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OPPORTUNITIES TO EXCEL

Collected Advice and Dialogues on U.S. Air Force Acquisition

Edited by Steven Darbes and Kimberly DeRose

Acknowledgments

To ensure accuracy and objectivity, the summary for each report was provided to the original study and workshops chairs and former members of the committee for review to ensure that the document accurately reflects the original reports. We would like to thank each of them for their time and attention to this document and its contents.

Gen. Douglas Fraser (USAF, retired) – Air Force Studies Board Chair
Lt. Gen. Claude Christianson (Army, retired)
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Hon. Paul Kaminski
Gen. Lester Lyles (USAF, retired)
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Lt. Gen. Henry “Trey” Obering III (USAF, retired)
Lt. Gen. Richard Reynolds (USAF, retired)

We would also like to thank Gen. Douglas Fraser (USAF, ret.), chair of the Air Force Studies Board and current members of the board who provided feedback on the document throughout its development.

Letter from the Chair

Over the past ten years, the Air Force Studies Board conducted five separate studies and two workshops on improving the U.S. Air Force acquisition enterprise. While each study provided recommendations for improving one step within the overall acquisition enterprise, the Air Force Studies Board staff recently reviewed these reports as a collection to discover if there were themes that were common to all. From this effort, we found four common themes – the need for sustained, empowered LEADERSHIP, for WORKFORCE improvements, for STRATEGIC PLANNING at the enterprise level, and for building a risk tolerant CULTURE.

These common themes suggest that the Air Force could make enduring improvements to the acquisition process if they could address these broad institutional issues. Specifically, two themes – the need for sustained, dedicated leadership and the need for improving the overall acquisition workforce management process – appear in the findings and recommendations throughout many of the reports and provide the best areas in which committed leadership focus could generate sustained improvements.

While this booklet provides a brief description of the common themes found across the Air Force Studies Board studies, the reader should review the recommendations in each study to understand the specific recommended actions.

Finally, I want to thank Steven Darbes, Research Associate with the Air Force Studies Board, for undertaking this effort and providing a clear, concise synopsis of the common themes across the studies and Kimberly DeRose for her assistance with the document's overall visual design.

General Douglas M. Fraser, USAF (ret.)
Air Force Studies Board Chair

About the Air Force Studies Board

Since 1996, the Air Force Studies Board (AFSB) has served as a convening venue for the discussion of a diverse set of topics of importance to the U.S. Air Force. In collaboration with Air Force leadership, the board develops various program activities related to the development and application of science and technology within the Air Force. These activities involve convening leading experts to participate in consensus studies, workshops, roundtables, and expert meetings. Recently, these studies have addressed strategic topics on experimentation and prototyping, defending against hypersonic weapons, and ensuring the future scientific and technical qualifications of Air Force acquisition personnel.

Learn more about the Air Force Studies Board at **nationalacademies.org/afsb**.

Introduction

Since its founding in 1996, the Air Force Studies Board (AFSB) of the National Academies of Sciences, Engineering, and Medicine has organized several projects focusing on the challenges facing the U.S. Air Force (subsequently referred to as USAF or Air Force) acquisition community. This booklet highlights key messages from a selection of recent reports and workshops focusing on different aspects of the Air Force acquisition process. Each of these activities was conducted by a separate, independent committee of expert volunteers, yet their discussions, findings, and recommendations mostly emphasize four cross-cutting themes: Leadership, Workforce, Strategic Planning, and Culture.

Taken together, the seven AFSB reports collected here cover the entire acquisition life cycle from essential pre-acquisition planning to life cycle sustainment and help to define an ideal state of acquisition excellence. Bringing them together in this collection allows the AFSB to clearly and concisely represent all of the cross-cutting themes and key messages in one document.

In some cases the reports collected here have already greatly impacted the Air Force acquisition enterprise. *Development Planning: A Strategic Approach to Future Air Force Capabilities* has been adopted as a key guide for Air Force development planning and has inspired a number of follow-on activities to help ensure the continuation and success of development planning in the Air Force. In other cases the reports collected here have served to reinforce and support ongoing shifts in the Air Force, such as *The Role of Experimentation Campaigns in the Air Force Innovation Life Cycle*, which has played a role as part of a greater shift to more experimentation in Air Force acquisition.

