Annual Report for FY 2023

Extramural Acquisition Innovation and Research Activities:

Engaging Academia to Improve Acquisition Outcomes

Report pursuant to Section 4142(f) of Title 10, U.S. Code

Director of the Acquisition Innovation Research Center

Acquisition Enablers Directorate

Office of the Under Secretary of Defense
for Acquisition and Sustainment [OUSD(A&S)]

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Summary

The Acquisition Innovation Research Center (AIRC) was established in September 2020 to engage academia on Department of Defense (DoD) challenges to improving the acquisition, fielding, and sustaining of critical defense operational capabilities. It satisfies the congressional mandate in 10 U.S.C. § 4142, for engaging extramural capabilities in academia to provide analyses and policy alternatives for innovation in defense acquisition policies and practices to policymakers in the Federal Government.[1]

Strategy for Establishing and Maintaining AIRC

The Acquisition Enablers (AE) directorate in the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) created AIRC as a center within DoD's existing Systems Engineering Research Center (SERC) University-Affiliated Research Center (UARC), reflecting that the defense acquisition ecosystem is, by nature, a system. This ecosystem includes the defense acquisition system and its interdependent nature with other major decision systems (e.g., the requirements, intelligence, and financial management systems). This approach sped the creation of AIRC, enabled a systems approach, and leveraged the SERC multi-university partnership (20 extramural universities, two DoD graduate schools, and additional emerging partner universities).

AE's initial focus was on the establishment of the center and conducting applied research to identify innovative ideas and concepts. Results from the first two years included the generation of over 100 AIRC recommendations and innovative concepts for application, piloting, or training. Funding of AIRC by AE was mostly obtained by competing for Defense Acquisition Workforce Development Account (DAWDA) funds as AIRC did not have a dedicated budget element for.

AE continues to seek ways to strengthen the Department's long-term strategic relationship with AIRC. AE uses the limited available DAWDA funds to initiate research that addresses key challenges to improving acquisition outcomes. The directorate also motivates expanding sponsorship across DoD through co-funding of important applications using DAWDA funds. This has paid dividends with about two-thirds of AIRC funding now coming from outside AE, including Congress' appropriation of FY 2023 DAWDA funding explicitly for the Defense Civilian Training Corps (DCTC).[2]

AE also partners with AIRC and supports its expanding outreach and engagement with the military services and defense agencies to facilitate understanding of practical problems and increase applications and transition. This includes the creation and expansion of the Acquisition Innovation Advisors (AIA)—chaired by AE and consisting of senior executives from

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[1] While there may be other DoD-funded extramural activities that fit the description in 10 U.S.C. § 4142(d), AIRC conducts all the Department's extramural acquisition innovation and research activities formally established in response to that statutory requirement.

[2] Key stakeholders providing with major funding for AIRC include Congress for the Defense Civilian Training Corps (DCTC) piloting, the Director of Operational Test and Evaluation (DOT&E), the Deputy Assistant Secretary of Defense for Materiel Readiness (DASD(MR)), the Planning, Programming, Budgeting, and Execution (PPBE) Reform Commission, the Defense Acquisition University (DAU), Defense Pricing and Contracting (DPC), and the Air Force.

across the Department to guide and advise AIRC research, modeling, piloting, training, and transitions. AE is also working with the SERC primary sponsors within OUSD(Research and Engineering) (OUSD(R&E)) and the UARC contracting specialists in the DoD's Washington Headquarters Services to streamline contracting actions and enable adding key universities with needed capabilities in management, law, public policy, economics, and other non-technical disciplines to broaden the academic disciplines being brought to bear through AIRC. This includes leveraging capabilities at historically black colleges and universities (HBCUs), and minority institutions (MIs).

Major Initiatives

Fiscal year (FY) 2023 saw several major AIRC efforts, including the following:

Designing and Piloting the Defense Civilian Training Corps (DCTC). AIRC and AE are working closely on designing, developing, piloting, and instrumenting the DCTC, which is the Department's major initiative to develop the next generation of DoD civilian employees through earlier applied training during undergraduate education. Major AIRC accomplishments include:

- Initiated DCTC pilots at four universities with students starting in the fall 2023 semester—a year earlier than required by Congress.
- Identified and selected 90 scholars out of 365 applicants (highly selective 24% rate).
  - These 90 scholars are enrolled in a total of 49 science, technical, engineering, mathematics (STEM), business, policy, law, and other majors; representing a broad demographic including both technical and nontechnical disciplines.
- Funded DCTC scholars (tuition, stipends, travel, internships).
- Leveraged early planning research by AIRC and early engagement by pilot universities.
- Rapid development of new undergraduate DCTC courses for fall 2023.
- Obtained 86 internship research proposals from 25 DoD organizations.
- Developed workforce robustness/resilience *Culture of Care* and mentoring frameworks.
- Established communication pathways (e.g., dctc.mil, social media, x-university sharing).
- Developed tools to identify critical workforce critical skills (current, future).
- Established linkages across DoD (acquisition, sustainment, personnel, training).
- Strong support across Military Services, the Office of the Secretary of Defense (OSD), and the Deputy Secretary of Defense.
  - Multiple stakeholders already interested in hiring DCTC scholars.

Next steps include preparing for the fall 2024 DCTC cadre and further refinement of these elements based on lessons from Cadre 0 piloting.

Implementing Digital Transformation Across Acquisition and Sustainment. Since its inception, AIRC has been identifying practical next steps and implementation options in support of the Department's data strategy and digital transformation efforts. AIRC's efforts support the DoD's Data Strategy and the OUSD(A&S) Acquisition and Sustainment Data and Analytics Strategic Implementation Plan. Successes include:

- Creating a multi-university collaborative research environment for sensitive data.
- Identifying needed A&S-function changes to implement model-based transformations.
- Developing strategies to address organizational barriers to digital transformations.
- Applying model-based tools for portfolio management, analysis, and decision making.
- Applying extramural data-science capabilities to real DoD problems/data (DLA, USMC).

- Applying model frameworks to align digital transformation of sustainment functions.
- Applying model-based perspectives to improving test and evaluation (T&E).

Next steps include supporting the new Air Force / Army Digital Materiel Management (DMM) initiative and working with other SERC initiatives to align, leverage, and coordinate these efforts as part of broader DoD efforts to bring the Department further into the expanding Digital Age.

Streamlining and Improving T&E. AIRC built its 2011 set of T&E incubator research efforts into a growing corpus of applied research, modeling, and piloting projects for the Director of Operational T&E (DOT&E) strategic plan. Successes include:

- Developing new techniques to speed and improve T&E.
  - o Challenge areas include the T&E of artificial intelligence (AI), machine learning (ML), autonomy, cybersecurity, rapid prototyping, and rapid fielding.

