Air Force Science & Technology Strategy

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The 2010 Air Force (AF) Science and Technology (S&T) Strategy contains the AF S&T vision, tenets, the strategic environment, and S&T priorities including increased emphasis areas.

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Air Force Science and Technology Strategy

Introduction

> *"As a leader in the military application of air, space, and intelligence, surveillance, and reconnaissance technology, the Air Force is committed to innovation to guide research, development, and fielding of unsurpassed capabilities. The Air Force nurtures and promotes its ability to translate our technology into operational capability—to prevail in conflict and avert technological surprise."*
>
> Air Force Doctrine Document 1

Air Force S&T Vision

Create compelling air, space, and cyber capabilities for precise and reliable Global Vigilance, Reach and Power for our Nation

The United States Air Force finds itself at an undeniably pivotal time in its history. It is without question the most effective and powerful air force in the world and the only air force that can truly project global power. The single most important factor in achieving this position has been the unmatched technological advantage the Air Force has attained over its many competitors (*Technology Horizons, A Vision for Air Force Science and Technology During 2010-2030*).

The Air Force's technological advantage is threatened by the worldwide proliferation of advanced technologies, including integrated air defenses, long-range ballistic missiles, and advanced air combat capabilities. In addition, advances in adversarial capabilities in space control and cyber warfare technologies may limit Air Force operations in air, space and cyberspace. Some of these technologies may be achievable at relatively minimal cost, resulting in lowering the barriers to entry that have historically limited the reach and power of non-state actors, organized militias, and radical extremists. The current world state presents a broad range of threats and an unpredictable set of challenges. Today's strategic environment requires flexibility and a shift from systems designed for fixed purposes or specific missions to those inherently more agile.

The Air Force depends on its Science and Technology (S&T) Program to discover, develop, and demonstrate high-payoff technologies needed to address these ever-changing environments and to sustain air, space, and cyberspace superiority in the near-, mid- and far-term. The Air Force S&T Program invests across a broad portfolio to attain a balance between near-term, quick-reaction capability support; mid-term technology development to modernize the force; and revolutionary technologies that address far-term warfighting needs.

The Air Force S&T Program will address the gaps identified by the Air Force Capability Review and Risk Assessment (CRRA) process and the Major Commands (MAJCOMs), while addressing the S&T Vision provided in *Technology Horizons*. The Air Force S&T Strategy will serve as the cornerstone of all Air Force S&T activities and will enable the development of an Air Force S&T Plan. The Air Force must continue to build its technological edge as it adapts to evolving threats to win today's fight and prepare for tomorrow's challenges.

Science and Technology Program Tenets

The Air Force has a single, fully integrated S&T Program directed by Air Force leadership and based on the following tenets:

- Prepare for an uncertain future and investigate game-changing technologies to affordably transition the art-of-the-possible into military capabilities
- Create technology options that address urgent warfighter needs and provide new capabilities in support of Air Force Service Core Functions
- Demonstrate advanced technologies that address affordability by promoting efficiencies, enhancing the effectiveness, readiness, and availability of today's systems, and addressing life-cycle costs of future systems
- Develop throughout the Air Force an appreciation for the value of technology as a force-multiplier
- Maintain in-house expertise to support the acquisition and operational communities and modernize and improve the sustainability of unique research facilities and infrastructure
- Remain vigilant over and leverage global science and technology developments and emerging capabilities

Strategic Environment

Informed by national posture statements, Quadrennial Defense Review (QDR), Defense Planning and Programming Guidance (DPPG), Air Force Strategy, CRRA, *Technology Horizons*, Air Force Service Core Function Master Plans, and additional strategic documents and stakeholder inputs, this section describes the strategic environment that influences Air Force S&T priorities. As adversarial operations have expanded to encompass the full spectrum of conflict, so too have the demands for a wider range of capabilities across all facets of conflict. The S&T strategic environment is dominated by the following major trends:

Evolving Operational Environment: Dense urban environments present strategic and tactical challenges. Defeating adversaries in urban environments requires new and unique scientific and technological efforts to enhance warfighting capabilities while minimizing collateral damage. In the air, the Air Force faces more capable anti-access/area denial capabilities making traditional power projection operations increasingly risky and costly. The space domain will become increasingly competitive, congested, and contested, with U.S. dominance no longer assured. Nearly all weapon systems have cyber dependencies and the Air Force should fully understand these dependencies and mitigate cyber vulnerabilities to assure mission success.

