force considers critical to ensure technological superiority over future adversaries.

Realizing that most deployed technology will remain in use for decades, the Air Force S&T Program not only focuses on enhancing performance, but has begun to put strong emphasis on reliability, maintainability, and affordability of weapon systems. Emphasizing affordability from the very beginning through training of our management and engineering staff, as well as through careful review of technology transition pilot projects, allows us to reduce the costs of technology early in the process. This emphasis on affordability will help us avoid excessive future costs in the acquisition phase and throughout a product's life cycle.

For instance, AFRL researchers developed laboratory test capabilities to facilitate the design, evaluation, and life extension of fighter aircraft tires. Based on field surveys using the F-16, the first generation of Extended Life Tires have exceeded all expectations with an average of 60 landings per tire, a 400 percent increase in service life that translates into

millions of dollars in cost avoidance. AFRL researchers have also flight demonstrated the first "power-by-wire" electric actuator subsystem for flight control on the C-141 "Electric Starlifter" program. The technology will eventually lead to "all-electric" flight controls and the elimination of maintenance-intensive and environmentally hazardous hydraulic flight control systems for both military and commercial aircraft. Other AFRL personnel are researching new aircraft coatings technologies that will lead to environmentally safe, long-life corrosion protection that will last up to 30 years, and mission tailorable topcoats, that will extend the maintenance cycle for repainting aircraft from less than two years to greater than eight years.

We are committed to maximize benefits from technology developments by other government agencies in order to fully exploit the total resources we can bring to bear on Air Force needs. We currently have Air Force laboratory liaisons and joint program managers working alongside personnel from DARPA, Ballistic Missile Defense Organization (BMDO), Director, Defense Research and Engineering (DDR&E), Office of Naval Research (ONR), and National Polar-Orbiting Environmental Satellite System program office run jointly by the Department of Defense (DoD), Department of Commerce (DoC), and NASA. For example, the Air Force provides the Deputy Program Manager for the DARPA-Air Force UCAV program and the NASA-Air Force Space Maneuver Vehicle (SMV) program.

The Space Technology Alliance (STA) was founded to coordinate the development of affordable, effective space technology products among all space technology developers to maximize return on investment. The STA is developing coordinated roadmaps which will increase leveraging and is also evaluating mechanisms. For example, Mighty Sat 1, the first in a series of low-cost AFRL small satellites which will demonstrate component technologies in a space environment, was launched from the Space Shuttle in December 1998. Mighty Sat I is

demonstrating important new technologies for advanced power, structures, electronics, deployment mechanisms, and sampling the space environment. The pervasive impact of Air Force Space S&T is huge. For example, 90 percent of all U.S. satellites (government and commercial) incorporate AFRL-developed electronics technology. The Air Force Office of Scientific Research (AFOSR) funds research projects across the country in critical areas that will contribute to future Air Force military capabilities. One exciting research collaboration is a microsatellite study called TechSat-21 which is developing the necessary capabilities to design and launch low-cost, flexible constellations of small satellites capable of carrying on necessary operations in space. Contributors to this AFRL program include the University of Kansas with algorithms for multi-dimensional signal processing, Carnegie-Mellon University with an innovative approach to satellite station keeping using solar pressure, and New Mexico State and Boston University developing techniques for building micro- and nano-satellites. AMPTECH, Inc. of Bedford, Massachusetts, and the AFRL Space Vehicle Directorate located at Kirtland Air Force Base, New Mexico, join these universities in the pursuit of space superiority.

