
DEFENSE RESEARCH ENTERPRISE REVIEW
SUPPORTING THE
WARFIGHTER
Innovation, Reliability, Success

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Executive Summary

In response to the Secretary of War's January 9, 2026, memorandum[1] "Transforming the Defense Innovation Ecosystem to Accelerate Warfighting Advantage" and pursuant to the January 28, 2026, directive from the Under Secretary of War for Research and Engineering (USW(R&E)), the Department of War (DoW) conducted a comprehensive 90-day assessment evaluating the current capabilities and future trajectory of the Department's research enterprise. This review, led by the Assistant Secretary of War for Science and Technology (ASW(S&T)), assessed the Department's research enterprise inclusive of its in-house laboratories, federally funded research and development centers (FFRDCs), and university affiliated research centers (UARCs) with the objective to ensure the enterprise is effectively aligned with the Department's strategic vision to accelerate warfighting advantage.

The Defense Research Enterprise[2] (DRE) is the engine of the Department of War's future warfighting advantage. The DRE does not merely perform support functions; it is the strategic foundation that prevents technological surprise and ensures the United States maintains its decisive military edge. The DRE ecosystem is uniquely positioned to pursue high-risk, high-reward research, sustain unique national testing infrastructure, and solve joint operational problems that the commercial market cannot or will not address. The research conducted in the DRE facilities today ensures that warfighters have the needed capabilities and protections for future missions. Without a robust, agile, and properly resourced DRE, the Department cannot rapidly onramp innovative capabilities or deliver the advanced capabilities the warfighter requires to deter and, if necessary, defeat emerging threats in an era of intense strategic competition.

The unprecedented data collection associated with this assessment shows the DRE is fundamentally sound and reflects mission-aligned institutional differentiation but needs to rapidly adapt to a new environment moving at the accelerating pace of commercial technology and driven by a broader set of global security threats.

The DRE has contributed considerable and unique value to national security. In the January 2026 "Arsenal of Freedom" speech series,[3] Secretary of War Pete Hegseth reiterated the criticality of defense research for today's warfighters and the requirement that the enterprise meet evolving national security demands. Modern warfare demands an agile and robust innovation ecosystem. Today's DRE faces a strategic environment that has dramatically changed from the environment in which most of the enterprise was constructed:

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[1] Secretary of War Pete Hegseth, "Transforming the Defense Innovation Ecosystem to Accelerate Warfighting Advantage," memorandum, January 9, 2026.https://media.defense.gov/2026/Jan/12/2003855657/-1/-1/0/TRANSFORMING-THE-DEFENSE-INNOVATION-ECOSYSTEM-TO-ACCELERATE-WARFIGHTING-ADVANTAGE.PDF.
[2] Defense Research Enterprise (DRE) refers to the in-house laboratories, FFRDCs, and UARCs, collectively.
[3] Secretary of War Pete Hegseth, "Arsenal of Freedom" speech series, January 2026.

- The pace of technological change is faster than ever with developers providing powerful capabilities on simple-to-use platforms.
- Adversaries access these technologies more readily than ever and provide non-traditional means for disruption, disturbance, and denial.
- These technologies can be operated at great distance from their targets and can deliver significant payloads accurately.
- The plethora of technologies has changed the ways nation-states approach conflict.
- As peers/near-peers such as China and Russia embrace the advantages offered by these technological changes, it is incumbent upon the DRE to maintain U.S. superiority in the use of these capabilities.
- China has solidified its civil-military fusion model and is investing on a scale and at a pace that requires the United States to develop a new Government–industry paradigm—one that advances and protects critical defense research while extending the technical reach of the DRE through industrial and academic partnerships the DRE itself does not own.[4,5,6]

This report provides senior leadership with actionable, high-fidelity insights necessary to drive and accelerate warfighting advantage. The overarching recommendations presented below for infrastructure, Science and Technology Reinvention Laboratory (STRL) workforce, and enterprise efficiency will have the greatest impact on the ecosystem.

The recommendations were developed based on the enterprise-wide data call, review, and input from an independent panel of experts convened through the Potomac Institute for Policy Studies and their report, and both OUSW(R&E) and the independent experts attending site visits. The team synthesized over 200 data submissions (>500 MB of data) from the DoW's research enterprise, which examined core competencies, financial and governance structures, technology transitions, partnerships, workforce, and infrastructure associated with the various entities within the ecosystem.

Site visits and interviews were conducted across the enterprise to supplement the data submissions. Visits were focused on highlighting each lab's, FFRDC's, or UARC's mission, strengths, and operating challenges, while identifying ways to work collaboratively to build a

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[4] *Review of the Defense Research Enterprise*, Project Trolley, Potomac Institute for Policy Studies, 2026, pg. 9

[5] U.S. Department of Defense, 2022 National Defense Strategy of the United States of America (Washington, D.C.: Department of Defense, October 27, 2022).https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF

[6]U.S. Department of War, 2026 National Defense Strategy: A Strategy of Restored Strength (Washington, D.C.: Department of War, 2026).https://media.defense.gov/2026/Jan/23/2003864773/-1/-1/0/2026-NATIONAL-DEFENSE-STRATEGY.PDF

more agile, innovative, and effective research and development (R&D) ecosystem for the Department. The assessment team visited 30 distinct sites, comprising 33 percent of UARCs, 30 percent of FFRDCs, and 30 percent of DoW laboratories. While only covering one-third of the enterprise, the assessment visits captured a representative and informative sample of the Department's breadth and depth of research, development, testing, and engineering, highlighting its ability to field new capabilities. The DoW research enterprise possesses a critical concentration of technical expertise that serves as a strategic enabler for the warfighter. Site visits confirmed that the institutional knowledge within DoW laboratories, UARCs, and FFRDCs consistently accelerates capabilities to the tactical edge. This became most notably apparent during conversations and demonstrations about real-time in-theater support for current military operations.

Ultimately, the recommendations presented herein seek to eliminate the largest bureaucratic friction points, optimize resource allocation, and empower DoW's scientific workforce. This report serves as the foundational blueprint to modernize the Department's R&D ecosystem and ensure the Department maintains an enduring technological advantage. The evidence in this report does not support consolidating or eliminating institutions: most overlap is driven by mission need. The findings suggest that the way to reform the DRE is to fix the system around its institutions—how authority, money, and decisions flow, and how the institutions are funded, measured, and governed. The findings do not suggest a revised list of institutions. The primary findings and recommendations are outlined below and are expanded in more detail in the relevant sections of this report.[7]

Finding 1: DoW's research, development, test, and evaluation (RDT&E) infrastructure is deteriorating and weakening the Department's ability to maintain a technically advanced warfighting capability. Authorized major military construction (MILCON) projects for modernization of critical joint-mission RDT&E infrastructure continually slip due to the Services' reprioritizing of scarce MILCON funds toward other operationally relevant priorities.

Recommendation 1: Establish a dedicated laboratory MILCON appropriation specifically for RDT&E infrastructure to prevent reprioritization of these funds and implement 10 United States Code (U.S.C.) §2810(a).

Finding 2: DoW's ability to meet urgent and rapidly changing laboratory needs for modifying facilities or to construct new facilities has been slowed due to the dollar limit in 10 U.S.C. §2805(d) for laboratory revitalization using the minor MILCON authority.

Recommendation 2: Modernize the Laboratory Revitalization Program (LRP) under 10 U.S.C. §2805(d) to enable the laboratories to respond faster to changing research and technology demands, increased security, and rapidly changing integrated weapons research. Request

[7] *Review of the Defense Research Enterprise*, Project Trolley, Potomac Institute for Policy Studies, 2026, pg. 6

Congress amend 10 U.S.C. §2805(d) to increase the minor MILCON limit for laboratory revitalization from $9M to $20M.

Finding 3: The Sensitive Compartmented Information Facility (SCIF) accreditation process is severely extended by manual, sequential reviews of Construction Security Plans (CSP) and Fixed Facility Checklists (FFC).

Recommendation 3: Digitize the CSP and FFC submission process using a unified compliance portal that pre-screens documentation for Intelligence Community Directive (ICD) 705 standard deviations prior to official action officer (AO) review. Concurrently, expand the Certified TEMPEST Technical Authority (CTTA) training pipeline and implement a framework for provisional accreditations or co-use agreements for mission-critical facilities awaiting final TEMPEST inspection.

Finding 4: A consolidated list of infrastructure and testing facilities across the DRE does not exist.

Recommendation 4: OUSW(R&E) create a searchable database of unique infrastructure.

Finding 5: The DRE comprises an inventory of specialized infrastructure and testing facilities, which have excess capacity to benefit external partners.

Recommendation 5: Explore commercial use of DRE facilities and equipment using similar methodology as that used with currently established partners.

Finding 6: Current DoW laboratory workforce management constraints are actively degrading the Department's ability to acquire, hire, and retain critical talent necessary for mission readiness.

Recommendation 6: Fully utilize all existing authorities to hire top talent. OUSW(R&E) issue policy to allow STRL directors to fully utilize 10 U.S.C. § 4091 to size their workforce based on available funding and sponsor needs.

Finding 7: Personnel security clearance approval adjudication backlogs persist due to siloed background investigation databases and manual review of continuous vetting (CV) alerts. Additionally, cross-Component clearance reciprocity is frequently delayed by redundant reviews of existing investigative data, extending the time-to-hire for mission-critical personnel.

Recommendation 7: Establish a centralized, AI-assisted adjudication workflow that automates the initial triage of CV alerts and flags only high-risk anomalies for human review. Enforce mandatory, system-driven reciprocity timelines across all DoW Components to eliminate redundant adjudications for personnel with active, in-scope investigations.

Finding 8: The congressionally mandated FFRDC Professional Technical Staff (PTS) ceiling prevents dynamic management based on budget and places unnecessary restriction on the use of FFRDCs.

Recommendation 8: Seek required congressional action to transition to a DoW-managed ceiling, eliminating the congressional ceiling altogether or, alternatively, enacting a legislative "Surge Authority" to allow the Secretary of War to meet emergent national security priorities.

Request language be removed from 10 U.S.C. § 4126 (formerly 10 U.S.C. § 2367) and enforced annually through the Consolidated Appropriations Act (historically under sections such as Section 8025) to allow the Department to dynamically manage the FFRDCs.

Finding 9: The absence of standardized reporting across the enterprise creates a critical visibility deficit, resulting in a lack of data necessary for informed, strategic decisions to occur quickly. The lack of an enterprise system of reporting also exacerbates the persistent fragmentation of technical communication between STRLs, FFRDCs, and UARCs, preventing real-time visibility into ongoing bench-level research.

Recommendation 9: Implement enterprise-wide, AI-friendly knowledge management and oversight frameworks that mitigate redundancy and eliminate operational silos through administrative baselines and standardized reporting.

Finding 10: The DRE operates using a diverse array of decentralized business models, with each structure historically tailored to the specific laboratory's operational context.

Recommendation 10: Initiate a targeted study to further analyze business models for potential standardization.

Finding 11: The Department's ability to rapidly transition technologies from knowledge producers to capability fielders is severely degraded by structural and cultural barriers, specifically bureaucratic stovepipes, fragmented funding streams, and misaligned mechanisms, authorities, and incentives.

Recommendation 11: Obtain and share best practices across the enterprise associated with partnering and transition efforts.

Finding 12: Measuring the value of the enterprise is complex. The OUSW(C) Rule-of-Thumb obligation and expenditure rates are insufficient to quantify national value.

Recommendation 12: Advocate for congressional action to acquire budget certification authority for the S&T portfolio.

Finding 13: The Department's vast intellectual property remains underutilized due to passive marketing and the lack of a centralized discovery mechanism. Current administrative burdens for transition agreements often exceed the funding timelines of startups, hindering innovation and collaboration.

Recommendation 13: Create a searchable marketplace for DoW intellectual property. Actively market IP with optimized license agreements, royalty structures, and pricing models to benefit the originating laboratory.

Finding 14: The enterprise operates without portfolio-level outcome accountability. Currently, there are no portfolio-level outcome metrics for each DRE organization. A framework for category-specific measures of effectiveness (MOE) and measures of performance (MOP), anchored on each institution's missions and capabilities and balanced to value the institution's comparative advantages, ensures reprogramming and budget decisions are tied to benchmark performance and adjusted as necessary.

Recommendation 14: Create an MOP/MOE framework as the primary portfolio-level accountability metric.

The remainder of this report provides greater detail on the findings and the recommendations. The findings and recommendations are broadly grouped into three categories: infrastructure, workforce, and efficiency.

Infrastructure

Finding 1: DoW's RDT&E infrastructure is deteriorating and weakening its ability to maintain a technically advanced warfighting capability. Authorized major MILCON projects for modernization of critical joint-mission RDT&E infrastructure continually slip due to the Services' reprioritizing of scarce MILCON funds toward other operationally relevant priorities. This misalignment creates a compounding risk profile as shown in Figure 1 for the continual rise of unfunded RDT&E infrastructure needs. When MILCON projects are deferred, the Department incurs massive cost growth for facility sustainment, forcing RDT&E organizations to operate in facilities that pose documented safety risks and technical limitations. As a result, a large portion of facilities, built well before the invention of the internet, AI, directed energy, stealth, and quantum, are expected to serve as premier research facilities to support modern research areas, requiring the diversion of RDT&E funding to be diverted to maintain the rising costs of the outdated facilities.

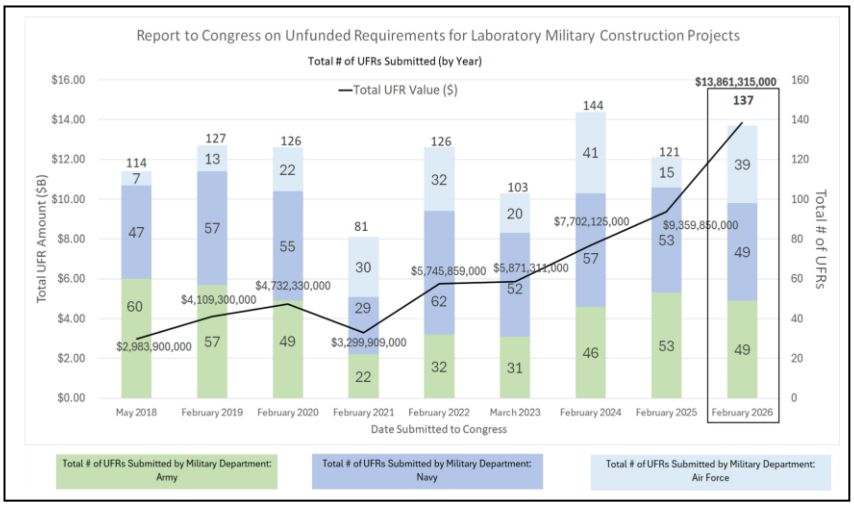


Figure 1. Historical trend of unfunded RDT&E facility needs.

Recommendation 1: Establish a dedicated laboratory MILCON appropriation specifically for RDT&E infrastructure to prevent reprioritization of these funds and implement 10 U.S.C. §2810(a). The recommended baseline funding profile shown below will enable DoW to address top-priority unfunded facilities as identified in the annual Unfunded RDT&E Facilities report to Congress. This will insulate critical joint-research infrastructure from Service-level budget volatility and ensure modernization aligns with National Defense Strategy priorities rather than individual Service MILCON lists.

FY 1	FY 2	FY3	FY4	FY 5
$650M	$715M	$786.5M	$865.15M	$951.7M

Figure 2. Recommended baseline of RDT&E major MILCON funding

Finding 2: The DoW laboratories must have agility to meet urgent and rapidly changing laboratory needs for modifying facilities or to construct new facilities. Laboratory modernization has been slowed due to the dollar limit in 10 U.S.C. §2805(d) for laboratory revitalization using the minor MILCON authority. This delay in meeting scientific needs results from a confluence of factors that drive up costs, including the highly specialized nature of these facilities, unprecedented demand in commercial investments for life sciences causing logistics shortages of material and construction personnel, and broad economic pressures impacting the entire construction industry. These factors have resulted in escalating costs that now pose a direct challenge to national security by constraining DoW's ability to quickly respond to urgent laboratory facility requirements while remaining under the existing $9 million MILCON funding limit.

Recommendation 2: Congressional action is required to amend 10 U.S.C. §2805(d), raising the minor construction cost limit to $20 million, enabling the laboratories to adapt facility needs to more complex and secure scientific demands at an accelerated pace. OUSW(R&E) should continue to strongly portray to Congress the urgent need for the increased ceiling for minor MILCON, explaining that the proposed higher limit would allow laboratories to take action on projects on the annual Unfunded RDT&E Infrastructure list that fall between $9 and $20 million, which are unlikely to compete well for MILCON funding due highly specialized requirements and relatively low cost for major MILCON projects; yet these facilities are critically needed by the RDT&E organizations to remain technically competitive. This targeted adjustment of the minor MILCON threshold is not just about funding; it is about restoring speed and agility to the facility revitalization process, ensuring the United States remains at the forefront of scientific and defense innovation.

Finding 3: The Sensitive Compartmented Information Facility (SCIF) accreditation lifecycle is severely extended by manual, sequential reviews of Construction Security Plans (CSP) and Fixed Facility Checklists (FFC). This administrative delay is compounded by a critical shortage of Certified Telecommunications Electronics Materials Protected from Emanating Spurious Transmissions (TEMPEST) Technical Authorities (CTTA) and Accrediting Officials (AO) available to conduct final physical site inspections.

Recommendation 3: Digitize the CSP and FFC submission process using a unified compliance portal that pre-screens documentation for Intelligence Community Directive (ICD) 705 standard deviations prior to official AO review. Concurrently, expand the CTTA training pipeline and implement a framework for provisional accreditations or co-use agreements for mission-critical facilities awaiting final TEMPEST inspection.

At the onset of the Cold War, the United States and DoW invested heavily in RDT&E infrastructure. The investment inspired an exponential growth in technology development within the Department along with growth in R&D expertise in U.S. industry and academia. Tremendous advancements were made in supersonic flight, microelectronics, energetics, nuclear assuredness, and underwater sensing (to name a few technologies), which propelled the military to new heights in global reach. Now, 70+ years later, many of those same DoW RDT&E facilities are struggling to support 21st century research. The time is now to significantly invest in revitalizing and modernizing the RDT&E infrastructure to create the "Laboratory of the Future." The methods of conducting scientific research have significantly changed since the Cold War, putting stringent demands on laboratory and test facilities. Demands include increased electrical load from high-powered electronics, strict vibration controls, tight environmental controls supporting nano and quantum measurements, and increased physical and data security requirements to combat cyber and industrial threats. The combination of facility age, modern methods of conducting research and testing, and low prioritization within the Services to modernize and properly maintain RDT&E facilities has resulted in a continually growing gap to match DoW RDT&E facilities with modern research and technology demands.

Finding 4: A consolidated list of infrastructure and testing facilities across the DRE does not exist.

Recommendation 4: OUSW(R&E) create a searchable database of unique infrastructure.

Finding 5: The DRE has under-utilized inventory of specialized infrastructure and testing facilities.

Recommendation 5: Explore commercial use of DRE laboratory facilities and equipment using similar methodology as with currently established partners.

Aging of Facilities/Assets

The average age of laboratory facilities across all the Services is greater than 45 years, with most built during the Cold War era. These facilities are past their traditional life expectancies and the methods and requirements of conducting research in the 21st century is beyond their capabilities. Since the Cold War, no significant large-scale investment in laboratory modernization has occurred aside from two major events in DoW history. The first, the Base Realignment and Closure process, resulted in the expenditure of several billion dollars to consolidate DoW bases and laboratories. The second was the congressional investment of $2.7 billion to rebuild the laboratory infrastructure after a series of earthquakes hit California in 2019, devastating the laboratories at China Lake. China Lake now operates the most advanced Government laboratory and test enterprise in the world.

The condition of the RDT&E infrastructure is not a new problem. The decline is a result of decades of tough competition with other high-visibility MILCON needs, such as barracks remediation, childcare center revitalization, and hospital modernization. The decline is compounded by insufficient levels of funding to adequately sustain or modernize unique research facilities and equipment to levels necessary to keep pace with increasing demands of research facilities for clean and stable environments, forcing laboratories and test centers to divert higher amounts of RDT&E funding toward facility maintenance. Furthermore, the decline in RDT&E facilities is occurring in parallel with the intense RDT&E investments made by competing nations, resulting in a global leadership shift away from the United States, with departures of U.S. technical talent and academia following suit.

The question "who is responsible for the condition of the buildings?" raises one of the challenges associated with aging facilities A significant number of laboratories in CONUS are tenant missions on bases or garrisons (as shown in the table), meaning that the laboratories are responsible for mission equipment inside facilities and the base/garrison is responsible for maintaining the structure and all utilities connected to the facility, such as power, water, police, fire, heating, ventilation, and air conditioning (HVAC), and communication infrastructure (COMMS). However, the requirements for the research mission can easily go beyond the physical structure and must compete for significantly more base resources above a standard level of support. For example, the rapid pace of technological development has driven research requirements for significant amounts of clean power, terabytes of data transfer across national networks, and tightly controlled environmental conditions that put demanding requirements on facility HVAC systems. These capabilities were not designed into the facilities when they were built. Since many bases cannot financially support these needs due to limited facilities, sustainment, restoration, and modernization (FSRM) funds, maintenance backlogs continue to rise, and laboratories must divert more of their RDT&E budgets toward funding items normally under the responsibility of the host base/garrison. For example, NIWC-Pacific (a tenant lab at San Diego Naval Air Station) recently reported that it spent more than $100 million annually in research funding on repairing and maintaining facilities; it has a maintenance backlog of ~$400M with the base. Similar statements from RDT&E organizations across DoW confirm that increasing amounts of RDT&E funding are being diverted to facility maintenance that otherwise should be covered by FSRM funding.

