

**DEPARTMENT OF THE AIR FORCE**

**PRESENTATION TO THE HOUSE ARMED SERVICES COMMITTEE  
SUBCOMMITTEE ON TERRORISM, UNCONVENTIONAL THREATS AND  
CAPABILITIES**

**UNITED STATES HOUSE OF REPRESENTATIVES**

**SUBJECT: Fiscal Year 2010 Air Force Science and Technology**

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## ***INTRODUCTION***

Mr. Chairman, Members of the Subcommittee, and Staff, I am pleased to have the opportunity to provide testimony on the Fiscal Year 2010 Air Force Science and Technology (S&T) Program.

The Air Force S&T Program is a subset of the larger Research and Development (R&D) enterprise and is poised to discover, develop, and demonstrate technologies that are sufficiently mature to transition into legacy systems and new system developments. This enterprise provides new and advanced warfighting capabilities plus the technical and intellectual capital essential for future capabilities – it is also one of the critical elements in maintaining a viable national industrial base. Coupled with this enterprise, the concept of prototyping is also essential to securing future warfighting capabilities and maintaining the industrial base. Government and industrial design teams need a structured environment in which to practice and maintain their expertise and the Air Force helps provide this environment through our support of robust, full-scale and sub-scale prototyping that is broadly based on anticipated future capability needs. S&T is also essential for acquisition excellence by ensuring technology is delivered at the right maturity level, at the right insertion date, and with the right performance to meet the needs of acquisition programs. Towards this end, advanced systems engineering planning for future concepts is strengthening the acquisition process by reducing risk and enhancing technology transition.

For the past two years, I have spoken extensively about adapting Air Force S&T to the security environment identified in the 2006 Quadrennial Defense Review and shifting investment emphasis from traditional or conventional threats to address new threats, such as terrorism. Balancing investments to prepare for a wide range of future contingencies is a challenge that involves maintaining military superiority against near-peers with traditional threats, while

addressing terrorists with unconventional weapons and tactics. The Air Force S&T Program continues to address this challenge by shifting investments among a broad portfolio to attain a balance between near-term capability support, sustainability of existing systems, operations requiring more efficient fuel usage, enhanced manufacturing capabilities, and revolutionary technologies that address far-term warfighting needs.

### ***AIR FORCE S&T FISCAL YEAR 2010 PRESIDENT'S BUDGET REQUEST***

The Air Force Fiscal Year 2010 President's Budget Request for S&T is approximately \$2.2 billion, which includes \$2.0 billion in "core" S&T efforts with the remaining funds supporting devolved programs to include High Energy Laser efforts and the University Research Initiative. These investments sustain a strong and balanced foundation of basic research, applied research, and advanced technology development to provide demonstrated transition options to support future warfighting capabilities. This year's budget request includes an increase of \$98 million or almost four percent real growth over the Fiscal Year 2009 "core" request. This healthy increase reflects the continued strong support of Air Force leadership for its S&T Program.

In keeping with Secretary Gates' objective to reshape our defense establishment priorities and, given the current budget environment, the Air Force has started the process to reduce the number of Advanced Technology Demonstrations and refocus this funding on basic and applied research, and on early advanced technology developments. While supporting current warfighting operations when needed, we are taking a longer term view of where we want to invest current resources to be ready for the next system deployment and to ensure our S&T Program is postured to address both the traditional and unconventional threats with which we might be faced. In

addition, we are focusing on sustaining legacy capabilities during these times of austere budgets and fewer new system developments.

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

In 2005, the Air Force established five principles to guide the S&T Program. They continue to be sharpened and are providing a comprehensive framework for our larger R&D strategic planning. The following five guiding principles reflect the current order of Air Force S&T priorities:

- **Value and Protect People** – Recruiting, developing, mentoring, and retaining the best and brightest Scientists, Technologists, Engineers, and Mathematicians in the S&T community is my number one priority.
- **Maintain Stability and Balance in the Portfolio** – Keeping the right balance is always a challenge and we continually assess these goals to ensure the right investment is in place to quickly respond to the threats of today and anticipate the challenges of tomorrow.
- **Focus Technology Development on Air Force Strategic Priorities** – Our S&T Program focuses technology investments on winning today's fight, while modernizing our air, space, and cyber inventories for the future, and is a foundation for recapturing acquisition excellence.
- **Transition Technology to Warfighters and System Developers** – Finding new and improved ways of transitioning technologies directly to the warfighter in the field and into our weapon systems acquisitions is an area that receives special attention as evidenced by the stand up of a new Technology Transition Office within Headquarters Air Force last year.

- **Honor Commitments with Our Partners** – Whether our commitments are with others in the Air Force, our sister Services and Defense Agencies, the Office of the Secretary of Defense, industry, academia, our allies, or Congress...Air Force S&T will deliver on our commitments.