The Air Force recognizes it is in the best interest of national security to have low-cost reliable access to space. While NASA has the lead in developing reusable launch vehicle (RLV) technology efforts, the Air Force has been the lead for ensuring technologies to support unique military requirements for reusable launch vehicles are developed. After the line item veto of the $10 million for the military spaceplane in Fiscal Year 1998, it became known as the Space Operations Vehicle (SOV) system, which includes an SOV launch vehicle (LV) and an upper stage like the Space Maneuver Vehicle (SMV). The SMV is envisioned to be a reusable, unmanned upper stage or spacecraft with integral propulsion that completes an on-

orbit mission, reenters the atmosphere, and lands for retasking. On August 11, 1998, a 90 percent scale model SMV demonstrator made a very successful first flight at Holloman AFB, New Mexico. This unmanned vehicle demonstrated an autonomous, unpowered approach and landing following release from an Army helicopter 9,000 feet above the ground. As the next step in developing SMV technologies, the Air Force has recently partnered with NASA following their selection of Boeing's X-37 Advanced Technology Vehicle (ATV) as a Future-X Pathfinder concept. The Air Force is investing an additional $11.1 million (Fiscal Years 2000-2002) beyond the $10 million in Fiscal Year 1998 funds to make the ATV more SMV-like (i.e., more militarily useful, by primarily increasing its ability to stay on-orbit and to maneuver).

DUAL-USE TECHNOLOGIES

The Air Force promotes the development of dual-use technologies in order to leverage commercial technology for military needs wherever possible. This commercial leverage strategy is essential in today's economic environment. Historically, the Air Force has played a significant role in the development of technologies that benefited not only the military, but also the private sector. Technologies such as turbine engines, composite materials, rocket propulsion, wireless communications, and information processing are excellent examples. We know that if we can work with the commercial sector to pursue military and commercial business based on the same technology, we can save costs in technology development, as well as later in production by taking advantage of the larger economies of scale. The Air Force has two dual-use programs that push toward these objectives, the Dual-Use Science and Technology (DU S&T) program and the Commercial Operations and Support Savings Initiative (COSSI) program.

The DU S&T program jointly funds research projects with industry for the development of dual-use technologies to solve specific technical problems. A dual-use technology is defined as a technology that has both military utility and commercial potential that is 50 percent cost-shared with the non-federal partner. The DU S&T program ensures all projects yield military value and that the industrial contribution can be characterized by "spin-on" of commercial technology for the benefit of reducing the cost and for enhancing the performance of Air Force systems, subsystems, and components. We have just completed the third annual solicitation and anticipate award of 19 Fiscal Year 1999 projects. There are 48 projects started under the Fiscal Year 1997 and Fiscal Year 1998 solicitation for a total approximate cost of $180 million of which the Air Force has invested roughly $42 million, or one quarter of the total project cost.

A model dual-use example is the Future Air Navigation and Traffic Avoidance Solution through Integrated Communication/Navigation/Identification (or FANTASTIC) program. FANTASTIC is aimed at developing technologies to allow both civil and military aircraft owners to do affordable retrofits to comply with civilian airspace navigation regulations with minimum impact. The Air Force has partnered with Rockwell-Collins to combine several avionics packages onto one standard aviation-size computer board, called a SEM-E module. Retrofitting aircraft using FANTASTIC will dramatically reduce the part counts, costs, and time to comply with new regulations. The potential cost avoidance associated with this new technology is estimated in the billions of dollars.

The Radiation Tolerant Electronics Program, a partnership between National Semiconductor Corporation (NSC) and the Air Force started in Fiscal Year 1998, is another good example. Through the DU S&T program, the Air Force has partnered with NSC to

upgrade NSC's fabrication lines to produce electronics that meet Air Force requirements, yielding a three-fold increase in radiation tolerance over the existing commercial fabrication facilities. This will provide the Air Force lower cost, commercially available technology for use in future military space systems. This program was the first of the Air Force Fiscal Year 1998 projects initiated and is already producing radiation tolerant electronics six months ahead of schedule.