Service	Tenant	Host	Total Replacement Value
AF	99%	1%	$5.38 B
Navy	100%	0%	$46.93 B
Army	85%	15%	$20.49 B

SCIF Accreditation Challenges

The enterprise's laboratories, FFRDCs, and UARCs face significant, time-consuming hurdles in achieving and maintaining Sensitive Compartmented Information Facility (SCIF) accreditation. This was one of the commonly shared frustrations on site visits, since many DoW facilities have seen a significant increase in requirements for secure spaces to support "near operational" research, allowing them to keep pace with rapid design-integrate-test-field cycles and utilize operational hardware-in-the-loop during advanced research. These challenges primarily stem from inconsistent security policies across multiple Government entities, the high capital cost of specialized infrastructure within non-profit or academic settings, the complicated approval process for combining unique research equipment in secure areas, and the inherent friction between the collaborative, continually changing nature of research and the strict, static, and compartmentalized requirements of secure environments.

Policy Inconsistency and Reciprocity Issues

A primary challenge for the enterprise is the lack of unified accreditation standards across different organizations. Because the labs, FFRDCs, and UARCs fall under different Services and or sponsors, they frequently encounter conflicting interpretations of ICD 705 and TEMPEST standards, as well as variations in actual processes. Common hurdles faced by the DoW laboratories, FFRDCs, and UARCs include:

- **Lack of Reciprocity:** A SCIF accredited by one agency may not be recognized by another, leading to redundant inspections or "administrative hang," where cleared personnel are barred from entry.
- **Sponsorship Dependency:** In a "chicken-and-egg" conundrum, centers often require a contract to justify SCIF but cannot compete for or execute classified taskings without existing secure space.
- **Policy Flux:** Frequent updates to security manuals (like the transition of accreditation portfolios to the Defense Counterintelligence and Security Agency (DCSA)) create moving targets for facilities currently in the construction or renovation phase, which then get hit with requirements that were never contemplated or the actual cost impact understood by the policy makers.

Infrastructure and Operational Constraints

The financial and logistical burden of building and operating SCIF is particularly acute for research-focused entities. Unlike large-scale defense contractors with massive industrial bases, labs, FFRDCs and UARCs must often integrate these high-security islands into campuses designed for openness and accessibility. Common constraints seen across DoW laboratories and FFRDC/UARCs include:

- **Prohibitive Costs**: The specialized materials, advanced RF shielding, and technical surveillance countermeasures required for SCIFs can cost millions. For university-based UARCs, these costs are often difficult to reconcile with academic budgets and indirect cost recovery structures.
- **Academic Cultural Friction**: For UARCs, maintaining a SCIF on a college campus creates a "locked-door" culture that can alienate faculty and students. Balancing the mission-critical need for secrecy with the academic mission of knowledge sharing is a constant administrative struggle.
- **Staffing Bottlenecks**: Even with a physical facility, the delays in personnel security clearances and the administrative burden of facility security officers (FSOs) can lead to "under-utilized" space where the facility is ready, but the workforce is still awaiting final adjudication.

Facility Conditions

Army

Being the oldest Military Service, the Army has some of oldest working laboratory facilities. Its oldest working laboratory building is the Electronics Design and Development Laboratory at Watervliet Arsenal, built in 1865. The facility conducts research on design, development, construction, testing, and validation of solutions for large-caliber cannons and armaments. Recent significant accomplishments and transitions of the laboratory include developing a cannon muzzle health monitoring mechanism embedded in recoiling components for more accurate measurement of tube heat.

The Army currently utilizes a large array of facilities for the execution of its RDT&E program. These facilities include, but are not limited to, laboratory space, testing facilities, ranges, magazines, hazardous material storage, and administrative support buildings at locations throughout the United States. With the facility inventory having an average age of over 50 years, facility modernization is of the utmost importance. As the pace of technological advancement has increased, so has the need to maintain and invest in new and modernized facilities to perform the required RDT&E operations. RDT&E infrastructure risk increases if the Army does not modernize facilities to support mid- and long-term requirements. Modern buildings, equipment, and adequate resources are vital to ensure the Army stays at the cutting edge of technology and continues to recruit and retain the most talented workforce. Due to a myriad of contributing factors, many RDT&E facilities have become outdated and require revitalization and recapitalization. A statement from the Army Combat Capabilities Development Command (DEVCOM) Chem-Bio Center (CBC) encapsulates the Army's concern: "CBC's ability to execute its mission is increasingly challenged by deteriorating laboratory facilities, driven by an aging facility inventory, decades of deferred maintenance from insufficient sustainment funding, and MILCON and restoration and maintenance projects that have been consistently deferred in lieu of other enterprise priorities."

The Army is making slow, but steady, progress by relying on a spectrum of congressional authorities to resource and modernize RDT&E facilities using operation and maintenance and MILCON funds. Army RDT&E infrastructure is critically important to the Department's ability to provide its Warfighters with vital military capabilities. Many of DoW's military advantages are a product of the technological innovations that come from the Army's RDT&E infrastructure. As the pace of technological change accelerates, the Army's need for a strong technical base grows. The core of the Army's technical base is its in-house RDT&E infrastructure, which enables a cadre of highly skilled scientists, engineers, and technical staff to remain at the forefront of technological development. The increasing age of the Army's RDT&E infrastructure, along with limited modernization investments, negatively impacts DoW's ability to keep pace with evolving technologies and deliver future warfighting capabilities.

Historically, Army RDT&E facilities have had minimal success in competing for Army MILCON funding. To mitigate this issue, the Army uses a variety of tools to modernize and revitalize its facilities. The Army STRLs successfully utilizes the Funding Laboratory Enhancements Across Four Categories (FLEX-4) authority (10 U.S.C. §4123). This authority allows directors of the STRLs to allocate not less than 2 percent and not more than 4 percent of all funding toward four initiatives: basic and applied research, technology transition, workforce development, and the revitalization and recapitalization of laboratory infrastructure and equipment. Army STRLs utilizes FLEX-4 funding to carry out minor MILCON construction described in 10 U.S.C. §2805(d). Additionally, the Army has had success in competing for funds under the Central Laboratory Investment Program (CLIP), which is administered by OUSW(R&E) for specific capital equipment updates and laboratory facility enhancements supporting R&D. Army T&E facilities have similar competitive opportunities for revitalization under the TRMC Central T&E Investment Program.

Navy

The Department of Navy (DON) is the second oldest DoW Service and has the second oldest working laboratory building. The Naval Research Laboratory Solar Coronagraph Optical Test Chamber was built in 1874, originally as a horse stable. It currently includes an International Organization for Standardization (ISO) 5 (Class 100) clean room for instrument assembly and testing and a calibration vacuum chamber. The lab supports the NASA-sponsored Wide-Field Image for the Parker Solar Probe, the Large Angle and Spectrometric Coronagraph, and two NOAA-sponsored Compact Coronagraphs (CCOR 1 and 2) used for real-time operational space weather forecasting.

As the DON RDT&E infrastructure continues to age, signs of deterioration are apparent, and the overall condition continues to decline. Infrastructure is critical to facilitate innovative solutions and to attract and retain a world-class workforce. The increasingly pivotal role of technology and innovation as the foundation of warfighting capability drives home the urgency of revitalizing our RDT&E infrastructure. The health of this critical infrastructure is monitored via a portfolio management approach that considers the condition, configuration, and capacity of critical components.

Historically, DON laboratory major MILCON projects receive lower priority than operational Navy needs. The Navy heavily uses the minor MILCON authority combined with FLEX-4 funding for specific modernization activities. However, the $9 million threshold limit for minor MILCON (10 USC § 2805(d)) for laboratory revitalization is extremely limiting, considering the rising costs of technical laboratory construction and additional costs for secure facility construction.

Furthermore, the working capital fund (WCF) model for the Navy laboratories has some inherent limitations for exercising flexibilities given to STRLs and RDT&E organizations, since legislation does not specifically authorize use of WCFs. 10 USC §2810(f) exemplifies this limitation. The Navy would like to use this authority to use WCF's funds allocated for RDT&E activities for major MILCON projects that are above the minor MILCON limit of $9 million and below $20 million. These projects are critical to keeping the laboratories in step with technology and research demands. Due to their small size in cost and scope, the projects would never compete well for major MILCON funding. However, the Navy Comptroller has ruled that WCFs are not applicable for 10 USC §2810(f), since the legislation specifically states funding to "amounts appropriated or otherwise made available to the Department of Defense for research, development, test, and evaluation"; WCFs are not directly appropriated for RDT&E activities. OUSW(R&E) is working with the Laboratory Quality Enhancement Program–Infrastructure panel to develop legislative proposals to incorporate WCF authorizations, where appropriate, to increase the flexibilities of special laboratory construction legislative authorities.

Air Force

Even though the Department of the Air Force (DAF) is the youngest of the three Services, the Air Force Research Laboratory (AFRL)'s infrastructure has a legacy pre-dating the official birth of the DAF. The DAF's oldest working laboratory facility is the Compressor Research Facility (CRF) built in 1929. It houses motor and generator sets historically used to turn propeller test stands. The CRF currently contains 15,000-horsepower and 30,000-horsepower electric motors that spin the modern engine compressors under test. The facility is used to determine aerodynamic and aeromechanical performance of the most advanced fans and compressors in the world while enhancing the understanding of their complex flow physics.

Like the Army and Navy labs, AFRL has an aging research facility infrastructure, with many of its 1,139 buildings well over 40 years old and past their expected lifetime. At the 2024 S&T Infrastructure Modernization Workshop, AFRL reported the average time from a facility design to completion as approximately 20 years. At that pace, AFRL would be able to replace its facilities once every 3,290 years. This timeline to modernize DoW laboratory facilities is unacceptable when China, to cite an illustrative data point, ran more than 20 times as many hypersonic tests as the United States in 2018–just one example of how laboratory facilities are holding back DoW capabilities.

All of AFRL's facilities are tenant organizations and rely on base civil engineering for maintenance of facilities, apart from Rome, New York, and Maui, Hawaii, sites. AFRL reports that it receives less than one third of the required FSRM funds and annually diverts $70 million in research funding to supplement maintenance of facilities, just to maintain critical research programs.

AFRL utilizes the FLEX-4 program to fund minor MILCON facility modernization projects. In FY 2025, AFRL spent $52.4 million on Category 4 (Revitalization and Recapitalization) projects. One of the main barriers to using FLEX-4 funding is the current limit of $9 million for minor MILCON under 10 U.S.C. §2805(d). In a recent analysis, AFRL reported several instances where it traded off required design scope of a minor MILCON project for cost and speed to keep the project under the $9 million minor MILCON limit, fearing that it would be delayed if forced into the lengthy major MILCON process. Increasing the minor MILCON limit to $20 million would also open the aperture for the Air Force to use FLEX-4 funding for several critical RDT&E projects on the "FY 2027 Unfunded Requirements for Laboratory Military Construction Projects" report. These costs for these projects are above $9 million and under $20 million. They would not compete well for major MILCON funding due to their small size and cost.

FFRDC/UARC

The Department's FFRDCs and UARCs operate within sound, modernized facilities. The FFRDCs and UARCs make use of long-term bonds and short-term loans and in some cases support directly from the university to modernize their facilities. The lone exception is the Massachusetts Institute of Technology Lincoln Laboratory (MIT LL), an FFRDC on Hanscom Air Force Base (AFB), most of its infrastructure consists of the original "Project Lincoln" structures erected in the early 1950s and since it is located on a DoW installation, is subject to the same DoW facility issues and low MILCON priorities described earlier for DoW laboratories. Many of the MIT LL buildings were designed for a temporary project, not an enduring national laboratory. Approaching 80 years of age, they have exceeded their expected effective lifespan for advanced microelectronics research and development by a factor of two. For the past decade, multiple independent and Government assessments have ranked this facility deterioration as the FFRDC's highest programmatic risk.

In 2015, the Primary Sponsor (USD(AT&L)) directed the USAF and MIT to resolve the facility crisis. A Facility Modernization Plan (FMP) and Analysis of Alternatives (AoA) established two distinct funding paths to address the most critical needs: the Compound Semiconductor Laboratory/Microsystem Integration Facility (CSL-MIF) and the Engineering Prototyping Facility (EPF). See Figure 3 and Figure 4.

Impact Category	Description of Realized Risk
Operating Expenses	Facility maintenance currently consumes ~40% of the laboratory's operating expenses and is projected to exceed 50%.
Process Efficiency	Aging environmental and power systems force inefficient workarounds and limit the integration of modern R&D tools.
System Failures	Last year, deteriorated piping caused a catastrophic failure of pneumatic air and chilled water systems, leading to months of lost prototyping capability.

CLS-MIF

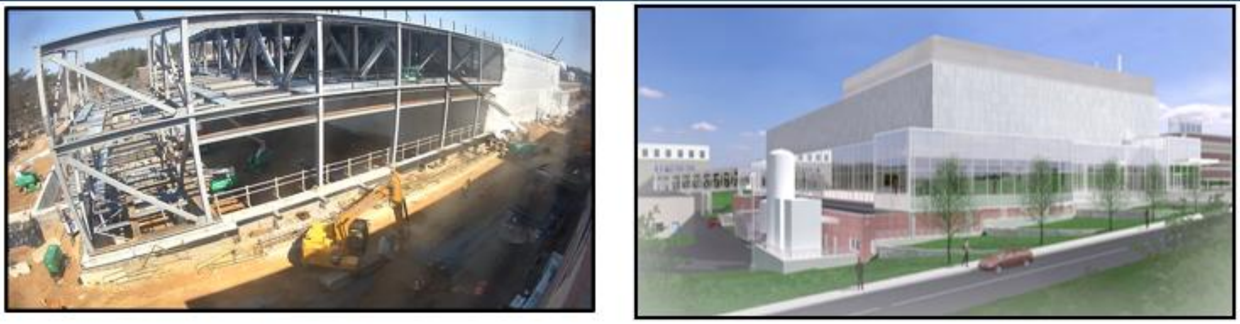


Figure 3. MIT LL construction photo and conceptual drawing of the CSL-MIF

EPF Laboratory

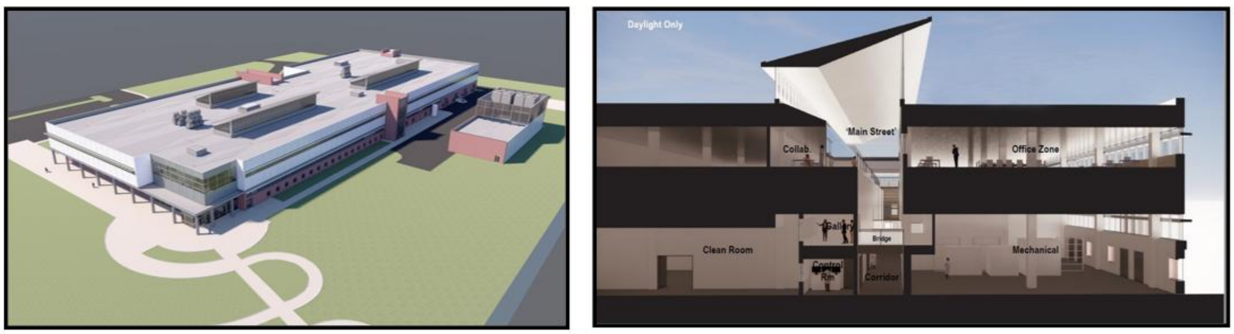


Figure 4. Conceptual design of the MIT LL EPF and for updated facility

Funding Mechanism	Project Scope	Current Status
MILCON	CSL-MIF and EPF (Address highest safety risks and core modern capabilities).	Significantly Delayed. CSL-MIF completion slipped to 2028. EPF remains in design with only partial funding.
Contract Surcharge	12 smaller, less expensive buildings funded via a ~1-2% surcharge on sponsored research.	Slow Progress. Execution is bottlenecked by the delays in the primary MILCON projects.

As the chronic schedule slips, primarily driven by MILCON funds being redirected to other Service priorities, the combined project costs have escalated from an initial $460 million to approximately $800 million and will continue to rise. In addition to new construction, MIT LL continues to modify existing footprints to meet ICD-705 standards for handling Sensitive Compartmented Information (SCI).

Industry Engagement in DoW Infrastructure

The Department of War has substantial institutional infrastructure for industry engagement. The mechanisms are well-established. Cooperative Research and Development Agreements (CRADAs) under 15 U.S.C. §3710a permit Federal laboratories to engage industry partners on collaborative research, as described in the adjacent commercialization section. The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, authorized under 15 U.S.C. §638, provide funded pathways for small businesses to engage Departmental research priorities. Partnership Intermediary Agreements under 15 U.S.C.

§3715 permit state, regional, or other intermediary entities to act as brokers between Federal laboratories and small businesses. Other Transaction Authority (OTA) under 10 U.S.C. §4022 (formerly §2371b) permits flexible agreements for prototype, research, and production activities that fall outside the standard Federal Acquisition Regulation framework. The Defense Innovation Unit, established in 2015 and reporting through USW(R&E), maintains a dedicated mission to bring commercial sector capability into Departmental use through Commercial Solutions Openings and related authorities. Educational Partnership Agreements under 10 U.S.C. §2194 permit Department of War laboratories to engage educational institutions in collaborative research and equipment-sharing arrangements.

Some DRE organizations sustain active engagement programs across multiple mechanisms simultaneously — robust CRADA portfolios, active SBIR phase III transitions, regular industry days, structured pre-solicitation outreach, formal advisory relationships with industry associations, and operational coordination with the Defense Innovation Unit and Service-specific innovation organizations. Other DRE organizations engage with industry primarily through procurement channels with minimal pre-acquisition or non-acquisition engagement; still others maintain engagement programs that fluctuate in intensity from year to year based on leadership-level priorities and individual program-office choices.

Additionally, institutional practices of external engagement tend to depend on individuals who choose to invest in the engagement. Whether the practice endures depends on whether that individual's commitment has been turned into institutional process by the time the individual departs. Across the DRE, the pattern is observable in two recurring forms. The first form is the inherited champion: a DRE organization that built strong industry engagement under a particular leader and has retained the practice across leadership transitions because the leader institutionalized the engagement through formal positions, documented processes, dedicated staffing, and external commitments that bind the successor leadership. The second form is the lost champion: a DRE organization that built strong industry engagement under a particular leader and has seen the engagement decay or fragment after the leader's departure because the engagement was personal rather than institutional.

The structural response to this pattern is to convert localized champion-dependent practices into Department-wide institutional practices. Establishing a USW(R&E)-led commercialization strategy with structured cataloguing of facilities and intellectual property, a marketplace, operating under standardized terms, and explicit routing of revenue back to originating laboratories will provide institutional infrastructure that does not depend on individual champions to operate. The localized champions remain valuable (institutional infrastructure supports champions, it does not replace them) but the practice of industry engagement becomes less fragile and more sustainable across the enterprise.

Unique Facility Examples

As part of the assessment data call, the DoW laboratories were asked to submit a listing of unique facilities and capabilities within their laboratory. The response included hundreds of entries, and it was quickly recognized that a compendium of the Unique Facilities would be too massive for this report. Instead, OUSW(R&E) S&T Foundations will compile the data into the S&T Infrastructure Dashboard currently under development. Having the data residing in the Dashboard would be beneficial to the Services to be able to search for and export results regarding capabilities to enhance their research and testing programs and allow OUSW(R&E) to track the health and status of nationally unique facilities which are critical to keeping the DoW equipped with advanced weapons concepts.

Listed below is a subset of the submitted data to demonstrate the breadth and depth of unique capabilities residing within the Defense Laboratories and test centers.

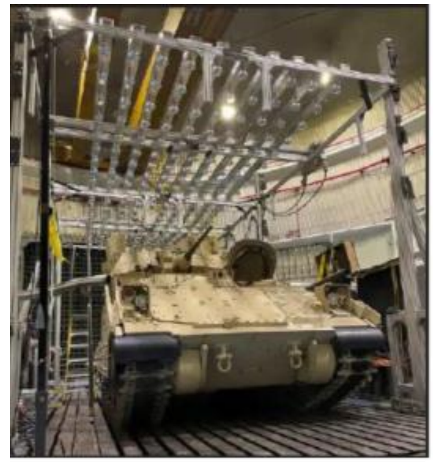
Secure Maritime Range at San Clemente Island

San Clemente Island is a DON-owned 14-square mile tactical range that provides a secure, controlled, and operationally relevant environment to test and validate next-generation technologies. Naval Information Warfare Center (NIWC) Pacific's on-island facilities provide an isolated, fully instrumented maritime range for complex exercises, including undersea warfare, multi-domain RAS vignettes, advanced electronic attacks, and more. The integrated capabilities include a sea-to-shore test bed, active-duty Navy Dive Locker, small boats, piers, line of sight and beyond line-of-sight communication systems, and extensive workspace at varying classification levels for a variety of projects. Additionally, San Clemente has DoW's only fully instrumented undersea trawl track which enables a repeatable method of testing the survivability of critical Navy systems in harsh environments.

Transducer Evaluation Center (TRANSDEC)

To ensure the U.S. Navy can distinguish hostile undersea threats from ambient ocean noise, NIWC Pacific operates the Transducer Evaluation Center (TRANSDEC), the Navy's premier acoustically silent test facility. This six-million-gallon anechoic pool provides a secure, interference-free environment for evaluating the most sensitive underwater sensors and waveforms. Its state-of-the-art instrumentation enables low-frequency measurements impossible at any other open-tank facility, and its qualification for Sound Pressure Level (SPL) Certification drastically accelerates the transition of undersea technologies to the warfighter. Furthermore, TRANSDEC serves as a low-risk environment for developing and assessing the in-water performance of autonomous systems and payloads, serves as the host location for the annual, international RoboSub competition.