Next steps include further development of these techniques across these key T&E challenge areas in the DOT&E strategic plan.

Emerging Major Efforts

Identifying Planning, Programing, Budgeting, and Execution (PPBE) Reform Options. In FY 2023, AIRC began researching innovative approaches for improving the PPBE system. Research for the PPBE Reform Commission involves case-study analysis of PPBE success and issues, examining how PPBE supports responsive acquisition (such as Middle Tier), researching ways to implement innovative concepts (such as portfolio budgeting and combined budget activities), identifying reform options that would require reforms not just in PPBE but in parallel with acquisition and/or requirement system reforms, and examining alternative ways to benchmark progress (or lack thereof) in obligating and expending funds. Results are pre-decisional to the Commission but are anticipated to be released in the spring of 2024 after the Commission releases its final report in March of 2024.

Aligning Incentives and Culture for Agility and Mission Outcomes. Perhaps the most challenging barriers to improving defense acquisition and sustainment come from workforce culture and incentives. A common expression states that "Culture eats strategy for breakfast."[3] While leadership emphasizes agility and focus on mission, our workforce also responds to the incentive structure in which we place them. Here, AIRC is applying an incentives analysis framework to identify, apply, and test organizational incentive changes to align with agility and mission outcomes.

Addressing Innovation Challenges

The incentives and culture project is a good example of the challenges in seeking innovative solutions to enduring DoD issues. No single entity "owns" the problem of acquisition innovation (e.g., underlying culture and incentive structures), and there is little available budget beyond DAWDA to initiate and test new ideas through applied research. Nevertheless, AE investments in AIRC research for the center's first three years are bearing fruit with significant funding emerging from other stakeholders across the Department. This phased approach with initial

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[3] This expression was attributed to management guru Peter Drucker in 2006. See, e.g., https://journal.jabian.com/culture-eats-strategy-for-breakfast-and-transformation-for-lunch/ and https://www.managementcentre.co.uk/management-consultancy/culture-eats-strategy-for-breakfast/.

seed funding followed by co-funding is working. AIRC continues to pursue and refine its approach through a series of steps: applied research, model, prototype, pilot, train, and transition. Applied research focuses on what can be done incrementally in the next few months rather than the next few years as steps toward eventual strategic goals.

Closing Thoughts

AIRC's main goals include improving the acquisition ecosystem through various approaches (e.g., digital transformation, data science, systems engineering, workforce development, incentives alignment, artificial intelligence (AI), agile hardware/ software development, and system/process integration and interoperability). All disciplines and communities in the acquisition ecosystem need to interoperate and improve to further the Department's mission. The expanded engagement of AIRC is putting us on a path for success.

While AIRC is just three years old, the center is producing promising new and innovative ideas. Many of these ideas address major, structural challenges and issues in defense acquisition and sustainment policy and practice. Major efforts such as DCTC illustrate what AIRC can do when provided with resources, DoD engagement, and support to address a major DoD challenge. Engaging new ideas and approaches from academia to DoD problems through applied research and consultation with an emphasis on efficiency, speed, and results is working to make a difference for the Department, our warfighters, and our taxpaying citizenry.

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The Acquisition Innovation Research Center

AIRC was established in September 2020 to provide analyses and policy alternatives from academia for innovative improvements in defense acquisition and sustainment policies and practices, including tackling barriers and enduring challenges to innovation by thinking systemically about defense acquisition.

The Structure of AIRC

AIRC has several unique features that facilitate its ability to develop innovative improvements in defense acquisition and sustainment policies and procedures.

Cross-Disciplinary. Acquisition and sustainment involve both technical and non-technical challenges. AIRC applies fresh, new insights from disciplines across academia, such as management, business, law, public policy, education, data science, and engineering.

A Multi-University Center. AIRC consists of a partnership of over 20 extramural universities (see Figure 1).[4] AIRC fulfills the statutory requirement, codified in 10 U.S.C. § 4142 (formerly numbered section 2361a), for leveraging academia to improve acquisition and sustainment outcomes. (See Appendix A for the statutory language.)

A Focus on Applications. AIRC's operational model begins with research and modeling, followed by application, piloting, and education development in anticipation of transition into practice within the Department (see Figure 2). The focus is on improving acquisition outcomes for the warfighter. AIRC seeks measurable results so that it can determine if the innovations are working and producing the desired effects and their costs.

Faculty Led; Expert Guided. Rather than relying on a bench of dedicated researchers, AIRC leverages faculty, students, and researchers from over two dozen universities paired with domain experts and users to combine fresh approaches with domain expertise and insight. This provides a deep set of capabilities and breadth of domains that can be tapped depending on the challenges of individual projects.

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[4] The 20 extramural SERC/AIRC collaborator universities are: Auburn University, Carnegie-Mellon University, Georgetown University, Georgia Institute of Technology (Georgia Tech), Massachusetts Institute of Technology (MIT), Missouri University of Science and Technology, North Carolina Agricultural and Technical State (NC A&T), Old Dominion University, Pennsylvania State University (Penn State), Purdue University, Stevens Institute of Technology (*lead*), Texas A&M University, University of Arizona (U. Arizona), University of Alabama in Huntsville (UAL Huntsville), University of Maryland (UMD), University of Massachusetts Amherst (U.Mass Amherst), University of Southern California (USC), University of South Florida, University of Virginia, Virginia Polytechnic Institute and State University (Virginia Tech), and Wayne State. Two (2) collaborating military universities include the Air Force Institute of Technology (AFIT) and the Naval Postgraduate School (NPS). AIRC also has access to five other universities: George Mason University (GMU), The George Washington University (GW), North Carolina State University (NCSU), The Ohio State University (OSU), and Arizona State University (Az State U.). AIRC also seeks participation with other Historically Black Colleges and Universities (HBCUs) and other Minority Institutions (MIs) besides North Carolina A&T State (official lists of HBCUs MIs are at https://sites.ed.gov/whhbcu/one-hundred-and-five-historically-black-colleges-and-universities/ and https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst-list-tab.html).

Figure 1. AIRC Universities

Figure 2. AIRC's Application Model

| Research | Model | Pilot & Apply | Educate | Transition |

Functional Pillars. There are four major pillars of activity in AIRC (see Figure 3). The first pillar, Information flow (data and knowledge sharing), is a key enabler to inform, improve, and accelerate acquisition functions and decisions. AIRC is looking at how the second pillar, acquisition tools and functions, can be improved by leveraging better information, models, and commercial innovation. AIRC is also exploring how the third pillar, models and analytics such as policy test ranges and better decision tools, can enable evidence-based decision-making. Underneath these three pillars is the all-important fourth pillar of addressing people and culture. Acquisition is a workforce-driven organization and culture affects how people operate and function. Innovation cannot proceed without addressing workforce improvements and tackling cultural barriers.