The COSSI program's mission is to implement a process that reduces DoD Operations and Support (O&S) costs by routinely inserting commercial components into fielded military systems. Typical technology areas include computers, electronics, software, information systems, open system architectures, advanced materials, and manufacturing processes. COSSI is currently focused on sustainment issues with Air Logistics Centers being key participants. There were six Air Force COSSI projects selected from the FY 1997 solicitation. However, in compliance with Fiscal Year 1998 Congressional language directing no new solicitations be initiated until Fiscal Year 1999, there was no Fiscal Year 1998 COSSI solicitation. The six Air Force COSSI projects from the Fiscal Year 1997 solicitation total approximately $51 million of which 51 percent was paid by the industry partner. The Fiscal Year 1999 COSSI program issued a solicitation in October 1998 and selected four programs in March 1999, with several others still being evaluated.

Several COSSI projects highlight the success of this program. The mini-MUTES (Multi-Threat Emission Simulator) Electronic Warfare Training System will replace the current computer, which is old and unreliable, with a commercial off-the-shelf Versa Module Europa (VME)-based computer. The project is on track for successful completion in Fiscal Year 1999 and a contract has been negotiated to purchase the kits. The estimated operations and support

cost savings are more than $100 million. Similarly, the data distribution kits for Mobile Command Centers will replace an obsolete network infrastructure with one employing asynchronous transfer mode and Synchronous Optical Network technologies. The project is scheduled for completion in April 1999, and funding is budgeted to purchase the kits in Fiscal Year 2000. Operations and support cost savings are projected at more than $30 million.

LINKS TO MANUFACTURING TECHNOLOGY (ManTech)

ManTech is a keystone Air Force affordability program that is a natural companion to the Air Force S&T Program. ManTech focuses on process improvements, cycle time reduction, and commercial/military integration. A pervasive program, ManTech works with industry, academia, and government organizations. Program benefits are found in both new acquisitions and in fielded systems.

The Air Force ManTech program has had two primary customer areas: aircraft and missiles/munitions. Beginning in Fiscal Year 1999, the program increased its emphasis on sustainment and space. Improvements in sustainment not only offer a tremendous opportunity on extending the service life of many of our legacy systems, but also are a necessity to reduce operations and support costs. Further, as the Air Force increases its activity in space, it is imperative that spacecraft and launch operations remain affordable and maximize adaptation to and adoption of commercial practices.

The ManTech program has three thrust areas: advanced industrial practices; processing and fabrication; and manufacturing and engineering systems. The processing and fabrication thrust focuses on shop floor issues for metals, non-metals, and electronics. Affordable, capable processes are crucial in both acquisition and sustainment. A recently completed ManTech metal forming simulation targeted the fluid cell press at Warner Robins

Air Logistics Center used to form sheet metal parts for the F-15, C-130, and C-141 aircraft. The effort resulted in a significant reduction in time and material used in the manufacture of these complex aircraft replacement components.

An Air Force Research Laboratory success story, that offers the potential to lower the cost of manufacturing and maintaining Air Force aerospace systems containing composite parts with complex geometry, is the development of a laser ultrasonic nondestructive inspection system. The use of reinforced composite materials in Air Force weapon systems has increased in recent years, progressively moving from small non-structural parts applications to complex major components such as the midfuselage section for the new F-22 Raptor. Lockheed-Martin Tactical Aircraft Systems will use the laser ultrasonic inspection system to reduce the costs for the F-22 by reducing the test cycle time by more than 90 percent. While conventional ultrasonic testing machines require nearly 24 hours to inspect a composite inlet duct for the F-22, the laser ultrasonic testing system can complete the same test in less than two hours.

Significant benefits have been achieved through ManTech's Lean Aerospace Initiative (LAI). Led by the Air Force Aeronautical Systems Center (ASC), LAI is now a collaborative effort with 19 U.S. defense companies; the Army, Navy, and Coast Guard; the Defense Logistics Agency; the Defense Advanced Research Projects Agency; the National Aeronautics and Space Administration; the Massachusetts Institute of Technology (MIT); and representatives of organized labor. The LAI is co-chaired by ASC, industry, and MIT. A recent survey has provided a multitude of successes in applying lean principles in industry. For example, Raytheon has applied lean modular factory concepts to the AMRAAM production line to optimize material flow, streamline procurement, and reduce lead-time. The effort has resulted in a 25 percent reduction in AMRAAM cycle time and a 50 percent inventory reduction.