Vehicle Full Load Cooling & Performance Test Cell



DEVCOM Ground Vehicle Systems Center (GVSC) cell 9, the Vehicle Full Load Cooling & Performance Test Cell, is GVSC's most unique testing facility, and among its most important, too. Many of GVSC's labs are not reproduced elsewhere in the Government. Cell 9 is a one-of-a-kind facility.

The test cell accommodates the Army's largest vehicles, more than 80 tons, testing their cooling systems under high powertrain loads while subjecting them to laboratory-controlled conditions simulating the harshest conditions on Earth:

- Temperatures up to 160 ºF
- Streaming airflow from 8 directions
- Replicates tracked vehicle loading up to 88,000 lb-ft per side, 128,000 lb-ft per side at stall
- Solar radiation up to 1,120 W/m^2

Triaxial Earthquake and Shock Simulator (TESS)

The **Triaxial Earthquake and Shock Simulator (TESS)** is a U.S. Army Engineer Research and Development Center (ERDC) facility in Champaign, Illinois, operated by the Construction Engineering Research Laboratory (CERL) in partnership with the University of Illinois Urbana-Champaign.

Core Specifications:

- Type: Experimental Three-dimensional "shake table" for dual mode shock and vibration testing
- Biaxial mode payload: 12,000 lb
- Triaxial mode payload: 120,000 lb
- Frequency range: Broad, covering both military shock/vibration and seismic environments
- Acceleration performance: High acceleration capability, with smaller payloads tested at up to twice rated accelerations
- Displacement range: Larger for seismic vibrations in triaxial mode

AF Maui Research Site

The Air Force Maui Optical and Supercomputing (AMOS) site is a U.S. Space Force and Air Force Research Laboratory facility on the summit of Mount Haleakala in Hawaii, at 10,023 feet. It is one of the world's only facilities combining Space Domain Awareness (SDA) operations with research and development.

Key Telescopes and Systems:

- **Advanced Electro-Optical System (AEOS)** – The Department of Defense's largest reflector telescope with a small secondary mirror to increase magnification and sharpness. AEOS supports the U.S. Space Force's SDA mission by tracking and imaging satellites and other space objects in visible and infrared.
- **Maui Space Surveillance System (MSSS)** – A state-of-the-art electro-optical facility that combines operational tracking with R&D. It includes small, medium, and large aperture tracking optics, plus visible and infrared sensors.
- **Ground-Based Electro-Optical Deep Space Surveillance (GEODSS)** – Three GEODSS sites, including the Maui site, track deep space objects from 10,000 to 45,000 km above Earth, detecting objects 10,000 times dimmer than the human eye can see.

711th Human Performance Wing Centrifuge

The 711th Human Performance Wing (711 HPW) at Wright-Patterson Air Force Base, Ohio, operates the only human-rated centrifuge in the U.S. Department of Defense.

Core Specifications & Capabilities

- Max sustained load: Up to 9g (nine times normal gravity) for training; can produce up to 20g in research/test scenarios.
- Acceleration rate: Capable of accelerating up to 15g in one second.
- Cockpits: Three interchangeable, realistic high-definition displays, each linked to a control room for a virtual battlespace — a feature not available in previous centrifuges.
- Motion simulation: Motorized pitch and roll axes for a more realistic g-force sensation.
- Training scope: Used for aircrew acceleration training (fighter pilots, astronauts, aircrew, flight surgeons, aerospace physiologists) and research/testing.
- Annual training capacity: Around 1,100–1,200 students per year.
- Operational status: Achieved Full Operational Capability on May 30, 2018, and began training on Oct. 1, 2018.

The combat superiority of the U.S. military is preserved in part by long-term, defense-specific, high-risk, work performed by the DoW laboratories, test centers, FFRDCs, and UARCs. The degradation of DoW RDT&E infrastructure has been decades in the making. The infrastructure challenges range from the lack of MILCON investments to gaps in FSRM funding. The modernization and revitalization of DoW RDT&E infrastructure is crucial to regaining world leadership in developing critical technology areas required to compete with our adversaries and to maintain areas where the United States still has the most advanced capabilities and weapon systems. Intertwined with state-of-the-art facilities, is the increased competitiveness for attracting world-class, talented individuals to work for DoW. In-house DoW resources and expertise are also necessary to objectively evaluate, monitor, and assess the technical work of others. The research conducted in DoW RDT&E facilities today ensures the Warfighters have the needed capabilities and protections for future missions.

Workforce

Finding 6: Current DoW laboratory workforce management constraints are actively degrading the Department's ability to acquire, hire, and retain critical talent necessary for mission readiness. STRL directors are unable to fully execute 10 U.S.C §4091 to prioritize talent needs and size their workforces based on their mission, available funding, and sponsor needs. The newly implemented strategic hiring committees and executive interviews are significantly increasing the overall time-to-hire while overall personnel strength is a number that does not often align to the talent necessary to support the mission. The Office of Personnel Management (OPM) reported that the Government-wide average time-to-hire for civilian Federal positions in FY 2024 was 101 days. This is substantially slower than typical industry timelines of 30-60 days for in-demand technical personnel, often resulting in the loss of top candidates before a Federal offer can be extended.[8]

Recommendation 6: Fully utilize all existing authorities to hire top talent. Provide policy to allow STRL irectors to fully utilize 10 U.S.C. §4091 to size their workforces based on available funding and sponsor needs.

Finding 7: Personnel security clearance adjudication backlogs persist due to siloed background investigation databases and manual review of continuous vetting (CV) alerts. Additionally, cross-Component clearance reciprocity is frequently delayed by redundant reviews of existing investigative data, extending the time-to-hire for critical mission personnel.

Recommendation 7: Establish a centralized, AI-assisted adjudication workflow that automates the initial triage of CV alerts and flags only high-risk anomalies for human review. Enforce mandatory, system-driven reciprocity timelines across all DoW Components to eliminate redundant adjudications for personnel with active, in-scope investigations.

Finding 8: The congressionally mandated ceiling prevents dynamic management based on budget and places unnecessary restriction on the use of FFRDCs.

Recommendation 8: Congressional action is required to transition to a DoW-managed ceiling eliminating the congressional ceiling altogether or, alternatively, enacting a legislative "Surge Authority" to allow the Secretary of War to meet emergent national security priorities. Request language be removed from 10 U.S.C. § 4126 (formerly 10 U.S.C. § 2367) and enforced annually through the Consolidated Appropriations Act (historically under sections such as Section 8025) to allow the Department to dynamically manage the FFRDCs.

Businessman, author, and speaker Harvey Mackay once said, "Your workforce is your most valuable asset. The knowledge and skills they have represent the fuel that drives the engine of business—and you can leverage that knowledge." Mr. Mackay is right. The DoW research

[8] https://www.opm.gov/about-us/reports-publications/opm-fy-2026-2027-agency-priority-goals.pdf, page 3.

enterprise has an incredible populace of talented people working daily to ensure that our men and women in uniform come home safe and leverage the best technology advantages available to them. The innovations that the DoW enterprise workforce contributes to the mission and, in many cases, as an after-effect to the public has been and continues to be superb.

DoW's extensive network of STRLs, FFRDCs, and UARCs are the engine of innovation for the nation's defense. Collectively, they are tasked with maintaining our military's technological edge to win the fight of today and be fully equipped for the ever-changing future landscape. The enterprise workforce is critical to accomplishing this mission.

Federal hiring is structurally slower than private-sector and academic-startup hiring. The consequence is visible in the Federal workforce demographics. Pew Research Center analysis cited in the May 2025 OPM Merit Hiring Plan documented that fewer than 9 percent of Federal employees are younger than 30, while approximately 28 percent are aged 55 or older. The Federal age pyramid is inverted relative to a sustainable technical workforce; the hiring-timeline gap is one principal cause. The DRE faces this challenge most acutely because its mission targets the early-career and mid-career STEM talent—the workforce segment for which the hiring timeline gap to commercial alternatives is widest.[9]

GAO has documented this picture across multiple audits over more than two decades. GAO-16-521 (August 2016), "Federal Hiring: OPM Needs to Improve Management and Oversight of Hiring Authorities," found that agencies underutilize and inconsistently use special hiring authorities. GAO-18-417 (May 2018), "Defense Science and Technology: Further DoD and DOE Actions Needed to Improve Coordination of Defense Laboratories Hiring Efforts," identified specific coordination gaps among defense laboratories that recommendations have only partially addressed. Most recently, GAO-24-106284 (December 2023), examining the quantum-technology workforce, found that the Army and Navy laboratories "don't consistently measure progress toward their workforce goals"—a recurring finding across two decades of audits indicating that hiring difficulties at DRE laboratories are structural rather than transient. The National Science Board, in its August 2023 report "STEM Workforce Shortages Across the Federal Government," characterized the Federal STEM-hiring challenge as broad-based, with agencies "grappling with a STEM talent shortage" exacerbated by the diffusion of digital technologies and the growing centrality of science and technology to policy.[10]

DoW Science Technology Reinvention Laboratories

The STRL workforce is comprised of military, civilian, and contractor personnel. The composition of the STRL human capital framework is critical to carrying out the science and

[9] *https://www.pewresearch.org/short-reads/2025/01/07/what-the-data-says-about-federal-workers/.*
[10] https://nsf-gov-resources.nsf.gov/nsb/meetings/2023/0815/presentations/NSB%20panel%20-%20STEM%20Talent%20-%20PHS%20Aug%202023.pdf.

technology (S&T) mission for DoW. As of this data call, the STRLs report a total workforce of 140,900 people across the Services as shown in Figure 5.

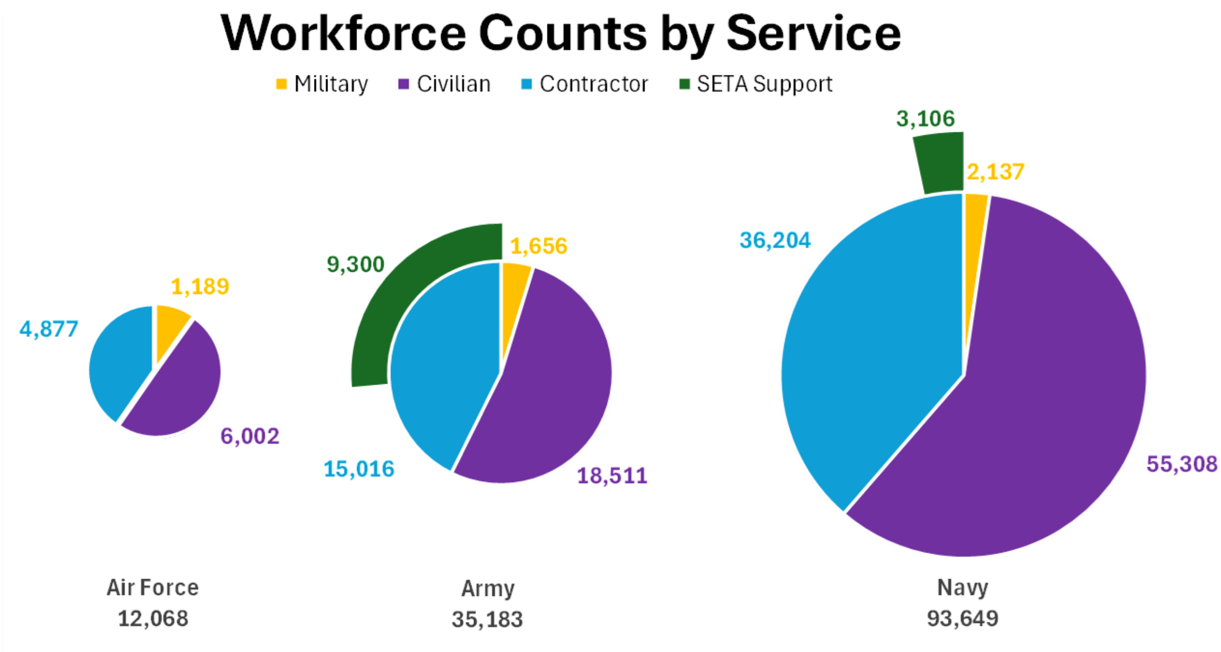


Figure 5. Personnel Count for STRLs summarized at the Service Level

The STRLs rely on a highly educated civilian workforce to advance research and development products, processes, and missions across the Services. Overall, a Bachelor of Science degree is the predominant education level comprising 44 percent of the civilian workforce (Figure 6). As expected, and given the scope of mission, the service research STRLs (Air Force Research Laboratory (AFRL), Army Research Laboratory (ARL) and Naval Research Laboratory (NRL)) hold the largest percentage of doctoral degrees at 48 percent overall (Figure 7).

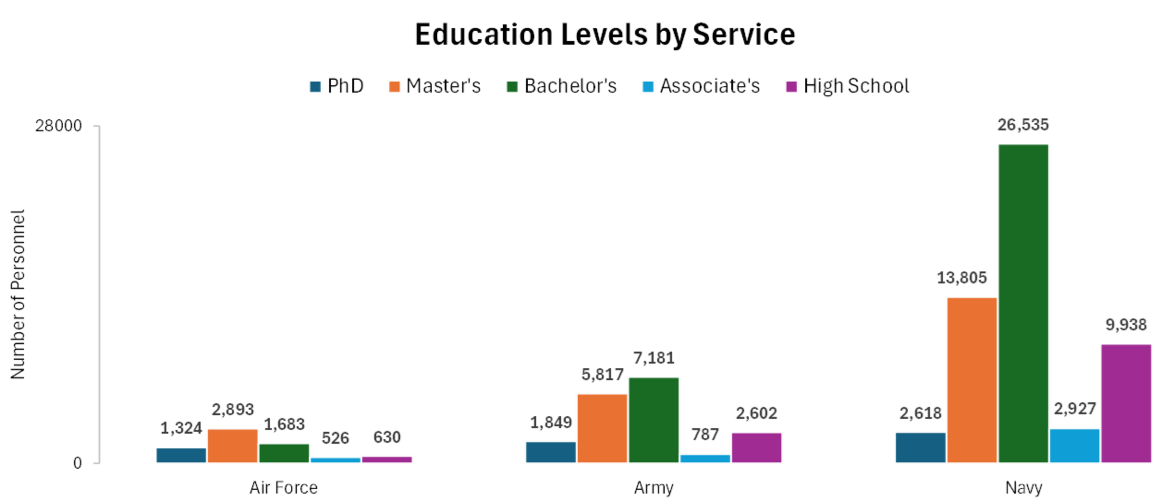


Figure 6. Education levels by Service

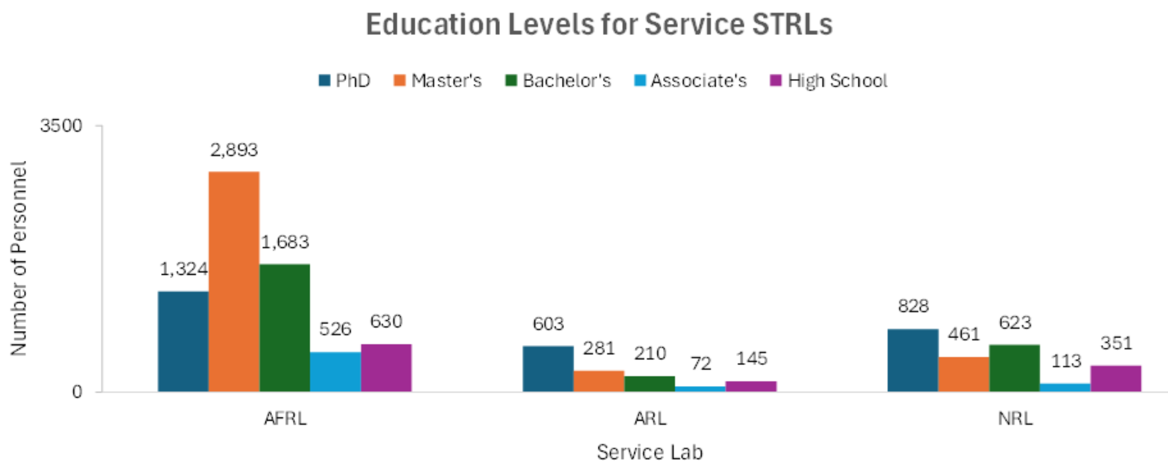
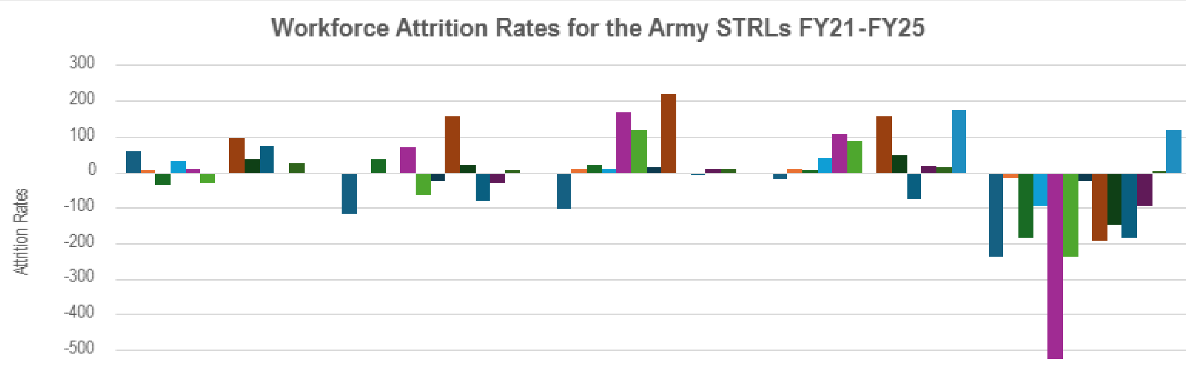


Figure 7. Education levels for Service STRLs

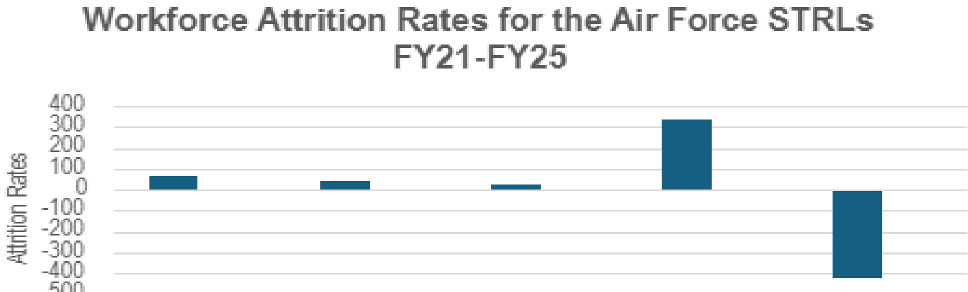
Between Fiscal Year 2021 and 2024, the overall workforce end strength across the STRLs remained stable. While some STRLs experienced routine fluctuations, most operated on a "hiring for losses" model, where the net attrition was at or near zero. The Army Engineer Research and Development Center (ERDC) and Army DEVCOM Aviation and Missile Center exhibited growth year-over-year. DoW STRL workforce net attrition rates are shown in Figure 8, Figure 9, and Figure 10.



	FY21	FY22	FY23	FY24	FY25
AC	59	-119	-104	-20	-236
ARI	6	-2	8	8	-16
ARL	-34	37	19	4	-186
ASIC/SEC	32	-6	11	41	-94
AvMC	11	71	165	107	-527
C5ISR	-33	-65	119	87	-237
CBC	-3	-23	14	-3	-26
ERDC	94	157	220	154	-192
GVSC	35	19	-7	48	-146
MRDC	74	-81	-9	-76	-184
SC	-5	-32	11	16	-97
SMDTC	24	4	9	12	2
T2COM	0	0	0	175	118

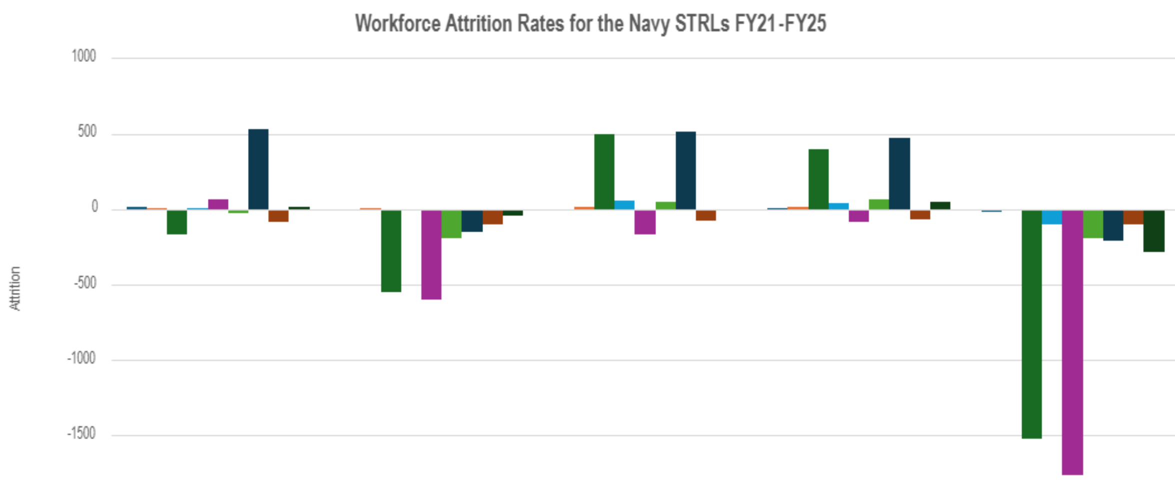
Fiscal Year (FY)

Figure 8. Army STRL workforce attrition rates for FY21-FY25



	FY21	FY22	FY23	FY24	FY25
AFRL	69	43	24	333	-426
JWAC					

Figure 9. Air Force STRL workforce attrition rates for FY21-FY25



	FY21	FY22	FY23	FY24	FY25
MCTSSA	14	-8	-1	4	-16
MCWL	5	6	13	11	-4
NAVAIR	-168	-551	495	397	-1522
NAVFAC EXWC	7	-1	57	39	-102
NAVSEA	61	-601	-167	-89	-1768
NIWC LANT	-24	-196	46	62	-197
NIWC PAC	529	-153	512	472	-207
NMRC	-83	-105	-73	-70	-106
NRL	15	-41	-2	51	-284

Figure 10. Navy STRL workforce attrition rates for FY21-FY25

Data from Fiscal Year 2025, however, is starkly different. Due to the Federal hiring freeze, Federal Government lapse in appropriations, the Deferred Resignation Program (DRP), and lack of ability for STRLs to fully use the authorities granted in statute, nearly every STRL lost a significant number of employees. Department-wide, the loss represented approximately 14 percent of the total STRL workforce. Unfortunately, because much of the loss was indiscriminate, the STRL Directors were unable to help shape the loss. This, coupled with end strength quotas, the newly implemented Strategic Hiring Committee (SHCs) approvals and executive interview requirements continues to cause challenges today. As of this report, many STRLs are still unable to hire the much-needed talent due to these restrictions as the new processes have further stalled an already lengthy hiring process. Only within the last month, are all STRLs able to fulfill DoW's commitment to Science, Mathematics, and Research for Transformation (SMART) Scholarship scholars and hire them as full-time civilians. Unfortunately, due to hiring restrictions and end strength quotas, the Department lost 108 SMART scholars during FY25 and the first quarter of FY26 which resulted in a loss of 269 years of service commitment and a $20.4 million investment.

