TRANSFORMING THE DoD CAPABILITY WORKFORCE THROUGH POLICY, SKILLS, AND CULTURE

Human Capital Development

SYSTEMS ENGINEERING RESEARCH CENTER

AIRC ACQUISITION INNOVATION RESEARCH CENTER

In an era marked by evolving global threats and rapidly advancing technology, the Department of Defense (DoD) faces a critical need for innovation to effectively transform its Acquisition and Sustainment (A&S) workforce. The recently unveiled Acquisition and Sustainment Workforce Framework (ASWF) serves as a pivotal guide, offering a structured set of principles—referred to as "pillars"—designed to align the workforce with the priorities outlined in the National Defense Strategy (NDS).

These four key pillars are:

- ✓ Acquisition Innovation to Match the Pacing Threat
- ✓ Making the DoD an Employer of Choice
- ✓ Talent Development in the Acquisition Ecosystem
- ✓ Continuous Improvement of Workforce Policies, Programs, and Processes

In line with these pillars, the Acquisition Innovation Research Center (AIRC) and the Systems Engineering Research Center (SERC) focus on advancing and equipping a highly skilled and adaptable acquisition workforce for both present and future challenges.

Through rigorous research, AIRC and SERC bolster the A&S strategic objectives in three crucial domains: the development of enhanced policy frameworks, the elevation of skill sets, and the cultivation of a forward-thinking culture. The following pages provide an overview of AIRC and SERC's research initiatives, highlighting approaches that ensure the A&S workforce is prepared to confront and overcome current and future challenges with agility and innovation.

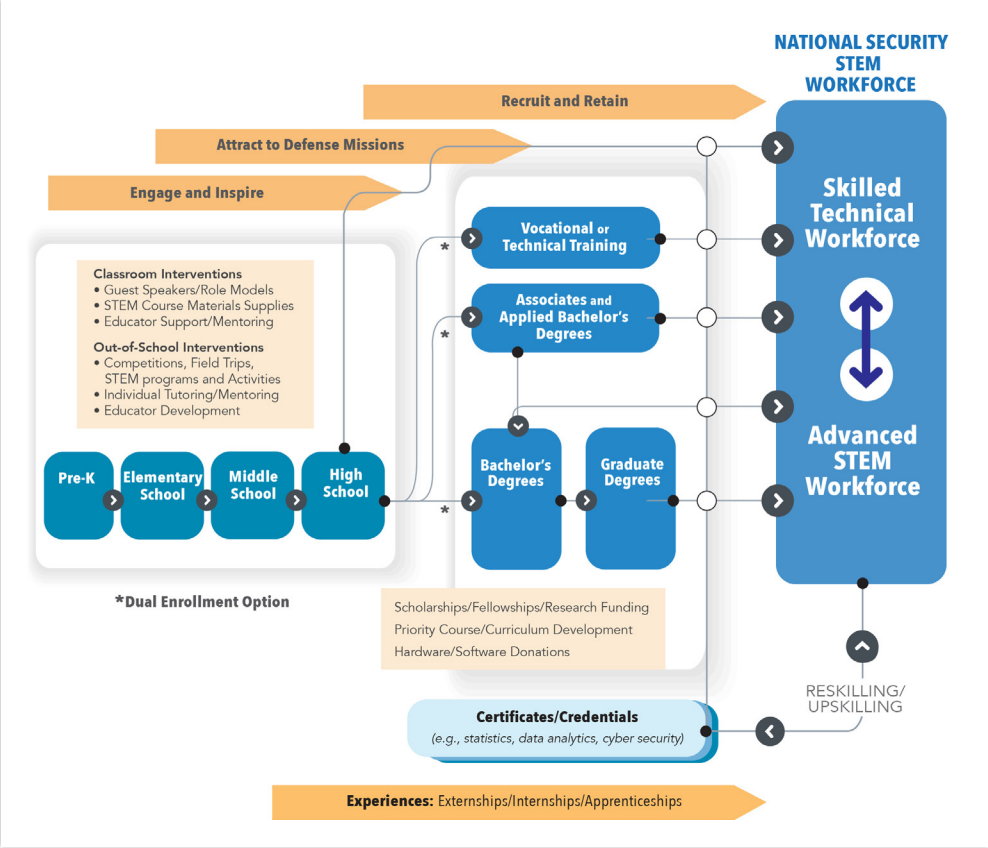
The research projects have been funded by several DoD organizations including OSD(A&S), OSD(R&E), DAU, and others.