**Figure 3. Functional Pillars of AIRC's Strategic Approach**

A Systems Approach to Innovating the Capability Ecosystem. Defense acquisition is a system. Often referred to as *Big 'A' Acquisition*, it includes not only the direct acquisition and sustainment functions but also the inputs and relationships with the requirements and financial systems, the Intelligence Community, the science and technology (S&T) community, and Industry, along with feedback loops relating acquisition to operations and threats. Thus, AIRC takes a systems approach to examining ways to improve acquisition outcomes through improvements in inputs and processes, outputs, and ultimately outcomes (see Figure 4). AIRC's tasks engage at three different levels: (1) acquisition-wide systemic elements, (2) major system elements, and (3) targeted functions and elements (see the sample projects around the capability ecosystem in Figure 4).

Figure 4. Applying Innovative Solutions from Academia to the Capability Ecosystem
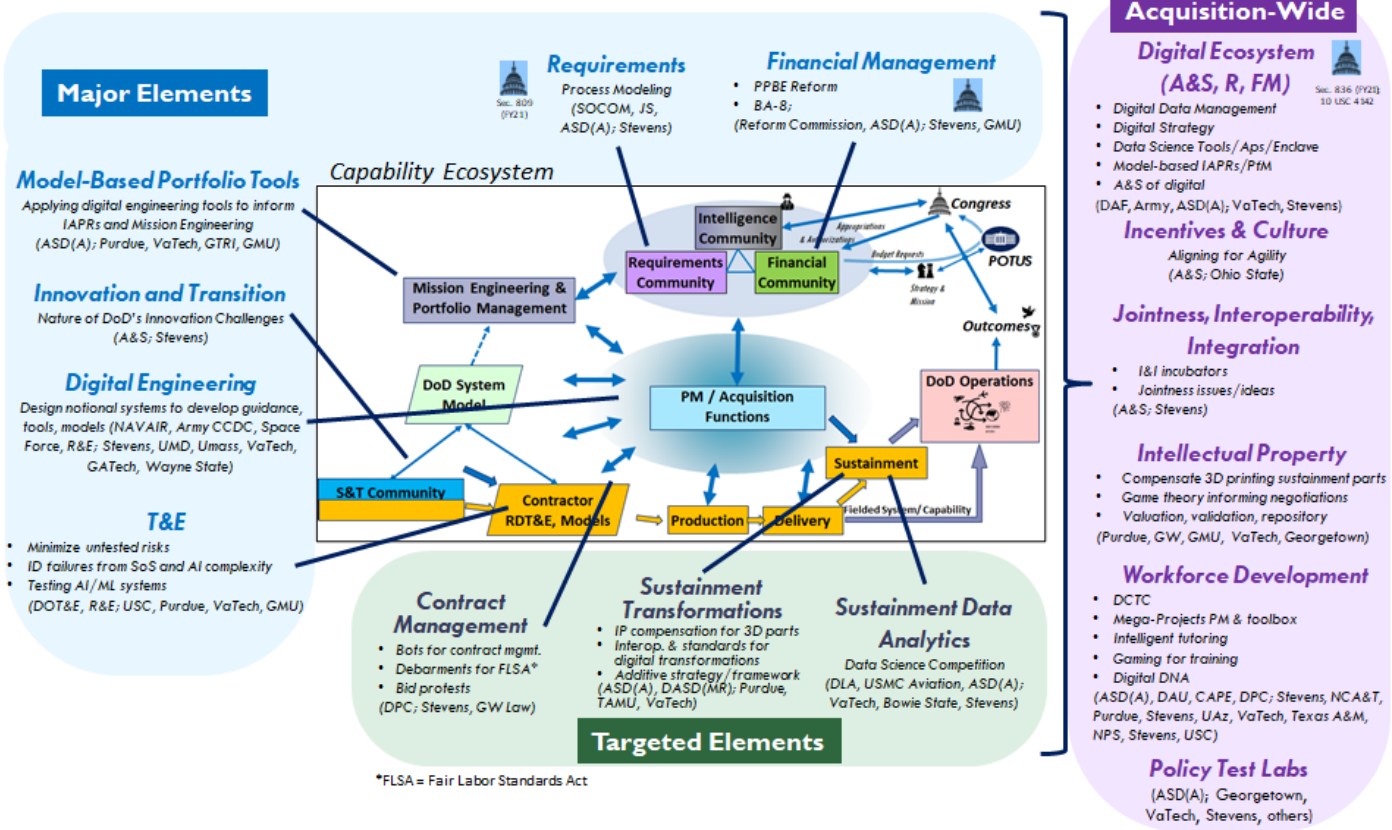
Multiple Sources of Ideas and Challenges. AIRC project topics come from three primary sources: (1) areas where the Department has identified major acquisition issues that could benefit from innovation; (2) statutory tasks assigned by Congress; and (3) targeted opportunities and new ideas identified by faculty and students at the universities in AIRC's collaborator network.

Growth and Outreach

Figure 5 illustrates the growth of AIRC's activities over the first three years of its existence. AIRC's initiatives—86 started to date—involve a broad range of functions across acquisition. Publicly released project reports are available on the AIRC website at https://acqirc.org/publications/.

In terms of universities leveraged, AIRC has now engaged faculty and researchers from 26 universities, not including those in the Capstone Marketplace (see Figure 6). These universities are primarily from the SERC/AIRC partnership, but others reflect potential additions to the network or faculty members engaged as AIRC fellows or research faculty in part-time relationships.

Finally, AIRC continues to expand its outreach and connections beyond its primary sponsor, the Director of Acquisition Enablers (AE) in the Office of the Assistant Secretary of Defense for Acquisition (ASD(A)). Figure 7 shows sponsoring or champion

organizations by number of projects engaged. The sponsor and champion organization base over the first three years has grown to include 20 DoD entities. This growth reflects strong strategic engagement from entities across the Fourth Estate including organizations in OSD, the Joint Staff, and the Defense Agencies. Figure 8 shows AIRC funding sources beyond AE. AIRC is working to strengthen its support from the Military Services to initiate important research tasks on key challenges. AIRC has also started to collaborate with U.S. Special Operations Command (USSOCOM) and U.S. Indo-Pacific Command (USINDOPACOM) to understand their challenges and approaches.

