

**DEPARTMENT OF THE AIR FORCE**

**PRESENTATION TO THE HOUSE ARMED SERVICES COMMITTEE**

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CAPABILITIES**

**UNITED STATES HOUSE OF REPRESENTATIVES**

**SUBJECT: Fiscal Year 2007 Air Force Science and Technology**

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## ***INTRODUCTION***

Mr. Chairman, Members of the Subcommittee, and Staff, I very much appreciate the opportunity to provide testimony on the Fiscal Year 2007 Air Force Science and Technology (S&T) Program. As the nation continues to fight the Global War on Terrorism, we are faced with a new security environment and Air Force leadership recognizes the increased value of its S&T Program in maintaining our superiority against irregular, traditional, disruptive, and catastrophic threats. The Air Force is committed to defending America by unleashing the power of science and technology to counter terrorism both at home and abroad. We are aggressively pursuing high payoff technologies focused on current and future warfighting capabilities. The Air Force S&T Program enables us to achieve our vision of becoming an integrated Air and Space Force capable of rapid and decisive global engagement anywhere, anytime.

The Air Force Fiscal Year 2007 President's Budget request for S&T is over \$2.1 billion, which includes \$1.7 billion in "Core" S&T efforts with remaining funds supporting classified Special Programs and devolved efforts, such as High Energy Laser efforts. These investments sustain the strong foundation of basic and applied research and advanced technology development efforts needed to support future warfighting capabilities. This broad and balanced S&T investment provides Air Force leadership with opportunities to respond quickly to the threats of today and those of tomorrow. Our prompt response to the Global War on Terrorism with the technologies needed to defend against unconventional adversaries is but one example of the flexibilities and capabilities provided by our S&T Program. We are able to deal with the uncertainty of tomorrow because of our broad investment in S&T today — an investment geared towards winning decisively, protecting our forces, and minimizing collateral damage at anytime and any place in the world.

### ***VALUE OF AIR FORCE S&T IN A NEW SECURITY ENVIRONMENT***

In the new security environment in which we are forced to operate, it is clear that a key component in meeting the challenges ahead is a solid investment in our S&T Program. This investment not only provides the warfighter with capabilities needed to meet today's threats, but also provides the support needed to identify future S&T focus areas that will provide tomorrow's warfighter with needed capabilities to meet the challenges of a new era.

In Fiscal Year 2006, there are many examples of Air Force S&T efforts directly supporting the warfighter in ongoing operations, and also in combating the Global War on Terrorism. I will address some of these in more detail later in my testimony. However, efforts such as day/night, all-weather, electro-optical/infrared laser countermeasures for MAN Portable Air Defense Systems or MANPADS; low-collateral damage munitions; and Battlefield Air Targeting Man-Aided kNowledge or BATMAN – an integral part of the Battlefield Air Operations Kit – all provide real-time support to today's warfighter and address the challenges of this new environment. At the same time, we are also focused on traditional threats with developments such as improved interoperability between manned and unmanned vehicles; responsive, tactically significant space capabilities; aerospace information dominance; and improved performance, durability, and fuel efficiency through the Versatile, Affordable Advanced Turbine Engine or VAATE program. Other efforts such as airborne active denial; directed energy weapons protective materials for sensors and humans; and bio-inspired materials are all being looked at to address emerging disruptive threats as well.

The Air Force recognizes the S&T contribution to these threats, as well as its overall contribution to future warfighting capabilities. This is reflected by Air Force senior

leadership meeting earlier this month for the Air Force's annual S&T Portfolio Review, and the increase in this year's S&T investment. The Fiscal Year 2007 President's Budget request for Air Force S&T reflects a positive increase over the Fiscal Year 2006 request. Our funding request for "Core" S&T efforts in Fiscal Year 2007 is over \$200 million higher than in Fiscal Year 2006 and represents real growth of 11.5 percent. A more reasonable measure, however, is to look at composite real growth over the period from Fiscal Year 2005 to Fiscal Year 2007. This takes into account Fiscal Year 2006 reductions that, when viewed alone against our Fiscal Year 2007 program, result in unrealistically high real growth. When looking at composite real growth, you get a more accurate 2.6 percent. I believe this increase and the aforementioned portfolio review represent an Air Force commitment to its S&T Program and recognition of its importance to future warfighting capabilities.

### ***AIR FORCE TECHNOLOGY VISION***

The Air Force has recently adopted a new technology vision – Anticipate, Find, Fix, Track, Target, Engage, Assess – Anything, Anywhere, Anytime. This technology vision, which was born in our Air Force Research Laboratory, builds on the Air Force's traditional kill chain construct by focusing it on the technology challenges presented by the Global War on Terrorism. It provides a tight link to the Air Force's capabilities-based planning and Capability Review and Risk Assessment (CRRA) processes. Our proactive program guidance ensures the Air Force S&T Program meets the capability needs of today's warfighter, while maintaining investments in those technologies that will ensure technological superiority and avoid technological surprise in the future.