Key Themes

In the pages that follow, we present a brief summary of each featured report and highlight four key themes:

LEADERSHIP

Nearly every study and workshop included here emphasizes the need for sustained, dedicated leadership in the acquisition community to provide clear direction and support to the whole acquisition team. Strong leadership is essential to empower the acquisition workforce, institutionalize strategic planning, and overcome cultural issues.

WORKFORCE

Improving the management, organization, resourcing, and technical skills of the acquisition workforce is a critical challenge for the Air Force acquisition enterprise. In the acquisition arena, a wide range of opportunities exist for encouraging the workforce, including enhancing the cadre of technical personnel, providing tools and spaces for innovation, and reducing the burden of program review processes.

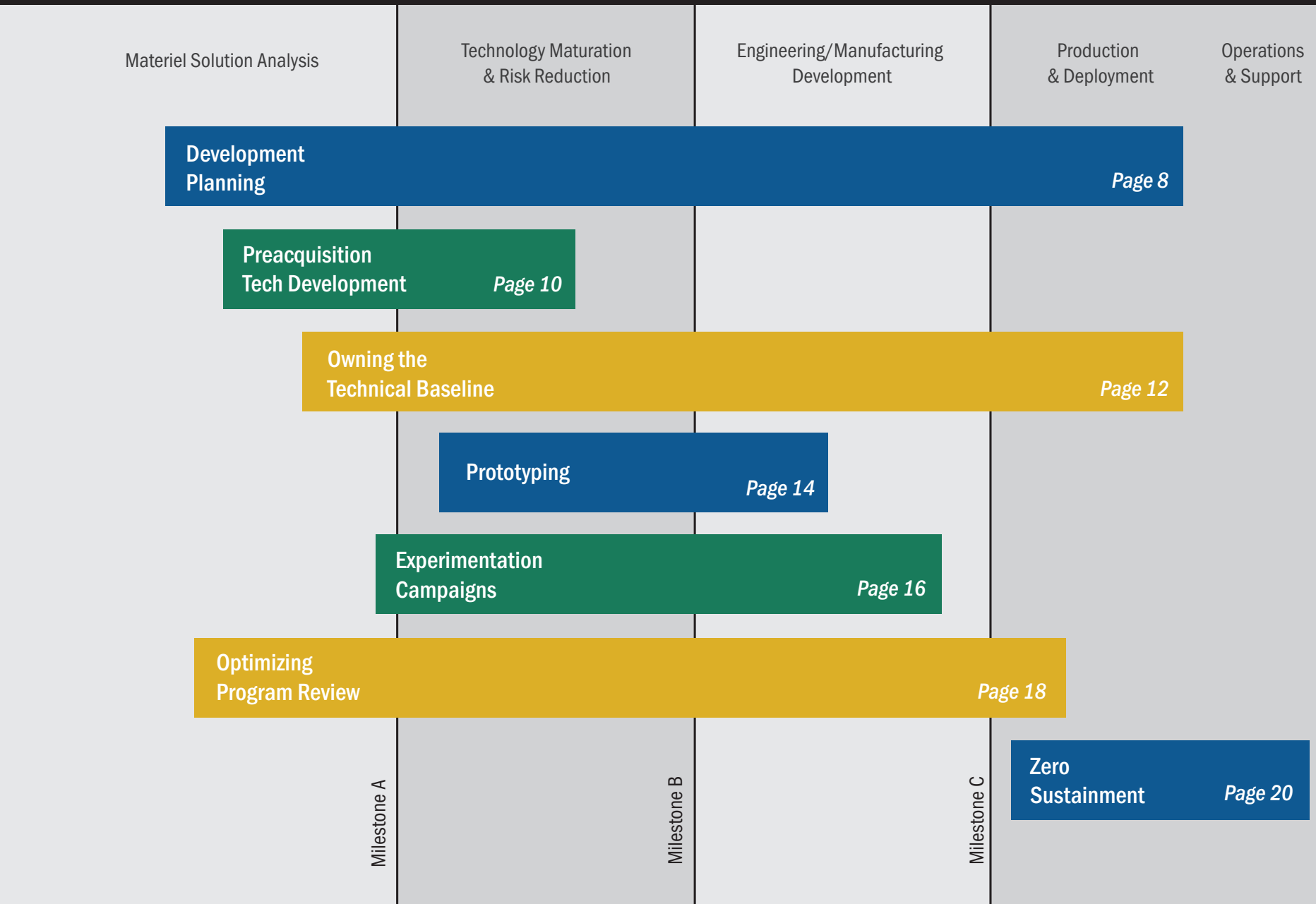
STRATEGIC PLANNING

Strategic planning - including elements such as vision, mission, objectives, strategies, and action plans - are important to keep a unified USAF moving along a desired long-term path. Several reports highlight the need for enterprise-level planning and aligning metrics, program reviews, technology development, and resources for specific programs.