Figure 5. Number of AIRC Projects by Funding Year
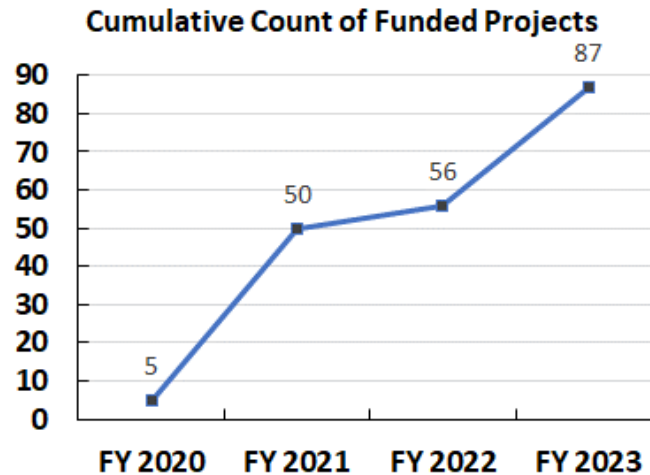
NOTE: Project counts in a FY include those funded towards the end of the year, including projects largely executed in FY 2022 that were funded in FY 2021 and projects funded in FY 2023 that will largely be executed in FY 2024.

Figure 6. Universities Engaged by AIRC Since Inception
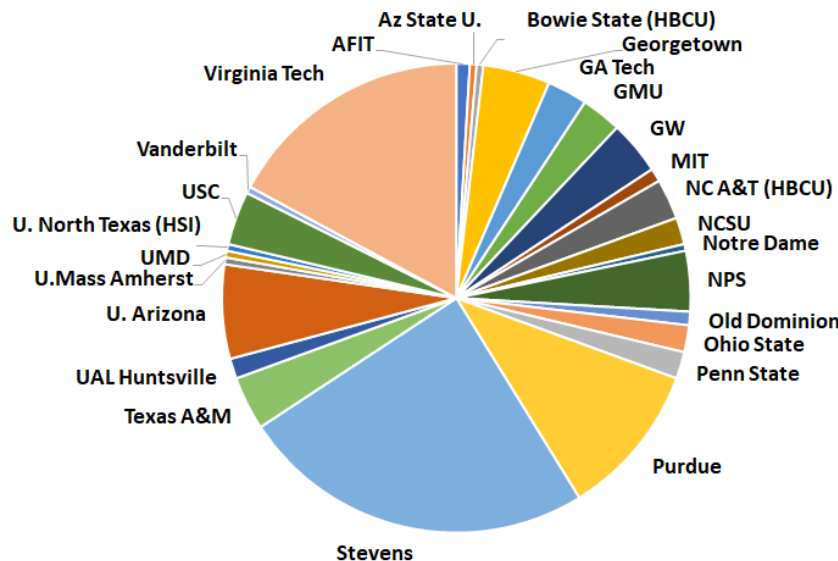
NOTE: ISDC = Interagency Suspension and Debarment Committee. The size of the pie graphic reflects the number of AIRC projects engaged. Also, some universities are listed because their faculty members are engaged as AIRC fellows or research faculty in part-time relationships.

Figure 7. AIRC Project Sponsors and Champions Beyond ASD(A)/AE (by # projects)
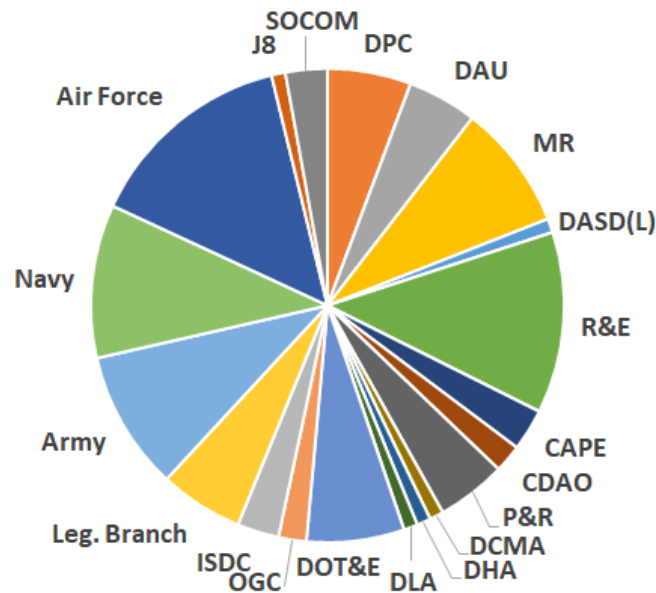
NOTE: A champion organization is an entity providing strong leadership interest and user engagement to facilitate research and application of an AIRC project.

AIRC Activities in FY 2023

FY 2023 was a growth year for AIRC, generating many innovative concepts, approaches, and recommendations for subsequent piloting and application by the Department. During FY 2023, AIRC had 42 active projects. Of these, 18 have concluded, 9 are ongoing, and 15 have recently started (see Tables 1–3).

Highlights of AIRC activities this FY include the following:

- **Designing and Piloting DCTC.** AIRC is working closely with AE and other key stakeholders across the Department on designing, developing, piloting, and instrumenting DCTC—the Department's major initiative to develop the next generation of DoD civilians through earlier applied training during undergraduate education. AIRC and AE achieved their stretch goal of rapidly initiating DCTC a year earlier than required by new legislation by establishing cadres of DCTC scholars at four pilot universities in the Fall 2023 academic semester. This leveraged early planning research by AIRC and dedicated early engagement by pilot universities in anticipation of just-in-time funding. AIRC activities include the development of a new series of undergraduate DCTC cross-disciplinary courses; identification of applied DoD research topics, innovation capstones, and innovation internships for DCTC scholars; scholarship, stipend, and travel support; DoD, government, and disciplinary orientation; and approaches for streamlined DoD hiring of students upon graduation. While still ongoing, this unprecedented activity with strong DoD and Congressional support is taking academic engagement to a new level to transform potentially the entire DoD workforce development pipeline. See the DCTC website for additional details: dctc.mil.

Implementing Digital Transformation Across Acquisition and Sustainment. Since its inception, AIRC has identified practical next steps and implementation options in support of DoD's data strategy and digital transformation efforts. These efforts supporting DoD's Data Strategy and the associated implementation plan in OUSD(A&S) include opportunities for applying model-based approaches across not only systems engineering but all acquisition and sustainment functions. This effort complements and intersects with other efforts across AIRC, such as the application of digital engineering tools for portfolio management, analysis, and decision making; the application of models for improving T&E, and support for the new DMM initiative by the Air Force and Army. AIRC is working with other SERC initiatives to align, leverage, and coordinate these efforts as facets of broader DoD efforts to bring the Department further into the expanding Digital Age.