## ***AIR FORCE S&T GUIDING PRINCIPLES***

The Air Force is committed to maintaining world-class in-house military and civilian intellectual capital. Our number one S&T guiding principle is “People.” This commitment is reflected in the use of the various flexibilities afforded the Air Force under the Laboratory Personnel Demonstration program or Lab Demo. In addition, the joint Science Mathematics and Research for Transformation – or SMART program – and other recruiting programs are also helpful in building intellectual capital and supporting the growth of future Air Force technical leaders.

Our second S&T guiding principle is one in which we seek a “Balanced Portfolio” between near-, mid-, and far-term investments. As a goal, no less than 15 percent will be allocated to our core 6.1, Basic Research efforts. Game changing opportunities for technological superiority and emerging threats to our superiority shall guide the investment strategy of these activities. Further, as a goal, no less than 30 percent of the S&T portfolio will be allocated to 6.3, Advanced Technology Development efforts, to meet the needs of technology transition and real-time support to the warfighter. To ensure a harder link to our capabilities-based planning process, we have introduced a new planning framework called Focused Long-Term Challenges or FLTCs. These FLTCs build upon the Long-Term Challenges identified in the comprehensive S&T Planning Review undertaken several years ago at the direction of Congress and will guide the investment of the remaining portfolio to include 6.2, Applied Research efforts, as well as the remaining 6.1 and 6.3 efforts.

Our third S&T guiding principle is to maintain a “Broad Investment” in the far-term. In a continuing effort to avoid technological surprise on the battlefield, maintaining a broad investment in 6.1, Basic Research across a myriad of technologies ensures the Air Force will maintain our technological superiority for generations to come.

“Honoring Commitments” is our fourth S&T guiding principle. We are committed to leveraging and synergizing our S&T investment through our Memoranda of Agreement and similar commitments with our sister Services and Defense Agency partners. Our commitment to the Office of the Secretary of Defense’s Reliance process, evidenced by our ongoing investment of fifty percent of our S&T portfolio in efforts supporting Defense Technology Objectives, also provides an avenue for the Services and Defense Agencies to benefit from each other’s S&T investments. In addition, our commitment to programs such as the Versatile, Affordable Advanced Turbine Engine or VAATE program provides innovative cost-share relationships with industry. Other equally important commitments include those to our allies and the North Atlantic Treaty Organization (NATO). Finally, rounding out the list is the United States Congress and our continuing commitment to ensuring that Congressional intent is met as we execute our program.

Last, but not least, of our S&T guiding principles is “Technology Transition.” The Applied Technology Council or ATC fosters top-level user involvement in the transition of technology from the laboratory to the system developer to the operational user. In addition, our efforts in the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) and the Manufacturing Technology (ManTech) programs are further examples of programs where we are seeking to improve technology transition. In fact, we are grateful for the Congressional direction contained in the National Defense Authorization Act for Fiscal Year 2006 authorizing the use of a small percentage of SBIR funds as part of the Commercialization Pilot Program to aid in the transition of technology, products, and services developed under SBIR to Phase III efforts and into the acquisition process. The Air Force appreciates this opportunity provided by Congress and is exploring options for improving the program’s technology transition. Coupling these efforts with a focus on more disciplined Systems Engineering in the pre-acquisition

planning phases will further strengthen the Air Force transition process resulting in acquisition programs with the latest technology and more mature technical planning and credibility.

### ***FISCAL YEAR 2007 BUDGET CHALLENGES***

Our Fiscal Year 2007 S&T investment reflects the challenges of the new security environment facing us. This new environment requires our investment in S&T meet four threat challenges: Irregular or unconventional methods adopted and employed by non-state and state actors; states employing traditional advanced military capabilities and recognizable military forces in long-established, well-known forms of military competition; international competitors developing disruptive breakthrough technological capabilities intended to supplant U.S. advantages in particular operational domains; and acquisition, possession, and employment of weapons of mass destruction (WMD) or methods producing catastrophic WMD-like effects.

Guided by our recently adopted technology vision, the Air Force has focused its investment on both near- and long-term technologies to provide the warfighter with the capabilities needed to combat the enemy in any of these diverse environments. As you might expect, we are focusing our near-term efforts against countering irregular and traditional challenges associated with ongoing operations, while simultaneously addressing disruptive and catastrophic challenges that threaten our nation in the far-term.

