

**Department of the Air Force Scientific Advisory Board
FY 2024 Study**

Enhancing Operational Cybersecurity

Terms of Reference

Background

During times of global competition or high-end armed conflict, competitors and potential adversaries will continually seek to exploit U.S. forces' dependence on data and network technologies in weapons systems, platforms, and critical infrastructure. Malicious cyber and cyber-physical activities may be designed to disable U.S. surveillance or strike assets; gather intelligence information; corrupt sensor data and message content; or impair transport, energy, and communication networks. To ensure continued ability to operate in contested environments, the Department of the Air Force (DAF) must act decisively to secure and defend its networks, assets, and facilities against a wide range of malicious cyber activity from sophisticated competitors and potential adversaries.

Effective cyber deterrence, defense, resilience, and recovery will be essential to DAF operations in any future conflict with peer adversaries. Preparing for mission success in cyber-contested environments requires enterprise-wide consideration of policies, strategies, and technologies that will allow U.S. forces to fully leverage the advanced weapons systems, facilities, and infrastructure developed with decades worth of investment. In view of the fast-evolving cyber landscape, the DAF would benefit from a review of its cybersecurity governance, processes, capabilities, and technologies.

Charter

The study will:

- Review past studies and assessments
- Understand the current state of DAF cyber resilience and readiness, to include space systems
 - Evaluate lessons learned in Ukraine and other ongoing conflicts
 - Consider recent exercises and simulations incorporating malicious cyber activity
 - Investigate vulnerabilities and shortfalls related to technology, acquisition, policy, and compliance, and cyber hygiene
- Assess cyber readiness for peer-adversary conflict in the Pacific theatre
 - Consider DAF weapons systems, critical infrastructure, facilities, and networks
 - Examine tactics, techniques, and procedures to detect, respond to, operate through, and recover from malicious cyber activity
- Provide recommendations for enhancing DAF enterprise cybersecurity and resiliency
 - Propose policy actions to coordinate and improve cyber posture, governance and investment decisions
 - Identify opportunities for scientific research and engineering development of technical tools for cyber-defense, automation, and digital engineering

Study Products

Briefing to SAF/OS in April 2024. Publish report in September 2024.

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Protecting Critical Technology

Terms of Reference

Background

The Department of the Air Force is facing unprecedented worldwide technological advancements as it develops and deploys highly advanced technologies across our DAF Forces. Our competitors and potential adversaries also recognize the importance of technology dominance on the battlefield, and their increased pace of advanced technology development and deployment are challenging the DAF's long-held technology dominance. Despite decades of tight information security procedures and policy attempts to withhold sensitive and classified technical data from the public domain, our competitors and potential adversaries have become adept at extracting and exploiting critical technology breeches to their advantage, regularly acquiring DAF technical details of sensitive technology development efforts. Failures to protect these critical technologies allow competitors and potential adversaries to duplicate our capabilities and/or negate their advantages on the battlefield. Protecting critical technology information across the DAF enterprise throughout the Research, Development, Test, and Evaluation (RDT&E) process performed under budget authority 6.2 through 6.8 is crucial to assuring long term Air and Space Force dominance.

Charter

The study will:

- Review NSDD 189 (21 Sep 1985) and USD(A) memo of 24 May 2010 on current US policy for exempting Budget Authority 6.1 ("Basic Research") from publication limits to assure PCT recommendations are de-conflicted with current DoD BA 6.1 policy guidance.
- Review case studies of adversaries obtaining RDT&E data covered under Budget Authority 6.2-6.8, then preemptively fielding capabilities that mimic or counter DoD capabilities. Case studies should include critical DAF RDT&E test ranges and infrastructures that are observable during use from commercial and/or adversarial intelligence, surveillance, and reconnaissance (ISR) platforms.
- Identify root causes for failures to identify and protect critical information involved in RDT&E technology research (BA 6.2-6.8).
- Assess current methods used by the collateral, SCI and SAP communities to provide appropriate security guidance to unclassified RDT&E activities to prevent unintended disclosures of classified information through uninformed unclassified RDT&E programs.
- Review the relative cost and collaboration/innovation impacts of controlling DAF information (CUI, collateral, SCI, and SAP) on the ability of DoD, industry, and academic organizations to effectively and efficiently execute DAF programs.
- Recommend innovative reforms to protect critical RDT&E data and methods, while minimizing negative impacts on DoD, industry, and academic organizations. Consider residual risks which may be exploited by adversaries if PCT protection is left unmitigated.