- **Streamlining and Improving T&E.** In addition, AIRC has expanded an earlier initial set of T&E incubator research efforts into a growing corpus of applied research, modeling, and piloting projects of new techniques to speed and improve T&E. These efforts for DOT&E are addressing challenges identified in the Director's strategic plan, including T&E of AI, ML, autonomy, cybersecurity, and rapid prototyping, and rapid fielding. For example, DOT&E and AIRC hosted a workshop on approaches for moving to a model-based T&E Master Plan (TEMP), including best practices, new methods and tools, and consensus on where digital transformation offer the largest benefits for T&E processes and documentation.
- **Identifying PPBE Reform Options.** In FY 2023, AIRC also began researching innovative approaches for improving the PPBE system. Research for the PPBE Reform Commission involves case-study analysis of PPBE success and issues, examining how PPBE supports responsive acquisition (such as Middle Tier), researching ways to implement innovative concepts (such as portfolio budgeting and combined budget activities), identifying reform options that would require reforms not just in PPBE but in the acquisition and/or requirement systems, and examining alternative ways to benchmark progress (or lack thereof) in obligating and expending funds. Results are pre-decisional to the Commission but are anticipated to be released in the spring of 2024 after the Commission releases its final report in March 2024.
- **Aligning Incentives and Culture for Agility and Mission Outcomes.** Perhaps the most challenging barriers to improving defense acquisition and sustainment come from workforce culture and incentives. "Culture eats strategy for breakfast" is a common expression.[5] While leadership emphasizes agility and focus on mission, our workforce also responds to the incentive structure that we place them in. Unless these are aligned, our workforce will try to follow leadership direction, but will ultimately act based on the incentive structures and culture that we place them in. Here, AIRC is applying an incentives analysis framework to identify, apply, and test organizational incentive changes to align with agility and mission outcomes.
- **Statutory Debarment Workshops.** As requested in the FY 2023 National Defense Authorization Act (NDAA) Joint Explanatory Statement (p. 215), AIRC is partnering with the Defense Acquisition University (DAU) to host a two-part webinar series on

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[5] *See, e.g.,* https://journal.jabian.com/culture-eats-strategy-for-breakfast-and-transformation-for-lunch/ and https://www.managementcentre.co.uk/management-consultancy/culture-eats-strategy-for-breakfast/.

issues and approaches associated with debarment of contractors based on violations of the Fair Labor Standards Act. This workshop helps disseminate findings from prior FY 2022 AIRC research.[6] Members of the acquisition workforce can receive continuing education units through DAU. Recording of the first session is available online at Assessing Contractor Labor Law Violations Responsibility and Debarment Part 1 (kaltura.com). Information on both sessions is available at Assessing Contractor Labor Law Violations.

- **Data Science Competition Engaging Faculty-Led Teams on DoD Problems.** AIRC successfully completed the Defense Data Grand Prix, its inaugural data-science competition. Established in September 2021, the inaugural 18-month project addresses shortages in data analytics capacity in the Department, incentivizes solutions through a competition structure to create innovative findings, and increase student awareness of defense acquisition system challenges, decisions, and processes to improve the DoD workforce pipeline (see https://acqirc.org/defense-data-grand-prix/). The Defense Logistics Agency was the primary operational sponsor, providing actual DoD data and problem statements. The U.S. Marine Corps Aviation Sustainment community also participated in the third semester-long competition. Fifteen university teams from six universities were engaged in this effort.

- **Agile Hardware and Hardware-Reliant Systems Development Workshop.** AIRC and Carnegie Mellon University's Software Engineering Institute co-hosted a two-day workshop in April 2023 with experts from academia, industry, and the Department to share foundational principles, approaches, best practices, and lessons in the agile development of hardware and hardware-reliant systems. The workshop report identifies ways that agile development approaches can be applied to hardware-reliant systems to speed acquisition: Agile Acquisition: History and Recommendations (acqirc.org).

- **Ontologies to Improve Interoperability and Harmonization of Underlying Information Models: A Workshop.** AIRC, SERC, and MITRE co-hosted a workshop to discuss how ontologies can facilitate system integration and interoperability. The results were a workshop report[7] and a proposal for "Roadmapping a Framework of Computationally Enabled Ontologies for Digital Engineering" for the Office of the Under Secretary of Defense for Research and Engineering [OUSD(R&E)], which was funded and initiated in September 2023.

- **DAU/AIRC Quarterly Research Forums.** Pursuant to 10 U.S.C. § 1746a, AIRC established a partnership with DAU. As part of this partnership. AIRC and DAU co-hosted four quarterly research forums that provided a platform for AIRC researchers to present their research and receive feedback from faculty and practitioners in the field and for DAU to discuss its curricula initiatives and challenges.[8]

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[6] See Congressionally Mandated Study on Contractor Debarments for Violations of U.S. Labor Laws (acqirc.org).

[7] See 1687966102.Information Models and Ontologies to Enable DE_Research Workshop Report_2023.pdf.

[8] The forums are available at: September 2022 recording: AIRC orientation and kickoff forum, Dec 2022 recording: Future of Acquisition, March 2023 slides: Improving the DOD Requirements Process, June 2023 recording: Digital Engineering and T&E.