CULTURE

Several of the reports found evidence of a risk-averse culture in the USAF acquisition community. Many other aspects of the USAF culture also inhibit the success of its acquisition programs, including weakening stakeholder collaboration, barriers to innovation adoption, and a stovepipe mentality.

Our work spans the entire acquisition process



Development Planning

Development planning supports U.S. Air Force (USAF) senior leadership in making strategic decisions to determine and develop needed capabilities throughout the entirety of a weapons systems life cycle, from acquisition to lifetime sustainment. Despite historically occupying a central role in USAF policy, development planning declined in the decade following the Cold War. To help revitalize it the USAF commissioned the study *Development Planning: A Strategic Approach to Future Air Force Capabilities*.

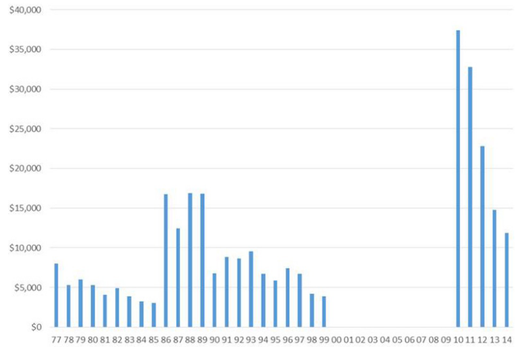
Download the complete report:
nap.edu/18971

Workforce

A central conclusion of the report is that development planning within the USAF is ineffective due to a lack of adequate resources (both human and financial), focused responsibility, capacity, and funding (particularly for cross-core function analysis and capability tradeoffs). To ensure the effectiveness of future development planning, the USAF should:

- Develop and standardize the use of development planning and capability collaboration teams across all USAF core functions;
- Adequately resource development planning to ensure success, with Core Function Leads identifying and prioritize capability gaps; and
- Emphasize development planning as a key workforce development tool.

Sustained emphasis on development planning will foster analytical skills, technical innovation, concept development, and systems engineering rigor and infuse them into the broader Air Force culture.



Development planning funding trends (in $1,000s and "then-year dollars" versus constant or inflation-adjusted dollars). Funding declined in the 1990s and was nonexistent from 2000-2010. The 2009 Weapons System Acquisition Reform Act boosted funding, but funding levels decreased over subsequent years leading up to this study.

Leadership

USAF development planning is localized, fragmented, and lacking prioritization from senior leadership. USAF leadership should claim ownership of development planning, provide top-level guidance to encourage interaction among all USAF organizations responsible for development planning, and redefine and emphasize development planning as a key process to support the Secretary of the Air Force and Chief of Staff of the Air Force's strategic decision making.

Strategic Planning

A key finding of the report is that USAF development planning, as implemented at the time of the study, is not adequate to meet USAF strategic needs. To address this deficiency, the USAF should:

- Create a planning team that reports directly to the Air Force Chief of Staff and is primarily responsible for integrating development planning and establishing capability collaboration teams across all service work functions; and
- Align resources (both human and financial) in support of these capability collaboration teams and periodically assess the state of development planning and whether it is providing the necessary support for strategic decisions and mission success.

Pre-Acquisition Tech Development

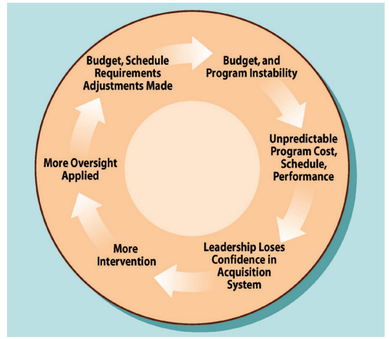
Ensuring a technological advantage over adversaries has long been a cornerstone of Air Force strategy. In modern USAF acquisition this requires integrating a number of component technologies into complex weapons systems, a process made especially difficult when component technologies are still under development. *Evaluation of U.S. Air Force Preacquisition Technology Development* examines the inherent challenges this presents and recommends a path forward for technology development in USAF acquisition.