Changing Adversaries: The possible set of adversaries has broadened from a few global powers to non-state actors, organized militias, and radical extremists. The Air Force must be prepared to deter and defeat this broadening spectrum of adversaries.

Increasing Global Demand for Energy: The world’s requirement for fossil fuels has substantially increased. Air Force mission success is becoming increasingly susceptible to supply disruptions and pricing impacts.

Maintaining Technological Dominance: Air Force technological superiority is increasingly challenged by globalization. The U.S. technical base is increasingly stressed as manufacturing expertise and its associated engineering are expanding overseas. Technological innovation is at risk unless the U.S. can

develop scientists and engineers who are well grounded in science, technology, engineering, and mathematics (STEM) and can attract them with desirable careers in the Air Force and industry.

S&T Program Priorities

As the S&T Program helps the Air Force adapt to the dynamic strategic, budgetary, and technology environments, it is critical to address the following overarching priorities:

- **Priority 1: Support the current fight while advancing breakthrough S&T for tomorrow's dominant warfighting capabilities. Pursue S&T to:**
  - Priority 1.1: Enable the Air Force to operate effectively and achieve desired effects in all domains and operations
  - Priority 1.2: Improve the agility, mobility, affordability, and survivability of Air Force assets

- **Priority 2: Execute a balanced, integrated S&T Program that is responsive to Air Force Service Core Functions. Increase emphasis in S&T that will:**
  - Priority 2.1: Improve the sustainment, affordability, and availability of legacy weapon systems
  - Priority 2.2: Reduce cyber vulnerabilities while emphasizing mission assurance
  - Priority 2.3: Support the needs of the nuclear enterprise
  - Priority 2.4: Develop autonomous systems and human performance augmentation technologies envisioned in *Technology Horizons*
  - Priority 2.5: Provide robust situation awareness to enhance decision-makers' understanding and knowledge by improving intelligence, surveillance, and reconnaissance capabilities and data processing, exploitation, and dissemination
  - Priority 2.6: Enable long-range precision strike
  - Priority 2.7: Reduce energy dependency

- **Priority 3: Retain and shape the critical competencies needed to address the full range of S&T product and support capabilities**
  - Priority 3.1: Increase level of in-house basic research
  - Priority 3.2: Enhance critical competencies of the organic cyber workforce
  - Priority 3.3: Support Air Force STEM initiatives to develop and optimally manage the future science and engineering workforce

- **Priority 4: Ensure the Air Force S&T Program addresses the highest priority capability needs of the Air Force**
  - Priority 4.1: Be a trusted partner of the acquisition/sustainment community to assess technology maturity and enhance and accelerate technology transition
  - Priority 4.2: Leverage research and development efforts within industry, including small businesses
  - Priority 4.3: Develop and demonstrate technology solutions that decrease manufacturing risks

Turning Science into Capabilities

The Air Force S&T Program will discover, develop, and demonstrate warfighter-relevant S&T to enhance air, space and cyberspace dominance. Key to this approach is the following four-stage process:

- Science and Knowledge
- Technologies
- Capability Concepts

- Service Core Function Capabilities

A balanced S&T investment portfolio is required to keep pace with threat developments and required capabilities. The Air Force S&T Program addresses far-term warfighting needs through science and knowledge, mid-term needs through technology development, and near-term needs through capability concepts and quick reaction support. Figure 1 illustrates the balance of Air Force S&T Total Obligation Authority (TOA) allocated in Science & Knowledge, Technologies, and Capability Concepts.