Study Products

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FY 2024 Study

Winning Strategic Competitions

Terms of Reference

Background

Throughout the “Cold War”, the US faced a well-defined near peer competitor. During this period, the DAF was highly effective at countering this adversary, developing and deploying effective systems with supporting logistics and well-trained operational forces. Manpower, procurement practices, industrial base, and global deployment strategies were well aligned against a known threat. The “second offset” strategy was adopted and implemented effectively to overcome numerical disadvantages with advanced technologies.

The threat scenario changed dramatically with counter-terrorism missions of the past 2+ decades. While flexibility of mission became increasingly important, the DAF could provide forces and capabilities to the joint warfighter to operate with nearly assured air superiority and space asset impunity throughout this period. With the current renewed focus on near peer competitors and potential adversaries, we face an agile threat with comparable technological and economic capacities. Further, with the digital revolution, the interconnectedness of systems and domains has become increasingly complex. Deterring aggression in this environment requires successful implementation of the defined Operational Imperatives and Baseline Programs. Winning the strategic competition requires that the DAF does so more effectively and at a greater pace than our competitors and potential adversaries.

Charter

The study will:

- Review system development and operational approaches used during the cold war, the war on terror, and those currently employed.
 - Migration of Air Force System Command to current development organizational structure
- Identify barriers to technical, acquisition, operations, and human resources innovation needed to win strategic competitions.
 - Process and organizational obstacles to developing technologies internally, to assimilating external technologies and best practices, such as agile software development and lean startup methodologies, and to rapidly testing, training and fielding systems
 - Issues with human capital requirements and recruitment, training, and promotion processes to develop technologically sophisticated workforce
- Identify strategic process or organizational concepts that could better leverage US strengths to provide a competitive advantage in performance, cost, and/or time-to-market.
 - Candidates include historical DoD approaches, current successful government organizations, and commercial models.
- Provide recommendations for DAF process and organizational change to improve DAF ability to provide forces and capabilities to enable the joint warfighter to win strategic competitions.

Study Products

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War Winning Weapons

Terms of Reference

Background

The Department of the Air Force requires a large inventory of air-delivered munitions against air and surface (ground and maritime) targets to enable the joint force to win future near-peer conflicts, per NDS scenarios. Weapon delivery will be challenged by advanced adversary defenses, and weapon quantities will likely be stressed by the scale of the fight. Such conflicts must be deterred and addressed by not only the quality but the quantity of future weaponry. As a result, the DAF must reassess acquisition approaches to ensure that next-generation weapons can be procured in the quantities necessary. Technology and manufacturing readiness levels must be evaluated for relevant weapons subsystems, as well as the cost effectiveness of using new technologies and concepts of employment (CONEMPS). Additionally, the DAF should take advantage of opportunities to enhance the effectiveness of already planned weapon procurements to improve exchange ratios, where possible.

Charter

The study will:

- Review previous and ongoing weapon studies. Consider the attributes and numbers of air and surface targets and defenses as outlined in national defense scenarios and in the context of joint-service operations. Assess the cost and effectiveness of planned weapon inventories, with associated CONEMPs, to meet projected mission needs. Assess mapping of existing and projected weapon inventories against available and projected platforms to carry them.
- Evaluate opportunities for enhancing effectiveness of current and emerging weapons through technology insertion and new tactics, techniques, and procedures. Recommend promising technologies and approaches for improving the efficiency of planned weapon inventories.
- Identify opportunities for next-generation weapons developments. Consider impacts of miniaturization, scaled manufacturing, artificial intelligence, GPS-independent PNT, networking, propulsion, and advanced energetics. Assess technology readiness levels and challenges to testing, sustainment, and training. Assess potential for cross-service collaborative developments.
- Describe potential acquisition strategies to avoid depletion of inventory and to maintain a responsive industrial base. Assess effectiveness and cost of these acquisition approaches.
- Propose longer-term science and technology investments, including experiments and demonstrations that can address identified gaps or limitations, as well as operational challenges.

Study Products

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