During the site visits that accompanied the data call, many organizations expressed deep concern for the future of their workforce, not only for the inability to hire, but the plethora of second- and third-order consequences: the decreasing morale of those at the laboratory who are working extra to support the mission, loss of experienced personnel, many partners having to establish new relationships as the previous point of contact(s) had left, and potential new hires skeptical with perceived lack of employment stability.

Coupled with the impacts of the FY25 Federal Government size reduction, an average of 18-20 percent of employees across Services are currently eligible to retire today. Individual STRLs report up to 40 percent (Naval Sea Systems Command (NAVSEA)) retirement eligible. See Figure 11, Figure 12, and Figure 13.

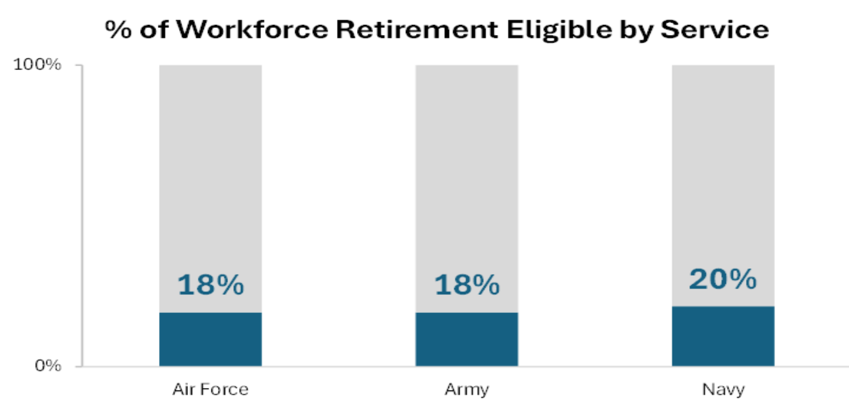


Figure 11. Workforce eligible for retirement by Service

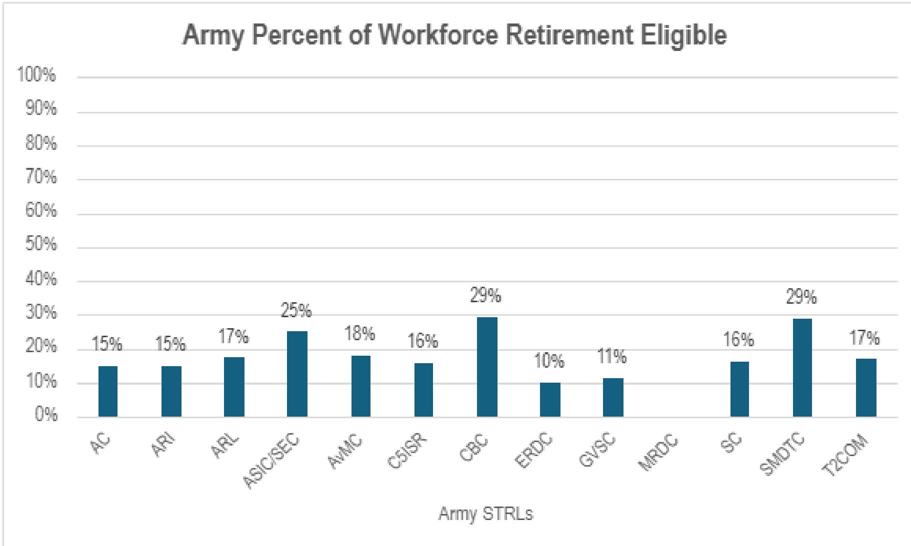


Figure 12. Army percentage of workforce eligible for retirement

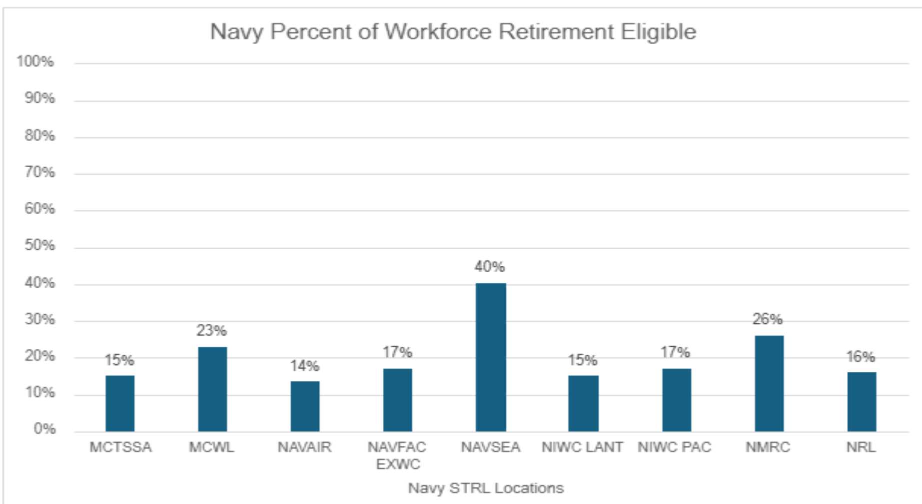


Figure 13. Navy workforce eligible for retirement

The effects of the hiring decisions and the retirement eligible workforce will likely have a significant impact on long-term mission readiness. The narrative is clear: without a swift and sustained reversal of these policies, DoW's innovation engine is at risk of stalling, with potentially grave consequences for the future of national defense and the Warfighter.

The STRLs Directors have a plethora of unique statutory personnel flexibilities to recruit, build, shape, and retain a talented workforce. The authorities allow bypassing typical hiring constraints, foster timely recruitment, further competing by offering competitive compensation, reward high performers, offer critical skills training, leverage Voluntary Early Retirement Authority (VERA) and Voluntary Separation Incentive Payments (VSIP) when needed and manage their workforce based on the budget available. These and other authorities will be critical in the coming years to rebuild the STRL workforce.

> Direct Hiring Authority (DHA), Expanded Pay Setting & Sabbatical at DEVCOM ARL for Dr. John Clayton:
> Dr. Clayton started his service at ARL via DHA with an advanced pay setting in 2003. He is a world expert in the field of mechanics, having authored seminal books advancing the theoretical foundations of thermoelectricity, Finsler geometry, and shock physics, many of which were advanced through year-long deep dives as his work during a Sabbatical at the Courant Institute in 2015. His work extended beyond the theoretical and has helped solved critical problems for shock mitigation in solids, injury biomechanics, and materials design of metals, ceramics, and polymers for high-rate applications.

To cultivate a robust talent pipeline, STRLs heavily rely on geographically targeted outreach and work-based training programs. By engaging in K-12 science, technology, engineering, and mathematics (STEM) efforts and establishing partnerships with local universities, laboratories foster early technical interest and align academic curricula with mission needs. This outreach funnels students to hands-on training opportunities, such as the SMART Program and various Service-specific internships. These programs serve as the primary mechanisms for vetting prospective full-time civilian employees. Furthermore, STRLs leverage social media and various career events to identify qualified candidates.

Through this data call a few Service level trends were identified:

Air Force

- **<u>Recruiting Efforts</u>:** The Air Force leans heavily on digital recruitment platforms and partnerships. Key efforts include utilizing USAJobs, Yello, social media campaigns, and maintaining strong university partnerships alongside internal hiring events.
- **<u>Effective Programs</u>:** The most effective tool for the Air Force is **Yello**, which accounts for most of their new hires, supported by a variety of various other internal programs.
- **<u>Effectiveness Metrics</u>:** Their primary metric for assessing success is straightforward: tracking the total number of new hires.

Army

- **<u>Recruiting Efforts</u>:** The Army employs a very broad, multi-faceted approach. Efforts range from K-12 STEM pipelines to highly targeted national events like the Black Engineers of the Year Award (BEYA) and specialized "ERDC Days" at universities. They also leverage the Consortium Research Fellows Program (CRFP) and Direct Hire Authorities (DHA).
- **<u>Effective Programs</u>:** Student and internship pipelines are highly effective, specifically the **SMART** Scholarship Program, **SSEP** (STEM Student Employment Program), and

DCAIP (DoW College Acquisition Internship Program). For retention, the Army finds success in pay-for-performance systems, academic training programs, mentoring, work-life balance initiatives, and financial incentives like the Student Loan Repayment Program (SLRP).

- **Effectiveness Metrics:** The Army uses comprehensive tracking, including conversion rates of students to full-time employees (many seeing >80 percent acceptance and long-term retention), time-to-fill/hire, climate survey satisfaction (targeting 80-90 percent positivity), and total candidate engagement/resume collection.

Navy

Direct Hiring Authority (DHA) at NAVAIR NAWCAD: In FY24, reduced time-to-hire for 100% of new hires to 47 days by using DHAs compared to 80+ days for Delegated Examining Unit.

- **Recruiting Efforts:** The Navy takes a highly data-driven and long-term cultivation approach. They select universities based on historical hiring/conversion rates and heavily mentor student competition teams. They pair this long-term strategy with aggressive "On-The-Spot" hiring at career fairs and robust direct hire authorities.
- **Effective Programs:** Pipeline programs are the bedrock of Navy recruitment, particularly **SMART**, **NREIP/SEAP**, **SSEP**, and **DCAIP**. For retention and development, they focus on professional development councils, strategic rotations, and immersing employees directly into fleet operations.
- **Effectiveness Metrics:** The Navy heavily tracks conversion rates from intern to permanent hire (with goals often set at 75 percent or higher, and some programs like SMART seeing 100 percent hiring rates). They also measure historical hiring data, direct customer feedback, and the financial value of reimbursable work.

Federally Funded Research and Development Centers

FFRDCs operate as independent, non-profit entities specifically chartered to assist the Government with complex systems engineering, policy analysis, and enterprise-level integration. At 17,000 plus, the inherent vendor-neutral objectivity and unique access to sensitive industry data provides a unique advantage. See Figure 14 for workforce levels by FFRDC organization.

As non-profit entities prohibited from manufacturing commercial products, FFRDCs act as a "trusted agent" that help bridge the gap between the Government and private industry.

The FFRDC workforce provides DoW with a concentrated pool of multi-disciplinary systems engineering talent that can bridge high-level policy with technical execution. FFRDCs are uniquely positioned to recruit elite experts across diverse fields—such as nuclear physics, advanced cyber operations, and defense acquisition policy—and organize them into cross-functional teams. However, this specialized workforce experienced a spike in attrition during FY25 driven by uncertainties regarding Government funding and a broader reduction in Federal contracts across the Federal Government. Despite these challenges, this workforce excels at translating broad mission requirements from senior military leadership into actionable technical specifications.

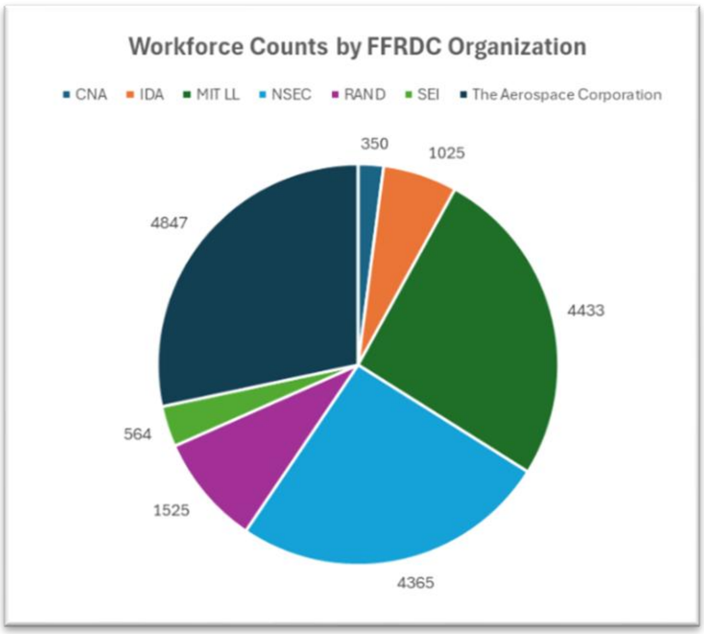
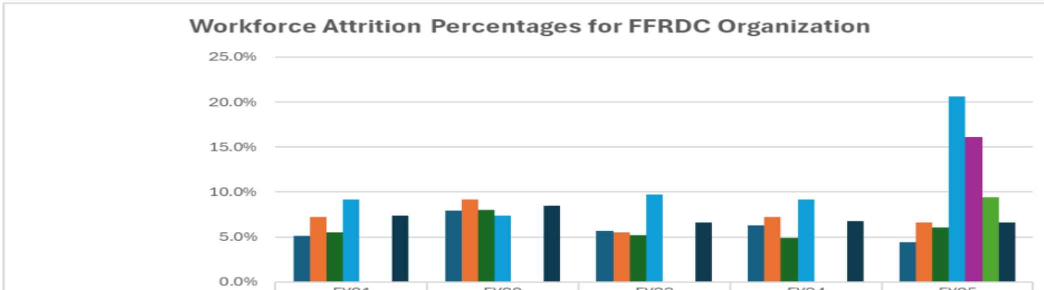


Figure 14. FFRDC workforce levels by organization

Unlike other Government FFRDCs, DoW centers are uniquely constrained by a rigid, congressionally mandated annual ceiling. While initially implemented to control unchecked organizational growth, this static limitation has evolved into a critical operational vulnerability. The compounding effects of this ceiling create three primary strategic risks for the Department:

- Systemic Degradation of Warfighter Support: Because the statutory ceiling remains static while the market cost of maintaining specialized technical talent rises, DoW effectively receives a diminished volume of actionable analytic and technical support each year. In the current economic environment, the cap guarantees an annual erosion of capabilities.
- Workforce Erosion: The inability to adjust the ceiling to match inflation and economic realities creates severe hiring and retention bottlenecks, directly threatening the DoW FFRDCs' ability to attract and maintain the top-tier technical expertise required for modern mission sets.
- Operational Inflexibility: The rigid statutory cap artificially constrains the Department's operational agility. It explicitly prohibits DoW from surging technical and analytic support to meet emergent threats or urgent mission requirements, completely independent of whether localized program funding is available to execute the work.



	FY21	FY22	FY23	FY24	FY25
CNA	5.1%	7.9%	5.7%	6.3%	4.4%
IDA	7.2%	9.2%	5.5%	7.2%	6.6%
MIT LL	5.5%	8.0%	5.2%	4.9%	6.1%
NSEC	9.2%	7.4%	9.7%	9.2%	20.6%
RAND					16.1%
SEI					9.4%
The Aerospace Corporation	7.4%	8.5%	6.6%	6.8%	6.6%

Figure 15. FFRDC workforce attrition percentages by organization

University Affiliated Research Centers

The UARCs attract and retain top-tier scientific and engineering talent who are dedicated to long-term national security missions. This workforce maintains expertise in niche and emerging technological domains. Also, as "trusted agents" for the Government, the researchers operate within a non-profit academic framework, where they are free from profit motives and production incentives that drive traditional contractors. This independence allows the UARC workforce to provide completely objective technical evaluations, rigorous systems testing, and unbiased advisory services.

The UARC workforce offers a unique and agile pipeline for talent and rapid response. UARCs leverage a constant flow of postdoctoral fellows, graduate students, and faculty who are already integrated into the university system with which they are affiliated and the surrounding universities. UARCs can offer internships and work-based training programs, which enables them to grow their workforce pipeline, recruit future employees, and support the DoW mission simultaneously. During site visits, the travel team met many researchers who are working full time at the UARC after experiencing one of the many pipeline programs first. The flexibility gained by this structure assists with maintaining a competitive edge and allows cleared personnel to be quickly redirected to new, urgent challenges when needed.

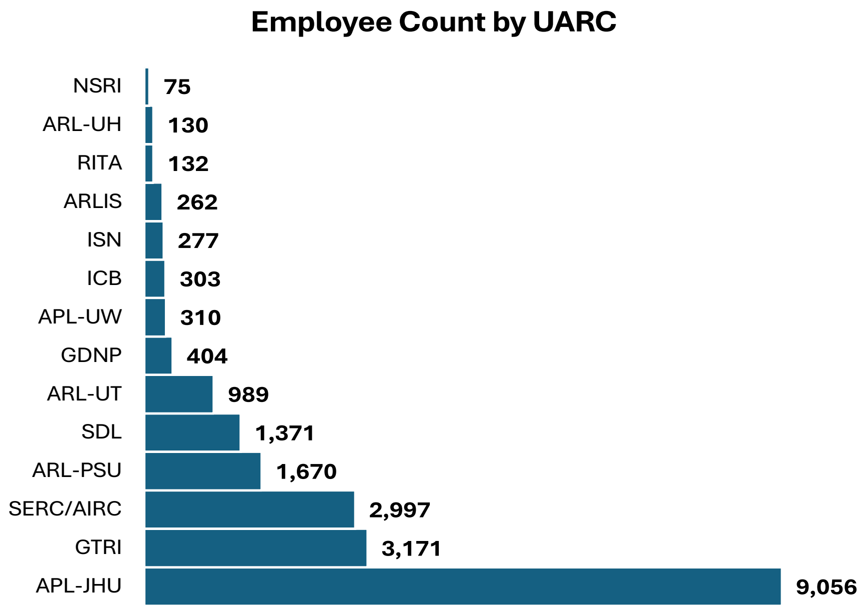


Figure 16. UARC employee count by organization

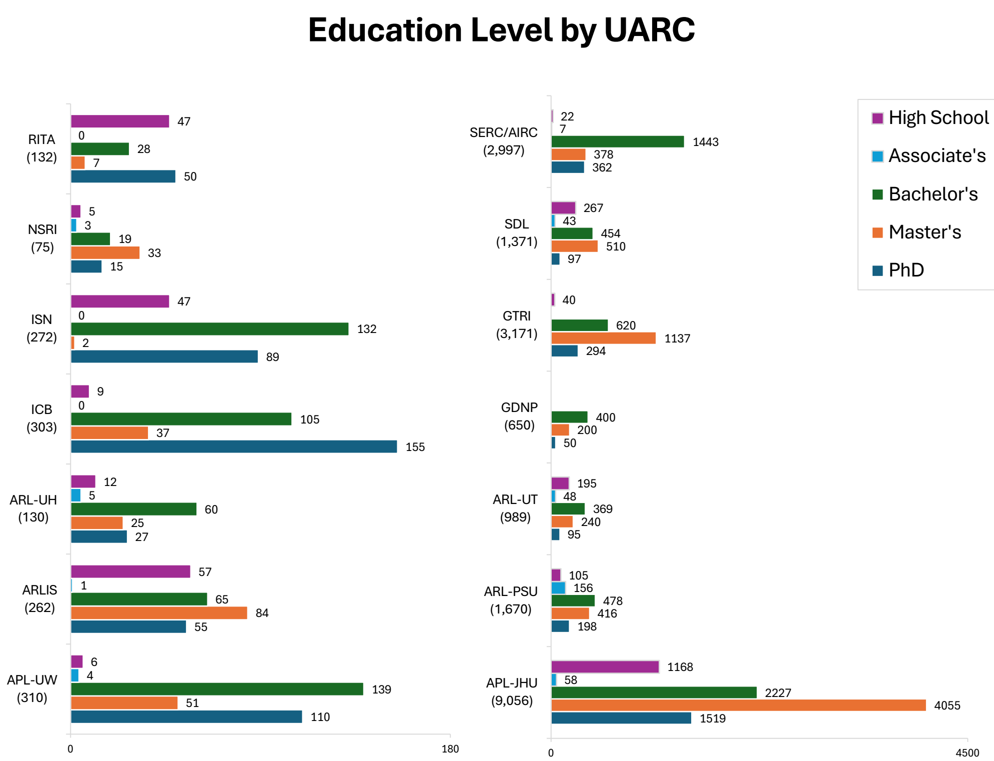


Figure 17. Education level by UARC organization

Although the recent Federal downsizing through DRP and ongoing realignment initiatives were nominally restricted to direct Government employees, site visit evaluations revealed that the second-order effects have severely degraded the operational readiness and throughput of the FFRDCs and UARCs. This indirect impact has created a systemic bottleneck, significantly reduced overall enterprise efficiency and jeopardized the execution of critical defense research.