The SERC and AIRC research network

FOCUS: POLICY

Data Drives Informed Policy and Decisions

Data-driven insights and systems thinking support informed decisions regarding effective policies, processes, and actionable strategies that can enhance talent outreach, recruitment, training, and retention. The following are representative SERC and AIRC research studies that support policies and decisions related to DoD workforce development.



Model-Driven Policy Innovations to Enhance STEM Pipeline

Purdue and Georgetown university researchers developed data-driven economic and system-dynamics models to support decisions about policy interventions that can increase the number of STEM-ready K–12 students and improve retention of STEM college students. These models have been evaluated and enhanced by the DoD, especially through engagement with university student interns hosted annually by the Department.

Strategic Skills and Capabilities Assessment

Stevens researchers conducted a meta-study that extracted information from pivotal studies including government, industry, and academic reports to identify the skills and capabilities needed within the DoD Acquisition workforce. The research goes beyond addressing immediate readiness by also contributing to strategic talent management and career development. The insights allow DoD decision-makers to make informed choices regarding talent acquisition, training and development programs, and skill gap remediation.

Toward Collective Improvements in DoD's STEM Education Activities and Outreach

A Stevens research team examined STEM outreach and activities of the DoD and the defense industrial base (DIB), uncovering an urgent need to bring coherence to the various initiatives that exist across the DoD and DIB. The team provided data-informed policy recommendations that would enable transformation of DoD/DIB collaborations from ad hoc to true partnerships that foster multiple pathways into the national security ecosystem.

Fostering Innovation through Improved Intellectual Property (IP) Understanding

AIRC is tackling the challenge of differing approaches to Intellectual Property (IP) between the DoD and the commercial sector to improve defense acquisition innovation. It began by hosting the inaugural DoD IP Workshop in collaboration with Georgetown University in 2021, which brought together DoD leaders, academics, and industry experts to review and discuss IP evaluation practices. Building on this, AIRC supported the DoD IP Cadre's Intellectual Property Forum in December 2023 that engaged government, industry, and academic stakeholders. These initiatives aim to bridge communication gaps and develop innovative strategies for IP management to enhance its value and utility in the defense acquisition context.

FOCUS: SKILLS

Enhancing and Upskilling the Defense Workforce

The DoD workforce needs critical skills to be effective and innovative. Numerous faculty members and researchers across the SERC and AIRC network have applied their expertise in workforce development to research. They created competency frameworks; assessed what it takes for individuals to be effective; created tools to understand organizational culture and incentives; and developed courses, webinars, and other resources to improve the workforce development community.

Cognitive Training and Advice Assistants

Researchers from Texas A&M and the University of Arizona created cognitive assistants: tools that improve the efficiency and effectiveness of training and provide relevant advice on current activities. The initial application use case was the training of DoD cost estimators that tailors learning activities to each individual's knowledge gaps. These techniques can be applied to other acquisition domains and focus annual training on areas new to each staff member.

Digital Engineering Bootcamp

Supporting the DoD Digital Engineering (DE) Strategy, SERC's DE Bootcamp provides workforce training and education that enhances systems engineering on complex programs. The bootcamp topics include introductory DE modules, advanced treatment of Model-Based Systems Engineering, and data/interoperability ontologies to enable DE. This initiative employs case studies to illustrate real-world conditions and ensure practical and applicable learning outcomes.

Capstone Marketplace

Today's increasingly complex defense systems challenge engineers to develop resilient systems that balance cost, schedule, performance, and risk in design options while integrating multiple components to achieve missions. SERC's Capstone Marketplace (CM) provides a platform for the DoD and other government organizations to pose needs for undergraduate design projects based on real-life operational challenges. CM mentors guide student teams to develop practical physical and virtual prototypes. Students gain enhanced problem-solving, team building, and leadership skills while solving real DoD technical problems. Since 2013, approximately 480 student engineers have completed CM challenge projects across 23 universities. Some results have transitioned to improve DoD capabilities, and the CM program prepares students to be future DoD and DIB engineers, scientists, and managers.

Webinars

Experts across the SERC network have helped develop multiple series of webinars on a wide variety of topics.