THE FUTURE OF COMMERCIAL-MILITARY-INDUSTRY ALLIANCES

The Air Force is committed to increasing our reliance on cooperative research projects with industry. We believe the Dual-Use Application Program (DUAP) and ManTech will allow the Air Force to take greater advantage of the competitive pressures and market-driven efficiencies that have led to accelerated development and savings in the commercial sector. Congress has been helpful in providing funds, although in Fiscal Year 1999 Congressional cuts in the President's Budget slowed our progress. The Air Force is concerned, however, by two specific requirements under DUAP. First, Congress has set objectives for the Services to obligate 15 percent (Fiscal Year 2001) of their total 6.2 budgets for dual-use projects. This goal is about twice as high as what we believe is achievable. The Air Force 6.2 funds are not exclusively used for contracts with industry, but also for grants to universities, and for the bulk of its intramural laboratory research program. Moreover, not all technology areas (such as munitions) are good candidates for dual-use.

Secondly, the Air Force would like to ask for a greater flexibility in the requirement for cost sharing. Presently, 50 percent of the cost of a dual-use project must be borne by industry using non-Federal funds. A range of 25 to 75 percent would permit more flexibility and expand the number of potential partners. For example, a small but cash-strapped business may be reluctant to participate at the 50 percent level, but would likely participate if the requirement were lowered to 25 percent.

If the United States is able to take advantage of technological advances in the commercial sector, potential adversaries will be able to do so as well. Therefore, while we must maximize the exploitation of commercial technology in order to save costs, we must still stay ahead in critical areas such as information-related sciences and space-related technologies.

That is why we must continue to invest in the development of specific technologies which integrate and leverage commercial technology for military superiority. These include advanced air- and space-borne sensors, information fusion techniques, automated targeting and detection, warfighter training, combat identification, information security, affordable launch-on-demand, and jam-resistant battle management and communications. Specific technologies such as these are key to making sure our warfighters dominate future battlefields even though our force structure will be smaller and we will be facing adversaries with easy access to state-of-the-art equipment.

IMPACT OF AIR FORCE S&T

The Air Force must prepare for worldwide availability of advanced weapons, wide-ranging terrorist activities, increasing regional instabilities, and other emerging and less predictable threats. We must develop technologies that permit flexible, yet lethal forces capable of operating far from home on short notice. We must also be able to afford these new capabilities once we develop them. To meet these challenges, we want the most promising technologies in order to project our forces, minimize collateral damage, and win decisively.

We continue to invest in militarily critical areas where there is no commercial market. For example, the Enhanced Recognition and Sensing Ladar (ERASER) program is quadrupling the range (up to 20 kilometers) for combat identification of ground targets by adding laser radar (ladar) image "snapshot" technologies to existing forward looking infrared (FLIR) equipment. This technology will allow weapons to be employed at longer standoff ranges and will help reduce incidents of fratricide. The Low-Cost Autonomous Attack System (LOCAAS) will develop a powered low-cost miniature munition capable of flying to a

designated target area and autonomously searching, detecting, identifying, and attacking prioritized military targets.

Our investment in S&T has been good for America. We are able to explore the widest range of technology options, cull those with lower potential payoffs, and select the best candidates for further development. We continue to be a crucial element in training future generations of America's scientists, engineers, and technical leaders. For example, approximately two-thirds of Air Force basic research is performed by universities with the involvement of thousands of engineering and science students. We also serve as a national reference source to assist non-military agencies in solving technical problems that have a significant military component.