The sudden departure of key Federal points of contact (POC) without designated personnel backfills or any transition plans has severed vital connective tissue between the Government and its research centers. As a result, critical project taskings that directly support time-sensitive, real-world operations are in some cases at a standstill or delayed.

It was noted where the POC remained, the redistribution of abandoned portfolios has created unsustainable workloads. The massive influx of collateral duties leaves these individuals with drastically reduced capacity to manage, direct, or review outgoing and incoming work products. This creates an administrative choke point that chronically delays essential research and development, indicating the current staffing levels are insufficient to sustain the mission.

Systemic Degradation of Readiness via Security Clearance Delays

The security clearance and adjudication process continues to suffer from acute, systemic delays. These prolonged timelines directly extend the time-to-hire for highly specialized mission personnel across the Department's entire research enterprise, including defense laboratories, FFRDCs, and UARCs. The inability to rapidly onboard cleared technical talent has a direct, detrimental impact on operational readiness and the execution of critical missions. Notably, this systemic failure was a universal complaint voiced by leadership across all organizations and was consistently reiterated as a major structural vulnerability during recent field site visits.

Primary Drivers of Clearance Timelines

The root causes of these compounding delays stem from obsolete data architecture and bureaucratic friction:

- Adjudication and Continuous Vetting Backlogs: The current adjudication pipeline is fundamentally constrained by highly siloed background investigation databases that prevent seamless data sharing and automated processing. This technical limitation is further exacerbated by an unsustainable reliance on manual, human-in-the-loop reviews to process Continuous Vetting (CV) alerts, creating severe and persistent backlogs.
- Failed Cross-Component Reciprocity: Despite established policies intended to accelerate the transfer of cleared personnel between agencies, cross-Component clearance reciprocity is frequently stalled. These delays are primarily driven by redundant bureaucratic reviews and the unnecessary re-adjudication of existing, fully valid investigative data, effectively neutralizing the intended speed and agility of the reciprocity process.

Efficiency

One of the goals of the DRE Laboratory Assessment was to determine if there were areas that could improve the efficiency of the laboratories beyond those topics covered earlier in the report. The Findings and Recommendations below will help to institutionalize improvement of business practices, provide relevant data for improved leadership decisions and guidance, and improve innovation through connections of Laboratory researcher, research projects, and Government-industry relationships.

Finding 9: The absence of standardized reporting across the enterprise creates a critical visibility deficit, resulting in a lack of data necessary for informed, strategic decisions to occur quickly. The lack of an enterprise system of reporting also permeates the persistent fragmentation of technical communication preventing real-time visibility into ongoing bench-level research.

Recommendation 9: Implement an enterprise-wide, AI-friendly, knowledge management, and oversight framework that mitigates redundancy and eliminates operational silos through administrative baselines and standardized reporting.

- Standardization and Financial Synchronization: The Department must eliminate operational silos by establishing unified, enterprise-wide administrative baselines and synchronizing R&D, procurement, and sustainment funding streams. This alignment is critical to ensure that joint research initiatives are not stalled by Component-level bureaucratic friction or mismatched funding cycles.
- Strengthened Governance Frameworks: The deployment of robust, cross-functional governance, accountability, and communication frameworks is required to maintain enterprise alignment. Unified oversight will break down organizational barriers, ensuring that laboratories, Components, and mission owners can seamlessly collaborate on emerging capabilities.
- Technical Communication Pathways: Implementation of an enterprise-wide, centralized knowledge management system with connection to frontline research scientists across the DRE is necessary to provide real-time, transparent tracking of ongoing projects, research outcomes, and external partnerships. The current 'siloed' approach creates a high probability of overlapping efforts, as multiple entities unknowingly pursue identical or similar scientific breakthroughs, it slows the overall pace of innovation and dilutes the operational impact of the Department's technical advancements.

Finding 10: Enterprise Business Model Variance and Assessment Limitations. The defense research enterprise operates using a diverse array of decentralized business models, with each structure historically tailored to the specific laboratory's operational context. Based on current data analysis and feedback from on-site visits, there is no clear indication that any single operational model is universally superior or broadly applicable across all laboratories. This variance is largely driven by the wide breadth of distinct research missions and warfighter support concepts required across the Department. However, the current assessment lacks the comprehensive, comparative data necessary to definitively evaluate the relative efficiency of these disparate models. Without standardized metrics baseline, there is insufficient information to make a fully informed, data-driven recommendation regarding enterprise-wide structural optimization.

Recommendation 10: Defer Standardization Pending Comprehensive Data Collection: The Department should not mandate immediate modifications or standardizations to existing laboratory operational models. Currently, each laboratory relies on its bespoke structure to manage internal research portfolios, meet localized customer demands, and facilitate targeted engagement with academia and the Defense Industrial Base (DIB). Attempting to standardize these models without empirical justification presents an operational risk.

Instead, initiate a targeted study to further analyze business models for potential standardization. This foundational information is required to establish accurate baselines and must be evaluated before any informed recommendations regarding structural realignment or operational model consolidation can be made.

Finding 11: The Department's ability to rapidly transition technologies from knowledge producers to capability fielders is severely degraded by structural and cultural barriers, specifically bureaucratic stovepipes, fragmented funding constraints, and misaligned mechanisms, authorities, and incentives.

Recommendation 11: Obtain and share best practices across the enterprise associated with partnering and transition efforts.

Include details on synchronized, dedicated funding must be allocated to sustain formalized innovation bridges. These entities are designed to cross the acquisition “valley of death” by providing agile, semi-autonomous environments for rapid prototyping and fielding. These innovation bridges must be modeled after highly successful, rapid-development paradigms seen in industry and agile DoD innovation hubs.

Finding 12: Measuring the value of the enterprise is complex. The OUSW(C) Rule-Of-Thumb obligation and expenditure rates are insufficient to quantify national value.

Recommendation 12: Advocate for Congressional action to acquire budget certification authority for S&T portfolio.

Finding 13: The Department’s vast intellectual property remains underutilized due to passive marketing and the lack of a centralized discovery mechanism. Current administrative burdens for transition agreements often exceed the funding timelines of startups, hindering innovation and collaboration.

Recommendation 13: Create searchable marketplace for DoW intellectual property. Actively market IP with optimized license agreements, royalty structures, pricing models to benefit the originating laboratory.

Finding 14: The enterprise operates without portfolio-level outcome accountability. Currently, there are no portfolio-level outcome metrics for each DRE organization. A framework for category-specific Measures of Effectiveness (MOE) and Measures of Performance (MOP) anchored on each institution's missions and capabilities, balanced to value their comparative advantages ensures reprogramming and budget decisions are tied to benchmark performance and adjusted as necessary.

Recommendation 14: Create an MOP/MOE framework as the primary portfolio-level accountability metric.

Core Competencies and Technical Focus Areas

Modern warfare is complex and sophisticated while also executing at an incredible pace, and the DoW enterprise reflects this reality. Integrated warfighting requires a broad spectrum of multidomain capabilities including sensing, C2, logistics, active and passive protection, and weapon system lethality. Advances in AI, software, and networks provide further force multiplication, both on the battlefield and within the laboratories and the department, while strategy, policy, modeling, and training function to realize capabilities into operational tempo. In response to the demand to rapidly develop and field warfighting advantage to the services, the enterprise has adapted and developed many specialized as well as cross-cutting capabilities. However, this data call has demonstrated that the sheer complexity and constant development of the endeavor has created a systemic information and communication issue regarding what efforts are being undertaken, by whom, and for what purpose. To use a software development analogy, the documentation process has not kept up with the development. At the laboratory and center level, capabilities and research are being defined with inconsistent scope and terminology to the point where it hinders internal and industry collaboration, obfuscates potential duplicative efforts, and impedes situational awareness for high-level decision makers.

The Institutional Fragmentation of Core Competencies

The foundational pillars of the research and engineering enterprise are its core competencies, which are currently obscured by a lack of standardized definition and reporting. By design, a core competency should represent a deep, foundational capability central to a laboratory's mission, providing a unique strategic advantage to the warfighter. When clearly defined, these competencies serve two critical functions:

Strategic Navigation: They provide leadership with the "10,000-foot view" necessary for enterprise-wide situational awareness, enabling the rapid alignment of emerging threats with the appropriate technical solution-providers.

Operational Landmarks: They act as essential beacons for principal investigators, program managers, and acquisition professionals to identify cross-Component expertise, specialized technologies, and potential collaboration partners.

The Challenge of Nomenclatural Inconsistency

Analysis of the current data call reveals that the terminology used to categorize these capabilities is inherently subjective and lacks a universal, enterprise-wide taxonomy. Individual laboratories, FFRDCs, UARCs, and service branches have historically developed localized lexicons shaped by specific mission sets, isolated funding streams, and distinct organizational cultures.

Consequently, the nomenclature used to describe a capability often fails to convey its actual technical scope or operational application. For example, a single technical domain may be variously labeled as "Human-Machine Teaming," "Autonomy and Teaming," or "AI Agent Development" depending on the reporting entity. This semantic variability ensures that high-level titles alone are insufficient for determining the true depth or specificity of the work being performed.

Impact on Strategic Decision-Making

This lack of linguistic standardization creates significant risk in the assessment of research portfolios, leading to two primary forms of misinterpretation:

Masked Redundancy: Two facilities may appear to have entirely distinct portfolios based on their titles, while performing nearly identical work. For instance, a "Cyber Resilience" initiative at one organization might focus on tactical edge hardware, while another targets enterprise cloud infrastructure; without technical transparency, these are often mischaracterized as redundant or identical.

False Uniqueness: Conversely, highly specialized or proprietary jargon can make a common research practice appear as a unique, one-of-a-kind capability.

Ultimately, without a unified technical lexicon, DoW cannot accurately identify true gaps in the research enterprise or effectively eliminate the "unconscious duplication" of effort that slows the pace of innovation.

Conflation with Technical and Capability Focus Areas

Building on the ambiguities found in core competencies, this systemic documentation shortfall extends directly into how laboratories define their primary technical and capability focus areas. Laboratories, FFRDCs, and UARCs provided these focus areas as additional detail; however, the data call revealed considerable conflation between the two categorizations. What one organization classifies as a foundational core competence, another designates as a subordinate technical focus area, and very few laboratories explicitly mapped or connected their focus areas back to their core competencies. Because the definitional scope of these technical focus areas is just as unstandardized as the competencies themselves, this mismatch creates a significant illusion of overlap across the enterprise.

Organizational Asymmetry and Formatting Inconsistencies

The challenge of comparing these efforts is further exacerbated by profound organizational and structural asymmetries. For example, Navy laboratories reported a combined 292 core competencies, whereas the Air Force Research Laboratory (AFRL) - which operates technology directorates on a scale like other DoW centers - submitted only six. This disparity is not indicative of capability gaps, but rather a lack of standardized reporting guidelines regarding the level of detail required.

Submissions ranged from isolated keywords to extensive paragraphs, severely impairing direct comparison. The table below illustrates the stark contrast in specificity provided across different submissions:

Scope Level	Example Submission	Impact on Assessment
Broad / Ambiguous	"Analysis," "Test and Evaluation," "Space," "Process Implementation," or "USW Sensor and Sonar Systems"	Indeterminate scope; impossible to gauge specific capabilities, mission alignment, or true overlap without further context.
Highly Granular	"High-frequency sonar as applied to warfighting applications including mine hunting/obstacle avoidance, reconnaissance, classification, swimmer detection..."	Overly specific; risks missing alignment with other laboratories conducting similar foundational research under broader or differing nomenclature.

Context Dependency and the Reality of Duplication

Even when nomenclature appears to align, context and mission application dictate the actual capability. A core competency in "Cyber" entails a vastly different set of skills and outputs for a technology development and deployment center like NIWC PAC compared to a Studies and Analysis FFRDC like RAND NDRI. Conversely, distinctly worded capabilities - such as DEVCOM AvMC's "Advanced Missile Science & Technology" and GTRI's "Advanced electronics design and packaging for very compact, high performance signal processing, automatic target recognition, and guidance and control subsystems" - may possess significant technical overlap that is only recognizable to subject matter experts.

Crucially, perceived overlap at the core competency or technical focus area level does not inherently indicate a duplication of effort. The military services require a broad spectrum of capabilities to engage in integrated warfare, and each laboratory tailors its efforts to specific service needs and operational use cases. True duplication can only be accurately identified through fine-grained, project-level analysis. Reductions in RDT&E budgets have actively incentivized laboratories to minimize internal redundancies and fostered collaboration across Communities of Interest (COIs). Site visits corroborated this, demonstrating that organizations possess highly unique capabilities; where occasional programmatic overlaps did occur, they were largely driven by a lack of enterprise-wide visibility into parallel efforts rather than intentional redundancy.

To accurately assess the DoW research and development landscape and make informed capability decisions, these subjective categorizations, whether labeled as core competencies or technical focus areas, must be evaluated alongside the specific mission contexts, operational domains, and applied technical outputs of each laboratory.

Lifting the Enterprise "Fog of War"

Ultimately, the subjective categorization of core competencies and technical focus areas creates an administrative "fog of war" across the Defense Research Enterprise. Just as operational commanders require a Common Operating Picture (COP) to employ forces effectively, enterprise leaders and researchers require a clear, standardized taxonomy of capabilities. Dispelling this fog is a strategic imperative. By establishing a rigorous, enterprise-wide framework for defining and tracking research efforts, DoW can transition from siloed, reactive deconfliction to proactive capability management. This increased visibility maximizes the impact of constrained RDT&E budgets and accelerates internal, cross-service joint research by making the enterprise's true capabilities easily identifiable.

Enabling Data-Driven Partnerships

Furthermore, lifting this informational fog is essential for extending collaboration beyond internal DoW boundaries. Currently, discovering capabilities and forging collaborative efforts often relies heavily on informal, personal networks of relationships—an inherently unscalable and inefficient model for an enterprise of this size. Standardizing how research capabilities are defined enables a shift toward a truly data-driven approach to capability matching. This transparency not only helps DoW entities accurately find one another, but it also provides the Defense Industrial Base (DIB) and academic partners with the clear landmarks needed to align their investments with DoW needs. Moving toward a standardized, data-centric model creates the foundational visibility required to cultivate agile, highly effective research partnerships, the specific mechanisms and opportunities of which are detailed in the following section.

Partnerships

To maintain technical advantage, push the next generation of research innovation, and ultimately accelerate support to the warfighter, the Defense enterprise relies heavily on networks of partnerships. The ecosystem spans multiple sectors, integrating ideas, capabilities, and skill sets. Partners include DoW STRLs, FFRDCs, UARCs, academia, nonprofits, industry, and other Federal and local government agencies.

Industry engagement across the Defense Research Enterprise is inconsistent in both volume and quality, and the variation tracks more closely with the presence of specific individuals — the "localized champions" of the finding — than with the categorical or organizational identity of the participating institution. The findings are structural: it reflects the absence of a sustainable, repeatable, Department-wide approach to industry engagement, not the absence of engagement itself. Many DRE organizations engage with industry actively and productively, but the engagement is sustained by individual leaders rather than by institutional practices, and when those leaders depart the engagement frequently does not survive their tenure[11].

The ecosystem relies on several engagement avenues:

- **Broad Agency Announcement (BAA)**: Procurement tool used to solicit proposals for basic and applied research and certain parts of development that are not tied to a specific system or hardware procurement. Benefits: Encourages innovation by prioritizing technical merit and scientific advancement over lowest price, flexible evaluation criteria allow agencies to assess proposals based on quality, relevance, and expertise. Challenges: Awareness outside of Government.
- **Cooperative Research and Development Agreement (CRADA)**: Authorize Federal labs to enter into agreements with other Federal agencies, state/local government, industry, non-profits, and universities for licensing agreements for lab-developed inventions or intellectual property to commercialize products or processes originating in Federal labs. Benefits: Allows for R&D cost sharing to reduce overall Government burden, has built in pathway for technology transition, protects Government IP rights, and is a faster mechanism than traditional contracting. Challenges: May have a complex legal review with lengthy IP negotiations, some industry partners are unfamiliar with the process, and Government funding uncertainty as it is often dependent on annual appropriations.
- **Commercial Service Agreement (CSA)**: Provide private sector access to Government facilities and expertise on a full cost-recovery basis. Benefits: Full cost recovery from private entity, ensures unique assets maintained and utilized with proficient workforce, provides access unavailable in private sector. Challenges: Pricing can be complicated to determine "full cost"; priority of Government mission; liability and safety risk with private parties; some facilities may be inaccessible due to security classification.
- **Commercial Solutions Opening (CSO)**: Competitive, solicitation process to acquire innovative commercial projects or services. Benefits: Significant process efficiency and adaptability by using an iterative approach that reduces duplicative steps and rigid timelines of traditional procurement, evaluates industry responses against selection factors defined within the CSO, ensures fair and transparent awards while describing general needs rather

[11] *Review of the Defense Research Enterprise*, Project Trolley, Potomac Institute for Policy Studies, 2026, pg. 45

than specific solutions, allows follow-on production contracts or transactions. Challenges: Can be complex process.

- **Cooperative Agreement**: Contract emphasizing collaboration in services or shared objective. Benefits: Enables collaboration with external organizations to achieve shared goals and advance technology development. Facilitates partnerships with academia, industry, and other entities. Challenges: Acquisition process, specificity from sponsor up front, administrative burdens.

- **Educational Partnership Agreement (EPA)**: Enable no-cost partnerships with academic institutions for research collaboration and STEM workforce development. Benefits: No Government funding required, universities have access to unique Government facilities and data sets and is a collaborative exchange of cutting-edge research and Government mission needs. Challenges: Not systematically paired with externally funded academic grants, significant time investment for mentoring students, no systematic way of tracking return on investment (publications, patents, student hires).

- **Grants to Colleges and Universities**: Research grants through Broad Agency Announcement (BAA) for a merit-based competition for proposals. Benefits: extend the reach of our S&T and encourage academia to focus on important problems unique to the mission, train the next generation of engineers and scientists, and establish a dynamic ecosystem of national expertise. Challenges: Need increased coordination with other grant authorities.

- **Information Exchange Annexes (IEA)**: Ability to evaluate possible future areas of cooperative research, exchange existing research data, and build information to support future programs. Benefit: Allows opportunity to find area of mutual interest with partners or potential partners. Challenges: Limited workforce training on these agreements.

- **Memorandum of Understanding/Memorandum of Agreement (MOU/MOA)**: Agreements used within the Government to establish defined terms for collaboration, temporary duty of employees, or other reasons. Benefits: Provide structure and agreed upon terms for parties involved in collaboration and flexibility to tailor the agreement. Challenges: Can be a lengthy process to obtain mutual agreements.

- **Partnership Intermediary Agreement (PIA)**: Enables third party organizations to facilitate partnerships between Federal labs and non-Federal entities. Benefits: reduced Government administrative burden (intermediary handles), access to intermediary network and potential broader reach, potential specialized expertise. Challenges: Lack of qualified organizations in remote areas to be intermediary, intermediary requires funding, unknown ROI, different than traditional partnership direct with industry.

- **Patent License Agreement (PLA)**: Improve the high-technology industrial base of the regions local to DoW entities, strengthen and advance student pipelines. Benefit: Ability to choose high tech partners to host public events like "Industry Days". Challenges: Vetting through Commanding Officer may take time.
- **Project Agreements (PA)**: international agreements that codify government-to-government collaboration for research and development projects. Benefits: Cost sharing increased global collaboration and knowledge of areas of research. Challenges: Intensive effort with organizations as well as international program office(s) to negotiate.
- **Other Transaction Authority (OTA)**: Ability to partner directly with non-traditional technology startups, and rapidly develop, test and deploy critical capabilities. Benefits: Accelerate development, bypass FAR system, direct pipeline to non-traditional defense companies, and allow startups to use Government infrastructure and expertise to mature technology effectively. Challenge: Requires heavy Government involvement often due to lack of infrastructure and deep expertise, requires Government to be the lead often managing several partners, Government takes lifecycle burden.
- **Technology Transfer Agreement:** Encompasses patent licensing, material transfer agreements, data use agreements and other mechanisms to transition Government-developed technology to external partners. Benefits: Government developed technology reaches warfighter, royalty offsets R&D investment, economic development, IP protection. Challenges: Industry is often unaware of Governmentt patents, licensing terms can take time and be complex, some technology restricted, limited staff expertise.
- **Test Service Agreement (TSA)**: Offers testing services to industry utilizing unique Government facilities. Benefits: Provides industry partners access to Government facilities and expertise, enabling them to invest in solutions without significant facility investments, Government has exposure to innovative solutions. Challenges: Funding mechanisms /efficient execution of industry funds, awareness of availability among commercial industry.
- **Work with Private parties (WWPP):** Executes contractual agreements that provide DoW technical testing services, private party use of DoW facility and equipment and products to commercial entities (private industry, academia, and Government) for an agreed-upon fee. Benefits: Reduction in operating and ownership costs, supports acquisition strategies, enhances commercialization of dual-use technologies, and increases private sector access to unique defense capabilities. Challenges: Difficult at times to capture ROI and outcome.