Table 1. AIRC Projects Completed in FY 2023

Area	Innovation Tasks (🏛 = Congressionally related)	Sponsors & Champions	Universities	Status
COMPLETED IN FY 2023				
Workforce	🏛 **DCTC Implementation Planning.** Developed range of options for implementing DCTC.	ASD(A)/AE, DAU	Stevens Institute, AIRC Fellows	Completed Sep 2023
Transformation and Data Analytics	🏛 **Innovative, Data-Enabled Acquisition Strategy (IDEAS).** Developed concepts for and approaches to address challenges to digital acquisition and sustainment.	ASD(A)/AE	Stevens Institute, Virginia Tech	Completed Dec 2022
Transformation and Data Analytics	🏛 **Digital Data Management and Analytic Pilots.** Developed and improved CUI enclave and tools for multi-university research teams. Identified implementation use case opportunities.	ASD(A)/AE	Stevens Institute, Virginia Tech	Completed Sep 2023
Transformation	**Acquisition and Sustainment Transformations Needed to Implement Digital Engineering.** Identifying challenges and changes needed across acquisition and sustainment functions to implement digital engineering and digital acquisition. Final report: Acquisition with Digital Engineering (acqirc.org)	A&S/AE	Stevens Institute, AIRC Fellows	Completed Sep 2023
Data Analytics	**Digital Data Grand Prix, Cycle I.** Three semester-long competitions engaging extramural data science capabilities on actual DoD data and problems.	ASD(A)/AE, DLA, USMC Aviation Sustainment	Virginia Tech, Stevens Institute, Bowie State, Texas Tech, UAL Huntsville, GMU	Completed Jul 2023
Requirements	🏛 **Improving the Process for Developing Capability Requirements for DoD Acquisition Programs.** Assessed time savings from alternative validation processes for middle-tier acquisitions. Proposed application for lower acquisition category (ACAT) programs. Online forum: Improving the DOD Requirements Process	USSOCOM, ASD(A)/AE	Stevens Institute, AIRC Fellows	Completed Sep 2023
T&E	**Methods for Testing Cyber, Security, and AI/ML.** Developed new approaches to improve and speed operational test and evaluation (OT&E).	DOT&E	Virginia Tech	Completed Sep 2023
Workforce	🏛 **Training in Innovation and Emerging Technology Adoption.** Developed recommendations for improving innovation training. Final report: Training in Innovation and Emerging Technology Adoption (acqirc.org)	DAU	Virginia Tech	Completed Mar 2023
Workforce	🏛 **DAU/AIRC Quarterly Research Forums.** Exchange of research results and activities between AIRC and DAU for the Acquisition Workforce. Online Forums: September 2022 recording: AIRC orientation and kickoff forum, Dec 2022 recording: Future of Acquisition, March 2023 slides: Improving the DOD Requirements Process, June 2023 recording: Digital Engineering and T&E	DAU	Stevens Institute	Completed Jul 2023
Sustainment	**Submarine Repair Capabilities and Capacity.** Developed model simulating drydock capacity and availability during current operations and alternative capabilities and structures.	DASD(MR)	NPS	Completed Mar 2023

Area	Innovation Tasks (🏛 = Congressionally related)	Sponsors & Champions	Universities	Status
Portfolio Management	**Portfolio Performance Analysis and Visualization.** Initial assessment of data and approaches.	ASD(A)/AE	UMD	Completed May 2023
Contracting	**Game Theory Application to Improving DoD Intellectual Property (IP) Transactions.** Improving DoD IP negotiation positions through models of DoD and industry values and posturing.	IP Cadre, ASD(A)/AE	GW, GMU	Completed Sep 2023
Wortkforce	**Gamification of Training in Emerging Acquisition Methods (Phase IIa)**. Identifying and testing different game-based training effectiveness. Final report: Loud and Clear: The Negotiation Game (acqirc.org)	ASD(A)/DPC, ASD(A)/AE	NPS, NCSU	Completed Sep 2023
Transformation	**Incubator Proposals: Integration and Interoperability.** Developed and rated innovative 29 proposals for improving DoD system integration and interoperability. Three were selected as new starts.	A&S/AE, ASD(A)/AI2	GMU, Georgetown, GW, MIT, NPS, Old Dominion, Purdue, Stevens Institute, Texas A&M, Virginia Tech, UAL Huntsville, U. Arizona, USC, AIRC Fellows,	Completed Sep 2023
Innovation Workshop	**Agile Hardware and Hardware-Reliant Systems Development** (April 2023). Identify practical ways to apply agile development techniques beyond software. Related report: Agile Acquisition: History and Recommendations (acqirc.org)	ASD(A)/AE, OUSD(R&E)	Stevens Institute, USC, CMU SEI, AIRC Fellows	Completed Aug 2023
Innovation Workshop	**Mission Engineering Roundtable** (May 22, 2023). Identify approaches across academia that teach mission engineering and portfolio management techniques.	OUSD(R&E), ASD(A)/AE, MITRE	AFIT, Johns Hopkins U., NPS, Old Dominion, Purdue, Stevens Institute, Virginia Tech	Completed May 2023
Innovation Workshop	**Ontologies Workshop** (May 23–24, 2023). Identify opportunities to improve interoperability and harmonization of underlying information models through (often executable) categories of hierarchical artifacts and their relationships. Final report: Information Models and Ontologies to Enable DE_Research Workshop Report_2023	OUSD(R&E), ASD(A)/AE, MITRE	Stevens Institute, GTRI, U. Arizona	Completed Aug 2023
Innovation Workshop	**Incentives for Motivating Workforce Agility and Innovation** (webinar). Explore needs, challenges, and approaches for addressing and aligning incentives and culture with mission objectives.	ASD(A)/AE, SAF/AQC, NCMA	OSU, GMU, Stevens Institute, AIRC Fellows	Completed Aug 2023

NOTE: ASD(A)/AE= Acquisition Enablers; CUI = Controlled Unclassified Information; DASD(MR) = Deputy Assistant Secretary of Defense for Materiel Readiness; DLA= Defense Logistics Agency; DPC = Defense Pricing and Contracting; GTRI = Georgia Tech Research Institute; NCMA = National Contract Management Association; SAF/AQC = Deputy Assistant Secretary of the Air Force for Contracting.

Table 2. Ongoing AIRC Projects

Area	Innovation Tasks (🏛 = Congressionally related)	Sponsors & Champions	Universities	Status
Workforce	🏛 **Defense Civilian Training Corps (DCTC).** Developing, piloting, and instrumenting a major new DoD program to develop the future DoD civilian workforce through a program of undergraduate DCTC cross-disciplinary courses, applied DoD research, innovation capstones, scholarships, and facilitated hiring. Website: dctc.mil	DSD, A&S, A&S/AE, P&R	NC A&T, Purdue, Virginia Tech, U. of Arizona, Stevens Institute, USC, AIRC Fellows	Ongoing (Cohort 0 began Aug 2023)
Innovation	**University Capstone Marketplace.** Engaging senior undergraduate research projects to develop innovative approaches and solutions for actual USSOCOM operational challenges. Website: capstonemarketplace.org	R&E, USSOCOM	Stevens Institute, Auburn, Michigan Tech, NC A&T, OSU, U. Texas Austin, U.S. Naval Academy, U. South Florida, U. Nevada, Las Vegas, U. South Alabama, ULA Huntsville, Texas A&M, Virginia Tech, San Jose State, U. Mass. Boston, AIRC Fellows	Ongoing
PPBE	🏛 **Planning, Programming, Budgeting, and Execution (PPBE) Reform Insights and Concepts.** Research and prototyping approaches and methods to improve PPBE insight, transparency, responsiveness, and effectiveness for improved mission outcomes.	PPBE Reform Commission	Stevens Institute, GMU, Penn State, AIRC Fellows	Ongoing through Mar 2024
Sustainment Transformation	**Mission-Aware Integrated Digital Transformation for Operational Advantage in Sustainment.** Prototyped and now applying model-based tools for actual DoD Integrated Acquisition Portfolio Reviews (IAPRs).	DASD(MR)	Purdue, Texas A&M	Ongoing (2nd year)
Innovation Workshop	**Debarments for Violations of the Fair Labor Standards Act (FLSA).** Disseminating insights on debarment decisions related to FLSA violations to improve contractor performance and compliance. Workshops are based on prior report: Congressionally Mandated Study on Contractor Debarments for Violations of U.S. Labor Laws (acqirc.org)	ASD(A)/DPC, OGC, ASD(A)/AE	Stevens Institute, George Washington U. Law School, AIRC Fellows	Ongoing
Innovation Workshop	**Intellectual Property Workshop** (December 2023). Uniting government, industry, and academia to advance DoD acquisitions through Intellectual Property Workshop agile and effective IP evaluations and strategies.	IP Cadre	Stevens Institute	Ongoing