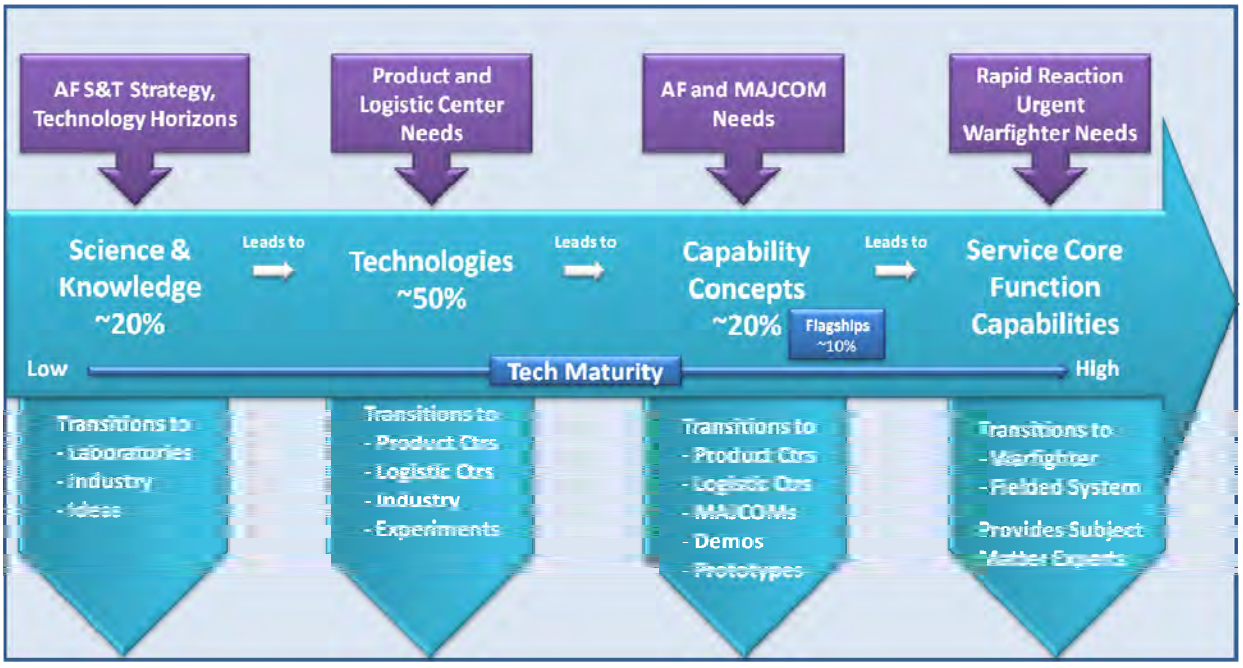

Figure 1: Science & Technology Maturation Cycle

Science and Knowledge

Science and knowledge are the foundation of the Air Force S&T Program and the cornerstone of the future force. Based on visions of the future established by Air Force leadership, Air Force scientists and engineers identify, nurture, and harvest the best basic research to transform leading-edge scientific discoveries into new technologies with substantial military potential. These technologies transform the art-of-the-possible into the near-state-of-the-art and offer new and better ways for the acquisition community to address far-term warfighter needs.

Technologies

Air Force scientists and engineers continually interact with warfighters to understand their capability needs. The Air Force S&T Program addresses these needs by leading and harnessing innovation across service laboratories, government agencies, industry, and academia. These efforts mitigate risk and create the foundation for new capability concepts.

Capability Concepts

Senior representatives from Headquarters Air Force, MAJCOMs, Centers, and Air Force Research Laboratory (AFRL) will work together to define a balanced set of capability concepts that support known warfighter needs and mitigate risk from emerging threats. The highest-priority capability concepts are designated as Air Force "Flagships Capability Concepts (FCCs)." These FCCs address validated capability gaps and increase Air Force leadership's visibility into the Air Force S&T Program.

Service Core Function Capabilities

The Air Force's investment in S&T ensures the infusion of revolutionary and evolutionary S&T-enabled capabilities that are needed to maintain air, space, and cyberspace dominance. The Air Force S&T Program will address the needs identified in each of the twelve Service Core Functions:

- Agile Combat Support
- Air Superiority
- Building Partnerships
- Command and Control
- Cyberspace Superiority
- Global Integrated ISR
- Global Precision Attack
- Nuclear Deterrence Operations
- Personnel Recovery
- Rapid Global Mobility
- Space Superiority
- Special Operations

Summary

The Air Force depends on the S&T Program to discover, develop, and demonstrate high-payoff technologies needed to address the ever-changing strategic and operational environment and to sustain air, space, and cyberspace dominance across in the near-, mid- and far-term. By embodying the S&T Program Tenets, focusing on the Air Force S&T Program Priorities, and utilizing the process of turning science into capabilities, the Air Force S&T Program will provide the technological edge needed to win today's fight and prepare for tomorrow's challenges.