The following are a few near-term efforts currently being developed within our Air Force S&T Program in support of our warfighters and the continuing Global War on Terrorism. Currently, operational aircraft do not have the capability to either detect or counter passive Electro-Optical/Infrared (EO/IR) tracking systems, which are increasingly being used by surface-to-air missiles. Day/Night EO/IR Tracker Countermeasures

(DETCM) would employ laser scanning to detect these threats and incorporate an improved laser-based Closed-Loop Infrared Countermeasures (CLIRCM) technique to defeat the tracking function. Successful implementation will significantly enhance aircraft survivability in scenarios where the threat includes adjunct EO/IR acquisition and tracking systems operating with radio frequency (RF), IR, and laser beam rider-guided missiles and anti-aircraft artillery. We also have focused efforts on Low-Collateral Damage (LCD) munitions. Conventional bombs pose risks for civilian casualties and infrastructure damage in urban environments. LCD munitions would allow a highly localized lethal footprint to support Military Operations in Urban Terrain. This capability would give the Air Force more flexibility in engaging and prosecuting targets. Additionally, with the increasing numbers of Unmanned Aerial Vehicles (UAVs) of all sizes operating in the same air space as manned aircraft, it is imperative that all these aircraft operate safely and without impeding each other. To address this issue, the Air Force is currently developing advanced flight control automation and adaptive algorithms for UAVs; improved aircraft design that will result in less drag, better engine performance, and reduced fuel consumption; and photonic sensing and flight controls. One last near-term effort that I would like to highlight today is focused on a very high priority of the Secretary of the Air Force – improved fuel efficiency. Within our VAATE program, we are developing and demonstrating technologies that improve turbine engine capabilities and affordability, including new lightweight fan rotors, by-pass ducts, front frames, augmentor technologies, and low-pressure turbines, fan dampening hard coatings, reduced cooling combustor liner, turbine thermal barrier coatings, new alloy turbine vanes, and high performance ceramic ball bearings. The benefits of this technology will include increased performance, weight savings, significantly improved engine hot time life, and lower cost.



As previously mentioned, we are concurrently researching solutions to disruptive and catastrophic threats – both offensive and defensive. For example, command and control technology efforts are providing the next generation of weapon systems with improved processing and presentation of information for real-time, distributed battle management. Advances in the ability to classify, identify, and track objects and events will improve the understanding and prediction of enemy intentions, allowing the development of effects-based courses of action to counter their intentions. These efforts will advance information management and dissemination technologies to ensure the delivery of high-quality, timely, secure information to the warfighter. Another exciting far-term technology is Microsatellites. Indications are that other nations, not all of which are friendly to the United States, are developing capabilities that could threaten our space systems. Since space dominance has provided an asymmetric advantage to the United States, we must develop and are developing technologies to detect future threats, understand the capabilities and intentions of those threats, and protect our space systems from them. One example is the Experimental Satellite System-11 or XSS-11 – a highly mobile, proximity operations effort. Another example is the MicroElectroMechanical System or MEMS-based PICOSAT Inspector also known as MEPSI, which will enhance satellite command and control operations by providing an active on-board imaging capability to assess spacecraft damages from man-made or environmental threats, monitor launch operations, and augment servicing operations. Yet another promising area is active denial non-lethal weapons technology. The Air Force is working on developing, demonstrating, and transitioning the enabling component technology required for an airborne non-lethal directed energy weapon. In Fiscal Year 2007, the Air Force will begin development of a test capability to enable final validation of a full power source for airborne applications. Efforts will continue to refine existing beam control/antenna

concepts to meet airborne requirements, to include addressing issues related to propagation and aim breakdown. It will be necessary to research, study, and identify technology or data (effects, safety, stabilization, engagement) requirements impacting the overall airborne conceptual approach. Challenges will include high-efficiency millimeter wave sources and antennas; new materials for power and millimeter wave sources; and multi-megawatt, lightweight power generation among others. One last area that I'd like to highlight is nanotechnology. Nanotechnology provides for the understanding and control of matter at dimensions of roughly 1 to 100 nanometers, where unique phenomena enable novel applications. The ability to build things atom-by-atom and molecule-by-molecule will provide for new classes of structural and electronic materials. Nanotechnology will enable Air Force systems to be lighter, stronger, smarter, cheaper, cleaner, and more precise. For example, in nanoelectronics, basic research seeks to understand the techniques needed to control growth of self-assembled quantum structures, connections to the structures, and combinations of both, which will lead to development of quantum computing systems and nanosensor and detector systems capable of collecting, processing, imaging, and communicating massive amounts of data with minimal size, weight, and power consumption. Nano-Enabled Materials – engineering materials at the nanoscale – will enable new or dramatically improved functionality for electronic, magnetic, photonic, and structural materials.

## ***CONCLUSION***

In conclusion, we are undertaking lots of exciting projects this year, but we are not without our challenges and we will be addressing them as the year progresses. Some of these challenges include transforming S&T processes under the Secretary's SmartOps 21

initiative, striving to make energy efficiencies a consideration in our S&T decisions, and strengthening the link between S&T and the intelligence community just to name a few.

Our Fiscal Year 2007 budget builds on past S&T successes and reflects our five guiding S&T principles and operating tenants that have served the Air Force well for over sixty years. With over \$2.1 billion, representing composite real growth of 2.6 percent, today's Air Force senior leaders have shown their commitment to supporting an Air Force S&T Program that is positioned to meet the challenges of this new security environment.

Mr. Chairman, thank you again for the opportunity to present testimony and thank you for your continuing support of the Air Force S&T Program.