Addressing these five S&T guiding principles is essential to maintaining a well-rounded S&T Program that supports Air Force priorities and core functions.

### ***FISCAL YEAR 2010 S&T INVESTMENT HIGHLIGHTS***

This budget request focuses investments to mature the technologies needed to address the modernization and development plans for the future. We continued to shift S&T investments from traditional areas to support unconventional warfare. A specific goal of the 2008 Air Force Strategic Plan is to bolster the Air Force core function of Intelligence, Surveillance, and Reconnaissance (ISR) support to the joint warfighter, emphasizing irregular warfare scenarios. The S&T Program is developing unprecedented proactive ISR technologies to create a universal situational awareness through a layered and flexible sensing architecture. Air, space, and cyber ISR technologies are being developed that will respond to the Commander's current and future requirements to collect, process, and distribute knowledge and information.

We have also increased investment in technologies, such as meta-materials, to decrease antenna aperture size and mass, increase gain and bandwidth, and reduce loss and power required. Persistent surveillance research and technology development being conducted will allow all-weather, day-night, continuous tracking of vehicles in an urban environment and dismounts showing anomalous behavior, such as Improvised Explosive Device deployment, while providing infallible forensics to track backward from any event.

In the space domain, we continue to highlight ISR research and develop technologies that are more responsive to the warfighter and ensure a space situational awareness. The ability to detect, track, and identify, as well as provide on-demand, highly detailed characterization of individual space objects and near-real-time, high-fidelity forecasts of space environmental effects are all prevalent space situational awareness challenges we are addressing. Defensive counterspace activities also continue to be emphasized in this year's budget and the Air Force is developing technologies to detect, understand, and mitigate the threats in the space environment across the full-range of natural and man-made sources. Such technologies include real-time proximity sensing, threat warning, nuclear detonation remediation, and survivable space electronics.

We also increased investment in smaller, plug-and-play types of satellites that offer more responsive construction and launch. Our microsatellite activities have led to new satellite acquisition concepts, leveraging small satellites to deliver essential ISR and communications capability to the warfighter faster.

ISR in the cyber domain is becoming paramount in maintaining our technological superiority and mission assurance in every domain. The goal is not to wait until after a cyber attack occurs and then analyze what happened, but to conduct ISR activities in real-time and provide feedback to adaptive defense measures to permit us to fight through any attack. We recently transitioned a prototype cyber operations center to the Air Force Network Operations Center. The prototype integrates real-time data sources, such as internet health and router data, and displays the data to create a multi-level situational awareness picture of Air Force cyber assets.

In order to modernize our air and space inventories, we continue to shift resources to address medium- to long-term risk. Energy efficient technologies are expected to yield big gains

in fuel consumption. We are leading the evaluation of alternative fuels that may lead to greater fuel efficiency and significantly reduce our dependence on oil. The Air Force is qualifying synthetic fuel based on domestic sources to ensure a stable energy supply regardless of political uncertainties in oil-producing countries or supply disruptions. The Highly Efficient Embedded Turbine Engine project is developing fuel efficient engine technologies for future ISR, tanker, mobility, manned and unmanned combat air vehicles. The Adaptive Versatile Engine Technology (ADVENT) project is developing technologies that allow efficient engine operation over a wide range of flight conditions. ADVENT is a variable-bypass ratio turbofan engine technology concept that allows efficient engine operation at both subsonic and supersonic speeds. These technologies are expected to improve fuel efficiency by at least 25 percent, substantially increase range and loiter times, and decrease vehicle size. Additionally, the Efficient Small Scale Propulsion program is developing fuel efficient engines for unmanned air systems.

Other modernization activities in which we have increased investment are sustainment technologies and composite materials. We are developing novel technologies to assist in prolonging the life expectancy of our aircraft systems, and conducting research and developing technologies to decrease the cost of sustaining our systems. Not surprisingly, our strong commitment to composite aircraft structures, materials, and manufacturing techniques continues.

Game-changing technologies where we have a focused investment include directed energy, hypersonics, cyberspace, and highly accurate, low collateral damage conventional munitions. Our directed energy activities plan to deliver precision effects and low collateral damage options for the warfighter in urban environments. An example of our game-changing hypersonics technology area is our X-51 Scramjet Engine Demonstration project, which plans to provide the hypersonic propulsion needed for an affordable, fast reaction, stand off weapon. In

support of hypersonic and space access technologies, we have also increased investment in high temperature materials' development and thermal management. Beyond the ISR cyber technologies already discussed, we continue to evolve the game-changing cyber arena. The cybercraft concept is developing technologies for a cyber platform that contains traditional-type payloads to ensure cyber command and control, attack options, damage assessment, and survivability. Game-changing precision guided micro-munitions' technologies are being developed that will provide warfighters the ability to engage high-value fleeting targets in an urban environment with low collateral damage.