DoW Science Technology Reinvention Laboratories

The STRLs rely on both internal within DoW and external partnerships to progress research and concepts to reality for the warfighter. Through the enterprise data call, the STRLs submitted nearly 5,000 partnerships across the laboratories. However, this figure represents only a partial list as many laboratories acknowledged engaging with large volumes of additional partners that were not formally listed (e.g., 500+ CRADAs, etc.). Of the partnerships listed, 42 percent involved direct collaboration with at least one industry partner, 26 percent with another DoW facility, and nearly 20 percent with academia. See Figure 18.

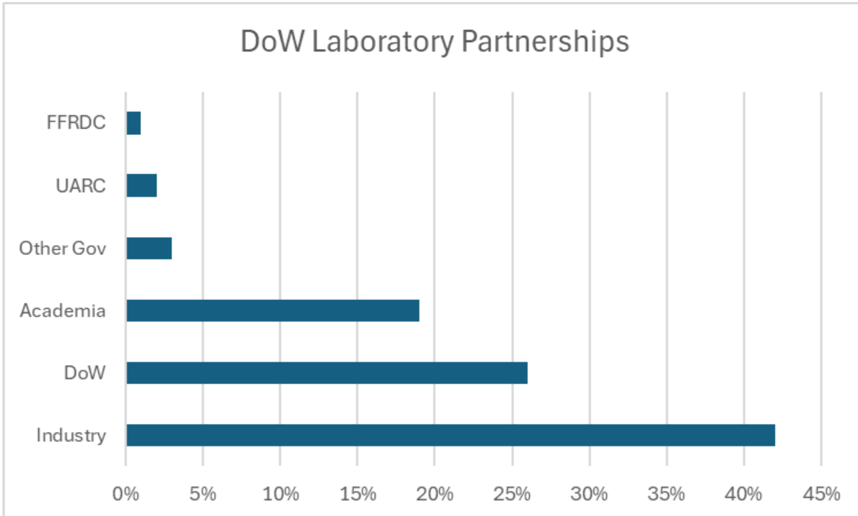


Figure 18. DoW Laboratory Partnerships

While traditional, large-scale defense prime contractors represent the most frequent industry partnerships, over 90 percent of the STRL industry engagements are distributed across an incredible array of other companies as shown in

Figure 19This is not entirely surprising as the larger industry partners have the facilities and workforce who are already security compliant and have the known ability to scale. The non-traditional engagements represent small businesses, spin-offs of the defense primes, and companies specializing in specific technology domains. In many projects, the STRLs are partnering with a multitude of partner types.

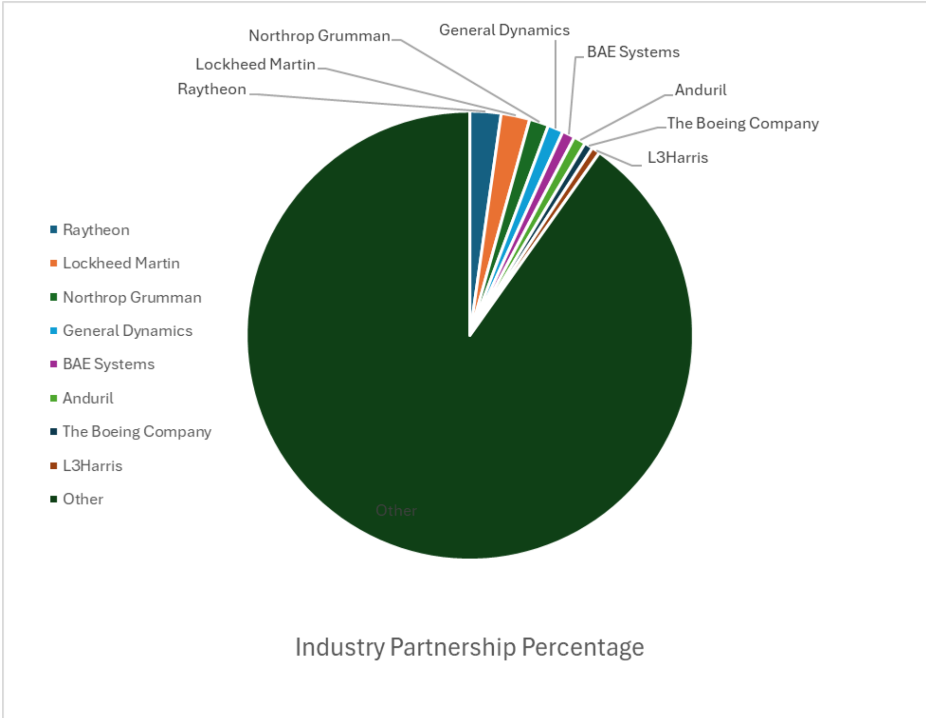


Figure 19. Various types of industry partnerships

Federally Funded Research and Development Centers

FFRDCs demonstrate a strong commitment to external collaboration, actively cultivating extensive partnership networks to advance their research and development missions.

At the forefront of this collaborative landscape are the Institute for Defense Analyses Systems and Analyses Center (IDA SAC) and the Aerospace Corporation, both of which boast robust networks of 15 partners each. This high level of engagement is closely matched by the Center for Naval Analyses (CNA) and the RAND National Defense Research Institute (NDRI), which each maintain active ties with 14 distinct partners.

The drive to build meaningful, collaborative ecosystems extends across the broader FFRDC community. MIT Lincoln Laboratory actively coordinates with 11 partners, while RAND Project AIR FORCE (PAF) and the RAND Arroyo Center support solid, engaged networks of 9 and 8 partners, respectively. Even organizations with more specialized or targeted scopes, such as the National Security Engineering Center (NSEC, operated by MITRE), maintain focused strategic partnerships.

Overall, the data highlights a highly integrated FFRDC environment that prioritizes and relies upon ongoing partner engagement to drive innovation and expand capabilities. The chart below illustrates the breadth of these strong collaborative networks across organizations.

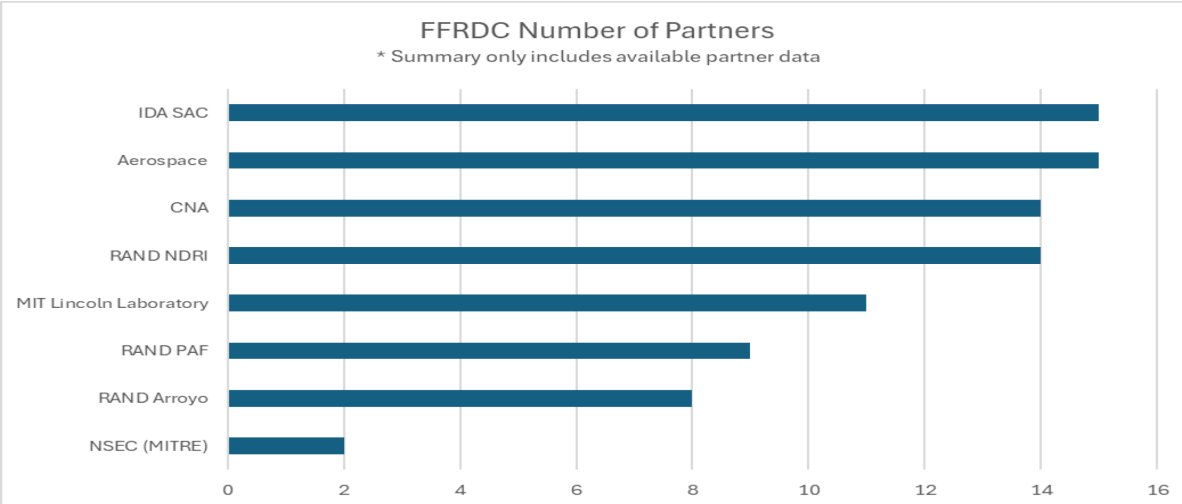


Figure 20. FFRDC partnership counts

University Affiliated Research Centers

UARCs demonstrate a highly active commitment to collaboration, maintaining extensive networks that are essential for driving innovation and shared success. Across the board, these centers engage heavily with external partners, successfully integrating diverse expertise into their research ecosystems. Notably, every institution represented sustains double-digit partnerships, reflecting a systemic culture of outreach and cooperation.

Leading this collaborative effort are the Systems Engineering Research Center (SERC) / AIRC, the USC Institute for Creative Technologies (ICT), and the Applied Research Laboratories at UT Austin (ARL:UT), each boasting highly expansive networks of over 50 active partners. Even beyond these top tier connectors, strong engagement is evident across institutions like Johns Hopkins University APL and the Institute for Collaborative Biotechnologies, which maintain dozens of key relationships. This widespread connectivity underscores the critical role UARCs play as highly engaged, central hubs for advanced research and development.

The following chart details the impressive scope of these partnership networks across various UARCs.

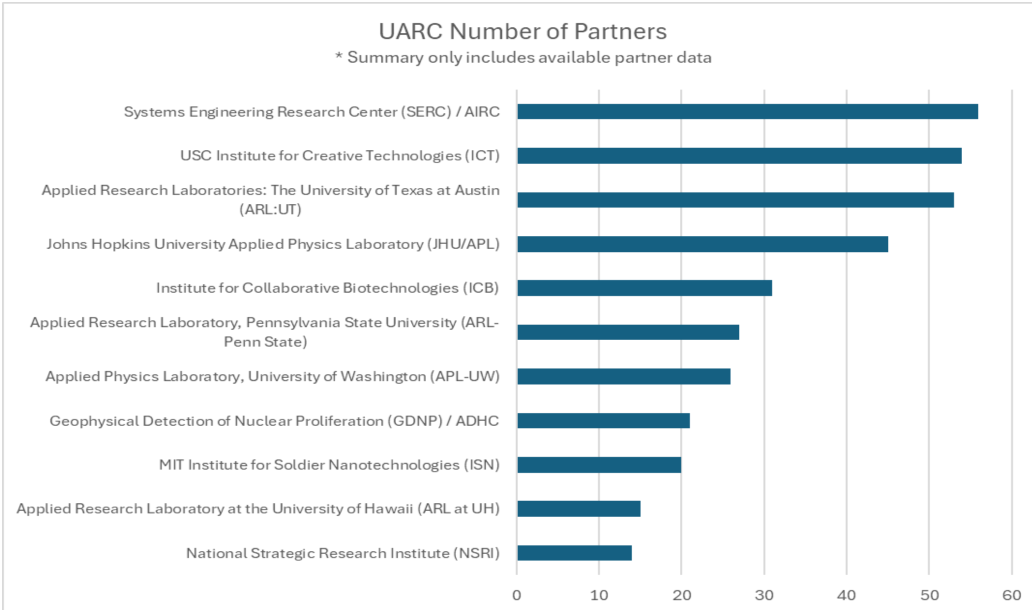


Figure 21. UARC partnership counts

The broad diversification of partnerships is critical for DoW; it enhances supply chain resilience, fosters competition, and allows the enterprise to access highly specialized, niche partners. The enterprise and ultimately, the warfighter benefit immensely from a robust and expanding network of partnerships, which serves as a critical force multiplier for innovation and collaborative mission success. However, the current landscape lacks a centralized tracking mechanism to provide a common operational picture of these diverse engagements. Without a standardized system to catalog and monitor ongoing initiatives, these valuable partnerships risk becoming siloed. This lack of enterprise-wide visibility ultimately inhibits cross-functional awareness, increases the potential for duplicated efforts, and obscures opportunities where different commands could leverage shared capabilities to accelerate strategic objectives.

Transitions

While the DoW research and development enterprise is successfully transitioning critical innovations directly to the warfighter for immediate in-theater utilization, this rapid operational tempo is severely taxing the workforce. Recent site visits validated that DoW laboratories, UARCs, and FFRDCs have a proven track record of accelerating capabilities to the tactical edge, delivering direct support to major efforts ranging from Operations Enduring Freedom, New Dawn, and TOMODACI, to Operation Allies Refuge, Ukraine assistance operations, and, most recently, Operation Epic Fury. However, frontline personnel report significant challenges in sustaining this pace of rapid fielding. Compounded by critical DRP losses, the remaining workforce is absorbing unsustainable workloads, relying on extended hours and sheer individual resilience to bridge expanding personnel gaps and ensure these systems are successfully integrated in the field.

The path from DRE research to fielded capability has been documented as broken since the 1980s, across many studies, and the interviews conducted for this assessment found the same pattern. Specific weaknesses named in the interviews include intellectual-property and legal barriers carried forward from the Bayh-Dole framework, the lack of a revived budget-certification process at OUSW(R&E), and the recurring problem that successful prototypes fail to transition because the receiving acquisition organization's leadership and priorities have changed.

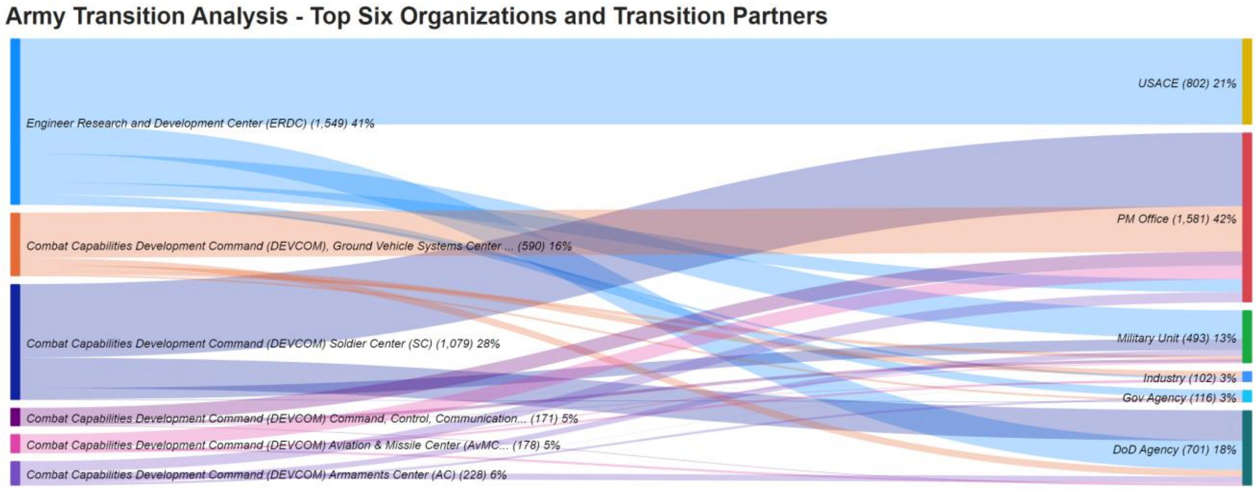
The persistent capability-to-delivery gap is in the connective tissue between knowledge producers and capability fielders. That connective tissue is the set of mechanisms, authorities, incentives, and organizational arrangements that move technology, engineering judgment, analytic input, and academic capability from upstream maturity to fielded capability within strategically relevant timelines. This gap is not the responsibility of any single category. It is the responsibility of the system that connects them, the oversight and coordination provided by the Office of the Secretary of War. The 2026 National Defense Strategy's industrial base emphasis reframes the capability-to-delivery problem. By identifying the defense industrial base, rather than the research enterprise, as the binding constraint on delivering capability, the strategy implicitly shifts the focus from technology generation to technology production, fielding, and sustainment at scale.[12]

[12] *Review of the Defense Research Enterprise*, Project Trolley, Potomac Institute for Policy Studies, 2026, pg. 24

Overall – DoW Laboratory highlights

The DoW laboratories reported 5,588 transitions overall. Army listed the greatest number of transitions (3,941)

Army



Remaining Army Organizations	Academia	DoD Agency	Gov Agency	Industry	Military Unit	N/A	PM Office	Program	Total
Transformation and Training Command (T2COM) STRL		14	1		11	4	20		**50**
Space and Missile Defense Technical Center		12	1	1	6		16	2	**38**
Research Institute for the Behavioral and Social Sciences	1	4			23		1		**29**
Army Medical Research and Development Command (MRDC)		4			5	5	5	2	**21**
Combat Capabilities Development Command (DEVCOM) Army Research Laboratory (ARL)		2		1	4		5		**12**
Combat Capabilities Development Command (DEVCOM) Chemical Biological Center (CBC)		3		1			6		**10**
CECOM Army Software & Innovation Center (Formally CECOM Software Engieering Center)							2		**2**
Total	**1**	**39**	**2**	**3**	**49**	**9**	**55**	**4**	**162**

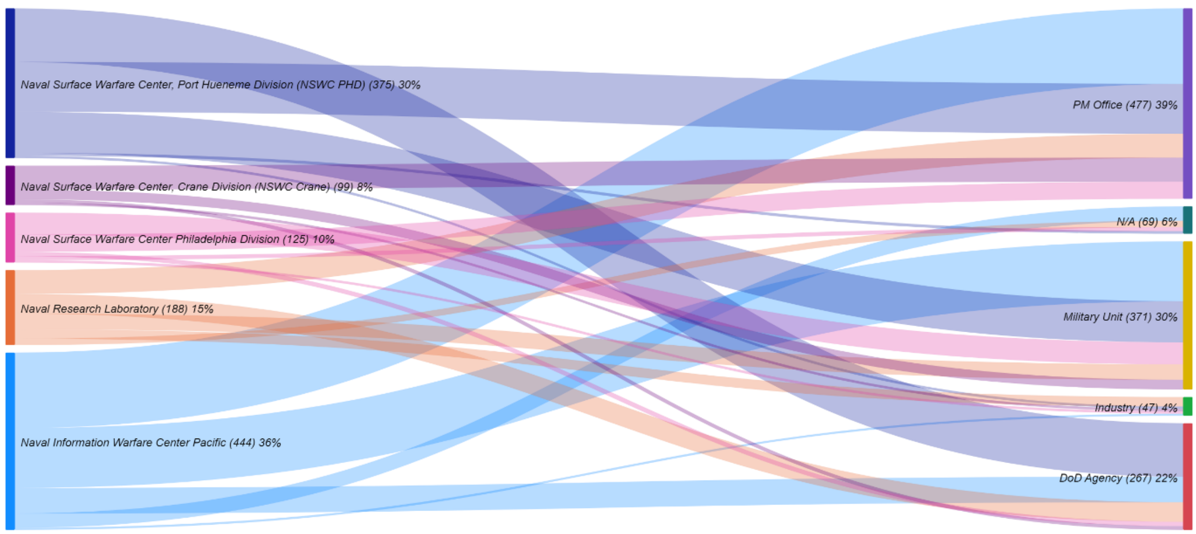
Figure 22. Army transitions between top 6 organizations and partners

Army transition partnership is predominantly driven by the Combat Capabilities Development Command (DEVCOM) Soldier Center (1,079 transitions) and ERDC (1,528 transitions) of the output among the top six organizations. The data highlights two distinct transition pathways:

- Most of the broader Army's output flows into traditional acquisition channels, making "PM Offices" the leading combined destination (~1,639 transitions, or 41.5 percent). This established pathway is mirrored across lower-volume Army organizations.
- ERDC's output is highly internalized and directs 52 percent of its output (801 transitions) straight back into the U.S. Army Corps of Engineers (USACE). The remaining ERDC output supports operational partners, notably "DoW Agencies" (~702 transitions, 18 percent) and "Military Units" (~485 transitions, 12 percent).

Navy

Navy Transition Analysis - Top Five Organizations and Transition Partners



Remaining Navy Organizations	Academia	DoD	DoD Agency	Facility	Fleet	Foreign	Gov Agency	Gov/DoD Agency	Industry	Joint Force	Medical	Military Unit	N/A	Other	Platform	PM Office	Program	Total
Naval Undersea Warfare Center Newport Division		1	11				1		1			39			2	54	8	**117**
Naval Undersea Warfare Center Keyport Division	2		3	1					1			4				26		**37**
Naval Surface Warfare Center Panama City Division (NSWC PCD)			11	1			1		8			31	8	1		12	1	**74**
Naval Surface Warfare Center Indian Head Division		1	9		1		1			1		15	3		1	42	2	**76**
Naval Surface Warfare Center Dahlgren Division			29			1	2					25	2	2		17	12	**90**
Naval Surface Warfare Center Corona Division			5	1						1		4	79			10	2	**102**
Naval Surface Warfare Center Carderock Division		1	10		1				2			7				63	1	**85**
Naval Submarine Medical Research Laboratory			11	1			1			8		7				26	1	**55**
Naval Medical Research Unit SOUTH	1		3				2			14								**20**
Naval Medical Research Unit San Antonio			7			1			3	3		4						**18**
Naval Medical Research Unit INDO PACIFIC							2		3	8		1						**14**
Naval Medical Research Unit EURAFCENT									4	14		1				1		**20**
Naval Medical Research Unit Dayton			10				2		3			8				2		**25**
Naval Medical Research Command			9				6		18	11		7				15		**66**
Naval Information Warfare Center Atlantic			4				1		1			13		16		15	2	**52**
Naval Health Research Center			2				4			17	1	36				4		**64**
Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC)			2				1					7				5		**15**
Naval Air Warfare Center Weapons Division		1	11			2	2			1		2	8	1	3	37	2	**70**
Naval Air Warfare Center Aircraft Division			3		1							2				17	1	**24**
Marine Corps Warfighting Laboratory / Futures Directorate			2									7	1			3	3	**16**
Marine Corps Tactical Systems Support Activity			7					1				7	9			2	7	**33**
Total	**3**	**4**	**149**	**4**	**3**	**4**	**26**	**1**	**44**	**78**	**1**	**227**	**110**	**20**	**6**	**351**	**42**	**1073**

Figure 23. Navy transitions between top 5 organizations and partners

Navy transition partnership highlights a robust technology transfer network driven primarily by the Naval Information Warfare Center Pacific (36 percent) and the Naval Surface Warfare Center, Port Hueneme Division (30 percent) among the top five organizations. The primary recipient of these transitions is the "PM Office," which absorb 39 percent (477) of the top-tier output, a trend consistent with formal program integration. However, unlike other branches, the Navy exhibits a notably strong direct-to-operator pathway, with "Military Units" receiving a substantial 30 percent (371) of top-tier transitions and serving as the second-largest partner for the remaining Navy organizations (227 out of 1,073 total transitions).