Area	Innovation Tasks (🏛 = Congressionally related)	Sponsors & Champions	Universities	Status
T&E	**T&E Methods for Middle Tier Acquisition (MTA).** Developing methods to streamline T&E for rapid prototyping and rapid fielding.	DOT&E	Virginia Tech, Purdue, Penn State, AFIT, and Arizona State	Ongoing (2nd year)
T&E	**Digital Transformation in T&E Methods.** Developing ways to exploit model-based approaches to streamline and improve T&E.	DOT&E	Virginia Tech, U of Arizona, and GTRI, GWU, and Florida International U.	Ongoing (2nd year)
Workforce	**Cognitive Training Assistants for Cost Estimators** (Phase II). Piloting and testing computer-aided training for acquisition professionals. Cognitive Assistant for Training Cost Estimators (acqirc.org)	CAPE, ASD(A)/AE	Texas A&M, U. of Arizona	Ongoing

NOTE: CAPE = Cost Assessment and Program Evaluation; P&R = Personnel & Readiness; OGC = Office of the General Counsel

Table 3. Newly Started AIRC Projects

Area	Innovation Tasks (🏛 = Congressionally related)	Sponsors & Champions	Universities	Status
Workforce	**DCTC Innovation Capstone.** Identify, disseminate, and mentor student research on actual DoD problems across DCTC pilot and other U.S. universities.	ASD(A)/AE	North Carolina A&T, Purdue, Virginia Tech, U. of Arizona., Stevens Institute, other U.S. accredited universities TBD, AIRC Fellows	New Start
Workforce	**The Future of Managing Mega-Projects.** Research and develop insights and curriculum on how data visualization, AI, and ML can be combined with human knowledge transfer across teams to aid in the management of DoD's largest programs (i.e., mega-projects). Forthcoming forum: The Future of Managing Mega Projects	DAU	Stevens Institute	New Start Sep 2023
Data Manageent and Analytics	🏛 **Digital Data Strategy: Updated A&S Implementation Plan and Pilots.** Continued research and implementation pilots for advancing digital transformation across acquisition and sustainment.	ASD(A)/AE	Virginia Tech, Stevens Institute	New Start
Transformation	**Executive Forum for Industry/Air-Force/Army Collaboration on Digital Materiel Management (DMM) Implementation at Scale**. Drive collaboration to employ digital methods across research, acquisition, and sustainment.	Air Force, Army	Stevens Institute	New Start Sep 2023

Area	Innovation Tasks (🏛 = Congressionally related)	Sponsors & Champions	Universities	Status
Transformation	**Roadmapping a Framework of Computationally Enabled Ontologies for Digital Engineering.** Roadmap to improve interoperability and harmonization of the underlying information models across various stakeholder domains at different stages of mission and system lifecycles.	OUSD(R&E)	Stevens Institute	New Start Sep 2023
Workforce	**Incentivizing Workforce Innovation and Culture** (Phase II Incubator). Pilot and test framework for identifying and re-aligning incentives and culture for agility and other mission objectives. Initial application: contracting officers.	AFICC, ASD(A)/AE	Ohio State University	New Start
Portfolio Analysis	**Applying Model-Based Tools to Actual Acquisition Integrated Portfolio Reviews.** Applying AIRC model-based prototypes to actual DoD IAPRs (Integrated Acquisition Portfolio Reviews). Report on prior prototypes: Data-Driven Capability Portfolio Management Pilot (acqirc.org)	ASD(A)/AI2, ASD(A)/AE	Purdue, GTRI, GMU	New Start
Requirements	🏛 **Pilot Alternative Requirements Approval Process.** Applied research to support application of alternative processes to lower-ACAT programs.	ASD(A)/AE, JS J8	Stevens Institute, AIRC Fellows	New Start
Sustainment	🏛 **Compensation for Additive Field Manufacturing of IP.** Identify ways to fairly compensate IP owners when DoD uses additive manufacturing of maintenance parts.	DASD(MR), A&S/AE	Purdue	New Start
Data Management and Analytics	**Digital Data Grand Prix, Cycle II.** Identify new DoD challenges for semester-long extramural research and analysis.	ASD(A)/AE	Virginia Tech, Stevens Institute	New Start
Contracting	**Bots for Repetitive or Rote Contracting Actions.** Prototype software "bots" to automate repetitive actions and release contracting officer time for higher cognitive activities.	AMIC, A&S/AE, A&S/DPC	Virginia Tech, Stevens Institute	New Start
Workforce	🏛 **Curricula on Financing and Operations of Start-Up Businesses.** Identify range of available courseware for acquisition workforce training.	ASD(A)/AE	Stevens Institute	New Start
Transformation	**Structuring Enterprise-Level Systems while Isolating Local Details** *(Incubator Phase I).* Improve interoperability and integration through knowledge and ontological functional enterprise-level relationships while retaining private details.	ASD(A)/AE	Stevens Institute, Texas A&M	New Start
Transformation	**Identifying, Designing, and Communicating Approaches for New Tech Adoption during Sustainment** *(Incubator Phase I).* Apply Organizational Theory and User-Centric (UX) Design to improve complex communication systems from the human perspective.	ASD(A)/AE	Virginia Tech, Georgetown	New Start
Sustainment Transformation	**Managing Reliability and Availability Requirements** *(Incubator Phase I).* Develop techniques for cross-cutting reliability and availability requirements through decomposition and storyboarding.	ASD(A)/AE	U. So. Calif.	New Start

NOTE: JS = Joint Staff.

Closing Thoughts

In summary, while AIRC is just three years old, the center is already producing promising new and innovative ideas. Many of these ideas address major, structural challenges and issues in defense acquisition. Major efforts such as DCTC illustrate what AIRC can do when presented with a major challenge and resources to pursue applied research, modeling, piloting, training, and transitioning to improve acquisition and sustainment outcomes. Engaging new ideas and approaches from academia with an emphasis on efficiency, speed, and applied problem solving is working to make a difference for the Department, our warfighters, and taxpayers.