- Data Analytics (series) including digital readiness, an introduction to data science, an overview of current practices, and horizon scanning of near-term expected capabilities.
- Artificial Intelligence/Machine Learning (AI/ML series) including a historical overview of the evolution of AI/ML, reasons behind the explosion and success of machine learning in the last decade, and an examination of the trends, expected evolution, and utility of emerging technologies like generative AI.
- Digital Engineering (series) including an overview of how digital engineering is fundamentally transforming the state of practice across government and industry, drivers for digital transformation, best practices and lessons learned, and insights into SERC research on digital transformation.
- Research Forum (series) – a quarterly webinar hosted by the Defense Acquisition University (DAU) featuring research from the SERC and AIRC. Topics have included:
  - What will the future of defense acquisition look like?
  - Improving the DoD requirements process
  - Digital engineering
  - Megaprojects – characterization, data and visualization, uncertainties, and leadership

Curriculum Recommendations for the Acquisition Workforce on Startup Business Operations and Intellectual Property

This project identified curricula for the DoD acquisition workforce so government officials can understand commercial startup financing, operations, and intellectual property issues to inform government actions on negotiations and support of the DIB. Research used natural-language processing and web-based techniques to survey over 210 online courses and educational materials. This initiative enhances business acumen and leadership skills, ultimately empowering the acquisition workforce to boost innovation in the DIB.

Preparing the Future Workforce through Strategic Planning and Partnerships

Increasing undergraduate awareness of, and engagement with, the DoD has created a robust talent pipeline for maintaining a competitive edge and addressing emerging challenges. Following are representative SERC and AIRC collaborative initiatives with educational institutions and DoD organizations that cultivate the skills and capabilities needed for the future defense workforce.

Defense Data Grand Prix

AIRC's Defense Data Grand Prix (DDGP) competition addresses two simultaneously occurring needs: engaging extramural data-science experts to address real-world DoD challenges and decision-making processes, and university students studying data science who require challenges to solve for their senior projects and graduate research. DDGP enables faculty-led teams to work alongside DoD stakeholders and problem "owners" over a semester to develop and propose solutions to real-world issues. The DoD gains data-driven analyses to support its operational and policy decisions and students gain experience with authentic data and analytic problems. To date, DDGP has developed improved models and decision tools for the Defense Logistics Agency, U.S. Marine Corps, and U.S. Navy to better optimize performance in areas such as warehouse management, supplier management, workforce performance, and sustainment.

Defense Civilian Training Corps (DCTC)

DCTC is a ground-breaking partnership between the DoD and academia to prepare undergraduates for careers as civilian acquisition professionals. Designed and piloted by AIRC, DCTC equips scholars with the DoD-specific knowledge, skills, behaviors, and character to make an immediate impact, adapt quickly, and robustly perform in the acquisition system. DCTC's unique design includes DoD-specific immersive learning, project-based internships, and resilience skills. The 2022 National Security Strategy and National Defense Strategy highlight the need for an upskilled workforce, and DCTC provides clear defense employment pathways for its scholars upon graduation.

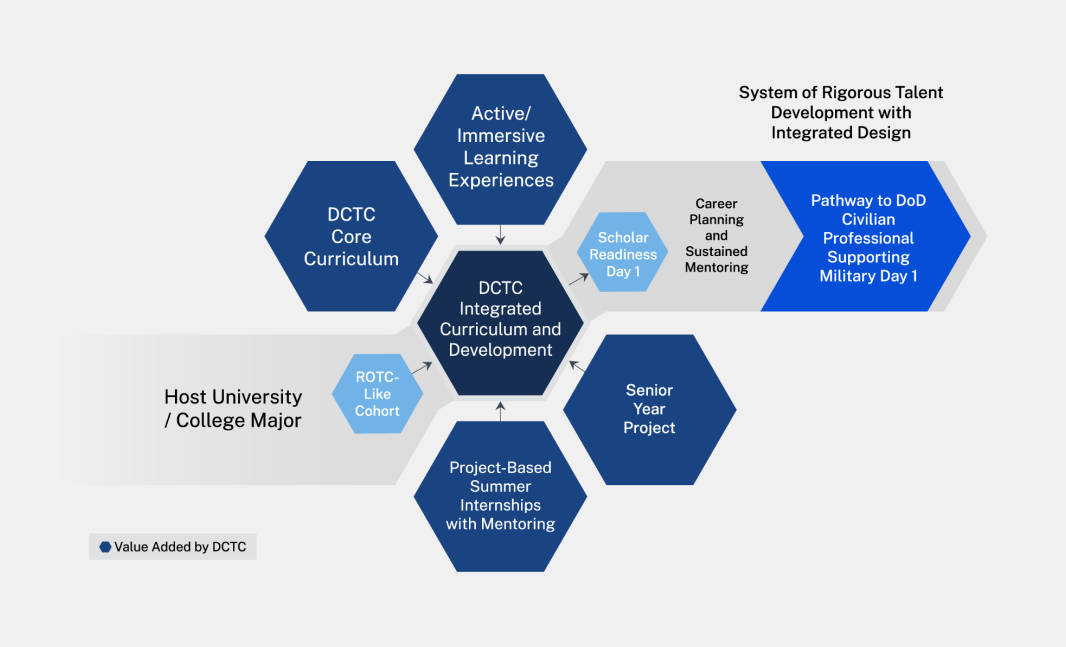
Identifying and Developing Competencies for the Future