Guided by Air Force strategic priorities to win today's fight, modernize our air and space inventories, and recapture acquisition excellence, and specifically, the goal to bolster ISR support to the joint warfighter, we have focused our investments to best position the Air Force to support the National Defense Strategy.

### ***RENEWED COMMITMENT TO ACQUISITION EXCELLENCE***

This year, the Air Force established a prototyping program and an early systems engineering and analysis program to support development of future weapon systems. We are also developing tools to assess the maturity of pre-program materiel concepts before they get selected as the preferred solution. We have released an Early Systems Engineering Guidebook and are developing a methodology to assess the maturity of early system concepts, with a focus on quality and sufficiency of technical planning, to get programs started right – these efforts stem from a National Research Council study we commissioned in 2007 to look at pre-acquisition systems engineering. This study also led to changes in the Department of Defense Instruction 5000.02 and to current Acquisition Reform Legislation. All of these activities will greatly facilitate risk reduction of materiel solutions during concept development, enhance transition



policy and processes, and help shrink the technology transition gap. Simply stated, shrinking this gap means a decrease in the time it takes to get matured technology into the hands of the warfighter to win today's war and into the hands of the acquisition developer to more rapidly modernize our warfighting capabilities – this is the link between Air Force modernization plans and technology development and equates to a stronger, more invigorated acquisition process.

As the Air Force Component S&T Executive, I have continued conducting Technology Readiness Assessments (TRA) on Air Force Major Defense Acquisition Programs (MDAPs) in support of the USC Title 10, Section 2366.b. statutory requirement for the Milestone Decision Authority to certify that the “technology in the program has been demonstrated in a relevant environment” prior to Milestone B approval (or Key Decision Point (KDP) B for Space MDAPs). The TRA process has proved to be highly beneficial in ensuring a program's technology readiness for a Milestone/KDP. To date, I've led approximately thirty TRAs with over twenty completed, two Manufacturing Readiness Assessments, one Program Support Review, and multiple other independent reviews. However, I am concerned about the proliferation of these specialty reviews and we are collaborating with the Office of the Secretary of Defense (OSD) to develop a synergized independent program review and assessment process that integrates multiple technical reviews (e.g., technology, systems engineering, reliability, manufacturing, logistics, and risk) into a single review process. Leveraging off our experience with TRAs and working in cooperation with OSD, we are currently assessing the Small Diameter Bomb II program's readiness for Milestone B using this integrated review process and interim feedback is highly promising.

In addition, the strength and effectiveness of Air Force warfighting capability depends on our ability to ensure the industrial base is poised to be responsive to our warfighting needs. Our industrial base activities help to increase the supply, improve the quality, and reduce the cost

of advanced materials and technologies needed for national defense. We are reducing U.S. dependency on foreign sources of supply for critical materials and technologies, and strengthening the economic and technological competitiveness of the U.S. defense industrial base. Our Technology Transition Office is performing admirably as an integrating body between developing policies, assisting in pre-acquisition systems engineering planning, and focusing the necessary resources to shrink the technology transition gap.

### ***CONCLUSION***

Guided by Air Force strategic priorities, the Air Force S&T Program is rebuilding and shaping the workforce, balancing and focusing investments to modernize our inventories for a wide range of contingencies, shrinking the technology transition gap, and honoring commitments with joint and coalition teams to win today's and future fights. While the S&T Program has many challenges, we continue to ensure the development and care for our people and focus and protect our S&T investments to maintain Air Force dominance of air, space, and cyberspace.

History clearly demonstrates the broad benefits to the Air Force of our S&T efforts in terms of military power, industrial capability, economic growth, educational richness, cultural wealth, and national prestige. The Air Force continues to show a strong commitment to the S&T Program, and maintains a diverse and ambitious portfolio. This commitment is clearly shown through the Air Force Fiscal Year 2010 President's Budget request of \$2 billion for "core" S&T efforts. The Air Force S&T Program is vital to ensuring the Air Force maintains technological advantages and prevents technological surprise in a rapidly changing world.

Of course, none of this can be accomplished without a strong, robust and well-educated workforce. As already stated, recruiting, developing, mentoring, and retaining the best and brightest Scientists, Technologists, Engineers and Mathematicians – the Air Force STEM

workforce – is my number one priority. We commissioned a National Research Council study to define STEM. This study is due out this summer and will provide recommendations and a blueprint for moving forward in developing our STEM workforce. We are also in the process of developing an Air Force STEM Strategic Plan aimed at all phases of this critical workforce's life cycle. In addition, the Air Force is a key user of the National Defense Education Program and the Science, Mathematics, and Research for Transformation Program. Finally, the Air Force is planning its first-ever STEM Conference. It is a testament to Air Force leadership commitment to STEM that the Chief of Staff of the Air Force will be attending to kick off this conference.

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.