Our long-term outlook results in payoffs for both warfighters and for the American people. The Air Force laboratory system played an integral role in the development of stealth technology for the B-2 bomber. As a result of our investment in stealth and our recognition of the importance of lightweight, high-strength materials, our technology programs paved the way for the now widespread use of composites in the commercial sector.

Likewise, the commercial turbine engine industry has benefited significantly from long-term investment in turbine engine technologies. Even basic research in militarily-unique areas can have a significant commercial payoff. For example, fundamental research into adaptive processing techniques aimed at reducing the effect of radar jamming has led to the ability to squeeze more cellular phone channels into narrow frequency bands.

Thus, while we are dedicated to developing militarily-relevant technologies, we also feel a responsibility to make applicable technologies available for commercial use with the result being enhancement of the economic vitality of the nation.

TRANSITIONING RESEARCH RESULTS TO APPLICATIONS

In general, the three parts of S&T investment serve different, yet interconnected functions in technology development: Basic Research (6.1) seeks an expansion of the engineering and scientific knowledge base in militarily-relevant disciplines; Applied Research (6.2) focuses on laboratory development of new (and often multidisciplinary) technologies based on these principles; and Advanced Technology Development (ATD) programs (6.3) take maturing technologies to demonstrate their utility in military environments. For example, 6.1 research resulted in the ability to grow high-density nickel alloys into a single, strong crystal; 6.2 research yielded the ability to grow these crystals to the size and shape of a turbine engine blade; and 6.3 research proved the military utility of single crystal blades by using them in core engine demonstrators.

Some of the more mature technologies developed under the ATD program provide the basis for Advanced Concept Technology Demonstrations (ACTDs). ACTDs are closely tied to immediate (usually joint) user needs, prove operational utility, and effect in situ technology transition by leaving a residual capacity once the demonstration is completed. The Air Force currently participates in 24 ACTDs. The ACTD process gives us the opportunity to move fast and involve the warfighter early; it also couples us to other Services and DoD Agencies. An example of an ongoing ACTD, Miniature Air Launched Decoys (MALD), recently completed a successful flight test and the Air Force is looking at plans to transition this capability.

An example of a revolutionary technology area in which we are increasing our investment and, at the same time, transitioning mature components to the warfighter is directed energy. The Airborne Laser Program was born out of laser technology programs dating back to the early 1970's. The Secretary and Chief of Staff of the Air Force are supportive of

increased Air Force investment in directed energy; in fact, they have sponsored several studies and have chartered a directed energy task force to identify additional opportunities beyond ABL and to draft a roadmap towards achieving goals such as a Space Based Laser.

Another way in which the Air Force speeds transition of technology is by contracting out the majority of the S&T budget to industry and academia, while the remainder goes to in-house laboratory research programs. This strategy allows the Air Force to be a "smart" buyer of technology, provides the capability for technical support to operational users, maximizes taxpayer return on investment, facilitates rapid technology transitions from academia or AFRL to industry, and back from industry to our weapons and systems programs.

CONCLUSION

The Air Force is committed to providing the advanced technologies needed to ensure we remain on the cutting edge of technology, performance, military flexibility, and affordability. By investing in a focused selection of technology developments, we are able to advance those technologies with the highest payoff and manage their transition into warfighting capabilities. The close cooperation of AFRL with industry, academia, and other agencies has forged partnerships that are the bedrock of future modernization.

The superior weapon systems of today's Air Force and our sister Services exist because of ideas and technologies developed by teams in our laboratories, universities, and industry. Future warfighting capabilities are dependent upon the continuation of this successful legacy of innovative technology development, demonstration, and transition into weapon systems. Our challenge is to adapt to the faster pace of technology introduction, to the more wide-spread availability of high-tech products, and to the need to not only consider performance but also cost. As an integral part of the Defense S&T team, we look forward to working with

Congress to ensure a strong Air Force S&T Program in order to achieve our vision of an integrated air and space force capable of rapid and decisive global engagement.