Appendix A. AIRC in Statute

Below is the statute, codified in Title 10, U.S. Code (as of Release Point 117-113not103).

§4142. Extramural acquisition innovation and research activities

(a) ESTABLISHMENT.—The Secretary of Defense, acting through the Under Secretary of Defense for Acquisition and Sustainment and in coordination with the Under Secretary of Defense for Research and Engineering, shall establish and maintain extramural acquisition innovation and research activities as described in subsection (d), which shall include an acquisition research organization within a civilian college or university that is not owned or operated by the Federal Government that is established to provide and maintain essential research and development capabilities through a long-term strategic relationship with the Department of Defense.

(b) GOALS.—The goal of any activity conducted pursuant to this section shall be to provide academic analyses and policy alternatives for innovation in defense acquisition policies and practices to policymakers in the Federal Government by using a variety of means intended to widely disseminate research findings from such an activity, in addition to executing demonstration and pilot programs of innovative acquisition policies and practices.

(c) DIRECTOR.—
    (1) APPOINTMENT.—Not later than June 1, 2020, the Secretary of Defense shall appoint an individual from civilian life to serve as the director for the extramural acquisition innovation and research activities required by this section (referred to in this section as the "Director").
    (2) TERM.—The Director shall serve a term of five years.

(d) ACTIVITIES.—The activities described in this subsection are as follows:
    (1) Research on past and current defense acquisition policies and practices, commercial and international best practices, and the application of new technologies and analytical capabilities to improve acquisition policies and practices.
    (2) Pilot programs to prototype and demonstrate new acquisition practices for potential transition to wider use in the Department of Defense.
    (3) Establishment of data repositories and development of analytical capabilities, in coordination with the Chief Data Officer of the Department of Defense, to enable researchers and acquisition professionals to access and analyze historical data sets to support research and new policy and practice development.
    (4) Executive education to—
        (A) support acquisition workforce development, including for early career, mid-career, and senior leaders; and
        (B) provide appropriate education on acquisition issues to non-acquisition professionals.
    (5) On an ongoing basis, a review of the implementation of recommendations contained in relevant Department of Defense and private sector studies on acquisition policies and practices, including—
        (A) for recommendations for the enactment of legislation, identify the extent to which the recommendations have been enacted into law by Congress;
        (B) for recommendations for the issuance of regulations, identify the extent to which the recommendations have been adopted through the issuance or revision of

regulations;

    (C) for recommendations for revisions to policies and procedures in the executive branch, identify the extent to which the recommendations have been adopted through issuance of an appropriate implementing directive or other form of guidance; and

    (D) for recommendations for the resources required to implement recommendations contained in relevant Department of Defense and private sector studies on acquisition policies and practices.

    (6) Engagement with researchers and acquisition professionals in the Department of Defense, as appropriate.

    (e) FUNDING.—Subject to the availability of appropriations, the Secretary may use amounts available in the Defense Acquisition Workforce and Development Account to carry out the requirements of this section.

    (f) ANNUAL REPORT.—Not later than September 30, 2021, and annually thereafter, the Director shall submit to the Secretary of Defense and the congressional defense committees a report describing the activities conducted under this section during the previous year.

Acronyms and Abbreviations

A&S	Acquisition and Sustainment
ACAT	Acquisition Category
AE	Acquisition Enablers
AFIT	Air Force Institute of Technology
AI	Artificial Intelligence
AI2	Acquisition Integration and Interoperability
AI/ML	Artificial Intelligence and Machine Learning
AIRC	Acquisition Innovation Research Center
Army CCDC	Army Combat Capabilities Development Command
ASD(A)	Assistant Secretary of Defense for Acquisition
Az State U.	Arizona State University
BA-8	Budget Activity 8
CAPE	Cost Assessment and Program Evaluation
CMU SEI	Carnegie Mellon Software Engineering Institute
CUI	Controlled Unclassified Information
DASD(MR)	Deputy Assistant Secretary of Defense for Materiel Readiness
DASD(L)	Deputy Assistant Secretary of Defense for Logistics
DAU	Defense Acquisition University
DAWDA	DoD Acquisition Workforce Development Account
DCTC	Defense Civilian Training Corps
DHA	Defense Health Agency
DLA	Defense Logistics Agency
DMM	Digital Materiel Management
DoD	Department of Defense
DOT&E	Director Operational Test and Evaluation
DPC	Defense Pricing and Contracting
FLSA	Fair Labor Standards Act
FM	Financial Management (Community)
FY	Fiscal Year
GA Tech	George Institute of Technology
GMU	George Mason University

GTRI	Georgia Tech Research Institute
GW	The George Washington University
HBCU	Historically Black College or University
IAPRs	Integrated Acquisition Portfolio Reviews
IDEAS	Innovative, Data-Enabled Acquisition Strategy
IP	Intellectual Property
ISDC	Interagency Suspension and Debarment Committee
J8	Director, Force Structure, Resources, and Assessment
JS	Joint Staff
LA	Legislative Affairs
LCO	Legislative & Congressional Oversight
MI	Minority Institution
MIT	Massachusetts Institute of Technology
MITRE	The MITRE Corporation
ML	Machine Learning
MTA	Middle Tier of Acquisition
MR	Materiel Readiness
NAVAIR	Naval Air Systems Command
NC A&T	North Carolina Agricultural and Technical State University
NCMA	National Contract Management Association
NCSU	North Carolina State University
NDAA	National Defense Authorization Act
NPS	Naval Postgraduate School
OGC	Office of the General Counsel
OSD	Office of the Secretary of Defense
OUSD	Office of the Under Secretary of Defense
OUSD(A&S)	Office of the Under Secretary of Defense for Acquisition & Sustainment
OUSD(R&E)	Office of the Under Secretary of Defense for Research & Engineering
P&R	Personnel & Readiness
Penn State	Pennsylvania State University
PPBE	Planning, Programming, Budgeting, and Execution
PfM	Portfolio Management
R	Requirements (Community)
R&E	Research & Engineering
SAF/AQC	Deputy Assistant Secretary of the Air Force for Contracting

S&T	science and technology
SERC	Systems Engineering Research Center
SoS	System of Systems
STEM	Science, Technology, Engineering and Mathematics
TAMU	Texas A&M University
T&E	Training and Evaluation
TEMP	Test and Evaluation Master Plan
UAL Huntsville	University of Alabama in Huntsville
UARC	University-Affiliated Research Center
UMD	University of Maryland
U. Mass Amherst	University of Massachusetts Amherst
USC	University of Southern California
UINDOPACOM	U.S. Indo-Pacific Command
USMC	United States Marine Corps
USSOCOM	U.S. Special Operations Command