Several SERC and AIRC research studies have supported the development of competency frameworks that identify the knowledge, skills, abilities, and behaviors required for individuals working across a variety of disciplines. Competencies have been developed in the following areas:

- Technical Leadership
- Systems Engineering
- Megaproject Leadership
- Mission Engineering
- Digital Engineering and Transformation

Scan the QR code or click the link to learn more.

https://sercuarc.org/competency-framework



FOCUS: CULTURE

Developing Community Resources

SERC and AIRC researchers collaborate across their university network and the defense community to develop resources that increase awareness and improve understanding of key topic areas.

Systems Engineering Body of Knowledge (SEBoK)

SEBoK is a free online global resource that disseminates best practices and advances through references and links to critical systems engineering tradecraft, information, and resources. It is overseen by a wide range of editors from around the world and is maintained as a wiki.

SERC is a steward of the SEBoK through Stevens Institute of Technology, shepherding its strategic outlook and ensuring that it evolves to meet the needs of the community.

Quarterly Research Forums

As part of its partnership with the Defense Acquisition University (DAU), AIRC conducts DAU's Quarterly Research Forums that engage DAU leadership and faculty with academic experts from fields pertinent to acquisition functions, such as law, policy, business, management, education, engineering, and data science.

Building on the success of the quarterly forums, AIRC now collaborates with DAU on webinars centered around megaproject management, addressing topics such as data visualization, AI, and ML tools that support more effective and efficient management of large DoD programs.

Understanding and Incentivizing Cultural Changes

Recognizing culture as pivotal to organizational success, SERC and AIRC researchers have developed tools to assess and align to strategic objectives through the following representative projects.

Addressing Systemic Factors That Influence Risk Aversion

Researchers at the Ohio State University partnered with OUSD(A&S) and the Air Force Installation Contracting Center (AFICC) on a pilot that produces interventions to address the systemic pressures faced by the acquisition workforce that impede innovative behaviors. The pilot produced models of understanding as well as workshops to effectively measure the impact of interventions. This initiative demonstrated the potential to further apply and transition this approach across other acquisition and sustainment functions and organizations.

Building Tools to Understand Organizational Culture

Researchers at Stevens have developed tools that allow organizations to assess their own culture. These approaches utilize findings from SERC research studies as well as published cultural assessment tools, such as the Competing Values Framework and the Qi Index, to assess innovation culture. These tools are freely available online.

The Systems Engineering Research Center (SERC) and Acquisition Innovation Research Center (AIRC) are University Affiliated Research Centers (UARCs) of the Department of Defense (DoD). The UARCs leverage the research and expertise of faculty, researchers, and students from more than 25 collaborating universities throughout the United States.

Begun in 2008 and led by Stevens Institute of Technology, the SERC is a national resource providing a critical mass of systems engineering researchers. SERC researchers have worked across a variety of domains and industries, and bring that wide-ranging wealth of experience and expertise to their research.

AIRC leverages its multi-university partnerships to connect DoD domain experts with faculty-led research teams with backgrounds in engineering, management, business, law, economics, policy, data science, and more. These multidisciplinary teams deliver innovative research, which they then apply in practical pilot projects focused on addressing enduring challenges in defense acquisition policy, practice, education, and training.

Together, SERC and AIRC provide the nation with a research community of broad experience and interests and deep knowledge that delivers impact beyond what any single university could accomplish.

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