Download the complete report:
nap.edu/13030

Workforce

A highly skilled, knowledgeable, and well-organized workforce that collaborates well with industry and exists under a streamlined program review regime is critical for successful pre-acquisition technology development. To strengthen the USAF's ability to transition technology from laboratories to product centers and on to major commands, the USAF should:

- Re-establish development planning organizations (see our report on Development Planning on page 8)
- Establish "collaboration forums" in order to drive greater collaboration among warfighters, laboratories, developers, and industry
- Direct resources to the practice of competitive prototyping and technology demonstrations prior to Milestone B
- Direct technical acquisition professionals outside of the program office to conduct assessments to ensure programs do not enter the engineering and manufacturing stage with immature technology
- Develop a mechanism that allows the USAF to seek oversight relief in order to avoid the instability cycle created by Department of Defense (DoD) management and oversight systems



The management and oversight systems of the Department of Defense generate significant program instability.

Culture

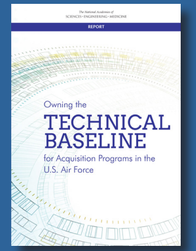
The report identifies a "death spiral" caused by a pervasive lack of trust in the entire DoD acquisition process. To address this critical issue the report calls for greater collaboration among stakeholders - warfighters (including joint and coalition partners), laboratories, developers, and industry. The USAF needs to create an environment that allows stakeholders to collaborate to ensure effective tradeoffs between technologies and operational requirements prior to Milestone B.

Strategic Planning

To ensure that preacquisition technology development effectively supports USAF strategy, the USAF should:

- Maintain an enterprise-wide science and technology strategy, linked to operational requirements, to avoid fragmented prioritization and allocation of technology transition funds
- Decouple technology maturation and system development to reduce overall risk and increase the likelihood of acquisition success
- Only enter the engineering and manufacturing development stage with mature technologies
- Consider adopting a structure similar to other services technology development oversight groups
- Avoid freezing requirements too early or too late and ensure that there is a full understanding of the capabilities and limitations of the technology prior to committing to an acquisition program

Owning the Technical Baseline



Owning the Technical Baseline for Acquisition Programs in the U.S. Air Force found that the USAF has lost its previous recognition as a premier acquisition enterprise due to a decline in the technical training of its acquisition workforce, a risk-averse acquisition culture, and a lack of sustained leadership in acquisition programs. The report recommends a pathway to address these challenges.

Download the complete report:
nap.edu/23631

Workforce

The technical workforce in the USAF's acquisition community has declined rapidly over the last quarter century due to attrition and an apparent devaluing of technical skills and experience in the acquisition workforce. The result is a critically understaffed technical workforce insufficient to manage the current acquisition portfolio. To address these deficiencies, the report recommends that the USAF:

- Emphasize the value of technical training and experience, including industry experience, in the acquisition workforce
- Establish a dedicated, STEM-intensive career path for program acquisition officers and invest in a more structured mentoring program for the acquisition workforce
- Review and make appropriate changes to assignment policies and practices to ensure greater depth of experience in the acquisition career path
- Clarify the lines of authority between contracting officers and program officers and ensure that contracting officer performance evaluations are tied to program success
- Clarify the criteria for the use of relevant contract types and methodologies such that the government acquisition team can determine what is appropriate for the program while best delivering value and capability

"We are fighting tomorrow's wars in today's program development offices"

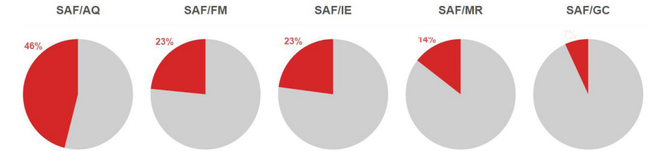
Lt. Gen. (USAF, Ret.) Henry A. "Trey" Obering III,
Study Chair

Leadership

The report's first and key finding is that the USAF lacks consistent tenancy and leadership in the position of the Assistant Secretary of the Air Force for Acquisition (SAF/AQ). From 2000 to 2016, the SAF/AQ position has been in acting or vacant status nearly half the time. The USAF should investigate the cause of these vacancies and work to minimize them.