Air Force

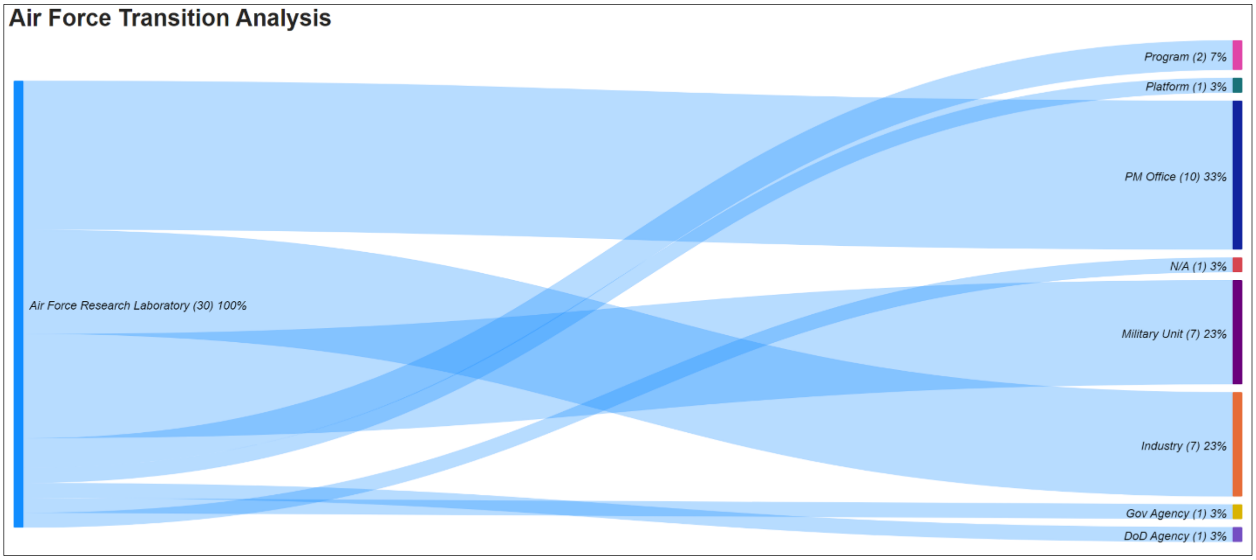


Figure 24. Air Force transitions between top 5 organizations and partners

The Air Force Research Laboratory (AFRL) accounts for 100 percent of the 30 tracked transitions shown. From this singular origin point, the technology transfer is distributed primarily among three main partners. The leading recipient is the "PM Office," which absorbs 33 percent (10) of the output, closely followed by direct-to-operator "Military Units" and commercial "Industry" partners, which each receive 23 percent (7 transitions apiece). The remaining fraction of transitions is thinly spread across minor categories such as specific Programs, Platforms, and other Government or DoW agencies.

Fourth Estate

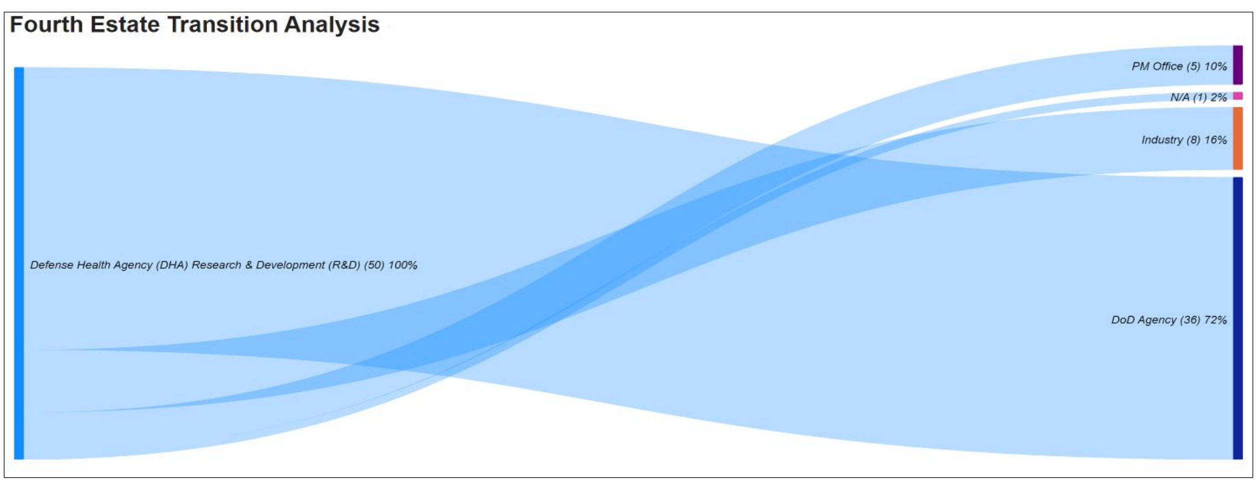


Figure 25. Fourth Estate transitions

The Defense Health Agency (DHA) Research & Development (R&D), which accounts for 100 percent of the 50 tracked transitions. Unlike the military service branches that predominantly funnel technologies into Program Management (PM) Offices or directly to operational units, the Fourth Estate's output is overwhelmingly directed toward broad Government channels, with “DoW Agencies” receiving the vast majority at 72 percent (36 transitions). The remaining output is distributed across commercial “Industry” partners (16 percent) and “PM Offices” (10 percent), with a negligible fraction (2 percent) categorized as not applicable. This data highlights a uniquely insular, agency-to-agency transition ecosystem.

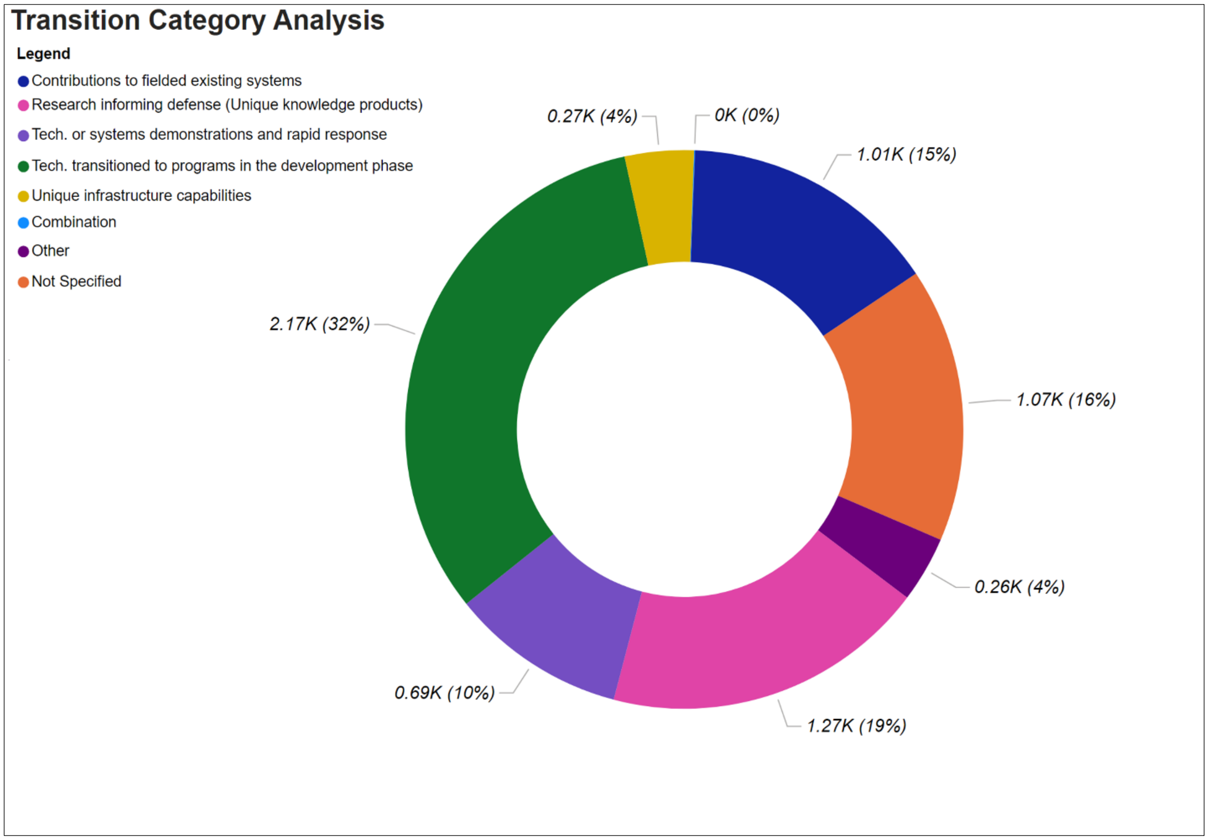


Figure 26. Total transition categories and percentages

The data reveals that the most prominent pathway is “Technology transitioned to programs in the development phase,” accounting for nearly a third of the total distribution at 32 percent (2.17K transitions). This is followed by “Research informing defense (Unique knowledge products)” at 19 percent (1.27K) and “Contributions to field existing systems” at 15 percent (1.01K). Notably, a significant portion of the transitions (16 percent;1.07K) are categorized as “Not Specified,” indicating a potential gap in tracking or categorization.

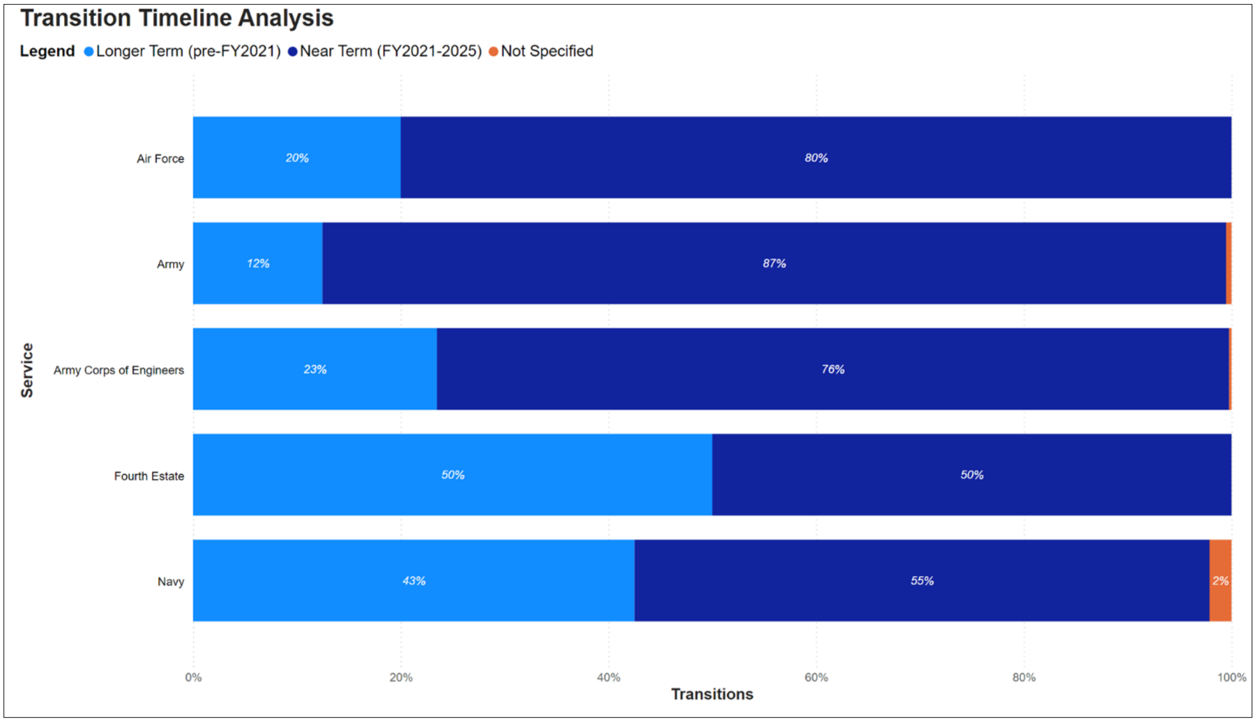
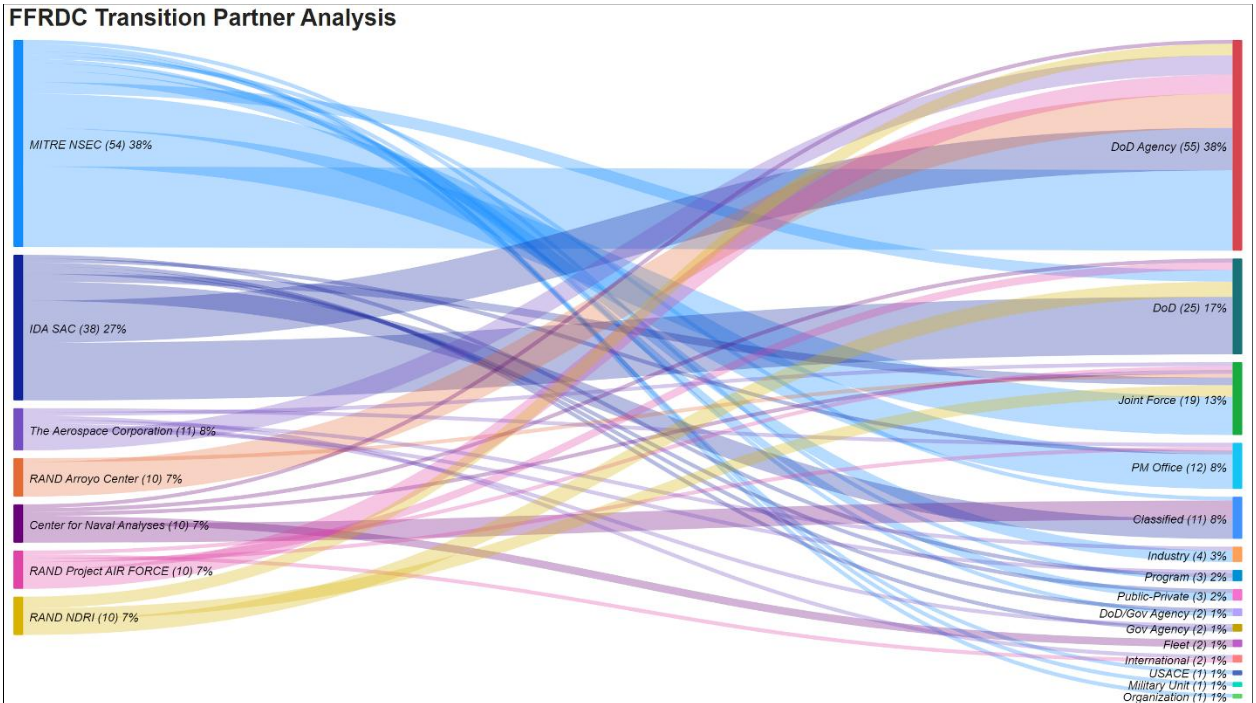


Figure 27. Transition timelines

An assessment of the longitudinal number of transitions across the analyzed branches reveals a clear strategic emphasis on near-term initiatives (FY2021-2025), most notably within the Army (87 percent) and Air Force (80 percent). The Fourth Estate maintains a balanced approach, splitting its transition efforts evenly between longer-term (pre-FY2021) and near-term timeframes. Conversely, the Navy retains the highest proportion of older transitions at 43 percent, indicating a larger share of legacy activities initiated prior to the current fiscal period.

FFRDC

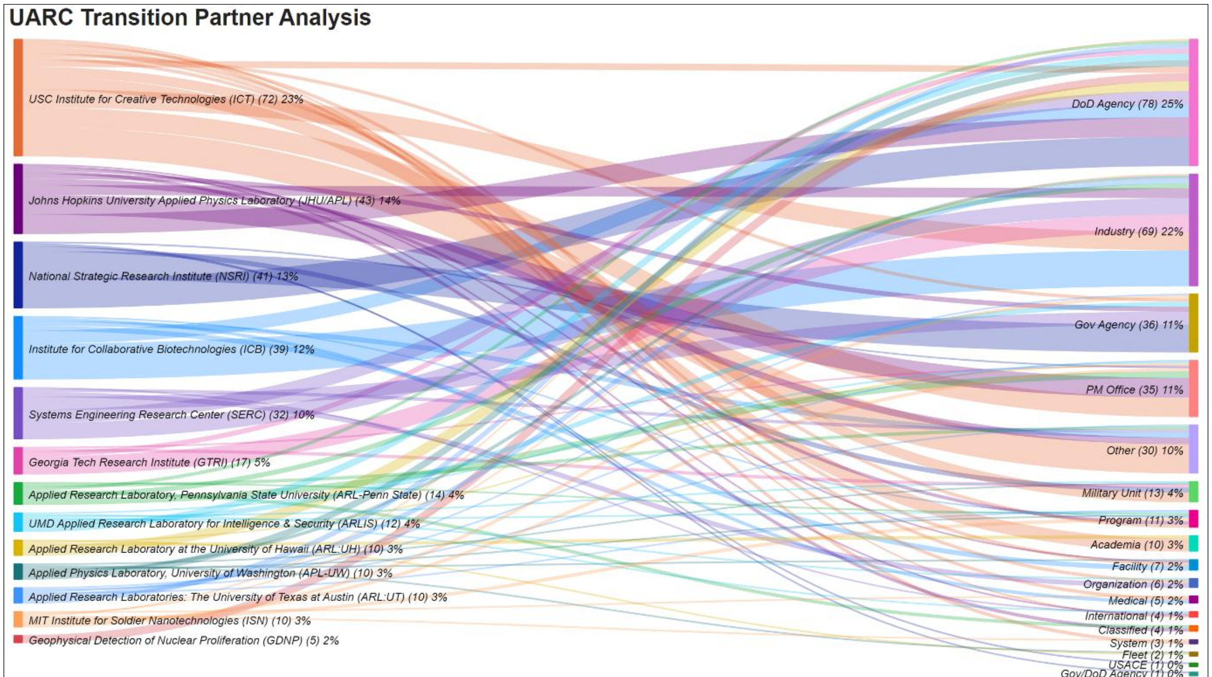


FFRDC	Classified	DoD	DoD Agency	DoD/Gov Agency	Fleet	Gov Agency	Industry	International	Joint Force	Military Unit	Organization	PM Office	Program	Public-Private	USACE	Total
Center for Naval Analyses	5	1	1		2				1							10
IDA SAC	5	15	11	1		1			2			1	1	1		38
MITRE NSEC	1	3	21	1			3		10	1	1	9	1	2	1	54
RAND Arroyo Center			9						1							10
RAND NDRI		4	3						3							10
RAND Project AIR FORCE		2	5					1	1			1				10
The Aerospace Corporation			5			1	1	1	1			1	1			11
Total	**11**	**25**	**55**	**2**	**2**	**2**	**4**	**2**	**19**	**1**	**1**	**12**	**3**	**3**	**1**	**143**

Figure 28. FFRDC transitions

The FFRDCs has a diverse transition ecosystem led predominantly by MITRE NSEC, which accounts for 38 percent (54) of the 143 total tracked transitions, and IDA SAC at 27 percent (38 transitions). Further, the FFRDCs overwhelmingly direct their outputs to broader defense and strategic entities. "DoW Agencies" serve as the primary recipient, absorbing 38 percent (55) of the total volume, followed by general "DoW" partners at 17 percent (25) and "Joint Force" entities at 13 percent (19). Notably, this network also includes a distinct "Classified" transition pathway (8 percent, or 11 transitions) sourced primarily from the Center for Naval Analyses and IDA SAC, highlighting the specialized, high-level advisory and research roles these organizations fulfill across the defense enterprise.

UARC



UARC	Academia	Classified	DoD Agency	Facility	Fleet	Gov Agency	Gov/DoD Agency	Industry	International	Medical	Military Unit	Organization	Other	PM Office	Program	System	USACE	**Total**
Applied Physics Laboratory, University of Washington (APL-UW)			4	1	1			2			1				1			**10**
Applied Research Laboratories: The University of Texas at Austin (ARL:UT)			3			1		3					1	1	1			**10**
Applied Research Laboratory at the University of Hawaii (ARL:UH)	2		6		1									1				**10**
Applied Research Laboratory, Pennsylvania State University (ARL-Penn State)		2	2					3					2	4	1			**14**
Geophysical Detection of Nuclear Proliferation (GDNP)			5															**5**
Georgia Tech Research Institute (GTRI)			3					11			2			1				**17**
Institute for Collaborative Biotechnologies (ICB)			8	3				22		2			3		1			**39**
Johns Hopkins University Applied Physics Laboratory (JHU/APL)		2	12	1		3		6	1				4	12	2			**43**
MIT Institute for Soldier Nanotechnologies (ISN)			1			2		1		1				2	2	1		**10**
National Strategic Research Institute (NSRI)			18			17	1				3			1			1	**41**
Systems Engineering Research Center (SERC)			8			8		10	1			3	2					**32**
UMD Applied Research Laboratory for Intelligence & Security (ARLIS)			4			3			1		1	1		1	1			**12**
USC Institute for Creative Technologies (ICT)	8		4	2		2		11	1	2	6	2	18	12	2	2		**72**
Total	**10**	**4**	**78**	**7**	**2**	**36**	**1**	**69**	**4**	**5**	**13**	**6**	**30**	**35**	**11**	**3**	**1**	**315**

Figure 29. UARC transitions

The data illustrates a highly diversified and robust technology transfer ecosystem spread across 13 distinct UARCs, yielding a total of 315 tracked transitions. The pipeline is led by the USC Institute for Creative Technologies (ICT) with 23 percent (72 transitions) of the output, followed by the Johns Hopkins University Applied Physics Laboratory (JHU/APL) at 14 percent (43). In contrast to traditional military service branches that heavily rely on direct-to-acquisition pipelines via Program Management (PM) Offices, the UARC network distributes its research predominantly to broader "DoW Agencies" (25 percent, or 78 transitions) and commercial

"Industry" partners (22 percent, or 69 transitions). Traditional "PM Offices" and other "Gov Agencies" receive a smaller, equal share at 11 percent each. This distribution highlights the unique, foundational role of UARCs in bridging academic research with widespread defense enterprise applications and commercial industry commercialization.