Culture

The USAF suffers from a risk-averse culture in its acquisition community that hinders program managers from making informed, timely, and independent decisions about acquisition programs. This negatively impacts program success through rising costs and protracted schedules. USAF leadership should take proactive steps to address this issue and foster a risk-tolerant culture within the USAF.



Percentage of time (in red) from Jan. 2000 to Jan. 2016 when Air Force Assistant Secretary Positions were at acting or vacant status.

Prototyping

Despite the historically proven benefits of prototyping in USAF acquisition, the practice has declined in recent decades. In response, the Air Force turned to the AFSB and the National Academies to conduct a workshop to explore the practice of prototyping in USAF acquisition and the opportunities it presents for the USAF acquisition workforce, culture, and strategic planning.

Download the complete report:
nap.edu/18580

Workforce

Workshop participants identified prototyping as a tool that is best leveraged across acquisition, at all levels and phases of the enterprise, and benefits the whole acquisition workforce. These benefits include:

- The attraction, retention, and maintenance of a highly motivated and capable technical workforce as well as their accompanying skills and knowledge;
- Increased room for innovation empowerment for technical staff;
- Reduced time to development; and
- Acquisition risk reduction through concept maturation and demonstration before system development.

Participants also noted that the practice of prototyping requires adequate funding and strong incentives for USAF personnel to take risks and collaborate to meet the enterprise's strategic goals.

"Strong leadership support for prototyping in the acquisition process is critical"

Gen. (ret) Lester Lyles
Workshop Planning Committee Chair

Strategic Planning

Workshop participants identified a strong relationship between prototyping and strategic planning for the USAF with clear strategic benefits including:

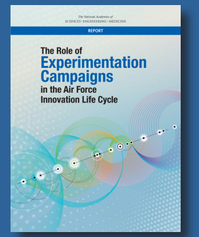
- Overall support for the national security strategy;
- The ability to test concepts with minimal risk before committing to specific design configurations;
- Long-term cost and resource savings through technology maturation, capability testing, and effective tradeoff decision making;
- Providing a hedge against technical uncertainty and unanticipated threats; and
- Serving as a form of deterrence for adversaries by demonstrating new capabilities.

Culture

Participants noted that the practice of prototyping provides numerous benefits for the USAF acquisition culture by:

- Encouraging innovation and risk tolerance;
- Increasing collaboration among government, industry, and academia;
- Empowering acquisition personnel and promoting entrepreneurial attitudes; and
- Providing tangible examples of innovation.

Experimentation Campaigns

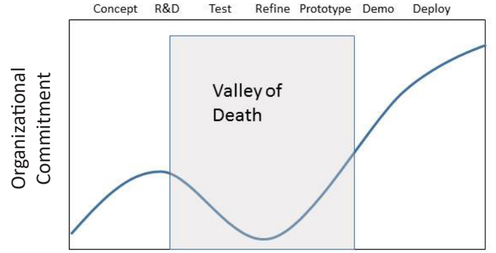


Once an inextricable part of USAF technology development, support for Experimentation Campaigns, sets of related experiments intended to prove or disprove the validity of promising innovations, has diminished across the organization. *The Role of Experimentation Campaigns in the Air Force Innovation Life Cycle* found that in order to retain the USAF's edge against the growing capabilities of near-peer competitors, the USAF must revitalize the practice by fostering innovation and experimentation across the USAF.

Download the complete report:
nap.edu/23676

Leadership

Dedicated leadership in innovation and experimentation is largely missing in today's Air Force and is critical for future capabilities development. The Air Force should determine where it most critically needs innovation and establish Innovation Catalysts, directly linked to senior leadership, to connect otherwise isolated pockets of innovation and experimentation and ensure a pathway for innovations from research to operational use. Innovation Catalysts are responsible for working with other senior leaders to maintain the strategic technical vision and for leading campaigns of experimentation and innovation to fulfill those visions.



Stages of the Innovation Life Cycle

Workforce

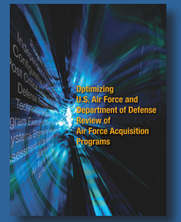
Despite a history of innovation through experimentation and a few small pockets of innovation in today's USAF, there is too little space, time, tools, and funding for experimentation-driven innovation across the organization. To drive innovation on the scale necessary for the USAF to meet the total competitive threat presented by adversaries, USAF leadership should work with Innovation Catalysts to proactively create organizational space and establish a portfolio of proven management methods for experimentation-driven innovation.

Culture

Innovation and experimentation are crippled in today's USAF by a culture that is intolerant of risk taking and unsupportive of experimentation, especially when it leads to disruptive innovations. This drives a tendency for the USAF to mistakenly categorize an experiment that ends in disappointing results as a failure even when the outcome increases our understanding of potential capabilities. Senior leaders should establish tailored metrics for each program and develop a clearer set of messages and incentives to encourage innovation, innovators, and risk taking in experimentation.

Innovation Catalysts use proven management tools and interdisciplinary teams to drive innovation. They have direct access to senior leadership and can exist at every level of the organization.

Optimizing Program Review



Optimizing U.S. Air Force and Department of Defense Review of Air Force Acquisition Programs reviews and assesses Air Force and DoD acquisition program reviews. The report finds that while program and technical reviews are essential to the health and success of acquisition programs, the excessive quantity of reviews, the demands they place on labor, and the fact that they are not properly mapped to the unique aspects of each program create obstacles to program success and effective review.

Download the complete report:
nap.edu/12673

Leadership

Key challenges and opportunities for the USAF acquisition leadership include:

- Additional reviews should be examined by the USAF Senior Acquisition Executive and compared to existing reviews to avoid duplication and determine if they can be incorporated into existing reviews.
- Review outputs should be documented and they should provide actionable recommendations for the program manager.
- The USAF Senior Acquisition Executive should develop a plan for timely, synchronized execution of all program reviews at each level of the organization that should align with program decision milestones and decision points.
- Program review formats and processes should reflect the complex system of systems they are reviewing instead of focusing on a single system.
- The purpose, scope, information needs, key issues, and expected outcomes of reviews should be clearly specified and evaluated based on their potential to add value to the program.

Can changes in the number, content, sequence, or conduct of program reviews help program managers more successfully execute their programs?

Strategic Planning

The report notes a lack of strategic planning in regard to program review. Most notably, the program review format does not reflect the greater complexity and interrelationships among USAF acquisition programs. The sequencing, timing, and frequency of reviews are not tied to the program schedule in a way that supports program execution. The program review process must be realigned to help, not hinder, program execution and require USAF acquisition communities at all levels to engage in planning for program reviews that evaluate clear, comprehensive, and measureable objectives.

Workforce

There are two key challenges for the USAF acquisition workforce that must be addressed:

- Effective program reviews are hampered by the lack of consistent participation by program principals, key stakeholders, and subject-matter experts and must be staffed appropriately to have positive effects on the program under review.
- The quantity and frequency of programs reviews excessively divert the program office's time and resources away from program success and drive cost overruns.

Zero Sustainment

The National Academies convened a workshop on Zero-Sustainment Aircraft for the U.S. Air Force where expert speakers discussed the growing costs of weapon system sustainment, which was 4% per year at the time despite declining sustainment budgets. The workshop summary details discussions among participants that focused on the critical challenges in USAF aircraft sustainment related to workforce, leadership, and culture.

Download the complete report:
nap.edu/18295

Leadership

Workshop participants identified key challenges for USAF leadership, including:

- The need for dedicated leadership with enterprise-wide visibility and accountability for managing overall aircraft sustainment or sustainment decisions made within individual acquisition programs
- The need for leadership buy-in with regard to enterprise-wide aircraft sustainment and the urgency of needed policy changes
- The need to ensure enterprise level strategy and policies internalized down to the wing level
- The need for leadership to play the key role in incentivizing change in the USAF

DoD does not have the tools to measure return on investment or life-cycle cost, and instead of chief executive officers, chief financial officers, and quarterly reports, there is a political process that makes it hard to run sustainment in a business-like manner.

Strategic Planning

Workshop participants identified key challenges in strategic planning affecting aircraft sustainment:

- Metrics are often focused on consumption of resources, with the implicit assumption that more consumption is better, rather than focusing on value to the mission or end user.
- Budget metrics are often tied to various legislative requirements without a strong connection to cost reduction.
- The USAF has not been able to plan strategically for sustainment in regard to driving down costs. There is a lack of standardized tools for tracking and analyzing the total sustainment costs and return on investment over an aircraft's life cycle.
- Early planning and design phases often do not take into consideration the weapon system's entire life cycle.