The pace at which commercially developed technology advances the state of the art in fields of direct relevance to defense has accelerated to a point where the standard DoW capability-to-development timeline produces predictable obsolescence. The pattern is clearest in fields where commercial investment substantially exceeds DoW investment. In artificial intelligence, commercial sector capital expenditure on training infrastructure and large-model development now substantially exceeds DoW R&D spending in the same field. In semiconductor process technology, the commercial leading edge has migrated to nodes (3 nanometers and below) that defense applications historically could not justify on their own. In cloud computing infrastructure, the principal commercial providers operate at scales and refresh cadences that no DoW cloud architecture can match. And in space launch and small-satellite production, commercial production rates and unit-cost reductions have shifted the economic calculus that historically argued for Government-led development. The list is illustrative rather than exhaustive.[13]

The 2026 National Defense Strategy further intensifies the prioritization, naming specific technology areas — artificial intelligence, autonomous systems, advanced computing, biotechnology, advanced materials, hypersonics, directed energy, quantum information sciences — in which the United States must maintain or recover lead positions, and identifying commercial-sector engagement as a principal element of how that lead is achieved and maintained.

The second element is the broadening of the global security threat picture. Successive National Defense Strategies provide the authoritative articulation of this broadening:

- The 2018 National Defense Strategy named long-term strategic competition with the People's Republic of China and the Russian Federation as the principal Departmental priority.
- The 2022 National Defense Strategy reaffirmed and intensified the focus, with a clearer prioritization of the China challenge while addressing the simultaneous Russia challenge that the war in Ukraine made acute.
- The 2026 National Defense Strategy retains the China and Russia priorities and adds explicit treatment of the broader threat surface: North Korean and Iranian capability development; transnational threats including terrorism, weapons-of-mass-destruction proliferation, and gray-zone operations; the homeland-defense imperative including air,

[13] *Review of the Defense Research Enterprise*, Project Trolley, Potomac Institute for Policy Studies, 2026, pg. 28

missile, and cyber threats; and the contested-domain dimensions of space, cyberspace, and information operations.

The structural implication for the DRE is that the technical scope the Department must address is broader than at any prior point in the post-Cold-War era. The historical concentration of DRE R&D priorities (air superiority, undersea warfare, ground maneuver, strategic nuclear deterrence, and intelligence, surveillance, and reconnaissance) has not diminished, but new priorities have been added at a rate that exceeds the rate at which historical priorities have been deprioritized. Cyber and space-domain capabilities, present at modest scale in the 1990s and 2000s DRE portfolio, now constitute substantial enterprise priorities. Counter-unmanned aerial systems, hypersonic systems and counter-hypersonics, directed energy, and advanced electronic warfare have moved from peripheral research interests to central capability priorities. Artificial intelligence and autonomous-systems work, present in concept development in the 2010s, now constitute large and growing portions of every Service Laboratory portfolio and a substantial portion of the FFRDC and UARC effort.

The broader threat picture intersects with the commercial pace differential because many of the new priority areas (artificial intelligence, autonomous systems, space, cyber) are precisely the domains where commercial-sector capability development and adversarial adoption is most rapid. The Department of War faces a double front adaptation challenge: the technology areas of greatest threat are also the technology areas of greatest commercial acceleration. The institutional differentiation across the seven DRE categories provides genuine adaptive advantages — different categories are differently positioned to engage commercial-pace technology development — but the rate of adaptation across the enterprise has not collectively matched either the pace differential or the broadening of the threat picture.

Overlap and Drift Analysis

One of the challenges for the DRE in controlling overlap and drift is that the labs must address technical needs from past, present, and future weapon systems and technology, all at the same time. As reported by the Potomac Institute during their assessment of the DRE,

> *"The historical concentration of DRE R&D priorities (air superiority, undersea warfare, ground maneuver, strategic nuclear deterrence, and intelligence, surveillance, and reconnaissance) has not diminished, but new priorities have been added at a rate that exceeds the rate at which historical priorities have been deprioritized. Cyber and space-domain capabilities, present at modest scale in the 1990s and 2000s DRE portfolio, now constitute substantial enterprise priorities."* [14]

[14] *Review of the Defense Research Enterprise*, Project Trolley, Potomac Institute for Policy Studies, 2026, pg. 29-33

The headline finding is that the overlap within and across the DRE categories is warranted by design, and that the cases deserving closer scrutiny are concentrated in specific crosscutting enabling competencies, rather than in the broader institutional map.

- **Observation 1 — The most significant overlaps are in crosscutting enabling competencies, not in core missions.** AI, software engineering, cyber, digital engineering, AI engineering, modeling and simulation, and data analytics are now required across every STRL, FFRDC, and UARC. These competencies overlap because they are pervasive, not because institutions are duplicating each other's core work. Capabilities distributed across multiple categories without a coordinating structure is a specific overlap the analysis flags as warranting closer scrutiny. The productive response is coordination and standardization of foundational tools, methods, and workforce development, not elimination of application-specific work that is structurally tied to the operational, mission, or sponsor context in which it is generated.

- **Observation 2 — Service-specific, mission-specific, and sponsor-specific differentiation justifies most overlap in applied research and applied engineering.** Autonomous systems for air, land, sea, undersea, and space face fundamentally different design challenges. Materials for aircraft, ships, ground vehicles, soldier equipment, and infrastructure serve different environments. Eliminating these overlaps would require eliminating the contextual expertise that makes the research and engineering operationally relevant — a cure worse than the disease. The tri-Service medical research structure (Army WRAIR; Navy NMRC and NAMRUs; Air Force USAFSAM) is the most explicit DRE example of service-specific differentiation in apparent overlap, with each Service maintaining medical research organizations whose contextual expertise is the core competency rather than a duplicative cost.

- **Observation 3** — At the basic-research level, **a degree of parallel independent investment is appropriate and even desirable.** Multiple independent approaches to foundational problems are how basic research is completed and validated, and it would be counter-productive to consolidate it. The risk worth watching is narrower: parallel investment in the same pre-domain-specific areas (AI theory, quantum science foundations, foundational materials chemistry, computational methods) fragments the national talent pool below the critical mass needed for world-class output in a given subfield. Coordination of 6.1 investments could address this without restructuring the laboratories themselves.

- **Observation 4 — Most overlap within and across DRE categories is driven by mission needs.** Service specific needs effectively manage overlap. The warfare centers' development/sustainment pairings (Newport/Keyport, Dahlgren/Port Hueneme, NAWCAD/NAWCWD) represent a mature and effective approach to dividing work within a domain. The DEVCOM November 2025 PAE construct's same-site engineering-to-acquisition coupling at multiple centers extends the lifecycle-stage approach to engineering-to-acquisition coordination. The FFRDC sponsor-agreement model under FAR 35.017 and the UARC sponsoring-agreement framework structurally limit overlap by sponsor approval.

- **Observation 5 — Intra-organizational consolidations address genuinely duplicative analytical overlap.** The March 2026 transition of DEVCOM Analysis Center and TRAC into the Transformation Decision Analysis Center (TDAC) under AFC consolidated two analysis organizations whose work overlapped. The April 2026 AFRL reorganization is a parallel example of internal overlap rationalization through consolidation of eleven organizations into seven major entities. GAO's running enumeration of 95 open recommendations on duplication, fragmentation, and overlap across DoW, with estimated potential savings of $8 billion to $100 billion if implemented, suggests that overlap management is a persistent Department-wide challenge that DRE remediation should be situated within rather than treated in isolation.
- **Observation 6 — Reform-induced damage is the principal risk in any overlap-rationalization initiative.** The DRE's specialized expertise cannot be reconstituted on procurement timelines once it is lost. Some examples of specialized expertise include: submarine acoustics at NUWC Newport; energetics at NSWC Indian Head; hydromechanics at NSWC Carderock; combat systems at NSWC Dahlgren; aviation systems engineering across AvMC; networked mission systems at C5ISR; chemical-biological surety at CBC; ground-vehicle systems engineering at GVSC; soldier-equipment engineering at Soldier Center; dual-use civil-military engineering across the seven ERDC laboratories; space-enterprise systems engineering at Aerospace; broad R&D at Lincoln Laboratory; software engineering and cybersecurity at SEI; the studies-and-analysis FFRDC analytic cultures; the Navy UARCs' undersea and maritime depth; and JHU APL's mission-embedded breadth.

No DRE institution has abandoned its chartering purpose. The service laboratories still conduct service-specific research; the warfare centers still provide unparalleled engineering, integration, test, and sustainment; the DEVCOM engineering centers still translate science into integrated capabilities; the ERDC laboratories still deliver unmatched engineering (their outputs are not uniformly 'dual-use' for military and civil engineering projects; the funding source determines the primary purpose); the FFRDCs still operate as independent sponsor-aligned institutions; the UARCs still preserve sponsor-aligned core competencies; and the medical research enterprise still produces operationally translatable biomedical knowledge. The drift that exists is more subtle: the gradual shift from long-horizon, institution-directed work toward near-term, customer-directed work under the pressure of reimbursable funding models and transition-oriented metrics.

Operational Models

The DoW research and engineering enterprise relies on a diverse set of financial business models to fund laboratory operations, balance baseline stability, and maintain mission agility. Understanding these funding mechanisms, ranging from fixed appropriations to customer-driven reimbursements, is critical for optimizing resource allocation and ensuring DoW laboratories can rapidly respond to emerging warfighter requirements. The business model types are:

Core Funded. In a core funded arrangement, a laboratory receives a fixed, upfront budget to cover all costs for a defined scope of work, usually described in the Laboratory's R-2 Doc. This funding covers both direct and indirect costs and can include Laboratory Civilian salaries.

Reimbursable. A reimbursable model is when the laboratory performs work for a customer and is paid only for the actual costs incurred, plus any agreed-upon fee. This model is often used for customer directed research (e.g., from a program office), specialized services, or engineering support.

Hybrid Model. A hybrid model typically involves a combination of the core funded and reimbursable models. Core funding offers a level of stability since a basic level of funding is programmed into budgets. The reimbursable side of the hybrid model allows the laboratory to recover "surge" costs associated with performing work for a customer. This may include surging their civilian and contractor workforces and recovering specific costs associated with conducting dedicated research or engineering support.

Working Capital: When Congress establishes a WCF, they provide direct appropriation to a fund. This initial appropriation and positive fund balance is called a cash corpus. Using the cash corpus, fund managers purchase products and services, usually in advance of an anticipated requirement (e.g., a deport overhaul of an aircraft or ship), and establish a product catalog for its customers. Fund managers set product prices and established rates for services that typically do not change until the next fiscal year.

Congress has established several WCFs for DoW:

- Navy Working Capital Fund (NWCF): The Assistant Secretary of the Navy (Financial Management & Comptroller) manages the NCWF. Four activity groups (called "business areas") support the Navy and Marine Corps: Depot Maintenance, Transportation, Supply Management, and ***Research and Development***. The NWCF for R&D is a significant source of funding for the Navy Laboratories and Warfare Centers.

- Army Working Capital Fund (AWCF): The Assistant Secretary of the Army (Financial Management and Comptroller) manages the AWCF. There are two activity groups in the fund: Supply Management and Industrial Operations. The AWCF is not a significant source of funding for the Army laboratories.

- Air Force Working Capital Fund (AFWCF): The Air Force Deputy Assistant Secretary for Budget (SAF/FMB) manages the AFWCF: There are two activity groups: Consolidated Sustainment and Supply Management-Retail. *The AFWCF is not used for any AF laboratory activity.*

Business Models used in the Laboratories

Figure 30 shows how the four types of business models are used in the Defense Research Enterprise as reported in the Laboratory Assessment data call.

Each of the business model types have both pros and cons in how the laboratory responds to research and engineering demands. Listed below are typical Pros/Cons for each type.

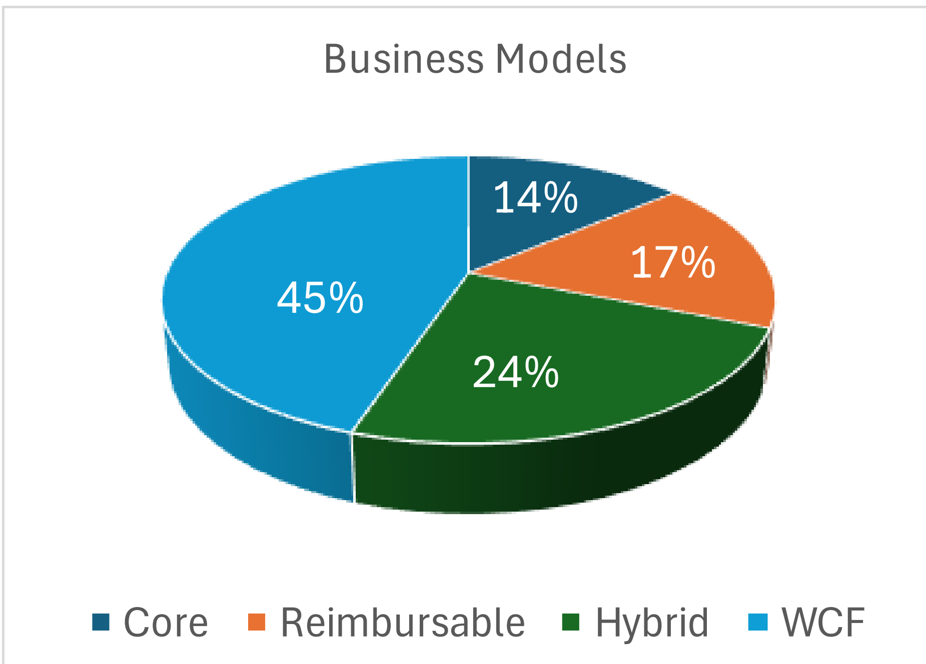


Figure 30. Percentage of laboratory business models

Pros & Cons of the Lab Business Models

Business Model	PROS	CONS
Core Funded	• Budgets are known up front from year to year	• Budgets are fixed across the FYDP and are slow to respond to urgently emerging requirements
Reimbursable	• Provides mechanism for charging for additional research and engineering support • Enhances the adaptability of organizations to fluctuations in customer demand	• Budgets can be unpredictable based on customer requirements
Hybrid	• Provides a balance between the stability of known core budgets and flexibility of responding to customer needs	• May increase accounting workload
Working Capital	• Provides maximum flexibility to respond solely to customer demands for laboratory skills and capabilities • Can expand or contract based on demand. Efficiency: It forces us to justify our costs to customers who have choices. • WCFs funds do not have fiscal year limitations and do not expire, allowing for long-term planning and stability, freeing activities from certain constraints of annual appropriations	• In some cases, WCFs are not equivalent to RDT&E funds for certain Laboratory flexibilities • Time delay of approximately 2 years to re-establish rates can potentially cause a deficit in the WCF • STRLs using WCF cannot use their Manage-to-budget to flex their civilian workforce • If a major program is delayed, we still have fixed labor costs but no incoming “revenue,” leading to potential deficits.

Enterprise Measurement

Across the DRE, the existing measurement framework consists of two sets of indicators: activity and financial. Activity indicators are measurements such as number of patents filed, CRADAs executed, TRLs advanced, contribution scores achieved, utilization rates, customer-satisfaction surveys, transition events, comprehensive-review findings, Defense staff years of technical effort (STE)/professional technical staff (PTS) ceiling utilization, and contract-ceiling drawdown. Financial indicators are the OUSW(C) obligation and expenditure rates. However, none of these measures demonstrate what the institution achieves at the portfolio level against the comparative advantages, capability backstops, and perishable expertise that define their value. Isolated programmatic success stories are routinely cited in the data call, annual reports, and congressional testimony to validate the existence of the DRE. But isolated examples from multi-billion-dollar, multi-faceted portfolios do not constitute portfolio-level evidence of performance commensurate with investment.

Furthermore, a notable observation in the enterprise management of the DRE is the frequent transition of senior leadership within the laboratories. Using corporate tenure for peak effectiveness benchmark as a comparison, the Corporate Executive Officer average length of assignment in 2025 was 7.1 years, DRE service-laboratory commanders operate at roughly half of the corporate CEO peak effectiveness benchmark. AFRL and NRL commanders are at approximately one third of the six-year peak. ARL Directors at ~5–6 years approach the year-six peak; ERDC Directors at ~7 years exceed it. The civilian SES versus military rotation distinction explains the gap. The continued rotation of senior leadership is a contributing factor slowing the innovation efficiency of the DRE and adding additional burden to the DRE performance.

The most analytically consequential finding is that the absence of portfolio-level outcome accountability produced a measurement framework whose center of gravity is the OUSW(C) Rule-of-Thumb Acquisition Obligation and Expenditure Rates published by the Defense Acquisition University (DAU).[15] This framework has filled the institutional accountability space that adequate strategic-outcome metrics would otherwise occupy.

The OUSW(C) benchmarks are excellent for the purpose they were built for: tracking the velocity at which appropriated funds move through legal commitment and disbursement processes, protecting Comptroller-level oversight of cash-flow planning, and identifying funds at risk of expiration. They are deeply problematic as the effective primary performance signal for institutions whose strategic mission is sustaining technology-based comparative advantages, maintaining surge-readiness and mobilization capacity, preserving perishable technical expertise, providing trusted independent advice through long-duration sponsor relationships, or producing the engineering depth that connects research to fielded capability. Measures of performance would enable a director of any DRE institution to objectively determine, at the portfolio level, whether the institution is performing as expected commensurate with the size of its budget and the scope of its mission.

A portfolio-level measurement system for any of the DRE institutions should possess seven characteristics:

1. *Declared by the institution itself:* anchored on each institution's declared comparative advantages, capability backstops, and perishable expertise, rather than imposed externally
2. *Auditable:* capable of being verified by independent third parties
3. *Longitudinal* tracking changes over multi-year time horizons consistent with research and engineering depth
4. *Comparable*: allowing comparison across categories while respecting the differences in mission and business model.
5. *Gaming-resistant*: designed to discourage the activity-metric capture and Goodhart's Law dynamics that have eroded existing proxy metrics.
6. *Differentiated by category/business model/etc.*: recognizing that the appropriate measurement framework differs for an analysis FFRDC, a UARC, a laboratory, a warfare center, an engineering center, and the medical research enterprise, etc.
7. *Carry institutional consequence at least equal to the OUSW(C) benchmark framework*, because metrics that do not carry consequence do not change institutional behavior.

[15] Office of the Under Secretary of War (Comptroller) and Defense Acquisition University, Rule-of-Thumb Acquisition Obligation and Expenditure Rates (most recent update February 1, 2026).

Recognizing that the frameworks are not currently implemented at any institution in the enterprise, implementation should be a foundation for future work.

Conclusion

The findings of this defense enterprise assessment highlight vulnerabilities in how DoW manages, staffs, and secures its research ecosystem. Identifying these systemic bottlenecks, including deteriorating infrastructure, SCIF accreditation hurdles, restrictive workforce ceilings, and fragmented bench-level communications across STRLs, FFRDCs, and UARCs, is a vital first step. These operational friction points actively degrade our technological edge and overextend our existing workforce. Translating these insights into actionable solutions will require a sustained, aggressive remediation effort rather than passive observation, ensuring our research enterprise can rapidly adapt to the demands of modern warfighting.

Furthermore, these roadblocks intersect with the MILCON community, enterprise-wide security adjudication, contracting, and human capital, where the complexity and scope dictate a synchronized, whole-of-department approach. To effectively dismantle these silos, the Department must leverage and empower established governance structures where applicable, specifically the Laboratory Quality Enhancement Panels, the Science and Technology (S&T) Executive Committee, and the Communities of Interest, and establish cross-functional working groups to drive and execute changes across the enterprise.

To guide this sustained effort and systematically address the large number of institutional barriers identified during the enterprise-wide data call, R&E will develop a comprehensive implementation plan. This plan will serve as the strategic roadmap for these established groups, having clear milestones, actionable metrics, and definitive timelines for executing the recommended reforms. By tracking progress against this implementation plan, leadership can ensure accountability and maintain the momentum necessary to overcome entrenched bureaucratic resistance.

Only by integrating stakeholders from intelligence, security, facilities, and personnel with our R&E leadership can we forge a resilient, unified defense research enterprise. Driving these necessary reforms, such as securing dedicated RDT&E infrastructure funding, standardizing administrative procedures, and deploying centralized knowledge management, will eliminate the largest friction points. Ultimately, this whole-of-department effort, anchored by a rigorous implementation plan, will optimize resource allocation and ensure the Department maintains a highly agile ecosystem, capable of delivering timely, world-class capabilities to the warfighter at the tactical edge without redundant investments.