Culture

Workshop participants identified key challenges affecting the USAF acquisition culture, including:

- A stovepipe mentality among managers that inhibits visibility across the sustainment enterprise
- A lack of incentives for innovation in aircraft sustainment across the acquisition life cycle
- A breakdown in personnel relationships with industry and the need to mentor personnel to work with industry
- The need to adopt a transformational management approach that defines the user-driven goals of the enterprise, empowers people to achieve them, and holds them accountable

Key Themes by Report/Workshop

	CROSS-CUTTING THEMES			
REPORT/WORKSHOP TOPIC	Leadership	Workforce	Strategic Planning	Culture
Development Planning	✓	✓	✓	
Pre-Acquisition Tech Development		✓	✓	✓
Owning the Technical Baseline	✓	✓		✓
Prototyping		✓	✓	✓
Experimentation Campaigns	✓	✓		✓
Optimizing Program Review	✓	✓	✓	
Zero Sustainment	✓		✓	✓

More Information

Development Planning: A Strategic Approach to Future Air Force Capabilities - http://nap.edu/18971
Committee Members: Claude M. Bolton, Jr., *Co-Chair*, Paul G. Kaminski, *Co-Chair*, Francis J. Baker, Robert F. Behler, W. Peter Cherry, Keith A. Coleman, Jill P. Dahlburg, Brendan B. Godfrey, John M. Griffin, Robert J. Hermann, Lester L. Lyles, William L. Melvin, David J. Nicholls, Thomas E. Romesser, Sonya F. Sepahban, David M. Van Wie

Evaluation of U.S. Air Force Preacquisition Technology Development - http://nap.edu/13030
Committee Members: Richard V. Reynolds, *Chair*, Donald C. Fraser, *Vice Chair*, Charles E. Adolph, Brian A. Arnold, Francis J. Baker, Thomas W. Blakely, Claude M. Bolton, Thomas J. Burns, Llewellyn S. Dougherty, Richard B.H. Lewis, Ellen M. Lord, Christopher E. Manuel, Matt L. Mleziva, Ronald E. Mutzelburg, Richard L. Rumpf

Owning the Technical Baseline for Acquisition Programs in the U.S. Air Force - http://nap.edu/23631
Committee Members: Henry A. Obering III, *Chair*, Lawrence J. Delaney, *Vice Chair*, Donald R. Erbschloe, Millard S. Firebaugh, Michael D. Griffin, Gary A. Kyle, Thomas L. Maxwell, Sue C. Payton, Richard T. Roca, William J. Strickland, Deborah L. Westphal, Rebecca Winston

Assessment to Enhance Air Force and Department of Defense Prototyping for the New Defense Strategy: A Workshop Summary - http://nap.edu/18580
Committee Members: Lester L. Lyles, *Chair*, Claude M. Bolton, Jr., Keith A. Coleman, Jill P. Dahlburg, Lawrence J. Delaney, Brian K. Hershberger, William L. Melvin, Paul D. Nielsen

The Role of Experimentation Campaigns in the Air Force Innovation Life Cycle - http://nap.edu/23676
Committee Members: Lester L. Lyles, *Co-Chair*, Alex Miller, *Co-Chair*, Ted F. Bowlds, Charles R. “CR” Davis, Blaise J. Durante, Antonio L. Elias, Ivy Estabrooke, David E. Hamilton, Jr., Bernadette Johnson, William Johnson, Joseph Lawrence, Robert Andrew Kirk Mitchell, Benjamin Riley, Joel Sercel, Daniel Ward

Optimizing U.S. Air Force and Department of Defense Review of Air Force Acquisitions Programs - http://nap.edu/12673
Committee Members: Rand H. Fisher, *Chair*, J. Daniel Stewart , *Vice Chair*, John A. Betti, Christopher L. Blake, Claude M. Bolton, Jr., Allan V. Burman, John T. Dillard, Charles E. Franklin, Charles L. Johnson II, Leslie F. Kenne, Andrew P. Sage, Mark D. Schaeffer, George R. Schneiter, Robert J. Skalamera, Richard Szafranski, Randall S. Weidenheimer, Rebecca A. Winston

Zero-Sustainment Aircraft for the U.S. Air Force: A Workshop Summary - http://nap.edu/18295
Committee Members: Claude M. Bolton, Jr., *Chair*, Claude V. Christianson, Thom J. Hodgson, Ronald Mutzelburg, Lyle H. Schwartz, Raymond Valeika

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